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LABORATORY RECORDS
1954

# OPERATIONS DIVISION
# MONTHLY REPORT FOR
# MONTH ENDING OCTOBER 31, 1950

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# OPERATIONS DIVISION

# MONTHLY REPORT

for

Month Ending October 31, 1950

by

M. E. Ramsey

DATE ISSUED

NOV 27 1950

OAK RIDGE NATIONAL LABORATORY
Operated by
CARBIDE AND CARBON CHEMICALS DIVISION
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SUMMARY ORNL-882

1. Lost pile-operating time averaged 12.3%, compared to 11.1% for the year-to-date. (Page 4.)

2. The seventy-sixth ruptured slug was detected and discharged during the month. (Page 4.)

3. The pile was operated at about 60% of full power from October 16, 1950, to October 27, 1950, while one of the pile-cooling fans was replaced with a slightly larger fan. (Pages 4, 6, and 7.)

4. The $I^{131}$ equipment failed during the latter part of the month and will be repaired during the coming month. (Pages 8 and 9.)

5. The equipment for separation of $C^{14}$ from irradiated $Be_3N_2$ slugs was installed in Building 905 during the month and the first run has been made without appreciable difficulties. (Pages 10 and 11.)

6. Extensive chemical work was done on the ion exchange process which is to be used for separation of the fission products from the Chalk River Redox waste. (Pages 13, 14, and 15.)

7. The activity discharged to White Oak Creek was 17.2 curies, compared to 7.7 curies during September, 1950. The discharge from the evaporator was 0.21 curie, compared to 0.30 curie last month. A large amount of the increased activity discharged was due to the difficulties with the $I^{131}$ process. (Pages 16 and 17.)

8. The next RaLa run was postponed again by Los Alamos. It is now scheduled to start shortly before January 1, 1951. (Page 19.)

9. The RaLa process filters continued to plug during filtration of dummy runs. Larger filters have been designed and an effort is being made to determine the reason for the plugging. (Pages 19 and 20.)

10. There were 760 radioisotope shipments during the month, compared with 671 for September, 1950. (Page 21.)

[redacted]

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## A. PILE DEPARTMENT

### I. Operating Data:

| | OCTOBER 1950 | SEPTEMBER 1950 | YEAR-TO-DATE 1950 |
|---|---|---|---|
| Total Accumulated KWH | 1,982,849 | 2,289,904 | 22,262,761 |
| Average KW/Operating Hour | 3038.08 | 3630.26 | 3433.38 |
| Average KW/24-Hour Day | 2665.12 | 3220.50 | 3051.37 |
| Percent Lost Time | 12.3 | 11.8 | 11.1 |
| Excess Pile Reactivity | 125-135 inhours | 125-135 inhours | |
| Slugs Discharged | 337 | 191 | 2271 |
| Slugs Charged | 337 | 191 | 2399 |
| Product Made (Grams) | 72.37 | 84.63 | 812.51 |
| Product Discharged (Grams) | 27.11 | 2.79 | 145.03 |

### II. Pile Operation:

The pile-down time was 12.3%, compared with 11.8% for the previous month and 11.1% for the year-to-date. The small increase in pile-down time was occasioned by the replacement of one of the pile cooling fans with a new Sturtevant fan.

There was one ruptured slug during the month. This was located by visual inspection and discharged from Channel No. 1473 on October 23, 1950, without difficulty. It had been in the pile 2,183 days at a maximum metal temperature of approximately 230°C. This was the seventy-sixth rupture since the beginning of pile operation in November, 1943.

During the replacement of the No. 3 fan, the pile operated at approximately 60% of full power from October 16, 1950, to October 27, 1950. The replacement was completed on schedule and the new fan has been operating satisfactorily. The replacement of the No. 2 fan is scheduled to begin on November 13, 1950, with completion of replacement expected to require approximately the same time as was required for replacement of the No. 3 fan.

[redacted]

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II. Pile Operation: (Continued)

On October 12, 1950, approximately 160 curies of radioactive argon was released into the Pile Building from a leak in the argon tube in Hole 18. This material was being irradiated by the Health Physics Division for the Stack Gas Monitoring Program. The pile was shut down and the building was evacuated for approximately one hour and thirty minutes. No overexposures nor appreciable difficulties were caused by this release of radioactivity.

Fifteen Al-Si bonded slugs have performed satisfactorily in the pile at a temperature of 350°C. since insertion on November 14, 1949. The first batch of bonded slugs is expected to be completed by Y-12 early next year. The use of these will permit the pile to be operated at a somewhat higher metal temperature and flux than at present. The use of bonded slugs is also expected to reduce the frequency of slug ruptures.

The excess pile reactivity is approximately 130 inhours. This is about the same as the excess reactivity at the end of September, 1950.

All the calcium nitrate slugs in the pile for production of $C^{14}$ have been discharged. No more will be charged since it is expected that the irradiation of beryllium nitride at Hanford will produce an adequate supply of this radioisotope.

