# Chemical Processing Department
## Monthly Report
### For May, 1959

Compiled by Operation Managers

June 21, 1959

HANFORD ATOMIC PRODUCTS OPERATION
RICHLAND, WASHINGTON


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**MASTER**

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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT
MAY, 1959

GENERAL SUMMARY

PRODUCTION

The production of plutonium from the separations plants during May was 116 per cent of the monthly commitment; however, year-to-date production is slightly below the commitment.

Both the production and shipments of UO$_3$ conformed to the operating and shipping schedules.

The output of buttons was 97 per cent of schedule and shape production was 121 per cent of the Official Forecast. The higher than forecasted shape production resulted from an AEC request for additional weapons parts for this fiscal year. Button and shape shipments on a year-to-date basis are 100 per cent and 110 per cent, respectively, of the Official Forecast.

Recuplex (Product Recovery) operated at record rates, establishing the highest monthly throughput in the history of the operation.

ENGINEERING

Processing at Purex was carried out with the HS column by-passed throughout the period. The uranium decontamination was borderline and 185 tons were processed through silica gel.

Palm processing resulted in excellent product quality but the yield was below expectations. The 2A and 2B columns were used in the primary separation and decontamination of the Palm.

A sample of fission products was prepared for shipment to Curtiss-Wright for irradiation studies. This gallon sample contained 1000 curies of zirconium, 879 curies of niobium and 560 curies of cerium centrifuged from Purex IWW. A test precipitation from the IWW supernatant yielded 350,000 curies of cerium-144 (20 per cent of the cerium originally contained).

Piping modifications to the Purex Plutonium Ion Exchange unit were made to better control resin pushes and make unit operation more stable.

The prototype dual pass silver reactor at Purex was successfully unplugged and the unit was returned to service.

During half of May, when Redox operated on normal uranium feed, the improved acid absorber and the prototype silver reactor were both tested satisfactorily.
They were subjected to nearer capacity conditions than has been possible under recent E-metal schedules.

One special batch of Redox feed material was prepared with dichromate oxidation. The uranium and plutonium streams increased five-fold and ten-fold, respectively, (ruthenium) as anticipated. Continuous in-line gamma monitors responded perfectly.

Detailed design of the prototype demister installation for the Purex E-F6 Waste Concentrator is essentially complete.

Preliminary designs of several product containers and shipping casks for Fission Product recovery were made, and the heat transfer problems attendant to each alternate were studied.

The definitive scope design covering multipurpose dissolver equipment at Redox was completed.

The scope for a prototype installation for the sub-assembly of Pit 65 weapon components has been agreed upon and detailed design of this facility was initiated during the month.

The final version of the criteria for acceptance of power fuel casks at Hanford was approved and forwarded to the ABC for use as a part of the power fuels reprocessing contracts.

**GENERAL**

There were two serious accidents investigated during the month. One was a case where a Chemical Processing Operator experienced some discomfort due to lack of oxygen caused by leakage in an inert gas line. The other case concerned an employee who received some localized contamination on his coveralls. Investigation revealed the skin dose to be below the permissible limit.
STAFF

Vice President and General Manager, Atomic Products Division . . L. R. Fink

General Manager, Hanford Atomic Products Operation . . . W. E. Johnson

General Manager, Chemical Processing Department . . . W. K. MacCready

Manager, Production Operation . . . . . . . . . . . . . . . . J. H. Warren

Manager, Purex Operation . . . . . . . . . . . . . . . . . . P. R. McMurray

Manager, Redox Operation . . . . . . . . . . . . . . . . . . C. T. Groswith

Manager, Finished Products Operation . . . . . . . . . . W. N. Mobley

Manager, Power & General Maintenance Operation . . . T. G. LaFollette

Manager, Financial Operation . . . . . . . . . . . . . . . K. G. Grimm

Manager, Facilities Engineering Operation . . . . . . H. P. Shaw

Manager, Research and Engineering Operation . . . . . V. R. Cooper

Manager, Relations Practices . . . . . . . . . . . . . . . R. B. Britton
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<th>5-31-59</th>
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<td>PUREX</td>
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<td>REDOX</td>
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<td>218</td>
<td>221</td>
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<td>FINISHED PRODUCTS</td>
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<td>7</td>
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<td>TOTAL</td>
<td>369</td>
<td>361</td>
<td>1020</td>
<td>1002</td>
<td>1389</td>
<td>1363</td>
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CHEMICAL PROCESSING DEPARTMENT

PATENT SUMMARY
FOR
MONTH OF MAY, 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>
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<tr>
<td>D. B. Hagen, Facilities Engineering Operation</td>
<td>&quot;Quick Acting Safety Cap&quot;</td>
</tr>
<tr>
<td>W. H. Swift, Research &amp; Engineering Operation</td>
<td>&quot;The Use of Helium as a Replacement Atmosphere in the Handling of Heat Generating Powders&quot;</td>
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</table>

W. J. Masury
General Manager
Chemical Processing Department
I. RESPONSIBILITY

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

II. ACHIEVEMENT

A. Production Statistics

1. Purex Operation

<table>
<thead>
<tr>
<th></th>
<th>May</th>
<th>April</th>
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<tr>
<td>Tons uranium processed</td>
<td>353.56</td>
<td>270.04</td>
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<tr>
<td>Average production rate</td>
<td>19.4</td>
<td>11.0</td>
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<td>during operation (T/D)</td>
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<td></td>
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<tr>
<td>Total waste loss (%)</td>
<td>0.02</td>
<td>0.14</td>
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<tr>
<td>Uranium</td>
<td></td>
<td></td>
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<tr>
<td>Plutonium</td>
<td>0.19</td>
<td>0.53</td>
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<tr>
<td>Average cooling time (days)</td>
<td>104</td>
<td>107</td>
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<tr>
<td>Minimum cooling time (days)</td>
<td>90</td>
<td>93</td>
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<tr>
<td>On-line efficiency (%)</td>
<td>87.7</td>
<td>82.5</td>
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2. Redox Operation

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<tr>
<td>Tons uranium processed</td>
<td>26.7E</td>
<td>94.9</td>
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<td></td>
<td>68.2</td>
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<tr>
<td>Average production rate</td>
<td>7.4</td>
<td>5.3</td>
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<tr>
<td>during operation (T/D)</td>
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<tr>
<td>Total waste loss (%)</td>
<td>0.18</td>
<td>0.16</td>
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<tr>
<td>Uranium</td>
<td>0.51</td>
<td>0.42</td>
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<tr>
<td>Plutonium</td>
<td></td>
<td></td>
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<tr>
<td>Average cooling time (Days)</td>
<td>206E</td>
<td>219E</td>
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<tr>
<td>Minimum cooling time (days)</td>
<td>102</td>
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<tr>
<td>On-line efficiency (%)</td>
<td>64.7</td>
<td>66.0</td>
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3. 234-5 Operation

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<tbody>
<tr>
<td>Batches input to Task I</td>
<td>270</td>
<td>137</td>
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<td>Runs completed through Task III</td>
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<td>119</td>
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<tr>
<td>Batches through Product Recovery</td>
<td>86</td>
<td>61</td>
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<tr>
<td>Reduction yield (%)</td>
<td>98.8</td>
<td>98.7</td>
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<tr>
<td>Waste disposal (units)</td>
<td>288.93</td>
<td>320.87</td>
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4. UO₃ Operation

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<th>April</th>
<th>To Date</th>
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<tr>
<td>UO₃ loaded (tons)</td>
<td>(38.5 72.9 E)</td>
<td>(254.36 E)</td>
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<tr>
<td>UO₃ approved for shipment (tons)</td>
<td>(469.2 457.3 E)</td>
<td>(33 082.7 E)</td>
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<tr>
<td>UO₃ shipped (tons)</td>
<td>(49.2 47.1 E)</td>
<td>(191.71 E)</td>
</tr>
<tr>
<td>UNH backlog (tons)</td>
<td>(351.99 454.37 E)</td>
<td>(32 806.94 E)</td>
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5. Power

<table>
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<tr>
<th>Raw water pumped (gpm)</th>
<th>200 East</th>
<th>200 West</th>
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<tr>
<td>Filtered water pumped (gpm)</td>
<td>952</td>
<td>746</td>
</tr>
<tr>
<td>Maximum steam generated (lbs/hr)</td>
<td>232 000</td>
<td>130 000</td>
</tr>
<tr>
<td>Average steam generated (lbs/hr)</td>
<td>159 842</td>
<td>79 114</td>
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<tr>
<td>Total steam generated (M lbs)</td>
<td>118 922</td>
<td>58 861</td>
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<td>Coal consumed, est. (tons)</td>
<td>7 636</td>
<td>3 905</td>
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6. Waste Storage

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<th>Equivalent Tons U</th>
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<td>May</td>
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<tr>
<td>Salt waste reserve storage capacity-Redox</td>
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<tr>
<td>Salt waste reserve storage capacity-Purex</td>
</tr>
<tr>
<td>Coating waste reserve storage capacity-Redox</td>
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<td>Coating waste reserve storage capacity-Purex</td>
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E. Reports and Documents

1. Prepared and Issued

- HW-60265 RD Redox Plant Production Schedule, May, 1959
D. McDonald

- HW-60266 RD Purex Plant Production Schedule, May, 1959
D. McDonald

- HW-60267 RD UO₃ Plant Production Schedule, May, 1959
D. McDonald

- HW-60268 RD 234-5 Plant Production Schedule, May, 1959
D. McDonald

- HW-60378 Essential Materials Consumption - Purex, Chemical Processing Department, April, 1959, J. E. Lentz

- HW-60394 RD Purex Plant Production Schedule, May, 1959 (Revised)
D. McDonald
HW-60395 RD  UO₃ Plant Production Schedule, May, 1959 (revised)  
D. McDonald

HW-60419  Chemical Processing Department Waste Status Summary,  
for April, 1959, J. E. Lentz

HW-60420  Scheduled Shutdown - Purex Plant, J. H. Warren

HW-60383  Essential Material Area Report to Cost and Purchasing,  
Production Operation, Chemical Processing Department  
for April, 1959, J. E. Lentz

2. Prepared for Signature and Issuance

HW-60243  Production - April, 1959, W. E. Johnson

III. ORGANIZATION AND PERSONNEL

A. Safety

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

B. Security

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

J. H. Warren  
Manager  
Production Operation
CHEMICAL PROCESSING DEPARTMENT
PUREX OPERATION

May, 1959

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

      | Product       | Percent |
      |--------------|--------|
      | Uranium      | 89     |
      | Plutonium    | 103    |

   b) Production Rates

   Processing at a normal 2.4 CF continued from the April run period until 5-19-59. At this time processing of hot feed was stopped and preparations made for a special Palm run. Processing throughout the month was carried out with the HS column by-passed. As a result, the uranium decontamination was borderline and approximately 185 tons were processed through silica gel. Erratic performance of the plutonium ion exchange system early in the month was responsible for the product being slightly above specification. Some of this material was shipped to Recuplex while the remainder was either blended or recycled.

   Palm processing was started on 5-21-59 and was completed on 5-27-59. Product quality was excellent but the yield was below expectation. Flooding of the 2A column on the first day of operation caused the loss of some Palm to the 3WF system. The Palm recovery flowsheet was a refinement of that used in April with only the 2A and 2B columns being used for the primary recovery and decontamination.

   The normal processing startup was delayed until 5-29-59 due to a failed DOV in the F-10 to H-4 (3WF) system and a faulty J-2 replacement pump. Rates were maintained at a 2.4 CF for the remainder of the month with both products slightly out of specification due to normal startup conditions.
2. Special Processing

During the first part of the month approximately 26 tons of high gamma uranium were reprocessed through the final uranium cycle by increasing X Cell rates to a 2.7 CF. A batch of IDW waste, containing 230 units of plutonium, was reworked by adding approximately 300 gallons to each HAF feed batch.

