**DECLASSIFIED
WITH DELETIONS**

ISO--610-Del.

DE93 006692

This document consists of
45 pages. Copy No. [redacted]
of [redacted] copies. Series [redacted]

CHEMICAL PROCESSING DIVISION
MONTHLY REPORT
FOR

AN. 96316

NOVEMBER, 1966

Compiled by
SECTION MANAGERS

December 21, 1966

ISOICHEM INC.
RICHLAND, WASHINGTON

**DECLASSIFIED
WITH DELETIONS**

By Authority of CG-FB-1

DS 61010 10-4-92

DA 61010 10-10-92
PM Eick 10-16-92

Work performed under Contract No. AT(45-1)-1851 between
the Atomic Energy Commission and Isochem Inc.

Received by OSTI

NOV 30 1992

DISCLAIMER

ROUTE TO:

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

FILE AND DATE

**DECLASSIFIED
WITH DELETIONS**

GROUP 1

Excluded from Automatic Down-
grading and Declassification.

DISTRIBUTION RESTRICTED TO U.S. ONLY

DISTRIBUTION

Copy Number

1	J. N. Judy
2	H. D. Gilbert
3	E. T. O'Sullivan
4	P. E. Reed - J. H. Warren
5	R. F. Campbell
6	W. C. Cronin - W. A. Lane
7	L. I. Brecke
8	M. K. Harmon
9	T. A. McCoy
10	R. W. McCullugh
11	G. H. Sahler
12	R. E. Smith
13	L. L. Zahn
14	C. R. Bergdahl
15	R. E. Tomlinson
16, 17, 18	U. S. Atomic Energy Commission, Richland Operations Office Attention: D. G. Williams, Manager
19, 20, 21	U. S. Atomic Energy Commission, Washington 25, D. C. Attention: F. P. Baranowski, Director Production Division
22	File Copy - V. R. Chapman
23	Isochem Files, 271-U, 200-West

TABLE OF CONTENTS

DISTRIBUTION	2
TABLE OF CONTENTS	3
STAFF	4
I. SUMMARY	5-6
II. ACHIEVEMENTS	
A. Production Planning Section	A-1 through A-3
B. Purex Section	B-1 through B-2
C. Redox Section	C-1 through C-4
D. Plutonium Finishing Section	D-1 through D-2
E. Financial Operation	E-1 through E-3
F. Facilities Engineering Section	F-1 through F-4
G. Research & Engineering Section	G-1 through G-8
H. Employee Relations Operation	H-1 through H-4
I. Waste Management Section	I-1 through I-2
J. CPD Services Section	J-1 through J-2
III. PERSONNEL ACTIVITIES	K-1 through K-2
IV. REPORTS ISSUED	L-1 through L-2
V. PATENT SUMMARY	M-1

STAFF

President, Isochem Inc.	J. N. Judy
Vice President, Business Management	H. D. Gilbert
Vice President, Marketing	E. T. O'Sullivan
Vice President, Plant Operations	P. E. Reed
Manager, Facilities Engineering	H. P. Shaw
Manager, Research and Engineering	R. E. Tomlinson
Manager, Manufacturing	J. H. Warren
Manager, Plutonium Finishing	L. I. Brecke
Manager, Production Planning	M. K. Harmon
Manager, CPD Services	T. A. McCoy
Manager, Redox	R. W. McCullugh
Manager, Waste Management	R. E. Smith
Manager, Purex	L. L. Zahn

DECLASSIFIED

ISO-610

CHEMICAL PROCESSING DIVISION
MONTHLY REPORT

DEL

NOVEMBER, 1966

I. SUMMARY

November production, as percent of the Quarterly Forecast (ISO-377), is summarized below:

	<u>November</u>	<u>Fiscal Year to Date</u>
Separated plutonium nitrate	69	106
Separated uranium nitrate	78	104
Uranium oxide	94	106
Plutonium metal buttons	95	99

All production facilities performed satisfactorily although an unusual variety of feed materials were processed. The Purex plant completed an irradiated natural uranium processing campaign during the first part of the month and processed irradiated 94-metal from the five old reactors during the last part. In addition, 2000 gallons of sulfate-free waste were separated for shipment to Battelle-Northwest laboratories. The Redox plant completed the processing of N-reactor fuels about mid-month. This was followed by a PRTR fuels processing campaign. At month's end, the Redox plant was being prepared for the processing of Shippingport Reactor blanket fuel elements. The Uranium Oxide plant operation was limited to the processing of depleted natural uranium except for the processing of a small inventory of depleted 94-metal material which was used up the first three days of the month. Performance of the plutonium button line and the plutonium reclamation facility was satisfactory.

The shipment of depleted enriched uranium oxide, which was discontinued during the Fernald plant strike, was resumed on November 17.

Metallographic examination of a typical drain lid from the depleted uranium oxide outside storage area indicates that there should be no failure of lids for five years.

Purex head end processing of acid waste recovered 720 kilocuries of promethium-147 and 240 kilocuries of strontium-90. A total of 120,000 curies of cesium-137 was loaded for shipment to Oak Ridge National Laboratory.

The In-Tank Solidification unit completed processing non-boiling wastes in the 101-BY underground waste storage tank and in the process reclaimed 2.88 million gallons of tank space. The unit was switched to the 102-BY tank and resumed operation on November 23.

An analysis of the large condensers in the Purex plant indicates that the thermal insulation can be eliminated with no significant detrimental effect

DECLASSIFIED

on canyon ventilation or equipment and at a significant saving (\$5,000 - \$7,000 average) for each condenser replaced or repaired in the future.

Preliminary study of the Redox Multiproduct Capability Facility indicates that the entire dissolution and extraction process can be housed in the 202-S canyon and silo areas. Present buried "hot" piping is adequate and spare pipe routings are available.

Laboratory studies indicate that not all the material in the first In-Tank Solidification tank (101-BY) will solidify. In search of a method to prevent the formation of a liquid phase in 101-BY, some of the concentrate was pumped to 105-BY where 1.1 pounds of Portland cement was mixed with each gallon. Pumping was accomplished satisfactorily at a 400 gpm rate with a 400 gpm Barrett Haentjens' pump driven by a 25 hp motor. The transfer lines were electrically heated. No data is available at this writing on the condition of the waste-cement mixture.

The propylene pall rings in the Plutonium Reclamation CO column (used to strip plutonium from the extractant) were found to have deteriorated severely and were replaced with a mixture of green and white teflon and kynar rings which should prove superior.

Vice President
Plant Operations

DECLASSIFIED

~~SECRET~~ **CLASSIFIED**

ISO-610

SECRET

CHEMICAL PROCESSING DIVISION
MONTHLY REPORT

NOVEMBER, 1966

II. ACHIEVEMENTS

A. PRODUCTION PLANNING

1. Production Statistics

a. <u>Percent of Forecast(1) Achieved</u>	<u>November</u>	<u>Fiscal Year to Date</u>
Separated plutonium nitrate	89	106
Separated uranium nitrate	78	104
Uranium oxide	94	106
Plutonium metal buttons	95	99
b. <u>Purex</u>	<u>November</u>	<u>October</u>
Uranium nitrate produced (tons)	491	915
Average production rate during operation (T/D)	28	30
Total waste loss (%)		
Plutonium	0.56	0.32
Uranium	0.27	0.23
On-line efficiency (%)	74	100
c. <u>Redox</u>		
Uranium nitrate produced (tons)	69	146
Average production rate during operation (T/D)	4	6
Total waste loss (%)		
Plutonium	1.00	0.30
Uranium	0.48	0.43
On-line efficiency (%)	73	70
d. <u>Uranium Reduction (tons)</u>		
Normal UO ₃ loaded	626	718
Enriched UO ₃ loaded	40	196
Normal UO ₃ approved for storage	626	718
Enriched UO ₃ approved for shipment	51	172
Normal UO ₃ shipped	0	0
Enriched UO ₃ shipped	132	121
Normal UNH backlog	102	433
Enriched UNH backlog	275	53

(1) ISO-377, QUARTERLY PRODUCTION FORECAST

DECLASSIFIED

**DECLASSIFIED
WITH DELETIONS**

ISO-610

CEL

f. Power

	<u>200-East</u>	<u>200-West</u>
Raw water pumped (gpm)	9 430	6 120
Filtered water pumped (gpm)	995	998
Maximum steam generated (lbs/hr)	234 000	144 000
Average steam generated (lbs/hr)	167 000	109 000
Total steam generated (M lbs)	120 251	78 507
Coal consumed (tons)	5 975	3 957

All production facilities performed satisfactorily although an unusual variety of feed materials was processed. The Purex plant completed an irradiated natural uranium processing campaign during the first part of the month and processed irradiated 94-metal from the five old reactors during the last part. In addition, 2000 gallons of sulfate-free waste were separated for shipment to Battelle-Northwest laboratories. The Redox plant completed the processing of N-reactor fuels about mid-month. This was followed by a PRTR fuels processing campaign. At month's end, the Redox plant was being prepared for the processing of Shippingport Reactor blanket fuel elements. The Uranium Oxide plant operation was limited to the processing of depleted natural uranium except for the processing of a small inventory of depleted 94-metal material which was used up the first three days of the month. Performance of the plutonium button line and the plutonium reclamation facility was satisfactory.

