[redacted]

ORNL-1654
Progress

DECLASSIFIED

Classification Changed To:
By Authority Of:
By:

LABORATORY RECORDS 1954

OPERATIONS DIVISION MONTHLY REPORT

FOR

MONTH ENDING NOVEMBER 30, 1953

AEC RESEARCH AND DEVELOPMENT REPORT

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

[redacted]

[redacted]

ORNL-1654

This document consists of 20 pages.

Copy 3 of 51 copies. Series A.

Contract No. W-7405-eng-26

OPERATIONS DIVISION MONTHLY REPORT

for

Month Ending November 30, 1953

by
A. F. Rupp

DATE ISSUED

JAN 15 1954

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

[redacted]

[redacted]

ORNL-1654
Progress

INTERNAL DISTRIBUTION

1. C. E. Center
2. Biology Library
3-4. Central Research Library
5-7. Laboratory Records Department
8. Laboratory Records Department, ORNL R.C.
9. C. E. Larson
10. P. C. Aebersold
11. E. A. Bagley
12. E. E. Beauchamp
13. G. E. Boyd
14. R. B. Briggs
15. D. W. Cardwell
16. G. H. Clewett
17. D. D. Cowen
18. J. A. Cox
19. K. A. Fowler
20. J. H. Gillette
21. C. S. Harrill
22. A. Hollaender
23. H. K. Jackson
24. R. W. Johnson
25. E. M. King
26. C. P. Keim
27. M. T. Kelley
28. T. A. Lincoln
29. R. S. Livingston
30. S. A. Lough
31. K. Z. Morgan
32. E. J. Murphy
33. P. M. Reyling
34. L. P. Riordan
35. A. F. Rupp
36. E. D. Shipley
37. A. H. Snell
38. F. L. Culler
39. H. F. Stringfield
40. C. D. Susano
41. J. A. Swartout
42. A. M. Weinberg
43. C. E. Winters
44. E. J. Witkowski

EXTERNAL DISTRIBUTION

45-48. AEC, Washington
49. Technical Information Service, Oak Ridge
50-51. Hanford Operations Office

[redacted]

[redacted]

CONTENTS

[redacted]

OPERATIONS DIVISION MONTHLY REPORT

SUMMARY

The activities of the Operations Division for the month ending November 30, 1953 are summarized and indexed below:

1. Lost graphite reactor operating time averaged 7.6%, compared with 7.7% for the year to date (p. 2).
2. The LITR down time was 10.6%, compared with 13.5% for the year to date (p. 2).
3. Reactor radiation damage tests on LITR neoprene gasket material indicate that the reactor tank gasket has suffered considerable damage (p. 7).
4. The new iodine plant is 80% complete (p. 9).
5. The absorption of carrier-free I^{131} on metallic silver is being considered as a purification procedure (p. 10).
6. Cesium chloride appears to be a promising compound for use in forming Cs^{137} sources (p. 11).
7. The average molecular weight of Arco fission-product xenon was determined to be 131.76 (p. 11).
8. There were 1044 radioisotope shipments this month, compared with 1060 in October (p. 12).
9. An increased amount of activity was discharged to White Oak Creek because of Rala wastes: 48 curies, compared with 6.3 curies last month (p. 12).
10. Rala run 54 was a failure because of filtration difficulties (p. 14).

REACTOR OPERATIONS

Operating Data

	NOVEMBER 1953	OCTOBER 1953	YEAR TO DATE 1953
ORNL Graphite Reactor			
Reactor power			
Total accumulated (kwhr)	2,471,236	2,587,962	27,759,410
Average kw/operating hr	3,700	3,687	3,752
Average kw/24-hr day	3,432	3,478	3,463
Lost time (%)	7.65	5.65	7.71
Excess reactivity (inhr)	131	139	
Slugs discharged	92	113	1,177
Slugs charged	70	95	1,080
Product made (g)	90.19	94.45	1,013.12
Product discharged (g)	4.26	6.17	35.26
Low-Intensity Test Reactor			
Reactor power			
Total accumulated (kwhr)	1,923,600	1,927,573	13,175,842
Average kw/operating hr	2,988	2,994	1,900
Average kw/24-hr day	2,672	2,591	1,644
Lost time (%)	10.57	13.5	13.47
Position of No. 2 shim rod (in. out)	20.111*	20.382	

*This corresponds to approximately 2.9% excess reactivity.

