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**CHEMICAL PROCESSING DEPARTMENT MONTHLY REPORT FOR JULY, 1959**

Compiled by OPERATION MANAGERS
August 21, 1959

HANFORD ATOMIC PRODUCTS OPERATION RICHLAND, WASHINGTON

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

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6  K. G. Grimm
7  C. T. Groswich
8  T. G. LaFollette
9  P. R. McMurray
10 W. N. Mobley
11 H. P. Shaw
12 C. R. Bergdahl
13 M. G. Mass
14, 15, 16 Atomic Energy Commission, Hanford Operations Office
    Attention: J. E. Travis, Manager
17, 18, 19 Atomic Energy Commission, Washington 25, D. C.
    Attention: E. J. Bloch, Director
    Division of Production
20 Extra
21 JEO File
22 Record File
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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT
JULY, 1959
GENERAL SUMMARY

PRODUCTION

The production of plutonium from the separations plants was only 65 per cent of the monthly commitment as a result of temporary difficulties in the Purex plant.

Both the production and shipments of UO₃ conformed to the operating and shipping schedules.

Although the production of unfabricated plutonium metal was reduced because of feed shortage, inventories of material were such that all shipping commitments were met on schedule. Shape production slightly exceeded the Official Forecast and shipments satisfied the requirements of the latest Albuquerque Schedule.

ENGINEERING

Although decontamination performance of the Purex solvent extraction battery was subnormal after completion of a Palm recovery run in early July and after start-up on normal irradiated uranium processing, the equipment responded satisfactorily to extensive flushing. Plutonium decontamination was excellent during the remainder of the month and the uranium product met specifications after silica gel treatment.

A total of 860,000 curies of Ce-144 was recovered from Purex concentrated IWW and a sample was sent to Oak Ridge National Laboratory for evaluation.

The all-titanium L-3 concentrator loop was installed in the Redox Plutonium Concentrator and the second batch of concentrated product was within specifications for metallic impurities.

A new concept in canyon open cell inspection was utilized this month with the acquisition of a special TV camera for inspection of a broken thermomh wall connector in H-cell at Redox. Pictures of the television monitor were obtained by the use of a Polaroid camera. This was the first application of television for in-cell repair work and investigation, and points out the possibilities of this tool.

The nuclear safety factor of the slag and crucible dissolver in Finished Products Operation was improved by initiating, this month, an addition of 1300 grams of cadmium to each dissolver batch. The product from solvent extraction, following this addition, averaged less than 10 ppm cadmium.
A preliminary engineering study for Purex interim waste storage tanks was initiated.

An Advance Process Development engineering study for the installation of Palmolive reprocessing and fabrication facilities in the Hot Semi-works Plant at Hanford on the basis of a 2 kilogram per year production rate for Olive was reviewed and transmitted to the Commission.

Concurrent with preliminary engineering work on the Palmolive project, a joint engineering study is being made to integrate the Palm Recovery Project, CGC-821, with the proposed Palmolive facilities. The purpose of the engineering study is to advise the Commission of the potential cost savings involved, as an added incentive for the installation of Palmolive facilities at Hanford. The Commission is expected to decide by about October 1, 1959, whether Hanford or Savannah River will perform the Palmolive processing.

A smooth draft of a project proposal requesting funds for an emergency water supply for the Purex 241-A waste storage tank farm was prepared. Refinements to the cost estimate, schedules, and methods of performing work are being made prior to obtaining approvals.

A study was completed in cooperation with IPD on the suitability of six available SRP-60-ton casks for the shipment of NPR fuel between Hanford facilities. It was concluded that the small capital savings which might be realized through acquisition of the SRP casks, as opposed to procurement of new NPR casks, would be outweighed by increased operating expenses associated with the SRP casks.

GENERAL

A fire was discovered in the east end of the storage gallery of the 202-S Building at approximately 8:30 p.m. on July 27, 1959. Equipment damage was estimated at approximately $2500. Details of the incident are covered in Fire Alarm Report #22 (CPD).

Responsibility for the cost accumulations functions and other routine clerical services of the Production Cost Subsection was transferred to the centralized clerical operation of Contract and Accounting. Physical relocation of the twelve persons affected was completed July 20, 1959.

An increase in the cost of living, raising the price index to 124.5 per cent, resulted in an upward adjustment of 0.59 per cent to weekly paid employees, effective July 27, 1959.

Five clerical-functional and six semi-technical nonexempt jobs in Chemical Processing Department were evaluated in conjunction with a Relations Operation Wage Specialist. Purpose of the comprehensive review was to validate a revised point evaluation plan and to establish a high degree of uniformity in interpretation of the plan by each major HAPO component.

Interviews with Section and Sub-section managers in connection with the Communication Workshop for first line supervisors, were completed during the month, and a report is now being prepared.
### STAFF

<table>
<thead>
<tr>
<th>Position</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vice President and General Manager, Atomic Products Division</td>
<td>L. R. Fink</td>
</tr>
<tr>
<td>General Manager, Hanford Atomic Products Operation</td>
<td>W. E. Johnson</td>
</tr>
<tr>
<td>General Manager, Chemical Processing Department</td>
<td>W. K. MacCready</td>
</tr>
<tr>
<td>Manager, Production Operation</td>
<td>J. H. Warren</td>
</tr>
<tr>
<td>Manager, Purex Operation</td>
<td>P. R. McMurray</td>
</tr>
<tr>
<td>Manager, Redox Operation</td>
<td>C. T. Groswith</td>
</tr>
<tr>
<td>Manager, Finished Products Operation</td>
<td>W. N. Mobley</td>
</tr>
<tr>
<td>Manager, Power &amp; General Maintenance Operation</td>
<td>T. G. LaFollette</td>
</tr>
<tr>
<td>Manager, Financial Operation</td>
<td>K. G. Grimm</td>
</tr>
<tr>
<td>Manager, Facilities Engineering Operation</td>
<td>H. P. Shaw</td>
</tr>
<tr>
<td>Manager, Research and Engineering Operation</td>
<td>V. R. Cooper</td>
</tr>
<tr>
<td>Manager, Relations Practices</td>
<td>R. B. Britton</td>
</tr>
<tr>
<td>OPERATION</td>
<td>EXEMPT</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td></td>
<td>6-30-59</td>
</tr>
<tr>
<td>General Manager's Group</td>
<td>10</td>
</tr>
<tr>
<td>Production</td>
<td>6</td>
</tr>
<tr>
<td>Purex</td>
<td>49</td>
</tr>
<tr>
<td>Redox</td>
<td>52</td>
</tr>
<tr>
<td>Finished Products</td>
<td>50</td>
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<td>Power &amp; General Maintenance</td>
<td>44</td>
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<td>Financial</td>
<td>15</td>
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<td>Facilities Engineering</td>
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<tr>
<td>Research &amp; Engineering</td>
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<td>Relations Practices</td>
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<tr>
<td><strong>Total</strong></td>
<td>360</td>
</tr>
</tbody>
</table>
CHEMICAL PROCESSING DEPARTMENT

PATENT SUMMARY
FOR
MONTH OF JULY, 1959

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

<table>
<thead>
<tr>
<th>INVENTOR</th>
<th>TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane A. Bray, Research and</td>
<td>A Thermobalance For Thermo</td>
</tr>
<tr>
<td>Engineering Operation</td>
<td>gravimetric Analyses</td>
</tr>
</tbody>
</table>

W.K. [Signature]
General Manager
Chemical Processing Department
I. RESPONSIBILITY

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

II. ACHIEVEMENT

A. Production Statistics

1. Purex Operation

<table>
<thead>
<tr>
<th></th>
<th>July</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tons uranium processed</td>
<td>214.86</td>
<td>625.65</td>
</tr>
<tr>
<td>Average production rate during operation (T/D)</td>
<td>15.7</td>
<td>21.8</td>
</tr>
<tr>
<td>Total waste loss (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uranium</td>
<td>0.18</td>
<td>0.04</td>
</tr>
<tr>
<td>Plutonium</td>
<td>0.53</td>
<td>0.19</td>
</tr>
<tr>
<td>Average cooling time (days)</td>
<td>110</td>
<td>102</td>
</tr>
<tr>
<td>Minimum cooling time (days)</td>
<td>87</td>
<td>93</td>
</tr>
<tr>
<td>On-line efficiency (%)</td>
<td>62.9</td>
<td>96.3</td>
</tr>
</tbody>
</table>

2. Redox Operation

<table>
<thead>
<tr>
<th></th>
<th>July</th>
<th>June</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tons uranium processed</td>
<td>(16.64 N 62.92 E)</td>
<td>(76.7 E)</td>
</tr>
<tr>
<td>Average production rate during operation (T/D)</td>
<td>5.6</td>
<td>5.1</td>
</tr>
<tr>
<td>Total waste loss (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uranium</td>
<td>0.10</td>
<td>0.11</td>
</tr>
<tr>
<td>Plutonium</td>
<td>0.45</td>
<td>0.42</td>
</tr>
<tr>
<td>Average cooling time (days)</td>
<td>(113 N 182 E)</td>
<td>166</td>
</tr>
<tr>
<td>Minimum cooling time (days)</td>
<td>(110 N 112 E)</td>
<td>109</td>
</tr>
<tr>
<td>On-line efficiency (%)</td>
<td>64.7</td>
<td>68.8</td>
</tr>
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</table>

3. 234-5 Operation

<table>
<thead>
<tr>
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<th>July</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Batches input to Task I</td>
<td>176</td>
<td>241</td>
</tr>
<tr>
<td>Runs completed through Task III</td>
<td>140</td>
<td>227</td>
</tr>
<tr>
<td>Waste disposal (units)</td>
<td>587.64</td>
<td>420.46</td>
</tr>
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</table>
4. UO₃ Operation

<table>
<thead>
<tr>
<th></th>
<th>July</th>
<th>June</th>
<th>To Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>UO₃ loaded (tons)</td>
<td>(84.3 E)</td>
<td>(46.8 E)</td>
<td>(385.5 E)</td>
</tr>
<tr>
<td></td>
<td>(396.2 N)</td>
<td>(292.4 N)</td>
<td>(33771.3 N)</td>
</tr>
<tr>
<td>UO₃ approved for shipment (tons)</td>
<td>(46.6 E)</td>
<td>(48.1 E)</td>
<td>(286.4 E)</td>
</tr>
<tr>
<td></td>
<td>(401.3 N)</td>
<td>(353.4 N)</td>
<td>(33659.3 N)</td>
</tr>
<tr>
<td>UO₃ shipped (tons)</td>
<td>(46.59 E)</td>
<td>(48.12 E)</td>
<td>(344.48 E)</td>
</tr>
<tr>
<td></td>
<td>(451.42 N)</td>
<td>(544.87 N)</td>
<td>(344.48 E)</td>
</tr>
<tr>
<td>UNH backlog (tons)</td>
<td>(23 E)</td>
<td>(38 E)</td>
<td>(33713.23 N)</td>
</tr>
<tr>
<td></td>
<td>(207 N)</td>
<td>(384 N*)</td>
<td></td>
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</tbody>
</table>

*Includes 81 T. for silica gel treatment and 140 T. to be reworked.

5. Power

<table>
<thead>
<tr>
<th></th>
<th>200 East</th>
<th>200 West</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw water pumped (gpm)</td>
<td>8 734</td>
<td>4 269</td>
</tr>
<tr>
<td>Filtered water pumped (gpm)</td>
<td>864</td>
<td>797</td>
</tr>
<tr>
<td>Maximum steam generated (lbs/hr)</td>
<td>213 000</td>
<td>100 000</td>
</tr>
<tr>
<td>Average steam generated (lbs/hr)</td>
<td>118 000</td>
<td>66 400</td>
</tr>
<tr>
<td>Total steam generated (M lbs)</td>
<td>87 783</td>
<td>49 402</td>
</tr>
<tr>
<td>Coal consumed, est. (tons)</td>
<td>5 283</td>
<td>3 238</td>
</tr>
</tbody>
</table>

6. Waste Storage

<table>
<thead>
<tr>
<th></th>
<th>Equivalent Tons U</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>July</td>
</tr>
<tr>
<td>Salt waste reserve storage capacity-Redox</td>
<td>3 447</td>
</tr>
<tr>
<td>Salt waste reserve storage capacity-Purex</td>
<td>31 403</td>
</tr>
<tr>
<td>Coating waste reserve storage capacity-Redox</td>
<td>30 226</td>
</tr>
<tr>
<td>Coating waste reserve storage capacity-Purex</td>
<td>43 798</td>
</tr>
</tbody>
</table>

E. Reports and Documents

1. Prepared and Issued

   - HW-60932 RD Redox Plant Production Schedule, July, 1959
   - HW-60933 RD Purex Plant Production Schedule, July, 1959
   - HW-60934 RD UO₃ Plant Production Schedule, July, 1959
   - HW-60935 RD 234-5 Plant Production Schedule, July, 1959
   - HW-61072 Essential Materials Consumption-Purex, Chemical Processing Department, June, 1959, J. E. Lentz

[DECLASSIFIED]
HW-61094  Essential Materials Area Report to Cost and Purchasing, Production Operation, Chemical Processing Department for June, 1959, J. E. Lentz

HW-61095  Chemical Processing Department Waste Status Summary, for June, 1959, J. E. Lentz

HW-61500  Hanford Atomic Products Operation, Production, July 10, 1959, R. E. Roberts

2. Prepared for Signature and Issuance

HW-60916  Production - June, 1959, W. E. Johnson

HW-61036  HAPO Production Forecast, July 24, 1959, W. E. Johnson

III. ORGANIZATION AND PERSONNEL

A. Safety

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

B. Security

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

C. Visits


During the period July 27 and 28, 1959, R. E. Tomlinson visited Atomics International at Los Angeles, California and General Electric Company, San Jose, California, to attend technical consultations on reprocessing power reactor fuels.

