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Progress Report
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OPERATIONS DIVISION

MONTHLY REPORT

FOR

Month Ending March 31, 1951

RESEARCH AND DEVELOPMENT REPORT

DECLASSIFIED
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OAK RIDGE NATIONAL LABORATORY
OPERATED BY
CARBIDE AND CARBON CHEMICALS COMPANY
A DIVISION OF UNION CARBIDE AND CARBON CORPORATION
UCC
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OAK RIDGE, TENNESSEE

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OPERATIONS DIVISION

MONTHLY REPORT

for

Month Ending March 31, 1951

by

M. E. Ramsey

DATE ISSUED

MAY 8 1951

OAK RIDGE NATIONAL LABORATORY
Operated by
CARBIDE AND CARBON CHEMICALS COMPANY
A Division of Union Carbide and Carbon Corporation
Post Office Box P
Oak Ridge, Tennessee

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ORNL-996
PROGRESS REPORT

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SUMMARY

1. Lost pile-operating time averaged 11.2%, compared to 9.5% in February and 10.4% for the year-to-date. (Page 4.)

2. Five ruptured slugs were detected and discharged during the month. (Page 4.)

3. The Pile Department assumed operation for the Low Intensity Training Reactor on March 5, 1951, and spent most of the month training operating personnel. Operation was at levels up to one megawatt. (Page 5.)

4. Seventy-one slugs of irradiated beryllium nitride were processed to produce 2,968 millicuries of C^{14}. (Page 12.)

5. The repair work has been completed on the fission product equipment in Building 3026 and operation has been resumed. (Page 14.)

6. The airlines have raised the permissible limit of radiation at the surfaces of packages from 15 mr/hr to 200 mr/hr. This has permitted the proportion of non-returnable carriers used to be increased from approximately fifty percent to approximately eighty percent. (Page 18.)

7. The activity discharged to White Oak Creek was 5.1 curies, compared to 5.2 curies during the previous month. The discharge from the evaporator was 0.05 curie, compared to 0.04 for the previous month, with decontamination factors of 12,156 and 7,496, respectively. (Page 19.)

8. The resin column equipment was completed on March 31, 1951. The first "hot" RaLa run (fifty-curie shipment) is scheduled to start on April 2, 1951. (Page 21.)

9. Several "cold" runs were made through the RaLa equipment. These located several equipment difficulties and indicated the changes needed in operating procedures before the test fifty-curie run is made. (Page 21.)

10. There were 857 radioisotope shipments, compared to 793 shipments last month. (Page 22.)

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A. PILE DEPARTMENT

I. Operating Data:

	MARCH 1951	FEBRUARY 1951	YEAR-TO-DATE 1951
Total Accumulated KWH	2,551,449	2,426,390	7,688,927
Average KW/Operating Hour	3860.2	3989.7	3971.9
Average KW/24-Hour Day	3429.4	3610.7	3559.7
Percent Lost Time	11.2	9.5	10.4
Excess Pile Reactivity	165 inhours	152 inhours	
Slugs Discharged	369	1696	2169
Slugs Charged	369	1701	2273
Product Made (Grams)	93.12	88.55	280.62
Product Discharged (Grams)	39.03	253.56	298.92

II. Pile Operations:

The average pile power per operating hour for the month was 3,860.2 KW, compared with 3,989.7 KW for February, 1951.

The pile-down time was 11.2%, compared with 9.5% in February, 1951, and 10.4% for the year-to-date.

The No. 1 galvanometer chamber was changed during the month. A modified GE-type chamber constructed of aluminum was replaced by an old-type chamber when it failed to perform satisfactorily due to drifting.

Five slug ruptures were detected during the month of March, 1951. This is the largest number to occur in any month since July, 1948, when there were six.

Rupture No.	Date of Discharge	Row No.	No. of Days in Pile	Maximum Temperature	Remarks
82	3-1-51	2271	846	200° C.	Indicated by probe - located by scanner. This was a thermocouple slug.
83	3-5-51	1776	2,330	200° C.	Located by visual inspection.
84	3-12-51	1573	14	200° C.	Indicated by probe - located by scanner.
85	3-26-51	1378	2,344	145° C.	Indicated by probe - located by visual inspection.
86	3-28-51	1572	1,213	200° C.	Indicated by probe - located by scanner.

II. Pile Operations: - (Continued)

The project to prepare bonded slugs at Y-12 has been handicapped due to the delayed delivery of aluminum for the cans. It is now believed that sufficient priority can be obtained to insure early delivery. During the month the question arose as to whether uranium rod first rolled and then reduced to exact diameter by drawing could be substituted for rolled-and-machined-rod. It was learned that considerable development on such rod has been done and it is now available from the Bridgeport Brass Company. However, upon checking, it was learned that no slugs made from this new material have been irradiated and it was decided that sufficient data were not available to justify substitution for the standard rolled material. Accordingly, instructions have been given to Y-12 to proceed with the rolled-rod as previously planned.