Prior to the Palm run, ten tons of cold uranium were processed to purge the system of plutonium. The 2A and 2B columns were given a hot nitric flush in an effort to improve the capacity of these columns during the Palm run.

The C dissolver was taken out of service to permit unplugging of the reactor with water and thiosulfate flushes. The flushing was successful in reducing the D/P of the reactor to a very satisfactory level of 2-3 inches of water.

The third step in the test recovery of fission products from waste was completed. The operation involved separation and sampling of the cerium and rare earth cuts. The recovery was approximately 40 percent.

B. Radiation Experience

The total radio-iodine emission for the month was 21.7 curies. The maximum during a seven day period was 6.9 curies.

Seven Radiation Occurrences were incurred during the month. One was skin contamination exceeding 10,000 d/m plutonium; one was skin contamination exceeding 10,000 c/m fission products; one was uncontrolled vehicle contamination; two were loss of contamination control within a radiation zone and two resulted from failure to comply with procedures.

The HS column, after extensive in-cell decontamination, was removed from the cell for major repair. The dose rates encountered for the repair work completed to date has varied from 200 mrads/hr to a maximum of 3 rads/hr at six to ten inches.

Two failed tube bundles from F-6 and F-11 concentrators were buried. Excellent contamination control was exhibited.

A one-gallon IDW sample was placed in a three-ton cask for shipment to Curtiss-Wright. The maximum radiation measurement obtained was 15 rads/hr four inches above the open inlet port.

C. Mechanical Experience

During the month extensive repairs were completed on the UI-2 and U2-2 turbine pumps after leakage developed in the upper throttle bearings. Repairs consisted of replacing the shaft, seals, and bearings.
The installation of pH prototype equipment for E3 tank was completed at month's end. The equipment was designed by Instrument Development as a prototype installation in order to determine pH values in E3 service.

Both the inboard and outboard ball bearings were replaced on the H2 alternator which supplies variable frequency alternating current to the H2 pulser. Repairs were made after a routine maintenance inspection detected excessive noise in the unit.

Defective bearings were detected and replaced on the inboard bearing of the SF-1A fan and the outboard bearing of the SF-2A fan which supply air to the canyon and sample gallery, respectively.

The installation of a Stevens liquid level recorder and associated piping on the 216-421 crib was completed during the month. The install- 
alation was designed and sponsored by FEO to record liquid level data relating to crib life and capacity.

The J-2 pump was replaced with a new unit during the shutdown. Excessive leakage had been observed between the adapter flange and the tank flange. The pump had been in service since plant startup.

Replacement of the failed H-4 (West) tube bundle on 5-27-59 was the ninth since plant startup. The failed unit had been in service only nine months.

A diaphragm-operated valve on the 3WF system failed during the plant startup on 5-29-59, necessitating fabrication and installation of a new jumper. Smoke checks indicated a leak in the main control diaphragm.

Leaks developed in a two-inch stainless steel condensate line from the F-5 fractionator at a point where the line passes through the wall of the trap pit. Failure appeared to be the result of stress corrosion. Samples of the line were sent to HLO for study and analysis.

D. Analytical Performance

Analytical Control provided additional investigative effort to help correct difficulties in the final uranium cycles just prior to shutdown for the Palm recovery run. The Palm run required the lightest sampling schedule for such a run to date.

Additional analyses requested for rare earths required considerable investigation and method development because of the lack of proven methods for the rare earths. Because of previous efforts, methods for zirconium, niobium, cerium and ruthenium were available.

E. Improved Performance

1. Process Tests and Revisions

The ferrous sulfamate addition to the 2DF tank was gradually
reduced from 0.55 flows to 0.0 flows on a controlled basis. It was found that 0.16 flows was optimum in maintaining good partitioning of plutonium and uranium.

The 2HX stream was made 0.045 M in sulfamic acid to "kill" the nitrite which was being recycled to the IHF stream via the 2HN stream. Since the addition was started there has been no tendency to lose partitioning.

F. Inventions and Discoveries

Nothing to report.

G. Events Influencing Costs

A failed canyon-type agitator with a replacement value of $8,782 was decontaminated and successfully repaired at a total cost of $2,340.

The reduction of ferrous sulfamate addition from 0.55 to 0.16 flows permitted a small reduction to process costs.

III. ORGANIZATION AND PERSONNEL

A. Safety

There were no disabling or near-serious accidents during the month. Five medical treatment injuries were reported.

B. Security

There were no security violations.

C. Personnel Activities

S. E. Wray was promoted from Chemist to Supervisor - Analytical Control, on 5-1-59.

A. J. Walligura visited Argonne National Laboratory, Savannah River Project and Oak Ridge National Laboratory during the week of 5-18-59.

G. J. Behling visited Vallecitos on 5-5-59.

Five Purex exempt personnel completed PBM-I.

Thirty-four employees completed the 10-hour First Aid Training course.

Roy D. Shoults, General Manager of ANP Department, and George White, General Manager of ANP Department visited Purex on 5-18-59.

A luncheon for Dr. Lyman R. Fink, Atomic Products Division General Manager, was held in the new Purex conference room on 5-20-59.

PB McMurray: EAF: gt
I. RESPONSIBILITY

There were no changes in the scope of responsibility of the Redox Operation this month.

II. ACHIEVEMENT

A. Processing Operation

Processing of normal uranium, which was started on April 27, 1959, was continued into May with the last charge to the dissolvers being made on May 4, 1959. By May 14 the normal uranium building inventory had been depleted and operations were again diverted to E-Metal processing. The normal uranium monthly production was met and E-Metal production amounted to approximately 27 units. In all, approximately 95 units were processed. The period of operation on normal uranium was very successful with the change being made very efficiently and without incident.

Both product streams were under satisfactory control during the month. The sodium content of the UNH stream was held to specification (100 ppm or less) although five batches required blending to meet shipping specifications. The batch operation of the 233-S Concentration Building, plus the higher processing rates during the normal uranium processing period, combined to produce improvements in the iron content of the plutonium production stream such that some batches met the most recent iron specification of 12,500 ppm or less. Fission product content of the product streams varied a little, but this was due to ruthenium slippage through as a result of process tests being conducted in the building. However, no problems developed from these fission product trends. Product waste losses were under satisfactory control for the month averaging 0.18 percent and 0.51 percent for uranium and plutonium respectively.

A series of acid flushes was put through the 233-S Concentration Building equipment during the month as a check on the recurrence of plutonium deposition encountered in October of 1958. However, no evidence of such accumulation was found.

Iodine 131 emission to the 291-S stack totalled 9.6 curies for the month. The maximum emission for a 24 hour period was approximately one curie and occurred during the processing of normal uranium which had aged from 95 to 105 days.

B. Maintenance Operation

Fabrication of a new standard dissolver pot, by the Power and General Maintenance Operation, was completed during the early part of the month.
and the new unit installed in the vacant C-2 dissolver position on May 6, 1959. Operation to date has been satisfactory.

The B-2 dissolver, which was taken out of service on April 30, 1959 because of a leaking coil, was replaced on May 28, 1959 with a repaired unit from the 221-U Equipment Decontamination and Repair Facility. The replacement unit (formerly the A-2 dissolver which had developed a coil leak) had undergone extensive repairs which included a modification of the coil supports to avoid wear of the coils on the supports. With the installation of this unit the full complement of three dissolvers will be available for the June production run.

A tube bundle flange leak of long standing in the G-3 concentrator pot was corrected by threading a Viton O-ring through the envelope of the regular teflon gasket. Several previous attempts to repair this leak by installing new gaskets and adding "C" clamps, to replace the broken hold-down studs, have never been completely satisfactory. The thicker cross section of the new gasket coupled with the high resilience of Viton has eliminated the need for any type of hold-down devices. This may be a big step forward in the installation of remote equipment. The Viton material was selected as a product which met all requirements for this service such as high heat resistance, resilience, and radiation and corrosion resistance. In connection with this installation the heat exchanger, which also had a tube leak, was replaced with a unit which had been previously removed from the B-12 waste concentrator when a coil type heat exchanger was installed in this unit on December 5, 1958.

The inconcrete piping leak problem in the Redox Plant has apparently been solved with the successful installation of a fluoroflex liner in the D-56 two inch steam line from D cell to the pipe gallery. The line has been in satisfactory operation since mid-May. Although only time will reveal the degree of success of this method of repair everything so far indicates that this is the answer to the inconcrete piping problem.

The inert gas drier for the inert gas system arrived on Plant site during the month. Installation has been completed and the unit placed in service on a trial basis. However, it will not be placed in permanent service until after the installation of the new high pressure receiving tank which also arrived this month. The latter has been sandblasted and painted with Amercoat to prevent interior corrosion which caused the failure of the original unit. The new vessel is scheduled for installation early in June.

Four jumper installations were made in the 202-S Canyon during the month. Two of these were new designs and two were replacements for leaking trap jumpers.

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>12,685 gallons</td>
</tr>
<tr>
<td>Redox Salt Waste Received (5K Farm)</td>
<td>108,260 gallons</td>
</tr>
</tbody>
</table>
Waste Handling (Continued)

Total Gallons Boil-Off Salt Waste 137,156 gallons
Waste Received at TX (From 221-U) 35,000 gallons

A total of 215,189 gallons of Redox Coating Waste was pumped from the 107-S Tank to the 107 and 108-U Tanks for permanent storage.

Reinforcement of the dike around the Redox process cooling water swamp was completed early in the month. First indications were that the percolation rate was not sufficient to take care of the flow rate, however, subsequent daily checking indicates that no immediate work will be necessary to retain the cooling water.

Slight increases in the 240-S diversion box catch tank during the early part of the month indicated a possible leak. Subsequent inspection revealed three small leaks. Two of the leaks were stopped by re-impacting the jumpers. However, the Redox water segregating jumper continued leaking after re-impacting and a replacement jumper is now being readied for installation.

2. Equipment Decontamination and Repair

a. Regulated Steam Pit

Twenty-one vehicles, ten pieces of heavy equipment and several miscellaneous items were decontaminated at the regulated steam pit during the month. A total of 142 man-hours was charged to this operation.

b. Railroad Equipment

Forty-eight man-hours were charged to decontamination and operational coverage for repairs to equipment at Riverland. Decontamination work included four locomotives and one well car.

c. 221-U Canyon

Decontamination and repair of the Redox A-2 dissolver pot was completed this month and the unit returned to the Redox Processing Operation for installation in the B-2 dissolver position in the 202-S Canyon Building. The unit was thoroughly inspected by Engineering personnel before being returned for service. Decontamination and repair of this unit was completed at a total cost of $17,000 and represents a savings of approximately $15,000 over the cost of a new unit. Greater savings are expected to be realized on any future work of this nature since considerable job knowledge was gained during the repair of this unit.

Decontamination and repair of one Purex K-1 pump was completed this month and the unit returned to the customer. A savings of approximately $2,130 over the cost of a new pump was realized. The maximum radiation exposure to personnel during this repair operation was 300 mR/hr. Prior to decontamination, readings of 100 to 150 mR at 150 feet were observed.
d. 221-T Canyon Building

Preliminary work in preparation for the relocation of the Redox Waste Handling and Decontamination Operation from the 221-U to the 221-T Canyon continued this month. The work included: (1) The transfer of underwater maintenance equipment to the 221-T swimming pool, (2) activation of the No. 2 exhaust fan at 291-T to insure adequate ventilation in the 221-T Canyon, (3) removal of automatic steam controls from 221-U for installation on bath tub tanks at 221-T, and (4) continued cleaning of bath tub tanks prior to remodeling.

