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CHEMICAL PROCESSING DIVISION

MONTHLY REPORT

FOR

NAW-95584

AUGUST, 1966

Compiled by
SECTION MANAGERS

ISOICHEM INC.
RICHLAND, WASHINGTON

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By Authority of CG-PR-2

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PM Eck 10-23-92

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STAFF

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Vice President, Chemical Processing	.	.	.	.	.	.	.	.	.	P. E. Reed
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CHEMICAL PROCESSING DIVISION
MONTHLY REPORT

AUGUST, 1966

I. SUMMARY

Production for August and the fiscal year to date is summarized below. Comparisons against the Quarterly Production Forecast are omitted from this report, since a new forecast, adjusting schedules for the 44-day work stoppage which started at midnight July 8, is not yet available.

	<u>August</u>	<u>Fiscal Year to date</u>
Separated plutonium nitrate (kg Pu)	13	64
Separated uranium nitrate (tons U)	32	100
Uranium oxide (tons U)	40	40
Plutonium metal buttons (kg)	0	114

The HAMTC work stoppage against Isochem Inc. ended on August 22, 1966 following the ratification by the Union membership on August 21 of the settlement proposal. Operation of the Uranium Oxide plant was resumed on August 22, the first calciner operation since June 17 when the plant was shut down for repairs and for vacations. The processing of normal uranium in Purex was started on August 28, following the thorium cleanout and plant restoration activities which were carried on through the work stoppage period. A neptunium removal campaign and plant acid flush were carried out during the work stoppage period in Redox, and the plant was starting up at month's end. The plutonium button line was shut down all month due to the lack of feed, but the plutonium reclamation columns and slag and crucible dissolvers operated all month at curtailed rates.

The In-Tank Solidification unit was shut down the last eight days of the month to repair weld failures in the main air line to the circulator. Before shutdown, the unit had recovered 125,000 gallons of waste space in August and a total of 2.5 million gallons since startup.

The 242-T waste evaporator boil-off for August was 181,300 gallons.

Following the discovery in July of a leaking waste line in the concrete

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encasement between the Purex canyon building and the 241-A waste tank farm, the encasement was broken into and the pipes were inspected at nine separate bends. Although no additional leaks were found, four wrinkles were observed in the piping at two locations. These distorted sections of pipe were replaced. Engineering analysis indicates that temperatures in excess of 180 F may have been encountered which would cause expansion interference with adjoining hardware. Intensive study was begun on the problem of appropriate temperature control.

Vice President
Chemical Processing Division

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CHEMICAL PROCESSING DIVISION MONTHLY REPORT

AUGUST, 1966

II. ACHIEVEMENTS

A. PRODUCTION PLANNING

1. Production Statistics

<u>a. Plutonium and Uranium Products</u>	<u>August</u>	<u>Fiscal Year to Date</u>
Separated plutonium nitrate (kg Pu)	13	64
Separated uranium nitrate (tons U)	32	100
Uranium oxide (tons U)	40	40
Plutonium metal buttons (kg)	0	114
 <u>b. Purex</u>	 <u>August</u>	 <u>July</u>
Thorium nitrate produced (tons thorium)	0	41
Uranium nitrate produced (tons)	29	0
Average production rate during operation (T/D)	8	6
Total waste loss (%)		
Plutonium	0.22	-
Uranium	0.11	-
U-233	-	1.2
Thorium	-	2.4
On-line efficiency (%)	12	23
 <u>c. Redox</u>		
Uranium nitrate produced (tons)	3	68
Average production rate during operation (T/D)	-	10
Total Waste loss (%)		
Plutonium	-	0.38
Uranium	-	0.18
On-line efficiency (%)	-	23
 <u>d. Uranium Reduction (tons)</u>		
Normal UO ₃ loaded	0	0
Enriched UO ₃ loaded	85	0
Normal UO ₃ approved for storage	0	0
Enriched UO ₃ approved for shipment	40	0
Normal UO ₃ shipped	0	0
Enriched UO ₃ shipped	0	40
Normal UNH backlog	92	64
Enriched UNH backlog	84	166

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e. Plutonium Metal Processing

August

July

Waste disposal (grams)	376	110
------------------------	-----	-----

f. Power

200 East

200 West

Raw water pumped (gpm)	8 893	5 583
Filtered water pumped (gpm)	753	946
Maximum steam generated (lbs/hr)	188 000	88 000
Average steam generated (lbs/hr)	63 000	49 000
Total steam generated (M lbs)	46 781	36 604
Coal consumed (tons)	2 372	1 890

The HAMTC work stoppage against Isochem Inc. ended on August 22, 1966 following the ratification of the settlement proposal by the Union membership on August 21. Operation of the Uranium Oxide plant was resumed on August 22, the first calciner operation since June 17 when the plant was shut down for repairs and for vacations. The processing of normal uranium in Purex was started on August 28, following the thorium cleanout and plant restoration activities which were carried on through the work stoppage period. A neptunium removal campaign and plant acid flush were carried out during the work stoppage period in Redox, and the plant was starting up at month's end. The plutonium button line was shut down all month due to the lack of feed, but the plutonium reclamation columns and slag and crucible dissolvers operated all month at curtailed rates.

MK Harmon

Manager, Production Planning
Chemical Processing Division

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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	2,670	0	1,000	75	930	0		0	0
0	0	0	16,560	220 (1)	0	0		0	0
						40		40	

Sr-90

Pm-147 (Unaged)

Pm-147 (Aged)

Cs-137

(1) 20 KCi loss from Process Test #2.

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CHEMICAL PROCESSING DIVISION
MONTHLY REPORT

AUGUST, 1966

II. ACHIEVEMENTS (Continued)

B. PUREX SECTION

1. Operating Continuity

Post-thorium processing operations and final preparations for normal uranium metal processing were completed during the report period. Initial plant startup was at 0500 on August 28, 1966, and hot feed entered the extraction battery at 2130. Continuity of operations was maintained through the end of the month.