Information received from the Brookhaven National Laboratory on the rate of oxidation of graphite at high temperatures indicated that less than one percent will be oxidized per ten years at 300° C.

A revised estimate for the permanentization of the north side of the X-pile was made. Including the cost of air-conditioning, the new estimate is $281,000.

It is now planned to replace the mattress plates in April, 1951. The present ones have holes in them which have allowed slugs to slide under the covering. They were installed in September, 1950.

The Pile Department assumed responsibility for the operation of the Low Intensity Training Reactor on March 5 and used most of the month for training personnel. About two weeks of the month were devoted to removing wooden plugs from the horizontal and vertical beam holes. These plugs had swollen due to absorption of moisture

II. Pile Operations: - (Continued)

and some had to be burned out with hot irons. The plugs on the east side were badly damaged on the ends by radiation. This was expected since the ends of these holes are very close to the fuel. Those on the west side are not so close to fuel and the radiation damage on the wooden plugs was less due in part to the lower fast neutron flux.

Tentative plans have been made for an additional one foot of extra concrete block to provide enough shielding so that the LITR can be operated at a power above one megawatt. Special heavy blocks with a density of about 3.5 will be used to get the maximum possible effect. This work will, however, be deferred until the LITR is operating routinely at a megawatt.

After the wooden plugs were removed and graphite-sheathed aluminum plugs substituted, the LITR was operated continuously for three days at a power of about a megawatt. The purpose of the run was to determine what problems might be encountered in steady operation. No major failures of equipment occurred, although a number of the instruments had to be repaired or adjusted from time to time. The power calculated on the basis of heat removed by the water from the reactor tank was approximately 700 KW. This neglects the heat losses into the shield.

After three days' operation, the beta activity in the water in the reactor cooling system had risen to about 6,000 beta counts/minute/milliliter. The radiation from the reactor tank and cooling water lines, however, was due mostly to nitrogen 16 which was not included in the above figure because of its short half-life. It is still

II. Pile Operations: - (Continued)

not definitely determined whether it will be necessary to purge part of the cooling water or whether it will be possible to operate without purging.

III. Fan House:

The clearances and alignment of the rotor in the No. 3 fan were checked on March 19, 1951. This was done at the suggestion of the manufacturer of the fan, since in some installations the fan rotor had settled enough to reduce the clearance between the rotor and the housing to a dangerous value. It was found that the clearances had not changed. The alignment was also satisfactory. On the following Monday, March 26, the fan bearings were inspected and found to be in good condition.

The new Allis-Chalmers motor will be installed in the early part of April, 1951.

On March 25, an insulation failure occurred in the No. 2 fan cubicle. Fortunately, this was discovered before much damage was done and was repaired immediately.

IV. Filter House

The following table compares the pressure drop across the exit air filters last month with this month, and that experienced when all filters were clean:

Date	Glass Wool (In. w.g.)	CWS #6 (In. w.g.)	Total Across House
3-31-51	2.6	4.0	8.0
2-28-51	2.4	3.8	7.6
Clean Filters	1.1	1.0	3.3

Most of the increase occurred after replacement of the inlet filters, which increased the air flow about 300 pounds per minute.

V. Radioisotopes:

The following table is a comparison of the radioisotope and research samples into the pile during March, 1951, with those handled in February, 1951:

	MARCH, 1951		FEBRUARY, 1951	
	Research	Radioisotopes	Research	Radioisotopes
Stringers 13, 14, and 16	9	185	6	230
Hole 22 (Pneumatic Tube)	64	6	51	2
All Other Holes	7	19	4	22
TOTAL BY GROUPS	61	254	80	210
TOTAL FOR MONTH	315		290	

At the end of March, 1951, there were 386 cans of target material in Stringers 13, 14, and 16, compared to 414 cans of target material in these stringers at the end of February, 1951.

VI. Water Demineralization Building:

The operation of the building was normal with 698,760 gallons of water being demineralized of which 49,820 gallons were also deaerated.

Produced (Gallons)	March, 1951	February, 1951	Year-to-Date
Demineralized	698,760	641,460	1,925,060
Deaerated	49,820	114,420	164,240

B. CHEMICAL SEPARATIONS AND RADIOISOTOPE DEVELOPMENT DEPARTMENTS

I. Radioisotopes:

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

Fifty-nine ORNL slugs were processed and 34,947 millicuries were shipped; all products were within specifications.