ORNL Graphite Reactor

There were no slug ruptures during the month. Recently, the uranium metal temperature has been generally below 250°C because the power has not been increased above 3700 kw with the advent of cool weather. The absence of a rupture may be due to the lower metal temperature.

The excess reactivity was quite high during part of November because of the removal of the hole 12 water-cooled facility. An excess reactivity of 200 inhr existed part of the time that this hole was empty. Two poison slugs of cadmium were charged, and a new tube was inserted on November 23 in hole 12 which reduced the excess reactivity to about 130 inhours. A number of gold slugs will be prepared for replacing the cadmium so that Hg^{198} may be produced.

Radioiodine will be produced in several new channels, and the old channels will be left empty so that the excess reactivity will be reduced. If these holes are needed later, they can be recharged.

Operation of the exhaust fans was normal during the month.

The usage of experimental facilities in the ORNL Graphite Reactor is shown in Table 1.

TABLE 1. USAGE OF EXPERIMENTAL FACILITIES – ORNL GRAPHITE REACTOR

HOLE NUMBER AND ORIENTATION	DIMENSIONS (in.)	DIVISION ASSIGNED TO	PERSON IN CHARGE	TYPE OF EXPERIMENT OR USAGE
1, north and south	4 × 4			Regulating rod
2, north and south	4 × 4			Regulating rod
3, north and south	4 × 4	Operations	J. A. Cox	Sulfur exposure for radio-phosphorus production
4, north and south	4 × 4	Operations	J. A. Cox	Miscellaneous exposures of special samples
5, north and south	4 × 4			Shim rod
6, north and south	4 × 4			Shim rod
7, vertical	4 × 4			Safety rod
8, vertical	4 × 4			Safety rod
9, vertical	4 × 4			Safety rod
10, vertical	4 × 4	Solid State	J. H. Crawford	Low-temperature sample-exposure facility (no samples during month)
11, vertical	4 × 4	Operations and Chemical Technology	J. P. McBride	Boron shot safety tube and HRP fuel studies (no samples during month)
12, vertical	4 × 4	Operations	J. A. Cox	General exposures of samples in water-cooled facility
13, north and south	4 × 4	Operations	J. A. Cox	Target exposures for radio-isotopes and research
14, north and south	4 × 4	Operations	J. A. Cox	Target exposures for radio-isotopes and research
15, north and south	4 × 4	Operations	J. A. Cox	Miscellaneous large-sample exposures
16, north and south	4 × 4	Operations	J. A. Cox	Target exposure for radio-isotopes and research
17, north	4 × 4	Unassigned		Empty
17, south	4 × 4	Physics	E. O. Wollan	Neutron polarization
18, north and south	4 × 4	Operations	J. A. Cox	Miscellaneous large-sample exposures
19, north and south	4 × 4	Solid State	O. Sisman	Water-cooled exposure facility
20, north	4 × 4			Graphite temperature thermocouples
20, south	4 × 4	Solid State	J. C. Wilson	Creep of metals (no samples during month)
21, north and south	4 × 4	Operations	J. A. Cox	Sulfur exposure for radio-phosphorus production

TABLE 1 (continued)