Manager, Production Planning
Chemical Processing Division

**DECLASSIFIED
WITH DELETIONS**

NOVEMBER, 1966

2. FISSION PRODUCT DATA (Kilocuries)

INVENTORIES									
HEAD END	002-CR	003-CR	B-PLANT	SSW IN PROCESS	SSW PRODUCT	CASK	CONSIGN- MENTS	RECOVERY	SHIPMENT
0	2670	1030	1,000	20(1)	930	-	-	240	-
0		3110	10,090	100(2)	0	-	-	720	-
			6,510						
						120		120	0

Sr-90

Pm-147 (Unaged)

Pm-147 (Aged)

Cs-137

DECLASSIFIED

(1) 55 KCi loss from Process Tests 3 and 4.

(2) 120 KCi loss from Process Tests 3 and 4.

DECLASSIFIED

ISO-610 DEL

CHEMICAL PROCESSING DIVISION
MONTHLY REPORT

NOVEMBER, 1966

II. ACHIEVEMENTS (Continued)

B. PUREX SECTION

1. Operating Continuity

Processing of normal uranium at a 3.6 capacity factor rate continued until shutdown, November 1 through November 5, in order to replace resin screens in the plutonium ion exchange unit and a plugged feed jumper in the #1 organic solvent system. Operations then resumed at the same rate on normal uranium until November 12 when the plant was shut down for cleanout in preparation for the 94 metal run and planned maintenance. Processing of 94 metal containing defense grade plutonium began November 20 and continued at 3.3 capacity factor rate until month's end except for a brief outage November 22 to make a sulfate-free waste separation. Approximately 2000 gallons of sulfate-free waste were collected in the early portion of the 94 metal run by using synthetic 3WB (backcycle).

2. Processing Operation

Production of scheduled normal uranium for the month was achieved and turn-a-round completed to 94 metal. Processing of the 94 metal was successful and exceeded the scheduled amount for the month.

Product quality remained excellent for both plutonium and uranium and was well within specifications.

Waste losses were acceptable with uranium at .026 percent and plutonium at 0.53 percent of the respective monthly throughputs. The plutonium loss was higher than normal due to the HAO organic blend jumper leak, which partially drained the HA column.

Two neptunium runs were processed in the Neptunium Purification Facility and two shipments were made during the month totaling 1710 grams.

3. Equipment Experience

The failed Pulse Generator J-2 was completely reconditioned this report period by replacing the carbon rings, expanders, push rods, seals, and bushings to the process cylinder. The electric gear head drive motor was replaced and the main gear box was overhauled.

The electric driven roll-up type metal door to the railroad tunnel, 202-A Building, was overhauled and repositioned. Vertical clearance

DECLASSIFIED

DECLASSIFIED

ISO-610 DEL

CHEMICAL PROCESSING DIVISION
MONTHLY REPORT

NOVEMBER, 1966

II. ACHIEVEMENTS (Continued)

B. PUREX SECTION

1. Operating Continuity

Processing of normal uranium at a 3.6 capacity factor rate continued until shutdown, November 1 through November 5, in order to replace resin screens in the plutonium ion exchange unit and a plugged feed jumper in the #1 organic solvent system. Operations then resumed at the same rate on normal uranium until November 12 when the plant was shut down for cleanout in preparation for the 94 metal run and planned maintenance. Processing of 94 metal containing defense grade plutonium began November 20 and continued at 3.3 capacity factor rate until month's end except for a brief outage November 22 to make a sulfate-free waste separation. Approximately 2000 gallons of sulfate-free waste were collected in the early portion of the 94 metal run by using synthetic 3WB (backcycle).

2. Processing Operation

Production of scheduled normal uranium for the month was achieved and turn-a-round completed to 94 metal. Processing of the 94 metal was successful and exceeded the scheduled amount for the month.

Product quality remained excellent for both plutonium and uranium and was well within specifications.

Waste losses were acceptable with uranium at .026 percent and plutonium at 0.53 percent of the respective monthly throughputs. The plutonium loss was higher than normal due to the HAO organic blend jumper leak, which partially drained the HA column.

Two neptunium runs were processed in the Neptunium Purification Facility and two shipments were made during the month totaling 1710 grams.

3. Equipment Experience

The failed Pulse Generator J-2 was completely reconditioned this report period by replacing the carbon rings, expanders, push rods, seals, and bushings to the process cylinder. The electric gear head drive motor was replaced and the main gear box was overhauled.

The electric driven roll-up type metal door to the railroad tunnel, 202-A Building, was overhauled and repositioned. Vertical clearance

DECLASSIFIED

[REDACTED]

to the entrance of the tunnel was increased by raising the roll-up door assembly eighteen inches. To improve the reliability of this equipment the metal curtain to the door assembly was replaced and mechanical repairs were made to the brake and drive mechanism.

The gear box to the R-2 motor generator set, which is the control unit for the R-2 Pulse Generator, was reconditioned this report period by replacing the bearings and seals. This work was a Preventive Maintenance Program item.

The load cable to the 40-ton hoist, located on the 202-A Building Canyon West Crane, was replaced this month. The need for this replacement was determined through the Preventive Maintenance Inspection Program.

Other equipment work at the Purex Plant included:

- a. Replacement of the feed pump to tank F-12 with a reconditioned spare.
- b. Overhaul of the railroad car pulley in the railroad tunnel by replacing the bearings and wheels.
- c. Installation of two new 1500 watt quartz light fixtures on the canyon west crane to improve general lighting for crane work in the canyon cells.
- d. Replacement of the feed recirculation pump in the neptunium recovery cycle with a repaired unit.
- e. Completion of work in trap pit #5 to tie in the new K4 condensate line to the header.
- f. Replacement of the resin regeneration piping in the demineralized water cation units.

4. Radiation Experience

Iodine-131 emission for the month was 3.95 curies with no significant excursions.

5. Analytical Experience

Assistance was provided to the Redox Analytical Laboratory during the November outage for analytical support of the Fission Product rare earth demonstration runs at the Strontium Semiworks Facility.

Two D-5 composites were analyzed during the month for plutonium, using the Pu-242 Isotopic Dilution method. The results, when received from the 234-5 Building Mass Spectrograph Laboratory, will be compared with results obtained by the Total Alpha method. Isotopic Dilution should provide an established independent method for the direct measurement of plutonium in process feed material.

DECLASSIFIED

Ch. Malady
for Manager-Purex

DECLASSIFIED

ISO-610

DEL

CHEMICAL PROCESSING DIVISION
MONTHLY REPORT

NOVEMBER, 1966

II. ACHIEVEMENTS (Continued)

C. REDOX SECTION

1. Operating Continuity

The processing of N-Reactor zircaloy-clad enriched fuels (NPR) started on October 28, was satisfactorily completed on November 17 and on November 18 the charging and dissolution of fuels from the Plutonium Recycle Test Reactor (PRTR) was started. PRTR processing was completed and the in-plant inventory depleted by 11-30-66. This was the fifth and last PRTR campaign scheduled for the Redox plant. During the final stages of PRTR processing, preparations were started for processing Shippingport blanket fuel elements (PWR). At month end the build-up of a feed inventory was well under way.

Plant performance during both the NPR and PRTR fuel processing campaigns was satisfactory. All products were well within shipping specifications and no extraction waste reworking was required during the entire month.

The Uranium Oxide plant operated satisfactorily throughout the month and the expected production of both depleted and 94 metal uranium oxide was achieved. All feed received from the primary plants and all powder produced met quality specifications.