Lower than usual yields were experienced on most of the runs this month. A great part of this lower yield is due to a shorter than usual exposure time in the pile, which is a result of pushing and processing more slugs per week to meet an increased customer demand; another row in the pile was assigned recently to I^{131} production to alleviate this condition. Other reasons for the lower yield are not known; the runs appeared normal throughout, except for the activity.

Iodine Development Work

A design schedule for this project has been established. For the past two weeks, the design group has spent about three-fourths of its time on these problems. The equipment flow sheet is about one-half finished. Glassware for experimental work has been designed. The heat transfer coefficient for the dissolver was determined to be 560 Btu/ft. hr° F from tests on equipment in Building 3515. Experimental work for the condenser heat transfer coefficient was completed, but results have not yet been calculated.

A study of an ORNL weld in a specimen of 347 stainless steel 20% clad steel plate is being made. Various corrosive decontaminating agents are being used. We are contemplating using this material in a dual role as liners for the cubicles, as well as forms for the concrete. It appears that clad steel will prove more economical than 100% stainless steel plate.

I. Radioisotopes: - (Continued)

1. Iodine Development Work

The general fission products recovery equipment design and process chemistry will be carried along with work on I^{131}. However, emphasis will be on finishing the I^{131} design as soon as possible because the present I^{131} plant is now operating at several times design capacity.

Excavation for the installation of the 1,000-gallon, metal-waste holdup tank and piping is well along.

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

Twelve 2,000-gram cans of irradiated sulfur were processed and 8,148 millicuries were shipped; all products were within specifications.

Filling and testing of the new sulfur irradiation containers were begun. The new type of container differs from the old one in that it is round and has a different construction for handling and filling. Advantages of this container are that it is cheaper to build, easier to fill with sulfur, and holds approximately 2,500 grams as compared to 2,000 grams in the old container, while occupying the same space in the pile. Use of these containers in the pile will begin during the early part of next month.

Phosphorus Development Work

Fifty of the new cylindrical X-10 sulfur cans were fabricated. Preliminary tests using 2,700 grams of sulfur indicated that this quantity is excessive and that the seals were faulty. The caps were redesigned and the amount of sulfur was reduced to 2,500 grams. Tests of five cans at 140° C. revealed no leakage. This final design has been accepted.

I. Radioisotopes: - (Continued)

2. Phosphorus Development Work

A program to study the purification of sulfur has been started. Two thousand grams of sulfur were digested with twenty grams of MgO for sixteen hours and filtered. A sample of the filtrate was placed in a Carius tube with ten milliliters of 0.2 H HNO_3 and heated in an oven at 140° C. for twelve hours. A control sample of unpurified sulfur was heated in the same manner. The acid supernate of these samples will be analyzed for Mg and heavy metals.

Glassware was designed and fabricated for use in determining the pressure developed by the reaction of organic impurities with sulfur. This simple test may serve as an analytical control on the quality of the sulfur to be used as target material.

Two phosphorus products were produced from Hanford-irradiated P_2O_5. The analyses are as follows:

	#1	#2
Total P^{32}	499 mc	681 mc
Concentration	4.99 mc/ml	6.81 mc/ml
Specific Activity	0.81 mc/mg P	0.82 mc/mg P
Acidity	0.491 N (H_3PO_4)	0.656 N (H_3PO_4)
H. M.	<10 ppm	<10 ppm

Two carrier-free phosphorus products were produced with the following analyses:

	#1	#2
Total P^{32}	148.4 mc	169 mc
Concentration	1.06 mc/ml	1.41 mc/ml
Acidity	0.053 N (HCl)	0.05 N (HCl)
H. M.	<10 ppm	<10 ppm
Total Solids	0.5 mg/ml	0.0 mg/ml

I. Radioisotopes: - (Continued)

3. Carbon (C^{14} - 5700y)

There were 843 millicuries of C^{14} in the form of $BaCO_3$ on hand at the end of the month. The isotopic ratio varied from 0.1 to 0.25.

Carbon Development Work

A total of seventy-one slugs of beryllium nitride was processed to produce 2,968.2 millicuries of C^{14}. The millicuries of C^{14} ranged from 14.6 to 53.0 millicuries per slug for the old slugs (average, 30 mc per slug). The new slugs which were processed gave an average of ninety millicuries per slug, according to present analysis. There is some question about part of this analysis and it is being rechecked.