V R Chapman
Acting Manager
Production Operation
I. RESPONSIBILITY

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

II. ACHIEVEMENT

A. Processing Experience

1. Production Statistics

   a) Production - Percent of Monthly Commitment

   Uranium 54 Percent
   Plutonium 56 Percent

   b) Production Rates

   Processing was suspended from 0600 on June 30 until July 7 at 1100 at which time a Palm run was started. The Palm run was completed on July 12 and normal production, at a 2.4 CF, was initiated at 2130 on the same day. The inability to satisfactorily decontaminate the plutonium stream forced a shutdown on July 17 for the purpose of flushing the final plutonium cycle. Production at a 2.4 CF was started on July 22 and continued through the remainder of the month.

   c) Operating Continuity

   Uranium 44.5 Percent
   Plutonium 18.4 Percent
   Overall 52.9 Percent

   d) Waste Losses

   Uranium 0.18 Percent
   Plutonium 0.53 Percent

   e) Uranium Re-treated through Silica Gel 412 Tons

2. Normal Processing

   The Palm recovery flowsheet was essentially the same as that used in May; however, the gamma activity of the product was ten-fold higher than in the May product. The increased activity in this run was the result of the addition of the HA-HS flush solution to the Palm feed solution in the H-4 concentrator prior to the
Palm run, which caused the feed activity to be about 150-fold higher than for the May run. The Palm recovery was approximately 90 percent with the remainder recycled to the process.

Following the startup on July 12 both products exceeded the gamma specification. On July 15 recycling of the uranium stream was started in order to make possible the rework of out-of-specification plutonium product. After radiation profiles of the final plutonium cycle columns revealed abnormally high readings the decision was made on July 17 to shut down and flush the system. It was postulated that the gamma activity of the columns was either the result of processing the "hot" Palm feed material or the buildup of a siliceous crud deposit from the #1 organic system flushes that preceded the Palm run.

During the ensuing outage, the 2A-2B system, the IC column and the #1 organic systems were flushed.

After the startup on July 22 the plutonium product came into specification almost immediately; however, the uranium gamma ratio leveled out at approximately 4, thus requiring silica gel treatment before shipment.

Waste losses for the month were high, 0.53 percent for plutonium and 0.18 percent for uranium, because of the large amount of flushing dome and the low monthly production.

On July 24, overloading of the plutonium ion exchange resin bed resulted in large quantities of plutonium being backed up to the 3WB concentrator. The plutonium content of the concentrator was reduced by dilution and by jetting out one-half the volume. No adverse effects resulted.

Approximately 412 tons of high gamma uranium were processed through silica gel during the month.

3. Special Processing

Prior to the Palm run the HA-ES system was flushed with 15 percent nitric and 5 percent carbonate solutions. At the same time the #1 organic system was flushed. A bulk solids sample was removed from the G-1 tank and was found to be mainly MnO₂. After this was removed with a 3.5 percent nitric-5 percent oxalic flush, another sample revealed a carbonate precipitate which was dissolved in 30 percent nitric. A third layer made up of a gelatinous material was then found. The tank was given a 10 percent caustic-5 percent tartrate flush following the Palm run for the removal of this material.

In conjunction with the G1 tank flushes, the IO column, the G2 and G7 tanks were flushed for the removal of MnO₂.

Following the July 17 shutdown the 2A-2B system was extensively flushed with 60 percent nitric acid, 5 percent oxalic acid-3.5 percent
nitric acid and 10 percent caustic-5 percent tartrate solutions. The #1 organic system was again flushed with the same solutions used previously and the IO column was flushed with 15 percent nitric acid.

The startup was delayed an additional 45 hours when MnO₂ was found in the 05 and 07 samples. The 07 tank was flushed with a 2.5 percent oxalic acid-5 percent nitric acid-5 percent tartaric acid solution to remove the MnO₂. Solids were removed from 05 by continuously reprocessing the tank contents through the IO column and the 03 centrifuge.

B. Radiation Experience

The total radio-iodine emission during the month was 9.33 curies. The maximum emission during a 7-day period was 3.51 curies.

Purex encountered six Radiation Occurrences of the following types during the month: a) unplanned radiation level exceeding 6 mrem/hr outside a radiation zone; b) loss of contamination control from a radiation zone; c) skin contamination exceeding 10,000 d/m plutonium; d) injury caused by a contaminated object; and e) two losses of contamination control within a radiation zone.

Nineteen cases of skin contamination and seven cases of personal effects contamination were incurred during the month. The maximum skin contaminations encountered were 40,000 d/m plutonium and 10,000 c/m fission products. All personnel contamination was reduced to non-detectable.

Processing of high level material through the HR room at mid-month resulted in high radiation levels in the HR room. Maximum dose rates varying from 1 to 4 r/hr. were encountered during valving for process transfers from L10 to L11 to E6.

The transfer of a batch of un-neutralized fission product waste to the 21-L tank farm resulted in nitrogen dioxide fumes being emitted from the A-8 proportional sampler vent stack and the tank farm vent house stack with a subsequent spread of fission product contamination. Follow-up surveys revealed general particulate contamination extending 150 yards outside the tank farm radiation zone. Radiation levels varied from 500 c/m to 400 mrad/hr. Extensive decontamination effort restored the tank farm and adjacent areas to an acceptable status by month end.

The movement of several pieces of highly contaminated process equipment within the canyon during the month resulted in high level fission product contamination being spread to extensive portions of the canyon and canyon equipment. Contamination levels on the deck varied from one and two rads/hr. at surface to 500 rads/hr. at six inches to one foot. A large portion of the crane way and horizontal surfaces of the shielded crane and slave crane were contaminated to 400 to 500 mrad/hr. An intensive decontamination effort has been started to restore the canyon to acceptable contamination status.
C. Mechanical Experience

During the July shutdown several changes were made in the ion exchange piping systems to improve the resin pushing operation. The changes consisted of increasing the size of the vessel vent header from 1" to 2" and installing a new push tank and probe. Some improvement has been noted in the initial operation.

The outboard pedestal bearing on the #1 exhaust fan at 291-A failed when cooling water entered the bearing oil reservoir and displaced the oil. During replacement of the bearing it was learned that water gained entry into the oil reservoir through a minute crack in one of the copper tubing connections. Similar conditions were found in other water cooled bearings in 291-A and these are being corrected.

Both fan bearings on the #1 fan were replaced on a scheduled basis after observing intermittent temperature rises. The bearings had been in service since plant startup.

Both motor bearings on the #2 exhaust fan were replaced after developing unusual noise and vibration. The bearings have been in constant service for approximately five years.

The #3 exhaust fan was damaged extensively when the unit was operated for approximately 16 hours with a defective inboard fan bearing. The fan bearings and shaft and the supporting concrete pad were severely damaged. Repairs will not be completed for several weeks.

The F-10 pump failed after 43 months of service. A reconditioned unit, recently returned from U Plant, was installed as a replacement.

The RR room exhaust fan was forced out of service because of excessive vibration. An internal inspection disclosed severe corrosion of the impeller. Arrangements are being made to replace this mild steel fan with a stainless steel fan as part of the ion exchange conversion project.

A major leak developed at the top flange of the U-6 reboiler of the vacuum fractionator. It was necessary to reinforce the damage to correct the deficiency which had brought on the failure.

The O-7-2 turbine pump was replaced with a unit which was shortened to serve as an operating spare for the O-7-1 pump. The shortened pump will not require use of a boot as is used with the present O-7-1 pump.

D. Analytical Performance

Palm and fission product recovery run analytical requirements were met with a minimum of analytical problems. Palm sample handling presented special problems when sample carriers reached maximum readings of 12 r/hr., but these were resolved without holdup of the process or compromise of safe working practices.
Operating difficulties during the month resulted in numerous requests for special analytical services. A newly developed Zr-Nb distribution ratio method for the organic solvent proved invaluable for pinpointing process difficulties.

**Improved Performance**

1. Process Tests and Revisions

   The G3 centrifuge was reactivated when MnO₂ solids were found in the G7 tank. Beekman readings before and after cleaning the centrifuge revealed no activity buildup.

   The addition of Permacol to the Purex steam supply was stopped on July 28 because of the possible effect that this material might have on UO₂ reactivity.

   Installation of proportional samplers in the H6, 201 pump pit, proportional sampler pit and at the chemical sewer discharge were completed. Although the samplers will be used in monitoring the more innocuous waste streams, this new sampler was recommended by S.S. Accountability to give a further check on waste discards.

**Inventions and Discoveries**

Nothing to report.

**Events Influencing Costs**

The large amount of flushing performed in combination with low production levels will materially increase unit costs.

The HS column, which has a replacement value of $45,000, was decontaminated and repaired at a total cost of $13,000.

**Organization and Personnel**

A. Safety

   All Purex personnel have received instructions and are familiar with the Criticality Incident Alarm and Evacuation Procedures.

   There were no disabling or serious accidents during the month. Six medical treatment injuries were reported during the month.

B. Security

   There were no security violations.

C. Personnel Activities

   G. J. Behling, Supervisor-Analytical Control, terminated on July 29 to accept a position at Vallecitos, California.
G. L. Qurwell, Supervisor-Product and Material Handling Operation, transferred to Analytical Control on July 13, 1959.

W. C. Johnson, Chemist, reported to Analytical Control Operation on July 14, 1959.

W. A. Hendricksen, Technical Graduate, joined Analytical Control on a rotational assignment.


D. Visitors

The following personnel visited the Purex facility during the month:

July 1: George W. Graves, Product Cost, AEC, Washington

July 27: Ninety (90) Technical Graduates and Summer Juniors received orientation talks and a tour of the building.

SG Smolen: Signature

Acting Manager-Purex
I. RESPONSIBILITY

In line with the reassignment of responsibilities associated with the execution of the NPF Program as outlined in the CPD General Manager's letter of June 26, 1959, a new position was established within the Facilities Engineering Operation to discharge operational responsibility of major CPD projects. Effective July 1, 1959, C. B. Foster, formerly Manager of the Redox Product and Material Handling Operation was transferred to fill the new position in FEO.

The 271-CR and the 601-C Buildings were transferred from the Redox Operation to the Power and General Maintenance Operation, effective July 1, 1959. This transfer was effected as the Hanford Laboratories Operation had requested these buildings on a rental basis and since the Power and General Maintenance Operation handles most rental space for the Chemical Processing Department.

II. ACHIEVEMENT

A. Processing Operation

Dissolving and processing of E-Metal was conducted as scheduled through July 19, 1959. On July 20, diversion from E-Metal to normal uranium processing was requested and charging of the dissolvers with normal uranium was started on this same date. Actual processing through the extraction system started on July 27 and continued through month end. The E-Metal monthly commitment was exceeded by 4.5 percent and a total of 16.6 units of normal uranium was processed through the building, bringing the total uranium production for the month to approximately 80 units while operating at 65 percent of the total hours available for column operation. The dissolvers were operated continuously to provide the metal necessary for the production achieved. The production rates averaged 5.6 units per day during the scheduled column operation and the mechanical efficiency for the month was 97.8 percent.

The quality of both product streams was under good control during the month. Only two batches of UNH required ozonation to bring the gamma ratio within shipping specifications. No other tail-end treatment was necessary.

Product waste losses were under satisfactory control for the month averaging 0.10 percent and 0.45 percent for uranium and plutonium respectively. However, 19 batches of waste were slightly on the high side and were returned to the process stream for "catalytic-kill" in head-end makeup and/or reworking through the 1A and 1S columns.

Iodine 131 emission to the 291-S stack totalled 7.03 curies for the month. The maximum emission for any 24 hour period was 0.75 curies.
Installation of the titanium loop for the L-3 product concentrator in the 233-S Building was completed this month. The first batch of concentrated product following the installation of the new all-titanium L-3 concentrator loop slightly exceeded specifications (12,500 parts iron per million parts plutonium) but the second batch was within specifications. It is hoped that the new combination of the old tantalum heat exchanger and the new titanium concentrator loop will permit the plutonium product to meet metallic impurity specifications consistently.

A series of acid flushes processed through the 233-S Building equipment during the month just prior to the installation of the new titanium L-3 concentrator loop showed no evidence of a recurrence of the plutonium deposition encountered in October 1958. The flush materials were returned to the production streams via regular methods.

Some deposition of contaminated particles around the 291-S stack area was encountered the first part of the month. Flush samples and deposits from a weld crack on a dissolver vent line indicated that solids were building up in the dissolver off-gas lines and then passing to the stack and thence to the atmosphere. Special and more frequent flushing procedures of the stack, stack breaching, and dissolver vent lines were inaugurated, which apparently have alleviated the situation.

B. Maintenance Operation

Fabrication of the titanium loop for the L-3 product concentrator in the 233-S Building was completed and the new unit installed on July 25, 1959 without incident.

The F-1 feed tank pump, which failed because of reduced output, was replaced on July 24, 1959 with a modified TBP pump with glass bearings. The failed pump was the open throat glass bearing type and had been in service for fifteen months. Since this is the first open throat pump with glass bearings to fail, and since this type pump was originally installed on a test basis, no identical replacement was immediately available. The TBP pump, which had previously been modified as a spare for this position was therefore installed.

A new concept in open cell inspection was utilized this month with the acquisition of a special TV camera from the General Precision Laboratory by the Facilities Engineering Operation. The TV camera was mounted in a special box with a pan and tilt unit and lowered into H-Cell for inspection of the broken thermocouple wall connector at the H-7 tank. This connector is stuck on the wall receptacle because the impact screw has become separated from the guide plate. A General Precision Monitor (receiving set), located in the 202-S Building SWP lobby, produced a picture far superior to anything previously obtained and the information gained should help considerably in developing a device or method for removal of the broken connector. The new TV equipment promises much in the way of helping to solve cell equipment failures and correcting improperly fitted units.
Four replacement jumper installations were made in the 202-S Canyon during the month. These included the DS-3 weight factor, H-5 thermohm, D-12 thermohm, and the D-1 specific gravity and weight factor.

C. Waste Handling and Decontamination Operation

1. Waste Handling

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Redox Coating Waste Received (S Farm)</td>
<td>9,938 gallons</td>
</tr>
<tr>
<td>Redox Salt Waste Received (SX Farm)</td>
<td>84,195 gallons</td>
</tr>
<tr>
<td>Total Gallons Boil-Off Salt Waste</td>
<td>152,072 gallons</td>
</tr>
<tr>
<td>Waste Received at TX (From 221-U)</td>
<td>81,818 gallons</td>
</tr>
<tr>
<td>Waste Transferred for Permanent Storage</td>
<td>244,306 gallons</td>
</tr>
</tbody>
</table>

Installation of diversion box jumpers and line testing prior to transferring non-boiling salt waste from SX Farm to TX Farm was completed this month, and 244,306 gallons of waste was pumped to the 105-TX Tank for permanent storage.

Additional isolation valves were installed in the instrument air lines to all of the SX waste storage tanks this month (except 113-SX which is empty). This action was taken to eliminate any blow-back on the instrument manifolds as was recently experienced on the 114-SX tank.

Daily checking of the tank bottoms in the SX Tank Farm has revealed no tank bottom movement.