HOLE NUMBER AND ORIENTATION	DIMENSIONS (in.)	DIVISION ASSIGNED TO	PERSON IN CHARGE	TYPE OF EXPERIMENT OR USAGE
22, north	4 × 4	Unassigned		Empty
22, south	4 × 4	Operations	J. A. Cox	Two pneumatic tubes for general usage
30	9 × 9	Solid State (G.E.)	L. E. Stanford (G.E.)	Life tests of equipment in radiation (no tests during month)
31	9 × 9			Blocked by one end of air seal H beam across top of graphite
32	9 × 9			Contains chamber for high-power-level trip circuit
33	9 × 9			Contains chamber for high-power-level trip circuit
34	9 × 9			Contains chamber for No. 2 power-level galvanometer
35	9 × 9			Blocked by one end of air seal H beam across top of graphite
36	9 × 9			Contains chamber for high-power-level trip circuit
37	9 × 9	Training School	H. S. Pomerance	Contains chamber for reactor kinetics study
40	9 × 9			Contains chamber for No. 1 power-level galvanometer
41	6-in. dia			Rear wall suction pressure tap; hole into west plenum
42	6-in. dia			Unit pressure differential tap; hole into west plenum
43	6-in. dia			Unused (inaccessible); hole into west plenum
44	6-in. dia			Unused; hole into west plenum
45	6-in. dia			Gas discharge from hole 22 pneumatic tubes; hole into west plenum
46	6-in. dia			Used for viewing west end of graphite with periscope; vertical hole into west plenum

TABLE 1 (continued)

HOLE NUMBER AND ORIENTATION	DIMENSIONS (in.)	DIVISION ASSIGNED TO	PERSON IN CHARGE	TYPE OF EXPERIMENT OR USAGE
47	6-in. dia			Used for viewing west end of graphite with periscope; vertical hole into west plenum
50, north	4 × 4	Solid State	J. H. Crawford	General sample-exposure facility
50, south	4 × 4	Physics	E. O. Wollan	Neutron spectrometer
51, north	4 × 4	Solid State	J. H. Crawford	Water-cooled U^{235} neutron converter
51, south	4 × 4	Physics	C. G. Shull	Neutron spectrometer
52, north	4 × 4	Solid State	J. H. Crawford	Facility for exposing samples at the temperature of liquid nitrogen
53	4 × 4	Solid State (G.E.)	L. E. Stanford (G.E.)	Half-hole for miscellaneous large-sample exposures
54	4 × 4	Solid State (G.E.)	L. E. Stanford (G.E.)	Half-hole for miscellaneous large-sample exposures
55	4 × 4	Solid State (G.E.)	L. E. Stanford (G.E.)	Half-hole for miscellaneous large-sample exposures
56, north	4 × 4	Physics	E. C. Campbell	Fast pneumatic tube
56, south	4 × 4	Physics	H. S. Pomerance	Oscillator for measuring neutron absorption cross sections
57, north	4 × 4	Training School	H. S. Pomerance	General purpose neutron collimator
57, south	4 × 4	Physics	S. Bernstein	Neutron polarization
58, north	4 × 4	Solid State	O. Sisman	Circulating loops for Na and NaK
58, south	4 × 4	Chemistry	H. Levy	Neutron spectrometer
59	4 × 4	Unassigned		Half-hole; blocked by work at hole 17, south
60	4 × 4	Solid State	J. C. Wilson	Half-hole; transferred to Solid State during September 1953 (no samples during month)
61	4 × 4			Half-hole; general large-sample exposures
East animal tunnel				General exposures of large samples to low flux

TABLE 1 (continued)

HOLE NUMBER AND ORIENTATION	DIMENSIONS (in.)	DIVISION ASSIGNED TO	PERSON IN CHARGE	TYPE OF EXPERIMENT OR USAGE
West animal tunnel				General exposures of large samples to low flux
Thermal column		Physics		Used by several groups for low-level neutron flux work
Inclined animal tunnel in thermal column				Exposures of biological specimens
West core hole		Physics	E. P. Blizard	Lid tank for shielding studies
A	1.68-in. dia	Operations	E. E. Beauchamp	Charging-face hole containing 20 small cans of $CaCO_3$
B	1.68-in. dia	Solid State		Charging-face hole; coaxial cable exposure
C	1.68-in. dia	Chemical Technology		Charging-face hole; thorium exposures
D	1.68-in. dia	Chemical Technology		Charging-face hole; uranium exposures
1069	1.5-in. dia	Unassigned		Charging hole containing an aluminum liner; used for general exposure of suitable samples
1768	1.75 in. square	Solid State	R. H. Kernohan	Charging hole containing neutron converter donut; used for general exposures of samples to fast-neutron flux
1867	1.75 in. square	Solid State	R. H. Kernohan	Charging hole containing neutron converter donut; used for general exposures of samples to fast-neutron flux
1968	1.75 in. square	Solid State	R. H. Kernohan	Charging hole containing neutron converter donut; used for general exposures of samples to fast-neutron flux
2079	1.5-in. dia	Operations	J. A. Cox	Charging hole containing pneumatic tube; used for exposure of research and radioisotope samples