2. Processing Operations

a. Redox Processing

The final NPR fuel processing campaign, scheduled for the Redox plant, was terminated on 11-17-66. Overall the campaign proceeded very well. Performance of the solvent extraction system was good, overall waste losses were nominal and product streams within shipping specifications. No difficulty was experienced in disposing of dissolver coating wastes. During the initial NPR campaign earlier this year, frequent plugging of the coating waste line was encountered. Indications are that the adoption of the reverse strike technique (adding waste to caustic versus the usual caustic addition to waste) for neutralizing the coating waste may be responsible for the improved performance in this area.

The fifth and final processing campaign using irradiated fuel material from the Plutonium Recycle Test Reactor (PRTR) was initiated on November 18, with the charging of the A-2 dissolver. Subsequent

[REDACTED]

solvent extraction processing went very well and the in-plant inventory was depleted by 11-30-66. Since the irradiated fuel material was of no further value to the Plutonium Recycle Program, no extensive product segregation was necessary between NPR and PRTR fuel processing.

Concurrent with the final stages of PRTR processing, preparations were started for the processing of Shippingport blanket fuel elements (PWR) and included: 1) salt flushing of the processing equipment, 2) isolation of the in-plant neptunium inventory, 3) dissolving and build-up of the PWR feed solution.

Charging of the PWR fuels to the Redox plant's B-2 dissolver was started on 11-23-66 and at month end the last of this material was being charged to the A-2 dissolver. The fuel, which had been stored underwater in the T-Plant canyon, was transferred via special cask cars temporarily assigned to this service.

The solvent extraction columns were shut down late on 11-23-66 to permit the majority of employees to observe the Thanksgiving Holidays, November 24 and 25. However, fuel dissolving and the build-up of feed inventory was maintained with minimum crews.

b. Uranium Oxide Processing

Processing in the Uranium Oxide plant was very satisfactory throughout the month and the expected production of both depleted and 94 metal uranium oxide was achieved.

The work stoppage at the National Lead Company plant, Cincinnati, Ohio, was terminated on 10-21-66 and three flatcars of empty shipping containers were received at mid-month. Shipments of enriched uranium oxide powder to National Lead were resumed on 11-17-66.

The processing of standard 94 UNH feed from the Redox plant was completed on 11-4-66, using one calciner. Subsequently all six calciners were put on depleted UNH feed from the Purex plant. Processing continued essentially uninterrupted until the feed inventory was depleted on November 23. Plant operations were suspended for the Thanksgiving Holidays and the following weekend as scheduled. Processing was resumed on 11-29-66, using 94 UNH feed from the Purex plant and continued through month end.

Thorium oxide conversion test No. 6 was resumed and completed this month. This particular test run was started during June 1966, but higher than expected radiation levels were encountered during the denitration step, forcing an indefinite postponement of the test to allow additional "cooling" time.

[REDACTED]

DECLASSIFIED

DECLASSIFIED

ISO-610

DEL

Preparations are in progress to provide a quantity of 210 uranyl nitrate trihydrate (UNT) required for criticality studies in the Physical Constants Test Reactor. The studies will provide basic information necessary for the design of processing equipment to handle higher enriched uranium. Batch type pot calciner No 17 has been selected for performing this work and at month end rejuvenation and modification of the pot was essentially complete. It is planned to start UNT preparation during December, 1966.

Investigation of the observed corrosion on the lids of the 55-gallon mild steel drums used for outside storage of uranium oxide powder was completed this month. A drum lid, typical of many which had been stored unprotected in the upright position for about two and one-half years, was submitted to the Materials and Process Chemistry Unit, Battelle-Northwest laboratories, for metallographic examination. The deepest penetration observed is about five mils. A radiograph of the lid was made which showed the location of the deepest pit. Examination of a cross section through this pit showed a penetration of about nine mils. It appears, from the above investigation, that the present method of storage presents no immediate problem (i.e. within the next five years). However, a similar annual inspection is planned in order to monitor the rate and extent of corrosion.

3. Mechanical Experience

a. Redox Plant

The E-13 UNH ozonator pump failed on 11-4-66, after approximately two years of service. A rebuilt replacement pump was installed; however, difficulties encountered with the in-canyon power jumper installation and obtaining electrical continuity extended plant down time to approximately fourteen hours. The power jumper could not be made up to the existing canyon wall head and it was necessary to revert to a spare head and revise the wiring.

A plant outage was taken on 11-11-66, for replacement of the D-14 backcycle waste pump which failed to provide adequate feed solution delivery rates. During this same outage other equipment installations were completed, including: 1) replacement of the ammonia scrubber drain valve jumper between the B-2 dissolver tower and the B-1 rinse water receiving tank, 2) a new E-13 UNH ozonator sampler jumper.

The quartz-iodine lamps, ordered in August, 1966 for the 202-S Building canyon crane trolley arrived this month and were installed. A significant improvement in lighting has resulted, estimated by the crane operators to be as much as 50 to 75 percent. The new lamps are the same wattage as the incandescent lamps they replaced and are rated at twice the life.

b. Uranium Oxide Plant

The large Worthington process air compressor located in the 271-U Building was given a complete overhaul this month. Valves on the high and low compression cylinders, gaskets, motor sheave, and drive belts were replaced.

A break in the eight-inch sanitary water line near the 2715-UA Building occurred on 11-28-66. Excavation and repair was completed on 11-29-66 by the J. A. Jones Construction Company. No calciner operating time was lost due to this water line failure.

4. Radiation Experience

The removal of piping and equipment from the 1-F cubicle in the 222-S Analytical Laboratory was completed this month. Although radioactive contamination levels were high, the job was completed without incident. The 1-F cubicle is to be converted to an analytical hot cell by the J. A. Jones Construction Company as part of the laboratory conversion to Waste Management - Fission Product work.

5. Analytical Experience

In addition to the routine analytical work in support of NPR, PRTR, and PWR fuel processing in the Redox plant, the following special services were provided: 1) uranium analyses on forty-one samples submitted by the Separations Chemistry Laboratory to provide data for their studies related to the processing of 2-5 percent U-235 fuels, 2) americium-241 by gamma energy analyses on a series of samples taken from the Z-9 crib area to provide data on the extent of migration of this isotope from the Z-9 crib, 3) gas chromatographic analyses on fifteen organic samples submitted by Materials and Process Chemistry, Battelle-Northwest Laboratories, as part of their continuing study to determine the degradation of TBP and D2EHPA due to radiolysis, 4) lithium and sodium analyses on forty-eight aqueous samples submitted by Materials and Process Chemistry, BNW, in support of their waste solidification program.

RH M. Callaghan
Manager - Redox

DECLASSIFIED
WITH DELETIONS

ISO-610 **DEL**

CHEMICAL PROCESSING DIVISION
MONTHLY REPORT

NOVEMBER, 1966

II. ACHIEVEMENTS (Continued)

D. PLUTONIUM FINISHING SECTION

1. Operating Continuity

The production of plutonium metal was satisfactory during the month. Plutonium-recovery operations were slowed by slag-and-crucible dissolver plugging and by failure of the packing in the organic cleanup column. The incinerator furnace was operated on a part-time basis, as manpower was available.

2. Processing Operations

a. Plutonium Processing

Button line production consisted of weapons-grade plutonium exclusively.

Shipments of nondefense plutonium were made to Argonne National Laboratory (14 kilograms of metal and 1.5 kilograms of oxide), United Nuclear Corporation (242 grams of oxide), and Euratom (2 kilograms of metal).

b. Plutonium Reclamation

Sixty-eight kilograms of plutonium, as nitrate, were recovered and delivered to the button line from the recovery facilities.

Fourteen hundred and fifty-two cans containing 26 kilograms of plutonium were processed through the slag-and-crucible dissolvers.

Eighty-two grams of plutonium were returned to the main process stream from 135,000 liters of aqueous waste processed through the waste-treatment facility.

Twenty-two boxes of waste were processed through the incinerator furnace.

D-1

DECLASSIFIED
WITH DELETIONS

3. Maintenance

The button line equipment performed satisfactorily during the month. Minor delays resulted in fluorinator vacuum problems and calciner filter blow-back difficulties. At month-end it was necessary to replace the gear drive of the vacuum drum filter.

Recovery equipment performed well, with the following exceptions. It was necessary to replace the packing in the CO (organic cleanup) column. (The Pall rings made from polypropylene were found to have dissolved and/or disintegrated. Replacement was made with 90% Teflon Raschig rings and 10% Kynar Raschig rings.) The Mark II (04) slag-and-crucible dissolver plugged, and two of its thermohms failed. Nineteen process pumps failed (18 repaired and one, a Deanline, buried).