D. Analytical Control Operation

Analytical work was confined primarily to routine operation in support of the Redox Processing Operation. The new 256 channel gamma scintillation counter and analyzer arrived on site this month and is currently being tested and calibrated by instrument and laboratory personnel.

Procedures for performing essential material analyses according to official methods as established by the CPD Essential Materials Manual, HW-54125, issued by the Research and Engineering Operation, were rewritten in the standard working format and incorporated in the Redox Standard Laboratory Manual.

E. Radiation Monitoring Operation

Seven radiation occurrences were recorded during the month. Most significant was the potential over-exposure of an instrument technician on May 6 while completing a hydrostatic test reading on the 114-SX tank at the 241-SX Tank Farm. Details of this occurrence are covered in the investigation report of Potential Overexposure Incident No. CPD-59-1.

Dose rates to a level of 4 rads/hr. were encountered by personnel while decontaminating the floor area of rooms T-7 and T-8 in the 222-S Building tunnel. Dose rates up to 1500 mrad/hr. were detected while steam cleaning on the failed 60-Ton hook on the Redox canyon crane. Subsequent steam cleaning reduced the dose rates by a factor of four, thus increasing the working time needed to make necessary welding repairs.

Replacement of the old wire fence around the 241-T and 241-U Tank Farms with the standard stake and chain barricade was started this month. This work is being done by the Power and General Maintenance Operation and is now approximately 50 percent complete.

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 during May, 1959.

G. Events Influencing Costs

Spare parts inventory reductions during May amounted to $937. Total reductions for CY 1959 to date amount to $48,745.

The Redox Plant was shutdown for the Memorial Day holiday and only standby personnel were scheduled to work.

H. Plant Development and Expansion

1. Preparatory Engineering

H-2 Centrifuge

Contacts were made this month with a representative of the Bird Machine Co. relative to the design of new centrifuges for the H-2 position. The Bird Machine Co. has agreed to submit drawings of their latest type centrifuge which is the extreme opposite of past procurement practices whereby the vendor is supplied with scope drawings. If the Bird Machine Co. is low bidder on the two centrifuges proposed for purchase, their drawings will be used for an as-built basis, rather than duplicate through HAPO drawings.

2. Design and Construction Liaison

CG-764 - Test Wells, 216-BC Crib Area

This project was completed and closed out during the current month.

CG-783 - Additional Fire Protection, 222-S Building

The Washington Rating Bureau found several exceptions to the contractor's installation and have held up issuing a certificate of approval until these exceptions have been eliminated. The correction of exceptions is strictly between the contractor and the Rating Bureau. As provided by a warranty, the contractor agrees to meet the specifications of the Rating Bureau for acceptance.

CAC-812 - Equipment Decontamination Building, 2706-W

The contractor has completed excavation and has poured concrete for footings and bottom slabs for end wall columns, sump pit, and the automotive pit.

MA-10 - Waste Tank Leak Detection, 113-SX

The exceptions have been cleaned up and the project engineer is in the process of disposing of the surplus materials, thus eliminating the loss incurred in sending these materials to excess.
I. Reports Issued

No secret reports were issued by Redox Operation personnel during the month of May, 1959.

III. ORGANIZATION AND PERSONNEL

A. Safety

There were no disabling injuries or serious incidents in the Redox Operation during May, 1959. Nine medical treatment injuries were reported during the month.

One serious accident occurred on May 11, 1959 when a chemical process operator suffered temporary discomfort when exposed to an atmosphere containing too much inert gas and consequently a shortage of oxygen. There were no further complications and immediate steps were taken to provide against future similar incidents. Details are covered in the investigation report of Serious Accident CPD No. 59-2.

B. Security

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

C. Personnel Activities

O. E. Anderson and R. G. Hewlett of the Washington AEC Office visited the 221-U Decontamination and Equipment Reclamation Facility on May 20, 1959 to obtain first hand information for Hanford History.

Twelve Engineering Officers from States Marine Corps visited the 221-U Decontamination and Equipment Reclamation Facility on May 20, 1959 to observe decontamination methods and radiation zone work. They are assigned to the atomic powered N.S. Savannah.

M. L. Short, Manager, Redox Waste Handling and Decontamination Operation visited the Automotive Steam Cleaning Co. in Seattle, Washington on May 1, 1959 to observe and determine if the high pressure water cleaning techniques being used by this company could be utilized in the new Automotive and Railroad Decontamination Facility.


Manager - Redox

CT Gwoswift: EWM: mh
I  RESPONSIBILITY

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

II  ACHIEVEMENTS

A.  Processing Operation

Production of unfabricated plutonium met 97% of schedule. Process difficulties at the primary plants resulted in a shortage of feed during the very early part of the month and this shortage ultimately affected the total monthly production. All shipping commitments were met without difficulty. Recuplex (recovery) operated at record rates and established the highest monthly production throughout in the history of the operation. Production of uranium oxide powder was 3% above schedule for normal material and on schedule for enriched material. An approximate total of 517,000 pounds of 100% nitric acid was sent to Purex from the recovery system of the Uranium Reduction plant.

Operating difficulties experienced during April at Purex continued during the very early part of May, resulting in a period of feed shortage. Approximately one-third of the nitrate received from Purex was slightly high in G/AT ratio, but was accepted on a waiver basis. A major portion of the material from Redox failed to meet normal specification on iron and G/AT ratio but was also accepted on a waiver basis. No difficulties were experienced as this feed was successfully blended with "in-specification" Purex and Recuplex materials. A large part of the total production of unfabricated plutonium made during this month was from material recovered from scrap by the Recuplex facility. Mechanical troubles were normal with no major breakdowns experienced.

The Recuplex (recovery) operation processed at above-normal rates during the month. The aluminum breakthrough problem which persisted during April was completely resolved during May. Nine containers of high gamma plutonium nitrate from Purex were processed without incident. A record of 113 kg of plutonium was recovered during the month on 42 slag and crucible runs, plus metal dissolver, supernate and Purex nitrate feed streams.

Cleanout of the vacuum header in the 234-5 Building has progressed satisfactorily and without incident. Approximately 6 kg of plutonium have been recovered to date.
A. Processing Operation (Cont'd)

uranium Reduction plant operation continued at a normal rate. Production
schedules for this month were met without difficulty. However, feed
supplies were left at essentially the zero point at month end. Redox
has resumed the production of E metal UNH after a short period of
production of normal UNH.

B. Fabrication Operation

Production of the 65 model assemblies exceeded the goal forecast by
21.25%. Deliveries exceeded basic requirements by 25%. This higher
than normal output represents compliance with a request of the AEC for
additional weapons parts for this fiscal year. The casting quality was
poor during the very early part of May and this had an adverse effect
on production. A sharp improvement after the first week resulted in
unusually good progress of the work for the balance of the month.

Equipment failures in the 200 BR Hood which required extended time
for repair made use of the new equipment installed under Project CG-745
mandatory in order to meet schedule requirements. Operation proved to
be satisfactory.

An improvement in the maintenance of sufficient machining stock resulted
from improved reliability of the casting equipment. A considerable
amount of material was processed through the new 3-station prototype
induction heat melting hood this month. However, this new equipment
has not functioned as well as anticipated and more development work
will be performed.

C. Maintenance Operation

Operation of the equipment used in plutonium metal preparation was good
during the month. The major difficulty involved the frequent necessity
to replace the vacuum drum filter cloth.

Operation of the equipment used for plutonium fabrication was
satisfactory during the month, with the only major failure involving
the motor of the plug turning lathe in 200 BR Hood.

The plutonium recovery equipment functioned well with the exception
of one failure of H-1 column pulser bellows, and a corrosion failure
of the Hood 41 dissolver pot.

The Uranium Reduction plant equipment operated very satisfactorily
during the month. Principal difficulties involved pump failures and
commutator brush wear on the ACA motors of the calciner drives.
D. Control Operation

Analytical work proceeded routinely during the month with the performance of 6516 determinations made on 1399 samples submitted.

Average total impurities (excluding carbon) was 987 ppm. Eight low density buttons were analyzed and showed a high concentration of aluminum.

acceptable parts averaged 99.768%.

There were 7 radiation occurrences, 14 cases of skin contamination, and 3 cases of clothing contamination. Stack emission at Z Plant averaged 8.9 microcuries per day, ranging between a high of 16.2 microcuries per day and a low of 3.5 microcuries per day. At the Uranium Reduction plant stack emission ranged between less than 1 to 192 microcuries per day with an average of 26.5. Filters were changed at both the U and UA buildings at month end.

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. The proposal to allow processing of material with reactor exposure levels of 1000 MWD/T in the RMC Button Line, is being circulated for approval. This proposal is a revision to Project CG-734.

b. Phase II of Project CA-826, Vacuum System Improvements, 234-5 Building has been sent to Washington, D. C., for final AEC approval.
G. Plant Development and Expansion (Cont'd)

1. Projects - Study, Scoping or Approval Phase (Cont'd)

c. Phase II of Project CGC-811, Additional Fabrication Equipment is being circulated for General Electric Company approval.

d. Project CGC-813, Pu Recovery from Contaminated Waste has been submitted to the AEC in Washington, D. C., for approval.

e. A project proposal for Initial Assembly Facilities, Z Plant, is in the study and preparation phase.

f. Project action is being scoped to provide a button line capable of processing fuels with exposures from 1000 to 10,000 MWD/T.

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
CG-725, Liquid Waste Handling, UO3
CGC-843, Disposal of UO3 Condensates

High Level Radiation Alarms are being installed at 234-5 and the UO3 plant. The funds are available from Appropriation Request, AR-59-CPD-32.

3. Projects - Completed

No capital expenditure projects were completed for Finished Products Operation during the period.

III ORGANIZATION & PERSONNEL

A. Organization Changes

C. W. Campbell, a Technical Graduate from the Rotational Program was taken into the Processing Operation on permanent assignment on 5-1-59. He has been assigned as Contact Engineer.
B. Safety Experience

No disabling injuries or serious accidents occurred during April. Three medical treatment injuries were experienced as compared to eleven in April. The frequency rate decreased from 2.41 to 0.66.

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).

E. Security Experience

There were no security violations experienced during the month.

F. Personnel Activities

Seven exempt employees completed the Professional Business Training Course (PBM-I).

G. Miscellaneous

L. M. Knights, Manager, Control, visited the Dow Chemical Company, Rocky Flats, Colorado, on May 4, 5, and 6, 1959, to discuss analytical, radiation monitoring and final inspection problems.

L. M. Knights, Manager, Control, and P. B. Fisk, Supervisor, Product Inspection, visited LASL, Los Alamos, New Mexico, on May 7 and 8, 1959, to attend a Symposium on Non-destructive Testing of Uranium and Plutonium Parts. Mr. Fisk presented a report, "Facilities and Procedures for Non-destructive Testing of Plutonium Parts at Hanford Works."

Dana E. Elliot of LASL visited HAPO on May 22, 1959, as a final step in the certification of N. S. Wing in cobalt 60 radiography.

[Signature]

Acting Manager - Finished Products

JJ Courtney:JPT:jjh
CHEMICAL PROCESSING DEPARTMENT
POWER AND GENERAL MAINTENANCE OPERATION

MAY, 1959

I. RESPONSIBILITY

There were no significant changes in the responsibilities of the Power and General Maintenance Operation during the month.

II. ACHIEVEMENT

A. Operating Continuity

Steam, water, and emergency electrical services were supplied in a manner sufficient to sustain continuity of operation of the prime production plants for the period covered by this report.