Replacement of the wire fencing around the 241-T and 241-U Tank Farms with the standard stake and chain barricade was completed this month. The work was done by the Power and General Maintenance Operation.

D. Equipment Decontamination and Repair

1. Regulated Steam Pit

Seven vehicles, two pieces of heavy equipment and several miscellaneous items were decontaminated at the regulated steam pit during the month. A total of 82 man-hours was charged to this operation.

2. Railroad Equipment

Thirty-one man-hours were charged to decontamination and operational coverage for repairs to equipment at Riverland during the month.

3. 221-U Canyon

Decontamination work on the Redox IV-A-2 dissolver pot was approximately 90 percent complete at month end. Radiation readings have been reduced from 40 mR at 150 feet to 400 mR at surface. This unit is to be decontaminated and repaired and held as a spare for the Redox Processing Operation.
The Purex Plant F-13 pump, which was decontaminated and repaired during the latter part of June was returned to the customer on July 19, 1959. A savings of approximately $1300 over the cost of a new pump was realized.

Two impact wrenches, one for Purex and one for Redox, were decontaminated and returned to the customers.

Decontamination and repair work on one F-10 Purex pump was completed and run-in started at month end. A similar unit was received this month for decontamination and repair.

Approximately 50 reactor pigtail were decontaminated for the Reactor Technology Group and one trailer tank-truck was decontaminated for the Hanford Laboratories Operation.

4. 221-T Canyon Building

Reactivation of all canyon ventilation supply units was completed this month. A contingency maintenance order for $60,000 was issued to complete the necessary work in preparation for the relocation of the Redox Waste Handling and Decontamination Operation from the 221-U to the 221-T Canyon Building.

D. Analytical Control Operation

Installation of the new 256 Channel Analyzer was completed this month and the instrument checked out by the vendor's representative. Previous difficulties encountered were resolved by overcoming feed line voltage fluctuations and the instrument is now being used for analyzing routine process and coupon samples. Calibration work is continuing in order that a wide variety of gamma emitting isotopes can be measured.

Highly radioactive coupon samples from a 100 Area reactor test loop, in which a slug had ruptured, were submitted for analysis this month. Mounting for analysis was handled under water in the specially devised radiation cell with little difficulty and no radiation exposure.

In cooperation with the Process Chemistry Group studies involving the use of a quartz spring recording thermal balance were started on Hanford produced uranium powder. Runs involving weight versus time and temperature on both heating and cooling cycles are being made in an effort to characterize the behavior of U3O8 powder in the critical temperature range of 600 to 1000°C. Similar information will be obtained on samples of powder from other sites in an effort to further reduce any between site differences.

E. Radiation Monitoring Operation

Three radiation occurrences were recorded during the month. Most significant was the presence of high fission product air in the South Operating and Pipe Galleries in the 202-3 Building for a brief period of time on July 31, 1959, following a routine jetting from the H-7
metal solution tank to the H-4 oxidizing tank. Investigation revealed that the contaminated air was vented to the galleries through an open valve in the chemical delivery line to the H-4 tank. Nasal smears of exposed personnel were found free of contamination. Corrective action has been taken to avoid any similar occurrences.

Five cases of personnel skin contamination occurred during the month. All were at a low level with the maximum contamination being 1000 d/m. In all cases the contamination was promptly and effectively removed.

The failed H-2 centrifuge, which had been stored in the 202-S Canyon, was moved to the burial ground on July 15, 1959 without incident. Dose rates encountered were 7 r/hr at 35 feet, 2.5 r/hr at 50 feet, and 5 mr/hr inside the engine cab. Good job planning was evident due to the expeditious manner in which the burial progressed.

Radiation traverses of the 202-S Building ventilation air sandfilter continue to reveal that radiation levels inside the sandfilter are gradually reducing. This trend has been almost continuous since January 1958, when a maximum of 600 mrad was reached following the H-4 oxidizing tank failure and the resultant cell contamination. Since this time a 60 percent reduction in the radiation level has been observed.

F. Improvement Experience

1. Process Tests and Revisions

Information related to this item is covered in the Research and Engineering portion of the Department report.

2. Inventions or Discoveries

There were no inventions or discoveries of a patentable nature reported in the Redox Operation in July, 1959.

G. Events Influencing Costs

The Redox Operation was shut down for the July 4th holiday and only standby personnel were scheduled to work.

New cost codes have been set up to cover waste handling and containment costs for labor, materials, and maintenance. These codes were effective July 1, 1959 and will provide a cost figure which in the past could only be estimated. The codes provide a breakdown for liquid waste, dry packaged waste, and burial ground waste.

One failed H-2 centrifuge, originally valued at $22,498 was removed from the 202-S Canyon Building to the burial grounds on July 15, 1959.
H. Plant Development and Expansion

1. Preparatory Engineering

H-2 Centrifuge

It was reported in the June Monthly Report that new centrifuges of the type now in service at Redox were installed at "B" Plant during the reactivation of this facility by CPFF forces. However, additional investigation has disclosed that only repairs were made to existing centrifuges and the new centrifuges were held as spares. One of these spares is now in service at Redox and the other is being mocked up at central shops. A meeting has been scheduled with FEO and Power & General Maintenance representatives to firm up specificatons for the purchase of two new centrifuges.

221-U Waste Handling & Decontamination Relocation

A Contingency Maintenance Request for $60,000 to effect relocation of the Waste Handling and Decontamination Facilities from 221-U to 221-T was prepared during the month and is presently being reviewed by the CPD Manager of Finance.

2. Design and Construction Liaison

CG-686 - In-Line Monitoring Instruments, Redox

This project will be closed out at the end of July as scheduled. Exceptions such as the 1-AFS gamma sampler will be corrected on an accrual basis.

CG-772 - Multi-Purpose Dissolver, Redox

The project has been approved by the Commission for construction of the dissolver and associated equipment by plant forces. A directive is being issued on this basis. A review of components, made in light of the national steel strike, has shown materials available on plant for fabrication.

CAC-812 - Equipment Decontamination Building, 2706-W

The Butler Building arrived on site as scheduled. Structural iron work has been erected and work started on installation of corrugated sheeting and insulation. Drawings have been prepared and approved for construction of the lean-to for housing the solvent tank and pumping facilities.

I. Reports Issued

No secret reports were issued by Redox Operation personnel during the month of July, 1959.
III. ORGANIZATION AND PERSONNEL

A. Safety

There were no disabling injuries or serious accidents in the Redox Operation during July, 1959. Two medical treatment injuries were reported during the month.

A fire was discovered in the east end of the storage gallery of the 202-S Building at approximately 2030 on July 27, 1959. The Fire Department was summoned immediately and the fire was extinguished in an orderly fashion. Damages to light fixtures, the PAX system, and emergency clothing and equipment were estimated to be approximately $2500. It is theorized that the fire was caused from friction on the drive belt of a fresh air fan to the PAX room, causing the belt to over-heat, burn in two, and drop into the emergency clothing stored directly below. Details of the incident are covered in Fire Alarm Report #22 (CPD).

Seven nuclear excursion evacuation meetings were conducted during the month including two with CPD Power and General Maintenance Operation personnel.

B. Security

There were no security violations in the Redox Operation during the month of July, 1959.

C. Personnel Activities

Effective July 1, 1959, C. B. Foster, formerly Manager of the Redox Product and Material Handling Operation was transferred to the Facilities Engineering Operation.

M. L. Short, Manager of the Redox Waste Handling and Decontamination Operation, and R. P. Knight, Supervisor in the 222-S Analytical Laboratory, attended a symposium on equipment decontamination, sponsored by the Turco Products Co., at the Desert Inn on July 8, 1959.

Dr. Kenneth Newman, Chief Process Engineer, Turco Products Company, visited the Redox Waste Handling and Decontamination Operation on July 9, 1959 to discuss methods and chemicals used in the decontamination process.

J. C. Langford, Analytical Chemist, transferred to the Hanford Laboratories Operation on July 1, 1959.


Manager - Redox

CT Groswith:HWM:mh

DECLASSIFIED
I. RESPONSIBILITY

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

II. ACHIEVEMENTS

A. Processing Operation

All shipping commitments for unfabricated plutonium as stated in Document No. CXXX-1700 were met for the month of July. However, because of feed shortages production of this material met only 74% of the July forecast (HW-61036). The Recuplex (recovery) operation produced 157% of the local schedule and in so doing furnished a significant portion of the plutonium feed. Shipping schedules for uranium oxide were met, with 100% and 94% of forecast (HW-61036) being achieved for normal and enriched material respectively. A total of 372,035 pounds of 100% nitric acid was delivered to the Purex plant from Uranium Reduction recovery system.

The supply of unfabricated plutonium feed was short during the first three weeks of the month. The material received during this period was high in G/AT ratio. A minor portion was blended with the Recuplex and Redox feed before processing. The major portion (40 kgs) was processed through Recuplex. Starting on July 24 satisfactory feed was received and has continued through the remainder of the month.

The Recuplex (Recovery) Operation was curtailed during the initial portion of the month when severe column operating difficulties developed while processing materials from the floor of the solvent extraction hood. Excellent operation during the latter portion of the month resulted in a new record production. This achievement was possible as a result of the processing of the high G/At nitrate material and also to addition of the new Hood 42 skull dissolver to the recovery facility.

The new receiver tank for nitrate solutions, located in Hood C-6, was utilized for the first time in conjunction with the metal preparation facility. Mechanical difficulties with the sampler and the scale have prevented use of this equipment for accountability purposes.

The Uranium Reduction facility operated satisfactorily during the month with only the lack of "normal" feed curtailing production. A period of down time on the "enriched" production equipment was utilized for cleaning partially plugged lines in the powder recovery and filter systems. This cleanout indicated a powder buildup over a prolonged period and the recovered powder will result in a plus BPID figure on "enriched" material for July.
B. Fabrication Operation

The production of plutonium parts proceeded largely as scheduled during the month. The reject rates for both castings and machined parts were significantly lower this month. The bulk of the melting of metal was again conducted in the old style resistance furnaces. Experimental melting was conducted during the entire month in the prototype induction heat melting unit by Research and Engineering personnel. Results this month have been better than in previous months and several parts which have been machined from this stock were of good quality and within specifications. Testing is to be continued. Testing of the new equipment in 24B Hood continued using stand-in material. Performance is encouraging and it is planned to continue the cold testing for several months in order to gain additional experience and also to train personnel.

C. Maintenance Operation

Operation of the equipment used in plutonium metal preparation was satisfactory during the month. Maintenance was of a routine nature, the only unusual item being a vibrating agitator in the PRT tank, Hood 7. This faulty agitator was replaced with a new unit supplied by Facilities Engineering Operation on Project CG-691. The plutonium fabrication equipment functioned well with the only significant difficulties involving the drill unit in Hood 200 3R. The product recovery equipment performance was sub-par this month. There were no major repair items but there was a considerable number of minor troubles and extra craft manpower was necessary to maintain continuity of operation.

The Uranium Reduction plant equipment operated very satisfactorily during the month with most of the work being of a routine nature. Significant items involved the replacement of three water-damaged motors in O Cell, filter changes on X-19 and X-30, replacement of hammermill screens, and replacement of shear pins in the H Calciner.

D. Control Operation

All plutonium buttons analyzed spectrochemically were accepted. Impurities averaged 881 ppm excluding carbon, which averaged 560 ppm. Recuplex product ranged widely in aluminum content, from 320 to 5000 ppm. Cadmium is now being determined routinely as a check on poison addition to Recuplex tanks. The average purity for the 6506 and 6507 model shapes was 99.85%. Gauging acceptance on these parts was 85.1% and 78.2% respectively.
D. Control Operation (Cont'd)

There were 7 radiation occurrences, 16 cases of skin contamination and 3 cases of clothing contamination experienced by Finished Products employees during the month. One fabrication operator received a contaminated injury which, by virtue of prompt cleaning action, did not result in plutonium deposition.

Control of radioactive stack emission was good in both Z and U plants, there being an average of 11.3 and 3.2 mc/day discharged respectively.

A review of the crib status shows that the Z-9 crib (which receives Recuplex column waste) has about 9 months life remaining. Discharge streams to the swamps are normal and there is good ditch flow.

E. Improvement Experience

1. Process Tests and Revisions

Information relating to this item will be covered in the Research and Engineering portion of the Department report. Other information concerning Weapon Data will be covered in a separate report to be written at a later date.

2. Inventions or Discoveries

No inventions or discoveries of a patentable nature were reported during the month.

F. Events Influencing Cost

Nothing significant to report.

G. Plant Development and Expansion

1. Projects - Study, Scoping or Approval Phase

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

a. Project CGC-734, Revision 2, RMC Button Line

This project proposal revision provides supplementary radiation shielding and other improvements in radiation protection in the RMC Button Line area.

b. Project CGC-811, Phase II, Additional Fabrication Equipment

This has been forwarded for Commission approval.

c. Project action is being scoped to provide a button line capable of processing fuels with exposures from 1000 to 10,000 MWD/T.
G. Plant Development and Expansion (Cont'd)

2. Projects - Construction

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

CG-734, RMC Button Line
CGC-800, Reduction of Radiation Exposure, RMA Line
CGC-811, Phase I, Additional Fabrication Equipment
CG-789, Additional Fire Protection, 234-5
CG-723, Conversion of Recuplex to a Manufacturing Facility
CG-767, Miscellaneous Improvements, UO3
CGC-843, Disposal of UO3 Condensates
CGC-813, Pu Recovery from Contaminated Waste
CGC-826, Phase II, Vacuum System Improvements

The installation of high level radiation detection devices is complete at the 234-5 building and the UO3 plant. The funds are available from Appropriation Request, AR-59-CPD-32. Additional alarms or sirens are to be installed and funded from the original appropriation.

3. Projects - Completed

Project CG-725, Liquid Waste Handling, UO3 plant was accepted as completed June 30, 1959.

III ORGANIZATION & PERSONNEL

A. Organization Changes

None

B. Safety Experience

No disabling injuries or near-serious accidents occurred during the month. Seven Medical treatment injuries were experienced in July as compared to 7 in June.

C. Radiation Experience

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

D. Security Experience

There were no security violations experienced during the month.

E. Personnel Activities

Nothing significant to report.

WN Mobley:JPT:jjh

Manager - Finished Products
CHEMICAL PROCESSING DEPARTMENT  
POWER AND GENERAL MAINTENANCE OPERATION  
JULY 1959

I. RESPONSIBILITY

There were no significant changes in the responsibilities assigned the Power and General Maintenance Operation during the period covered by this report.