III. Filter House:

On October 23, 1950, the glass wool filters in Cell No. 3 were replaced without incident. These are the last of the original glass wool filters installed in November, 1948. The following is a table showing pressure losses before and after this change:

[redacted]

[redacted]



III. Filter House: (Continued)

| Date | CELL NO. 3 Glass Wool Filters (In. w.g.) | FILTER HOUSE AVERAGE Glass Wool (In. w.g.) | CWS #6 (In. w.g.) | TOTAL ACROSS HOUSE (In. w.g.) |
|---|---|---|---|---|
| Before Change | 4.7 | 3.2 | 3.5 | 7.9 |
| After Change | 0.7 | 1.9 | 3.6 | 6.7 |
| 10-31-50 | 0.7 | 2.0 | 3.6 | 6.8 |

IV. Fan House:

The replacement of the No. 3 fan began on October 16, 1950, and proceeded according to the following schedule:

1. October 16 - The cell was decontaminated and the old fan and ductwork removed.
2. October 17 - The J. A. Jones Construction Company began tearing out the old foundation.
3. October 19 - The pouring of cement for the new foundation was started.
4. October 20 - The installation and alignment of the new fan was begun.
5. October 25 - The installation was completed and a trial run made during which it was found that the motor shaft pulled on the fan shaft causing the fan thrust bearing to heat. The motor was removed from its pedestal and it was found that the magnetic center of the motor was displaced to the north limit of the rotor travel and that the coupling had become stuck on the motor side.

   The magnetic center of the motor was determined and the motor reset with an increased clearance in the coupling of approximately 3/16", compared with the 1/16" clearance initially recommended by the fan manufacturer.

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IV. Fan House: (Continued)

6. October 27 - The new fan began operation at 3:40 p.m. It draws somewhat more air than the No. 2 fan, since the new fan is more efficient than the old one and is large enough to fully load the motor even with the higher temperatures of exit pile-cooling air encountered during the summer months.

Permanentization of the Fan House (Building 115) is approximately 81% completed. The instrumentation for No. 3 fan has been completed and the instrumentation for the Filter House has also been completed.

V. Radioisotopes:

The following is a comparison of the radioisotope and research samples charged into the pile during October, 1950, with those handled during September, 1950:

| | OCTOBER, 1950 | | SEPTEMBER, 1950 | |
|---|---|---|---|---|
| | Research | Radioisotopes | Research | Radioisotopes |
| Stringers 13, 14, and 16 | 13 | 194 | 17 | 182 |
| Hole 22 (Pneumatic Tube) | 77 | 2 | 69 | 2 |
| All Other Holes | 9 | 25 | 8 | 22 |
| TOTAL BY GROUPS | 99 | 221 | 94 | 206 |
| TOTAL FOR MONTH | 320 | | 300 | |

At the end of October, 1950, there were 369 cans of target material in Stringers 13, 14, and 16, compared with 381 cans of target material in these stringers at the end of September, 1950.

VI. Water Demineralization Building:

The operation of the building was normal throughout the month with 580,080 gallons of water being demineralized. Since the MTR Mock-Up was down for alterations during the month, none of the demineralized water was deaerated.

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VI. Water Demineralization Building: (Continued)

| Produced (Gallons): | October, 1950 | September, 1950 | Year-to-Date |
|---|---|---|---|
| Demineralized | 580,080 | 654,860 | 6,120,100 |
| Deaerated | -0- | 34,800 | 370,800 |

B. CHEMICAL SEPARATIONS AND RADIOISOTOPE DEVELOPMENT DEPARTMENTS

I. Radioisotopes:

1. Iodine ($I^{131}$ - 8d)

Eighty ORNL slugs were processed and approximately 30,180.6 millicuries were shipped.

Many difficulties were encountered during the processing of the runs in the last three weeks and yields were low. Some of the difficulties were:

a. Plugging of the instrument lines and draw-off lines from the dissolver.

b. An unusually rapid rise in dissolver temperature at the beginning of the slug dissolving and a continued high temperature throughout the dissolving.

c. Evolution of copious quantities of $NO_2$ during the final glassware distillation in some runs.

d. Appearance of a gray cloudiness in the final product, not appearing on redistillation.

e. An apparent reduction of the capacity of the dissolver from twenty-two liters to about sixteen liters.

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I. Radioisotopes: (Continued)

1. Iodine ($I^{131}$ - 8d)

During the dissolving of the last run of the month, the dissolver began leaking into the steam jacket; this jacket discharges into a drain outside the cell wall, thus giving high radiation levels in the operating area. After completion of this run, decontamination of the equipment was started in preparation for repairs.

2. Phosphorus ($P^{32}$ - 14.3d)

Twenty 2,000-gram cans of irradiated sulfur were processed and approximately 8,317 millicuries were shipped.

All runs during the month showed good yields and the products were within specifications.

Phosphorus Development Work

The 906 Building $P^{32}$ equipment is now in routine operation. The extraction yield (based on extract and residual sulfur analyses) is ~90% and the purification yield (in the glassware) is ~94%.

The sulfur melter for filling irradiation cans was installed and is now in operation.

Work continued on tests of round sulfur irradiation cans. Tests were made on test samples of round cans at 50 psi at room temperature; no deformation or leaks were found. However, heating tests conducted at 150°C. with the cans filled with 3,000 grams of sulfur showed up some defects which must be corrected. The amount of free space left in the can for gas accumulation (generated by reaction of organic matter and molten sulfur) has an important bearing on the final pressure.