B. Inspection, Maintenance, and Replacement

The collapse of an earthen dike allowed slightly contaminated process cooling water from Redox to cover an area of approximately sixty acres. The affected area lies outside the 200 West Area perimeter fence in a southwesterly direction from the Redox Plant. Remedial measures taken included repairing the break, extending the dike an additional 300 feet, and increasing the height from 9 to 12 feet. The area over which contaminated water had extended was covered with a new layer of earth to prevent further contamination spread.

Evidence accumulated from third party (Travelers Insurance Company) boiler inspections conducted during the month, indicates that the introduction of a boiler sludge conditioner (A-Gel Feed) which was initiated in July '58 has prevented excess sludge accumulations, and that pitting and scaling is being held to a minimum. The two boilers inspected were observed to be in excellent condition.

Installation of stack gas (O\textsubscript{2}) analyzers and recorders on the boilers in 200 West Area Power House is in progress and was an estimated 70 per cent complete at month end. The units were deemed necessary to provide boiler operators with acceptable means of determining correct fuel-air ratios. Increased boiler efficiencies are anticipated upon completion of this work.

The failure of a motor-generator set in the 284-E Power House occurred May 27. Examination disclosed the failure was the result of a short circuit in the armature.

Repair of the failed ES column at the Purex Facility progressed satisfactorily notwithstanding limitations imposed by the exposure time for contact maintenance. The affected area of the vessel has been removed and a newly designed replacement section was complete and ready for installation at month end.

Fabrication of two tube bundles for the Purex concentrators is in
progress on a priority basis as a result of the failure of one of the in-service units on May 24. This failure reduced the number of immediately available spares to one. The first of the units currently in fabrication is scheduled for completion July 1.

The model 3 dual pass silver reactor for the Purex Facility is complete with exception of sheathing which is scheduled to be finished in early June.

Fabrication and installation of the waste handling system, (Project CG-725) at the UO₃ Plant continued on schedule. The project was approximately 90 per cent complete at month end.

Installation of a high level radiation alarm system in the Hanford Laboratories Operation's 231-Z Facility was completed. The system contains four detection instruments complete with indicating lights and sirens, with an extension siren on the duct level.

Completed for the Hanford Laboratories Operation was the fabrication of a carbon steel hood equipped with plexiglass panels for use in the development of procedures to be used in the control of hood fires.

Mock-up and tests are now complete on the ozonator tower, designed and built for Redox to provide additional ruthenium decontamination.

Fabrication of the electron beam vacuum furnace for Hanford Laboratories is now 45 per cent complete; however, customer demands for more critically needed work has resulted in moving the target completion date to August 1.

Installation of the sulphuric acid metering system at the UO₃ Facility was completed. Acceptance tests were satisfactory and the system is in service at this time.

An automatic temperature measurement and control system is being installed on the vacuum chucks of a Gorton lathe at the 234-5 Facility. The system includes complex instrumentation equipment, an oil circulating system and heat exchanger, and is designed to control the temperature of the chucks well within the tolerances required for the critical machining of plutonium.

A survey of the ventilation system in the 146-PR Building, Hanford Laboratories Operation's Aquatic Biology Operation, was conducted. Evidence accumulated revealed the supply fan to be 30 to 40 per cent below design volume. Corrective alterations designed to overcome the condition were recommended.

III. ORGANIZATION AND PERSONNEL

A. Safety and Security

There were no disabling injuries or security violations incurred during the month.
Medical treatment cases reported for the month totaled 17, which reflects a frequency rate of 3.75.

[Signature]
Frank L. [Name]
Acting Manager
Power and General Maintenance Operation
I. RESPONSIBILITY

The bookkeeping responsibility for two functions and the clerks performing the work were transferred to the centralized clerical operation of Contract and Accounting. The transferred functions are maintenance of (1) general ledger and (2) product unit cost ledger.

II. ACHIEVEMENT

A. Production Cost

A cost distribution procedural change was developed and installed during the month, stabilizing recycle charges from Finished Products Processing Operation to the Fabrication Operation.

Three meetings on Nonproduction Fuel elements were attended during the month. These meetings were held primarily for discussion of problem areas and for planning purposes.

For the purpose of assisting department and engineering management in evaluating engineering cost increases projected into FY 1960-61 budget, charts analyzing engineering costs for fiscal year 1957-61 were prepared and made available to management.

Research and Engineering costs were reduced $136,526 in May through the capitalizing of the Pit 65 Prototype ($36,526) and partial capitalization of the Ion Exchange Prototype ($30,000). The balance of the Ion Exchange Prototype will be capitalized in June for an estimated additional $100,000.

A detailed schedule of standard monthly rental billings to other HAPO departments has been submitted to Power and General Maintenance for review. This will assure our maintaining a current basis for such charges in FY 1960.

IBM tabulations, representing fiscal May feedback from Buildings and Grounds Maintenance Assignment Tickets, were delivered to Power and General Maintenance management on Wednesday, May 27. This performance constituted keypunching of the final week's tickets, IBM 702 processing of the month's data, financial review of the tabulations, and delivery to management one day following receipt of the last group of tickets from Power and General Maintenance.

Notification was received that a target budget submission would be required this month. Preliminary letters to this effect were sent to all section managers, and personal contact will be made with them within the next few days.
Special studies completed during May were:

1. Post Acceptance Cost Comparison Study on CG-691 (Improved Task I and II Facilities, 234-5). The study compared costs prior to, and subsequent to, the project.

2. Estimated hourly cost in connection with receipt of Power Fuels, and furnished Redox personnel this information for inclusion in a study.

3. A study showing the ratio of maintenance costs to plant investment in Purex and Redox plants was completed and furnished to Research and Engineering management in connection with a presentation made to the Division General Manager.

4. A fixed and variable cost per ton of Purex and Redox throughput (on a historical basis) was furnished Research and Engineering management for the same purpose.

5. Information concerning Redox and Purex essential material utilization was furnished to Production Operation.

B. Personnel Accounting

Much conversation and correspondence has developed concerning the rejection or acceptance of insurance claims originated by Dr. White of the Happy Acres Memorial Hospital. We have copies of correspondence with the Oregon State Insurance Commissioner which clearly indicates a rejection of any and all such claims.

If there remained any doubt as to the denial of these claims, this was removed during the recent seminar conducted by Stan Tatro and Russ Hubbard of the New York office and ably assisted by Art Dwyer and Bob Preston of Metropolitan Life Insurance Company New York office. During this seminar it was brought out that Metropolitan had finally decided to refuse all claims involving chiropractors practicing in the State of Oregon and that as a result of this decision they did not anticipate any litigation.

Another interesting fact brought out at the seminar was that insurance claims submitted by CPD personnel for weekly sickness and accident benefits were far below the Company average; yet hospitalization, both frequency and length of stay, exceeded the Company average. In the discussion that followed it seemed to be the consensus of opinion that the governing factor was the doctors readiness to hospitalize employees on the slightest excuse. Some of the managers present expressed the thought that maybe this was a good thing and resulted in early recovery. The low weekly sickness and accident payments are a result of all employees at HAPO being salaried and, therefore, receive salary continuance for the first 20 days of illness in any 12-month period.

Misunderstanding has existed in a few areas in regard to the authority which remained in the CPD Personnel Accounting function. This resulted
in numerous calls and a few visits to subsection managers during which we clearly defined our function and the authority which we retained and at which time we underscored the fact that any and all contacts involving Personnel Accounting problems are to be made through our office.

C. General Accounting

The April General Ledger Trial Balance for April and May reports of travel and living expenses were delivered to Contract and Accounting Operation on schedule.

An analysis was made and a report issued to section managers covering CPD travel expense incurred during the first nine months of FY 1958 and FY 1959.

Physical inventories of TBP, Bismuth Phosphate, and Waste Facilities spare equipment have been completed. The reports will be issued in June.

Plant and Equipment depreciation reserves have been reviewed for adequacy. As a result of this review, an adjusting entry was made increasing reserves approximately $400,000.

As of April 30, 1959, expenditures of $9,534,048 and commitments of $198,375 had been incurred against active CPD projects with $14,056,870 of authorized funds.

A Construction Completion and Cost Closing Statement was issued for Project CA-773, Interim Waste Crib - Purex, with final General Electric cost of $30,535.

Two new projects were authorized by the ABC during May: CTC-850, Purex 215-A-4 Crib Replacement, with authorized funds of $65,000 to cover total project, and CGC-643, Disposal Facilities for 203 Process Condensate, with authorized funds of $70,000 to cover total project. Design funds for Project CGC-613, Plutonium Recovery from Contaminated Materials - 234-5 Building, were increased $30,000 to $75,000. The total project authorization for Project CG-719, Additional Facilities for Purex Tank Farm Vapor Wastes, was reduced $312,000 to $1,068,000.

Three supplemental Appropriation Requests totaling $51,284 in new funds were approved in May. They were as follows:

<table>
<thead>
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<th>AR No.</th>
<th>Description</th>
<th>Operation</th>
<th>Additional Funds</th>
<th>New Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Gorton Lathe</td>
<td>R&amp;E</td>
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<td>$ 35,000</td>
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<td>17</td>
<td>Geeling &amp; Measuring</td>
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<td>34</td>
<td>Standards &amp; Accessories</td>
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<td></td>
<td>Diversion Catch Box Tank</td>
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<td><strong>Totals</strong></td>
<td></td>
<td><strong>$51,284</strong></td>
<td><strong>$145,427</strong></td>
</tr>
</tbody>
</table>

In addition, An Appropriation Request for a "Down-draft Cave" was approved in May for $26,000.
D. Auditing

A formal audit report was issued covering our findings and recommendations relating to an audit of Sundry Employee Benefit Plans and Payroll Reports. In our opinion, the activities audited were satisfactory.

A critical review was made of each purchase requisition originating in the Department during the month classed as "emergency". Authors were contacted and advised of the emphasis currently being placed on the economical utilization of premium procurement practices.

A proposed HAPO OPG, "Control of Property Furnished Fixed Price Construction Contractors", was reviewed with the Manager, Project Engineering and with the Manager, Property Management of the Contract and Accounting Operation.

A proposed HAPO OPG, "Property Passes", was reviewed and suggested changes were discussed in a meeting of HAPO Internal Auditors and Managers, Property Accounting. The procedure is being developed by the Manager, Property Management at the request of the Commission. The new OPG will incorporate recommendations offered in our past audit of Material and Package Passes.

Discussions were held with L. A. Shore, Traveling Auditor, relating to the audit of Consultant Agreement No. 176, A. E. Little, Inc. Mr. Shore is conducting the audit starting May 26 and reported that considerable difficulty was being experienced in obtaining source documents in support of travel expenses billed by the Consultant.

At the request of Finished Products we reviewed the reimbursability aspect of Company repair of 15 flat cars used in shipment of material between HAPO and other AEC installations. No problem of reimbursement was disclosed.

E. Procedures

Personnel of Purex Maintenance, CPD Office Procedures, Industrial Engineering, and Product Cost met to assure common goals and maximum integration between the existing maintenance assignment procedures in Power and General Maintenance and the new maintenance assignment procedure in Purex. It was pointed out that CPD Financial is prepared to offer keypunching on a weekly basis relative to maintenance assignment tickets and to arrange for running time on EDPM on a monthly basis. Machine-listed information could be furnished to Purex Maintenance management showing effort by system, craft, foreman, and individual.

At the request of the Specialist, Personnel Placement a study was started to develop a program for accumulating information data on exempt employees. This information is used by the Specialist in submitting candidates for jobs within all components at HAPO and other G.E. installations.

The Procedures Specialist and Analyst attended a special meeting with Facilities Engineering and Stores personnel regarding stainless steel
requirements of CPD. Attendance at the meeting was primarily in an advisory capacity on problems relating to material flow and control.