II. ACHIEVEMENT

A. Operating Continuity

There were no outages of steam, water or emergency electrical services that affected continuity of operation of the prime production facilities during the month. A break in the 12" raw water line in the 200 North Area occurred on July 9, interrupting service to the 251 substations. Temporary service was supplied by means of a tank truck until repairs were accomplished and the line returned to service.

B. Inspection, Maintenance and Replacement

The second of two tube bundles, which were fabricated on a priority basis for the Purex concentrators, was completed July 22, thus providing a total of three spares and relieving a very critical situation which existed when only one spare was available. Fabrication of two additional units is in progress to further assure operating continuity.

Fabrication of the Purex HS column continued on schedule and was an estimated 75% complete at month-end. Some difficulties have been encountered in the procurement of stainless steel sieve plates; however, measures are being taken to overcome these obstacles, and it is anticipated that the scheduled completion date of August 31 will be met.

Installed at the Purex Facility were three sampler pumps for the purpose of obtaining composite samples of the flow at the 216 steam condensate pit, the 201 pump pit and the chemical sewer streams east of 202-A.

Installed in the reboiler section of the Redox L-3 concentrator were new upper and lower loops fabricated from titanium materials. Reasons established for using titanium materials in preference to stainless steel at this location were to enhance product purity.

Modifications to a malfunctioning off-gas heater from the Purex Facility were successfully accomplished, and the unit has been returned to service. The work was performed at the 202-A hot shop, and consisted of changing the originally designed bolt-on head to a newly designed welded head.

An off-gas filter vessel, designed for the Purex Plant, was withdrawn from Spare Parts and made ready for installation, should the need arise, to replace an in-service unit on short notice.

DECLASSIFIED
The reactivation of utilities and services in the 221-T canyon has been completed in preparation for removal of the Equipment Decontamination Function from the "I" to the "T" Facility. Air, steam and water services to all sections of the canyon have been re-established, and all 22 ventilation units are ready to be placed in service.

A spare F-1 pump was made ready and shipped to the Redox Plant as a replacement for a failed unit. As a precautionary measure, an additional Redox F-1 pump was made ready and placed in standby status.

Fabrication of the electron beam furnace for Hanford Laboratories Operation's 231 Facility was 95% complete at month-end, with total completion scheduled for August 31. Considerable difficulty was experienced in getting a weld between copper and stainless steel that would not leak under the high vacuum characteristic of this furnace; however, indications are that this has been accomplished. The furnace will be used in development work in connection with the need for high purity plutonium.

The machining of precision tools and fixtures required by HLO for a Whitney project was 97% complete at month-end. Completion has been delayed by technological difficulties encountered in the preparation of sintered bronze castings. Calculation of shrinkage has necessarily been empirical and, consequently, inaccurate at times, resulting in the loss of some castings from checking and cracking. Indications are that these obstacles will not delay completion longer than August 7, however.

The installation of a vendor-fabricated 8' autoclave in cell five of the 231-Z Facility was completed. Included in the work was the fabrication of a portable support frame, the assembly of an electrical furnace and the installation of necessary piping and power services.

Modification work is in progress on the oxide and satellite hoods at the 231-Z Facility to permit operation on either inert or dynamic atmosphere. Included in the work is the installation of a valve designed to automatically control the hood pressure, instrumentation to prevent implosions or explosions, and two argon supply lines. The program is approximately 80% complete at this time.

Four additional test wells were sunk in the area south of Gable Mountain, for use by Hanford Laboratories Operation's Chemical Effluents Technology Component in obtaining water samples and to observe water levels and flow. The wells consist of 2" pipe driven to a depth of 20 feet.

No. 8 fire hydrant, located immediately west of the 200 West Area garage (2713-W Bldg.), was replaced in the interest of better fire protection. Operating difficulties were encountered with the previously existing hydrant, in that it opened against the water pressure. Isolating valves were included in the installation, in conformance with HAPO Plant standards.

A defective and highly contaminated H-2 centrifuge was removed from the Redox canyon and buried in No. 6 trench of the 200 West Industrial Burial Garden. The burial proceeded without incident, with no significant radiation exposure to personnel.
Third-party inspections were conducted on No. 2 boiler in 200 West Power House, and on No. 3 boiler in 200 East. Travelers Insurance Company representatives served as the third party, and reported the boilers to be in good state of repair.

Assistance was rendered the Irradiation Processing Department in achieving favorable performance from the ventilation systems in the 146-FR, 105-D, 115-D, 105-F and 108-F Buildings.

The regular quarterly inventory of precious metals, for which this Operation has control custody, was completed July 10. Results of the inventory indicate no significant differential exists between the supply on hand and Financial Operation's records.

III. ORGANIZATION AND PERSONNEL

A. Personnel Activities

J. H. Palmer and W. J. Richardson presented joint papers at the sixth AEC Air Cleaning Seminar held at Idaho Falls, Idaho, on July 7, 8 and 9.

P. E. Cunningham and J. H. Palmer visited the Dow Chemical Company's Rocky Flats Facility at Boulder, Colorado, July 23 and 24, to witness filter-burning tests and to further investigate the use of package boilers.

B. Safety and Security

There were no disabling injuries or security violations incurred during the month.

FT Keenan: ap

Acting Manager
Power & General Maintenance
I. RESPONSIBILITY

Responsibility for the cost accumulations functions and other routine clerical services of the Production Cost Subsection was transferred to the centralized clerical operation of Contract and Accounting. Physical relocation of the twelve persons affected was completed July 20.

II. ACHIEVEMENT

A. Production Cost

Section managers were furnished FY 1960 target budget schedules including a division of cost between those which are directly incurred and those which are services from others, together with a distribution of these costs to end function. A target budget status report format was developed and will be issued to the respective managers on a monthly basis.

Detailed monthly budget reports were furnished to the centralized accumulations group so that they could insert the budget figures on monthly operating reports. This work was completed for the first quarter of FY 1960 and all budget revisions to date were incorporated.

Special requests have been received for shipments of experimental quantities of plutonium to Argonne National Laboratory and to Westinghouse Electric Corporation. The Purchase Order has been received for the Westinghouse shipment. Billing on the Argonne shipment will be made directly to HOO, and no purchase order will be issued. Another special request, involving burial of small amounts of Albuquerque wastes, each quarter for the next two or three years has passed the initial contact phase.

A monthly accrual was established to charge current Research and Development 3000 Program costs with estimated costs incurred by Manufacturing Services in connection with the "Hands Off Program".

Cost accumulation centers were established to permit segregation of waste handling and containment charges into the three categories of liquid, dry packaged and equipment burials.

A Contingency Maintenance Request involving the relocation of the Waste Handling and Decontamination Operation was processed and submitted to HOO-AEC for approval.

A special familiarization meeting on waste storage amortization was held with the members of Redox Technology.
Effective with FY 1960 business, RW freight will not be charged to the Essential Materials Inventory. These charges are now being made directly to cost; however, they will continue to be shown as Essential Material in the operating reports. The effect of this change will be higher unit costs during periods of stockpiling with corresponding lower unit costs during periods of high consumption.

B. Personnel Accounting

The 40 CPD employees receiving their initial bonus under the terms of the Stock Bonus Plan at CY 1959 year and were notified of this and given information relative to joint registration of stock certificates. We observed the recommended policy and practice of past years in not emphasizing too strongly the joint registration provision because of the complications encountered in the State of Washington. In this state a written agreement between the joint registrants (husband and wife) is required to make the right of survivorship effective, and in order to develop a legal agreement, legal counsel is strongly recommended. Because of this difficulty, few registrations in joint ownership are prepared by our employees.

An increase in the cost of living, raising the price index to 124.5%, has resulted in a cost of living increase adjustment effective to weekly paid employees July 27 of .59%. Exempt employees are affected only in relation to their area differential. This was increased from $45 to $45.22. The "adder" effective July 27 was 35.9% and represents an increase of 17.9% since September 1, 1956, the date of decentralization. It is interesting to note that in the "adder" of 35.9%, 9.4% represents cost of living increase and the balance the result of general increases.

July's meeting of Specialists - Personnel Accounting and the Manager - Personnel Accounting of Contract and Accounting was hosted by the Specialist in IPD. Several of the irritating procedural loose ends were discussed and appropriate solutions agreed to. Some of the items discussed were the correction of errors appearing on the magnetic tape submitted to Schenectady covering participation in the Savings and Security Program, the method of handling distribution of salary checks to the widely dispersed Tech. Grads, the completion of the Proof of Death form, and the paper work on transfer of employees between HAPO components.

C. General Accounting

As of June 30, 1959, expenditures of $4,185,306 and commitments of $128,035 had been incurred against active CPD projects with $8,460,970 of authorized funds.

During July two projects were increased by the ABC: CGC-830, Plant Modifications for Reprocessing Non-Production Reactor Fuels from $700,000 to $1,450,000 to cover design, management services and construction of the Receiving and Storage Facility; and CG-772, Multi-Purpose Dissolver - Redox from $30,000 to $265,000, also to cover design and construction.
Physical Completion Notices were received for GG-725, Liquid Waste Handling Facilities - UO3 Plant, and for GG-745, RMG Fabrication Line.

Three Appropriation Requests were approved for a total of $8,789. Two were supplements and one a new approval for a Neutron Double Moderator Counter with Printer ($4,925).

Plant and Equipment ledger balances at June 30, 1959, were as follows:

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<tr>
<th>Asset</th>
<th>Reserve</th>
<th>Net</th>
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</thead>
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<td>$70,944,881</td>
</tr>
<tr>
<td>Held for Future Use</td>
<td>704,609</td>
<td>173,902</td>
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<tr>
<td>Not Used Nor Currently</td>
<td>108,248,623</td>
<td>108,248,623</td>
</tr>
<tr>
<td>Useful</td>
<td>$318,945,276</td>
<td>$179,367,406</td>
</tr>
</tbody>
</table>

D. Auditing

A formal audit report covering materials furnished off-site vendors was issued. In our opinion, the activities audited were satisfactory.

E. Measurements and Procedures

The Chemical Processing Department annual Report of Representative Economy Measures was completed and issued on time. This report is submitted at the request of the AEC for inclusion in a combined report covering the Hanford Atomic Products Operation.

At the request of the Maintenance and Industrial Engineering Sub-Section, a program compatible with IBM 709 application was developed for the implementation and processing of special time study data. In spite of the short notice given the Procedures Analyst, all necessary information was provided to the engineers without any disruption in their time schedule.

Information relative to microfilming records was distributed to all sections with requests for additions or deletions to the existing program.

III. ORGANIZATION AND PERSONNEL

A. No medical treatment, disabling injuries, or security violations were experienced during the month.
B. Reports Issued

<table>
<thead>
<tr>
<th>Report Number</th>
<th>Title</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>EW-60944</td>
<td>June Operating Report</td>
<td>MM McDonald</td>
</tr>
<tr>
<td>EW-61091</td>
<td>Essential Material Inventory</td>
<td>GE Dyreng</td>
</tr>
<tr>
<td>EW-61130</td>
<td>CPD Cost and Production Analysis - June</td>
<td>KG Grimm</td>
</tr>
<tr>
<td>EW-61131</td>
<td>Redox Cost and Production Analysis - June</td>
<td>FA Fieser</td>
</tr>
<tr>
<td>EW-61132</td>
<td>Purex Cost and Production Analysis - June</td>
<td>FA Fieser</td>
</tr>
<tr>
<td>EW-61133</td>
<td>Finished Products Cost and Production Analysis - June</td>
<td>FA Fieser</td>
</tr>
<tr>
<td>EW-61217</td>
<td>CPD Report of Representative Economy Measures - FY 1959</td>
<td>KG Grimm</td>
</tr>
<tr>
<td>EW-61350</td>
<td>Redox Productivity Report - Six Months</td>
<td>FA Fieser</td>
</tr>
<tr>
<td>EW-61351</td>
<td>Purex Productivity Report - Six Months</td>
<td>FA Fieser</td>
</tr>
</tbody>
</table>

Manager - Finance

\[\text{Signature}\]
CHEMICAL PROCESSING DEPARTMENT
FACILITIES ENGINEERING OPERATION

July, 1959

I. RESPONSIBILITY

Facilities Engineering has been delegated responsibility and accountability for the application of sound safety and operability principles and design on the Non Production Fuel Reprocessing Program.

II. ACHIEVEMENT

PUREX OPERATION

A. Research and Development

Waste Storage

Preliminary engineering study for the Purex interim storage tanks was initiated. At a meeting of NHO and R&E personnel it was determined that additional information was needed on four points: a) type of waste, acidic or basic, to be used as feed for the Purex waste solidification process; b) chemical composition of Purex LW after formaldehyde kill; c) method of disposal or storage of carbonate wash and cell drainage; and d) material of construction for the interim storage tanks.

Dr. Frank Neumann, Seismologist at the University of Washington, is scheduled to meet with HAP0 personnel here on August 13 and 14 to discuss progress of the seismological study and make recommendations for further work.

In-Cell pH Measurement

The prototype remote pH probe operated successfully in the E-3 tank for six weeks. It failed after that time, apparently due to radiation damage to the cable. Investigations of other types of cables are being made.

Tests made in the instrument laboratory demonstrated pH changes with temperature in synthetic LW solution as a cross-check on the response which was observed on the prototype Purex installation. Similar effects were noted, confirming that the remote pH probe was operating correctly.

In-Line Pu Monitor, 1BXP Stream

Drafting is nearly complete on jumpers for an installation of a neutron counter in J-Cell for measuring Pu concentration in the 1BXP stream. The electronic circuitry which is mocked up in the laboratory to simulate an in-cell installation has continued to operate satisfactorily this month.
In-Line Uranium Photometer

The prototype installation was completed on the HSP sampler. Test operation has been delayed by contamination of the sampler box and cell during a process flushing operation.

Acid Concentrator Demister

Corrosion rates were determined by HLO on vendor samples of 6-mil zirconium, stainless steel, titanium and tantalum demister wire exposed in vapor from boiling Purex synthetic LWW solution. The tantalum wire is the best (and only) wire which can be recommended for the subject service.

