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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT
FOR
FEBRUARY, 1960

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By J. Phillips 3-4-92

DG Krisher 8-4-92

Compiled By
OPERATION MANAGERS

March 21, 1960

HANFORD ATOMIC PRODUCTS OPERATION
RICHLAND, WASHINGTON

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Date 5/15/73
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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

FEBRUARY, 1960

I. SUMMARY

A. RESPONSIBILITY

There were no changes in the responsibilities of the Chemical Processing Department during February.

B. PRODUCTION

The production of plutonium nitrate from the separations plants during February was below the Official Forecast; however, fiscal year-to-date output is slightly above that forecasted.

The production of UO_3 exceeded commitments for the month and fiscal year while shipments of UO_3 conformed to the established shipping schedule.

Unfabricated plutonium metal production in February was slightly below commitment; however, fiscal year-to-date output exceeds commitment.

C. ENGINEERING

Decontamination performance of the Purex solvent extraction system continued to be subnormal much of the month. Uranium was recycled to the system about 35 percent of the time to reprocess out-of-specification plutonium. Brief intervals of normal performance occurred just following periods of uranium recycling.

A coincidence has been observed time-wise between unstable performance in the Purex uranium stripping column (1C) and regeneration of the cation bed in the water demineralizer. White solid material was noted in the Recovered Acid system and laboratory tests showed that the solids accumulate fission products and affect solvent quality. These phenomena are being studied.

Two separate brief periods of loss of partition efficiency occurred at Redox during startups. Plutonium losses into the uranium-hexone stream (1BU) were noted to be 20 to 30-fold above normal. These disturbances have previously occurred but to a lesser degree (July 1959). The loss in efficiency has been assigned to sodium dichromate extracted (entrained) into the organic product stream while the first decontamination column (1A) was being filled but before it reached equilibrium.

A revised process for reclaiming plutonium from cutting oil was successfully demonstrated in Recuplex. Plutonium recoveries, ranging from 85 percent to 95 percent, were realized.

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Plutonium nitrate solutions have been successfully concentrated for future use in critical mass experiments. The Development Laboratory, starting with Purex product, concentrated the nitrate to a stable, pumpable solution of 630 grams per liter in six molar nitric acid.

Preliminary scope drawings were prepared for a new Purex waste storage tank farm. Project cost estimates and schedules were developed.

A study layout drawing was made of the Purex Continuous Neptunium Package. Two basic alternates to provide sampling are being considered; the first involves the addition of one new sample cup; and the second involves the addition of a new three-cup sampler. Fundamental criteria on radiation, radiation stability, and chemical stability for neptunium shipments have been developed. In response to an AEC request, preliminary design studies covering shipping alternates are in progress.

D. GENERAL

A fire occurred in Purex N Cell on February 24 during conversion of the ion-exchange prototype to a production facility. The incident resulted from welding being performed by a Minor Construction employee. There was no damage to the hood or equipment in the hood. Contamination spread was restricted to the N Cell section of the building.

W.K. MacCready

General Manager
Chemical Processing Department

WK MacCready:lbp

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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

FEBRUARY, 1960

II. ACHIEVEMENTS

A. PRODUCTION OPERATION

1. Production Statistics

a. Purex

	<u>February</u>	<u>January</u>
Plutonium nitrate produced (Kgs.)	250.5	348.4
Uranium nitrate produced (tons)	375.7	600.9
Average production rate during operation (T/D)	19.3	19.4
Total waste loss (%)		
Uranium	0.10	0.08
On-line efficiency	70.1	100.0

b. Redox

Plutonium nitrate produced (Kgs.)	24.8	49.6
Uranium nitrate produced (tons)	47.7	(71.7 E
		(12.6 N
Average production rate during operation (T/D)	6.4	6.2
Total waste loss (%)		
Uranium	0.11	0.19
On-line efficiency	37.4	67.4

c. Uranium Reduction

Normal UO ₃ loaded (tons)	404.2	498.4
Enriched UO ₃ loaded (tons)	9.6	54.6
Normal UO ₃ approved for shipment (tons)	505.1	402.3
Enriched UO ₃ approved for shipment (tons)	0	49.2
Normal UO ₃ shipped (tons)	553.0	403.2
Enriched UO ₃ shipped (tons)	0	0
Normal UNH backlog (tons)	309	240
Enriched UNH backlog (tons)	58	23

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d. Plutonium Metal Processing

	<u>February</u>	<u>January</u>
Input to Task I (batches)	205	265
Reduction yield (%)	97.9	96.6
Plutonium metal buttons produced (% of commitment)	93.7	146.1
Plutonium metal buttons shipped (% of commitment)	116.6	102.4
Product recovery output (% of schedule)	80.0	112.0
Product recovery backlog (Kgs.)	170.8	106.9
Waste disposal (grams)	393	663

e. Plutonium Metal Fabrication

Weapons parts produced (% of commitment)	84.0	114.4
Weapons parts shipped (% of commitment)	118.6	106.8

f. Waste Storage

Redox salt waste reserve (tons U)	2 947	2 994
Purex salt waste reserve (tons U)	27 975	28 353
Redox costing waste reserve (tons U)	23 988	24 035
Purex costing waste reserve (tons U)	33 554	33 932

g. Power

	<u>200 East</u>	<u>200 West</u>
Raw water pumped (gpm)	6 681	3 518
Filtered water pumped (gpm)	1 069	667
Maximum steam generated (lbs./hr.)	237 000	164 000
Average steam generated (lbs./hr.)	206 152	112 846
Total steam generated (M lbs.)	143 481	78 541
Coal consumed, est. (tons)	8 330	4 788

J. H. Warner
Manager - Production

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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

FEBRUARY, 1960

II. ACHIEVEMENTS (Continued)

B. PUREX OPERATION

1. Operating Continuity

Continuity of operation was maintained at a nominal 2.2 CF until 1000 on February 26, at which time normal processing was suspended in order to conduct a Palm recovery run and perform necessary flushing and maintenance work. The completed run period had started on December 13, 1959, and was the longest continuous run period in Purex history. The production for the month was short of forecast by 25 tons. Plutonium waste losses were and uranium losses were 0.10 percent for the month.

A Palm recovery run was begun on February 28 and completed on March 4.

2. Processing Experience

During the first four days of the month, uranium and plutonium were reworked in order to reduce a backlog of out-of-specification plutonium product. Process performance was excellent upon returning to normal feed. The plutonium remained well within specifications and the uranium was within silica gel limits.

During the periods of troublesome operation it was noted that the First Cycle uranium stripping column (IC) was very unstable and could have contributed to the marginal performance of the entire extraction system.

Processing was ended on February 26 and a Palm recovery run started and was in process at month's end.

A total of 394 tons of uranium was processed through the silica gel facility.

3. Mechanical Experience

A modified pump was installed in the organic wash tank (G1) to accomplish better mixing of organic and aqueous wash solutions for improved organic cleanup.

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The A-2 dissolver heater-reactor was cleaned with sodium thiosulfate and water flushes to restore normal operating conditions.

The agitator in the neutralized waste (F16) tank failed and was replaced.

During the Palm run all of the concentrator tube bundles were checked for leaks. Both of the acid concentrator (F6) tube bundles, as well as the back-cycle (H4) concentrator east tube bundle, were found to have leaks and will require replacement.

The waste concentrator (F11) condenser was replaced with a spare unit after severe water leaks developed at both bolted flanges. The failed unit will be decontaminated and repaired.

The R1-2 pump on the No. 2 solvent feed tank was replaced with a short pump for improved solvent decontamination.

4. Radiation Experience

A fire occurred in the plutonium ion exchange (N Cell) hood while J. A. Jones' forces were welding a two-inch pipe to the top of the hood. An inlet air filter was partly consumed but no damage was done to the hood or the equipment in the hood. There was extensive contamination of the hood room, air lock, regulated shop, and PR corridor. Surveys disclosed plutonium contamination levels greater than 6×10^6 d/m in N Cell and the N Cell AMU area and levels from 20,000 to 40,000 d/m in adjacent areas. At month's end routine decontamination efforts were restoring the area to the pre-spread status.

Seven cases of plutonium skin contamination (2,000 d/m to 40,000 d/m) resulted from this contamination spread. All skin contamination was reduced to less than detectable.

5. Analytical Performance

In support of the fission product recovery program, a new counting method was developed to distinguish between Ce-144 and Ce-141.

6. Events Influencing Costs

Recycling of both product streams for approximately six days this month adversely affected essential material usage and contributed to higher unit costs.