The 1 MEV X-ray unit was dismantled, packaged, and shipped to the Lawrence Radiation Laboratory on November 30.

4. Radiation Experience

Radiation and contamination control statistics indicate satisfactory control.

One case of potential plutonium deposition occurred when an operator experienced a puncture wound while working in one of the process hoods. The wound required excision by the industrial physician. The extent of the deposition has not been determined.

5. Quality Control

Average Button Impurity (TMI+C)	573 ppm
Average Button Pu-240 Content (WG) (as determined by neutron count)	6.06 %
Average Button Density	19.44 g/cc
Button Line Recycle to Reclamation	32.1 kg
Average Impurities in Reclamation Output (TMI)	1,660 ppm

6. Analytical Control

Number of Samples	3,058
Number of Determinations	5,709

The backlog of work for the mass spectrometer was significantly relieved during the month.

L. J. Brecha
Manager
Plutonium Finishing

DECLASSIFIED

~~DECLASSIFIED~~

ISO-610

DEL

CHEMICAL PROCESSING DIVISION
MONTHLY REPORT

NOVEMBER, 1966

II. ACHIEVEMENTS (Continued)

E. FINANCIAL OPERATION

1. Cost Accounting

November operating costs amounted to \$2,525,000 which is the highest recorded in the fiscal period to date. However, the total figure is only \$23,000 above that recorded for October. This increase is the net result of the following variances from October expenditure levels:

<u>Increase In:</u>		<u>Decrease In:</u>	
Salaries and Benefits	\$ 53,000	Materials	\$ 59,000
J.A. Jones Charges	39,000	Railroad	26,000
Battelle Charges	7,000	Data Processing	3,000
Service Assessments	20,000	Other	<u>21,000</u>
Other	<u>13,000</u>		
Total	\$132,000	Minus	\$109,000 = <u>\$23,000</u>

2. Asset and Inventory Control

As of November 30, 1966 there were fifteen active projects. Following is a summary of current status of projects:

	<u>\$ In Thousands</u>
Total Authorized Amount of 200 Area Projects	\$17 557
Funds Authorized to Isochem Inc.	
Total Cost to Date	\$3 280
Commitments & Open Work Balance	267
Unencumbered Balances	<u>1 406</u>
	<u>4 953</u>
Total Funds Held and/or Authorized by the AEC	<u>\$12 604</u>

During November, one Modification to a Directive and one Work Authority were received from the AEC: Modification No. 4, Directive No. EQT-009, Project CGC-124, Increased Processing Flexibility - Purex, authorizing extension of directive completion date from November 1, 1966 to May 1, 1967; Work Authority No. I-3, Directive No. EQT-028, Project CAC-176, Second In-Tank Solidification.

~~DECLASSIFIED~~

DECLASSIFIED

System - 200 East Area, authorizing increase of funds to \$150,500, and transfer of capital equipment in the amount of \$185,000.

b. FY 1967 General Purpose Equipment

Isochem-managed FY 1967 fund allocation was increased to \$1,900,000 by AEC Directive EQT-55, Modification 4. Of this \$65,000 was reallocated to Battelle-Northwest for procurement of equipment to work on Isochem's O2 sponsored R&D programs.

The following AR's were issued in November:

76013	Temperature Monitors at Semiworks	\$ 4 900
76016	Dissolver Off-Gas Temperature Control System	7 950
76019	Replace TV Equipment for A Column	5 500

The following AR's are being held:

76004	Air Conditioners for 801A, B&C; 102A & 105A	4 700
76010	Atomic Absorption Spectrophotometer	13 000
76017	Marshall PT-RH Wound Tubular Furnace	4 794
76018	Controlled Atmospheric Welding Booth	19 548

Total expenditures plus commitments for FY 1967 through November are \$685,514.

c. Use Tax Increases

A recent change in AEC interpretation of Washington State Use Tax laws provides that all Research and Development capital equipment procured after June 6, 1961 and costing more than \$100 with an estimated life of three years or more will be subject to use tax.

A review of our procurement from June, 1961 shows that it will be necessary to increase Isochem Use Tax base by \$200,000. The revised interpretation will result in an increase to our use tax payments of \$788 annually for a new total of \$4,400.

d. Tighter Controls

In connection with the Presidential directive to cut expenditures, it was agreed by the Manufacturing Department section managers to have their subsection managers review purchase requisitions in excess of \$100 for the balance of FY 1967.

DECLASSIFIED

DECLASSIFIED

ISO-610

Del

3. Financial Planning and Management Systems

a. AEC Management Information System

Several meetings and informal discussions were held during the month to resolve problems resulting from changing input and system requirements of the Financial subsystem.

The additional requirement that each contractor's master file balance within fund type caused major revisions to the beginning balance input and will require extensive analysis of the sub-accounts structure prior to resubmission of July changes.

b. Forms Control

A program designed to review printed forms requirements revealed 189 forms which were no longer required.

for Treasurer

CHEMICAL PROCESSING DIVISION
MONTHLY REPORT

NOVEMBER, 1966

II. ACHIEVEMENTS (Continued)

F. FACILITIES ENGINEERING SECTION

1. Purex

IAP-600 - Purex 203-A UNH Rework Storage Facility

Directive No. AEC-267, Mod. 1, extended the project completion date from November 15, 1966 to March 1, 1967.

IAP-605, Rev. 1 - Purex Analytical Laboratory Modifications

The project proposal revision requesting total project funds of \$220,000 was in the comment draft stage at the end of the month. The scope of the project is revised to include the storage addition, modifications for a new hot laboratory and a fire sprinkler system for the entire main floor of the laboratory building. The building addition for office space was deleted.

IAP-606, Rev. 1 - Purex Process Condensate Crib 216-A-38

A project proposal revision, requesting a one-half sized process condensate crib (\$157,000), is circulating for approval.

ICE-608 - Purex D-5 In-Line Sample Station

The project proposal to provide an in-line sample and analytical facility, capable of analyzing large volumes of high radioactivity dissolver solutions, is circulating for Isochem approvals. The estimated cost is \$100,000.

IAP-610 - Purex Steam Condensate Crib 216-A-37

A project proposal requesting \$70,000 for a supplemental steam condensate crib is circulating for approval.

CGC-172 - Plutonium Concentration and Storage Facilities, L-Cell, Purex

A project proposal revision requesting a reduction in the project scope of work and an extension of the schedule is circulating for approval. The estimated project cost remains at \$230,000.

DECLASSIFIED

ISO-610

100-1

CGC-124 - Increased Processing Flexibility, Purex

Project Proposal, Revision 3, requesting extension of the project completion date to May 1, 1967, was authorized by Directive No. EQT-009, dated November 15, 1966.

Filter Rejuvenation, 291-A Filter #1

The instrumentation required for a humid air circulation system was reviewed. Portable instrument racks will be set up in the 213-A Building. All principal instrument components required for the installation are available on-site.

Atomic Absorption Flame Spectrometer

An appropriate request has been approved and money is now available to complete the installation of the atomic absorption flame spectrometer in the Purex laboratory. Components needed to complete the installation are being purchased. The scrubber has been re-designed to allow fabrication and assembly from readily obtained components to avoid the long delivery on the packaged unit.

Thermal Insulation of Purex Condensers

An analysis of the large Purex condensers indicates that the thermal insulation can be eliminated with no significant detrimental effect on canyon ventilation or equipment. Plant concurrence has been received and the insulation will be eliminated from the new 1-UD Condenser, Project CGC-183; also, a "hot" condenser presently being repaired will not be reinsulated. An estimated immediate cost savings of \$10,000 to \$12,000 will result from this change. An additional savings of \$5,000 to \$7,000 will be realized for each future condenser replacement or extensive "hot" modification.

Pumps as Steam Jet Replacements

Detail design is proceeding to install pumps as steam jet replacements in TK-G8, TK-R8 and TK-F18 to eliminate the possibility of exceeding the 150° F design temperature of the encased waste lines.

2. Redox

Project ICP-604 - Waste Management Analytical Laboratory, 222-S

All detail design drawings and specifications have been issued. The project cost estimate, based on complete detail design, is \$256,000 as compared to the project proposal estimate of \$340,000.

DECLASSIFIED

Redox Multiproduct Capability, MRC-11

Preliminary study indicates that the entire dissolution and solvent extraction process can be housed in the existing 202-S canyon and silo areas. Presently installed "hot" piping is adequate and spare routings are available. In addition, it would be possible to provide more spare "hot" routings for those portions of the process that require light shielding; these routings could be provided by light shielded encasements in the north and south sample galleries and/or in the south storage gallery.