Agreement was reached with Purex Operation and Purex Technology on the installation of equipment on a stepwise basis, as follows:

<table>
<thead>
<tr>
<th>Phase</th>
<th>Items of Work</th>
<th>Schedule</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Installation of Prototype</td>
<td>3 to 4 months after</td>
<td>$39,000</td>
</tr>
<tr>
<td></td>
<td>Demister and Jumpers</td>
<td>authorization</td>
<td></td>
</tr>
<tr>
<td>IIA</td>
<td>By-passing of E-Flt</td>
<td>2 to 3 months after</td>
<td>$20,500</td>
</tr>
<tr>
<td></td>
<td></td>
<td>authorization</td>
<td></td>
</tr>
<tr>
<td>IIB</td>
<td>Procurement of Spare</td>
<td>Not Critical</td>
<td>$40,000</td>
</tr>
<tr>
<td></td>
<td>Damister Vessel</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B. Process Technology

Fission Product Recovery

Work was continued on the scope design of the fission product loadout facilities. The scope drawings were completed following resolution of comments at a meeting held with Purex and HLO personnel. The scope document is approximately 80 percent complete.

Mock-up tests in the 200 East Shops showed that three 1/2 or 3/4 inch pipes can be pulled through a 3-inch pipe of the same configuration as the spare line available, without damage to the small diameter pipes.

The prototype filter units were received from the Pall Filtration Corporation. Filtering tests made with a cold rare-earth sulfate slurry verified the practicability of the filter concept for collecting fission products, and sufficient data were obtained to proceed with detailed design of the fission product container for the interim program. Detailed design of the filter is proceeding, and detail design of the lead shipping cask was initiated.

Titanium Reboiler for Purex Concentrators

A review was made of vendor proposals for titanium reboilers for Purex concentrators.
The Griscolm-Russell proposal, supplemented with additional information received on July 27, 1959, represented an original approach in terms of reduced titanium usage, improved scale removal, and condensate disposal features. The Griscolm-Russell design called for a Bent-Tube evaporator with process solution outside the tubes; the remote flange which mates with the concentrator serves as the upper tube sheet. Proposals from other vendors in general recommended present type canisters with the substitution of titanium tubes for stainless and the sheathing of exposed surfaces with titanium.

Further work on the titanium reboiler concept will be deferred pending receipt of more data on the corrosion resistance of titanium, zirconium, stainless steel, etc., in alternate Purex concentrator services.

Palm-Olive Program

An Advance Process Development engineering study for the installation of Palmolive reprocessing and fabrication facilities in the Hot Semiworks Plant at Hanford on the basis of a 2 kilogram per year production rate for Olive was reviewed, concurred in by Facilities Engineering personnel, and transmitted to the Commission. Subsequently, the AEC requested 1) immediate initiation of Title I work, 2) notification of when a project proposal would be submitted, 3) when Title II and construction work could begin, and 4) cost of Title I work.

In response to the AEC request, preliminary engineering work has been initiated under R&D funds. The Commission has been notified that the project proposal will be submitted by August 14, that Title I work is in progress and will cost $70,000 and that Title II design could start on January 1, 1960, with construction to start by May 1, 1960. A project cost estimate and project schedule have been prepared. The total project cost was estimated to be $1,800,000 for the installation of facilities in the Hot Semiworks Plant for Palmolive reprocessing and fabrication.

Concurrent with preliminary engineering work on the Palmolive project, a joint engineering study is being made to integrate the Palm Recovery Project, GGC-821, with the proposed Palmolive facilities. The purpose of the engineering study is to advise the Commission of the potential cost savings involved, as an added incentive for the installation of Palmolive facilities at Hanford. The Commission is expected to decide by about October 1, 1959, whether Hanford or Savannah River will perform the Palmolive processing.

C. Plant Engineering

HS Tower Spare

A revised schedule for shop fabrication of this unit was issued. The stainless steel sieve plates fabricated for this unit by an off-site vendor are considered unacceptable, and a new order has been placed.
This is expected to delay completion of this unit until the third week of September.

New Canyon Crane

A test was conducted to determine the feasibility of using alternating current on the fields of the amplidyne to cancel out residual fields which caused mis-operation of the auxiliary hooks in slow speed operation. The method proved to be feasible and will be incorporated into the control circuits for the four auxiliary hooks.

D. Project Activities

CG-719 Additional Facilities for Purex Tank Farm Vapor Wastes

Startup of the facility was further delayed because of the strike. With the strike over as of July 30, plans have been made for necessary corrections in piping; and it is expected that the facility will start up by August 5.

DO-51202 Emergency Water Supply – 241-A

A smooth draft of a project proposal requesting funds for an emergency water supply for the Purex 241-A tank farm has been prepared. Refinements to the cost estimate, schedules, and methods of performing work are being made prior to obtaining approvals.

REDOX OPERATION

A. Research and Development

Pu Concentration Monitor. 3BP Stream

Design was completed for a neutron counter installation in the 3BP sampler box. A pot will be placed in the same box which was provided for the in-line gamma monitor installation for that stream. The sample will flow through this pot and a neutron detector will provide a signal to an instrument which will be calibrated in terms of Pu concentration. This will provide a continuous record of the product stream from the 3BP column to the E-3 tank.

B. Process Technology

Redox Operation

Testing and evaluation is continuing of a transistorized pulse height analyzer for gamma energy measurements. Recent modifications suggested by HLO are being investigated in an attempt to obtain satisfactory operation. If successful, it is planned to use the instrument in a trial iodine monitor system at Redox.
C. Plant Engineering

H-4 to H-5 Vapor Line Tower Spares

Shop work on this unit has been initiated and is expected to be completed in September.

Tank-Saw Modification

A design has been completed and issued for an independent feed drive assembly on the tank saw. Based on experience gained in cutting the Redox dissolver for decontamination and repair, an independent drive for forward speed will reduce cutting time, improve tool life, and improve the surface contour of the cut profile.

Cell Equipment Viewing

Twice during the past month a television camera has been lowered into H-Cell and excellent views of cell electrical wall connectors have been obtained. Pictures of the television monitor were obtained by the use of a Polaroid camera. This is the first application of TV for in-cell repair work and investigation, and points out the possibilities of this tool.

D. Project Activities

CG-772, Rev. 2 Multipurpose Dissolver - Redox

Directive HW-445, modification No. 2, dated July 27, 1959 has been received. Following verbal contacts with the AEC relative to methods of performance of work, this directive authorized the total project in the amount of $265,000.

FINISHED PRODUCTS OPERATION

A. Research and Development

Chemical Processing and Reduction

Studies on replacement of the RMA Button Line were continued at about the same level of activity as has been maintained for the past four months. Eighteen study type drawings covering the PR can unloading facility, portions of the wet chemistry, and the furnace and pickling station of Task III, were prepared and distributed. Comments on all of these prints were received in one of the periodic review meetings which was held near the end of the month. A prototype pressure vessel and crucible are now on hand and will be used for firing a reduction charge with a stand-in material sometime in August. Preliminary tests were performed in the 200-West Shops on a rock bit which is being evaluated for use in separating the slag and crucible from the button. A detail study was performed during the month on the design of a pressure vessel which would be suitable for use with low frequency induction heating. Inquiries to vendors have been sent out to study
the feasibility of casting these pressure vessels from a 400 series stainless steel. Also designs were developed during the month for using O-rings and toggle action "C" clamps to seal most of the critical joints on all of the equipment. Inquiries have been sent to vendors to obtain more information on the cost of a suitable toggle action "C" clamp and on the casting of the special flanges.

The vendor has started detail design on the continuous centrifuge which will be evaluated as a possible replacement to the vacuum drum filter. A comment issue of an arrangement drawing for the centrifuge has been received, and comments were transmitted to the vendor.

**Weapons**

Three drawings on the prototype dry atmosphere hood were completed and approved for construction. Vendor quotations for the super dryer were evaluated, and an order for a dryer was placed. A comment issue was made on the dry atmosphere hood arrangement.

Tests were conducted with the prototype hood in which leak rates through glove ports, plastic bags, sphincter seals, and hood panels are being evaluated. Near the end of the month these tests were interrupted in order to convert the plastic panels from a self-sealing weather strip mounting to the more conventional clamping procedure with the use of Nelson studs.

**Neutron Counter for Energy Analysis**

Plans are being made for assembly of a neutron counter for energy analysis work to be conducted by Finished Products Technology. The instrument will be of a double moderator type, and as recommended by HLO Radiological Physics Operation. Various items of equipment are being borrowed for an interim setup in order to start taking measurements as soon as possible.

**B. Process Technology**

The new design for a critically-safe vacuum drum filter doctor blade was approved, and fabrication of the first unit was started. It is presently planned to install this first unit for testing on Hood H-9A.

Preliminary design of an improved backup filter for the vibrating tube reactor off-gas has been completed. This improved design will permit a greater degree and ease of powder removal during cleaning.

**Radiation Level Recording**

Work is in progress to install cables and connectors from Zone 2 to Zone 3 for various radiation recording instruments. This will provide a flexible arrangement and greatly reduce the equipment contamination problems.
C. Plant Engineering

Hood 24-C - Electrical Design

Electrical design was completed for a lathe installation in Hood 24-C, to replace a press which will be removed.

D. Project Activities

Project CG-734, RMC Button Line

Because of the strike, the over-all field progress is now estimated to be 88.3 percent as compared to a scheduled 90 percent. Hoods HC-6 and HC-42 were hot-tested and placed into operation. All but three of the plate glass viewing windows have been installed. Welding of shielding frame clips on seven windows, Hood 9-B, was performed without contamination incident. Considerable progress was made in painting of the facility. With the return of the pipe fitters and electricians on July 30, scheduling of cold acceptance tests for the majority of the hoods is underway.

CG-745 RMC Fabrication Line, 234-5

The procurement of engineered material and equipment is virtually complete on this project with the exception of the following 4 orders: one bench lathe scheduled for plant site arrival during August, 1959; one F-1 special lathe scheduled for shipment in December, 1959; one order of plexiglass as scheduled for completion on August 15, 1959; and another order covering x-ray glass which is scheduled for completion on August 15, 1959.

CG-830 Plant Modifications for Reprocessing Non-Production Reactor Fuels

Directive HW-483, Modification No. 1, dated July 16, 1959 increased the prior authorization to the total $1,450,000 previously requested. It also authorized initiation of procurement for the mechanical preparation facility and use of one A-E to perform certain design work and to fabricate and furnish mechanical preparation facility equipment.

Preparation of Revision 2 of the project proposal has been initiated. This revision is expected to request total funds $6,300,000, and will firm up schedules and methods of performing work.

Criteria have been prepared for a critically-safe centrifuge (HW-61229). This criteria will be used as a basis for a survey adapted to the power fuels processing plant. If no readily adaptable unit is found, the same criteria will be used as the basis for a research and development contract.
OGC-843 Disposal Facilities for UO₃ Condensates

Detail design has been suspended pending study as to the need for a change. The original scope called for neutralization facilities. Data now indicates that neutralization may not be necessary, in which case a new crib would be given consideration. There is also a possibility that the effluent might be dumped into the swamp under certain conditions. These alternates are being studied.

GENERAL ACTIVITIES

A. Research and Development

NPR Casks

A study was completed in cooperation with IPD on the suitability of six available SRP-60-ton casks for the shipment of NPR fuel between Hanford facilities. It was concluded that the small capital savings which might be realized through acquisition of the SRP casks, as opposed to procurement of new NPR casks, would be outweighed by increased operating expenses associated with the SRP casks.

B. Process Technology

Waste Tank Inspection

Closed-circuit TV equipment is being designed for inspection of high-level radioactive waste storage tanks. The TV equipment has been purchased and demonstrated in a non-contaminated zone. A remotely-operated optical prism, radiation protective enclosure, and a method of providing light in the tank are being designed so that TV cameras can be lowered through a 12-inch diameter access riser at ground level. It is planned to demonstrate this method of inspection of the 113-SX tank.

C. Plant Engineering

Analysis of Equipment Maintenance Experience

Surveys were made of the equipment record cards of the Purex and Redox Plants, and the repair records of the Waste Handling and Decontamination Operation, to check for trouble spots where the application of plant engineering could reduce repair costs. No areas warranting immediate attention were noted.

Study of Equipment Burial Improvements

Study of alternate burial box designs and associated procedures was continued. Further alternates on metal skirted cover and total metal box design were estimated to be quite expensive. However, vendor contacts on aqueous foam revealed the availability of what appears to be a low-cost, long-lasting foam for application where equipment temperature is below 212° F. A test sample is being obtained.
Work Sampling

Work Sampling Programs for Finished Products Operation, Shops Operation, and General Maintenance have been organized. These programs are carried on by each operation with guidance from the Industrial Engineering Unit.

D. Project Activities

In-Line Instruments, CG-686

The circuit modifications to correct flow-alarm malfunctions have resulted in satisfactory operation of these devices during the past month. Problems are being encountered in the sampling system of the Redox L-9 alpha monitor. Modifications are planned which should provide a correction.

III. ORGANIZATION AND PERSONNEL

A. Personnel

J. R. Fritz accepted a job offer with APED at San Jose and terminated July 31, 1959.

S. R. Bierman, Engineer I, formerly associated with the Standard Oil Company of New Jersey, Aruba, Dutch West Indies, reported to Extraction Design and Development on July 22, 1959.

C. B. Foster transferred from Redox on July 1, 1959, to perform liaison and contact engineering on all NPR projects.

C. M. Thomas and R. F. Worden, graduates of the Company's Manufacturing Training Program, joined Industrial Engineering. Mr. Thomas' most recent assignment was at the Hermetic Motor Department, Ft. Wayne, Indiana; Mr. Worden's at Dishwasher and Disposal, Louisville, Kentucky.

Fred Cox, Specialist, Reports and Services, was transferred to CE&UO on July 20, 1959, as Specialist, Inspection Scheduling.

B. Safety and Security

The regular Safety-Security-Health meetings were conducted for all personnel, and the stress on individual participation was continued. The Safety Specialists continued their Department-wide efforts toward safety promotion programs, revision of safety rules, review of engineering in the plants, and other specific contacts.

There were two security violations during the month.

C. Inventions

J. M. Gerhart filed an invention report, "A Method of Capsulating Radioactive Material So As To Be Useful As A Radioactive Source or As A Disposal Method."
D. Reports Issued


HW-61109, "Results of Tests to Determine the Feasibility of Pulling Three 1/2 or 3/4-inch Pipes through a 3-inch Pipe Containing Several Bends", J. M. Gerhart, July 30, 1959.


HW-61088, "Palmolive Reprocessing and Fabrication Facilities - 200 East Area (Budget Data Sheet)", D. R. Gustavson, dated June 27, 1959.