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The use of the Wash Down Capsule for reducing the radiation levels on failed concentrator tube bundles was successfully demonstrated. There was a significant saving in decontaminating chemical consumption, reduced exposure rates during burial, and reduced risk of contamination spread during burials.

During the plant shutdown tests revealed three concentrator tube bundle failures.

Manager-Purex

PR McMurray:BAF:gt

[REDACTED]

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

FEBRUARY, 1960

II. ACHIEVEMENTS (Continued)

C. SPECIAL SEPARATION PROCESSING & AUXILIARIES OPERATION

1. Operating Continuity

Processing operations were suspended on a planned basis this month to replace the D-12 waste concentrator which had developed a serious leak over the course of several months at the tube bundle flanges and possibly in the wall of the vessel. Operations were resumed on 2-22-60 and continued as scheduled to the end of the month. Production for the month was slightly under that scheduled, however the quarterly commitment is expected to be met.

2. Processing Operations

Because of the scheduled shutdown taken this month for replacement of the failed D-12 waste concentrator, E-Metal processing was confined primarily to the last week of the month. During this short production run 48 units of E-Metal were completed while operating at 38% of the total hours available for column operation. The quality of both product streams was well within shipping specifications and waste losses were under very good control.

Approximately 90 units of UNH from the Purex Plant, with a gamma ratio of approximately 5.00, was processed through the silica gel system to reduce the gamma ratio to an average of 1.5. All of this material was shipped to the UO₃ Plant for final processing.

3. Mechanical Experience

The major maintenance item encountered during the month was replacement of the failed D-12 waste concentrator. Inspection of the vessel prior to its removal from the canyon cell revealed that the steel "T" brace on one of the lifting trunnions had corroded away. Fabrication of a special yoke was necessary before the tank could be removed. This incident provides ample evidence that future trunnions, supports, etc. should be fabricated from stainless rather than mild steel.

Considerable difficulty was encountered during the installation of the new D-12 unit. The original vessel with its associated jumpers was completely mocked up in the shop before installation in December of 1955. This was obviously not possible with the replacement unit. Although the new vessel was dimensionally completely satisfactory, the differences between it and the original vessel were sufficient to offset the nozzle locations as much as one inch at the top of the tower.

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This slight difference, plus the numerous jumpers involved, made it extremely difficult and time-consuming to get the cell jumpers to make-up to the new vessel.

In conjunction with the new D-12 waste concentrator installation, fluoroflex plastic liners were installed in the two four inch in-concrete steam supply lines leading to the D-12 heat exchangers. This was done as a preventive measure against possible in-concrete piping corrosion. One weakness which developed during the fluoroflex liner installation is that the flared end at the cell nozzle can be damaged unless the canyon jumper is a very close fit. A method of capping the flared end of the fluoroflex lines with thin stainless steel is currently under development.

Twelve cell jumper replacements were made in the 202-S Building canyon during the month. Four of the installations were made to simplify the flow pattern on Palm recovery runs, six were associated with the new D-12 waste concentrator installation, and two were made to improve jetting times on product transfers.

4. Waste Handling and Decontamination

A total of 67,483 gallons of stored non-boiling salt waste was pumped from the 112-SX tank to the 111-SX tank for in-farm concentration. No difficulty was experienced with this operation.

Repair of a leaking diversion valve in the SX Tank Farm condensate valve pit, located near the 112-SX boiling waste tank, was completed and pumping of condensate from the 106-SX tank to the boiling waste tanks was started on 2-10-60. The use of rock and poured cement in the valve pit reduced radiation levels from a maximum of 20 r/hr to a working field of 2 r/hr. Repair of the leaking valve was then accomplished at personnel dose rates ranging from 150 mr/hr to a maximum of 1 r/hr.

Using reclaimed jumper heads, a new process jumper was installed in the 240-S diversion box on 2-18-60. Use of the reclaimed jumper heads resulted in a saving of approximately \$1,400 in jumper fabrication.

A total of 249 man-hours was charged to the decontamination of automotive, railroad, and heavy equipment this month. The following is a breakdown of the decontamination work:

Automotive and Heavy Equipment

<u>Item</u>	<u>Operation Charged</u>
Pickup Truck 1-C290	Redox (WHDO)
Truck 68B-4637	P&GM
Truck 68B-2570	P&GM
Truck 68B-2568	P&GM
Evacuation Bus 1B-6673	P&GM
Motor Crane 17-T-19951	P&GM
Air Compressor	P&GM
Welding Machine	Redox (WHDO)

Railroad Equipment

<u>Item</u>	<u>Operation Charged</u>
Two UO ₃ Flat Cars	FPO
Flat Car 3618	Purex

Process Equipment

<u>Item</u>	<u>Operation Charged</u>
F-11 Condenser	Purex
Six Process Jumpers	Redox
D-12 Waste Concentrator Vapor Jumper	Redox
Impact Wrench (Crane)	Redox
Three Diversion Box Jumpers	Redox

Miscellaneous Items

<u>Item</u>	<u>Operation Charged</u>
Aluminum Pipe (4" - 200 ft.)	FEO
Electrical Circuit Alternator	Transportation
Grease Pan and Oil Container	Transportation
Welding Cable (200 ft.)	Redox (WHDO)

The F-11 condenser, which was received from the Purex Plant for decontamination, was contaminated generally with low level fission products to 60,000 c/m. The unit was cleaned to isolated spots of 2,000 - 3,000 c/m, non-smearable, and shipped to the Power & General Maintenance Shops for repair. This unit is valued at approximately \$52,000.

5. Radiation Experience

Removal and burial of the failed D-12 waste concentrator from the Redox canyon was completed on 2-11-60. The vessel was highly contaminated and created a radiation field of 150 r/hr at a distance of six feet from the five inch thick concrete box in which it was placed for burial. Transfer of the vessel from the building and subsequent burial were accomplished without incident - a significant accomplishment.

There have been no observable fission product emissions from the 291-S stack since the occurrence reported on 1-7-60. Subsequent wetting with snow and rain, plus water flushing, has reduced the level of ground activity to near normal status. In the meantime, two courses of action are being firmed up in an effort to resolve the particulate contamination problem from the 291-S stack. These include: (1) reuse of the 293-S Building scrubber to handle the ammonia off-gases from the uranium coating removal operation and (2) installation of a scrubber in J-cell which will handle the off-gases from all three dissolver locations, and then routing the scrubbed gases to the sand filter via the ventilation tunnel.

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6. Analytical Experience

The reduced work load resulting from the planned shutdown of the Redox Plant during the first part of the month provided a much needed opportunity for additional development work on analytical methods and procedures.

Greater realization of the capabilities of the multi-channel analyzer have improved accuracy and sensitivity and broadened the scope of alpha and gamma analyses to such an extent that demands for this service have increased to the point where the present instrument, operating on a 24-hour basis with normal maintenance downtime, is no longer able to keep up with all requests and provide good service on rush analyses. Studies of procedural changes or supplemental equipment to remedy this situation were made this month and recommendations will be made upon concurrence of the Research and Engineering Operation.

Standard recoveries and precision of Palm analyses showed considerable improvement as a result of concentrated effort, study, and practice to improve procedures and techniques during the period of the Redox Plant shutdown. The difficulty is inherent in the Redox process and arises chiefly from trying to account for small traces of material in large amounts of interfering substances. Present recoveries on standard solutions compare favorably with comparable work on Purex type solutions as well as with the Savannah River Plant, where the nature of the process requires assay of solutions with Palm concentrations 500 times greater than those encountered locally.

7. Events Influencing Costs

More efficient performance in waste concentration should result from the installation of the new D-12 waste concentrator. The elimination of leaks from the tube bundle flanges, which previously required reconcentration of large quantities of sump wastes, is expected to affect a monetary savings in steam usage.

The highly radioactive D-12 waste concentrator, which was removed from the Redox canyon and buried this month, was transported in a newly designed concrete burial box proposed by the contact engineering personnel of the Operation. The new design allows box fabrication to be made by pouring the concrete sides on the horizontal and then raising to a vertical position for assembly. This method of fabrication eliminates the interior and exterior forming previously needed, thus reducing costs by approximately \$1,100 and fabrication time by approximately 50%.