Alternate waste management concepts have been developed for handling high level wastes in the Redox Plant.

A "di-2-ethyl process" would be installed in Redox to remove promethium and strontium from the high level radioactive waste. Storage capability and a cask loadout station would be provided to permit the accumulation and transfer of these isotopes to the FPCE plant. Facilities would also be provided for perpetual care storage.

No Recovery Cleanout and Am-Cm Recovery

Design work was started on flow sheets and jumpers for cleanout of the Redox Neptunium recovery facilities and an americium-curium recovery campaign from Shippingport fuel.

3. Waste Management

IAE-607 - Third In-Tank Waste Solidification System, 200 West Area

Preparation of a project proposal requesting a third ITS unit to be located in the 241-TX Tank Farm is continuing.

CAC-176, Rev. 2 - Second In-Tank Waste Solidification System, 200 East Area

A project proposal revision requesting total project funds in the amount of \$800,000 including \$35,000 for transferred capital property was authorized by Directive No. EQT-028, Mod. 2, dated Nov. 10, 1967.

IAP-609 - Purex Tank Farm Vent System Expansion

The project proposal requesting total project funds is being altered to include a heater in the vent exhaust system.

Additional Waste Storage Tanks, Purex

Preparation of a project proposal was started to request authorization of detail design for four additional waste storage tanks adjacent to the AX Tank Farm.

DECLASSIFIED

ISO-610

DEL

Waste Disposal Crib 216-T-35

Criteria for the construction of Crib 216-T-35 has been prepared and is circulating for approval. This crib is a replacement for Crib 216-T-34, which is currently being used for the disposal of Battelle-Northwest 300 Area laboratory wastes. Current indications are that the new crib will be required about January 1, 1967.

4. Plutonium Finishing

Americium Monitor

A prototype probe has been assembled and used to provide final design data. Satisfactory performance has been obtained with only a 0.040" thick NaI crystal (1mm). It is believed that this very thin crystal will improve the ability to separate interfering gammas of higher energy. Design work has been started on the installation of the americium monitor in the 242-Z Building.

5. General

Emergency Power Test

The annual test of the emergency electrical power system for the Purex Facility was conducted on November 15, 1966. Simulated outages were made on each of the normal feeders to test the automatic closure of the 2300 volt bus-tie breaker. The emergency generator at Building 282-E was allowed to start automatically and assume the load which would be experienced in case of a complete failure of normal power. Two diesel powered generators start automatically and take over the essential loads in the tank farm. All components of the emergency system functioned properly.

Manager - Facilities Engineering

CHEMICAL PROCESSING DIVISION
MONTHLY REPORT

NOVEMBER, 1966

II. ACHIEVEMENTS (Continued)

G. RESEARCH AND ENGINEERING SECTION

1. Separations Process Engineering

Redox

a. KOH Metathesis Test

During the chemical decladding of Zircaloy-clad uranium metal fuel elements, some of the uranium metal is converted to uranium fluoride. This uranium fluoride remains in the dissolver after the coating solution is removed and, when the nitric acid is added to the dissolver to dissolve the uranium metal, the uranium fluoride also dissolves. Aluminum nitrate is added to the Redox dissolvers prior to uranium dissolution to reduce the corrosive effect of the fluoride ion. While this method is compatible with the aluminum nitrate salted Redox process, the aluminum additions currently required are undesirable for application to the Purex process because of the large increase in the high-level waste volumes. Current plans call for a potassium hydroxide metathesis step in the Purex dissolvers. This operation would remove a large portion of the fluoride from the dissolver prior to uranium metal dissolution.

A metathesis test was performed after chemically decladding a charge of Zircaloy-clad N-Reactor fuel elements in a Redox dissolver. In preparation for the metathesis, the decladding solution was diluted from 1,300 to 1,650 gallons, air sparged and transferred from the dissolver, and the dissolver rinsed with three 60-gallon water flushes.

The next three steps removed a total of 21 pounds of fluoride per ton of uranium charged. This amount of fluoride was enough to have reacted with 3.3 percent of the uranium metal charged to the dissolver to form uranium tetrafluoride.

Step 1 - Boil 1,000 gallons of 2.0 M potassium hydroxide solution for 2 hours.

Step 2 - Flush dissolver with 500 gallons of water.

Step 3 - Dissolve the uranium metal with nitric acid.

DECLASSIFIED

ISO-610

DEL

Step 1 removed 18 percent, and Step 2 removed 50 percent of the total fluoride. This left 7 pounds of fluoride per ton uranium in the metal solution. The goal for Purex metal solutions is less than 5 pounds of fluoride per ton. The metathesis solution and rinse water waste loss were 0.014 percent for uranium and 0.07 percent for plutonium.

2. Fission Products Process Engineering

a. In-Tank Solidification (ITS)

Waste Concentrate Pumping

Operation of the In-Tank Solidification unit in tank 101-BY was terminated during the month, and the unit moved to tank 102-BY. Tank 101-BY had reached terminal concentration (calculated 22 M sodium) with a volume of 540,000 gallons of waste representing the concentrate from evaporating 2.8×10^6 gallons of stored waste. A prototype pump transfer system was tested in tank 101-BY to evaluate the feasibility of pumping waste at terminal concentration to adjacent tanks. The system consisted of a 400 GPM Barrett Haentjens' pump, driven by a 25 HP motor, and associated electrically heated transfer lines. Operation of the pump was satisfactory at an average transfer rate of 400 GPM. Flow of bearing lubricant water had to be increased from 0.04 to 0.20 GPM to maintain adequate water in the bearing assembly; this amount of water dilution is not considered excessive.

ITS Concentrate Solidification

The wastes processed in the first ITS (In-Tank Solidification) tank were primarily sodium nitrate and carbonate solutions which, laboratory studies have indicated, will not completely solidify on cooling. This is due to the lack of sufficient waters of hydration associated with these salts. In an effort to prevent a liquid phase from separating as the tank cools and solidifies, a laboratory study was undertaken to determine which of the commercially available desiccants was most suitable for fixing the small amount of free water. Magnesium sulfate and commercial Portland cement were determined to be acceptable and, on the basis of cost and availability, the latter was chosen. Tank 105-BY was treated with Portland cement in the ratio of 1.1 lbs of cement per gallon of concentrate. Cement and concentrate were alternately added to tank 105-BY to effect mixing. Cement was transferred into the tank through three rotating nozzles with commercial cement air fluidization equipment. Gases were vented from the tank through a bag filter and a final high efficiency filter. Concentrate was transferred with the prototype Barrett Haentjens' pump. Operation of all equipment systems was satisfactory.

b. Cesium Cask Loading

The precipitation problems associated with the cesium feed solutions have been further defined and can be avoided by: (1) diluting the feed; (2) changing the pH of the feed; or (3) using uncooled feed.

Feed dilution with chilled water is used at present with the Decalso loaded ORNL SFT casks but has the disadvantage of adding water to nonboiling waste storage space which is presently at a premium. Changing the pH of the feed would require extensive equipment modifications, while use of uncooled feed reduces the Decalso loading to a level that is unacceptable.

Laboratory tests have been completed which demonstrate that AW-500 loading capacity near ambient tank temperature (50 C) is about a factor of 2 higher than the Decalso system using chilled feed. Extrapolation of the laboratory data indicates the SFT casks could be loaded to 90,000 Ci of cesium if the Decalso resin was replaced with AW-500. Loading at elevated temperatures would avoid feed precipitation problems and would reduce water addition to waste storage to a minimum.

c. Brink Off-Gas Deentrainer

The prototype Brink Mist Eliminator (tradename of Monsanto Company) installed in the ITS unit off-gas stream has continued to operate satisfactorily with radiation readings and differential pressures unchanged during the month. It can now be concluded that the prototype demonstration is successful, and a Brink unit is suitable for handling alkaline ITS type off-gases with a particle removal efficiency of 98-99 percent.

3. Plutonium Process Engineering

a. Process Experience - Plutonium Reclamation

The CO column, used for stripping plutonium from the TBP-CCl₄ extractant in the Reclamation Facility, was removed from service when the CO product line became plugged and could not be flushed clear. Upon removing the top of the column, it was found that all of the 1/2-inch propylene pall rings had disintegrated, and that all but about 5% were missing from the column. These rings had been in service about two years, or about one year longer than their predicted life expectancy. Except for a siege of plugging problems, there was no other outward indication of their total failure and disappearance. The organic seems to have been stripped well with the only mixing in the 6-inch column provided by two screen plates. Aqueous waste losses have been acceptably low. The column.