E. Trips

R. A. Kennedy and C. B. Foster visited Oak Ridge National Laboratory and General Mills Mechanical Division, Fairbanks-Morse Pump Company, and Deming Pump Company, commercial equipment manufacturers, to inspect mechanical processing equipment for power fuels and discuss developments.

R. A. Kennedy visited Allis Chalmers, Dresden (GE), PRDC, and Yankee to review power reactor fuel design and handling methods.

W. A. Graf visited Atomics International and GE at San Jose to consult on reprocessing power fuels.

P. S. Kingsley, Metallurgical Engineer, completed an extended trip to the East and Midwest to attend the ASTM meeting, and to confer with possible vendors of materials for NPT dissolvers.

Visitors

Mr. L. H. Winter, General Precision Laboratories, Inc., Los Angeles, California, visited the plant July 28 and 29, 1959, to set up and instruct maintenance personnel on TV equipment.

Mr. R. H. Studebaker, Process Equipment Company, visited W. H. Koontz on July 24 relative to design considerations on the order for design and fabrication of the Purex remote jumper cutter.

Messrs. Tourek, Duda, Willis and Yerkes of Vitro Corporation visited on July 29 and 30 regarding Architect-Engineering negotiations on power fuels.
Fission Product Recovery

While the neptunium recovery run was in progress, a second rare earth recovery study was conducted to evaluate further the sulfate precipitation recovery method for Cerium-144. Two thousand gallons of concentrated waste were centrifuged to remove the precipitate normally in IWW. Although approximately eighty percent of the Ce$^{144}$ present in the IWW was removed by centrifugation, it was recovered by a 6 M nitric acid wash. Contrary to previous studies, essentially no Zr-Nb was removed by centrifuging. Over-neutralization (to pH > 1.5) of the centrifugate precipitated iron compounds which produced an electrical overload of the centrifuge when the solution was centrifuged after the first sodium sulfate strike; consequently, the cake was inadequately washed. Decontamination factors for Zr-Nb and Ru-Rh were only 1 and 33, respectively, for the first strike. A second sodium sulfate strike, performed after the first cake was dissolved in 6 M HNO$_3$, was made at pH = 1.2 but produced no significant additional decontamination. A total of 860,000 curies of Ce$^{144}$ were recovered, and a sample of this product was sent to Oak Ridge National Laboratory for evaluation.

Solvent Extraction

Because of a neptunium recovery run and extensive equipment flushing, only 46 percent of the month was spent on normal irradiated uranium processing. Typical performance data from the operating period are summarized below:

<table>
<thead>
<tr>
<th>Cycle</th>
<th>Log Decontamination Factor</th>
<th>Instantaneous Loss, Percent</th>
<th>Recycle, Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plutonium</td>
<td>Uranium</td>
<td>Plutonium</td>
<td>Plutonium</td>
</tr>
<tr>
<td>First</td>
<td>4.6</td>
<td>3.7</td>
<td>0.04</td>
</tr>
<tr>
<td>Final</td>
<td>3.0</td>
<td>2.7</td>
<td>-</td>
</tr>
<tr>
<td>Ion Exchange</td>
<td>&gt; 0.4</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Overall</td>
<td>&gt; 8.0</td>
<td>6.4</td>
<td>0.04</td>
</tr>
</tbody>
</table>

Initial July solvent extraction operation was characterized by mixed decontamination performance. After the HAF Tank and HA and HS Columns had been flushed during the plant shutdown, the 2AF gamma activity was the lowest achieved since conversion to the two-cycle process, but the 2IF gamma ratio was three to five times normal. Despite the low 2AF radioactivity, the 2BP exceeded specifications because the Final Plutonium Cycle decontamination factor was only fifty (normal = 2000). Radiation profiles taken along side the 2A and 2B Columns pinpointed zones of extremely high radiation at the bottom of
the 2A and middle of the 2B Columns. These concentrations of radioactivity were considered to be residual from the neptunium recovery run, and the plant was shut down for 2A and 2B Column flushing. Flushes used to successfully remove the fission product concentration from the columns included: (a) hot 60 percent nitric acid, which removed less than one percent of a day's production from the 2B Column, and indicated the presence of little or no plutonium polymer, (b) hot 3.5 percent nitric acid - 5 percent oxalic acid, and (c) hot 10 percent caustic - 5 percent tartaric acid, used in the 2A Column only. The 2BF produced subsequent to the Final Plutonium Cycle flushing was lower in gamma activity than any other since the inauguration of two-cycle operation. Plutonium decontamination in the solvent extraction system remained excellent during the remainder of the month.

Because of the high 2IF radioactivity, the final uranium product gamma ratio ranged from 3.0 to 4.5 despite a 500 to 700 decontamination factor in the 2D Column. Since various HA Column flowsheet adjustments failed to produce significant improvement in the 2IF radioactivity, it has been concluded that residual fission products from the neptunium recovery operation remain in the ICU Concentrator and in the 2IF Tank. Future flushing of these equipment pieces is planned. Meanwhile, silica-gel processing reduced the gamma ratio of all off-standard uranium to $\gamma_{\text{eff}}$.

Waste losses were comparatively high during the month due to extensive flushing operations. In addition, initial HAW plutonium losses were high because the contaminated, concentrated uranium from the neptunium recovery run, transferred to head-end for reprocessing (the ICU Concentrator contents and 2IF Heel were included), received an insufficient sodium nitrite addition to properly adjust the valence.

Other items of interest to Solvent-Extraction included:

(a) A possible partitioning failure was averted by reducing the IBS flow to flowsheet from 45 percent above flowsheet.

(b) When a 56 percent reduction in the HA0 flow reduced the First Cycle decontamination performance and increased the gamma activity of the 2AF and 2IF 1.5 fold, the flow was returned to normal.

(c) Calculations indicate that the operating critical mass control limit for the Backcycle Waste Concentrator was exceeded when the XAW plutonium recycle from the Ion Exchange Unit became excessive due to off-standard operation of the unit. An investigation of the incident produced recommendations designed to better control operation of the unit.

(d) The addition of Permacol, a filming amine which has been added to the power house steam since March 27 to reduce rust in the steam and condensate systems, was eliminated on July 28 on the basis that it may have contributed to the low reactivity of the $\text{UO}_3$ powder being produced.
Neptunium Recovery

Only 750 grams of an estimated 1100-gram neptunium inventory, which had been accumulated in the plant at the end of the June operating period, were made available for recovery because the ICU Concentrator and the 2IW Tank were not emptied prior to the start of the recovery run. Of the available amount 91 percent (680 grams) were isolated in a routine neptunium recovery run utilizing the 2A and 2B Columns. Typical 2AW and 2BW neptunium losses were 1.0 and 0.4 percent, respectively. High gamma activity in the feed, produced by the addition of HA Column flushes to the 3WB, resulted in a ten-fold higher-than-normal gamma activity in the neptunium solvent extraction product.

Processing of the uranium separated during the neptunium recovery run increased the gamma activity of the solutions in the ICU Concentrator and the 2IW Tank to such an extent that these solutions were transferred to head-end to be processed as HAF. Although sodium nitrite was added for valence adjustment, proper oxidation was not achieved, and the entire 350 grams of neptunium plus some plutonium were lost via the HAW. Approximately one-half the neptunium was segregated in DW for future rework.

Variations in HA Column uranium saturation control and column acidity both have contributed to high HAW neptunium losses since start-up; consequently, no appreciable accumulation of neptunium had occurred in the plant at month end.

Plutonium Concentration

Smooth operation of the plutonium Ion Exchange Unit has been hampered by minor mechanical difficulties. One of these, a leak around the XAF valve stem, required the unit to be shut down for four hours for maintenance. During this time the 2BP was allowed to collect in the XAF Tank without the normal nitric acid addition, and upon start-up low XAF nitric acid concentration, plus a four-fold increased plutonium processing rate and insufficient resin movement, produced XAW plutonium losses in excess of one-hundred percent. This high plutonium recycle caused the Backcycle Waste Concentrator and other processing vessels to accumulate excess plutonium (see Solvent Extraction). Operation of the unit returned to normal after the proper operating conditions were re-established.

Solvent Treatment

Samples of the solids in the Batch Contactor (TK-31), where the alkaline permanganate contact is made, revealed the three distinctly different solids, as shown below:

(a) A black crystalline solid (mostly MnO₂) - soluble in 5 percent oxalic acid - 3.5 percent nitric acid at 50°C.

(b) A carbonate solid (Mn and Na) - soluble in 25 percent nitric acid at 60°C.

(c) A gelatinous black solid (Mn, Si, and Na) - slurried by 5 percent caustic - 5 percent tartaric acid at 50°C.
Use of the recommended flushing solutions removed solids from the Raschig ring packed section equivalent to about 950 gallons of volume (tank volume = 5000 gallons). Thorough flushing of the remainder of the No. 1 Solvent Treatment equipment was also required to remove contained solids. Visual observation of the aqueous recirculation pump performance in TK-01 proved the operation was excellent.

Extensive flushes of the Batch Contactor (TK-01), followed by solvent treatment prior to, during, and subsequent to the neptunium recovery run, reduced the solvent gamma activity from 4500 to 900 uc/gal. The quality of the No. 1 System solvent appeared to be excellent with the plutonium retention measured as $3 \times 10^7$ (values below $7 \times 10^7$ indicate satisfactory solvent).

**Waste Treatment and Acid Recovery**

Operation of the Waste Treatment and Acid Recovery equipment has been satisfactory. Column flushes, plus flushes of solvent treatment equipment, produced higher-than-normal waste volumes and losses during the month. Waste sent to the underground storage tanks averaged 69, 1069, and 76 gallons per ton of uranium for neutralized IW, solvent washes, and cell drainage, respectively. Overall plutonium and uranium waste losses for the month were 0.53 and 0.18 percent, respectively. Plutonium and uranium coating waste losses accounted for 11 and 23 percent of the over-all losses, respectively.

IW transfers to the 241-A Tank Farm were routed from TK - 102 to TK - 104 on July 10, 1959. After collecting waste in TK-102 for 16 months, the tank contains 68 percent of the sodium required to produce 8 molar at the hydrostatic head limit. Solvent washes are currently routed into TK-102 until TK-104 starts self-concentrating.

Self-concentration continues in Tanks 241-A 101, 102, and 103 at 3.4, 18.7, and 0.8 gallons per minute, respectively.
Solvent Extraction

Exploration of probable flowsheet conditions for neptunium recovery, for processing of non-production fuels or dichromate-oxidized feed solutions, has indicated additional fission product decontamination 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 a low-acid flowsheet on the Third Plutonium Cycle was therefore made while the plant was processing normal metal on a short-term assignment. The acid additions to the 3A Column streams were reduced stepwise until the 3AW stream was -0.1 M acid, compared with the normal value of 0.25 to 0.3 M. There was no noticeable increase of plutonium loss in the 3AW stream during the test. Evaluation of the effect on the fission product decontamination was not possible due to a change in processing rate plus a waste rework operation started while the test was in progress. Another test will be made at a later date.

Uranium-plutonium partition efficiency dropped sharply during two separate periods of operation, with plutonium losses to the IBU stream ranging from 3 to 10-fold higher than normal. The highest loss, in which nearly four percent of the entering plutonium accompanied the uranium effluent, was suffered during the use of a supply of LBX in which the ferrous-to-ferric ratio was abnormally low. The plutonium partitioning returned to normal when the LBX ferrous iron content was increased 50 percent and remained normal with the subsequent use of normal LBX. However, since the reasons for the erratic behavior are not as yet known, the standard LBX ferrous iron concentration has been increased 10 percent on the theory that the original concentration was on the borderline of the requirement. This theory is in part supported by the fact that occasional unexpected high plutonium concentrations have been observed in the IBF stream indicating the possibility of reflux of plutonium in the IB Column.

Another test of the behavior of boric acid in the extraction system was made by processing three successive feed batches containing 0.1 M boron as boric acid. (Previous tests involved only single batches with the same concentration of boron, which is being considered as a neutron poison for possible critical mass control in the future.) Analytical results on the final products were below the detection limits of one part of boron per million parts of uranium and 20 parts of boron per million parts of plutonium.

Approximately 35, 2000-gallon batches of concentrated waste have been processed through the extraction system since January, 1959, employing the following EA Column flowsheet or a variation of it:

HAF:HAS:HAX = 300:60:100
At current low production rates, this is done concurrently with normal feed processing and without production delays by the use of the two parallel HA Columns, one for metal solution and the other for waste solutions. The above flowsheet costs approximately $170 in chemicals and waste storage space to rework a 2000-gallon batch of concentrated waste. The last twelve batches have been reworked using only one-fourth of the above flow of HAS, thus reducing the cost to approximately $48 for a 2000-gallon batch. The wastes reworked in this fashion contained a total of approximately 1100 pounds of uranium and 1000 grams of plutonium and were processed at an approximate cost of $3100 in chemicals and waste storage space. Based on an estimated recovery of 95 percent of the uranium and 90 percent of the plutonium, and using the current values of $50 per gram of plutonium and $18 per pound of irradiated enriched uranium, the net savings in product values exceeds $60,000.

The HAF and 1AF stream acidities were decreased from -0.3 to -0.4 and from -0.25 to -0.35 M nitric acid, respectively. This was done to provide a range in which the normally experienced acidity variations would have less effect on the product decontamination obtained in the extraction battery. Efforts during the past several months to stay on the more acid-deficient side of the acid specifications of the Precycle and Partition Cycle streams have more consistently produced product within fission-product specifications. The acid change was made in line with this experience.

Plutonium Concentration

A series of acid flushes through the 233-S Building equipment during the month just prior to the installation of the new titanium L-3 concentrator loop showed no evidence of a recurrence of the plutonium deposition encountered in October, 1958.

The first batch of concentrated product following the installation of the new all-titanium L-3 concentrator loop slightly exceeded specifications (12,500 parts iron per million parts plutonium) but the second batch was within specifications. It is hoped that the new combination of the old tantalum heat exchanger and the new titanium concentrator loop will permit the plutonium product to meet metallic impurity specifications consistently.

Essential Materials

Hexone loss rates have exceeded the anticipated loss rate since the Redox plant began operations in 1952. For the first six months of 1959, hexone losses have greatly exceeded the experienced loss rates of the preceding four years. In a continuing effort to check these losses, Redox Technology personnel determined that the vacuum was abnormally high on the concentrator vessel vent system and recommended that it be reduced approximately 50 percent. This was done during the subsequent week of operation, and including start-up and shut down, the hexone loss was decreased to approximately 250 pounds per ton of uranium processed compared to a four-year average of 450 pounds per ton. Up to this time the average cost for hexone had been approximately 23 percent of the total chemical cost. This operating technique is still being evaluated.
FINISHED PRODUCTS TECHNOLOGY

URANIUM CONVERSION OPERATION

Process Performance

All UO₃ shipped met product specifications. Nine hundred fifty five (955) pounds of nitric acid per ton of uranium processed (90.6% of theoretical) were recovered at an average concentration of 47%. Eight carloads of acid were shipped to Purex.