2. Processing Operation

A capacity factor rate of 2.8 was attained at startup and has been sustained to date.

Both plutonium and uranium products met specifications. One run of out-of-specification Redox neptunium was processed through the purification facility.

3. Equipment Experience

The east Sample Gallery Hood exhaust fans, the P.R. exhaust, and the PIV Room exhaust fans were reconditioned this month by replacing bearings and drive belts as required to place the units in good condition.

The canyon process organic pump. G-1-2, failed this report period when the pumping requirements could not be met. The replacement pump was a reconditioned, contaminated spare.

Other equipment work at the Purex Plant included:

- a. Replacement of miscellaneous jumpers.
- b. Replacement of the R-2 column interface float in the No. 2 organic system.
- c. Installation of the C3 dissolver ammonia scrubber catch tank and dissolver tower.
- d. Completion of repairs by Minor Construction to the damaged organic wash waste line and the F-18 waste line in the encasement between the 202-A Building and the 241-AX diverter stations.

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4. Radiation Experience

Iodine-131 emission for the month was .017 curies.

5. Analytical Experience

A new procedure has been developed for the determination of neptunium-237 in neptunium product samples by X-ray fluorescence. Basically, the sample is read directly on the instrument, thus requiring a minimum amount of analytical time for sample preparation.

John Zahn, Jr.
for / Manager-Purex

LL Zahn:WCJ:gt

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CHEMICAL PROCESSING DEVISION
MONTHLY REPORT

AUGUST, 1966

II. ACHIEVEMENTS (Continued)

C. REDOX SECTION

1. Operating Continuity

The neptunium recovery campaign, started in the Redox plant during the latter part of July, was successfully completed and a record load-out of 3,707 grams shipped to the Purex plant for final purification. The neptunium recovered was 19 percent higher than the previous record established in March, 1964. The processing of 94 metal was resumed on August 27.

Because of the HAMTC strike against ITT/FSS and Battelle-Northwest and the work stoppage invoked against Isochem Inc., the Uranium Oxide plant remained in shutdown status until August 22. On this date calcination of 94 UNH feed from the Redox plant was resumed. No depleted UNH processing was done this month pending the return of the Purex plant to uranium-plutonium processing.

2. Processing Operations

a. Redox Processing

The neptunium recovery campaign, started on July 16, was brought to a successful conclusion this month and a new neptunium recovery record was established. The final loadout of neptunium following the July-August recovery run was 3,707 grams. The previous record of 3,110 grams was established in March, 1964.

The ruthenium released from the Redox stack during ozone treatment of the neptunium product for ruthenium removal was particularly successful. Less than three curies (2.8) total was emitted from the stack.

Concurrent with the final stages of neptunium processing, the Redox plant was cleared of organic solvent and all processing equipment flushed with 57 percent nitric acid. Approximately two kilograms of plutonium were recovered and returned to the system for reworking.

The processing of virgin 94 metal feed was resumed on August 27. However, plant on-line performance through month end was limited to approximately 36 hours because of equipment failures which

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required correction. These included: 1) regasketing of a leaking L-12 plutonium concentrator, 2) replacement of a plugged let-down valve on the LA extraction column, 3) repair of the steam trap on the LCU concentrator.

The 242-T waste evaporator operated at an on-line efficiency of 95 percent for the month at an average boil-off rate of 3.4 gpm. The equivalent of 143,687 gallons of underground nonboiling waste storage space was recovered, bringing the total to 1,688,156 gallons since startup on 12-3-65. Low evaporator boil-off rates experienced early in the month were increased appreciably with the transfer of low specific gravity feed from the 101-TY waste tank.

On two occasions during the month the waste transfer line between the 116 and 117-TX evaporator bottoms tanks became restricted if not entirely plugged due to the salting out of waste. On these occasions the 116 tank pump leaked small amounts of waste solution to the ground surface. The contamination in each instance was properly removed. To prevent recurrences of this type incident the 116 transfer pump has been equipped with a leak detection device and an automatic pump shutoff.

b. Uranium Oxide Processing

The Uranium Oxide Plant remained in shutdown status until August 22, because of the work stoppage invoked against Isochem Inc. With the termination of the strike against ITT/FSS and the work force at normal strength one calciner (H) was restarted on 94 UNH on 4-12 shift, August 22. This was the first calciner operation since the plant was shut down for a maintenance and vacation outage on June 17. No significant startup problems were encountered and the calciner operated satisfactorily. Maintenance work to return G calciner to operational status was subsequently completed and two-calciner operation (G and H) at 100 percent rates was resumed on August 29, and continued through the end of the month. All product produced met quality specifications. One carload of product was approved for shipment on August 31.

3. Mechanical Experience

a. Redox Plant

Canyon equipment performance during the neptunium recovery campaign, conducted during the work stoppage period, was satisfactory and no major equipment problems or breakdowns occurred. During this period special attention was given to critical equipment such as ventilation fans, air compressors, radiation instruments and alarm systems.

Equipment failures were encountered after 94 uranium metal processing

was resumed on August 27 and on-line performance was limited to approximately 55 percent of the available time in the balance of the month. Shutdowns were required to: 1) replace a flange gasket on the L-12 plutonium concentrator, 2) replace a plugged let-down valve on the 1A extraction column, 3) repair a leaking steam trap on the 1CU concentrator.

Other significant equipment work completed during the month included: 1) replacement of two failed impact wrenches on the 60 ton canyon crane, 2) lagging of the transfer line between the 116 and 117-TX evaporator bottoms tanks, 3) installation of a cut-off switch and alarm system on the pump at the 116-TX evaporator bottoms waste tank to detect packing gland and flange leaks.

b. Uranium Oxide Plant

Plant surveillance incorporating supervision was eliminated on August 22, 1966 when the work stoppage ended and a normal work force returned to work. Activities prior to August 22 continued to be directed toward maintaining the plant and facilities in safe standby condition.