Chas. S. Grosz

Manager - Special Separation
Processing and Auxiliaries

CT Grosz:sws

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

FEBRUARY 1960

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II. ACHIEVEMENTS (Continued)

D. FINISHED PRODUCTS OPERATION

1. Operating Continuity

Shipping commitments for all products were met or exceeded. Production of weapons parts and "normal" uranium oxide were on schedule. Unfabricated plutonium was under schedule due to the shortage of acceptable feed at the beginning and end of the month, and also due to mechanical difficulties with the continuous processing equipment. Recovery operations were permitted to drop below schedule this month in order to provide the time needed for extensive cleanup of hoods and equipment made necessary because of high radiation levels. "Enriched" uranium oxide production was under schedule from a lack of acceptable feed material.

2. Processing Operations

a. Plutonium Fabrication

The progress of the work during the month was good. Machining rejects were low and the equipment performance was relatively trouble-free. One extra assembly was fabricated at the direction of the Commission to replace an assembly damaged by the customer during his phase of the work. Final shipment of this model, originally scheduled for March, was made in February at the request of the Commission. No formalized plutonium fabrication is now planned until July. Available manpower will be used in training as well as for reducing hood holdups and preparing equipment for removal later this year.

b. Plutonium Processing

Production of unfabricated plutonium was limited this month by the failure of the platinum liner of the fluorinator tube of the continuous calciner-fluorinator (resulting in three days lost operational time). This, plus the shortage of acceptable feed at the start and end of the month resulted in failure to achieve the scheduled production.

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In the recovery facilities, emphasis on hood and equipment cleanup to reduce the high radiation levels which developed last month, reduced the output this month. These efforts were relatively successful and personnel exposure levels have been reduced. At month end all recovery operations were down in order to make needed plate replacements in the solvent extraction column.

Two over-batch-size incidents occurred in Recuplex during the month. Both have been investigated and reports have been issued. Steps have been taken to prevent recurrence.

c. Uranium Reduction

Activities in the Uranium Reduction facility were normal during February with shortages of shipping containers being troublesome but not critical.

3. Mechanical Experience

Equipment performance in U and Z Plants was satisfactory during the month with only two unscheduled shutdowns being required. One involved the ruptured platinum liner of the fluorinator tube of the continuous plutonium processing unit. The other involved a powder seal failure on the "G" continuous calciner in the Uranium Reduction plant.

4. Radiation Experience

Radiation control was good during the month, with statistics showing improvement over last month. Personnel exposure rates continue to be higher than normal, especially in the Recuplex and Button Line areas. Counter measures in use include the installation of additional shielding, major and continuing cleanup of hoods and equipment, and rotation of personnel.

5. Analytical and Final Inspection Experience

	<u>February</u>	<u>January</u>
Number of Samples	853	1003
Number of Determinations	8082	11419
Average Impurity Content - Buttons	1057 ppm	1130 ppm
Purity - Shapes	99.899%	99.868%
Gauging Acceptance - Shapes		

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J. J. Courtney
Acting Manager - Finished Products

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CHEMICAL PROCESSING DEPARTMENT
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II. ACHIEVEMENTS (continued)

E. POWER AND GENERAL MAINTENANCE OPERATION

1. Operating Continuity

Steam, water, and emergency electrical services were supplied the prime production facilities, in a manner sufficient to maintain continuity of operation for the entire month.

2. Inspection, Maintenance and Repair

Fabrication of the Multipurpose Dissolver for the Redox Facility was completed February 17, and current schedules indicate the unit, complete with all component parts, will be delivered to the job site March 21. Several minor problems disclosed during mock-up installation are being corrected, and an off-gas filter, absorber tower and heater are being made ready for simultaneous mock-up with the dissolver, to assure proper fit of all interconnecting components.

The Fabrication Shop was placed on an emergency around-the-clock basis February 10, in order to expedite fabrication of equipment required for the removal of a failed waste concentrator from a Redox canyon cell. During removal, in the conventional manner, of a failed waste concentrator, a lifting bale separated from its fixed position on the vessel. Before removal of the damaged vessel could continue, it was necessary to cover the three flanged openings in the vessel with blanks, to which lifting bales had been attached, and provide a lifting yoke, designed especially to meet existing conditions. The removal and subsequent burial of the damaged vessel was accomplished without further incident.

During installation, in the Purex canyon, of a new Vapor Condenser (F-11), used in conjunction with a process acid concentrator, a nozzle header was accidentally pulled out of position by the crane hook. The vessel was decontaminated and returned to the Boiler Shop for repairs. The damage has since been repaired and the vessel returned to service.

Modifications and revisions, designed to improve through-put of the Solvent Extraction Pulse Column and Pulse Generator at the Purex Facility, are in progress and scheduled for completion March 8. Included in the modifications to the column was the replacement of the existing nonremoteable sieve plate cartridge with a new remoteable type that was fabricated on site. The amplitude of the Pulse Generator was increased by machining and installing a new crankshaft with a throw twice that of the original installation. A water column, simulating the hydraulic load on the IC Column, has been erected in the 272-E Shop, on which the revised pulse column is being tested.

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Preliminary work has been started on the installation of a High Level Cave in the Sample Gallery of the Purex Facility. The cave will be equipped with two mechanical manipulators, designed to permit controlled handling of process samples emitting high levels of radiation. The installation requires relocation of overhead pipe lines, conduit, air ducts, etc., and job progress will be contingent upon production schedules at the Purex Plant.

Fabrication was completed on three stainless steel hoods for use in classified work in the 222-S Control Laboratory. Installation is scheduled for completion in March.

All revisions and additions to the evacuation alarm system of Hanford Laboratories Operation's 231-Z Facility have been completed. The work was necessitated by the rearrangement of offices and equipment, and included the installation of three additional alarm activating stations, two new klaxons and a new master control unit.

In progress at month's end was the conversion of a spare Redox Process Storage Vessel (H-10) to an Ozone Contactor Vessel (E-13), as required to replace a failed unit in the Redox canyon. Installation of the converted unit is scheduled for March 24.

Fabrication of cell pipe jumpers during the month consisted of:

16 for Redox
8 for Purex
<u>24</u> total

Modifications and revisions to the calciner and fluorinator in Hood 9-B of the Finished Products Operation's RMC Line were completed during the month. The work was done as part of Project CG-691 (Improved Facilities, Tasks I and II, 234-5). The planned relocation of Hood 9-B in the RMC Line precluded completion of the work prior to this time.

Special emphasis is being placed on expediting fabrication of three prototypal shipping containers and "bird cages," each of different design, that are to be used in test shipments of weapons shapes, as an aid to determining a final design.

Completed during the month, for the Finished Products Operation, was the temperature control hood, designed for supplying controlled air to the Sheffield Gauge Hood. Final assembly of this hood group is pending arrival of the Sheffield Gauge Machine, which is scheduled for arrival on the plant site about April 1. The machine will be used for precision measuring of weapons shapes.

Replacement of the electrical heating elements in the Hydrogen Atmosphere Sintering Furnace in Hanford Laboratories Operation's 231-Z Facility was completed without incident. This was a very delicate assignment and, because of the amount of contamination involved, required a high degree of job preparation and control.

The removal of 12 contaminated hoods and equipment from the 231-Z Facility, and delivery of these hoods to the 308 Building in the 300 Area, is in progress. This is part of the PRTR Program (Project 747), and is being

done under the direction of the Hanford Laboratories Operation. The removal is scheduled to extend over a ten-week period.

A Vibrator and Vertical Impact Plate were installed in the 200 East Area coal silo to facilitate recovery of coal under adverse weather conditions. The problem of wet coal packing and "arching over" inside the silo has been one of long standing, and the addition of a vibrator is expected to make recovery from the silo considerably less difficult.

The ventilation system of the 141-FS Facility (Aquatic Biology Laboratory) was rebalanced as an aid to the Hanford Laboratories Operation, in the control of air-borne contamination.

During a planned shutdown of the Purex Facility it was necessary to open the 151-A Diversion Box and install a flexible pipe jumper, in order to reroute flushing material from the 202-A Building to the 105-C storage tank. The presence of contamination in the diversion box necessitated installing the jumper by remote methods, using portable mirrors for visual aid. The job was completed without incident.

A motor crane was dispatched to the UO₃ Operation for use in replacing the failed X-19 feed pump to the "E" metal calciner. The work was done on a crash basis, in that there is no auxiliary X-19 feed pump, and failure of the one existing unit precludes further operation until replacement is effected.

T. S. LaDre

Manager-Power & General Maintenance

TGL:JFL:ap

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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

February, 1960

II. ACHIEVEMENTS (Continued)

F. FACILITIES ENGINEERING OPERATION

1. Purex

a. Process Design and Development Engineering

Radioactive Wastes

Preliminary scope drawings were prepared for a new Purex tank farm. Project cost estimates and schedules were obtained for the new tank farm and for the laterals-caisson type of leak detection at Redox 241-SX and Purex 241-A Tank Farms.

