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CHEMICAL PROCESSING DIVISION
MONTHLY REPORT
FOR

JULY, 1966

Compiled by
SECTION MANAGERS

ISOICHEM INC.
RICHLAND, WASHINGTON

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CHEMICAL PROCESSING DIVISION
MONTHLY REPORT

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I. SUMMARY

July production as per cent of the Quarterly Production Forecast (ISO-213), is summarized below:

	<u>July</u>	<u>Fiscal Year</u> <u>To Date</u>
Separated plutonium nitrate	17	17
Separated uranium nitrate	12	12
Uranium oxide	0	0
Plutonium metal buttons	41	41

July production of all products was far below forecast due to the effects of a work stoppage on Isochem Inc. starting July 8, 1966 when the HAMTC union went on strike against two of the Hanford contractors, Federal Support Services and Battelle. Operations and maintenance activities in the production facilities were severely curtailed due to only 25-40 per cent of the Isochem bargaining unit employees reporting to work.

Thorium processing was continued in the Purex plant until July 5, when dissolver heel cuts were completed and cold thorium was recycled to strip the plant of uranium-233. Chemical flushes and equipment changes followed and continued through the end of the month to prepare the plant for normal uranium-plutonium processing. The work proceeded at a satisfactory pace despite the reduced work force. Purex thorium processing campaign produced approximately 220 kilograms of uranium-233 of excellent quality. In most of the product, uranium-238 impurity ranged between 0.7 and 0.9 per cent, essentially that in the thorium before irradiation.

The Redox plant was shut down July 8 for routine acid flushing of the columns. Because of the labor situation at completion of the flushes, the in-plant inventory of uranium and plutonium was run out instead of processing the scheduled 94-metal. A neptunium recovery run was then started on July 16, and processing continued through the end of the month.

The Uranium Oxide plant was shut down during the period of June 27 - July 17 for planned maintenance and for vacations for the majority of the employees. Operations were not resumed following this period because insufficient personnel returned to work.

All the Plutonium Finishing operations were normal until July 8 when all operations were suspended due to the work stoppage. Available manpower was reorganized to give 24-hours per day, 7-day week coverage on the standard Hanford ABCD shift schedule to continue operation, on a limited basis, of the plutonium reclamation and waste treatment facilities. The plutonium button line remained shut down all month due to lack of feed.

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The In-Tank Solidification unit operated satisfactorily with only two days down time; 165,000 gallons of waste storage space were recovered.

The 242-T Waste Evaporator operated with on-line efficiency of 63 per cent, and an average boil-off rate of 4.65 gallons per minute. An equivalent of 131,313 gallons of underground, non-boiling waste storage space was recovered, bringing the total space recovered to an equivalent of 1,544,469 gallons since start-up on December 3, 1965.

One STT cask was loaded with 60,000 curies of cesium-137 and shipped to ORNL on July 7 along with the other STT cask which was loaded in June with 60,000 curies of cesium-137.

A computer program -- SECRETARY -- has been developed which will provide information, upon command, of the current heat, salt, and important radionuclide inventory of any or all of the underground waste storage tanks.

TEF (ternary eutectic fluoride) in two test attempts failed to extinguish burning plutonium.

A total of \$735,000 was authorized for complete design and start of procurement for Project CAC-181, Revision 2, "B-Plant Modifications for FPCE - Waste Management Integrated Facilities".

Vice President
Chemical Processing Division

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CHEMICAL PROCESSING DIVISION
MONTHLY REPORT

JULY, 1966

II. ACHIEVEMENTS

A. PRODUCTION PLANNING

1. Production Statistics

a. <u>Percent of Forecast⁽¹⁾ Achieved</u>	<u>July</u>	<u>Fiscal Year to Date</u>
Separated plutonium nitrate	17	17
Separated uranium nitrate	12	12
Uranium oxide	0	0
Plutonium metal buttons	41	41

b. <u>Purex</u>	<u>July</u>	<u>June</u>
Thorium nitrate produced (tons thorium)	41	130
Uranium nitrate produced (tons)	0	0
Average production rate during operation (T/D)	6	5
Total waste loss (%)		
U-233	1.2	0.5
Thorium	2.4	0.8
On-line efficiency (%)	23	89

c. <u>Redox</u>		
Uranium nitrate produced (tons)	68	241
Average production rate during operation (T/D)	10	10
Total waste loss (%)		
Plutonium	0.38	0.28
Uranium	0.18	0.19
On-line efficiency (%)	23	84

d. <u>Uranium Reduction (tons)</u>		
Normal UO ₃ loaded	0	0
Enriched UO ₃ loaded	0	226
Normal UO ₃ approved for storage	0	0
Enriched UO ₃ approved for shipment	0	206
Normal UO ₃ shipped	0	0
Enriched UO ₃ shipped	40	201
Normal UNH backlog	64	64
Enriched UNH backlog	166	97

(1) ISO-213, QUARTERLY PRODUCTION FORECAST

e. Plutonium Metal Processing

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JulyJune

Waste disposal (grams)

110

116

f. Power200-East200-West

Raw water pumped (gpm)

7 139

5 485

Filtered water pumped (gpm)

710

904

Maximum steam generated (lbs/hr)

162 000

90 000

Average steam generated (lbs/hr)

80 199

54 846

Total steam generated (M lbs)

59 668

40 806

Coal consumed (tons)

2 950

2 014

Thorium processing in the Purex plant was discontinued on July 8, 1966, with the depletion of all the sufficiently aged feed. Production of all other products fell far short of forecast due to the effects of a work stoppage on Isochem Inc., starting July 8, 1966, when the HAMTC union went on strike against two of the Hanford contractors, Federal Support Services and Battelle. Production activities after the start of the work stoppage were restricted to a neptunium recovery run at Redox, limited operation of the plutonium recovery and waste treatment facilities in the Plutonium Finishing plant and operation of the In-Tank Solidification unit and the 242-T Waste Evaporator. The Uranium Oxide plant, which was shut down late in June for vacations and equipment repairs, was left in stand-by condition during July.