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I. Radioisotopes: (Continued)

3. Carbon ($C^{14}$ - 5,720y)

Thirteen hundred $Ca(NO_3)_2$ slugs were processed. The first twelve hundred slugs yielded about 815 millicuries with an average isotopic ratio of 2.70%; results are not yet available on the remainder.

The last run (100 slugs) made last month for which results were not available yielded fifty-two millicuries which an isotopic ratio of 1.97%.

The following is a list of the $C^{14}$ available in the unprocessed $Be_3N_2$ and $Ca(NO_3)_2$ slugs:

| | |
|---|---|
| No. of $Ca(NO_3)_2$ Slugs in Pile | 0 |
| No. of $Ca(NO_3)_2$ Slugs in Canal | 187 |
| Total $C^{14}$ Content in $Ca(NO_3)_2$ Slugs | 112 mc |
| No. of $Be_3N_2$ Slugs on Hand | 910 |
| Total $C^{14}$ Content in $Be_3N_2$ (Estimated) | 40,950 mc |
| Total $C^{14}$ Available (Estimated) | 41,062 mc |
| $C^{14}$ in the Form of $BaCO_3$ on Hand at End of Month | 269 mc |
| TOTAL | 41,331 mc |

Carbon Development Work

The small $Be_3N_2$-$C^{14}$ unit in Building 905 was started up and 633.4 millicuries of $C^{14}$ as homogeneous $BaC^{14}O_3$ was produced by combining the low isotopic ratio $C^{14}$ made from $Ca(NO_3)_2$ with high isotopic ratio $C^{14}$ made from $Be_3N_2$.

Installation of the large equipment began October 16, 1950. The furnace hood has been installed and the furnace and crusher are ready for mounting. Preliminary tests with the crusher

[redacted]

[redacted]



I. Radioisotopes: (Continued)

3. Carbon Development Work

indicated that the hammer requires modification in order to fracture the hardest of the $Be_3N_2$ pellets.

A lead storage vault was installed and approximately 450 slugs were put in storage.

A dry-box will be used to enclose the apparatus and for final conversion of $Na_2C^{14}O_3$ solution to solid $BaC^{14}O_3$. The box will be constructed of Lucite and will have facilities for maintaining an atmosphere of dry nitrogen.

4. Sulfur ($S^{35}$ - 87.1d)

Four curies of elemental $S^{35}$ were produced during the month, with a specific activity of one curie/gram S. The overall yield was 92.8%.

5. Nickel ($Ni^{63}$ - 300y)

A "W" unit was processed by carrier and electrolytic techniques to produce the following preparation:

Total $Ni^{63}$----------237.6 mc
Concentration---------1.76 mc/ml
Specific Activity-----86 mc/g Ni
Acidity----------0.88 N (HCl)
$Co^{60}$----------0.0076%

The $Co^{60}$ in these "pure" Ni irradiation units, as received, is so great that it completely masks the soft $Ni^{63}$ activity.

6. Zinc ($Zn^{65}$ - 250d)

The following $Zn^{65}$ preparation was made from a "W" irradiation unit:

Total $Zn^{65}$----------930 mc
Concentration---------15.5 mc/ml
Specific Activity-----119 mc/g Zn

[redacted]

[redacted]



I. Radioisotopes: (Continued)

7. Iridium ($Ir^{192}$ - 75d)

The $Ir^{192}$ preparation reported previously had the following analysis:

Total $Ir^{192}$----------612 mc
Concentration---------5.1 mc/ml
Specific Activity-----6,000 mc/g Ir
Acidity----------2.7 N (HCl)

8. Fission Products Development Work

Several runs were made on the 910 Building TBP unit using UNH from the $I^{131}$ dissolver. A large amount of brown crud was found to remain with the mixed fission products after U removal. This material was tentatively identified as organic material, possibly connected with recent low yields of $I^{131}$. Investigation of this material will continue.

A new sampler was designed and installed with which it is possible to take precisely measured samples of concentrated fission products in 0.081 ml, 0.159 ml, and 0.231 ml volumes.

The activity which was found in the TBP-$CCl_4$ scrubbed fractions was principally $I^{131}$. This is no particular handicap to the process.

The following fission products were purified during the month:

a. $Sr^{89}$ - (55d)

Total $Sr^{89}$----------69 mc
Concentration---------0.69 mc/ml
Total Solids----------1.2 mg/ml
$Sr^{90}$----------1% of total activity

[redacted]

[redacted]



I. Radioisotopes: (Continued)

8. Fission Products Development Work

b. $Zr^{95}$ - $Nb^{95}$ - (65d-35d)

Total $Zr^{95}$-$Nb^{95}$-------2,275 mc
Concentration---------17.5 mc/ml
Acidity----------0.3 N oxalic
Purity----------$>$99%
Pu----------0

c. $Pr^{143}$ - (13.8d)

Total $Pr^{143}$----------11 mc
Concentration---------0.44 mc/ml
Total Solids----------0.0 mg/ml
Pu----------30 c/min/ml

d. $Y^{91}$ - (57d)