Demister Vessel

The tantalum pad to be used in the demister vessel between the concentrator (F-6) and the acid absorber (F-5) was found to be non-uniform and less dense than permissible. The pad was returned to the vendor for rewinding and addition of tantalum wire mesh to meet original specifications. Tests of a glass fiber cartridge (Brink Filter unit) showed that the tantalum pad demister is preferable for Purex concentrator de-entrainment services.

Continuous Palm Recovery

A study layout drawing was made of the Purex Continuous Palm Package, as if installed in the J-2 Canyon position and including major equipment. The study was then amplified to show essential services and jumper installations. Additional layout studies are required to satisfy all critical mass and sampling requirements. Two basic alternates to provide sampling are being considered; the first involves the addition of one new sample cup; and the second involves the addition of a new three-cup sampler.

Palm Shipment

Fundamental criteria on radiation, radiation stability, and chemical stability for Palm shipment have been developed. In response to an AEC request, preliminary design studies covering shipping alternates are in progress.

b. Project Engineering

CGC-850 - Purex 216-A-4 Crib Replacement

The contract was let for drilling the two test wells of about 400 feet each. Drilling was started during the third week of February.

c. Manufacturing Engineering

Pulse Generator Revision

Design work has been completed on the pulse generator and the column cartridge for the change which increases the stroke of the pulse generator from 1-3/8 inches to 2-3/4 inches. The pulse generator is undergoing run-in tests in the 272-E Shop, and the column cartridge is being assembled, both for installation in early March, 1960.

2. Special Separation Processing

a. Process Design and Development Engineering

Alpha and Beta-Gamma Air Monitors

The three beta-gamma and the five alpha monitors have been completed and delivered to Redox. Drawings of the instruments are being corrected for design modifications which the tests showed to be necessary.

b. Project Engineering

CG-772 - Multipurpose Dissolver - Redox

Fabrication and mock-up of the dissolver and jumpers was completed in preparation for installation during March.

CAC-843 - Disposal Facilities for UO_3 Condensates

When the fixed-price contractor began excavation on February 23, a 5-6 foot layer of relatively impervious sand and silt was found. Consequently, the crib site was relocated 100 feet southward to avoid this layer.

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c. Manufacturing Engineering

Instrument Service Requirements

Based on two months of operating experience, the instrument repair requirements were evaluated by the "queueing" theory. The results show that one man per shift can provide the repair service and still have time for fill-in work. All remaining work can be scheduled through the day crew.

3. Finished Products Operation

a. Process Design and Development Engineering

Plutonium Reclamation Facility

New engineering flow diagrams are being prepared, based on the use of continuous "critically-favorable" dissolvers for all solid feeds and a packed solvent extraction column for waste cleanup. Perspective type drawings are being prepared for use in future discussions and for preparation of cost estimates on the four proposed building arrangements. These arrangements are based upon the maintenance philosophy to be utilized, semi-remote, contact, hood cell, or remote. Location of the building has been tentatively agreed upon as between the Incinerator Building and the 234-5 Building.

Continuous Centrifuge

Shop testing of the critically-safe continuous centrifuge has been started by the vendor.

Shell Breaker

Feasibility was demonstrated for the breaking of unalloyed plutonium shapes into pieces small enough for recasting. The tests showed that the method, pressing between two flat surfaces, was applicable to unalloyed plutonium only. The alloyed plutonium must be reduced by cutting; so a prototype cutter is being designed and built on research and development funds.

b. Project Engineering

CG-789 - Additional Fire Protection - 234-5 Building

The bid package for the furnishing and installation of the fire detection system was forwarded to AEC on February 19. The contractor has completed the outside underground work and started erection of the sprinkler piping inside 234-5 Building.

CGC-811 - Additional Fabrication Facilities, 234-5 Building

On February 24th the decision was reached to "go hot" with the machining hood (HC-24B) for prototype shell production. Preparations will be completed by March 7, 1960.

Construction of the new Inspection Facility is proceeding at an accelerated pace as the contractor builds up his work to overcome earlier delays.

c. Manufacturing Engineering

Steam Stripper Vessel

The possibility of fabricating a titanium steam stripper for 234-5 Recuplex installation is being considered. Materials cost information is being developed.

4. General

a. Process Design and Development Engineering

Transistorized Equipment

A review has been made of the need for training craftsmen in maintenance of transistorized instrumentation. Arrangements have been initiated for location, schedule, course content, and demonstration equipment. The course is intended to accompany the current introduction of transistorized equipment into process control systems.

Leak Detection Instrument

Fabrication of the "powered ferret" leak detection instrument has been initiated, and completion is expected by April 1, 1960. This device, which was designed to bear instrument probes through lines beneath waste storage tanks, is being tested under simulated operating conditions.

Advance Engineering, Long-Range Programs

Five CPD Plant Improvement Programs were advanced to the draft stage during the month. They are Palmolive, Fission Products, Non-Production Fuels Reprocessing, Continuity of Operations, and Increased Plant Return.

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b. Project Engineering

Project cost information as of February 14, 1960:

Total authorized funds - 15 active projects	\$ 9,424,000
Total cost-to-date	3,887,000
Commitments and Open Work Releases	2,009,000
Unencumbered balances	3,528,000
Cost charged to above projects 1-17-60 to 2-14-60	319,209

CAC-812 was dropped from active status during this period:

Authorized funds - \$ 29,000 Total Cost \$ 28,783

CGC-830 - Plant Modifications for Reprocessing NPF

In accordance with instructions from AEC the calcination of NPF uranyl nitrate solutions has been deleted from the project scope. Construction has been deferred until receipt of a new directive for the new scope of work.

c. Manufacturing Engineering

Equipment Burial

Evaluations were issued on four suggestions relating to burial containers, which had been submitted through the employee suggestion system. An order was placed for test quantities of an aqueous-chemical foam, and rental of a foam generator, for evaluation of a method to displace contaminated air from burial boxes.

Manager
Facilities Engineering

HP Shaw:WWC:al

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

FEBRUARY, 1960

II. ACHIEVEMENTS (Continued)

G. RESEARCH AND ENGINEERING OPERATION

1. Purex Process Technology - R. G. Geier

a. Feed Preparation

A silver reactor, plugged after processing the off-gases from dissolving 2900 tons of uranium, was successfully rehabilitated by flushing with a solution of 2 M $\text{Na}_2\text{S}_2\text{O}_3$ - 0.2 M NaOH . Differential pressure as measured across the reactor was reduced from 20 to three inches of water prior to regeneration. During its previous operating life, the reactor had been regenerated five times.

Two special uranium dissolutions were made in an attempt to determine the reason for the apparent low plutonium distribution ratio values (two to four in 3 M HNO_3 contacts) reported by the laboratory for normal metal solution. The first dissolution was normal except no mercuric nitrate (for radioiodine suppression) was added; the second was made with fifty per cent fresh nitric acid instead of recovered acid. After the distribution ratio values of these solutions were determined to be 3.1 and 2.3, respectively, and values for Redox Plant dissolver solution were approximately the same, it was concluded that this measurement had little or no significance.

b. Solvent Extraction

Subnormal solvent extraction decontamination performance necessitated recycling uranium about 35 per cent of the operating time to reprocess out-of-specification plutonium. The only period of normal performance followed immediately after a period of operation on recycled uranium. In addition to improvement possibly produced by a purge of the system during operation on "cold" uranium, other factors which may have contributed to the good decontamination performance were as follows: (a) addition of refluxed waste rework to the solvent extraction feed, (b) improved solvent quality and (c) reprocessing Plutonium Ion Exchange waste solutions in the HA Column without concentration in the Backcycle Waste Concentrator (E-H⁴). As noted previously, the addition of refluxed waste to the solvent extraction feed (HAF) exhibited a pronounced beneficial effect on decontamination in the First Cycle. An attempt to reproduce the improvement in

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First Cycle decontamination performance by the addition of 0.047 M $\text{Al}(\text{NO}_3)_3$ to the HAF to complex sulfate produced no significant results.

Although laboratory studies are still underway to determine to what extent degraded anion resin affects First Cycle decontamination, the wastes from the Plutonium Ion Exchange unit were rerouted directly to the HA Column without concentration to avoid any degradation of resin fines by boiling in high concentration nitric acid bottoms of the Backcycle Concentrator.