The outlet ion chamber showed quite a high reading when the apparatus was first checked. To check on the amount of activity lost, a furnace and scrubber were attached to end of line and the activity from twenty slugs was collected. The total activity was 3.7 millicuries. Since this check was made, the gas flow through the copper oxide furnace has been reversed, and this reduced the reading of the outlet ion chamber by fifty percent. Apparently, the loss of C^{14} is now very low. However, a new furnace is being made to heat a one-and-a-half-inch quartz tube. While the run was being made from slugs recently received from Hanford, a scrubber was inserted between the dissolver and the copper oxide furnace. In this scrubber, some carbonate was collected and also some cyanide. The cyanide was volatilized with acid as HCN

I. Radioisotopes: - (Continued)

3. Carbon Development Work

and collected in a $AgNO_3$ scrubber as silver cyanide. The assay on this precipitate is not completed but the filter paper, while still wet, read 200 mr/hr near contact with a thin-shelled Cutie Pie.

Processing the new slugs directed attention to the gamma radiation coming from these slugs. As a result, more shielding has been installed and the equipment for recovery of beryllium from waste will be completed as soon as possible.

Some effort has been made to establish time necessary for completion of a run. It is rather variable, but up to the point of beginning the hydrogen peroxide addition, six or seven hours are required. The next run will be made in such a manner that during the long sweeping time the gas will be directed through a fresh scrubber. This will enable us to establish a time (or a point on the activity indicator) beyond which it will not be profitable to go.

Because of the time required for production work, no further research on beryllium recovery was possible this month.

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

The carrier-free sulfur product reported last month had the following analysis:

Total S^{35}	6600 mc
Concentration	44.0 mc/ml
$SO_4^{=}$	0.0 mg/ml
Total Solids	0.0 mg/ml
Acidity	0.014 N (HCl)

I. Radioisotopes: - (Continued)

5. Chalk River Waste Separations

The jet at W-15 was repiped to permit test transfers of waste to the crystallizer in Building 3515. Painting of cell interior, equipment, and gallery interior was completed. Liquid-level indicators for glass-lined column and ruthenium evaporator were installed. Instrumentation of the crystallizer was tested and repaired. Vacuum trap and sampler shields were installed. The hoist monorail was relocated. Fabrication of glassware is about seventy-five percent complete.

Test runs were not started as planned on April 1 because of the priority of other work.

6. Fission Products

Repair work was completed on the fission product equipment in Building 3026. A hot run using UNH from the iodine dissolver was made to recover crude fractions of Zr-Nb, rare earths, and Ba-Sr. Approximately two curies of mixed fission product solution was prepared in the new TBP-CCl_4 batch solvent extractor which was recently installed in this cell. The Pu content of the mixed fission products was within specifications. Sufficient mixed fission product solution is now on hand to take care of all outstanding orders. All equipment worked very well during this run. The crude rare earth, Zr-Nb, and Ba-Sr fractions are now in process of final purification.

A strontium 90 purification run of five curies was made.

7. Fission Product Purification Cell, Building 3028

Very little was done on this project during the month. The stainless steel floor tray on the third level was secured to the grating beneath to reduce buckling and attendant noises. The

I. Radioisotopes: - (Continued)

7. Fission Product Purification Cell, Building 3028

stair railing near the cell opening was removed for accessibility to cell interior. Requested but unfinished work will be accomplished when the exhaust duct is installed. Material for this duct was received last week.

8. Thallium (Tl^{204} - 3y)

The thallium product reported last month had the following analysis:

Total Tl^{204}	69 mc
Concentration	0.46 mc/ml
Specific Activity	12.0 mc/gm
Acidity	0.0438 N (HNO_3)

9. Chromium (Cr^{51} - 26.5d)

The chromium products reported last month had the following analysis:

	#1	#2
Total Cr^{51}	360 mc	405 mc
Concentration	4.05 mc/ml	4.05 mc/ml
Specific Activity	378 mc/gm	378 mc/gm
Cr	10.6 mg/ml	10.6 mg/ml
Acidity	1.31 N (HCl)	0.32 N (HCl)

Two chromium products were produced from a Hanford-irradiated unit. The unit contained Cr_2O_3 which was enriched in Cr^{50}. The analysis is as follows:

	#1	#2
Total Cr^{51}	96.6 mc	4.55 mc
Concentration	0.77 mc/ml	0.091 mc/ml
Specific Activity	4160 mc/gm	*2936 mc/gm
Acidity	0.0219 N (HCl)	0.095 N (HCl)
Ni^{63}	0.2%	0.2%
Cr	0.185 mg/ml	0.031 mg/ml

*The disparity in specific activity is probably due to analytical error in attempting to measure the low concentrations of chromium.