DECLASSIFIED

ISO-610

DEL

was repacked with a mixture of green and white teflon and kynar rings, all of which, by test, should provide much longer service life.

The original slag and crucible dissolver (04) used in the Reclamation Facility has experienced continued plugging problems. The trouble appears to be due to failure of the condenser to condense surges of off-gas vapors; the off-gases later condense in the off-gas system and create significant volumes of liquid to be reprocessed. It is suspected that the condenser tubes are partially plugged, and that heat transfer is poor, even though numerous flushes have been made. The dissolver has been replaced and will be overhauled when work on the CO column is complete.

b. Process Experience - Americium Recovery

In the Americium Recovery Facility, americium is extracted from the salt solutions in a batch contact with di butyl phosphonate in carbon tetrachloride. Recently, the solvent losses incurred in this step have increased markedly. This increase has been due to the increase of "interface crud", which in turn has been due to the higher volume of incinerator ash leach solution being processed. Attempts are being made to improve the "crud" handling techniques so as to reduce organic losses.

The W-14 cation exchange column was eluted on October 24, 1966. All of the cuts were recycled since the americium concentration was very low. The resin had been changed on September 12, 1966, but loading conditions had not been entirely satisfactory during the following weeks. It had appeared that the column was actually eluted during the loading cycle on several occasions since high sump tank americium analyses were experienced. The resin was removed on October 25, 1966, and approximately 11 liters of new resin were added. Loading improved considerably following the change and was readily apparent by the gamma energy profile of the W-14 column. The column was eluted three times in November, and a total of 10.06 grams of americium was loaded out.

4. Separations Chemistry Laboratory

a. Solubility of Uranyl Nitrate in Nitric Acid

Data concerning uranyl nitrate - nitric acid solubility relationships as a function of temperature have been extended as an aid in evaluating the processing of 2 - 5% U-235 enriched fuels. While uranyl nitrate-nitric acid

solutions can readily be supercooled making freezing points difficult to determine, the clear point, or temperature at which the last crystal dissolves, can be determined reproducibly. Some representative data are tabulated below:

"Clear Point", in °C, of Uranyl Nitrate -
Nitric Acid Systems

<u>UN Conc.</u>	<u>0.6 M</u>	<u>0.8 M</u>	<u>1.65 M</u>
<u>HNO₃ Conc.</u>			
6 <u>M</u>	5	12.5	31
7 <u>M</u>	11	17	30.5*
8 <u>M</u>	12	16.5*	26
9 <u>M</u>	10*	15.5*	21
10 <u>M</u>	8	12	32
12 <u>M</u>	-4	-3	**

* Interpolated value.

** At 11.5 M HNO₃, clear point was 35 C.

b. Application of Atomic Absorption Spectrophotometer

Atomic absorption procedures have been demonstrated in the analysis of B-Plant essential materials for their calcium content. Sensitivities of 3, 2, 0.5 and 1.5 ppm were demonstrated on 40% DTPA, 40% HEDTA, 30% H₂O₂ and tartaric acid, respectively.

Modifications to the burner head which widened the 10 cm slot from 1/2 mm to 1 mm were accomplished also, and applications to high salt solutions were noticeably improved.

c. Specific Ion Electrodes for Calcium and Sodium

A specific ion electrode has been evaluated for possible application in determining the calcium content of strontium solutions. Reliable and repetitive detection was demonstrated in the range from 8 ppm to 0.2 M Ca. However, the instrument readings also varied with changes in strontium concentrations, and this will require further investigation.

Similarly a sodium electrode has been calibrated for synthetic solutions of supernate waste at sodium concentrations of 10⁻⁴ to 10⁻¹ N. Sodium values were reproducible to ± 8% and variations in anion content did not bias the results.

d. Solubility of Aliquat-336 in Waste Supernate

The solubility of Aliquat-336 (trademark - General Mills) in

synthetic waste supernate solutions was determined to be 3.1 g/gallon at 70 C decreasing to a very low value at 25 C. The determination was made by suspending a 5% by volume solution of Aliquat-336 on an inert 50-60 mesh substrate in a column jacketed for temperature control and then passing the supernate through the column. The remaining Aliquat-336 was then extracted with carbon tetrachloride and measured to determine the solubility by difference.

e. Technetium Analytical Extraction Procedure

Another analytical procedure for technetium has been developed which is based on the quantitative extraction of Tc-99 from a 0.5 N phosphoric acid matrix with cyclohexanone. The decontamination factors for RuRh-106 and Cs-137 were 980 and 16,500, respectively. The organic extract gave good recovery as demonstrated by mounting and beta counting. The procedure also yields a solution compatible with liquid scintillation counting requirements.

f. Methods for Organic Materials

Effort has been expended in the laboratory for several months in an effort to characterize organics and to evaluate competing diluents for the extraction processes. These efforts are essentially completed and have led to changes in specification methods of analysis as well as to the development and application of new methods. New distillation equipment has been purchased and placed in service. A new method for determining bromine number (method D1159-61 ASTM) was found to be superior to our procedure, and it has been incorporated into the Manual of Essential Materials. During this work it was found that storage of the diluents at temperatures near or below 0 F should be avoided since they partially solidify in that temperature region.

Only the Southhampton NPH diluent has met all specification tests to date. Most other diluents fail on the permissible aromatic content.

5. Plutonium Chemistry Laboratory

a. Low Level Waste Processing

Hydroxide precipitation studies are being conducted on low level solvent extraction waste, CAW. The purpose is to find conditions for immobilizing the alpha activity in a solid cake.

Using high pH values (≥ 9.5) and concentrated NH_4OH , a manageable precipitate was obtained containing all precipitable salts, and the plutonium and other alpha emitters.

Using concentrated NaOH and a pH of 4, the entire mass sets up to a gel. This would be a cheap method of immobilizing the solution. Reverse strikes enable one to bypass this gelling pH range when trying for a high pH.

To precipitate only a fraction of the hydroxides, the pH region ≤ 3.6 must be employed using concentrated reagent NH_4OH as the precipitant.

b. Rhodium, Palladium and Technetium Recovery

Methyl tricapryl ammonium chloride absorbed on firebrick or diatomaceous earth was shown to extract palladium from alkaline supernatant solution. Only moderate amounts of rhodium were absorbed. Thirty-five hundred micrograms of palladium per gram of substrate were loaded after 136 column volumes of feed with no palladium breakthrough. Rhodium showed 50% breakthrough at 10 column volumes, and 100% breakthrough at 20 column volumes. Continued column operation resulted in reducing the rhodium peak on the column so that only 100 micrograms rhodium per gram of substrate were left after 136 column volumes. Selective, consecutive, stripping of rhodium by ammonium nitrate and of palladium by ammonium thiocyanate-ammonium hydroxide was demonstrated.

c. Measurement Problems in Americium Purification

The preliminary results from a laboratory study of the D2EHPA solvent extraction purification flowsheet of americium indicated serious material balance discrepancies. A more detailed study of this problem was initiated to analyze, determine, and remedy the material balance problems.

Problems such as sampling technique; solution handling; volume measurement; homogeneity and constituents of solutions; the effects of time upon sampling, analyzing, and consistency of solutions; the adhesion of americium to the glass and plastic equipment; interface between phases; and analytical procedures were considered causes for error. A detailed, single extraction cycle test showed similar discrepancies on a beaker-scale. All of the above causes except analytical procedure and techniques were eliminated as major contributors of error.

A statistical average value of the analyses for the Plutonium Finishing Section Analytical Laboratory and for the Separations Chemistry Standards Laboratory, and their 95% limits on the

DECLASSIFIED

ISO-610

Dec.

aqueous and organic solutions were obtained. There was no bias between laboratories.

Since the analysis of the organic solution had the largest variation in both laboratories, another organic analytical procedure was considered. This procedure involved a strip cycle of the organic with HNO_3 , and an analysis of the resulting phases.

The results of the aqueous phase analysis from a 6 M HNO_3 strip showed an increase of 10% in the amount of americium over that of the originally reported value. By using the results of the strip cycle products in lieu of the original organic analysis, the material balance for this extraction cycle closed within 4%. It was concluded that the analysis of the organic phase was the largest single source of error.

d. Lithium Aluminate Development

Experimental pressing of cylinders continued using a 7/8 in. die. Three mixes were used, all without PVA. Moisture content of the pressing mix was the variable.