White solid material, which may be degraded resin from the water demineralizers, has been discovered in the Purex Recovered Acid system and may have contributed to poor decontamination performance. Laboratory tests have showed these solids, which accumulate fission products, increase the plutonium retention value of the solvent and transfer fission products into the solvent.

Plutonium waste losses via the First Cycle raffinate (HAW) were erratic and generally ranged from 0.1 to 0.5 per cent (normal ≤ 0.10 per cent). The higher losses usually correlated with the recycle of plutonium waste solutions especially those not treated with sodium nitrite, although losses in the 0.1 to 0.2 per cent range have not been explained.

Other items of interest to solvent extraction during the month included:

- (1) Periodic tests of eliminating the Backcycle Waste Stream (3WB) from the flowsheet proved this stream had no adverse effect on First Cycle decontamination.
- (2) After the pulse frequency of the 2E Column was increased from 39 to 52 cycles/min., organic was detected in the uranium product stream; thus the frequency was reduced to 44 cycles/min. Cold semiworks studies indicated column operation at 70 to 80 cycles/min. should be possible.
- (3) A radiation profile of the aqueous feed tank for the Final Uranium Cycle (2DF Tank) showed no significant accumulation of fission products as may be collected in degraded solvent or floating solids.
- (4) Unstable operation in the IC Column has been found to correlate time-wise with regeneration of the demineralized water cation bed. Further study is underway.

c. Neptunium Recovery

Despite several operational and process changes made to improve decontamination performance plus two shifts from irradiated to "cold" and back to irradiated uranium feed, solvent extraction neptunium losses remained near or below the lower analytical detection limits. At month end, a neptunium recovery run was being conducted during a scheduled plant shutdown.

d. Plutonium Concentration

The nitric acid of both the feed and scrub to the Plutonium Ion Exchange extraction column were increased from 6.0 to 7.2 M in an attempt to improve decontamination in the unit. Frequent variations in the gamma activity of the feed solution prevented an accurate measurement of decontamination improvement resulting from this change; however, any improvement appeared to be slight despite indications from laboratory studies which showed a significant decontamination improvement should result.

The amount of plutonium recycled from the ion exchange unit to the solvent extraction system remained in the 0.5 to 2.0 per cent range except during periods when plutonium solution collected in the old concentration equipment was added to the ion exchange unit feed. Despite treatment with sodium nitrite prior to blending, the amount of plutonium recycle was temporarily increased to ten per cent.

e. Solvent Treatment

Gamma activity of the No. 1 System solvent ranged from 1000 to 2000 uc/gal during most of the month with occasional bursts up to 3000 uc/gal. When "cold" uranium was recycled, the gamma activity dropped to the 500 - 1000 uc/gal range.

A new mixing and recirculation pump was installed in the Batch Wash Tank, TK-G1. Used solvent, routed into the suction of the pump, is now mixed with the carbonate-permanganate wash solution and discharged through a distributor ring above a Raschig ring packed section in the tank. Intimate mixing of the organic and aqueous phases is accomplished in the pump which delivers a total flow of 200 gpm. Although the increase in decontamination performance of the new pump is still being evaluated, greater sodium carbonate entrainment has been noted in the solvent pumped to the Solvent Wash (IO) Column. In order to counteract the more rapid neutralization of the nitric acid in the IO Column, the scrub solution acidity has been increased from 0.05 to 0.15 M HNO_3 .

At the time the new aqueous recirculation pump was put into service in TK-G1, the organic centrifuge in the No. 1 Solvent System was restarted to prevent any increase in aqueous entrainment of the solvent from the IO Column.

f. Waste Treatment and Acid Recovery

Waste rework plus operation of solvent extraction equipment on recycled uranium produced a higher-than-normal concentrated waste (IWW) volume per ton of uranium processed. Waste volumes transferred to underground storage tanks averaged 81, 795, 15 and 374 gallons per ton of uranium processed for neutralized IWW, solvent washes, centrifuge cleanouts and cell drainage, respectively.

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2. Redox Process Technology - M. K. Harmon

a. Solvent Extraction

Flowsheet conditions for neptunium recovery and probable conditions for processing of non-production fuels indicate additional fission product decontamination is and will be needed for the plutonium product. One method of obtaining additional decontamination is the operation of the Third Plutonium Cycle on a low-acid or acid-deficient flowsheet. A test of the low-acid flowsheet was therefore started during the last half of February and is still in progress. The acidities of the 3A Column streams were reduced to the point where the 3AW stream is now -0.1 M in acid compared with the normal value of 0.05 M. This corresponds to a reduction of approximately 65 percent in the equilibrium acid balance around the final extraction column. So far, there has been no noticeable increase of plutonium loss in the 3AW stream. This is attributed to the ozonation of the Second Plutonium Cycle product stream which converts the plutonium quantitatively to the (VI) valence state before it is fed to the final cycle.

Evaluation of the effect on the fission product decontamination has been complicated by other changes made about the same time (e.g., the minimum processing rate was raised 40 percent and this is known to improve decontamination) but preliminary data indicate an approximate increase in decontamination by an arithmetic factor of 2 to 3 due to the change in acidity.

Uranium-plutonium partition efficiency dropped sharply during two separate periods of operation, with plutonium losses to the 1BU (uranium in hexone) stream ranging from 20 to 30-fold higher than normal. The plutonium loss was reduced to normal in the first case by increasing the 1BX rate 10 percent for approximately 16 hours; on the second occasion it returned to normal in approximately 8 hours without any changes having been made. Similar poor partition incidents of lesser magnitude occurred as early as July, 1959, when the presently used startup procedure was first adopted.

The loss in partition efficiency appears to be associated with startup and is believed to be caused in part by the extraction of sodium dichromate into the organic product stream while the 1A Column is being filled and before it comes to equilibrium. This sodium dichromate, entering the 1B Column then oxidizes the 1BX ferrous iron normally used to reduce the plutonium to the hexone inextractable tri-valent form.

b. Neptunium Recovery

It was reported in last month's report that approximately one-half (200-250 grams) of the total inventory of neptunium (450 grams) had been irretrievably lost to underground waste storage in the last week of January operation. It has since been determined that approximately

half (100 grams) of this loss was still in the Redox building (202-S) in salt waste that had leaked from the Salt Waste Concentrator (D-12) into the cell sump. This neptunium has been returned to the internal recycle system by means of an acidic variant of the special rework flowsheet developed and described during the first half of 1959. At month-end the total neptunium accumulation in the plant was approximately 425 grams with no signs of approach to an equilibrium loss.

Removal of the accumulated neptunium is planned for the third week of March using the same basic flowsheet as used in the first removal performed in December, 1959. The process routings for the removal flow pattern have already been simplified in the solvent extraction portion (Building 202-S), and additional piping simplifying the routing through the Plutonium Concentration Building is scheduled for installation just prior to the removal.

c. Gaseous Effluent Problem

As reported in January, fission products discharged in the ventilation exhaust gas from the Redox plant stack have caused low level contamination of the plant environs in recent months. An intensive gas sampling campaign to identify the source of the activity has shown the dissolver off-gas streams to be the principal contributors. It is known that ammonium nitrate contaminated with fission products is formed in these lines and contributes markedly to the environs contamination problem when dislodged and discharged through the stack to the atmosphere.

The spare in-cell, gas-train filter has been repacked for greater efficiency as mentioned in the January report and is ready for installation with the multi-purpose dissolver in March. The former iodine removal scrubber (presently used as a back-up acid absorber) in the 293-S Acid Recovery and Iodine Removal Building will be reconverted in March to a scrubber to provide complete separation of ammonia from the oxides of nitrogen downstream from 293-S. The ammonia from the slug decladding operation will combine with the residual nitric acid from the metal dissolution operation to form ammonium nitrate in the scrubber; the resulting ammonium nitrate solution will be disposed of to an underground crib. Reconversion of the scrubber will result in an increased processing cost of approximately \$5 per ton of uranium because of reduced acid recovery but may be cheaper than any ammonium nitrate preventives developed for permanent use.

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3. Finished Products Technology - R. E. Smith

a. Uranium Reduction Operation

(1) Process Performance

The gamma radioactivity of UO_3 produced from Purex feeds returned to a more normal level during the month (56% of that of aged natural uranium). Calcination of Purex feed processed through the Redox silica gel facility assisted greatly in reducing the UO_3 radioactivity.