Participated in a meeting of HAPO procedural personnel on integrated Data Processing System relating to cost operations. Input data for the department had previously been submitted and the accumulation of output data was started this month. Close liaison with Cost and Procedures personnel will be maintained to assure that departmental needs are adequately provided for under the system.

III. ORGANIZATION AND PERSONNEL

A. Safety and Security

No medical treatment, disabling injuries, or security violations were experienced during the month.

B. Organization and Personnel

A. R. Adeline has accepted a promotional transfer to Specialist, Transportation and Maintenance Cost, CE&U.

G. H. Temple has accepted a promotional transfer to Specialist, Measurements, CE&U.

A series of internal changes resulted in the following alignment:

Personnel Accounting
W. T. McKeown, Specialist
H. W. Libby, Analyst

General Accounting
L. E. Christopher, Manager
F. W. Gates, Specialist, Appropriations
L. Moorman, Specialist, Property Accounting

Production Cost Accounting
B. M. Dobbs, Manager
J. E. McDonald, Specialist, Plant Costs
S. A. Spohr, Specialist, R & D Costs
J. V. Walton, Specialist, Service Costs
C. A. Kremer, Analyst, Budget Consolidations

Auditing
T. E. Sparks, Specialist, Auditing

Measurements and Procedures
F. A. Fieser, Specialist, Measurements and Procedures
W. J. Burnside, Analyst, Procedures
C. Reports Issued

HW-60355  April Unit Cost Information  BM Dobbs
HW-60399  Purex Cost and Production Analysis - April  FA Fieser
HW-60400  Finished Products Cost and Production Analysis - April  FA Fieser
HW-60401  Redox Cost and Production Analysis - April  FA Fieser
HW-60253  April Operating Report  MM McDonald
HW-60306  Essential Materials Inventory and Consumption Report - April  GE Dyrengr
CLVI-712  CPD Cost and Production Analysis - April  KG Grimm
CHEMICAL PROCESSING DEPARTMENT
FACILITIES ENGINEERING OPERATION

May, 1959

I. RESPONSIBILITY

There were no significant changes in responsibilities assigned to the Facilities Engineering Operation during the month.

II. ACHIEVEMENTS

PUREX OPERATION

A. Process Technology

Waste Concentrator Prototype Demister

Detail design of the prototype demister installation for the E-F6 concentrator is essentially complete. This demister, to be installed with Process Technology funds, is expected to sufficiently decontaminate the feed to the T-F5 acid rectifier to permit eventual shutdown of the E-F11 waste concentration system.

Concentrator Tube Bundle Redesign

The design of the steam condensate discharge piping within the Purex reboiler cannisters was altered for improved condensate withdrawal. The present design permits superheating of condensate before condensate is discharged from the cannisters. The revised design provides cooling of condensate by the process solution; as a result of this design modification, some improvement in Purex steam trap operation is expected. This revision is being incorporated into the design of spare cannisters now under construction in the CPD Shops.

Fission Product Recovery

Preliminary designs of several product containers and shipping casks were made, and the heat transfer problems attendant to each alternate were studies.

The most promising design consisted of a cylindrical product container approximately 4-inches in diameter by 48-inches long. The fission product precipitate would be collected on an internal filter, the container would then be purged with helium gas and sealed for shipment.
Because of the complex geometry involved, the heat transfer problem was computed on an analog computer. This calculation showed that the maximum internal temperature of the powder would be $200^\circ F$ above the container skin temperature when filled with powder having a heat generation rate of 58,000 BTU/hour/sq. ft. Each container would hold approximately $\frac{1}{4}$ cubic foot of fission products. For the rare earth sulfate mixture precipitated from Purex LW, the amount of activity per tube would be approximately as follows:

<table>
<thead>
<tr>
<th>Isotopes</th>
<th>Activity (curies)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ce (all isotopes)</td>
<td>775,000</td>
</tr>
<tr>
<td>Pm (all isotopes)</td>
<td>84,000</td>
</tr>
<tr>
<td>Si (all isotopes)</td>
<td>175,000</td>
</tr>
<tr>
<td>Cs (all isotopes)</td>
<td>210</td>
</tr>
</tbody>
</table>

The shipping cask would hold three containers and would be filled with Dowtherm to transfer heat from the containers to the cask. The cask would have internal fins and be air-cooled. The maximum fission product powder temperature during shipment would be approximately $600^\circ F$.

B. Plant Engineering

HS Column Repair

An analysis of the failure of the HS column was made and a design was issued outlining details of a patch to be made to the lower barrel assembly. This patch will remove the tank appurtenance subject to repeated failure and include the new design feature of an interface float chamber on a side arm cavity. The section to be replaced has been successfully removed and the replacement part is under fabrication.

Sample Piping Clamp

Design has been completed for a special flange clamp that will be used where sample piping jumpers have been bent or distorted in such manner that alignment of the screw fasteners prevent assembly.

Concentrator Tube Bundles

The failure pattern of the Purex concentrator tube bundles has indicated a need to increase the number of available spare to cover replacement needs. One spare is available at the present time, four are under fabrication in area shops, and two are on order from an off-site vendor. Material is on order to cover the fabrication of six additional tube bundles and negotiations are underway for this fabrication work.
C. Project Activities

GGC-850 Purex 216-A-4 Replacement Crib

Directive HM-489, dated May 20, 1959, has been received authorizing total project funds ($63,000) and construction of a new waste crib for the Purex Laboratories. A work order has been initiated requesting a field survey for basic topographic information.

BODOX OPERATION

A. Research and Development

Multipurpose Dissolver

The definitive scope design covering multipurpose dissolver equipment at Bodox was completed. One new dissolver vessel with modified downcast tower, approximately 28 new jumpers, and miscellaneous service-side modifications are proposed for installation in the Bodox Plant. This equipment as installed will be nuclear safe by geometry for the processing of E-Metal or natural uranium. With minor modifications necessary for the airflex process, it will also be adaptable to processing of NPR and certain other fuels up to an equivalent enrichment of one per cent U-235 with nuclear safety by geometry.

Pu Concentration, L-16 Tank

The neutron monitor instrumentation on the L-16 tank in the 233-S Building is performing satisfactorily. A number of calibration points have been obtained in terms of Pu concentration, and the instrument is being used as a process monitor.

B. Plant Engineering

Dissolver Time Cycle Efficiency

The data assembly phase of a dissolver time cycle efficiency study was completed. The objective is to determine how much more throughput is attainable by applying an understanding of the mathematics which affect the chemical reaction rate. Data such as slug types, pile exposure, chemical concentrations and reaction times are being related by explanatory hypotheses, the validity of which will be statistically tested by the 709 Computer.

FINISHED PRODUCTS OPERATION - Z PLANT

A. Research and Development

Chemical Processing and Reduction

Design studies on the RMA line replacement have continued and several design concepts have been worked out for the Task III portion of the line. The following operating functions have been studied and at least one conceptual layout completed on each: (1) overhead pressure vessel positioner;
(2) small sand loader; (3) crucible dispenser; (4) large sand loader; (5) vacuum cleanout; (6) fluoride dispenser; (7) chemical addition; (8) mixer; (9) gasket dispenser; (10) gasket remover; (11) slag and crucible grinder; (12) drum pickler; (13) sampler; and (14) pallet drive and positioning section.

With the exception of the gasket remover, all of the above equipment is removable through the top of the hood by crane. The equipment is then transferred to the maintenance hood by utilizing plastic bag procedures. The primary problems remaining are means of storing and weighing the charged pressure vessels, loading the pressure vessel into the furnace for the reduction operation, and a means of remotely removing samples, gaskets and slag and crucible for processing in other parts of the building. Until such time as a scheme for removing this contaminated material from the hood is worked out, a plastic bag procedure will be required. Work will continue towards eliminating the need for plastic bag operation.

A tentative design proposal for the Hood 9B vibrating tube low frequency induction coil has been received from the Equipment Development group. This proposal outlines the design of a coil which could be substituted for the existing resistance coil on the vibrating tubes in the existing Hood 9's. Only minor design changes would be required in the hood for installing this coil and these changes can be incorporated in Hood 9B during the redesign presently underway.

The development of a suitable bellows design for the seal between the vibrating tube and the powder valves has continued favorably and HL0 proposes to fabricate a bellows and test it under simulated conditions.

Weapons

The scope for a prototype installation for the sub-assembly of Pit 65 weapon components has been agreed upon and detail design of this facility was initiated during the month. Purchase specifications for the hood frame and a cold box were prepared and purchase orders have been placed.

Preliminary specifications have been prepared for air drying equipment suitable for maintaining a dew point of -120° F inside the glove box during the time that the sub-assembly operations are being performed. Detail designs on other jigs and fixtures are being prepared.

Radiation Level Recording

Installation has been completed of a single point gamma radiation recorder in hood 7 for use as a process control aid.

B. Plant Engineering

Radiation Survey - 234-5 Building

Work sampling observations to determine the amount of time spent by operating personnel in the various production areas in the 234-5 Building
were completed. This data was integrated with radiation exposure readings, both gamma and neutron, to forecast the total exposure to personnel both by location and by specific tasks. This information will be used in training operators to recognize the factors contributing to elevated exposure and to alter their work patterns to minimize the radiation received.

C. Project Activities

CG-734 - RMC Button Line

Final designs for the HC-42 continuous dissolver installation were completed. Near the end of the month work was undertaken to re-evaluate the shielding on this project in line with the extensive radiation studies carried out during April and May.

GENERAL ACTIVITIES

A. Research and Development

Waste Storage

A report (GEN-24380) on natural ground vibration studies was submitted this month by Dr. Frank Neumann. This study was performed in accordance with Consultant Agreement CA-204. A recommendation was made that these results be correlated with HAPO geological data for further identity and that the period of oscillation be determined on underground structures.

Critical Incident Alarm

Ten of the 35 critical incident alarm instruments have been completed and installed. The remainder are near completion, pending arrival of all components. One of the alarm instruments was tested at Los Alamos Scientific Lab by exposing it to radiation bursts from the Godiva II reactor at distances from five feet to 350 feet. Operation was satisfactory in all cases. A burst from the Godiva II is typically similar to that which has been estimated as possible from a criticality incident in GPD facilities.

Enclosure Development

Design emphasis in the enclosure development program is now concerned with barrier panels. Concepts for simplified attachment and changing of panels are being detailed. Preliminary drawings of three alternate methods for fabricating a panel fastening device have been made and are being submitted for shop estimating of prototype fabrication cost. The first few panel openings, as completed on the demonstration hood cell, will be used for testing the relative effectiveness of the three designs.

All drawings required for fabricating and installing the framework and crane of the demonstration hood cell have been completed. Iron work for installing the bridge-crane supports has been started.
B. Process Technology

Processing of Nickel-Coated Slugs

Two major alternates in connection with the processing of nickel-coated aluminum jacketed slugs in the CPD are under consideration:

1. Removal of nickel in new vessels or equipment installed in slug storage basins.
   - Chemical removal methods.
   - Mechanical removal methods.

2. Removal of nickel within the dissolvers.
   - Mercury catalyzed dissolving.
   - Use of specific chemical agents.

The first alternate being considered would involve the installation of new tanks or mechanical equipment within slug basins to remove nickel prior to standard dissolving procedures. The nickel would be discharged to coating waste. This alternate involves high capital costs, due to the lack of service facilities and process routings at the slug basins. Also, there is a potential for spread of contamination when buckets of slugs are later transferred to the dissolvers.

The second alternate, removal of nickel coatings within the dissolvers, appears attractive from the standpoint of low capital investment and was recommended on that basis for further consideration. Based on a literature survey on the corrosion of nickel by nitric acid, it appears that nickel coatings of 1/2 mil thickness can be removed rather easily by rinsing the slugs within present dissolvers with dilute nitric acid followed by water rinses.