John Muecke
for

Manager, Production Planning
Chemical Processing Division

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Sr-90
Pm-147 (Unaged)
Pm-147 (Aged)
Cs-137

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CHEMICAL PROCESSING DIVISION
MONTHLY REPORT

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II. ACHIEVEMENTS (Continued)

B. PUREX SECTION

1. Operating Continuity

Thorium processing continued through July 5, 1966, when dissolver heel cuts were completed. Cold thorium was then recycled to strip the plant of uranium-233. Stripping was completed July 10, 1966, and was followed by chemical flushes and equipment changes to prepare the plant for normal processing.

2. Processing Operation

Plant operations continued at a capacity factor rate of 0.685 through July 5, 1966, on irradiated thoria material, after which cold thorium was recycled for plant cleanout of uranium-233. Chemical flushes and equipment changes commenced immediately following the stripping and continued to the end of the month.

Product quality remained excellent for uranium-233 and satisfactory for the final thorium batches. Uranium-233 offsite shipments were completed to Nuclear Fuels Services and Oak Ridge National Laboratory. Thorium was shipped to storage at U-Plant.

3. Equipment Experience

The new C3 multipurpose dissolver was set in place and final installation will take place after modification of the reflux tower is completed at T-Plant.

Following the start of the work stoppage on July 8, 1966, the available maintenance personnel routinely checked plant machinery and facilities as needed. Special attention was given to critical equipment such as ventilation fans, air compressors, radiation instruments and alarm systems. At month end no major equipment problems or breakdowns had occurred.

Other equipment work at the Purex Plant included:

- a. Regeneration of A, B, and F Cell silver reactors.
- b. Removal of thorium jumpers and restoration of normal canyon routings.
- c. Restoration to normal condition all of the electrical and instrumentation systems which were modified for the thorium run.

4. Radiation Experience

Iodine-131 emission was 0.22 curies for the month.

5. Analytical Experience

The Purex Laboratory has demonstrated the applicability of the Pu-242 isotopic dilution method for the determination of plutonium in process feed material (D-5). Pu-242 standard recoveries were very good with an average of 99.88 percent on ten pieces of data. The CPD average was 99.58 percent $\pm$ 0.722 percent.

SG Smolen
Manager-Purex Section

SG Smolen:gt

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CHEMICAL PROCESSING DIVISION
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II. ACHIEVEMENTS (Continued)

C. Redox Section

1. Operating Continuity

The processing of 94 metal in the Redox plant was continuous until July 8. At this time processing was discontinued to permit routine acid flushing of the extraction columns. However, on this same date Isochem Inc. experienced a work stoppage due to the strike initiated by the HAMTC against ITT/FSS and Battelle-Northwest, and normal 94 metal processing was not resumed. The period from July 8 to July 16 was used to remove residual uranium and plutonium from the plant and to accumulate the in-plant neptunium inventory. Authorization to proceed with a neptunium recovery run was received on July 16; and, with all operating stations pertinent to this type of operation manned by regular qualified operating personnel, the campaign was started. Neptunium recovery processing continued through the end of the month.

The Uranium Oxide plant remained shut down as planned through July 15. However, because of the work stoppage experienced by Isochem Inc., plant start-up was not resumed on July 18 as planned, and the plant remained down for the balance of the month. Activity by the limited number of personnel available was confined to plant stand-by surveillance tank calibration, and general plant housekeeping.

2. Processing Operations

a. Redox Processing

The Redox plant performed well until July 8 when the plant was shut down for a routine acid flush of the 1A solvent extraction column. Ninety-four metal processing was conducted at rates varying from 90 to 106 percent, and waste losses were maintained at nominal levels - 0.06 and 0.26 percent for uranium and plutonium respectively.

Because of the HAMTC strike against ITT/FSS and Battelle-Northwest and the work stoppage invoked against Isochem Inc., 94 metal processing was not resumed, but the plant was prepared for a neptunium recovery campaign. Inter-cycle uranium and plutonium inventories were processed to final product status, and the neptunium in-plant inventory was collected for the neptunium run, subsequently authorized on July 16.

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With adequate operations, maintenance and radiation monitoring personnel available for neptunium processing, the recovery campaign was started on July 16. All operating stations pertinent to this process were manned by regular qualified processing personnel.

By month end the initial neptunium inventory had been processed up to the point of ruthenium volatilization and stored in the E-6 tank. At month end processing of the wastes from the initial recovery campaign was in progress. No significant process problems have been encountered to date, and satisfactory process control has been maintained.

The 242-T waste evaporator operated at an on-line efficiency of 63 percent for the month and at an average boil-off rate of 4.65 gpm. The equivalent of 131,313 gallons of underground nonboiling waste storage space was recovered, bringing the total of 1,544,469 gallons since start-up on 12/3/65. Evaporator shut-downs which occurred during the month were due to: 1) a leak at the pump seal and discharge line on the 116-TX evaporator bottoms tank, 2) intermittent plugging of the transfer line between the 116 and 117-TX evaporator bottoms tanks, 3) necessary liquid level adjustments in the 116, 117, and 118-TX evaporator feed tank.

b. Uranium Oxide Processing

Plant start-up after the planned annual maintenance and vacation shutdown (June 27 through July 17) did not materialize due to the work stoppage, and no processing was done during the month. At month end approximately a two-week backlog of 94 metal UNH feed was on hand.