Total $Y^{91}$----------1,130 mc
Concentration---------11.3 mc/ml
Total Solids----------0.0 mg/ml
Acidity----------1.67 N (HCl)
Pu----------8 c/min/ml

e. $Nb^{95}$ - (35d)

Total $Nb^{95}$----------36.2 mc
Concentration---------2.41 mc/ml
NVM----------0.0 mg/ml
$Zr^{95}$----------$<$ 1%
Pu----------39 c/min/ml
Acidity----------0.4 N (citric acid)

d. $Ba^{140}$ - (12.8d)

Total $Ba^{140}$----------203 mc
Concentration---------1.35 mc/ml
Total Solids----------2.3 mg/ml
$Sr^{89-90}$----------$<$ 1%
Pu----------39 c/min/ml

9. Chalk River Wastes Separation Development Work

Extensive chemical work was done on the ion exchange process which is to be used for processing the Chalk River Redox waste. This material is of interest because of the $Sr^{90}$ and long half-life rare earth activities which are present in considerable amounts.

[redacted]

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I. Radioisotopes: (Continued)

9. Chalk River Wastes Separation Development Work

The individual pure fission products are being studied in tracer amount, using the conditions that will exist in operation on diluted Redox waste. This synthetic waste is 0.2 molar in $Al_2(NO_3)_3$, corresponding to a 5 to 1 dilution of the original waste. The fission products are adsorbed on a Dowex 50 resin column and the Al selectively eluted with oxalic acid. One cycle is considered to be adsorption to complete saturation with $Al^{+++}$ and other cations, followed by oxalic acid regeneration. Using $Sr^{89}$, the Sr loss in the oxalic acid regenerant was found to be 0% for the first cycle, 0% for the second, 5.6% for the third, 11.6% for the fourth, and 14.4% for the fifth. It is apparent that about five cycles may be made before it is necessary to remove the Sr from the column. Approximately the same results were obtained when pure tracer runs of $Y^{91}$, $Pr^{143}$, and $Ba^{140}$ were made. Both Dowex 50 and Amberlite IR-100 resins were studied, but the much higher capacity of the former indicated its use as had been indicated by earlier work.

Other important points in the separations system are the capacity of the metathesis columns and the probable conversion yield. Again, the Dowex resin was found to be superior to the Amberlite resin for this purpose. Two stages of metathesis columns will be used in order to reduce the volume to the smallest value.

Design work for alteration of the cesium unit in the South Tank Farm was started to incorporate the new ion exchange equipment in the same cells. The main column will be glass-lined steel,

[redacted]

[redacted]



I. Radioisotopes: (Continued)

9. Chalk River Wastes Separation Development Work

6" in diameter and 9' long. The cesium crystallizer tank will be used as a feed tank for the hot waste solution and the column will be fed by a Vanton polyethylene pump. Citric and oxalic acid eluting solutions will be made up in a glass-lined tank and forced into the column by air pressure. The finishing equipment will be made of glass and Tygon tubing. A glass-lined evaporator, taken from the Building 908 cesium cell, will be used for effluent evaporation and Ru distillation. It is estimated that this equipment will be in operation by late January, 1951.

10. Miscellaneous Work

a. Cobalt Sources

$Co^{60}$ sources were loaded in special holders as follows:

Aton Electric Laboratories--------5000 mc.
St. John X-Ray Laboratory--------- 300 mc.
University of South Dakota-------- 450 mc. (2)
Armour Research Foundation--------1100 mc.

A $Co^{60}$ source (for beta) was placed on platinum foil according to a customer's specifications.

b. $Sb^{125}$ from Sn; $Te^{125}$ from Sb

Preliminary work was completed on the electrolytic separation of carrier-free $Sb^{125}$ from Sn. Similar work was completed on the electrolytic separation of $Te^{125}$ from Sb and Sn.

c. Cesium Source

A $\beta$-ray spectrographic $Cs^{137}$ source was prepared for the University of Tennessee.

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[redacted]



II. Tank Farm:

1. General

a. The weir box on the outlet side of the Settling Basin is complete with the exception of installation of the proportional sampler and general landscaping. The recording flowmeter is installed.

b. The automatic jet modulating valve at W-12 was replaced and the limit switch mechanism readjusted.

c. The steam line through the Tank Farm is apparently finished except for being tied in for use.

d. The chain fence on the north side of the South Tank Farm has again been removed. It will be replaced and re-aligned with the new steam line support poles.

e. The inlet weirs and diversion box at the Settling Basin were cleaned of accumulated solid material.

f. The evaporator gallery was repainted.

2. Wastes Discharged to the White Oak Creek

Approximately 16.40 curies of beta activity were discharged from the Settling Basin this month.

Two slugs of activity were discharged during the last week of the month to raise the total amount discharged by a large factor. The first one was investigated thoroughly, but the origin of the activity was never determined. The second and larger slug was definitely traced to the $I^{131}$ cell in Building 706-C, where a leak had developed in the dissolver jacket, thence to the Basin.