Weekly flushes of the 100% UNH concentrator off-gas mist separator which drains to the 100% UNH feed tank resulted in appreciable increases in the iron content of the 100% UNH for the period immediately following the flush. Total metal impurities in the UO_3 product were not greatly affected, however.

b. Metal Finishing Operation

(1) Recuplex

New plutonium neutron counter factors were determined for Task III crucibles, Task IV crucibles, waste boxes, slurries, and solutions. Improvements in instrumentation and studies on shielding geometry and moderation have led to more accurate factors. Individual probe (8-probe counter) calibrations and circuit balancing have allowed a gram of Pu as PuF_4 to count the same as a gram of Pu as PuO_2 , and only four times greater than a gram of Pu as metal (previous factors 2 and 15, respectively). Shielding studies have demonstrated that some gamma is counted, but its effect is similar with all types of Pu (metal and compounds), hence, the accuracy is not seriously impaired. Geometry (surface area phenomenon) and moderation experiments resulted in lowering the factors on waste boxes and Pu slurries by about two-fold.

Studies on submerged neutron counters in process tanks were resumed during the month. Calibrations of all probe circuits were made. Five circuits were found in good working condition and two had become inoperable due to corrosion of the probe circuit. Five of these circuits are monitored for critical mass control and one is used for process control. The seventh circuit has been changed, on a test basis, to the bottom of the D-2 dissolver to monitor the heel build-up of plutonium.

A revised process for reclaiming Pu from cutting oil was successfully demonstrated. The process involves butting 400 - 600 liters of oil with 20% TBP in CCl_4 and then stripping the combined organic with a hydrofluoric acid - ferrous sulfamate - sulfuric acid mixture. Plutonium recoveries ranging from 85% to 98% were realized.

Product purity tests were continued using the new "cold" scrub stream flowsheet, i.e., 1 M HNO_3 as primary scrub and recycled product (CAS) as intermediate scrub. Results of the test are given below.

Impurities in 100 g/l Plutonium Product Leaving Columns
(ppm/million parts Pu)

<u>Sample</u>	<u>Al</u>	<u>Ca</u>	<u>Cr</u>	<u>Fe</u>	<u>Mg</u>	<u>Na</u>	<u>Ni</u>	<u>Others</u>	<u>Total</u>
1	L200	200	100	1075	200	200	100	L110	L2185
2	L200	L200	10	190	100	200	20	88	L1000
3	L200	-	20	L 50	100	50	20	L 70	L 520
4	L200	L200	50	467	50	50	50	L 55	L1122

Generally, after the 100 g/l column product is given a two-fold concentration, the final total impurities are in excess of 3000 ppm. A new single tube combination titanium stripper and concentrator is being designed for test to reduce corrosion impurities.

(2) Task I - II

Frequent plugging of the hydrofluorinator off-gas filter continued to be a problem. For the second straight month, daily filter brushing was required. It was observed that the velocity of the HF entering the hydrofluorinator was a major cause of the high powder loading of the off-gas. A minor modification was made to the HF inlet dip-tube which reduced the gas velocity. This reduced, but did not eliminate, dusting caused by the gas velocity.

The temperature of the HF entering the hydrofluorinator was measured at 180°C. This compares favorably with an off-gas temperature of 192°C measured earlier. It appears that it will be necessary to install a preheater to heat the gas to a higher reaction temperature.

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4. Process Chemistry - K. M. Harmon

a. Purex Process Assistance

Laboratory studies aimed at identifying possible chemical causes of the poor solvent extraction performances currently experienced at Purex were continued.

Further laboratory studies were carried out to pinpoint the source of the agent(s) which have been contributing to flooding in the uranium stripping columns (1C and 2E). Previous tests showed that such an agent is acquired in the uranium cycle either in, or prior to, the first uranium stripping column (1C). Recent laboratory dispersion-disengaging tests on the various plant "cold" streams entering the uranium cycle show that, with possible exception of the reducing solution (1BX), the agent is not added via the cold streams. Occasionally the ferrous sulfamate solution used in the 1BX make-up contains large quantities of cruds. At concentrations of 8 parts of the crud per 1000 parts synthetic 2DF, a stable emulsion was formed when contacted with laboratory solvent. At one tenth this concentration of crud, the disengaging time was a factor of two greater than normal. However, since the ferrous sulfamate is filtered and diluted before addition to the process, it is difficult to visualize how appreciable quantities of this material can reach the process.

Other studies were devoted mainly to identifying and testing extraneous white solids, recently observed in Purex recovered acids. The solids are soluble in solvent and in hot concentrated (8-10 M) nitric acid, but insoluble in cold nitric acid or water. They have an apparent density of 1.0 - 1.2; they volatilize at about 200 C, leaving a tar-like residue; and they appear as a transparent gelatinous material on examination with a microscope. Simulated first column (HA) runs, using the cruds dissolved to about 15 g/l in plant recovered solvent, gave gamma decontamination factors which were lower than normal by a factor of five and plutonium retention numbers which were a factor of ten greater than normal. The anion exchange resin (Duolite-A-30) used in the water demineralizer was tested and found to be a possible source of the white crud. Solvent extraction studies using the resin dissolved in nitric acid did show that this material can definitely have an adverse effect on solvent extraction performance. However, a positive relation between Duolite-A-30 and the white solids found in recovered acids has not been established experimentally.

b. Analytical Assistance(1) High Gamma Activity of Plutonium Buttons

As part of a program to identify the non-plutonium gamma-emitting nuclides in current plutonium buttons, samples of ten high gamma activity buttons were dissolved and scanned with the 256 channel pulse energy analyzer. These scans showed two principle non-plutonium gamma emitters, one being zirconium-niobium-95 and the second a non-identified low energy (0.1 Mev) emitter. Work is currently in progress to identify this component.

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5. 234-5 Development - H. H. Hopkins, Jr.

a. Direct Calcination Of Plutonium Nitrate

Fabrication of the furnace for the three-inch direct calcination unit has been completed, and the equipment is ready for cold testing.

b. Fluid Bed Halogenation

Chlorination of direct-calcined oxide has not been successful to date, whether in batch or fluid bed tests. The trouble evidently lies in lower reactivity of the direct calcined oxide rather than in the fluid bed process. Oxide from calcined plutonium oxalate shows considerably higher reactivity. Many possibilities for investigation remain, paralleling the uranium experience.

c. Continuous Chlorination Of Plutonium Dioxide

Operating experience with the vibrating tube chlorinator has been reviewed and the effect of temperature variations in the three heating sections is now better understood.

In the first section, plutonium dioxide at a temperature of less than 100 C enters near the end of the tube and within a few inches is in the heated area. Temperatures in most of this eleven-inch section have been varied from 310 to 520 C. At 450 C and above, the powder caking is severe. At 350 C, the optimum temperature, there is little formation of lumps. The addition of part of the phosgene at this end of the reactor aids in minimizing lump formation.

The twelve-inch middle section has been operated in the range of 350 to 500 C. At 500 C, the powder has sometimes caked. At temperatures below 425 C, there was indication that chlorination was less complete. The optimum temperature will probably be found between 425 and 500 C.

The eighteen-inch section should be operated at 500 C to complete the chlorination. Higher temperatures may cause excessive corrosion to the Hastelloy B reactor tube. The last six-inch part of this section is below 450 C and it probably serves no purpose except to heat incoming phosgene.

The latest operation at temperatures of 350, 425 - 500, 500 C in the consecutive furnace sections gave the best powder yet obtained.

d. Cause Of Low Density Buttons

The reason for occasional low density buttons from the chloride process is being sought. The results of plutonium metal samples submitted for gas analysis showed between 18 - 35 ppm H₂, 1 - 50

ppm O₂, and about 1 ppm N₂. No correlation between gas content and density of the metal was evident.

e. Electrolytic Reduction Of Plutonium Trichloride

Electrolytic reduction runs were of longer duration this month, and metal yields ran from 22 grams to 54 grams per run, with electrical efficiencies from 6 to 17 percent. Metal quality was good except for molybdenum and aluminum, picked up by corrosion of process refractories.