All thorium nitrate solution transfers from the Purex plant to the 241-WR vault were completed this month. Approximately 115,000 gallons of solution are currently in storage. No significant problems were encountered during the solution transfers, and adequate radiation monitoring coverage was available.

3. Mechanical Experience

a. Redox Plant

There were no process outages related to mechanical equipment problems in the 202-S Canyon Building this month, and the mechanical efficiency for the period was 100 percent.

100

Mechanically the Redox plant operated very well, and the necessary maintenance was accomplished with the limited number of craft personnel available. All critical equipment lubrication and inspections were completed as scheduled (i.e., ventilation equipment and air compressors).

A temporary power outage occurred on a lighting circuit to the Redox dispatcher's office on 7/13/66 due to a normal transformer failure. A new higher rated transformer was installed which should satisfactorily handle the electrical load which has gradually increased in recent years from added instrumentation.

Three canyon cell jumper replacements were made, two of which were flexible jumpers fabricated by the Redox plant maintenance force.

Maintenance work performed at the 242-T waste evaporator this month included: 1) overhauling of the gang valves, 2) replacement of the 116-TX "bottoms tank" storage pump, and 3) relocation of the switchgear to the pumps on both the 116 and 117-TX "bottoms" storage tanks so that both pumps may be operated from the same position.

b. Uranium Oxide Plant

Maintenance at the Uranium Oxide plant was at a virtual standstill due to the work stoppage at Isochem Inc. as a result of the HAMTC strike against ITT/FSS and Battelle-Northwest which was initiated on July 8. However, the two large shutdown jobs planned during the maintenance and vacation outage period were completed on July 7. These jobs involved the installation of the electrical feeder system from bus bars to insulated cable. In addition, the C-2 cell drainage waste tank was cleaned, and the tank coil hydro-statically tested. Sleeving of the corroded calciner thermowell risers was 95 percent complete at the time of the work stoppage. About two days of maintenance work will have to be completed before the enriched calciner system can resume operation.

4. Waste Handling and Decontamination

The waste volume discharged to the 216-T-34 crib site from Battelle-Northwest this month was approximately 135,000 gallons (27 tank-truck loads).

There were no significant changes in the radiation readings under the 107, 108, and 109-SX underground waste storage tanks during the month, and no measurable losses of tank contents were detected. Routine tank farm surveillance was conducted by regular qualified operating personnel as would be the case during normal plant operation.

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Preparation work by J. A. Jones Construction Company on the 105-SX tank for receiving Redox self-boiling process waste was hampered by the present work stoppage. However, adequate radiation monitoring service was available to the construction contractor as requested.

5. Radiation Experience

Maintenance work in radiation zones throughout the Redox Section was maintained at a bare minimum during the month. One trip to the Redox 60-ton canyon crane was necessary to repair the right hand impact wrench. No problems were encountered, and personnel radiation exposure was well controlled. Qualified radiation monitoring coverage was available during the entire job.

Construction forces completed all modifications to the Purex dissolver tower except for insulation and painting. The average working dose rate during the final phases of the work was 15 mr/hr. Surface contamination was controlled below 2000 c/m, and all air samples were below mask requirements.

The drilling of seven vertical monitoring wells around the perimeter of the 105 tank in the SX Waste Tank Farm by the Hatch Drilling Co. was completed. The work was done under controlled radiation excavation procedures. Maximum radioactive contamination detected on earth samples taken was 10,000 c/m.

6. Analytical Experience

In addition to the routine analytical work in support of the processing plants in the Redox Section, the following special services were provided: 1) thorium analyses on thorium nitrate solutions received from the Purex Plant for storage in the 241-WR vault, 2) thorium analyses, by X-ray fluorescence, on samples of dibutyle phosphate scale removed from the Purex plant solvent extraction columns, 3) alpha total counts and alpha energy analyses on americium product samples, submitted by the Weapons Manufacturing Section, for purity and concentration, 4) strontium analyses on environmental water samples received from the General Electric Co., and 5) quality control measurements on plutonium nitrate samples submitted by the Critical Mass Physics Section, Battelle-Northwest Laboratories, in support of their criticality experiments.

R. W. McCullough

Manager - Redox

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CHEMICAL PROCESSING DIVISION
MONTHLY REPORT

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II. ACHIEVEMENTS (Continued)

D. PLUTONIUM FINISHING SECTION

1. Operating Continuity

All operations were normal until Friday, July 8, 1966, when the Hanford Atomic Metal Trades Council strike of Federal Support Services and Battelle resulted in large numbers of Isochem Inc. bargaining-unit employees remaining off the job. The plutonium processing facilities (button line) remained shut down from that date through month-end because feed was unavailable. The plutonium reclamation facilities were operated on a limited basis (cleanouts, flushes, and treatment of fabrication oil) as qualified manpower was available. Aqueous waste was treated as necessary before disposal.

As a result of the labor situation, the Plutonium Finishing Section's facilities were supervised, starting July 8, 1966, and continuing through the month-end, by a special organization which provided 24-hour-per-day, seven-days-per-week coverage as the standard Hanford A-B-C-D shift schedule. Each crew was headed by a subsection manager and included exempt-roll employees skilled in all phases of the operations. This organization was effective in maintaining safe conditions under all circumstances.