The average operating rate of the calciners was 7.1 tons uranium per unit for each day on the line. The overall calciner operating efficiency was 93%.

Process Improvement

Automatic proportioned control of the sulfuric acid addition to the normal and enriched 100% UNH was placed into service. Experience to date indicates closer control of sulfur content at high production rates compared to the batch addition method.

The slope of the drain line from the concentrator de-entrainment vessel to the 100% UNH storage tank was increased. Since this change, the drain line has not plugged. Prior to the modification, pluggage occurred about three times a month.

The H calciner agitator hub assemblies were removed for enlargement of the shear pin holes. Three-quarter inch diameter pins with a 5/8 inch shear diameter were installed. This change was made to remove excess motion of the arm assemblies.

The calciner powder bed temperature was increased from 270°C to 280°C on July 15 as part of a test program to determine whether improved reactivity is obtained during subsequent processing by the customer.

The slide valves on the inlet to the cyclones in the UA powder handling system were replaced with an air operated "Y"-dike diverter valve. Performance of this unit has been completely satisfactory to date.

METAL FINISHING OPERATION

Recuplex

Thirty-nine runs, consisting of crucibles, fragments, powders, and clean-outs, were processed through the S & C hood. Slurry losses to crib averaged 0.06% of the recovered plutonium. The addition of 1300 grams of cadmium to each dissolver batch to improve the nuclear safety factor was started this
this month. Cadmium concentrations in the product from the solvent extraction columns has averaged less than 10 ppm.

Increasing the dissolution time from three to four hours to reduce accumulation of solids in the dissolver did not reduce the required frequency of clean-outs. The dissolution time will be returned to the normal three hour cycle.

The SE Hood processed 1490 liters per day at 76% operating efficiency for an average instantaneous rate of 1980 liters per day. Waste losses to crib averaged 0.009 g/l or 0.47% of the feed plutonium. Hood floor flushes processed during the month resulted in solvent degradation, which required rigorous treatment with sulfuric acid for clean-up. The presence of sulfate, Pu(III), and solvent impurities in the extraction system contributed to the higher than normal waste losses.

Decontamination factors of 20 were attained while processing Purex product slightly high in fission products. Four successive Purex batches were followed by a minimum of two "cold" Recuplex runs to maintain the high decontamination factors.

Polyvinylchloride gloves manufactured by Jomac, Inc. were tested in the Recuplex and Task I hoods. All gloves resisted attack by the process solutions but failed in a combined sewed-welded seam between the hand and gauntlet parts of the glove. If the welded seam could be eliminated by the manufacturer, the glove appears to be a good replacement for neoprene where chemical resistance is required.

Task I - II

One hundred seventy six (176) runs were processed with an average filtrate recycle of 4.92%.

Operation of the continuous unit was intermittent during the month due to variances in the feed supply. Frequent start-ups contributed to the above normal recycle.

The new feed storage hood, HC-6, was started up, but lack of feed prevented complete testing of sampling variables as related to accountability requirements.
PROCESS CHEMISTRY

PUREX PROCESS ASSISTANCE

During the month, laboratory work in support of the Purex Plant centered primarily on 1) the identification and dissolution of the foreign matter accumulated in the G-1 tank and 2) the clean-up of deteriorating solvent.

Laboratory tests of the foreign substance in G-1 tank showed the solids to be a mixture of three different materials. The first, which was principally $\text{MnO}_2$, was found to dissolve in a nitric acid-oxalic acid mixture, and the second, a carbonate material, was dissolved in 25% nitric acid. For the third material, a dark green, slimy crud tentatively identified as "interface crud", treatment with a solution of 5% tartrate in 5 M NaOH gave the greatest degree of dissolution and produced the most desirable slurry for removal from the tank. Spectrographic analysis of the carbonate material showed the principal metallic constituents to be phosphorous, manganese, and sodium, whereas a similar analysis of the "interface crud" showed the metallic constituents to be largely manganese, silica, iron, and chromium.

The search for a better method of solvent treatment was continued. With the exception of such reagents as HF, Na$_2$SiF$_6$, or organic reducing agents, e.g., hydroquinone, a double batch contact with K$_3$MnO$_4$ - Na$_2$CO$_3$ still appears to be the most practical method of solvent treatment.

REDOX PROCESS ASSISTANCE

Dichromate Oxidation of Plutonium in Acid Deficient UNH

To eliminate the ruthenium volatilization associated with the present permanganate head-end treatment, it appears likely that the permanganate will be replaced with dichromate in the Redox head-end treatment. In order to avoid the high corrosion rates resulting from an acid dichromate oxidation step, it would be desirable if most of the dichromate treatment and solution concentration could be carried out under acid deficient conditions.

Recent laboratory work has shown that 0.05 - 0.2 M Na$_2$Cr$_2$O$_7$ will oxidize 99% of the plutonium(IV) present in a -0.2 M HNO$_3$, 2.2 M UNH solution to plutonium (VI) in less than 30 minutes at the boiling point. The oxidized solutions show no valence change upon standing 1-2 days at 25 C or an additional three days at 40 C. For the acid oxidation, previous work has shown that 0.05 M Na$_2$Cr$_2$O$_7$ will oxidize greater than 98% of the plutonium(IV) present in an acid ($\approx$ 0.1 M HNO$_3$) UNH solution to plutonium(VI) in the time required to bring the solution to boiling.

Thus, for the Redox dichromate head-end step, it is proposed that 0.05 M Na$_2$Cr$_2$O$_7$ be added to the acid ($\approx$ 0.1 M HNO$_3$) dissolver solution and the solution brought to boiling. This treatment will oxidize the great majority of the plutonium to the hexavalent state, minimizing the danger of plutonium(IV) polymer formation in the subsequent caustic addition. Caustic
will then be added to attain acid deficiency. The solution will then be boiled for several hours for concentration and further plutonium oxidation. This treatment should insure plutonium in the hexavalent state and minimize the corrosion due to dichromate.

Ozone Volatilization of Ruthenium from 2BP

Additional experiments on the volatilization of ruthenium from Redox 2BP solution using ozone in conjunction with various auxiliary oxidizing agents and/or catalysts were carried out. Of the various auxiliary reagents tested (cobalt, silver, and ceric ion) for use with the 0.7% ozone, permanganate appears to be the most acceptable for immediate plant use. Accordingly, it is recommended that in the initial plant test the ozonation be carried out in 0.003 M permanganate.

In laboratory tests of the various auxiliary reagents, the presence of cobaltic ion during the ozonation gave the most rapid rate of ruthenium removal. Because of the difficulty in preparing and maintaining the cobalt in the trivalent oxidation state, the use of cobaltic ion is, for the present, limited to laboratory application. Of interest is the fact that cobaltic nitrate solutions, as concentrated as 0.4 M in cobaltic ion, have been prepared by the electrolysis at 0-10 C of 0.5 M cobaltous nitrate solution in 5 M HNO₃. Solutions of 0.4 M cobaltic ion were also prepared by ozonation of a similar starting solution for 3.25 hours with 0.7% ozone at 0-10 C.

NEPTUNIUM PROCESSING

Neptunium Purification

Six hundred eighty grams of neptunium from the Purex plant and 160 grams of neptunium from dissolved reject elements were processed in the anion exchange facility during the month. Measured losses of neptunium to waste were 20 grams (2 per cent). Fifty per cent of waste loss occurred during acidification of the anion exchange column which indicates that not all of the neptunium had been eluted from the resin during the preceding run. In future runs the effluent from the anion column during the acidification step will be segregated for rework if the neptunium content of this effluent is high. The amount of neptunium loaded on the column for these runs was limited to 25 grams of Np/l of resin. However, because the ratio of uranium, plutonium, and thorium to neptunium was low compared to the previous month's run, less than 50 per cent of the capacity of the column was used. The nitric acid concentration in the feed for run 16, in which the dissolved reject elements were processed, was reduced to compensate for the aluminum nitrate present. The total nitrate concentration was 6 molar. The lower acid concentration alleviated the difficulty experienced last month in washing adsorbed plutonium from the column.

Neptunium oxalate was precipitated by the direct addition of the anion exchange product [20 g/l Np, 1.0 M HNO₃, and >99% Np(IV)] to sufficient oxalic acid-nitric acid to precipitate the neptunium as the di-oxalate and yield a final slurry ~0.1 M in oxalic acid and ~2 M in nitric acid.
Neptunium dioxide was formed by calcining the neptunium oxalate at 550-600°C for one hour.

Neptunium losses to the filtrate totaled less than 0.6 per cent. The filtrates were concentrated to ca. 10 M HNO₃ to destroy oxalate ion and were returned to the anion exchange unit for neptunium recovery.

**Dissolution of Np₂O₃-Al Extruded Elements**

Further studies were made on the nitric acid dissolution of Np₂O₃-Al extruded elements. By adding 8 liters of 9 M HNO₃ to an element containing 42.7 g Np₂O₃, 271.3 g Al, and 4 g Al₂O₃, an average of 241.7 moles of acid was consumed regardless of whether the acid was added all at once, or incrementally over a 2 to 3 hour period. The reaction was catalyzed with either 0.32 or 0.16 moles of mercuric nitrate. The amount of mercuric nitrate made no apparent difference in rate of dissolution. When the nitric acid was added all at once or in large increments, an extremely rapid reaction occurred at the start of dissolution, lasting from 15 to 30 minutes. The rapid reaction was easily controlled by controlling the rate of acid addition. In all cases, dissolution of the element was complete within 6 hours. Insoluble material, presumed to be refractory Al₂O₃, amounted to less than 0.1 volume per cent. Filtering the dissolver solution through a glass wool filter removed about 90% of the solids.

**Palm-Olive Equipment Development**

Operation of the 222-S anion exchange facility was made without a top resin hold-down weight. No excessive shifting or movement of the resin was observed during the three runs. A top resin hold-down plate in the proposed plant ion exchange column does not appear necessary.

**ANALYTICAL ASSISTANCE**

**Spectrographic Determination of Tantalum in Plutonium**

At the request of the 234-5 Development sub-section, a spectrographic method was developed for the determination of tantalum in plutonium. The method consists of separating tantalum from plutonium by anion exchange and measuring the tantalum spectrographically. An 8.25 M nitric acid solution of the plutonium-tantalum mixture is passed through an anion exchange column using Dowex 1 x 4, 100-200 mesh resin. The column effluent containing the tantalum is concentrated by thermal evaporation and an aliquot of the concentrated solution is loaded on 3 mm graphite electrodes and analyzed in a direct current arc. Initial tests indicate a detection limit of about 1000 parts tantalum per million parts of plutonium. Current efforts are directed toward improving the detection limit.
Beta Proportional Counting

After considerable initial difficulties, one highly stable beta proportional counter has been assembled and placed in operation in the 222-S Building. This will be used as a reference for testing other chambers and amplifiers so that eventually a 3 unit system may be tested as a possible replacement for the present EGO (Beta-Gamma Offset) counters used at the 222-S Building. The causes of the counting difficulties encountered earlier were found to be largely of an electrical nature, such as: 1) large line voltage changes, 2) electronic transients caused by the proximity of switches and electrical contacts on counting room instruments, 3) faulty high voltage cables, and 4) faulty electronic tubes.

QUALITY CONTROL AND STANDARDS

The Quality Control Program for the Chemical Processing Department analytical laboratories was maintained as usual. The "Quarterly Analytical Control Quality Report - April-June, 1969," (Unclassified, J. S. Buckingham) was issued.

Dissolution of PuO₂ in Phosphoric Acid

Work to investigate the use of plutonium dioxide as a primary standard was continued. Recent tests centered primarily on dissolving the dioxide in hot concentrated phosphoric acid. In tests using high fired oxide (1200 °C), it was found that 500 milligrams of the plutonium dioxide completely dissolves in 3 mL of hot (~200 °C) concentrated phosphoric acid in less than one hour. In an effort to find stable dilute solutions suitable for analysis by the ceric sulfate titration method, the concentrated solutions were diluted to about 20 g/l in Pu with various concentrations of HCl, H₂SO₄ and H₃PO₄. With the exception of dilutions made with concentrated phosphoric acid, dilution resulted in the formation of gelatinous phosphate precipitates. The concentrated phosphoric acid solutions, although apparently stable, were not found suitable for analysis by the titration method. Future efforts are aimed at converting the stable concentrated phosphoric acid-plutonium solution to a solution suitable for analysis.

Quartz Spring Differential Transformer Thermobalance

In conjunction with work on the development of plutonium and uranium compounds suitable for use as primary standards, a novel thermobalance was developed to study the pyrolysis curves of uranium and plutonium. The complete instrument obtains a continuous recording of the temperature and the thermobalance concerns the use of a quartz spring in series with the iron core of a linear differential transformer to continually sense the loss or gain in weight.
234-5 DEVELOPMENT

Direct Calcination Of Plutonium Nitrate

Direct calcination of plutonium nitrate to the oxide is being scouted as a replacement for the Task I process. This consideration is possible because ion exchange product purity approaches that required for buttons.

Some relatively short duration runs (15 - 30 minutes) have been made using a simple laboratory stirrer to agitate a hot bed of plutonium oxide contained in a stainless steel beaker. Plutonium nitrate solution (≈ 275 g/l Pu) was continuously dripped onto this bed and calcined to the oxide, with the bed remaining dry and free-flowing. No spattering of any sort was observed. The resulting oxide was primarily granular, but a fine fraction was definitely present and some dusting was encountered.

Samples of oxide from these calcination runs have been analyzed for residual nitrate and moisture. The results are tabulated below:

### RESIDUAL NITRATE AND MOISTURE IN DIRECT CALCINED PLUTONIUM OXIDE

<table>
<thead>
<tr>
<th></th>
<th>NO₃</th>
<th>H₂O</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batch calcined stock solution</td>
<td>2.83</td>
<td>2.4</td>
</tr>
<tr>
<td>Batch calcined Purex product</td>
<td>2.83</td>
<td>2.2</td>
</tr>
<tr>
<td>Continuous calcined stock solution</td>
<td>0.56</td>
<td>0.70</td>
</tr>
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</table>

Critical Mass Fuel Preparation

A number of test cylinders have been prepared for the Critical Mass Fuel Program. Cylinders have been fabricated from the following mixtures: plutonium oxide-polyethylene, plutonium oxide-methyl methacrylate, and plutonium oxide-paraffin. In all cases, the cylinders were one inch in diameter, and from one-half to three-quarters of an inch thick.