Adoption of a candling technique for checking refractory bodies has resulted in significant findings. Most of the refractories on hand have serious defects not apparent by usual visual inspection. Candling disclosed most impregnated bodies to vary greatly in uniformity. In a batch of 10 alumina vent tubes, all were found to have cracks or pin holes, with only two usable (by cutting off portions of the ends). These findings will result in a decrease in run failures due to faulty cells.

f. Oxide Dissolution With Phosphoric Acid Catalyst

Some success has been reported off-site in the dissolution of heels from skull material with 60 percent HNO₃ - 0.05 M H₃PO₄. A comparison between this solution and 12.7 M HNO₃ - 0.2 M HF was made on low temperature plutonium oxide produced by steam oxidation. In each case, approximately 200 grams of plutonium as plutonium dioxide was treated with 1.5 liters of the acid mixture. The nitric - hydrofluoric mixture had approximately twenty-fold faster dissolution rate.

g. Plutonium Nitrate Concentration

Plutonium nitrate solution has been successfully concentrated to a stable, pumpable solution of 630 g/l plutonium in 6 M nitric acid. The starting solution was Purex product, 250 g/l in plutonium and 3.6 M in nitric acid. The highly-concentrated plutonium nitrate solutions are desired for critical mass experiments.

V. R. Cooper

Manager
Research & Engineering

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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

FEBRUARY, 1960

II. ACHIEVEMENTS (continued)

H. Financial Operation

1. Production Cost

All section and subsection operating budgets for FY 1961 and 1962 have been completed, reviewed and accepted by the individual managers. At month end we were completing the consolidation of internal costs. Final budget completion (determination of end function totals and calculation of projected unit costs) awaits advice from the other departments as to service liquidations and assessments.

Budgeted manpower will remain approximately the same as the average for FY 1960 despite substantial additional weapons production and necessary supporting research efforts.

Material costs are budgeted to increase substantially due to requirements for numerous short use molds in connection with the expanded weapons program.

Equipment costs are anticipated to be greater than past requirements due to conversion to titanium tube bundles and equipment necessary for dissolving product and analyzing and controlling the radiation hazard resulting from the larger volume of more highly concentrated material.

We reviewed the following Plant Improvement Program documents and furnished Financial concurrence:

- a. HW-63744 RD, "Prime Separations and Uranium Conversion Facilities". No changes were made in operating costs quoted.
- b. Costs of Fission Product Recovery in phases. No objections were raised to operating costs quoted, since the document represented a summarization of previously approved studies.
- c. In conjunction with Facilities Engineering, we estimated costs for receiving and storage only for NPF.

2. Personnel Accounting

The 1954 Savings Bonds and accumulated income checks earned under the Stock Bonus Plan were received during the month and are scheduled for distribution in March. Those who participated to the maximum have earned a stock bonus of 1.92 shares and accumulated earnings of \$20.85.

3. General Accounting

Fourteen appropriation requests, totaling \$352,589, were approved in February, and requests for an additional \$47,585 were in process at the month end. All appropriation requests in process at February 29, 1960, have subsequently been approved. The major items approved were: (1) Shipping containers and gages (\$239,000), (2) radiographic hood for weapon component inspection (\$31,500), (3) capital equipment for Pratt and Whitney gaging prototype (\$13,200), (4) air lift circulator, pump and jumpers for Purex Waste Farm (\$11,666), and (5) precision grinder (\$10,000).

Plant and equipment ledger balances at January 31, 1960, were as follows:

<u>Account</u>	<u>Asset</u>	<u>Reserve</u>	<u>Net</u>
In Service	\$212 140 282	\$ 76 689 025	\$135 451 257
Held for Future Use	704 609	196 216	508 393
Not Used Nor Currently Useful	<u>108 068 051</u>	<u>108 068 051</u>	<u>-0-</u>
	<u>\$320 912 942</u>	<u>\$184 953 292</u>	<u>\$135 959 650</u>

4. Auditing

A tour of 200 Areas' facilities was conducted for three representatives of the General Accounting Office on February 9. The GAO auditors were interested in meeting members of CPD management and obtaining a brief summary of the activities conducted by Facilities Engineering, Financial, Finished Products, Power and General Maintenance, and Purex.

Audit memorandums were issued relating to (a) Tuition Refund Program, (b) Audit of Overtime Lunches, and (c) proposed HAPO OPG 8.20, Control of Engineered Equipment and Materials - Projects.

5. Measurements and Procedures

A demonstration of the Electrowriter system was presented to Department personnel on February 25. This equipment looks very promising and is currently undergoing field testing in Purex.

Requirements for input-output data have now been completed for the work sampling program. Data processing will complete the programming during March. Provisions were made to cover all contemplated reports and mathematical calculations necessary to cover future work sampling studies.

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[Signature]
Manager - Finance

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

FEBRUARY--1960

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II. ACHIEVEMENTS (continued)

I. RELATIONS PRACTICES OPERATION

1. Communication

Material concerning Chemical Processing Department's contribution to the NPR project was provided Relations Operation for use in a HAPO television program scheduled for March 10. Assistance was also provided in illustrating this portion of the program.

2. Salary Administration

The 1960 Salary Review was completed during the month. The results were analyzed and discussed with the General Manager.

3. Wage and Benefits

Suggestion Plant Activity

	<u>Received</u>	<u>Adopted</u>	<u>Awards</u>	<u>Savings</u>
February, 1960	35	20	\$195	\$476
January, 1960	39	-	-	-

4. Personnel Placement

A technical graduate has accepted an offer of permanent assignment with the Facilities Engineering Operation in the Process Design and Development Subsection.

R. B. Britton
Manager, Relations Practices

R. B. Britton

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III. PERSONNEL ACTIVITIES

A. FORCE SUMMARY

<u>Operation</u>	<u>Monthly Salaried</u>		<u>Weekly Salaried</u>		<u>Total</u>	
	<u>1-31-60</u>	<u>2-29-60</u>	<u>1-31-60</u>	<u>2-29-60</u>	<u>1-31-60</u>	<u>2-29-60</u>
General Manager's Group	10	10	1	1	11	11
Financial	13	13	11	11	24	24
Relations Practices	5	5	6	6	11	11
Research & Engineering	60	60	25	25	85	85
Facilities Engineering	66	66	20	20	86	86
Power & General Maintenance	43	44	232	226	275	270
Production	6	6	4	4	10	10
Special Separation Processing and Auxiliaries	49	48	218	218	267	266
Purex	49	49	206	206	255	255
Finished Products	<u>54</u>	<u>53</u>	<u>212</u>	<u>210</u>	<u>266</u>	<u>263</u>
Total	<u>355</u>	<u>354</u>	<u>935</u>	<u>927</u>	<u>1 290</u>	<u>1 281</u>

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B. PERSONNEL CHANGES

There were no personnel changes during the month of February.

C. TRIPS

<u>Visitor</u>	<u>To</u>	<u>Nature of Discussion</u>
<u>To other G.E. Components</u>		
V. R. Cooper E. F. Kurtz R. E. Smith	Manufacturing Services Schenectady, New York	Vendor contacts for equipment in support of the 3000 R & D program (2/17/60)
R. J. Pence	General Engineering Lab. Schenectady, New York	Design of fission product shipping cask (2/26/60)
<u>To A.E.C. and other A.E.C. Operational Contractors</u>		
P. B. Fisk	Dow Chemical Company Rocky Flats, Colorado	Inspection problems and meet- ing of representatives of the Non-Destructive Testing Group (2/11-12/60)
A. E. Smith H. E. York	Lawrence Radiation Lab. Livermore, California	Super Precision Committee (2/17-18/60)
V. R. Cooper B. F. Judson	The Martin Company Baltimore, Maryland	Fission product recovery (2/18/60)
V. R. Cooper B. F. Judson	A.E.C. Div. of Production Washington, D.C.	Fission product recovery (2/19/60)
R. A. Schneider	Du Pont, Savannah River Aiken, South Carolina	Analytical and Palm problems (2/22-23/60)
R. A. Schneider	U.S. A.E.C., New Bruns- wick Area Office, N. J.	Uranium chemistry - Measure- ments Evaluation Seminar (2/24-26/60)
R. B. Chitwood E. G. Pierick	Oak Ridge Nat'l Lab. Oak Ridge, Tennessee	Neutron activation analysis and energy spectroscopy (2/29/60)
R. J. Pence	Oak Ridge Nat'l Lab. Oak Ridge, Tennessee	Fission product shipping casks (2/29/60)
<u>To General Industry</u>		
J. S. Crowder G. A. Conner	Linde Company Seattle, Washington	ST-2 short-arc welding process and demonstration (2/3/60)

<u>Visitor</u>	<u>To</u>	<u>Nature of Discussion</u>
V. R. Cooper E. F. Kurtz R. E. Smith	Pratt & Whitney Co. Hartford, Connecticut	Vendor contacts for equipment in support of 3000 R & D program (2/15/60)
V. R. Cooper E. F. Kurtz R. E. Smith	Thayer Scale Co. Pembroke, Massachusetts	Vendor contacts for equipment in support of 3000 R & D program (2/16/60)
E. F. Kurtz R. E. Smith	Sheffield Gage Corp. Dayton, Ohio	Vendor contacts for equipment in support of 3000 R & D program (2/18/60)