2. Processing Operations

a. Plutonium Processing

Output of the button line was 112 kilograms of plutonium metal, all weapons-grade.

Shipment activity during the month included a delivery of 151 kilograms of weapons-grade metal to Dow-RF. In addition, 15 kilograms of nondefense metal and 25 kilograms of nondefense oxide were shipped to Argonne.

As operators were available, the Plutonium Processing Subsection assisted the recovery effort by the processing of fabrication oil and by the repackaging of dry plutonium-actinide scrap materials for shipment to Nuclear Fuels Services.

b. Plutonium Reclamation

Forty-eight (48) kilograms of plutonium were recovered from scrap

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materials during the month. Since July 8, the solvent extraction system was operated only intermittently to support vessel cleanouts and hood and cell floor flushes. No new feed except fabrication-oil wash solution was being generated during the latter part of the month.

Four hundred and ninety (490) cans containing eleven and a half (11.5) kilograms of plutonium were processed through the slag and crucible dissolvers.

The incinerator continued out of service. In fact, Minor Construction forces stopped work on repairs because of manpower shortages resulting from the labor dispute. No waste cartons were processed.

One hundred and fifty-eight (158) grams of plutonium were returned to the main process stream from 62,324 liters of aqueous waste processed through the waste treatment facility. In addition, 16.6 grams of americium were recovered and stored for further processing.

3. Maintenance

The button line equipment performed satisfactorily until it was shut down on July 8.

Recovery equipment performed well also during the very early part of the month. Later, the Mark II (04) slag and crucible dissolver revealed signs of plugging, but extended flushing out corrected the problem. The Mark III (08) dissolver developed a leaking flange in the hood. This was repaired without removing the vessel from its operating position. Fifteen (15) pumps failed and were replaced with spares. The failed pumps have either been repaired or are being held for future repair. The problem regarding the procurement of seals of proper quality for these pumps was corrected when the vendor supplied 78 proper sets of seals during the month.

In the analytical laboratory, the SU-13 mass spectrograph performed satisfactorily during the entire month. The SU-8 mass spectrograph was inoperative during the greater portion of the period. Repairs are in progress at month-end.

4. Radiation Experience

Radiation and contamination control statistics indicated good control.

There were no cases of potential plutonium deposition.

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Average button impurity (IMI+C)	907 ppm
Average button Pu-240 content (WG) (as determined by neutron count)	6.29 %
Average button density	19.41 g/cc
Button Line recycle to Reclamation	9.00 kg
Average impurities in Reclamation output (IMI)	1,469 ppm

6. Analytical Control

Number of samples	1,647
Number of determinations	3,253

The backlog of work for the emission spectrograph was essentially current at month-end. The backlog for the mass spectrograph was reduced significantly during the month.

Manager
Plutonium Finishing

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CHEMICAL PROCESSING DIVISION
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II. ACHIEVEMENTS (continued)

E. FINANCIAL CONTROLS OPERATION

1. Budgets and Cost Accounting

The total operating costs in July amounted to \$1,732,338, which was approximately \$563,000 below normal for the period. This reduction was due to the strike situation causing production curtailment. Of the total cost, we are charging \$287,520 or 16% to the Strike Shutdown account. Cost charged to this account consist primarily of overheads, electricity, service assessments, a portion of the UO₃ plant operating cost, and a small amount of Button Line costs.

The following funding schedule compares July budget to actual:

	<u>02</u> <u>Production</u>	<u>02</u> <u>R&D</u>	<u>03 Shutdown</u> <u>and Standby</u>	<u>Isotopes</u>	<u>Operating</u> <u>Cost</u>
<u>July</u>					
Budget	\$1,958	\$144	\$20	\$173	\$2,295
Actual	1,504	131	8	89	<u>1,732</u>
					\$ 563

2. General Accounting

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

	<u>In Thousands</u>
Total Authorized Funds and Transferred	
Capital Property Authorizations	\$4,835
Total Cost-to-Date	2,862
Commitments & Open Work Releases	419
Unencumbered Balance	1,554
Costs Charged During July 1966	26

During July, one Work Authority was received from the AEC: Directive No. AEC-265, Work Authority No. 1-2, Project CAC-181, B-Plant Modifications for FPCE - Waste Management Integrated Facilities for increase in funds to new total of \$15,000.

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One AR for the Remote Operated Car Mover (\$121,000) was approved. Seven small AR's totaling \$45,630 are being held for future availability of funds.

Directive EQT-055 was issued to Isochem for FY 1967 Capital Equipment Not Related to Construction Projects in the amount of \$125,000.

FY 1967 General Plant work orders were authorized for \$30,000.

3. Special Studies

The Semi-Annual Cost Reductions Report for the period ending June 30, 1966 was completed and forwarded to RLOO-AEC. This report summarizes contractor initiated actions in the period which reduced operating cost an estimated \$2,282,000.

4. Business Information Systems

Operation of the Redox Laboratory Communication Systems computer program has been more satisfactory during this report period. In efforts to reduce processing time and related cost, the master file size has been reduced 75 percent by changing the data retention period from one year to 90 days.

On line equipment at Redox was inoperable for an extended period during the month due to failure of a circuit board. A new board was unobtainable for three days because of the air line strike. IBM finally made temporary repairs and restored the equipment until spare parts arrived.