Major maintenance work conducted after August 22, included: 1) overhaul of the depleted powder handling system exhausters, 2) completion of calciner thermohm nozzle sleeving, 3) off-gas line modifications on J calciner, 4) installation of an automatic feed system on H calciner, 5) class "A" overhaul of the calciner powder discharge system on J, K, L, and M calciners.

4. Waste Handling and Decontamination

Decontamination and repair work on equipment received during this and prior months, and having an acquisition cost of \$246,000 was completed and returned to customers. A savings of approximately \$200,000 over the cost of new equipment was realized.

The J. A. Jones Construction Co. completed the modification work on the Purex TA-3-1 dissolver tower, and the tower was moved out of the 221-T railroad tunnel on 8-17-66.

The M-130 cask arrived at Hanford on August 8, loaded with Shipping-port assembled blanket fuel elements that had been temporarily held at Idaho Falls, Idaho. It was unloaded without incident on August 19, at T-Plant. Unloading was delayed until completion of the Purex dissolver tower modifications being made in the T-Plant railroad tunnel.

5. Radiation Experience

The drilling of three lateral leak detection tunnels under the 105-SX waste storage tank by the Bortun Co. was completed on 8-24-66. No radioactive contamination was detected on the earth samples taken.

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The J. A. Jones Construction Co. completed the drilling of four holes through the dome of the 105-SX waste storage tank this month. The holes are to be used for installing boiling waste circulators. The job was completed without incident.

6. Analytical Experience

Analytical work was completed on the sample exchange program between the Redox Analytical Laboratory and the Central Bureau of Nuclear Measurements, Euratom, Geel Belgium. Comparative analytical results agreed within 0.2 percent. The sample exchange (cobalt - 60 calibration foils) was designed to determine the relative accuracy of the two laboratories for flux monitor data correlation.

Seventy-three, 200 East Area waste tank supernate samples were received for complete characterization (26 analyses per sample). This work was requested by Fission Products Process Engineering in support of their computer program designed to maintain heat, salt, and volume inventories for the underground waste tanks.

One hundred sixty-seven UNH samples were received from the Battelle-Northwest Laboratories for low level uranium analysis. These samples represent control points in their continuing solvent extraction study to remove daughters of uranium-233 in the proposed final purification flowsheet for Isochem.

A Beckman Aquameter was installed in the Redox Laboratory this month to be used in the determination of water in plutonium samples submitted by the Critical Mass Physics Section, Battelle-Northwest Laboratories.

Manager - Redox

RW McCullugh:HWM:sss

CHEMICAL PROCESSING DIVISION
MONTHLY REPORT

AUGUST, 1966

II. ACHIEVEMENTS (Continued)

D. PLUTONIUM FINISHING SECTION

1. Operating Continuity

The button line remained out of service for the entire month because feed was not available as a result of the labor situation. The reclamation facilities were out of service until August 5, at which time limited operations were started. On August 22, at the conclusion of the labor disturbance, regular recovery activity was resumed. Normal rates were achieved by month-end.

2. Processing Operations

a. Plutonium Processing

There was no output from the button line during the month.

Shipment activity included a delivery of 151 kilograms of weapons-grade metal to Dow-RF. In addition, three deliveries of weapons-grade metal were made to BNW (13 kilograms total). Small shipments of nondefense nitrate went to GE-Vallecitos (399 grams), ORNL (754 grams and 200 grams), and BNW (10 grams). Four deliveries of nondefense metal were made. Three of these went to BNW (21 kilograms total), and one to Mol, Belgium (4 kilograms).

One hundred and forty-five (145) kilograms of nondefense plutonium metal (8.8% to 12.7% Pu-240) were received during the month from the United Kingdom.

Personnel of the Plutonium Processing Subsection assisted the recovery effort by processing fabrication oil and by repackaging plutonium-actinide scrap for offsite shipment.

b. Plutonium Reclamation

Twenty-seven (27) kilograms of plutonium were recovered from scrap materials during the month. Since no new scrap was generated, this represents a substantial reduction in the backlog.

Nine hundred and nineteen (919) cans containing fourteen (14) kilograms of plutonium were processed through the slag and crucible dissolvers.

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One hundred and eight (108) grams of plutonium were returned to the main process stream from 81,585 liters of aqueous waste processed through the waste treatment facility. In addition, 5.9 grams of americium were recovered and stored for further processing.

The CX column system (organic treatment) was used to process 35 PR containers of organic-contaminated plutonium solutions for the Purex plant.

3. Maintenance

The button line equipment was out of service during the entire month. Starting on August 22, it was reconditioned in anticipation of startup in early September.

Recovery equipment performed satisfactorily except for leakage of the Mark III (08) slag and crucible dissolver and failure of nineteen (19) pumps, four of which it was necessary to bury (one Dean-line and three Chempumps).

Reconditioning of incinerator support equipment has been started in anticipation of completion of incinerator furnace repairs by J. A. Jones forces on September 26.

4. Radiation Experience

Radiation and contamination control statistics indicated good control.

One case of potential plutonium deposition occurred when an operator incurred a contaminated wound while working in a process hood in the reclamation plant. Excision and flushing of the wound was performed by the industrial physician, and at month-end deposition was indicated to be less than 5% MPBB.

5. Quality Control

Pu Processing Data	- None Available
Average Impurities in Reclamation Output (TMI)	- 1,468 ppm

6. Analytical Control

Number of samples	1,677
Number of determinations	2,708

A significant reduction in the backlog of work for the mass spectrograph was achieved.

L. J. Brecker
Manager
Plutonium Finishing

CHEMICAL PROCESSING DIVISION
MONTHLY REPORT

AUGUST, 1966

II. ACHIEVEMENTS (Continued)

E. FINANCIAL CONTROLS OPERATION

1. Budgets and Cost Accounting

Total operating costs in August amounted to approximately \$1,739,000 for a two month total of \$3,471,000, bringing FY 1967 cost to \$1,145,000 below the budgeted level for the period.

The following schedule compares the July - August budget to actual in thousands.