I. Radioisotopes: - (Continued)

10. Cobalt (Co^{60} - 5.3y)

Cobalt solution was made up with the following analysis:

Total Co^{60}----------260 mc
Concentration----------2.08 mc/ml
Specific Activity----------1325 mc/gm
Acidity----------0.1896 N (HCl)

11. Argon (A^{37} - 34.1d)

Several changes were made in the argon system so that it could be operated more easily. A filter was placed in the tube leading from the dissolver to isolate the $CaCO_3$ from the rest of the system. A new drying trap was designed that could be readily removed for cleaning and filling.

12. Miscellaneous Work

a. Source Preparations

(1) Co^{60} sources were loaded in special holders as follows:

Penn Steel Castings Company----------1 source, 1 C
Pipeline Maintenance Corporation-------8 sources, 1 C each
Bell Telephone Laboratory----------1 source, 400 mc
National Bureau of Standards----------1 source, 10 C
Nat'l Advisory Comm. for Aeronautics---1 source, 1 C
A. O. Smith Corporation----------1 source, 3 C
C&CCC, K-25----------1 source, 3 C
Office of Civil Defense, Lincoln,Nebr.-4 sources, 3-100 mc,1-200 mc
Babcock & Wilcox Company----------7 sources, 500 mc each
Navy Research Laboratory----------1 source, 200 mc
National Bureau of Standards----------1 source, 100 mc
University of Wyoming----------6 sources, 100 mc each
X-Ray Engineering Company----------8 sources, 1 C each

(2) Sr^{90} sources were prepared as follows:

Los Alamos----------2 sources, 1 C each
Brookhaven National Laboratory---------1 source, 1 C

(3) A Ru^{106} source was prepared as follows:

Dr. W. Myers----------1 source, 3 mc, on copper backing.

I. Radioisotopes: - (Continued)

12. Miscellaneous Work

b. Packaging

Tritium was packaged for shipment as follows:

(1) Yale University, 1 package, 2.63 curies

(2) Tracerlab, Inc., 4 packages, one 2.63 curies, three 10 mc

(3) Radiation Lab., University of California, 1 package, 2.63 curies.

c. Services

(1) Sixty phosphorus plaques were made for irradiation.

(2) A neutron source was loaded for the Bulk Shielding Facility.

(3) A tin sample enriched Sn^{118} was put into solution for a special order.

d. Gas Analysis

Most of the layout sketch was completed on a gas analysis system for the complete analysis of most of the gases that will be encountered. An addition to this system for fractionating gases from low-temperature hydroxyapatite column will be made.

e. Maintenance

The C.W.S. No. 6 paper filters were changed in the building 3026 cell exhaust system, but no change of the glass wool filters was necessary. The pressure drops in inches of water across the system before and after changing were as follows:

	Glass Wool Filters	C.W.S. Paper Filters	Drop Across Both Filters
Before changing	0.7	6.0	6.7
After changing	1.3	1.8	3.0

I. Radioisotopes: - (Continued)

12. Miscellaneous Work

e. Maintenance

Before changing the filters, the pressure in cell A, Building 3026, had fallen to minus 1/4" of water; after changing, the pressure in this cell was adjusted to minus 1" of water.

The overload heaters on the 125 hp motor driving the building 3026 cell and hood exhaust fan tripped several times during the month, apparently from defective heaters; new heaters have been ordered and are to be installed as soon as received.

The space between the bottom of the radioisotope storage barricade and the floor was closed with 8" concrete block to lower the radiation background in the parking area. Also, the radiocobalt pellets in storage were moved into the heavy lead storage shield in the storage barricade. During moving of the radiocobalt, the pellets were monitored and inventoried.

A new section of acid resistant concrete floor was poured in the decontamination building; the old floor was badly pitted and cracked.

f. Shipping Regulations

The airlines raised their limit levels of radiation at the surface of packages for shipment from 15 mr/hr to 200 mr/hr; shipments are now limited by the number of units (one unit is defined as one mr/hr at one meter from the center of the package) per plane and varies with the airline from 10 units to 40 units per plane. As a result of this, the shipping weight of gamma emitters has been greatly reduced, and the proportion of

I. Radioisotopes: - (Continued)

12. Miscellaneous Work

f. Shipping Regulations

non-returnable carriers used has been increased from approximately 50% to approximately 80% of all carriers shipped.

II. Tank Farm

1. General

a. The three new waste tanks for Building 3026 have been installed in the northeast corner of the South Tank Farm. The tie-ins and backfilling have not yet been completed.

b. All the old wooden poles were removed from the North Tank Farm and replaced with steel poles.

c. New flood lights were installed in the North Tank Farm.

d. An additional 13,200 gallons of metal waste slurry was pumped from W-7 to W-10 in preparation for metal recovery. This transfer was accomplished with the electric pump, which previously failed, by making several changes in the operating procedure.