RA Cornell
Manager - Financial Controls

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CHEMICAL PROCESSING DIVISION
MONTHLY REPORT

JULY, 1966

II. ACHIEVEMENTS (Continued)

F. FACILITIES ENGINEERING SECTION

1. Purex Operation

Purex 4.0 CF Expansion, CGC-183

A design criteria revision was prepared to delete the new No. 1 solvent feed pumps in favor of an alternate approach. Plant tests have verified the hydraulics analysis of the No. 1 Solvent System and indicate the higher head pumps are not the best means of overcoming capacity limitation. The required capacity increase will be provided by revision of canyon piping to reduce frictional pressure losses in the system. This revision is not expected to increase the project cost.

Purex Replacement L-Cell Package, CGC-172

Based on essentially complete design, the construction cost estimate by Hanford Engineering Services is approximately \$300,000; the funds authorized are \$230,000 and were based on the preliminary estimate. A check of the high estimate is underway. Also under consideration are possible reductions of construction costs and possible alternate process schemes which could be used if portions of the package equipment must be eliminated.

New Condensate Line for J-Cell Concentrators

A design has been prepared for a new eight-inch line from the outside wall of Purex to J-Cell to be used to replace the existing condensate pipes where failure is anticipated. Design is similar to that used for K-Cell.

Remotely Controlled Locomotive

Three bids were received on the locomotive and are currently being reviewed. A pre-award conference with the low bidder is planned for the first part of August. The appropriation request has been approved.

2. Redox Operation

Waste Management Analytical Laboratory - 222-S ICP-604

Clarification of air flow requirements in Room 1-B and review

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of proposed transfer mechanisms for the Room 1-F cubicle were transmitted to the project engineer. The Title I drawing was reviewed and approved on July 25, 1966.

Separations Chemistry Lab Shielded Cell - 222-S

Work has started on the design criteria for a shielded cell in Room 1-A for research work related to Waste Management. It is proposed to provide a one-work station, manipulator-operated cell.

3. Waste Management

B-Plant Modifications for FPCE - Waste Management Integrated Facilities, CAC-181, Rev. 2

Directive No. AEC-265, Mod. 3, dated July 13, 1966, authorized \$735,000 as requested by the proposal revision No. 2. This authorizes total design and start of procurement and construction.

In-Tank Sludge Interface Measuring Instrumentation

The in-tank sludge interface measuring system has now been in operation approximately one month. Operating personnel report that they have had no problems with the system and that it is accurate.

Neptunium-Plutonium Recovery at 201-C Semiworks

Process flow diagrams and cell piping drawings for full-scale recovery of neptunium and plutonium in the 201-C Semiworks facilities are being reviewed. A cost estimate, based on these drawings and supplemental equipment drawings, is being obtained.

Air Lock for 221-B Crane

An air lock is being designed for the east side of the crane cab to improve conditions for operators in highly radioactive work.

Routing for Redox Supernatants

An investigation into the routing of Redox supernatants from the 200 West to B-Plant in 200 East Area indicates that for the most part suitable routings are available. Some new cross-connecting lines may be required. Use and condition information on the selected lines is being updated.

B-Plant - Pulse Generators

Work is in progress on pulse generator drawings preparatory to purchase of improved spares. All four existing machines will be

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needed in the plant, and no spares are now available. Design is being simplified where possible.

In-Tank Solidification - Third Prototype Electrical Heater

Scoping of the design for the third prototype electrical immersion heater was completed and the detailed prints are being prepared. The electrical heaters, originally scheduled for July shipment, will not be ready until the middle of August. Delivery is expected about September 1.

Purex Tank Farm Vent System Expansion

The design criteria for increased capacity of the Purex tank farm vent system (ISO-186) was approved by the AEC. The capacity of the system has been increased from an initially proposed 3000 cfm to 4000 cfm to handle additional circulator air requirements during temperature excursions in the tanks.

4. General

FY-1968 PACE Budget

A data sheet for the FY-1968 PACE Budget was submitted to RL00 for the Purex Analytical Laboratory Additions at \$950,000.

Zero Power Plutonium Reactor Program

A process for manufacturing ZPPR fuel elements has been developed at Argonne National Laboratory. There is interest in having some capability for the fabrication work at Hanford. An engineering study has been completed to determine equipment requirements and costs.

Manager - Facilities Engineering Section

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CHEMICAL PROCESSING DIVISION
MONTHLY REPORT

JULY, 1966

II. ACHIEVEMENTS (Continued)

G. RESEARCH AND ENGINEERING SECTION

1. Separations Process Engineering

Purex

a. Thoria Dissolution and Feed Preparation

The last charge of thoria target elements for the Purex thorium campaign was made on July 2, 1966. Based on reactor records, a total of 191.9 tons of thorium was charged to the dissolvers during the campaign. The minimum "cooling" time for the targets processed was 123 days, between reactor discharge and charging to the Purex dissolvers. The average dissolver charging rate for the entire campaign was 3.7 tons of thorium per day with a peak rate of 5.3 tons per day.

Of the approximately 192 tons of thorium charged to the dissolvers, only 181 tons were transferred through Tank D5 (head-end accountability tank) and Tank K6 (thorium product accountability tank). Only 3 to 4 tons of the 11-ton discrepancy can be accounted for in sump wastes, can-removal waste discarded without centrifuging, and post-run dissolver flushes. Additional flushes are being routed through other head-end vessels in an effort to locate the missing material.

b. Solvent Extraction

Solvent-extraction processing of the "hot" thorium feed was completed on July 5. This was followed by a two-day period of thorium product recycle for purging U-233 from the system.