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II. Tank Farm: (Continued)

2. Wastes Discharged to the White Oak Creek

During the latter part of the month, it became necessary to change the Tank Farm procedure slightly and to drain the contents of W-1 and W-2 tanks directly to the Settling Basin instead of to W-5 for evaporator feed. The reason for this was a serious lack of free space in the Chemical Waste System. The solution dumped to the Settling Basin was very low in activity.

An investigation was made to determine the source of an excessive amount of liquid entering W-1 and W-2. No definite contributor was determined, but the source was located to be in the vicinity of the 205 Building. This excessive flow approached normalcy in two or three days.

The source of the higher activity in the Retention Pond was finally located this week after intensive investigation employing the use of dyes. The leak has been established to be somewhere in the line between W-1 and W-2 diversion box and W-2 tank. The flow into W-2 tank was stopped and the activity dropped down considerably. Excavation is underway at present to uncover the inlet line to W-2 tank to locate the leak.

ACTIVITY DISCHARGED TO WHITE OAK CREEK

| | OCTOBER, 1950 | | SEPTEMBER, 1950 | |
|---|---|---|---|---|
| Discharged From | Gallons | Beta Curies | Gallons | Beta Curies |
| Settling Basin | 21,704,000 | 16.40* | 22,387,000 | 7.24* |
| Retention Pond | 375,147 | .83 | 500,688 | .47 |
| TOTAL | | 17.23* | | 7.71* |
| * Contributed by Evaporator | | .21 | | .30 |

[redacted]

[redacted]



II. Tank Farm: (Continued)

3. Chemical Waste Evaporator

Operation was normal for the first half of the month. During the last half, the evaporation rate and volume reductions were low due to the high specific gravity of the feed solution of material reprocessed from W-8.

The evaporator was down twice this month. The first time was due to the fact that the feed solution in W-5 was thermally hot from a solution having been jetted from W-8 to W-5; the jet from W-5 to the evaporator would not pick up this hot solution. After the solution cooled, and with some manipulation, the jet finally picked up the solution. The second shutdown was to replace a sheared pin in the valve in the line from the evaporator to W-6. An average decontamination factor of 11,510 was obtained for the month.

WASTE EVAPORATOR OPERATION

| Gallons Fed to Evaporator | Gallons of Concentrate to W-6 | Volume Reduction | Beta Curies to Evaporator | Beta Curies to Settling Basin |
|---|---|---|---|---|
| OCT. - 188,475 | 31,313 | 5.0:1 | 2,488.91 | .21 |
| SEPT.- 229,072 | 24,841 | 8.2:1 | 446.02 | .30 |

4. Waste Tank Inventory

| Tanks | Gallons Capacity | Gallons In | Gallons Out | Discharged To | Free Space |
|---|---|---|---|---|---|
| HOT PILOT PLANT STORAGE | | | | | |
| W3,13,14,15 | 48,500 | -0- | -0- | ------- | 9,670 |
| CHEMICAL WASTE STORAGE | | | | | |
| W-5 | 170,000 | 277,275 | 188,475 | Evaporator | 4,800 |
| EVAPORATOR CONCENTRATE STORAGE | | | | | |
| W-6, 8 | 340,000 | 13,200 | 39,600 | Evaporator | 99,600 |
| METAL WASTE STORAGE | | | | | |
| W4,7,9,10 | 543,000 | 3,600 | -0- | ------- | 169,544 |

[redacted]

[redacted]



III. RaLa ($Ba^{140}$ - 12.5d):

Los Alamos again postponed the next run date. It is now scheduled to start shortly before January 1, 1951.

The process filters continued to plug during filtration of the extraction solutions despite intense cleanouts of all tanks and lines. The material which caused the filter plugging was determined to be silica. Slight process revisions were made when it was found that radical temperature changes seemed to assist in the gelling of the silica before going through the crud filters. This change worked well when using ORNL pile slugs but was of no use whatsoever when using Hanford slugs. During one test run the crud filters, as well as the process filters, plugged while trying to filter the silica from the dissolved Hanford slug solutions.

The one bright feature of all the unsuccessful dummy runs was the fact that the filters, although slow, were very efficient. The lead losses which were low (in the vicinity of 5%) were proven to be from dissolved lead and not from precipitated particles which may have gone through the filter media.

The problem has been referred back to the Chemical Technology Division for further study. Meanwhile, the design section of the Chemical Technology Division has designed a new filter with a filtration area six times that of the original filter which should be able to filter at three to six times the filtration rate of the present filters under the same conditions. Investigation is underway also to determine the solubility of the silica filter aid in acid solutions and use of classified filter aid in preference to the run-of-the-mill commerical grade of filter aid.