2. Wastes Discharged to White Oak Creek

Approximately 5.02 curies of beta activity were discharged from the Settling Basin this month.

ACTIVITY DISCHARGED TO WHITE OAK CREEK

	MARCH, 1951		FEBRUARY, 1951	
Discharged From	Gallons	Beta Curies	Gallons	Beta Curies
Settling Basin	21,209,000	5.02*	17,954,000	5.07
Retention Pond	630,513	0.10	542,881	0.14
TOTAL		5.12		5.21
* Contributed by Evaporator		0.05		0.04

II. Tank Farm: - (Continued)

3. Chemical Waste Evaporator

Operation was normal during most of the month. An average decontamination factor of 12,156 was obtained.

The conductivity probe in the effluent stream of the evaporator was changed because it was suspected that the readings were too low to be correct. However, after the new installation, approximately the same readings were obtained as with the old probe.

WASTE EVAPORATOR OPERATION

Gallons Fed to Evaporator	Gallons of Concentrate to W-6	Volume Reduction	Beta Curies to Evaporator	Beta Curies to Settling Basin
MAR. - 181,228	23,420	6.7:1	610.61	0.05
FEB. - 175,463	18,903	8.3:1	317.91	0.04

4. Waste Tank Inventory

Tanks	Gallons Capacity	Gallons In	Gallons Out	Discharged To	Free Space
HOT PILOT PLANT STORAGE					
W-3,13,14,15	48,500	1,036	140	Bldg. 3026	8,422
CHEMICAL WASTE STORAGE					
W-5	170,000	195,628	181,228	Evaporator	56,400
EVAPORATOR CONCENTRATE STORAGE					
W-6, 8	340,000	24,000	10,800	Evaporator	79,200
METAL WASTE STORAGE					
W-4,7,9,10	543,000	23,600	9,600	----	235,688

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

Assembly and tie-in of the #200 resin column equipment was completed on the last day of the month. The first "hot" run (50-curie shipment) is scheduled to start on April 2, 1951, and to be shipped on April 5, 1951, as requested by Los Alamos.

Eight dummy runs were made to test the new equipment and to evaluate the new operating procedures. Seven runs were made while the equipment was above ground and one after it was connected below floor level. Two runs were processed completely from the uranium dissolving step through the product evaporation. These runs proved to be extremely valuable in showing many pieces of faulty equipment and needed changes in operating procedures.

Further drying tests were made in the loading cubicles. It was found that with the outlet air temperature at 450° C and an airflow of approximately 5 C.F.M. the product could be dried in seven hours.

Upon receipt of the Los Alamos carrier and cone, the product loading cubicle equipment was aligned and put in operating condition.

The new 347 stainless steel sintered media process filters were received, installed and tested. These operated very satisfactorily through two dummy runs.

The second resin cubicle is now being constructed and is expected to be ready for shakedown runs on April 13, 1951.

Phoenix carrier #4 was completed and shipped to Hanford.

Engineering design drawings have been completed for the 148-slug "Tucson" carrier which may be used if 30,000-curie runs are attempted. The approval for this project, however, has not yet been received from the Atomic Energy Commission.

C. RADIOISOTOPE CONTROL DEPARTMENT

I. General

During March, 1951, there were 857 radioisotope shipments, compared with 793 during February, 1951, and 662 during March, 1950.

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

	March 1951	February 1951	March 1950	August, 1946, to March, 1951, inclusive
Separated Material 706-D Area	628	598	476	16,739
Unseparated Material 100 Area	229	195	186	5,174
TOTAL SHIPMENTS	857	793	662	21,913

The breakdown of shipments according to non-project, project, and foreign shipments is as follows:

	March 1951	February 1951	March 1950
Non-Project	678	621	525
Project	163	155	120
Foreign	16	17	17
	857	793	662

II. Hanford Irradiations:

The following radioisotope samples were received from Hanford during March, 1951.

Sample No.	Material	Date Discharged	Date Received
ORNL-29	P 32 (3 pcs.)	1-6-51 (1) 2-19-51 (2)	3-12-51
ORNL-28	Fe (1 pc.)	1-24-51	3-12-51
ORNL-81	Zn (1 pc.)	1-6-51	3-12-51
ORNL-13	Be Nitride (190 pcs.)	2-7-51 (128 pcs.) 2-14-51 (62 pcs.)	