As reported in June, a replacement 1C Column cartridge was installed on June 23. Subsequently, the improved stability characteristics of this cartridge permitted an increase in aqueous-to-organic flow ratio from 0.46 to 0.50 and an increase in pulse frequency from 30 to 47 cycles/minute. These changes reduced the LCW U-233 waste loss from 0.5 to 0.1 percent.

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The thorium concentration in the HAF was increased from 1.4 to 1.5 M during the month. Appropriate adjustments in the flowsheet were made to compensate for this increase.

Laboratory investigation of samples of the white solids observed in the LC Column showed them to form a floating liquid organic layer when treated with warm concentrated HNO_3 . In a variety of other typical reagents (e.g., caustic, caustic-tartrate, etc.), dissolution or dispersion of the solids does not occur. The organic phase resulting from acid treatment amounts to 60 to 70 percent of the solids volume. Caustic neutralization or reasonable volume reduction of the aqueous phase alone does not yield precipitates or an organic layer. The organic phase is miscible in nitric saturated solvent (30 percent TEP in normal paraffin hydrocarbon), but if the nitric concentration of the solvent is reduced by dilution or stripping, the white solid reforms. The plant equipment is currently being flushed with concentrated nitric acid and with 30 percent TEP in NPH to remove the white solids.

c. Solvent Treatment

Operation of the 20 Column (T-R2) continued to be unstable. Varying amounts of MnO_2 solids were observed in 20SR samples from late June to the end of the thorium campaign. Solvent quality and solvent losses were maintained near the levels reported last month.

Post-run flushing of both solvent-treatment systems, with oxalic and nitric acids, is in progress. Flushes of the No. 1 Solvent Treatment System have thus far contained 15 grams of U-233.

d. U-233 Product

The uranium-233 product (about 220 Kg, total as UNH) has essentially been removed from the process vessels; flushes of N Cell are in progress, and small quantities of U-233 are being loaded into normal U-233 product containers for shipment.

The U-233 product quality remained essentially as reported last month, with the exception that the U-238 impurity content increased to about 0.9 percent from 0.7 percent. The reason for the increase has not been determined, but it may have resulted from a corresponding increase in the ratio of U-238/U-233 in the irradiated thorium targets.

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2. Fission Products Process Engineering

a. Stored Waste Inventory Computer Program (Secretary)

A computer program (Secretary) has been developed which will issue, upon request, the current heat, salt, and important radionuclide inventories in any or all of the underground waste storage tanks. A computer program not only performs the normal computations to account for decay and waste transfers but also performs a statistical analysis of the accuracy of the output data. These accuracy estimates will indicate when new field measurements are required for satisfactory inventory control. Computerized accounting of the waste inventories is felt to be a valuable process control tool for determining optimum scheduling of waste extraction and solidification processing within waste tank structural and heat generation limits.

b. Underground Waste Storage Tank Cooler

The prototype waste tank cooler has operated continuously during the month except for a brief period when electrical service was interrupted. Heat and water removal rates are stable, averaging 1.0×10^6 BTU/hour and 1.6 GPM, respectively. Fluctuations in these values have been observed when the evaporator or transfer operations are interrupted, suggesting that salt scums are forming during periods when relatively warm streams are not splashing on the liquid surface. Radiation levels on the exhaust system have gradually increased, reaching a maximum of 250 mr/hour on the bottom of the duct surrounding the filter preheater.

3. Plutonium Process Engineering

a. Americium Purification

The initial results of the sampling program for determining the origin of the zirconium found in the americium product have been received. Of the streams that make up the Reclamation Facility feed, only the recycled filtrate, the slag and crucible, and miscellaneous treatment continuous dissolvent (TK-80) streams contained measurable amounts of zirconium. These were 0.10, 0.07, and 0.01 grams/liter, respectively. From this information, it would appear that the zirconium may accumulate in the process through a reflux mechanism whereby the zirconium leaves the Reclamation Facility in the product stream, is removed from the product in the oxalate precipitation and reduction steps, and returns via the filtrate and slag and crucible. There would probably be an equilibrium value for this build-up, with any additional zirconium leaving the process via the aqueous

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waste (CAW) and the plutonium metal buttons. Zirconium is known to be present in the waste, but there is no reliable data on zirconium concentration in plutonium buttons.

4. Separations Chemistry Laboratory

a. Thorium Dibutylphosphate

The nitrate complex of this compound was prepared in the liquid form by dissolution in hot 10 M HNO_3 . The liquid form which had a SpG of 1.08, disengaged well from the acid as an organic phase and was miscible with Purex solvent so long as the acidity was in excess of 0.75 M HNO_3 . The solid phase reformed when the acid was stripped from the organic solvent.

b. Lead Nitrate

Hydrated basic lead carbonate (white lead) was successfully converted to lead nitrate in the laboratory, and on-site conversion with nitric acid appears to be feasible. Of the several samples tested, only one gave a satisfactory conversion. The strontium and calcium contents of this sample were 7 and 32 ppm parts lead, respectively.

c. Analytical Development: Carbonaceous Analyzer

A glove box furnace installation has extended the application of the carbonaceous analyzer to high alpha radiation samples. Detection limits for carbon were 10 ppm parts plutonium.