TABLE 1 (continued)

HOLE NUMBER AND ORIENTATION	DIMENSIONS (in.)	DIVISION ASSIGNED TO	PERSON IN CHARGE	TYPE OF EXPERIMENT OR USAGE
0857 0880 1484 1853 2857 2880				Charging-face holes containing boron-coated thermopiles for reactor instrumentation
Others				Seven uncharged peripheral holes contain $CaCO_3$ for radioisotope production; 409 uncharged peripheral holes remain unused

Table 2 shows a comparison of the pressure drop across the exit air filters last month with the pressure drop this month and with that experienced with clean filters.

Low-Intensity Test Reactor

The LITR has continued to operate very satisfactorily at 3000 kw, and it has been possible recently to schedule sample and fuel changes so that the top plug is removed only every two weeks instead of every week. Shutdowns are considerably shorter when the top plug does not have to be removed.

On November 25 after a shutdown, the radioactivity of the circulating water increased to about three times the normal value. It was found that several samples had broken and that enough uranium had been exposed to the water to cause a high activity. When the samples were removed, the activity returned to normal.

The fourth shipment of spent fuel elements was sent to Arco, Idaho on November 10.

A sample of neoprene suspended adjacent to one of the neoprene gaskets in the reactor tank was removed and examined. The elongation was less than 1%, indicating considerable radiation damage. This sample was in the reactor for a sufficient time to accumulate about 15% of the total radiation accumulated by the adjacent reactor gasket.

One bid on two mixed-bed demineralizer columns was received, but since it was rather high, additional bids are being solicited. The specifications for the columns have been rewritten in the hope that more suppliers would be induced to submit bids.

A stainless steel liner has been fabricated for the HB-2 hole and should reduce damage to the aluminum walls of the hole.

The usage of experimental facilities in the LITR is indicated in Table 3.

TABLE 2. PRESSURE-DROP DATA

	PRESSURE DROP (in. water gage)		
	Glass Wool	CWS No. 6	Total Across House
11/30/53	2.6	2.8	6.6
10/31/53	2.7	2.9	6.5
Clean filters	1.1	1.3	3.3

TABLE 3. USAGE OF EXPERIMENTAL FACILITIES – LITR

FACILITY NUMBER	TYPE OF FACILITY	DIVISION ASSIGNED TO	PERSON IN CHARGE	TYPE OF EXPERIMENT OR USAGE
HB-1	6-in.-ID beam hole	Physics	E. D. Smith	Chopper-type neutron velocity selector
HB-2	6-in.-ID beam hole	Solid State (G.E.)	D. S. Billington	General exposures of large samples and loops
HB-3	6-in.-ID beam hole	Solid State	J. C. Wilson	Creep of metals
HB-4	6-in.-ID beam hole	Chemistry	G. H. Jenks	
HB-5	6-in.-ID beam hole	Chemistry	H. F. McDuffie	HRP fuel stability and corrosion tests
HB-6	6-in.-ID beam hole	Chemistry	H. F. McDuffie	HRP fuel stability and corrosion tests
HR-1	Pneumatic tube	Operations	J. A. Cox	General short exposures of research and radio-isotope samples
HR-2	Pneumatic tube	Operations	J. A. Cox	General short exposures of research and radio-isotope samples
C-28	Hollow fuel element in core	Solid State	T. H. Blewitt	Exposure of metal crystals to high, fast flux
C-38	Hollow fuel element in core	Solid State	J. B. Trice	Exposure of specimens for flux determination methods
C-42	Hollow Be core piece with access tube from top plug	Solid State (G.E.)	L. E. Stanford (G.E.)	Exposure of miscellaneous small specimens
C-44	Hollow Be core piece with access tube from top plug	Chemistry	H. F. McDuffie	Empty
C-46	Hollow Be core piece with access tube from top plug	Solid State	G. W. Keilholtz	ANP fuel tests
C-48	Hollow Be core piece with access tube from top plug	Solid State	G. W. Keilholtz	ANP fuel tests
C-49	Be core piece with four vertical holes	Operations	J. A. Cox	Exposures of research and radioisotope samples
C-53	Mg tray in core space	Operations	J. A. Cox	Exposures of research and radioisotope samples
C-56	Mg tray in core space	Operations	J. A. Cox	Exposures of research and radioisotope samples