Study of Equipment Burial Improvements

A test was conducted to evaluate the feasibility of using fire-foam to displace contaminated air from burial boxes. Capability for pumping the fire-foam mixture and penetration of the foam into void spaces in the box were demonstrated favorably. However, the foam began to dissipate rapidly within an hour after box filling was complete. Since a foam life of about four hours would be required to allow the completion of backfilling, efforts are being made to obtain a longer life fire-foam.

Pu Core Drills

Improved procedures were developed for silver brazing Carboloy 883 inserts to type 440A stainless steel drill shanks. Joints, which radiographed successfully, were made by (1) grit blasting the parts before tinning, (2) pre-tinning both the insert and shank with silver alloy, and (3) observing strict cleanliness requirements throughout the operation.
C. Project Activities

Project Cost Information as of May 17, 1959:

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Authorized Funds - 23 Active Projects</td>
<td>$13,869,000</td>
</tr>
<tr>
<td>Total Cost-to-Date</td>
<td>$9,641,000</td>
</tr>
<tr>
<td>Commitments and Open Work Releases</td>
<td>$455,000</td>
</tr>
<tr>
<td>Unencumbered Balance</td>
<td>$3,773,000</td>
</tr>
<tr>
<td>Costs Charged to Above Active Projects -</td>
<td>$237,246</td>
</tr>
<tr>
<td>4-19-59 to 5-17-59</td>
<td></td>
</tr>
</tbody>
</table>

Project CGC-830, NPF Reprocessing

1. Cask Acceptance Criteria

The final version of the criteria for acceptance of power fuel casks at Hanford was approved and forwarded to the AEC for use as a part of the power fuels reprocessing contracts.

2. Processing Parameters

A study of available process information on all dissolution processes under consideration was completed and a summary of questions and developmental needs was prepared for presentation to HLO. A preliminary engineering flow diagram was prepared introductory to final process design work on this program once definitive process information is available.

A summary of the parameters concerning the processing design of dissolver equipment for the NPF reprocessing program was prepared in support of the circulating dissolver concept.

III. ORGANIZATION AND PERSONNEL

A. Personnel


G. B. Smyth and V. P. Madsen, Engineers, terminated in May to accept employment elsewhere.

B. Safety

The topic "Knowing Is Not Enough" has been featured in the regular monthly safety meetings.

C. Safety and Fire Prevention Activities

Serious Accidents

A Redox process operator in 233-S was exposed to an oxygen-deficient atmosphere on May 8, 1959. A chain failure on a P&G shop hoist caused
a jumper to fall, resulting in contusions and bruises to the operator, May 13, 1959.

**Training**

First Aid training certificates were issued to 36 Purex and 4 FPO employees.

**D. Inventions**

An invention description of a "quick acting safety cap" for Hanford reactors was submitted by D. B. Hagen in May.

**E. Reports Issued**


**F. Trips**

- J. M. Gerhart visited the Pall Filtration Corporation in Glen Cove, New York on May 18 to discuss filter media and container design.
- J. M. Gerhart visited the Isotope Division, Oak Ridge National Laboratory on May 19 and 20 to discuss fission product shipment equipment and to inspect the F3P Plant.
- M. T. Slind visited Los Alamos Scientific Lab May 18 and 19 to test the critical incident alarm.
- J. B. Fecht visited the Savannah River Plant May 25 through 28 to consult
P. J. Norderhaus attended the work simplification instructors seminar in Schenectady May 5, 6, and 7. The trip also included a plant visit to the Atlantic Refining Company in Philadelphia May 8.

G. A. Conner presented a talk on tungsten-arc cutting to the Portland and Seattle sections of the American Welding Society May 12 and 14, 1959. In addition, visits were made to vendors' plants in these cities to ascertain their abilities to fabricate high-alloy and titanium vessels which might be needed for the NPP program.

J. F. Kane made a trip to Seattle, Washington on May 6 and 7, 1959 to observe demonstrations on closed circuit television that might have application in CPD.

A trip was made by D. R. Gustavson to Seattle, Washington, on May 1 to inspect decontamination equipment at the Automotive Steam Cleaners for possible provision on Project CAC-812.


G. Visitors

Mr. Sheldon Dunning of Sheldon Dunning, Inc., Seattle, representative for "Amercoat", visited the 234-5 Building, May 28 to inspect a particular protective coating application on shielding tanks being installed on Project CG-734.

[Signature]
Facilities Engineering Operation

HP SHAW:FC:al
PUREX PROCESS TECHNOLOGY

Head End

Irradiated uranium, cooled from 134 to 90 days, was dissolved to form solvent extraction feed. Since no adverse effects have resulted from processing unclarified feed for the past two months, this procedure has been adopted as a permanent part of the plant flowsheet.

The prototype dual pass silver reactor (C Cell), which had become plugged, was flushed with 2 M Na₂S₂O₃·5H₂O - 0.2 M NaOH solution. Two chemical flushes of the bottom bed only followed by several water flushes, successfully removed the plug and permitted reactivation of the unit after regeneration.

Fission Product Recovery

Two-thousand gallons of IW, equivalent to waste from 50 tons of uranium processing, were centrifuged to remove Zr-Nb-bearing solids, and the solids slurried into about 2300 gallons of water. One gallon of this slurry, which contained 1000 curies of zirconium, 870 curies of niobium, and 560 curies of cerium, was obtained for shipment to Curtiss-Wright for irradiation studies. Although centrifuging removed sixty percent of the cerium originally contained in the IW, sampling difficulties interfered with analysis of the water wash and made it impossible to determine whether or not the cerium associated with the solids was readily removable.

A cerium-sulfate precipitation test was performed on the centrifuged IW, which analyzed 0.3 M Fe and 1.56 M SO₄²⁻, by directly neutralizing it with fifty percent caustic to a pH of 0.7 to 1.1. The prototype in-tank pH electrode performed satisfactorily despite the high radiation field. After a digestion period at 90°C, the cooled solution was centrifuged and the precipitate washed in the centrifuge with 1 M Na₂SO₄ (adjusted to pH 1 with nitric acid). Less than ten percent of the cerium in the feed was lost during the wash. The product cake was slurried from the centrifuge, dissolved, and yielded 350,000 curies of cerium-144 for a 45 percent recovery (20 percent of the cerium originally in the IW). Because the product was slurried from the centrifuge rather than dissolved, the Zr-Nb decontamination was only one; however, the ruthenium decontamination factor was about 45.

Solvent Extraction

The solvent extraction system operated for 67 percent of the month processing normal irradiated uranium at a nominal capacity factor of 2.4. The major portion of the remaining time was utilized in a neptunium recovery run.
Typical performance data for normal processing without the HS Column are summarized below:

<table>
<thead>
<tr>
<th>Cycle</th>
<th>Log Decontamination Factor, dF</th>
<th>Instantaneous Loss, Percent</th>
<th>Recycle, Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Plutonium</td>
<td>Uranium</td>
<td>Plutonium</td>
</tr>
<tr>
<td>First</td>
<td>3.9</td>
<td>4.0</td>
<td>0.07</td>
</tr>
<tr>
<td>Final</td>
<td>3.3</td>
<td>2.5</td>
<td>-</td>
</tr>
<tr>
<td>Ion Exchange</td>
<td>0.7</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Overall</td>
<td>7.9</td>
<td>6.5</td>
<td>0.07</td>
</tr>
</tbody>
</table>

Initial May operation was characterized by normal start-up difficulties after the forced shutdown near the end of April. Although sixty-five percent of the first week's production required silica gel treatment to meet gamma specifications, continued operation improved process control, and produced specification uranium (gamma ratio \( \geq 2.0 \)) despite the loss of the HS Column. Concurrent with the initial high uranium gamma activity, substantial amounts of out-of-specification plutonium required recycling to the head end because of poor performance of the Plutonium Ion Exchange Unit (see Plutonium Concentration). Just prior to shutdown for neptunium recovery, low uranium saturation in the HA Column increased the gamma ratio of the uranium product to 3.6, but all batches met specifications after silica gel treatment. The plutonium product was relatively unaffected because an increased IBF flow (fifteen percent above flowsheet) kept the 2AF gamma activity near normal.

Continued use of 0.045 M sulfamic acid in the 2BX eliminated all but normal plutonium in the IBU; consequently, the hypothesis that the tendency for loss of partitioning in the IBX Column was caused by recycle of nitrite into the IBXF via the 2BW seems well founded.

The lower plutonium concentration in the uranium product, as a result of introducing all the 2D Column nitric acid via the 2IF, was the basis for reducing the 2IF ferrous sulfamate concentration to 29 percent of flowsheet. After no significant increase occurred in the plutonium concentration of the uranium, all ferrous sulfamate addition to the 2IF was eliminated on a test basis, but an immediate increase in the plutonium content of the uranium (up to 24 ppb) was detected; consequently, the ferrous sulfamate flow was re-established. Three uranium batches exceeded the plutonium specification (10 ppb) before the process responded to the ferrous sulfamate and reduced the plutonium in the uranium to normal (\( \leq 1 \) ppb).

Start-up after completion of the neptunium run was characterized by normally high intercycle and final product gamma activities during the initial stages, but a downward trend toward normal conditions was apparent at month's end.

Neptunium Recovery

Neptunium continued to accumulate in the backcycle waste system all during the normal uranium processing because the EAW and 2DU Palm losses remained near
Research and Engineering

the lower detectable limits. However, as the inventory continued to increase, higher HAF losses occurred until up to twenty percent of the neptunium in the HAF was being lost at about a 1400 gram backcycle waste (3WB) neptunium inventory (0.2 g./gal.).

The May neptunium recovery run utilized approximately the same flowsheet as that used during the last run; the 3WB was reduced (ferrous sulfamate and hydrazine in the 2AS only) to obtain a separation from plutonium in the 2A Column. However instead of using the IBX Column, the neptunium - uranium separation occurred in the 2B Column with the neptunium being recycled to the 2AF Tank. The uranium passed overhead in the 2B and was stripped from the solvent in the IC Column after having been pumped through a stagnant IBX Column.

Performance and operation of the flowsheet was very satisfactory despite complications caused by excessive uranium in the 3WB (0.8 lb./gal.) and poor calibration of the 2AF flowmeter, both of which contributed to early 2A and 2B Column flooding accompanied by high 2AW and 2EW neptunium losses. After normal operation had been established, typical 2AW and 2EW neptunium losses were 0.5 and 1.4 percent, respectively. The final reflux-recycle operation of the 2A - 2B reduced the fissio product concentration of the neptunium product to three-fold lower than that attained during the previous recovery run. Some additional uranium decontamination was also obtained by increasing the 2AS acidity from 1.0 to 1.25 M during this period of operation. Because of the quantitative neptunium losses during the periods of column flooding only about sixty percent (798 grams) of the neptunium in the system was recovered; the remainder was returned to the backcycle waste system for future recovery.

Plutonium Concentration

Initial operation of the Plutonium Ion Exchange Unit was poor because erratic resin pushes upset the operating equilibrium and lowered the decontamination by a factor of three to four. Overloading of the resin with plutonium also contributed to the operational problem by making the resin more difficult to push. Eventually, adjustments in equipment and operating techniques greatly reduced the severity of the erratic pushes and re-established the normally obtained five to ten fission product decontamination factor. During the shutdown period, piping modifications were completed which will assure a constant amount of water for each resin push, despite upsets in equilibrium of the unit, and thus increase the ease with which the operation may be controlled.