5. Plutonium Chemistry Laboratory

a. Lithium Aluminum Targets

Improved methods are being sought to prepare lithium aluminate targets for the N Reactor tritium program. An initial 1" x 2" rod prepared by solid casting was sintered at 1300 C. Although cracking did occur, a density of 1.66 or 63% of theoretical was found. This is judged to be an encouraging result. Further efforts will aim toward preparing a slip having better rheological properties.

b. Americium Purification Development

A D2EHPA solvent extraction purification run was made using 2.3 g of americium from the concentrate described

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last month. The extraction coefficient was a disappointing 3.5, but the stripping coefficient was 0.01. Further small-scale tests have not yet shown the cause of the low extraction coefficient. Deterioration of DTPA was not a factor. Zirconium decontamination was excellent, although 25% of it held up in the solvent.

c. Reduction Liner Variations

Tantalum crucibles coated with ZrO_2 and with Fiberfrax were tested for plutonium tetrafluoride reduction on a 200-gram scale. Both coatings failed, although buttons of excellent appearance resulted.

d. Plutonium Metal Fire Studies

An attempt was made to extinguish 500 g of burning plutonium metal with an 8" x 8" bag containing 900 g of TEF (ternary eutectic fluoride). The metal fire was well established; upon application of the salt, burning metal sprues extended beyond the bag. Use of bag application appears unattractive for this reason.

A second test was made with poured application of 1,000 g of TEC (ternary eutectic chloride) on 600 g of plutonium metal. Several subsequent applications were required to fill burning cracks which developed over a two-hour period in the salt cone. Eventually the cracks ceased to develop, but only after the metal had been completely consumed.

R. E. Tomlinson

Manager
Research and Engineering

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II. ACHIEVEMENTS (Continued)

H. EMPLOYEE RELATIONS

1. Education and Training

All of the technical graduates and summer technical personnel were scheduled to attend the Nuclear Safety Orientation course given in July. Most of them did attend; however, due to the strike, some of the personnel were working shift work and were unable to attend.

The Nuclear Safety Training A Series course is being planned for the fall. This technically-oriented course, covering a period of some 20 - 22 weeks, will also include in attendance the technical graduates with Isochem.

2. Technical Recruiting

Three offers were made to minority group technical graduates interviewed in New York through the Richard B. Clarke and Associates Minority Group Employment Center. Two acceptances had been received by the month end from chemists, and it is expected that an acceptance will be received from the third offer made to a chemical engineer.

3. Union Relations

The 16th Joint Contractor-HAMTC Appendix A Meeting was held on 7-7-66 with FMCS in attendance. The meeting lasted well into the evening, but no progress was made and the meeting broke up with Union pronouncements about starting the strike. The strike started at midnight on 7-8-66 beginning with masses of observers at plant entrances. These have gradually dropped off, but Isochem bargaining unit attendance has been in the 25 per cent to 40 per cent range.

ITT/FSS continued to meet separately with the Union, and it appears that progress has been made toward settlement. Isochem representatives met with the Union on July 28 to review an ITT/FSS-HAMTC proposal. This proposal may ultimately represent the framework for settlement.

4. Communications and Community Relations

Eight news releases were made to local, regional, and national media. Good placement and treatment of the photo release on an Isochem "first" in processing neptunium to metal form was realized in the "Project News", local, and regional press. Northwest newspapers, such as the "Oregonian," are using this type of release material from Isochem.

5. Personnel Protection

<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										2
Ser Accidents										4
Med Treat Inj			5			3	7	4	19	228
Rad Occurrences						3	2	1	6	80
Contam Wds										5
New Dep Cases										5
Fires				1					1	8

Fire ISO-66-8, Waste Management, 241 BY, 7-4-66

Rupture of a hot air line resulted in ignition of the insulation covering. The loss was \$10.

H. B. Lindberg
for

Manager - Employee Relations

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CHEMICAL PROCESSING DIVISION
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JULY, 1966

II. ACHIEVEMENTS (Continued)

I. WASTE MANAGEMENT SECTION

1. Operating Continuity

The In-Tank Solidification unit operated satisfactorily nearly all month. Total down time was about two days to allow flushing of the deentrainers. One cesium cask was loaded at the Cesium Loadout Facility. The fission products processing facilities were down all month, primarily because of a work stoppage by union employees on July 8.

2. Processing Operations

a. Head End

The Head End equipment continued to be used as required for thorium processing.

b. B-Plant

Cell 5 equipment was flushed internally to prepare for its replacement during the Phase III waste management construction program. There was no processing of fission products because of (1) lack of feed early in the month, and (2) a work stoppage by union employees on July 8 which continued for the remainder of the month.

c. Semiworks

Because of the work stoppage, activities were limited to the preparation of chemical solutions which will be used in the next process test run.

d. Cask Loadings

One STT cask was loaded with 60,000 curies of cesium-137. As experienced during the latter part of June, the loading characteristics of this cask were also improved by diluting the feed with water. STT casks 44 and 47, containing a combined total of 120,000 curies of cesium-137, were shipped to ORNL on July 7.

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e. Waste Management

The In-Tank Solidification unit recovered 165,000 gallons of waste storage space. Although the circulator and deentrainers still require frequent flushing, most of the flushes are being performed without shutting down the unit. Total outage time during July was limited to about two days.

The preheating of Tank 104-AX was continued and the target temperature of 180°F was achieved by the end of July. This waste storage tank is now ready, whenever needed, to receive self-boiling wastes from Purex.

3. Equipment Experience

Concurrent with the work stoppage on July 8, the processing equipment was placed in a limited stand-by status, with surveillance checks being made as required. There were no significant failures or repairs to equipment.

4. Radiation Experience

The floor of the 801-A Building, which was contaminated on June 2, was covered with approximately eleven tons of lead shot to reduce the radiation exposure rate. Lead shielding was also installed around some of the valving and piping. The net effect of these actions was to reduce the radiation level to a range of 40 to 250 mr/hr. Additional shielding will be required, however, to reduce the radiation to a safe level for normal working conditions.