II. Hanford Irradiations - (Continued)

Sample No.	Material	Date Discharged	Date Received
ORNL-127	Iridium 192 (1 pc.)	March 1951	3-20-51
ORNL-129	Calcium (1 pc.)	March 1951	3-20-51
ORNL-60	KCl (3 pcs.)	March 1951	3-20-51
ORNL-28	Fe (1 pc.)	March 1951	3-20-51
ORNL-29	P 32 (1 pc.)	March 1951	3-20-51
ORNL-85	Selenium (1 pc.)	March 1951	3-20-51

III. Cyclotron Radioisotopes:

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

Material	Amount	Status
Be 7	5 mc	Material has been requested.
Mn 54	6.5 mc	Material in process.

BOMBARDMENTS RECEIVED

	M. I. T.		U. of CALIF.		U. of PITTSBURGH		WASHINGTON U.	
	Bombard-ments	Beam Hours	Bombard-ments	Beam Hours	Bombard-ments	Beam Hours	Bombard-ments	Beam Hours
Be 7					8	235.00		
Na 22	1	109.75			5	201.75	4	300.00
Mn 52					2	20.00		
Mn 54							3	150.00
Co 57							2	50.00
Fe 59			5	255.6				
Zn 65	1	100.00						
Sr 85	1	51.75			1	10.00		
As 73					1	10.00		
I 125							2	60.00
Molybdenum Metal					1	13.00	3	30.00
Sulfur					1	2.00		
TOTAL RECEIVED	3	261.50	5	255.6	19	491.75	14	590.00

III. Cyclotron Radioisotopes - (Continued)

REQUESTED BUT NOT RECEIVED

	M. I. T.		U. of CALIF.		U. of PITTSBURGH		WASHINGTON U.	
	Bombard-ments	Beam Hours	Bombard-ments	Beam Hours	Bombard-ments	Beam Hours	Bombard-ments	Beam Hours
Be 7					1	50.00		
Zn 65			1	40.00				
Co 56-57							1	50.00
Sr 85	1	8.00						
TOTAL HOURS OUTSTANDING (Not Received or Requested)		480.50		454.40		208.25		110.00

SHIPMENTS OF CYCLOTRON-PROCESSED RADIOISOTOPES

Material	No. Shipments March, 1951	No. Millicuries March, 1951	No. Millicuries To Date
Be 7	1	2.	166.073
Na 22	4	1.700	37.053
Mn 52			9.991
Co 57			2.
Fe 59			1.5 mc and 1 S.I.
Zn 65			6.5
Mn 54			.92
Fe 55-59			1.0
As 73			.650
Sr 85			6.0

IV. Activation Analyses:

A representative of the Reynolds Metal Company, Sheffield, Alabama, visited the Laboratory to discuss their seven aluminum samples now being run by ORNL personnel.

M. E. Ramsey

M. E. Ramsey, Superintendent
Operations Division

jml

NOTE: Correction in report for month of February 1951:
Arsenic (As^{73} - 90d) (Cyclotron)
The specific activity should have read: As^{73} - 309 mc/g As
As^{74} - 297 mc/g As.

V. S-F Material Control:

1. Fabrication of discs for the ANP program continued. During the month, 1,076 discs were shipped to Y-12, representing 6.3 Kgs. of 90-95% enriched uranium. This raises the total number of discs shipped to date to 3,763, representing 40.43 Kgs of 90-95% enriched uranium. In addition, 8.06 Kgs. of scrap were returned to production channels for reprocessing.

2. Two Hanford express cars were received during the month. The first car arrived on March 12, containing 1 irradiated slug for slicing into wafers for Schenectady, 6 pots containing irradiated material for radioisotope separation, and 32 boxes for Y-12. The second car arrived on March 20 and contained 2 Phoenix carriers loaded with 38 slugs for Sr^{90} extraction, 5 monsters loaded with 140 irradiated slugs for Purex Pilot Plant operation, and 5 pots loaded with material for radioisotope separations.

3. Fifteen shipments of normal uranium, TBP feed solutions, were received from Mallinckrodt Chemical Works, St. Louis Area, during March. These shipments are mentioned because they created a considerable burden on the SF office in identifying and associating batches with information shown on transfer documents. In some cases, material was delivered directly to the person to whom it was consigned and as much as two weeks elapsed before the SF office was informed of the receipts. The ORO SF accountability office has been informed of this and it was requested that they contact Mallinckrodt for the purpose of effecting closer coordination on shipments of this kind. Toward the end of the month, improvement was reflected.

V. S-F Material Control: - (Continued)

4. The Metallurgy Division's Thorium Research Program continues to require additional thorium. During March, four billets weighing 39 Kgs. were received. Continual rise in thorium inventory is presenting somewhat of a problem, particularly regarding scrap from grinding, extrusion, machining, etc., regarding storage and/or disposition. Apparently the AEC does not have facilities available to effect recovery of thorium scrap. (Ref: letter from J. H. Roberson to C. E. Larson, dated 12-5-50, Subj: Return of Thorium Scrap to Production Channels.) This situation has not yet reached a critical stage; however, it is mentioned in order that those concerned may consider the potentials of this developing problem.