Solvent Treatment

The flash points of fresh solvent (30 percent TBP in Shell E-2342) and 100 and 200 which have been in constant use in the Purex Plant were determined as follows:

<table>
<thead>
<tr>
<th>Solvent</th>
<th>Tag Closed Cup</th>
<th>Open Cup</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh</td>
<td>70</td>
<td>84</td>
</tr>
<tr>
<td>100</td>
<td>80</td>
<td>95</td>
</tr>
<tr>
<td>200</td>
<td>75</td>
<td>94</td>
</tr>
</tbody>
</table>
Waste Treatment and Acid Recovery

Although operation of the waste treatment and acid recovery equipment was normal, the flowsheet INW flow was exceeded routinely because of INW rework and adjustments in the concentrator specific gravity. Waste sent to the underground storage tanks averaged 75, 401, and 130 gallons per ton of uranium for neutralized INW, solvent washes, and cell drainage, respectively. The standard coating waste value of 231 gallons per ton of uranium was used to determine coating waste volume.

The consumption of sodium hydroxide, used to neutralize the nitric acid fractionator tail water, has been reduced to almost zero by a change in the pH control set point from eight to seven. This lowering of the pH was made when the tail water was rerouted from A9 Crib to the Chemical Sewer. A reduction in the fractionator reflux ratio from 0.35 to 0.30 produced no additional overhead losses but resulted in a steam saving equivalent to one dollar per ton of uranium.

Self-concentration in Tanks 241-A-101, 102, and 103 continued at boil-off rates of 2.7, 19.5, and 0.9 gallons per minute, respectively. The bottom sludge temperature in Tank 101 has cooled to 128°C after having reached a maximum temperature of 158°C during April when slight overconcentration occurred.
DECLASSIFIED

REDOX TECHNOLOGY OPERATION

Dissolving

For approximately two weeks, the Redox plant processed normal uranium at rates up to 10 tons per day. This period provided the first real opportunity for an evaluation of the improvement in acid recovery resulting from the conversion of the 293-S caustic scrubber to an acid absorber. Due to the large size of the charges of metal to the dissolvers and the sustained high rates as contrasted with the small charges and low rates attainable with E-Metal, it was possible to make a comparison of the 293-S performance with its performance before the conversion. The average concentration of recovered acid was 50 weight percent HNO3 and the over-all recovery efficiency was 96 percent, compared with corresponding values of 47 and 74 percent in 1958 when normal metal was being routinely processed.

Also during this period a brief opportunity was presented to obtain some data on the prototype silver reactor. The "age" of the metal was 95 to 105 days, or considerably less than half the "age" of the E-Metal. Gas samples drawn from the point between the first and second "stages" of the prototype reactor indicated some iodine-131 break through, but samples from the point between the second and third "stages" showed that the iodine did not get through the second "stage". Despite this, appreciable iodine (an average of about one curie per day for 14 days) was evolved to the stack a large share of which escaped through the sand filter. (Analyses showed that no iodine-131 reached the stack via the in-series acid absorbers in the 293-S Bldg.) By the time the data became available, it was too late to attempt to suppress the iodine evolution to the sand filter by adding mercuric ion to the metal solution. This technique will be tested, however, at the next opportunity.

Feed Preparation

The use of permanganate ion for feed oxidation was continued on the standard two-step basis. However, near the end of the month the steps were changed from 0.02 M - 0.01 M to 0.01 M - 0.01 M HNO4 for the first and second additions, respectively, to achieve a chemical cost reduction of approximately $5 per ton. Preliminary results indicated no adverse effects on over-all fission product decontamination.

Varying amounts of concentrated, unneutralized salt waste have for several months, been returned and blended with metal solution to prepare solvent extraction feed stock of nearly constant aluminum nitrate content. In addition to providing recovery of uranium and plutonium which would otherwise be irretrievably lost, this technique permits taking credit for chemicals returned. For example, in May the virgin dichromate ion requirements were reduced by the amount returned in the salt waste for an estimated average saving of $10 per ton.
At mid-month, one special feed batch was prepared with dichromate rather than permanganate oxidation. The purpose was two-fold: 1) to observe by means of the in-line monitors the behavior of the expected increase in fission product carry-through, and 2) to provide a second-cycle plutonium product typical of that to be processed through the prototype plutonium ozonator in the near future. The results fulfilled expectations. (See below)

**Solvent Extraction**

The uranium and plutonium solvent extraction products from the dichromate-oxidized feed, increased by five-fold and ten-fold, respectively in their fission product content as anticipated.

The continuous in-line gamma monitors responded perfectly and substantiated the analytical results showing the increase to be almost entirely due to ruthenium. Tail-end ozonation of the uranium product was required to meet specifications, but despite the loss in decontamination the plutonium was within specifications.

A large sample of the second-cycle plutonium product was obtained during this run and has been submitted to the Process Chemistry Operation for an extended series of ozonation development tests - currently in progress - in support of the prototype ozonator which is tentatively scheduled to be installed in the plant at the end of this month. (The prototype has been mocked up in the Mechanical Shop and is at present undergoing functional tests.)

The uranium cycle flowsheet (given in last month's report) which successfully reduced the sodium content of the E-Metal uranium product to acceptable levels, was adjusted to give lower water scrub flow when the processing of normal metal was begun. This resulted in an increase of sodium in the product to undesirably high levels which, although not above permissible, were immediately decreased by again increasing the 2DA flow rate slightly. When E-Metal processing was resumed, the flow rate of this 2DA stream was again raised to and held at the value given in the April report. Subsequently the sodium values ranged from 70 to 14 parts per million parts of uranium with an average of 28, compared with the upper allowable limit of 100.

**Plutonium Concentration**

The plutonium product has been concentrated batchwise rather than continuously in an effort to reduce residence time and the corresponding corrosion of equipment. This has been markedly successful, with several recent batches of concentrated product falling either within the new specification (12,500 parts iron per million parts plutonium) or only slightly above.

The new titanium L-3 concentrator loop section was to have been installed during the month but it was found to have some faulty welds which are presently being corrected. The unit is expected to be ready for installation later this month.
A series of acid flushes was put through the 233-S Building equipment during the month as a check on the recurrence of plutonium deposition encountered in October of 1958. No evidence of such accumulation was found. As a preventive measure, the acid concentration of the plutonium solution (3EP) fed to the stripper-concentrator was raised approximately 50 percent to 0.5 M HNO₃, thus reducing the potential for the formation and deposition of plutonium (IV) polymer.

**Waste Storage**

Extraction wastes currently being produced from E-Metal are comparatively low in heat content due to the long cooling time (frequently greater than 270 days) of the average metal shipment from the reactors. It has been calculated that the waste from the normal metal processed for only two weeks as mentioned earlier, doubled the available heat in the 241-lll-SX tank which has been in use since the E-Metal program was begun in December, 1958. From this it is estimated that if the normal self-concentration factor of 2.5 is to be reached in this tank in time to meet the figure of 400 gallons per ton currently used for the calculation of tank farm depreciation in CT 1959, it will be necessary to process from 75 to 100 tons of E-Metal cooled for 120 days or less in the next three to four months. If this is done, a boil-off rate equal to the waste receipt rate should be attained by October in which case the tank can be filled to the 14 psig hydrostatic head limit with waste of maximum concentration.
URANIUM CONVERSION OPERATION

Process Performance

All UO₃ shipped met product specifications.

One thousand twenty six (1026) pounds of nitric acid per ton of uranium processed (97.3 percent of theoretical) were recovered at an average concentration of 48 percent. Fourteen carloads of acid, averaging 48 percent 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 96.8 percent.

Process Improvement

Equipment has been installed for inventory control of the concentrators in both the enriched and normal systems. Although preliminary performance appears to be satisfactory, extensive testing has not been possible due to the shortage of feed material.

Start-up and shut-down feed programming was tested very successfully in K-cell. Tests in the complete system were terminated, however, when an electrode seal failure resulted in destruction of a magnetic flowmeter. The notched splined trim of a control valve, which had been under test, failed by corrosion of the stellated surfaces. Flow control had been extremely good until the trim was disturbed during inspection.

The hammermill screw feeder was removed from service due to the difficulty in starting the unit under load.

METAL FINISHING OPERATION

Recuplex

Forty-two (42) runs, consisting of crucibles, fragments, powders, and dissolver clean-outs, were processed through the SC Hood.

The SE Hood processed 1680 liters per day at 83 percent operating efficiency, for an average instantaneous rate of 2030 liters per day.
Task I - II

Two hundred seventy (270) runs were processed with an average filtrate recycle of 4.92 percent.

Considerable difficulty was experienced in maintaining accurate feed and oxalic acid addition rates. Inaccurate addition rates resulted in periods of wet oxalate cake and subsequent overflowing of the drum filter pan. These overflows were the main cause of the above normal recycle.
PROCESS CHEMISTRY - 

Redox Process Assistance

Laboratory studies of the jacket removal process (dissolution of the aluminum casing in NaOH-NaNO₃) have shown that the dissolution may be safely carried out with less caustic than has been used in the past. Accordingly, it has been recommended that the sodium hydroxide/aluminum mole ratio be reduced from 1.6 to 1.25. An investigation of the optimum sodium nitrate/aluminum ratio is underway.

Further work on the removal of radio-ruthenium from Redox 2BP by ozonation with 0.7% ozone has shown that markedly better results were obtained with a combination of catalyst and auxiliary oxidizing agent [e.g. cobalt or silver ion plus cerium(IV)] than with any of the agents individually.

ANALYTICAL ASSISTANCE

Determination of the Plutonium to Uranium Ratio in Dissolver Solution

Analytical tests to verify plutonium to uranium ratio values obtained in the "Redox Accountability Test" (Schneider, R. A., and Bray, L. A., "Redox Accountability Test Program - Initial Results," HW-38278, Nov. 1958) were completed. The Ru/U ratio was measured on an E-7 composite sample, representing all of the dissolver solution processed during the test run, using independent analytical methods. Plutonium concentrations were determined by quantitative separation on an anion exchange column and subsequent titration with a controlled-potential coulometer. Uranium concentrations were determined by direct titration with the coulometer. The average ratio obtained by these methods agrees within 0.5% with the value obtained in the Test run in which uranium concentrations were measured by the TBP extraction, X-ray absorption method, and plutonium concentrations by radioassay.
Task I Investigations

Spectrographic analyses of plutonium oxide samples taken from the laboratory Task I prototype unit show that the present product is significantly less pure than the oxide produced in the unit 18 - 24 months ago. This indicates that the present flow sheet employing feed at 150 - 200 g/l Pu does not give the cleanup obtained under the original flow sheet feed concentration of 100 g/l Pu. However, further investigation is necessary before this can be stated as fact. The feed material used in these recent runs was unusually impure, although comparable material had been run under the original flow sheet and gave a much better oxide. It is planned to make a few runs under the old flow sheet to see if a more pure oxide can again be obtained.

Chlorinator Off-Gas Studies

Filtering of chlorination off-gases through ceramic filters has continued. The ceramic finger filters first tried were easily broken when being installed or while being vibrated atop the chlorinator. The flange-mounted ceramic finger has been replaced by a ceramic cylinder supported inside by a metal rod with appropriate gaskets and lock nuts. No further filter breakage has been experienced.

Housings for the filters have been made of glass pipe. Breakage of the glass pipe at the flanges has occurred on pipe reworked in the glass shop. This may be influenced by the loss of the factory applied "double-tough" feature which of necessity is lost when the pipe is reworked. A glass filter housing (a 3" x 3" x 1-1/2" tee), which has the factory "double-tough" feature, is now in use.

Plutonium Trichloride Reduction (Batch)

An experimental reduction liner has been reused nine times. For the test, a 30-gram reduction vessel was fitted with a magnesium oxide crucible and sand. The crucible was then impregnated completely with a melt consisting of sodium chloride and potassium chloride (M.P. = ~ 550 C). This reduction vessel and crucible were then used for 10 reductions. After each reduction, slag and button were dug out without harming the crucible. The crucible changed very little in appearance after the first reduction.