There has been no significant change in the status of Tank 105-A, as indicated by radiation readings in the laterals underneath the waste tank and the bulge detectors for the bottom liner.

R.E. Smith

Manager
Waste Management

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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>6-30-66</u>	<u>7-31-66</u>	<u>6-30-66</u>	<u>7-31-66</u>	<u>6-30-66</u>	<u>7-31-66</u>
General	2	2	1	1	3	3
Research & Engineering	56	57	33	33	89	90
Facilities Engineering	93	92	191	185	284	277
Manufacturing						
General	1	1			1	1
Waste Management	25	28	67	106	92	134
Production Planning	4	4	3	4	7	8
Redox	62	61	231	231	293	292
Purex	54	50	236	190	290	240
Plutonium Finishing	<u>44</u>	<u>44</u>	<u>193</u>	<u>189</u>	<u>237</u>	<u>233</u>
Total CPD	341	339	955	939	1296	1278
Corporate Offices and Business Management Division	<u>83</u>	<u>82</u>	<u>74</u>	<u>75</u>	<u>157</u>	<u>157</u>
Grand Total	<u>424</u>	<u>421</u>	<u>1029</u>	<u>1014</u>	<u>1453</u>	<u>1435</u>

Does not include temporary Youth Opportunities Trainees or summer employees.

B. PERSONNEL CHANGES

G. E. Cunningham - Analyst Radiation Protection reporting to S. G. Smolen - Manager, Purex - transferred to Marketing Division 7-1-66 reporting to E. T. O'Sullivan - Vice President, Marketing Division.

R. E. Roberts - Specialist Waste Storage and Production Statistics - reporting to V. R. Chapman - Manager, Production Planning and Scheduling - transferred 7-1-66 to Manager, Operations Analysis reporting to R. E. Smith - Manager, Waste Management.

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C. TRIPS

<u>Visitors</u>	<u>To</u>	<u>Nature of Discussion</u>
<u>To Conventions and General Meetings</u>		
W. W. Watson, Jr.	U. S. Rubber Co. Wayne Research Center Wayne, N. J. (7/12 - 7/15)	Attend U. S. Rubber recruiting conference
<u>To AEC and Other AEC Contractors</u>		
D. McDonald	Albuquerque, N.M. (7/25 - 7/29)	Attend ALOO scheduling meeting

D. VISITORS

<u>Visitors</u>	<u>From</u>	<u>Nature of Discussion</u>
<u>From AEC and Other AEC Contractors</u>		
A. B. Shuck	Argonne National Laboratory Chicago, Ill (7/6)	Discussed possible assignment of ZPPR work to Isochem
<u>From General Industry</u>		
E. C. Moncrief	Babcock & Wilcox Co.	Discussed thorium program
H. C. Buckart	Lynchburg, Va (7/6 - 7/7)	

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IV. REPORTS

A. PREPARED AND ISSUED

- ISO-186, (Unclassified), "Design Criteria - Purex Tank Farm Vent System Expansion", J. W. Barnes, April 1, 1966
- ISO-338, (Secret), "Chemical Processing Division, Budget for FY 1968 and Revision of Budget for FY 1967, Plant and Capital Equipment", L. W. Finch, June 30, 1966
- ISO-368, (Secret), "Information on Selection of Radioisotopes for Space Power Systems", O. F. Hill, July 5, 1966
- ISO-369, (Unclassified), "Measurement of Plutonium Standard Forms by Isochem", R. W. Doerr and R. J. Sloat, July 6, 1966
- ISO-350, (Secret), "Polonium Processing - A Stepwise Production Capability Alternate", J. J. Shefcik and D. C. Nelson, July 29, 1966
- ISO-404, (Secret), "CPD Waste Status Summary April 1, 1966 through June 30, 1966", R. E. Roberts, July 15, 1966
- ISO-411, (Official Use Only), "Chemical Processing Division, Construction Project Data Sheet for FY 1968 Budget, Purex Analytical Laboratory Additions", C. A. Lyneis, July 27, 1966
- ISO-414, (Unclassified), "Safety Analysis and Hazards Review for High Frequency Induction Heating Equipment", H. H. Hopkins and J. M. Calkins, July 22, 1966
- ISO-416PTI, (Official Use Only), "Report of Investigation - Radiation Occurrence and Contamination Spread, Part One - The Accident and Related Actions", R. E. Smith, July 25, 1966
- ISO-416PTII, (Official Use Only), "Report of Investigation - Radiation Occurrence and Contamination Spread, Part Two - Conclusions and Recommendations", R. E. Smith, July 25, 1966
- ISO-418 1, (Unclassified), "Part II Design Criteria, Purex 4.0 Capacity Factor Expansion, Revision 1", J. H. Nordahl, July 25, 1966
- ISO-SA-14, (Unclassified), "The Semi-Remotely Maintained Plutonium Reclamation Facility", R. B. Laws and G. P. Kesel, July 8, 1966

ISO-SA-23, (Unclassified), "Sealing of Plastic Film by Electronic Welding for Alpha Contamination Control", J. W. Fillmore and H. A. Moulthrop, June 22, 1966

ISO-SA-24, (Unclassified), "Major Repair and Modification Techniques Used on Large Scale Separations Facilities", W. H. Koontz and J. F. Kane, July 15, 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

None

Vice President
Chemical Processing Division

END

DATE
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