	<u>02</u> <u>Production</u>	<u>02</u> <u>R&D</u>	<u>03</u> <u>Standby</u>	<u>Isotopes</u>	<u>Total</u> <u>Operating Cost</u>
Budget	\$3 943	\$287	\$40	\$346	\$4 616
July-August	<u>2 990</u>	<u>257</u>	<u>17</u>	<u>207</u>	<u>3 471</u>
Excess of Budget Over Actual	<u>\$ 953</u>	<u>\$ 30</u>	<u>\$23</u>	<u>\$139</u>	<u>\$1 145</u>

Of the total cost, we are charging \$675,229 to the strike shutdown account. It is too early to determine if any future charges will be made to this account. However, if non-productive costs are incurred due to a lack of feed from reactors, the shutdown account would be charged, although no such condition is expected. The latest production forecast indicates substantial basin backlog.

2. General Accounting

As of August 31, 1966 there were fourteen active projects. Following is a summary of current status of projects:

	<u>In Thousands</u>
Total Authorized Funds and Transferred	
Capital Property Authorizations	\$4 865
Total Cost-to-Date	2 949
Commitments & Open Work Releases	361
Unencumbered Balance	1 555
Costs Charged During July, 1966	87

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During August, one Work Authority and one Directive were received from the AEC: Directive No. AEC-265, Work Authority No. I-3, Project CAC-181, B-Plant Modifications for FPCE - Waste Management Integrated Facilities, for increase in funds to new total of \$20,000; Directive No. EQT-056, Project ICE-601, Co-Product Demonstration Processing Facilities, 200 Areas, interim authorization for initiation of design, \$25,000.

There were no Construction Completion and Cost Closing Statements issued during August.

AEC Directive EQT-055, Modification 1 was received increasing Isochem's authorization to incur FY 1967 obligations for capital equipment not related to construction to a total of \$300,000. As a result of these funds the following AR's were released:

AR-76002	Fluorescence Spectrophotometer, Purex	5,300
AR-76003	Breaking Control System for Centrifuges, Waste Management	5,750
AR-76005	Gas Chromatograph, Pu Finishing	4,730
AR-76006	Stack Monitors for 244CR Vault	5,500

Three AR's were received during the month as follows:

AR-76009	Lithium Drifted Diode, R&EO	9,000
AR-76010	Absorption Spectrophotometer, Pu Finishing	13,000
AR-76011	High Temperature Vacuum Furnace, R&EO	14,000

Approximately all allocated funds to date have been spent or committed.

3. Management Systems and Studies

Due to the reduced production activity, processing of the ROX program was suspended during the month of August. Processing of the data collected will be included during the first processing in September.

During the month several meetings were held with the RLOO-AEC on the new MIS System. The Cost Budget and Contract Systems were both introduced. Cost Budget input for the new system was completed and submitted to the AEC. Contract Information System input is in the beginning stages and is being prepared by the Purchasing Operation. The due date on this input is October 1.

RA Cornell
Manager - Financial Controls

CHEMICAL PROCESSING DIVISION
MONTHLY REPORT

AUGUST, 1966

II. ACHIEVEMENTS (Continued)

F. FACILITIES ENGINEERING SECTION

1. Purex

ICE-601 - CoProduct Demonstration Processing Facilities - 200 West

Directive No. EQT-056, dated August 15, 1966, authorized interim design funds in the amount of \$25,000. A Project Proposal Revision has been initiated. It will reduce the number of dissolvers to be modified from three to one and will change the blending location from the Redox storage area to the Purex Head End.

IAP-605 - Purex Analytical Laboratory Modifications

The project proposal requesting total project funds (\$240,000) was transmitted to RLOO August 16, 1966. RLOO is giving consideration to extending the project scope to include a sprinkler system for the entire laboratory.

IAP-607 - Purex Coil Water Diversion Facilities

Preparation of a project proposal requesting \$170,000 total funds was initiated. Transmittal of this project proposal to RLOO will be deferred pending receipt of authorization to replace the 216-A-10 crib (Project IAP-606) which is needed for the diversion facilities.

Alpha Survey Instrument Prototype

Although operation of the preliminary circuitry has been demonstrated using both the Scintran detection probe and the standard "poppy" probe, completion of the prototype instrument has been delayed to incorporate an improved detector high-voltage power supply.

Purex Canyon Shielded Viewing Window

The feasibility of installing a shielded viewing window in one of the south canyon wall doorways was studied. This window would be used for viewing equipment too "hot" to be viewed by other means. Evaluation of possible equipment radiation readings indicates that the window should have a shielding equivalent of at least two feet of concrete. A 24" x 30" lead glass window with shielding equivalent to two feet of concrete is estimated to cost \$20,000 to \$25,000.

Atomic Absorption Flame Spectrometer

The hardware required for the installation of the flame spectrometer has been designed. Fabrication and installation should be finished during the month of September.

Considerable experience has been gained in operating the spectrometer. Certain elements are quite difficult to detect with this particular instrument. The power supply and amplifier supplied with the instrument have been found to lack some desirable characteristics such as regulation, gain and ability to see the lamp without flame interferences. Resolution of these problems is under consideration.

Spare Multi-Purpose Dissolver

Further review indicated that a sloped bottom in the dissolver had so many disadvantages that this feature was not incorporated. The primary disadvantage was increased waste volume.

2. RedoxUO₃ Calciner Modifications

Study of calciner shaft modifications to accommodate higher enrichment of U-235 has continued. Determination of a critically safe geometry for 93 percent enrichment now indicates that an annulus of less than 2½" will be required. The actual size required will depend on the filler used in the shaft--a boron carbide filler is more favorable than graphite. Study type drawings of two 21" shaft designs have been submitted to Hanford Engineering Services for estimation of the fabrication and installation cost.

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

Preparation of a project proposal revision requesting total project funds is continuing. The low bid for the electrical heater was \$57,000 more than previously estimated. Contacts with the bidders have indicated that a lower priced unit can be obtained.

Modification of 219-S Facility for Cask Load-In

The project proposal was abandoned as a result of mutual agreement of RLOO, Battelle and Isochem that the proposed facility was not an acceptable solution for the Battelle waste handling problem.