To Other Government Agencies

R. B. Chitwood E. G. Pierick	Naval Research Lab. Washington, D.C.	Neutron physics (2/23/60)
R. B. Chitwood E. G. Pierick	Nat. Bureau of Standards Washington, D.C.	Neutron physics (2/24/60)

To Conventions and General Meetings

W. G. Browne	Carmichael Jr. High Richland, Washington	To speak to science classes (2/18-19/60)
R. B. Chitwood E. G. Pierick	Washington, D.C.	Seventh Scintillation Counter Symposium (2/25-26/60)
R. J. Pence	Atlanta, Georgia	National meeting of AIChE (2/21-24/60)

D. VISITORS

<u>Visitor</u>	<u>From</u>	<u>Nature of Discussion</u>
<u>From Other G.E. Components</u>		
W. T. Short R. W. Patrow H. P. Stevenson	Manufacturing Services Schenectady, New York	Work Simplification Seminar; Crane demonstration (2/15-19/60)

From A.E.C. and other A.E.C. Operational Contractors

C. F. Metz	Los Alamos Scientific Lab. Los Alamos, New Mexico	Analytical problems on NPF program (2/2/60)
G. F. Quinn	AEC - Div. of Production	Midyear Review, FY 1960
W. J. Lindsey	" "	"
R. A. Kohler	" "	"
S. W. Henceroth	" - Div. of Finance	"
L. P. Murphy	" - Liaison Officer Washington, D.C.	" (2/3-5/60)

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<u>Visitor</u>	<u>From</u>	<u>Nature of Discussion</u>
W. H. Farrow, Jr. J. F. LaBonte J. M. Hoffman W. J. Sullivan	Du Pont, Savannah River Aiken, South Carolina	Chemical processing and equipment, ion-exchange and conversion problems, uranium and plutonium reduction recovery, cost and production (2/10-12/60)
D. H. Warner J. B. Bryan	Lawrence Radiation Lab. Livermore, California	MC-1251 capability (2/15-16/60)
Cmdr. F. Thorne	AEC - Div. of Military Application Washington, D.C.	MC-1251 capability (2/15-16/60)
W. E. Gries H. M. Meyer K. R. Brazier E. C. Stewart	Los Alamos Scientific Lab. Los Alamos, New Mexico	Albuquerque schedule and material fabrication techniques (2/15-16/60)
<u>From General Industry</u>		
J. A. Callanan	J. A. Callanan Co. Chicago, Illinois	Problems relating to plastic sealing (2/3/60)
J. Kosaftis	Applied Research Lab. Glendale, California	Spectrographic equipment and make repairs (2/9-10/60)
<u>From Other Government Agencies</u>		
R. Watkins S. Boddy	Dept. of Commerce and Economic Development Olympia, Washington	Raw materials and by- products of HAPO in relation to State's program (2/19/60)
<u>Conventions and General Meetings</u>		
J. A. Callanan	J. A. Callanan Co. Chicago, Illinois	Plastic sealing seminar on 2/3/60 (about 75 HAPO people attended)

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IV. SAFETY AND SECURITY

Operation	Facil. Eng.	Finan.	Prod.	P&GM	Purex	SSP&A	Prod.	Rel. Prac.	Res. &		Total CPD	Year to Date
									Eng.	CPD		
Disabling Injuries						1*				1		1
Serious Accidents						4			2	33		65
Medical Treatment	1		8	11	7				1#	1		2
Injuries												
Tech. Overexposure												
Incidents												
Radiation Occur.			3		2	3			1	9		20
Contam. Wound												1
Pu Depositions			2#		1*#					3		3
Fires					2##					2		2
Security Violations												0

*The use of mild steel drums for storage of chromium nitrate solution in the 211-T area resulted in pressure generating, causing severe bulging of the drum ends. The pressure was released without incident.

#A Research and Engineering Laboratory assistant in Redox Laboratory sustained a local overexposure to a small area of the shoulder while performing routine hood work. A spot of beta contamination was detected on her coveralls in the women's locker room. There was no spread of contamination and no skin contamination.

##Three cases of internal plutonium deposition, occurring in January, 1960, were confirmed by Hanford Laboratories this month. Two 234-5 operators sustained a one percent deposition by inhalation. The contaminated wound sustained by a Purex operator (reported last month) while bagging out waste from the N Cell hood was confirmed as < one percent MPL.

A small fire occurred in the Purex Analytical Control laboratory on February 18, destroying a small plastic sheet. The second fire occurred in Purex N Cell on February 24 during conversion of the ion-exchange prototype to a production facility. A J. A. Jones employee was welding on top of the N cell hood and sparks or slag fell to the floor of the hood, causing the fire. Several individuals sustained skin contamination. Five sets of personal clothing and three film badges were contaminated. Contamination spread was restricted to the N Cell section of the building.

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V. REPORTS

A. PREPARED AND ISSUED

- HW-63711, Secret, "CPD Cost and Production Analysis - CY 1960", dated 2-10-60, K. G. Grimm
- HW-63712, Secret, "Special Separation Processing and Auxiliaries Operation Cost and Production Analysis - CY 1960", dated 2-10-60, F. A. Fieser
- HW-63713, Secret, "Purex Operation Cost and Production Analysis - CY 1960", dated 2-10-60, F. A. Fieser
- HW-63714, Secret, "Finished Products Operation Cost and Production Analysis - CY 1960", dated 2-10-60, F. A. Fieser
- HW-63716, Secret, "Third and Fourth Quarter FY 60, Forecast of Nuclear Materials Requirements - CPD", dated 2-1-60, R. E. Roberts
- HW-63733 RD, Secret, "Redox Plant Production Schedule - February 1960", dated 2-8-60, D. McDonald
- HW-63734 RD, Secret, "Purex Plant Production Schedule - February 1960", dated 2-8-60, D. McDonald
- HW-63735 RD, Secret, "UO₃ Plant Production Schedule - February 1960", dated 2-8-60, D. McDonald
- HW-63736 RD, Secret, "234-5 Plant Production Schedule - February 1960", dated 2-8-60, D. McDonald
- HW-63777, Secret, "Purex Operation Productivity Report - 4th Quarter CY 1959 and Calendar Year 1959", dated 2-4-60, F. A. Fieser
- HW-63811, Secret, "Essential Material Consumption - Purex, CPD, January 1-31, 1960", dated 2-5-60, J. E. Lentz
- HW-63896, Secret, "CPD Waste Status Summary - January 1960", dated 2-12-60, J. E. Lentz

A. PREPARED AND ISSUED (Continued)

HW-63922, Confidential, "Annual Summary and Program Review CY 1959, 234-5 Development Operation", dated 2-60, H. H. Hopkins, Jr.

HW-63951, Secret, "Comments on Draft of Minutes, Pu 238 Meeting held at ALOO, January 21, 1960", dated 2-17-60, J. H. Warren

HW-63975, Secret, "Plant Improvement Program - Separations - Increased Plant Return", dated 2-19-60, D. R. Gustavson

HW-63989, Secret, "Scheduled Shutdown - Purex, UO₃ and Z Plants", dated 2-22-60, J. H. Warren

HW-63992 RD, "Separations Cost Studies for NPR Contingent Methods of Operation", dated 2-22-60, V. R. Chapman

HW-64060, Secret, "Summary of US-UK Exchange Meetings at War-rington, England, and Eurochemic Meetings at Brus-sels, Belgium", dated 2-29-60, J. B. Fecht, R. G. Geier and O. C. Schroeder

HWS-7444, Unclassified, "Specification for Stainless Steel Corrosion Resistant Castings for Radioactive Serv-ices", dated 2-17-60, W. H. Koontz

HWS-7450, Unclassified, "Specification for Fire Resistive High Efficiency Particulate Air Filters", dated 2-12-60, J. H. Palmer and D. A. Snyder

B. PREPARED FOR SIGNATURE AND ISSUANCE

HW-63707, Secret, "Production - January 1960", dated 2-1-60, W. E. Johnson

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VI. 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.

<u>INVENTOR</u>	<u>TITLE</u>
A. W. Hildebrandt, Finished Products Operation	Blind Hole or Slot Sharp Edge Radius Determination Device

W. H. Cready

General Manager
Chemical Processing Department

**DATE
FILMED
12/23/92**