[redacted]

[redacted]



III. RaLa ($Ba^{140}$ - 12.5d): (Continued)

The following work was accomplished on the RaLa changes in Building 706-D during the month:

1. The monorail for the new six-ton crane was completed. The crane has not arrived on the plant as yet.
2. The dissolver tank thermocouples, instrument lines, and instruments were repaired and the tank recalibrated.
3. The concrete floor on the first level was installed.
4. Two leaks were repaired in the process filter cubicle inlet lines.
5. The lead and concrete shielding was replaced around the resin and loading cubicles.
6. Installation was begun on the loading cubicle equipment, particularly the movable shutter which shields the charging heads.
7. The 220-volt service was removed from Building 706-D and all electrical apparatus formerly operating on 220 volts is now operating on 440 volts with the exception of the final product dryers.
8. The west vacuum pump was reconditioned.
9. The A-5 and A-6 tanks specific gravity instruments were recalibrated.
10. The north and south hot laboratories and chemical laboratory hood fans were removed. The hoods in all laboratories are now tied directly into the 900 Area cell ventilation system which exhausts into the 900 Area stack.

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## C. RADIOISOTOPE CONTROL DEPARTMENT

### I. General:

During October, 1950, there were 760 radioisotope shipments, compared with 671 during September and 689 during August, 1950. In October, 1949, there were 496.

The breakdown according to separated and unseparated material is as follows:

| | October 1950 | September 1950 | October 1949 | August, 1946, to October, 1950, Inc. |
|---|---|---|---|---|
| Separated Material 706-D Area | 592 | 493 | 388 | 13,859 |
| Unseparated Material 100 Area | 168 | 178 | 108 | 4,291 |
| TOTAL SHIPMENTS | 760 | 671 | 496 | 18,150 |

The following table indicates the breakdown between non-project, project, and foreign orders for October and September, 1950, and October, 1949:

| | October 1950 | September 1950 | October 1949 |
|---|---|---|---|
| Non-Project | 579 | 503 | 389 |
| Project | 160 | 151 | 91 |
| Foreign | 21 | 17 | 16 |
| | 760 | 671 | 496 |

### II. Hanford Irradiations:

The following radioisotope samples were received from Hanford during October, 1950:

| Sample No. | Material | Date Discharged | Date Received |
|---|---|---|---|
| ORNL-13 | Beryllium Nitride (65 pcs) | 8-21-50 | 10-16-50 |
| ORNL-100 | Calcium Carbonate (1 pc) | 9-13-50 | 10-23-50 |
| ORNL-80 | Mercury (1 pc) | 9-27-50 | 10-23-50 |
| ORNL-83 | Titanium (1 pc) | 8-2-50 | 10-25-50 |
| ORNL-28 | Iron (1 pc) | 8-23-50 | 10-25-50 |
| ORNL-60 | KCl (3 pcs) | Oct. 1950 | 10-25-50 |
| ORNL-110 | Fe 58 Enriched (2 pcs) | Oct. 1950 | 10-25-50 |

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II. Hanford Irradiations: (Continued)

It is possible for ORNL to use two process channels at Hanford for irradiation of thin-walled sulfur slugs. Slugs are being made for this purpose. It has not been decided as yet just how much sulfur would be irradiated at one time or what the schedule of shipment would be. It is possible to have the irradiated sulfur returned in the same container Hanford uses for shipment of beryllium nitride slugs.

One channel of beryllium nitride, which was in the pile seven months, has been discharged and was received here on October 16, 1950. These slugs will be tested for built-up pressure as soon as equipment becomes available.

Hanford indicated that irradiation of the cobalt now at Hanford and the irradiation of sulfur together would exceed the 100-inhour limit. An effort will be made to have this limit extended to take care of these irradiations.

Tube DTHH at Hanford, which was discovered plugged on August 21, 1950, and which contained samples of zinc, nickel, silver nitrate, selenium, and thallium, was removed by Hanford personnel. Hanford reports that one of the slugs (the tube contained slugs other than those from ORNL) had burst causing a great deal of contamination, therefore, necessitating burial of the whole tube.

Hanford has notified ORNL that due to the type of contract NEPA has, it will be impossible for Hanford to bill NEPA directly for NEPA irradiations. An effort is being made through USAEC channels to provide a method for billing NEPA so that the cost of these irradiations will not be the responsibility of the Laboratory.

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II. Hanford Irradiations: (Continued)

ORNL-131 (cobalt) has been canceled, since the activity as the material is discharged from the pile is too great for the test hole facilities Hanford has for handling the material. Two slugs under this request have been discharged and are cooling until such time that they can be shipped.

III. Radioiodine:

The iodine equipment has developed leaks which must be repaired. Radioiodine shipments up through those scheduled on October 31, 1950, have been completed, but no shipments are contemplated for about two weeks, the period necessary for repairs of the iodine equipment. Customers who have had shipments of iodine scheduled during the week of November 7 and 14, 1950, have been notified of the iodine shortage.

IV. Cyclotron Radioisotopes:

A sixty-hour bombardment of rubidium carbonate scheduled at MIT has been reduced to fifty hours, since there was a request for a ten-hour bombardment to be made immediately. This ten-hour bombardment will be attempted by the University of Pittsburgh.