Efforts will be directed towards providing a cask station in B-Plant Cell 15.

Purex Waste Routings - 241-AX

Failure in the organic wash waste line in the Purex waste encasement prompted an investigation of all four pipes in different parts of the encasement. Damage in some of the bends may have occurred from overheating of the lines. A review of the original design was made and the calculated stress at a design temperature of 150 F was well under allowable design values. Analyses indicated that temperatures in excess of 180 F will cause expansion interference with adjoining hardware.

The lines were repaired and thermocouples were attached to each of the four lines and a fifth was installed to measure the ambient temperature of the encasement.

Radioactive Waste Handling and Storage - Waste Tank Evaluation

The two part Illinois Institute of Technology (IIT) contract, "Investigation of Earth Pressures and Settlements Analysis of Waste Tank Structures," is progressing on schedule.

Paul Hatch, Engineer, Process Design Subsection, attended a technical coordinating meeting with the contract consultants, Dr. E. Vey and Dr. K. Milbradt, at the IIT Center in Chicago, Illinois. Past work, current effort, future program direction and Isochem input requirements were discussed. Preliminary results indicated that the lateral thrust effects of the soil around the Hanford waste tanks will relieve a portion of the tank load resulting from the combination of hydrostatic head, vapor pressure, and thermal expansion. The final soils data will be forwarded to Dr. Milbradt for incorporation as one of the tank loadings to be considered in the stress and strength analysis portion. The soils evaluation portion is scheduled for completion by the end of September 1966.

IIT has modified three of their existing computer programs to form a computerized stress and deformation program which will simultaneously analyze all load conditions for the Hanford waste tanks. Once the final soils data is received by Dr. Milbradt, the stress and deformation effects for many operating variables can be determined quickly. The stress and strength portion of the waste tank evaluation program has a target completion date of December 1966.

Np-Pu Recovery in Strontium Semi-works

A project cost estimate of \$550,000 exclusive of decontamination costs has been obtained for the conversion of the Strontium Semi-works to a full scale facility suitable for recovering neptunium-plutonium and uranium from acidified sludge wastes. Further work directed toward improving product decontamination factors is required. A final report is being prepared.

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4. Plutonium

Analytical Laboratory

Samples to be analyzed in the 234-5 Building Mass Spectrometers are placed in the mass spectrometer vacuum chamber and a vacuum in the range of 1×10^{-6} torr is required before sample analysis can be completed. The high vacuum cannot be attained while the sample is outgassing, which in some cases takes several hours. If the samples could be outgassed prior to placing them in the mass spectrometer vacuum chamber, the operating efficiency of the instrument could increase. A study is in progress to determine the equipment requirements and cost of a vacuum system for outgassing samples prior to placing them in the spectrograph chamber.

5. General

Plastic Suit Development

Further refinements of the plastic suit design have been made. The features include a zipper to simplify dressing, an unvalved emergency air line leading to the helmet, reinforced crotch design, and revision of the hot air exhaust opening to permit a complete contamination seal while detaching the inner suit from the outer one during the sealed adhesion exit.

Manager - Facilities Engineering

CHEMICAL PROCESSING DIVISION
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II. ACHIEVEMENTS (Continued)

G. RESEARCH AND ENGINEERING SECTION

1. Separations Process Engineering

Purex

a. Solvent Extraction

After completion of the thorium campaign, the solvent-extraction system was flushed with hot 50% nitric acid followed by nitric-acid-saturated solvent. These flushes were followed in sequence by 3% nitric-5% oxalate, water, 5% caustic-2% tartrate, and water flushes. This flushing sequence appears to have been successful in removing product content, activity, and white solids, which were previously observed, from process equipment. Visual inspection of six column cartridges used during thorium processing showed them to be clean of the white solids.

Cartridge inspection also showed the top four plastic plates in the 2E sandwich cartridge to have sections broken out around the center support rods. The 2E cartridge is fabricated from 71 stainless steel nozzle plates and 22 3/4-inch thick linear polyethylene sieve plates that are periodically spaced between the nozzle plates. The color of the plastic plates also varied from a light rust brown at the top to a milky white polyethylene color at the bottom. The 2E Column cartridge had been in service for 50 months. A column temperature gradient, caused by heating the 2EX stream to 50 C, may have accelerated the solvent degradation and embrittlement of the linear polyethylene in the top section. The failed cartridge is being repaired by replacing the polyethylene plates with spares. A replacement cartridge will be fabricated using Fluorothene* plates.

In contrast to the linear polyethylene plates described above, the Fluorothene plates that were inspected (3B, 20, and 1C Columns; U-Pu processing nomenclature) were observed to be stain-free and flexible.

*Trademark - E. I. duPont deNemours & Company

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Redox

a. Neptunium Campaign

A neptunium recovery campaign was completed in the Redox plant solvent-extraction system using the flowsheet defined in RL-SEP-523-RD. Approximately 75 percent of the previously accumulated neptunium inventory was recovered and shipped to the Purex plant for purification. The remaining 25 percent "loss" resulting from tank heel volumes and column wastes was returned to in-process inventory for recovery in future operations. The neptunium product produced was decontaminated by approximate factors of 1.0×10^6 and 1.5×10^4 with respect to Zr-Nb and Ru, respectively.

Approximately 3 curies of Ru was released from the Redox stack during the course of ozone treatment of the Np product for Ru removal. Ventilation filter efficiency for Ru removal was estimated to be approximately 99.9% when hexone vapors were present in the air stream, and approximately 99.5% in a hexone-free stream. Apparently the increased efficiency in the presence of hexone vapors results from the reduction of volatile ruthenium tetroxide to a particulate form of ruthenium.