5. The SF Office continued its program of surveying material balance areas within the Laboratory. During the month, nine persons possessing SF material were visited and their material inspected and weighed where feasible. No apparent discrepancies were encountered.

6. Records of three analytical laboratories were audited during the month. Results of the audit disclosed that all records were in good order and proper accounting had been made for samples.

7. During March, there were thirty-three shipments received and seventeen shipments made, compared with twenty-two receipts and twenty-four shipments last month.

8. The quarterly radium inventory report was compiled and submitted during March.

V. S-F Material Control: - (Continued)

9. Following is a summary of receipts and shipments of SF material for the month of March, 1951:

RECEIPTS

From	Material	Content
Argonne National Lab.	Normal uranium (U/Zr rods)	18,760.00 gm
Argonne National Lab.	Normal uranium (wastes)	2,920.00 gm
Argonne National Lab.	Depleted uranium (wastes)	7,200.00 gm
Argonne National Lab.	Pu (wastes)	1.03 gm
Batelle Memorial Institute	Normal uranium (U ores)	290.00 gm
Batelle Memorial Institute	Thorium metal	310.00 gm
University of Calif. Rad. Lab.	U-233	7.98 gm
C&CCC, K-25 Area	Depleted uranium (waste)	2,517.00 gm
C&CCC, K-25 Area	Normal uranium (UF_4)	1,719.00 gm
C&CCC, Y-12 Area	Normal uranium (tube)	270.00 gm
C&CCC, Y-12 Area	Thorium metal (tubes)	504.00 gm
C&CCC, Y-12 Area	Normal uranium (UNH)	590,088.50 gm
C&CCC, Y-12 Area	Normal uranium (USO_4)	5,023.30 gm
C&CCC, Y-12 Area	Normal uranium (USO_4)	263.70 gm
C&CCC, Y-12 Area	Normal uranium (UO_2)	479.00 gm
General Electric Co. (HGE)	Depleted uranium (in slug)	1,778.07 gm
General Electric Co. (HGE)	Pu (in slug)	1.00 gm
General Electric Co. (HGE)	Thorium metal (in slug)	65,861.27 gm
General Electric Co. (HGE)	Depleted uranium (in slugs)	134,272.00 gm
General Electric Co. (HGE)	Pu (in slugs)	66.00 gm
General Electric Co. (HGE)	Depleted uranium (in slugs)	248,930.00 gm
General Electric Co. (HGE)	Pu (in slugs)	103.00 gm
Iowa State College	Thorium metal (billets)	39,140.00 gm
Mallinckrodt Chemical Works (15 shipments received)	Normal uranium	51,754.63 gm
U.S. AEC, Tonowanda Sub-office	Normal uranium (rods)	192,276.80 gm

V. S-F Material Control: - (Continued)

9. Summary of receipts and shipments for March, 1951:

SHIPMENTS

To	Material	Content
U.S. AEC, Oak Ridge Operations	Normal uranium (UNH)	63.60 gm
C&CCC, Y-12 Area	Enriched uranium (ANP scrap)	2,479.97 gm
C&CCC, Y-12 Area	Enriched uranium (ANP discs)	3,757.08 gm
C&CCC, Y-12 Area	Enriched uranium (ANP scrap)	1,463.13 gm
C&CCC, Y-12 Area	Normal uranium (UNH solutions)	0.39 gm
C&CCC, Y-12 Area	Normal uranium (rod)	210.85 gm
C&CCC, Y-12 Area	Enriched uranium (bulk shielding)	193.74 gm
C&CCC, Y-12 Area	Enriched uranium (bulk shielding)	0.86 gm
C&CCC, Y-12 Area	Normal uranium (W-slug)	1,778.07 gm
C&CCC, Y-12 Area	Enriched uranium (ANP discs)	2,577.10 gm
C&CCC, Y-12 Area	Enriched uranium (ANP scrap)	3,604.25 gm
C&CCC, Y-12 Area	Normal uranium (300 X slugs)	349,800.00 gm
C&CCC, Y-12 Area	Pu	0.07 ugs
Fairchild Engine & Airplane Corp.	Normal uranium (beta stds.)	1.00 gm
General Electric Co. (KAPL)	Enriched uranium (ANP foils)	3.04 gm
Tracerlab, Inc.	Normal uranium (U_3O_8)	0.44 gm
Tracerlab, Inc.	Normal uranium (U_3O_8)	0.45 gm