Following is a list of the outstanding orders for cyclotron radioisotopes now on hand:

| Material | Amount | Status |
|---|---|---|
| Be 7 | 22 mc | Bombardment has been requested. |
| Na 22 | 2 mc | Special work in progress. |
| Mn 54 | 3 mc | Bombardment has been requested. |
| As 73 | 12 mc | Bombardment has been requested. |

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IV. Cyclotron Radioisotopes: (Continued)

BOMBARDMENTS RECEIVED

| | M. I. T. | | U. of CALIF. | | U. of PITTSBURGH | | WASHINGTON U. | |
|---|---|---|---|---|---|---|---|---|
| | Bombardments | Beam Hours | Bombardments | Beam Hours | Bombardments | Beam Hours | Bombardments | Beam Hours |
| Be 7 | | | | | 6 | 180.00 | | |
| Na 22 | 1 | 109.75 | | | 5 | 201.75 | 4 | 300.00 |
| Mn 52 | | | | | 2 | 20.00 | | |
| Mn 54 | | | | | | | 2 | 100.00 |
| Co 57 | | | | | | | 2 | 50.00 |
| Fe 59 | | | 4 | 223.10 | | | | |
| Zn 65 | 1 | 100.00 | | | | | | |
| I 125 | | | | | | | 2 | 60.00 |
| Molybdenum Metal | | | | | 1 | 13.00 | 2 | 20.00 |
| TOTAL RECEIVED | 2 | 209.75 | 4 | 223.10 | 14 | 414.75 | 12 | 530.00 |

REQUESTED BUT NOT RECEIVED

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Be 7 | | | | | 1 | 50.00 | | |
| Zn 65 | | | 1 | 40.00 | | | | |
| As 73 | | | | | 1 | 10.00 | | |
| Sr 85 | 1 | 50.00 | | | 1 | 10.00 | | |
| TOTAL HOURS OUTSTANDING (Not Received or Requested) | | 490.25 | | 486.90 | | 265.25 | | 220.00 |

SHIPMENTS OF CYCLOTRON-PROCESSED RADIOISOTOPES

| Material | No. Shipments October, 1950 | No. Millicuries October, 1950 | No. Millicuries To Date |
|---|---|---|---|
| Be 7 | -0- | -0- | 127.073 |
| Na 22 | 2 | 1.2 | 24.547 |
| Mn 52 | -0- | -0- | 9.991 |
| Co 57 | -0- | -0- | 2.0 |
| Fe 59 | -0- | -0- | 1.5 mc and 1 S.I. |
| Zn 65 | -0- | -0- | 1.5 |

V. Radiocarbon:

The apparatus for standardizing the sodium carbonate $C^{14}$ samples is being installed and it is expected that standardization of the samples will be begun by the Analytical Chemistry Division in about two weeks.

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VI. Activation Analyses:

1. Vinylite Resins were submitted for analysis by Carbide and Carbon Chemicals Division, UCC, on November 25, 1949. One set of these samples was submitted for analysis of cadmium and other trace metals, and one set for iron and other trace metals.

   Present Status: They have been checked and compared favorably with other analyses here with the exception of polarographic analysis; these will be repeated by Carbide and also by ORNL in an effort to get better agreement.

2. Stainless Steel, Ni-Cr-Mo-W-Alloy, and Ferrous Material were submitted for analysis by Carbide and Carbon Chemicals Division, UCC, Niagara Falls, New York, on February 13, 1950.

   Present Status:

   a. Stainless Steel - these samples were found to vary from 0.04 to 0.21% tantalum.

   b. Ni-Cr-Mo-W-Alloy - this analysis is being held up for calcium determination.

   c. Ferrous Material - this analysis is being held up for calcium determination.

3. Magnesium Metal Alloys were submitted by the Dow Chemical Company on December 22, 1949, for analysis for trace elements.

   Present Status:

| Sample No. | Na | K | Ba, Ca, Sr |
|---|---|---|---|
| 63644 | .00017 | .00014 | .0001% |
| 6646 | .0001 | .00018 | .0001% |
| 61877 | .00015 | .00013 | .0001% |

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VI. Activation Analyses: (Continued)

4. Germanium Samples were submitted by Bell Telephone Laboratories, Inc., Murray Hill, New Jersey, for analysis for trace elements.

Present Status: Analyses have been completed and results reported to the Bell Telephone Laboratories; however, more work is in progress on Group 2 and Group 3 elements, since they have shown a great deal of interest in these.

M. E. Ramsey

M. E. Ramsey, Director
Operations Division

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VII. S-F Material Control:

1. During October, 1950, an additional 12.2 kilograms of highly-enriched uranium were received from Y-12 for KAPL disc fabrication work. This receipt fulfilled the special quota allowed for the KAPL work with the exception of approximately 500 grams. The quota allowed amounted to 53 kilograms of fissionable element ($U^{235}$) and the amount received against the quota totals 52.455 kilograms.

   Three shipments of discs were made to KAPL during the month. The number of discs shipped amounted to 15,927 and the amount of uranium totaled 40.07 kilograms with an enrichment range of 90-95%. This raises the total shipped through October 31, 1950, to 17,614 discs and 44.18 kilograms of uranium.

2. The first batch of separated Chalk River plutonium, numbered Batch VI RC #1, amounting to 41.3 grams, was shipped to Los Alamos during October, 1950. In addition, another shipment of Pu amounting to 100 grams was made to Los Alamos. The latter was Hanford Batch 6E8, which had been on hand since July 9, 1946, but had never been opened for use. It had originally been scheduled for use in connection with americium and curium extraction work.