TABLE 3 (continued)

FACILITY NUMBER	TYPE OF FACILITY	DIVISION ASSIGNED TO	PERSON IN CHARGE	TYPE OF EXPERIMENT OR USAGE
V-1	Inclined low-flux hole			Contains boron-coated thermopile for reactor instrumentation
V-2	Inclined low-flux hole	Analytical Chemistry	G. W. Leddicotte	Exposure facility for activation analyses
V-3	Inclined low-flux hole	Unassigned		Empty
V-4	Inclined low-flux hole	Unassigned		Empty

Irradiation Services

Stringers 13, 14, and 16 contained 181 cans of target material at the end of November, as compared with 198 cans of target material at the end of October.

Table 4 shows a comparison of the radioisotope and research samples charged into the ORNL Graphite Reactor during November with those handled in October.

RADIOISOTOPE PRODUCTION

Radioisotope production for the month is given in Tables 5 and 6. No special difficulties were encountered. The yield of I^{131} returned to normal this month, and it is now evident that the low yields experienced last month were caused by poor temperature control resulting from erratic operation of the temperature recorder. Yields improved immediately after the instrument was repaired. Special radioisotope preparations for the month are given below:

Co^{60} sources	1360 curies
A^{37} ampoules	2 mc
Tritium ampoules	410 mc
H^3-Zr targets	8240 mc
H^2-Zr targets	

RADIOISOTOPE DEVELOPMENT WORK

New Iodine-131 Processing Unit, Building 3028

Installation of piping in cell 2 is complete. The calibration of liquid levels in all vessels was completed, and installation of lines from the cells to the panel board is in progress. The instrumentation is now approximately 50% complete; the installation of all equipment is 80% complete.

TABLE 4. RADIOISOTOPE AND RESEARCH SAMPLES

	NOVEMBER 1953		OCTOBER 1953	
	Research	Radioisotopes	Research	Radioisotopes
Stringers 13, 14, 16	13	180	2	164
Hole 22	56	13	37	0
All other holes	13	29	12	38
Total by groups	82	222	51	202
Total for month	304		253	