A 200-gram reduction vessel and crucible were treated in the same manner with molten calcium chloride. This has been used for two reductions and is in good condition.

A 700-gram reduction was made in an RS-4 crucible coated with nickel 75 mils thick. The slag and button were dug out mechanically without harming the crucible. The magnesium oxide liner was cracked and pitted from the reduction; but it held its shape due to the nickel coating which appeared

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Research and Engineering

234-5 DEVELOPMENT OPERATION - H. H. Hopkins, Jr.

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to be unharmed. The crucible was soaked in water for 12 hours. This
soaking did not cause any change in the physical appearance of the crucible.
After drying at 900 C for a few minutes, the crucible was used for another
reduction. This time the nickel coating split apart on the bottom. The
coat was probably weakened by either the first reduction or the drying
cycle. Good reductions were obtained in both cases.
Ceramic Development

The difficulties experienced in the casting operation and the variable quality of Pit 65 castings prompted several urgent investigations. First, a new pouring crucible of greater diameter was designed and investment cast of MgO-CaF₂. This crucible, known as the I-10, exhibits a smooth interior surface as contrasted with the loose particles of adherent MgO evident in the current pouring crucibles. These new crucibles were under test at the end of the period.

A second effort resulted in the construction of a die and preparation of pressed sintered high-silica pouring crucibles of the same dimensions of the above I-10. These crucibles should exhibit high strength, as well as the larger diameter; and are also under test.

Pattern for a new Pit 65 slip cast magnesia mold is being fabricated. These molds, instead of being spherical, are elongated vertically and enlarged in the shoulder region. Use of these molds is intended to permit removal of the inclusions from the Pit 65 castings.

Eighty-three (83) Pit 65 magnesia slip cast molds (obtained commercially) were fired at 1000 C in order to insure their dryness before use in the processing operation.
Personnel

Effective May 1, 1959 H. P. Maffei transferred from the Finished Products Technology Operation to the Materials Development Operation, Hanford Laboratories.

Trips

V. R. Cooper visited the E. I. du Pont de Nemours and Co., Aiken, South Carolina on May 25 and 26, 1959 to discuss chemical separations technology with representatives of the United Kingdom.

V. R. Cooper visited E. F. Miller, Division of Production, Atomic Energy Commission, Washington, D.C. on May 27, 1959 to discuss Non-Production Fuels Reprocessing.


E. R. Irish attended the National Committee Meeting of the AIChE, Kansas City, Missouri from May 16 through May 18, 1959. Contact was made with B. B. Kuist.

E. R. Irish visited E. E. Lamb and F. L. Culler of the Oak Ridge National Laboratory, Oak Ridge, Tennessee on May 20 and 21, 1959 to hold technical discussions.

E. R. Irish visited the E. I. du Pont de Nemours and Co., Aiken, South Carolina from May 25 through May 26, 1959 to discuss chemical separations technology.

W. H. Swift visited W. A. Rodgers of the Argonne National Laboratory, Lemont, Illinois on May 18, 1959 to hold technical discussions.

W. H. Swift visited E. E. Lamb and F. L. Culler of the Oak Ridge National Laboratory, Oak Ridge, Tennessee from May 19 through May 21, 1959 to hold technical discussions.


K. M. Harmon attended the AEC Contractors' SS Materials Management Meeting in Washington, D.C. from May 25 to May 27, 1959 to discuss Accountability.

K. M. Harmon visited C. J. Rodden of the New Brunswick Laboratory, New Brunswick, New Jersey on May 28, 1959 to discuss plutonium-handling facility, standards program.
Trips (Continued)

T. R. McKenzie visited Dr. H. Gladys Swope of the Argonne National Laboratory, Lemont, Illinois on May 18 and 19, 1959 to discuss radioactive waste processing and high level facilities.


T. R. McKenzie visited Frank Bruce of the Oak Ridge National Laboratory, Oak Ridge, Tennessee on May 21, 1959 to discuss high level facilities, fission product recovery and NPP program.

Visitors


B. J. Buntz and N. F. Neumann of Mallinckrodt Chemical Works, St. Louis, Missouri visited G. C. Oberg on May 27, 1959 to inspect the Purex Plant. They also visited R. E. Smith and R. Y. Lyon for a demonstration of the continuous calciner.


Max Harris of the Lawrence Radiation Laboratory, Livermore, California visited W. K. MacCready, V. R. Cooper, R. E. Smith and A. E. Smith on May 20, 1959 to discuss Gorton Lathe capability tests, and general discussions pertaining to weapon fabrication.

Inventions

<table>
<thead>
<tr>
<th>Name(s)</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>W. H. Swift</td>
<td>The Use of Helium as a Replacement Atmosphere in the Handling of Heat Generating Powders</td>
</tr>
</tbody>
</table>
Research and Engineering

Inventions (Continued)

Name(s)                          Title

R. E. Tomlinson                     Containment Vessel and Heat
W. H. Swift                           Transfer Mechanism for Shipment of Radioactive Materials

V. P. Cooper
Manager
Research and Engineering
I. RESPONSIBILITY

There were no changes in responsibilities during the month.

II. ACHIEVEMENT

Salary Administration

Evaluations and HAPO reconciliations of all financial exempt positions were completed during the month. A revised Departmental organization directory was issued.

Participated in the study of evaluation of the overall HAPO position of first line supervisory positions. This study is incomplete and will be continued.

Wage and Benefits

One engineering assistant job was established in the Process Chemistry Sub-Section. Two nonexempt jobs were audited and the necessary changes were made.

One employee was retired and one retirement application was completed. One terminating employee elected to exercise his vested pension rights.

<table>
<thead>
<tr>
<th>Suggestion Plan</th>
<th>April</th>
<th>May</th>
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</thead>
<tbody>
<tr>
<td>Suggestions Received</td>
<td>81</td>
<td>46</td>
</tr>
<tr>
<td>Acknowledgements to Suggestions</td>
<td>81</td>
<td>46</td>
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<tr>
<td>Suggestions Pending Acknowledgment</td>
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<td>0</td>
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<tr>
<td>Suggestions Referred to Operations for Investigation</td>
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<td>46</td>
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<tr>
<td>Suggestions Pending Referral to Operations</td>
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<tr>
<td>Suggestions Completed and Closed</td>
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<td>58</td>
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<tr>
<td>Adopted Suggestions Approved by Board</td>
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<td>24</td>
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<tr>
<td>Adopted Suggestions Pending Approval by Board</td>
<td>18</td>
<td>12</td>
</tr>
<tr>
<td>Total Net Tangible Savings</td>
<td>$1103</td>
<td>$1153</td>
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<tr>
<td>Cash Awards Paid During Month</td>
<td>$318</td>
<td>$255</td>
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</tbody>
</table>

As of the end of May, $1,346 has been paid in awards with a total of $4,871 in net tangible savings. The average award of the 116 adopted suggestions is $11.60 (below criteria of $25.35) and the ratio of awards to savings is 27.6% (above criteria of 16.0%).

Total Number of Suggestions Outstanding to Operations at End of Month

154 151
AVERAGE OF OPEN SUGGESTIONS

Months

|-----|------|------|------|-------|------|------|------|------|------|------|------|-----|

Participation in Benefit Plans

<table>
<thead>
<tr>
<th>Benefit Plan</th>
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<tr>
<td>Insurance Plan</td>
<td>99.8</td>
<td>99.9</td>
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<tr>
<td>Pension Plan</td>
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<td>99.9</td>
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<tr>
<td>Stock Bonus Plan</td>
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<td>Good Neighbor Fund</td>
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</tr>
<tr>
<td>Savings and Security</td>
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<td>97.0</td>
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</table>

Personnel Placement

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<thead>
<tr>
<th>Employment</th>
<th>Exempt</th>
<th>Non-Exempt</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Additions</td>
<td>1</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>New Hires</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Reactivates</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Re-Hires</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Re-Engages</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Transfers from other components</td>
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<td>7</td>
<td>8</td>
</tr>
<tr>
<td>B. Removals</td>
<td>18</td>
<td>21</td>
<td>39</td>
</tr>
<tr>
<td>Retirement</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Leave of Absence</td>
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<td>0</td>
<td>0</td>
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<tr>
<td>Illness</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Transfer to other components</td>
<td>16</td>
<td>14</td>
<td>30</td>
</tr>
<tr>
<td>Resigned</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>
REQUISITIONS (Nonexempt) REQUEST FOR TRANSFER (Exempt) APPLICATIONS (Exempt)

On hand 5-1-59 9 5
Received 4 0
Filled 7
Hired
Transferred 1
Closed Out 0
On hand 6-1-59 6 4

Open Requisitions 6

Offers were extended to two Manufacturing Training Program graduates during the month. A chemist accepted a job offer and was assigned to the Purex Analytical Laboratory. He will work in Hanford Laboratories until his clearance is received.

Status - Personnel Development Program for Nonexempt Employees

Number of appraisals scheduled in May 75
Number of appraisals delinquent 5-31-59 46

Health, Safety, and Radiation

Chemical Processing Department May April Year to Date

Disabling Injuries 0 0 0
Serious Accidents 2 0 3
Medical Treatment Injuries 37 39 204
Technical Overexposure Incidents 0 0 0
Radiation Occurrences 22 16 89
Fires 1 1 5
Security Violations 0 2 8

A film entitled "Knowing Is Not Enough" was loaned to the 104th QM Company of a local Army Reserve unit, as a phase of the unit's safety training program. Reception of the film was very good and the results were rated as excellent.

The Supervisors' Safety Training Program was resumed during the month. Training provided by sub-section managers is ninety-five per cent complete. It is expected the program will be completed by the end of June.

Continued interest is being shown in the First Aid Training Program. Three classes completed during May were conducted by the Specialists, Safety and Fire Prevention, Facilities Engineering Operation, and R. L. Weston, Employee Services, Relations Operation. One class for shift personnel was conducted by the Fire Protection Operation, Construction Engineering and Utilities.
Investigations

There were two serious accidents investigated during the month. One was a case where a Chemical Processing Operator experienced some discomfort due to lack of oxygen caused by leakage in an inert gas line in a confined space in 233-S pipe gallery.

The other case concerned an employee who, while performing a hydrostatic liquid level measurement in the 241-SX Tank Farm, was exposed to 15 rads/hr from localized contamination on his coveralls. Contamination escaped through a manually operated valve which failed to close completely. Investigation of the employee's exposure by Hanford Laboratories revealed the skin dose to be below the permissible limit.

Communication

The Atomic Energy Commission's decision to contract the janitorial services for the 700-1100 area was communicated to management and people classified as janitors during the month.

The graduation dinner for PBM Group 59 was held at the Desert Inn on June 1. Fifty Chemical Processing Department men received diplomas.

On May 20, 1959, a lunch was served in the Purex Conference Room with Dr. Fink, Dr. Greninger and his staff, Mr. MacCready and his staff in attendance.

Arrangements were made for two Chemical Processing Department employees to accept civic speaking engagements, and editorial and approval assistance was provided for one technical paper. Two pictures of UO₂ equipment were submitted to a General Electric engineering publication for possible use as cover shots.

In addition to the normal items of information, Department mass printed communication carried a feature on the Waste Handling and Decontamination Operation, a feature on a Financial man, several organization items, President's Safety Award publicity, and Lingo program winners.

III. ORGANIZATION AND PERSONNEL

The Specialist, Health, Safety and Radiation presented a paper entitled "Some Aspects of Critical Mass Control Training", at the Atomic Energy and Contractors Safety and Fire Protection Conference held at the Argonne National Laboratory. He also visited with the Safety Engineers at the Argonne National Laboratory during this same period.

R. B. Britton, Manager
Relations Practices