2. Fission Products Process Engineering

a. Underground Waste Storage Tank Cooler

The prototype waste storage tank cooler was shut down on August 18, to repair a failed fan-shaft bearing on the cooler air blower. Prior to the blower bearing failure, heat and water removal rates averaged 1.1×10^6 Btu/hour and 1.6 gpm, respectively. Color pictures taken within one of the two storage tanks (TK 116-TX) being serviced by the cooler confirmed the presence of a salt scum on the surface of the liquid. The salt scum probably accounts for the reduced heat and water removal rates whenever the liquid surface is not disturbed by solution entering the tank.

b. In-Tank Solidification (ITS) Prototype Brink Deentrainer

A prototype deentrainer containing a Brink deentrainer element (manufactured by Monsanto Chemical Co.) was installed in the ITS off-gas system in parallel with the Teflon deentrainer pads. The element is cylindrical in shape and consists of a 4-inch thick packed bed of synthetic fibers retained between two concentric wire screens. The gas flows through the fiber bed and is exhausted from the cylinder's wire screen core. The unit is operated so that

deentrained liquid and, if necessary, supplemental spray water continuously flushes the fibers and removes accumulated particulate matter. At a gas flow rate of 50 cfm (velocity of 14.6 ft/min) the pressure drop across the deentrainer has been constant at approximately 3.6 in. H₂O for the first four days of operation. The cesium-137 removal efficiency has been approximately 98 percent.

c. Ground Contamination Near T-Plant

Several pockets of activity have been detected in the ground about 300 feet outside the north fence generally north of T-Plant. One spot detected March 1, 1966, had a count rate of 12,000 cpm total beta-gamma. On July 22, 1966, three spots were detected, reading 20,000, 5,000 cpm and 50 mr/hour of beta activity, respectively. A sample analysis from the 20,000 cpm location indicated the activity to be essentially all Sr-90. Samples of the soil which were reading 50 mr/hour were submitted for a mass spectrometer analysis of the strontium and for a Ce-144 analysis in an effort to establish the age and origin of the contamination.

3. Plutonium Process Engineering

a. Process Improvement - Concentration of W-2 Column Strip Solution

The static organic bed in the W-2 Column, through which is passed the aqueous solvent extraction waste stream (CAW), is stripped of its plutonium routinely. This 0.1 M HF solution, CWP in the W-5 tank, has been routed back to the recovery plant without concentration due to a lack of knowledge covering corrosion rates. Under Process Test PRF-66-7, five batches were concentrated before reprocessing and corrosion rates studied. The results show that corrosion should be less than 0.34 mil/year, and this is not significant. Since this recycle stream may be concentrated by a factor of 4 to 8, and processed without deleterious effect, a 1-2 percent capacity increase is achieved.

4. Separations Chemistry Laboratory

a. Sludge Permeability Studies

Laboratory apparatus has been constructed which permits measuring the flow rate of aqueous solutions through a waste sludge cake at controlled static heads. Treatment of the sludge cake at 100 C and 150 C permitted evaluation of the effect of temperature on the flow rate. The flow rate was calculated as the permeability coefficient, and the data disclose that the coefficient is relatively constant in sludges that have experienced temperatures of 150 C. However, at

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temperatures of 100 C, a reduction of the sulfate to sodium and/or carbonate to sodium ratio yield a much lower permeability value. Increasing the sodium concentration also lowers the permeability but not as markedly as a reduction in the sulfate or carbonate. The relatively constant coefficient measured at 150 C has been interpreted as a dehydration effect which is not operative at 100 C.

b. Trace Impurities by TBP Extraction and Spectrographic Analysis

An emission spectrographic technique has been evaluated for the determination of trace impurities in uranium, plutonium, and thorium. By (1) using a relatively large one gram sample, (2) using a TBP extraction step to separate the impurities from the primary constituent, and (3) removing the cyanogen interference during arcing by using an inert gas blanket at the spark source, the procedure achieves a detection limit as low as 0.05 ppm for such elements as chromium, nickel, cobalt, manganese and molybdenum, with a standard deviation of ± 0.87 spectrographic steps.

c. Atomic Absorption Development

Several modifications were made on the Jarrell-Ash Model 82-350 Atomic Absorption Spectrometer to improve its sensitivity. A mechanical chopper and a.c. amplifier were installed to minimize the effect of any flame intensity changes on the percent transmittance measured by the instrument. A periscope mirror was installed so that the light from the hollow cathode lamp will pass through the flame only once. A Walsh-Type laminar flow burner was installed to obtain better mixing of the fuel gas and sample and to provide a longer path length in which absorbance can occur. The flame obtained with this burner is very quiet, eliminating the jet noise associated with other burners. Future studies will determine the improvement in sensitivity achieved.

A vacuum system was built for use with a laboratory-fabricated technetium hollow cathode lamp. The lamp operates properly when evacuated and partially filled with argon. The relative intensity of technetium resonance lines in the 2549-3800 A wavelength region were determined.

5. Plutonium Chemistry Laboratory

a. Recovery of Plutonium from Incinerator Ash

Laboratory tests indicate that a 15 to 30 minute boiling time with nitric acid is almost as effective as the three hours presently used.

b. Americium Purification Development

The high activity waste from the first americium extraction was reprocessed as a feed stream for another extraction-strip test. The extraction coefficient was a satisfactory $E_a^0 = 11.9$, and stripping coefficient $E_a^0 = 0.007$, indicating high recovery.

Several variables were tested. Time after feed adjustment of one-half hour up to four days showed no effect on the extraction coefficient. Acidity at time of complexing agent addition up to 1.3 M H+ had no effect. The presence of Antifoam B in 0 to 2,000 ppm had no effect. The initial low recovery is not yet understood, but a saturation effect may be a contributor.

c. Lithium Aluminate Development

Conditions have been found for preparing and deflocculating an LiAlO_2 slip. Variables tested were calcining temperature, milling time, water content, and deflocculating agent. The best conditions involved calcining at 1000 C for 6 hours, wet milling for 18 hours, and deflocculating with 0.75% each Daxad 21 and Daxad 23. After de-aerating by vacuum, a slip with specific gravity 1.56 resulted. It drain cast and cold cast well.

Further work will seek to find modified conditions which will result in crack-free bodies upon air drying and firing.