Pellets were precompact and pressed at 8 tons, with a water content of 21% in the pressing mix. These procedures resulted in pellets with bulk densities of 90.6 and 92.6 percent of theoretical when sintered at 1300 C for 1½ hours.

Another set of pressings was performed identified as Run 3-P using PVA in solution, and a die of 1-1/8 in. in diameter. Pressing was done at 9 tons (precompacting) and 10 tons on the Watson-Stillman power press. Sintering temperature was 1300 C for two hours. Sintering was performed as the report period ended, and results appeared satisfactory.

R. E. Taulinson

Manager
Research and Engineering

CHEMICAL PROCESSING DIVISION
MONTHLY REPORT

NOVEMBER, 1966

II. ACHIEVEMENTS (Continued)

H. EMPLOYEE RELATIONS

1. Education & Training

Computer Sciences Corporation is starting a second series of classes in Introduction to Data Processing and Fortran Programming. Isochem has five people attending both the courses.

2. Technical Recruiting

Through November, 13 colleges have been visited by Isochem recruiting teams. The interview schedules in general have been somewhat smaller than last year, but the quality of those people interviewed seems to have risen considerably. Based on conversations with the students, other Hanford contractors, and recruiting representatives from other industries, plant visits will be necessary in practically all cases where we plan to extend offers. Even though last year the competition for engineers at the undergraduate level probably reached its peak, it appears that this year the competition will be even greater and also salary offers will be considerably higher--at least 5 to 6 per cent over last year's.

Isochem placed a one-page advertisement in the student AICHE Members Publication and also had a listing in the College Placement Annual. We have already received six letters from areas outside our recruiting sphere, indicating either an interest in consideration for permanent employment or for summer employment. We have also received several referrals from the U. S. Rubber Company; namely, PhD's who had expressed an interest in nuclear work and in Isochem. We expect to be referring a number of people also to both the U. S. Rubber Company and the Martin Company since we have already interviewed people who have expressed interest in both the parent organizations.

The Isochem Technical Graduate Manual was updated and reissued during the month. The new cover now shows the Isochem logotype.

3. Benefits

Alonzo "Jack" M. Stafford, Foreman - CPD Services, died November 1, 1966. Death was caused by a coronary-arteriosclerosis.

A special sale of golf balls as Christmas gifts was held from November 1 through 18. A total of 35 dozen golf balls was sold amounting to \$247.21.

DECLASSIFIED

ISO-610

Cal

3. Benefits (Continued)

William N. Jenkins, Separations Process Operator, died November 18, 1966. Death was caused by a myocardial infarction. This is Isochem's fourth death case.

4. Union Relations

There were 8 grievances filed during the month of November of which 4 were processed at the Step 2 level.

One of the most significant items, so far as the Union is concerned, has been the deduction of "service credits" for employees that did not work during the work stoppage. This was the subject of grievances at Step 2 by all contractors and the Union continues to exert pressure to get the companies to grant "service credits".

The Union has also pressed for lists of overtime worked during the work stoppage and intimated they would withdraw this demand if the Company would forget about deduction of "service credits".

It now appears that the Sandon grievance will be resolved short of arbitration. Meetings were held with the Union which included Instrument Development Laboratory personnel. The Union has agreed verbally to a settlement, but requested that the settlement be put in writing.

Wm. Watson Jr.
for Manager - Employee Relations

CHEMICAL PROCESSING DIVISION
MONTHLY REPORT

NOVEMBER, 1966

<u>Operation:</u>	<u>General</u>	<u>R&E</u>	<u>FES</u>	<u>Waste Mgt.</u>	<u>CPD Prod.</u>	<u>Serv.</u>	<u>Redox</u>	<u>Purex</u>	<u>Pu. Fin.</u>	<u>Total</u>	<u>YTD</u>
Dis. Injuries										0	2
Safety Invest.										2	7
Med. Treat. Inj. 1				2		8	4	6	3	24	343
Rad. Occurrences				3			5	2	3	13	128
Contam. Wds.									1	1	7
New. Dep. Cases										0	6
Fires									1	1	9

Safety Investigation, ISO-66-6, CPD Services, 11-9-66

Injured reached for tool on top of a shop bench and apparently dragged a six and one half-pound steam trap cover onto his foot, incurring fractures to the great toe and second toe of his left foot. The injured was not wearing safety shoes.

Safety Investigation, ISO-66-7, CPD Services, 11-17-66

As injured stepped down from a 30-inch high fabrication pad to an 18-inch stool, the stool tipped causing injured to fall backwards to the floor. Injured incurred contusions and abrasions to both hands and a fracture of a bone in his left wrist.

Fire, ISO-66-9, Plutonium Finishing, 11-23-66

Material containing a nitric acid solution was placed in a contaminated waste can and caused spontaneous combustion in waste paper. The loss was \$10.

ISO-610

DEL

CHEMICAL PROCESSING DIVISION
MONTHLY REPORT

NOVEMBER 1966

(Continued)

Radiation Occurrences, ISO-616, Waste Management, 11-29-66, 11-30-66

After loading the WSEP 30-ton liquid transfer cask with sulfate-free Purex LW solution in the 212-A Building on November 29, 1966, a small amount of flush solution was blown out of the flexible plastic fill line, contaminating four employees. One process operator received an internal deposition approaching 25 per cent of the MPBB for ruthenium-106 and 1.5 per cent of the MPBB for zirconium-niobium-95.

On November 30, 1966, after loading a similar cask, a small amount of the LW solution leaked out of the cask into the loading well causing high exposure rates to two operators. The maximum dose received was 1.7 rem penetrating and 3.3 rem derma.

DECLASSIFIED

ISO-616

CEL

[REDACTED]

CHEMICAL PROCESSING DIVISION
MONTHLY REPORT

NOVEMBER, 1966

II. ACHIEVEMENTS (Continued)

I. WASTE MANAGEMENT SECTION

1. Operating Continuity

Fission product recovery continued at the Purex Head End until mid-month when Purex was shut down. B-Plant processing facilities remained down to allow continuation of Phase III construction work. The Phase III process tests were resumed at the Semiworks. Two cesium casks were loaded at the Cesium Loadout Facility. In-Tank Solidification processing was switched from underground storage tank 101-BY to 102-BY.

2. Processing Operations

a) Head End (Purex)

Head End processing recovered 720 kilocuries of promethium-147 and 240 kilocuries of strontium-90 from Purex acid waste.

b) B-Plant

Processing facilities remained shut down to allow construction forces to proceed with Phase III work in Cell 5.

c) Semiworks

Phase III process test runs 3 and 4 were completed. Test 3 was made to demonstrate the solvent extraction flowsheet for Purex Acid Sludge waste in Phase III. Test 4 was made to demonstrate the solvent extraction flowsheet for Purex Acid Waste, using citrate complexing of the feed in place of HEDTA, a chelating agent previously demonstrated as being suitable. The equipment performed well. Detailed process performance is being analyzed and studied.

d) Cask Loadings

Two STT casks (46 and 48) were loaded with 60,000 curies of cesium-137 each and made ready for shipment.

DECLASSIFIED

ISO-610

[REDACTED]

Two of five casks, each containing 310 gallons of sulfate-free 1WW solution from Purex, were shipped to the Waste Solidification and Engineering Prototype (BNW). The three remaining casks will be loaded and shipped early next month.

Six casks, each containing 200 gallons of cerium waste, were received from Battelle-Northwest Laboratories and unloaded at the Semiworks for ultimate disposal to Tank 104-AX.

e) Waste Management

The 242-T waste evaporator recovered 185,000 gallons of waste storage space in November, making a total of 2.23 million gallons reclaimed by this unit.

Final In-Tank Solidification (ITS) processing was completed in Tank 101-BY on November 3. Since startup on 3-19-65, a total of about 2.88 million gallons of waste storage space was reclaimed. The ITS equipment was then moved to Tank 102-BY, the second tank to be solidified by this technique, where preheating of the tank contents was started on November 23.

Following installation of a steam coil in Tank 101-AX to evaporate the non-boiling waste contained in this vessel and thus supplement the waste space recovery program, preheating of the tank was started on November 23.

3. Mechanical Experience

Four transfer pumps, located in the underground waste storage tanks, failed during the month. Two of the failures occurred in the 118-TX Tank, which is the feed tank for the 242-T Evaporator. All of the failed pumps were successfully replaced.