3. Test runs were continued on the modified RaLa process. In this connection, seventy additional unirradiated Hanford slugs were received for the runs.

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VII. S-F Material Control: (Continued)

4. The SF Office completed its survey among research divisions relative to establishing overall Laboratory basic and special fissionable material requirements for the Calendar Year 1951. As a result, ORNL requirements were submitted October 17, 1950.

5. During October, 1950, ten thorium extruded billets were received from Ames Laboratory for use in connection with tensile test bars, torsion test bars, and impact test specimens to be fabricated by the Metallurgy Division. The weight of the billets amounted to 147.6 kilograms.

6. Surveys of material balance areas were continued by the SF Office. Nine persons possessing SF material were visited and their material inspected and weighed where feasible. No apparent discrepancies were encountered.

7. The records of three analytical laboratories were audited during October, 1950. Records were found to be in good order and all samples had been properly accounted for.

8. During the month there were nineteen shipments received and twenty-five shipments made, compared with thirteen receipts and twenty-three shipments last month.

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VII. S-F Material Control: (Continued)

9. Following is a summary of receipts and shipments of SF materials for the month of October, 1950:

RECEIPTS

| From | Material | Content | |
|---|---|---|---|
| Brookhaven National Lab. | Normal U Foil | 0.471 | gm. |
| " " " | Normal U Chips | 250.000 | gm. |
| C&CCD, K-25 Area | Normal U (UNH) | 125.000 | gm. |
| " " " | Normal U ($UO_2$) | 800.000 | gm. |
| C&CCD, Y-12 Area | Normal U (Metal) | 85.000 | gm. |
| " " " | Normal U ($UO_2SO_4$) | 578.700 | gm. |
| " " " | Enriched U (Metal) | 8,444.070 | gm. |
| " " " | Enriched U (Metal) | 3,001.910 | gm. |
| General Electric Co., Hanford | Normal U (X-Slugs) | 5,829.166 | gm. |
| " " " " | Normal U (W-Slugs) | 124,465.100 | gm. |
| Iowa State College | Thorium (Billets) | 25,300.000 | gm. |
| " " " | Thorium (Billets) | 21,480.000 | gm. |
| " " " | Thorium (Billets) | 35,330.000 | gm. |
| " " " | Thorium (Billets) | 18,640.000 | gm. |
| " " " | Thorium (Billets) | 46,810.000 | gm. |
| A. D. MacKay, N.Y.C. | Thorium ($ThO_2$) | 3,188.920 | gm. |
| " " " " | Thorium ($ThO_2$) | 3,946.230 | gm. |
| Los Alamos Scientific Lab. | Enriched Uranium | 0.250 | gm. |
| Westinghouse Electric Corp. | Thorium (Rods) | 687.085 | gm. |

SHIPMENTS

| To | Material | Content | |
|---|---|---|---|
| Brookhaven National Lab. | Irradiated U Foil | 0.048 | gm. |
| " " " | Irradiated U Foil | 0.094 | gm. |
| " " " | Irradiated U Foil | 0.095 | gm. |
| " " " | Irradiated U Foil | 0.089 | gm. |
| University of Calif. Rad. Lab. | Normal U/Mo Alloy Plates | 55,005.000 | gm. |
| " " " " " | U-233 ($UO_2(NO_3)_2$) | 8.259 | gm. |
| C&CCD, K-25 Area | Irradiated Normal U Buttons | 42.000 | gm. |

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VII. S-F Material Control: (Continued)

9. Receipts and shipments for October, 1950.

SHIPMENTS - (Continued)

| To | Material | Content |
|---|---|---|
| C&CCD, Y-12 Area | Enriched U/Alloy | 22.188 gm. |
| " " " | Enriched U ($UO_2F_2$ in $H_2O$) | 0.100 gm. |
| " " " | Normal U (Block) | 90.000 gm. |
| " " " | Enriched U (Al/Alloy) | 37.097 gm. |
| " " " | Enriched U (Al/Alloy) | 11.131 gm. |
| " " " | Enriched U (Al/Alloy) | 15.760 gm. |
| " " " | Normal U (Block) | 85.000 gm. |
| " " " | Enriched U (Al/Alloy) | 45.918 gm. |
| " " " | Enriched U (Al/Alloy) | 11.151 gm. |
| " " " | Normal U (Tube) | 265.000 gm. |
| Los Alamos Scientific Lab. | Pu ($Pu(NO_3)_2$) | 41.300 gm. |
| " " " " | Pu (Hanford Material) | 100.000 gm. |
| General Elec. Co., Schenectady | Enriched U/Al Alloy Discs | 20,220.750 gm. |
| " " " " | Enriched U/Al Alloy Discs | 8,790.340 gm. |
| " " " " | Enriched U/Al Alloy Discs | 11,060.780 gm. |
| Tracerlab, Inc. | Irradiated Normal $U_3O_8$ | 0.4133 gm. |
| " " | Irradiated Normal $U_3O_8$ | 0.4178 gm. |
| " " | Irradiated Normal $U_3O_8$ | 0.4281 gm. |

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