R. E. Tomlinson

Manager
Research and Engineering

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CHEMICAL PROCESSING DIVISION
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AUGUST, 1966

II. ACHIEVEMENTS (Continued)

H. EMPLOYEE RELATIONS

1. Communications and Community Relations

National and regional attention has been called to Isochem through extensive placement of news releases on the in-tank solidification program and plastic protective clothing. The national publication, "Chemical and Engineering NEWS", ran photographs in separate issues on the plastic suit and on the first neptunium to be produced in metal button form by Isochem at Hanford.

"Tomorrow", a special magazine section of the "Seattle Post-Intelligencer", ran photos and release material on the in-tank solidification milestone and the plastic suit in consecutive issues. These releases have also peaked the interest of the "Seattle Times" medical and science editor who plans to visit on September 23 to obtain information and photographs for feature articles on waste management and radioisotope applications.

The neptunium and plastic suit photos also appeared in the Portland "Oregonian". Total exposure of these releases is in the million readership circulation category.

Release information on Isochem million man-hour safety mark and participation in the Basel, Switzerland, international industrial fair has been sent to special editors of parent firm publications.

Eighteen photographs on Isochem activities and achievements have been provided the AEC for consideration in their annual report, Major Activities in the Atomic Energy Programs.

As a result of photographs of the in-tank solidification unit appearing in the Isochem NEWS, the AEC has requested prints to accompany cost reduction report material. These will be submitted to Washington for multi-audience exposure.

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2. Union Relations

ITT/FSS and the Union agreed to a basis for settlement, and following this, Appendix A negotiations for Isochem came to a climax beginning August 10 and resulting in a settlement agreement signed on August 17. The proposal was ratified by the Union on August 21, and employees started returning to work on the 22nd. Following the agreement in principle on the 17th, a meeting was held for all supervision in the 2101-M Building where the agreement was explained to supervisors and copies of the Memorandum of Understanding were handed out. New Appendix A progression schedules are being prepared for distribution. From a relations standpoint, the return to work was quite orderly and only minor incidents involving harassment have been reported.

3. Education and Training

One additional group of operating personnel was given projector training during the month and there are now sufficient personnel trained in the proper operation of projector equipment on all shifts in all facilities.

Differential aptitude tests were given to approximately seventy-five persons during the month, looking toward the reactivation of a training program for craft-type personnel. At this time it does not appear that the program will be activated until after the first of the year.

4. Technical Recruiting

Questionnaires are now being received from those college campuses where Isochem will visit during the coming recruiting season, requesting pertinent information related to the visit.

H. B. Lindber /

Manager - Employee Relations

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<u>Operation:</u>	<u>General</u>	<u>R&E</u>	<u>FEO</u>	<u>Waste Mgt.</u>	<u>Prod.</u>	<u>Redox</u>	<u>Purex</u>	<u>Pu. Fin.</u>	<u>Total</u>	<u>YTD</u>
Dis. Injuries									0	2
Sig. Incidents			1						1	5
Med. Treat. Inj.	2		11	2	1	3	6	4	29	257
Rad. Occurrences						2	1	3	6	86
Contam. Wds.								1	1	6
New Dep. Cases									0	5
Fires									0	8

Significant Incident ISO-66-5, Facilities Engineering, 8-5-66

A millwright trainee and a journeyman were removing a bent shaft from a coal crusher drum when the hydraulic jack, the jack being used to push the crusher shaft and the wedge, collapsed allowing the handle of the wedge to strike the trainee in the chin.

Vehicle Accident ISO-66-8, Administrative Services, 8-30-66

In backing to park, the left rear fender struck a fire alarm box dismounting the box from the service pole and damaging the fender. Damage repairs were \$158.50.

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II. ACHIEVEMENTS (Continued)

I. WASTE MANAGEMENT SECTION

1. Operating Continuity

The In-Tank Solidification unit was down for a total of eight days to repair weld failures in the main air line to the circulator. The fission product processing facilities, which were down until August 22 because of a work stoppage by union employees, were essentially back to normal operations by the end of the month. One cask was loaded with cesium and a second cesium cask was being loaded at month end.

2. Processing Operations

a. Head End

No Purex acid waste was available for processing during August.

b. B-Plant

There was no processing of fission products because of (1) a work stoppage by union employees which continued until August 22, and (2) lack of feed during the latter part of the month. Following extensive flushing of the equipment in Cell 5, removal of the equipment was started in preparation for its replacement. Tank 9-1, which receives feed from the CR Vault, was flushed thoroughly to remove solids which had accumulated.

c. Semiworks

The second of a scheduled series of seven process tests was completed, but analytical results were not available by month end for evaluation of performance. These tests, using fission product crude feed, are being made to demonstrate the B-Plant Phase III flowsheet for separation of cerium and promethium by oxidation with persulfate.

d. Cask Loadings

At the Cesium Loadout Facility, cask STT 48 was loaded with 40,000 curies of cesium-137. The loading of a second STT cask was under way at the end of the month.

e. Waste Management

The In-Tank Solidification unit recovered 125,000 gallons of waste storage space. To date, this unit has reclaimed a total of 2.5 million gallons of waste storage space.

3. Equipment Experience

Failure of welded joints continued to be experienced in the heated air supply line to the In-Tank Solidification unit's air-lift circulator. The cause of these failures is not known but investigation is continuing.

Following discovery last month of a waste line leak in the concrete encasement from the 202-A Building to the 241-AX Tank Farm, the encasement was broken into and inspected at nine separate bends. Although no additional leaks were found, three wrinkles were observed in the piping at two sites. In each case the ceramic roller spools, which facilitate expansion and contraction of the waste lines, were broken. The distorted sections of piping were replaced. In addition, an instrument with a recorder and an alarm is being installed to measure pipe and encasement temperatures in an effort to obtain information concerning the cause of these failures.

4. Radiation Experience

There was nothing significant to report.