A special prototype sludge pump, which will be required later for In-Tank Solidification Unit No. 2, was tested by pumping concentrated supernatant from Tank 101-BY to Tank 105-BY. The pump performed excellently, delivering an average of 400 gpm.

4. Radiation Experience

Four personnel received low level nasal and facial contamination while attempting to flush the loading lines which had been used to load a cask. All were successfully decontaminated and released.

OK Submit for R E Smith
Manager
Waste Management

CHEMICAL PROCESSING DIVISION
MONTHLY REPORT

NOVEMBER, 1966

II. ACHIEVEMENTS (Continued)

J. CPD SERVICES SECTION

1. Power Operation

There were no interruptions to steam, water or electrical services that affected continuity of operation at the production facilities.

The 200 East Area emergency electrical system was tested during the month. The emergency generator in the 284-E Building came on the line automatically and sustained the operation of the emergency equipment in the Purex Plant.

The electrical switch gear for the new raw water pumps for 282-E is now on the plant ready for installation.

It was necessary to raise the main 10-inch steam line to the 234-5 Building at the railroad overpass to allow clearance for large equipment that was moved from U-Plant to B-Plant. The line was raised about eighteen inches. This work was accomplished in an 8-hour period.

New floorsealant was applied to the firing aisle floors in both the 284-E and 284-W Buildings. The maintenance shop in 284-W and the chlorine room in 283-W were painted.

2. Shops Operation

Six round trip movements of 30-ton casks by truck to transport sulfate-free LWW waste from Purex to Battelle-Northwest laboratories were completed without incident. Two 200-gallon cask loads of waste from Battelle-Northwest laboratories were trucked to the Strontium Semiworks for unloading and were returned.

The modification of 150 existing M-102 shipping containers is in progress and is about 25 percent completed.

X-ray equipment located in the 234-5 Building plutonium inspection laboratory was removed and crated for shipment to the Lawrence Radiation Laboratory.

Shops and Services equipment and materials inventories were reduced by \$10,280 by excessing unneeded items.

3. Special Services Operation

Equipment valued at approximately \$10,000 was received from customers

J-1
DECLASSIFIED

DECLASSIFIED

ISO-610

DEL

for decontamination inspection and repair or burial. Equipment that was decontaminated and repaired and valued at approximately \$70,000, was returned to customers at a net savings of approximately \$50,000.

The PWR fuels, stored in the T-Plant canyon were loaded out to cask cars for shipment to Redox during the period December 20 through November 30.

Farmelo
Manager - CPD Services

CHEMICAL PROCESSING DIVISION
MONTHLY REPORT

NOVEMBER, 1966

III. PERSONNEL ACTIVITIES

A. FORCE SUMMARY

	<u>Monthly Salaried</u>		<u>Weekly Salaried</u>		<u>Total</u>	
	<u>10-31-66</u>	<u>11-30-66</u>	<u>10-31-66</u>	<u>11-30-66</u>	<u>10-31-66</u>	<u>11-30-66</u>
General	1	1	1	1	2	2
Research & Engineering	62	63	33	33	95	96
Facilities Engineering	63	63	19	18	82	81
Manufacturing						
General	1	1	-	-	1	1
Production Planning	4	4	4	4	8	8
Waste Management	35	35	120	121	155	156
CPD Services	32	31	185	189	217	220
Redox	49	47	194	193	243	240
Purex	51	51	184	185	235	236
Plutonium Finishing	<u>39</u>	<u>39</u>	<u>177</u>	<u>175</u>	<u>216</u>	<u>214</u>
Total CPD	337	335	917	919	1254	1254
Corporate Offices and Business Management Division	<u>83</u>	<u>81</u>	<u>76</u>	<u>79</u>	<u>159</u>	<u>160</u>
Grand Total	<u>420</u>	<u>416</u>	<u>993</u>	<u>998</u>	<u>1413</u>	<u>1414</u>

B. PERSONNEL CHANGES

No activity during the report period.

K-1

DECLASSIFIED

DECLASSIFIED

ISO-610

Dec

C. VISITORS

<u>Name</u>	<u>From</u>	<u>Nature of Visit</u>
G. Pashade	General Electric Portland, Oregon (11/15 - 11/17)	Oversee removal of the 1 MEV X-ray machine for shipment to the Lawrence Radiation Laboratory.
M. W. Boback J. A. Quigley	National Lead Co. Cincinnati, Ohio (11/29/66)	Discuss UO ₃ fission product specifications and tour UO ₃ plant.
Stanley Baldwin	Beckman Instruments Inc. Portland, Oregon (11/30/66)	To show equipment and tool samples.

CHEMICAL PROCESSING DIVISION
MONTHLY REPORT

NOVEMBER, 1966

IV. REPORTS

A. PREPARED AND ISSUED

ISO-70 1, (Secret), "Design Criteria, 210 Metal Processing, Purex Coproduct Demonstration Case," R. D. Ehrlich, 11/9/66

ISO-170 2, (Unclassified), "Design Criteria, Process Condensate Crib 216-A-38, Revision 1," G. C. Oberg, 11/10/66

ISO-185 1, (Unclassified), "Design Criteria, Purex Tank Farm Expansion," J. W. Barnes, 4/1/66

ISO-227 - Part 1, (Unclassified), "A Guide to Criticality Safety in the Plutonium Chemistry Lab - Specifications Bases and Criticality Hazards Control," H. H. Hopkins, 12/1/66

ISO-280 1, (Unclassified), "Design Criteria, Purex Analytical Laboratory Modifications and Additions," R. C. Roal, 10/17/66

ISO-533 1, (Unclassified), "Design Criteria, Purex L-Cell Package Replacement, Revision 1," R. C. Roal, 10/17/66

ISO-543, (Unclassified), "Trip Report: Oak Ridge National Lab and Savannah River Plant - September 26-30, 1966," R. E. Felt and D. C. Nelson, 10/24/66

ISO-551, (Secret), "Chemical Processing Division Construction Project Data Sheet for FY-1968 Budget, Neptunium and Plutonium Recovery Facilities at the Semiworks," C. A. Lyneis, 11/4/66

ISO-562, (Secret), "Waste Tank Strontium and Cesium Inventories," P. E. Reed, 10/28/66

ISO-566 1, (Unclassified), "Design Criteria, 216-A-37 Crib, Revision 1," G. C. Oberg, 11/3/66

ISO-567, (Secret), "Analysis of Neptunium Batches Purex No. 9-66 and 10-66," M. K. Harmon, 11/4/66

ISO-571, (Unclassified), "Operating Parameters for an R-F Plasma Torch," J. M. Caulkins, 11/4/66.

ISO-572, (Unclassified) "Plasma Spheroidization of Al_2O_3 and MgO ," J. M. Caulkins, 11/4/66

DECLASSIFIED

DECLASSIFIED

ISO-610

DEL

ISO-573, (Unclassified), "Measurement Problems in Americium Purification," J. M. Caulkins, 11/4/66

ISO-577, (Secret), "Evaluation of Process Test BL 66-1 Tantalum Lid for Pressure Vessel," I.N. Taylor, 11/11/66

ISO-584, (Unclassified), "Interim Evaluation of Purex Process Test - Normal Paraffin Hydrocarbon Diluent," F. L. Walser, 11/15/66

ISO-587, (Secret), "Analysis of Neptunium Batch Purex No. 10-66," M. K. Harmon, 11/14/66

ISO-592, (Unclassified), "Supplemental Shipping and Critical Mass Hazards Specifications - Shippingport Reactor Blanket Fuel Processing at the Redox Plant," G. L. Hanson and H. C. Rathvon, 11/17/66

ISO-593, (Unclassified), "Determination of Rhodium and Palladium by Atomic Absorption Spectrometry," D. P. Sandoz, 11/18/66

ISO-595, (Unclassified), "Proposed Redox Dissolution and Head End Flowsheets for PWR-1 (Shippingport) Blanket Fuel Elements," D. F. Davis, 11/22/66

ISO-597, (Secret), "Engineering Study, Coproduct Demonstration, Redox Blending," R. D. Ehrlich, 11/30/66

CHEMICAL PROCESSING DIVISION
MONTHLY REPORT

NOVEMBER, 1966

V. PATENT SUMMARY

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

Inventor

Title

None

Vice President
Plant Operations

DECLASSIFIED

END

**DATE
FILMED**

3 / 18 / 93