Plutonium oxide-polyethylene cylinders having an atomic ratio of H/Pu - 15 were compression-molded at 145 C. The effects of molding pressure were studied in the range of 4,000 to 10,000 psi. No increases were noted in the plutonium concentration as a result of the higher pressures. Any pressure in the range studied appears to be adequate for successful fabrication. The cylinders had a plutonium concentration of approximately 1800 g/l.

Additional test cylinders of plutonium oxide-polyethylene were fabricated at 145 C with a molding pressure of 8,000 psi. The cylinders were prepared with atomic ratios of H/Pu = 10 and H/Pu = 5, and the plutonium concentrations were 2300 g/l and 3100 g/l respectively.
Plutonium oxide-methyl methacrylate cylinders having an atomic ratio of H/Pu = 15 were compression-molded at 145 C. One cylinder molded at 4,000 psi had a plutonium concentration of 1150 g/l, while the remaining cylinders molded in the range of 6,000 - 10,000 psi were 1185 g/l.

One plutonium oxide-paraffin cylinder having an atomic ratio of H/Pu - 15 was molded at 50 C using a pressure of 8,000 psi. A plutonium concentration of 1680 g/l was obtained. No gassing or softening has been detected in the three days since fabrication.

Selected plutonium oxide-polyethylene and plutonium oxide-methyl methacrylate cylinders are being radiographed by x-ray to detect any imperfections. All fabricated units are being stored for periodic tests to determine any dimensional and weight changes.

Continuous Task III

A continuous electrolytic reduction process offers the advantage of a greatly-reduced by-product load for recovery. Equipment for demonstrating the electrolysis of plutonium trichloride has been assembled over the past year and hot tests are now in progress.

Seven tests of the electrodeposition apparatus have been made. These tests terminated due to equipment failures, and not due to the process. Early difficulties due to failures of the quartz envelopes have been overcome by changes in the envelope.

In the first test, the cell was charged for operation and heated to operating temperature. On reheating after an overnight shutdown, the zirconia cell was noted to have failed due to differential expansion of the cell contents during the heating and cooling cycle.

A second test, with an alumina cell, was terminated when the thermocouple well failed and the resulting loss of temperature control led to plugging difficulties. For a portion of the test, voltage was applied to the electrodes but no current was drawn—indicating the charge was not molten. However, the current that was drawn for a short time resulted in detectable plutonium deposits on the cathode.

The third test was terminated when the zirconia cell ruptured during the charging operation.

The fourth test ran with currents as high as 140 amps. However, early in the run the alumina cell was ruptured when a magnesia support failed. Despite the rapid loss of molten salt from the cell, electrolysis was attempted with frequent feed additions. Post-run examination disclosed cathode deposits of metal.

The fifth test was made with a relatively thin wall alumina cell. Rupture occurred during charging, apparently due to thermal shock.
The sixth test was the most successful to date, but failure of a valve handle and the thermocouple well caused early termination of the run. Post-run examination disclosed that the cathode had deposits, the crucible was still intact, and the thin-walled thermocouple wall was severely corroded.

The seventh test was made with the cell remaining from the sixth test. Failure of the thermocouple well again contributed to shutdown, with an unexplained leak of melt the prime cause. Process current was drawn and evidence of deposition was found after shutdown. The cell was again intact after shutdown and the melt leak was not traceable to the cell or its vent tube.

Inert Atmosphere Glove Box Facility

A system of glove boxes having a dry, inert atmosphere is now essentially complete and in operation. This facility was designed to permit open handling of hygroscopic materials and with an atmosphere inert enough to permit safe use of flammable gases in enclosed equipment.

Planning for this facility was begun the last quarter of 1957 and procurement and installation of major equipment items took place during the first half of 1958. Testing and modification of the system and procurement and installation of analytical, safety, and control instruments took place during the last half of 1958.

The system was operated with dry air atmosphere during the latter half of 1958. It has operated dry and with improving inertness since the start of 1959. During this period, much effort has been expended to reduce leakage into this system to attain a reasonable degree of inertness at an economical inert gas consumption.

This inert atmosphere system consists of five glove boxes operated in two independent banks. The first bank consists of Hood 31 (continuous Task III) and Hood 30 (dry compound preparation) (total volume: 100 ft³). The second bank consists of Hood 32 (weighing), Hood 33 (casting), and Hood 34 (breakout) (total volume: 160 ft³).

The atmosphere in these glove boxes is recirculated continuously. It is drawn through three high efficiency filters in series to a Gast graphite vane rotary air pump. It is forced by this pump through a Pittsburgh Lectrodryer containing Linde Molecular Sieve desiccant and returned to the glove boxes.

A vacuum of about 0.35" HgO is maintained in these glove boxes by means of Fisher Governor self-acting pressure control valves. Vacuum is increased as needed by drawing atmosphere off to the E-4 vent system (at 5" HgO vacuum). Vacuum is decreased as needed by introducing argon from a supply main (at 25 psig). A continuous purge from the system removes atmosphere to maintain a low oxygen level suitable to the work in progress.

The humidity of the dry recirculating atmosphere (or the atmosphere in any
one glove box) is measured and recorded continuously by a Beckman electrolytic hygrometer. The oxygen content of the recirculating stream (or the return from either glove box bank) is measured, recorded, and controlled by a Beckman magnetic susceptibility oxygen analyzer.

A Mine Safety Appliances combustible gas monitor provides warning of accumulation of potentially-combustible gases in the atmosphere.

The first bank of this system has a leakage rate of about 0.1 CFH (0.6 CFH/1000 CF). Outlet humidity is about 110 ppm (-45 F dew point) at a recirculation rate through the bank of 3 CFM.

The second bank has a leakage rate of about 0.3 CFH (3 CFH/1000 CF). Outlet humidity is about 70 ppm (-50 F dew point) at a recirculation rate of 4.5 CFM.

The entire inert atmosphere system is operating at an oxygen content of 1.0 - 1.5 percent at an argon consumption rate of about 4 CFH. Moisture entering the system by diffusion through gloves, etc., is about four times greater than moisture entering in leakage air.
PERSONNEL


Trips

V. R. Cooper attended a classification meeting on Separations Technology in Washington, D.C. on July 14 and 15, 1959.


K. M. Harmon attended the Atomic Energy Commission Contractors' Meeting regarding NPF measurements on July 14, 1959 at the Atomic Energy Commission, Germantown, Maryland.


Trips (Continued)

M. J. Stedwell visited F. R. Bruce of the Oak Ridge National Laboratory, Oak Ridge, Tennessee on July 29, 1959 to discuss recovery and exposure problems.

M. J. Stedwell visited F. W. Tober of E. I. du Pont de Nemours, Savannah River Plant, Aiken, South Carolina on July 30 and 31, 1959 to discuss recovery and exposure problems.

Visitors


T. A. Butler of the Oak Ridge National Laboratory, Oak Ridge, Tennessee visited R. G. Geier and W. H. Swift on July 15, 1959 to discuss fission product recovery.


William Crane of the Martin Company, Baltimore, Maryland visited E. R. Irish on July 1, 1959 to discuss fission product specifications.

H. R. Ralston of the Lawrence Radiation Laboratory, Livermore, California visited R. L. Stevenson on July 21, 1959 to discuss administrative procedures and details of nuclear safety control. Mr. Ralston also visited R. E. Smith and M. N. Raile on July 22, 1959 to discuss critical mass control procedures.
Visitors (Continued)


Inventions

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane A. Bray</td>
<td>A Thermobalance For Thergravimetric Analyses.</td>
</tr>
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</table>

Acting Manager
Research and Engineering
I. RESPONSIBILITY

There were no changes in responsibility during the month.

II. ACHIEVEMENT

Wage and Benefits

Five clerical-functional and six semi-technical nonexempt jobs in Chemical Processing Department were evaluated in conjunction with a Relations Operation Wage Specialist. Purpose of the comprehensive review was to validate a revised point evaluation plan and to establish a high degree of uniformity in interpretation of the plan by each major HAPO component.

Four secretarial jobs were reviewed and appropriate action taken. One clerical job was reviewed and reclassified.

Four employees were retired and one retirement application completed.

Two employee deaths occurred. Settlement of one claim has been delayed due to a question regarding the beneficiary.

<table>
<thead>
<tr>
<th>Suggestion Plan</th>
<th>JUNE</th>
<th>JULY</th>
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<tr>
<td>Suggestions Received</td>
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<td>Suggestions completed and closed</td>
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<td>Adopted suggestions approved by Board</td>
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<tr>
<td>Adopted suggestions pending approval by Board</td>
<td>7</td>
<td>10</td>
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Total Net Tangible Savings $2,337.60 $1,206.79
Cash Awards paid during month $455.00 $150.00

As of the end of July, 1959, $1,951.00 has been paid in awards with a total of $8,415.79 in net tangible savings. The average award of the 148 adopted suggestions is $13.18 (below criteria of $25.35) and the ratio of awards to savings is 23.18 per cent (above criteria of 16.0 per cent).

Total number of suggestions outstanding to Operations at end of the month 115 115
### AVERAGE AGE OF OPEN SUGGESTIONS

![Graph showing the average age of open suggestions over months.](image)

### Personnel Placement

#### A. Employment

<table>
<thead>
<tr>
<th></th>
<th>EXEMPT</th>
<th>NONEXEMPT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additions</td>
<td>6</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td>New Hires</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Reactivates</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Re-Hire</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Re-Engages</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Transfers from other components</td>
<td>3</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td><strong>Removals</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retirement</td>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Leave of Absence</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Illness (Deceased)</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Transfer to other components</td>
<td>6</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>Resigned</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

#### Requisitions (Nonexempt)

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number on hand at beginning of month</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number received during month</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number filled</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number on hand at close of month</td>
<td>10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Request for Transfer (Exempt)

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number on hand at beginning of month</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number received during month</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number transferred</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number Closed out</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number on hand at close of month</td>
<td>5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Applications for Employment (Exampt)

Applications received during month 2
Hired 0
Closed out 1
Applications on hand at close of month 2
Open requisitions 2

Two manufacturing training program graduates were placed on the Chemical Processing Department roll during the month. Also, four experienced chemical engineers joined the Facilities Engineering Section. Needs still exist for chemists in the Laboratory and for exempt personnel radiation monitoring. It is hoped that one or two people may be employed in Radiation Monitoring from the Atomic Energy Commission Health Physics Fellowship Program. It is planned to extend offers to at least two of these people, now on the plant.

Four men are presently in process for employment in the Analytical Laboratories of the Department to replace losses suffered during the past few months.

Status - Personnel Development Program for Nonexampt Employees

Number of appraisals scheduled in July: 55
Number of appraisals delinquent July 31, 1959 42

Military Service Record

Records show that Chemical Processing Department has a total of 108 employees who are subject to military training through Selective Service or Armed Forces Reserve action.

<table>
<thead>
<tr>
<th>Ready Reserve</th>
<th>Exempt</th>
<th>Nonexampt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ready Reserve</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>Standby Reserve</td>
<td>17</td>
<td>5</td>
</tr>
<tr>
<td>Deferments Requested</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Deferment Granted</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Deferment Requests Pending</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Health, Safety and Radiation

<table>
<thead>
<tr>
<th>Chemical Processing Department</th>
<th>June</th>
<th>July</th>
<th>Year to Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disabling Injuries</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Serious Accidents</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Medical Treatment Injuries</td>
<td>36</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Technical Overexposure Incidents</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Radiation Occurrences</td>
<td>18</td>
<td>20</td>
<td>138</td>
</tr>
<tr>
<td>Fires</td>
<td>0</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Security Violations</td>
<td>0</td>
<td>2</td>
<td>13</td>
</tr>
</tbody>
</table>

*Not available
Programs

Development of procedures and training of personnel in Criticality Instrument Alarms continued in the three plants under direction of Radiation Monitoring Managers.

The first two of a series of four lectures for Power and General Maintenance personnel were conducted by Radiation Monitoring representatives.

One First Aid class was conducted by the Specialist, Safety and Fire Protection. This will be completed early in August.

Other Services

An audit was conducted in Purex, Redox, and Finished Products of eye protection safety rules and protective equipment for acid handling. An audit of welding practices and "helpers" eye protective equipment was performed in the 200 East and 200 West shops and the 200 East Power House shop. Recommendations were made for equipment procurement and uniformity of procedures.

Arrangements were completed for participants in the Atomic Energy Commission Fellowship Program to receive field training in the three Chemical Processing Department Radiation Monitoring Operations. The first group of four participants reported on July 28, 1959.

Agreement was reached with Industrial Medical to provide the service of fitting non-prescription safety glasses in 200 East and 200 West First Aid.

Communication

The first of the revised HAPO OPB's were footnoted and distributed, along with a letter of explanation, to all Department OPB recipients.

Interviews with Section and Sub-Section Managers in connection with the Communication Workshop for first line supervisors, were completed during the month, and a report is now being prepared.

A news story on non-production fuel reprocessing was prepared and distributed to the GE NEWS, and the local and regional press. The Tri-City Herald carried both the story and an editorial on the program.

Certain of the arrangements for the visit at Purex by the General Advisory Committee members were made by the Communication office.

In addition to the normal items of information, one Round Table supplement, five Management News Bulletins, four Headliners, and two priority messages covered such subjects as the new GE-ASC contract, the private car situation, non-production fuel reprocessing, and benefit plan information.
Salary Administration

The organizational directory (July 1, 1959) for the Chemical Processing Department was issued.

The Financial organization for Chemical Processing Department was approved during the month. External reconciliations verified all position levels except one. Further consideration of this position is required.

Analysis of the Relations Operation's proposed Salary Pattern Index Report was made. Further study is continuing regarding the First Line Supervisory problem, and the Technical Graduates salary position.

Our request for reconciliation of several engineering positions with similar positions in other Departments and other Company components was forwarded to Relations Operation. Results of request have not been received.

III. ORGANIZATION AND PERSONNEL

There were no Medical Treatment Injuries in Relations Practices during July, and there were no security violations.

R. B. Britton, Manager
Relations Practices
END

DATE FILMED

11/10/92