R.E. Smith

Manager
Waste Management Section

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III. PERSONNEL ACTIVITIES

A. FORCE SUMMARY

<u>Section</u>	<u>Monthly Salaried</u>		<u>Weekly Salaried</u>		<u>Total</u>	
	<u>7-31-66</u>	<u>8-29-66</u>	<u>7-31-66</u>	<u>8-29-66</u>	<u>7-31-66</u>	<u>8-29-66</u>
General	2	2	1	1	3	3
Research & Engineering	57	58	33	34	90	92
Facilities Engineering	92	91	185	185	277	276
Manufacturing						
General	1	1			1	1
Waste Management	28	27	106	107	134	134
Production Planning	4	4	4	4	8	8
Redox	61	59	231	230	292	289
Purex	50	51	190	189	240	240
Plutonium Finishing	<u>44</u>	<u>44</u>	<u>182</u>	<u>182</u>	<u>233</u>	<u>233</u>
Total CPD	339	337	939	939	1 278	1 276
Corporate Offices and Business Management Division	<u>82</u>	<u>84</u>	<u>75</u>	<u>77</u>	<u>157</u>	<u>161</u>
Grand Total	<u>421</u>	<u>421</u>	<u>1 014</u>	<u>1 016</u>	<u>1 435</u>	<u>1 437</u>

Does not include temporary Youth Opportunities Trainees or summer employees.

B. PERSONNEL CHANGES

G. L. Gurwell - Supervisor, Laboratory Auxiliaries - transferred 9-1-66 to Manager, Analytical Laboratory.

R. W. Harvey - Manager, Industrial Engineering - transferred 9-1-66 to Applications Engineering.

W. A. Lane - Financial Analyst - transferred 9-1-66 to Manager, Financial Reports and Analysis.

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W. G. Smith - Manager, Special Studies - transferred 9-1-66 to Manager, Management Systems and Studies.

R. A. Zinsli - Senior Engineer - transferred 8-15-66 to Manager, Industrial Engineering.

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C. TRIPS

<u>Visitors</u>	<u>To</u>	<u>Nature of Discussion</u>
<u>To General Industry</u>		
M. E. Yates	P. F. Avery Corporation Billerica, Mass. (8-14 - 8-27)	Engineering Consultations
R. E. Tomlinson	Burns & Roe Co. Hempsted, LI, New York (8-17 - 8-19)	FPCE design review
P. W. Smith	Burns & Roe Co. Hempsted, LI, New York (8-13 - 8-26)	FPCE design review
<u>To AEC and Other AEC Contractors</u>		
L. M. Knights	Mound Laboratory Miamisburg, Ohio (8-15 - 8-16)	Investigate Pu-238 scrap recovery
L. M. Knights	National Lead Co. of Ohio Cincinnati, Ohio (8-17)	Discuss uranium oxide product specifications
L. M. Knights	Argonne National Lab Chicago, Illinois (8-18 - 8-19)	Discuss Zero Power Plutonium Reactor (ZPPR) program
A. E. Smith	Sandia Corporation Albuquerque, New Mexico (8-1 - 8-2)	Consultation on heat source requirements
A. E. Smith	LASL Albuquerque, New Mexico (8-2)	Programmed integration discussions
A. E. Smith	Lawrence Radiation Lab. Livermore, California (8-3)	Programmed integration discussions
<u>To Colleges and Universities</u>		
Paul Hatch	Illinois Institute of Technology Chicago, Illinois (8-15 - 8-17)	Conferring on contract SA-502

<u>Visitors</u>	<u>To</u>	<u>Nature of Discussion</u>
<u>To Colleges and Universities</u>		
W. L. Akers	U. of Arizona Tempe, Arizona (8-14 - 8-24)	Course in Modern Industrial Spectroscopy

D. VISITORS

<u>Visitors</u>	<u>To</u>	<u>Nature of Discussion</u>
G. H. Sykes	E. I. duPont deNemours & Co. Savannah River Plant Aiken, South Carolina (8-30 - 8-31)	Technical discussions on the Purex and thorium processes

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IV. REPORTS

A. PREPARED AND ISSUED

- ISO-170, (Unclassified), "Design Criteria - Process Condensate Crib 216-A-38", L. A. Grande and G. C. Oberg, March 15, 1966
- ISO-295, (Unclassified), "Design Criteria for a Third In-Tank Solidification System", H. L. Caudill, May 27, 1966
- ISO-301, Rev. 1, (Unclassified), "A Proposal for Increased Capacity of the First In-Tank Solidification Unit", L. A. Grande, June 29, 1966
- ISO-312, (Official Use Only), "Project Proposal, Purex Analytical Laboratory Modifications, Project IAP-605", C. A. Lyneis, August 11, 1966
- ISO-434, (Secret), "New Thoughts on Closed-Loop, Close-Coupled Processing for Irradiating Np-237", O. F. Hill, August 5, 1966
- ISO-436, (Secret), "Nuclear Materials Review - CPD Enriched Uranium System - Third and Fourth Quarters FY-1966", L. H. Taylor, August 9, 1966
- ISO-442, (Secret), "FY-1967 Revision of Cs-137 Index for Nuclear Materials - Content of Coating Wastes", W. H. Zimmer, August 10, 1966
- ISO-443, (Secret), "Isochem Inc. Sponsored Programs for Research and Development and Process Technology Support", O. F. Hill, August 29, 1966
- ISO-465, (Unclassified), "A Study of the Determination of Pu by the Isotopic Dilution Technique", N. S. Wing, August 29, 1966
- ISO-467, (Secret), "Trip Report - Mound Laboratory, National Lead Company of Ohio, and Argonne National Laboratory - August 15 through August 19, 1966", L. M. Knights, August 24, 1966
- ISO-468, (Secret), "Recovery of Pu-238 Scrap", J. H. Warren, August 31, 1966

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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

M. H. Campbell

CPDIR-141 Recovery and Purification of
Rhodium and Palladium Using
Liquid-Liquid Extraction with
Tricaprylyl Monomethyl Ammonium
Chloride

Vice President
Chemical Processing Division

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