TABLE 5. PROCESSED RADIOISOTOPE PRODUCTION DURING NOVEMBER

PRODUCT	SOURCE	AMOUNT (mc)	SPECIFIC ACTIVITY (mc/g)
Barium-140 (12.8 d)	Hanford metal	61	c.f.*
Cadmium-115 (43 d)	Hanford irradiation	39	45
Calcium-45 (152 d)	Graphite Reactor irradiation	560	3.8
Cerium-144 (275 d)	Hanford metal	213	c.f.
Indium-114 (50 d)	LITR irradiation	387	466
Iodine-131 (8 d)	Graphite Reactor metal	17,624	c.f.
Iodine-131 (8 d)	Hanford metal	128,400	c.f.
Iron-59 (46.3 d)	LITR irradiation	104	6,100
Mercury-203 (43.5 d)	Hanford irradiation	6,443	745
Nickel-63 (85 y)	Hanford irradiation	228	13.5
Niobium-95 (35 d)	Hanford metal	263	c.f.
Phosphorus-32 (14.3 d)	Graphite Reactor irradiation	15,007	40,000
Ruthenium-103 (42 d)	Hanford metal	220	60,000
Ruthenium-106 (1 y)	Hanford metal	1,857	28,500
Ruthenium-106 (1 y)	Scrup waste	8,760	18,700
Sodium-22 (2.6 y)	University of Pittsburgh cyclotron	24.4	1,877
Sodium-22 (2.6 y)	86-in. cyclotron	4.46	0.44**
Sodium-24 (14.9 h)	LITR irradiation	8,912	3,300
Sulfur-35 (87 d)	Hanford irradiation	1,674	c.f.
Zirconium-95–Niobium-95 (65 d, 35 d)	Hanford metal	9,400	c.f.
Gross fission products	Hanford metal	6,620	

*No added carrier.

**Special run using sodium target.

Purification of Iodine-131

The use of a column containing silver metal packing as a means of concentration and purification of I^{131} is being investigated. The proposed method involves the passing of the I^{131} solution over silver metal surfaces where the iodine is retained, apparently as AgI. Iodine is then eluted from the surface in a relatively small volume of a weak solution of H_2S in water. Tracer runs indicate that there is a high recovery of I^{131} from feed solutions simulating solutions from the evaporator in the normal I^{131} process. Studies are being made to determine (1) the effect of process variables in operating a column packed with silver pellets, including the effects of radiation, (2) the I^{131} losses incurred in sparging the boiling product solution with nitrogen to remove H_2S, (3) the chemical purity of the product made by using this procedure.

A few experiments already made indicate that the take-up of I^{131} on the silver is a rate process, for the highest retention was obtained at the lowest flow rates. Analysis of the product after sparging with nitrogen to remove H_2S indicated that only about 3% of the product was lost.

TABLE 6. UNPROCESSED RADIOISOTOPE PRODUCTION DURING NOVEMBER

PRODUCT	UNITS
Service irradiations	55
Antimony-124	1
Antimony-125	1
Arsenic-76	2
Arsenic-77	1
Barium-131	4
Bromine-82	7
Chlorine-36	1
Chromium-51	1
Copper-64	1
Gold-198	48
Gold-199	1
Hafnium-181	1
Indium-114	1
Iodine-131	4
Molybdenum-99	2
Osmium-191	3
Phosphorus-32	3
Potassium-42	13
Rubidium-86	2
Selenium-75	1
Silver-110	1
Silver-111	2
Sodium-24	28
Strontium-89	1
Zinc-65	1
Zirconium-95	3
Total	189

Cesium-137

Two batches of Cs^{137} were purified successfully in the recently revised purification equipment. Sixty-nine curies was used to replenish radioisotope stocks; the remainder was placed in storage for experimental purposes.

Physical and chemical studies were made for determining the suitability of using CsCl and CsF in fabricating sources instead of the Cs_2SO_4 previously considered. Cesium fluoride is not so attractive as CsCl for this use because of the difficulties in conversion to the fluoride and the corrosion of equipment used in source fabrication. Cesium chloride is being tested to determine its deliquescence, pelletizing characteristics, corrosion effects on various metals, and stability to radiation.

Forty-six curies of pure, dry, fission-product CsCl was placed in a glass container in contact with strips of carefully prepared brass, silver-plated brass, and stainless steel. After several months of exposure, the metal specimens will be removed and examined to observe the corrosion effects on the metal. Inactive CsCl was used to form pellets by hydraulic pressing at 15,000 psi. It was noted that this compound becomes fluid at these high pressures (at least momentarily) and that a dense, glassy-appearing pellet is produced. Preliminary experiments indicate that the CsCl is not deliquescent. Since this result does not confirm data given in the literature, additional data will be obtained.

Krypton-85

Developmental work was started on the separation of stable fission-product xenon and radioactive Kr^{85} (about 10 y half life) from crude Arco dissolver off-gases. The average molecular weight of the stable xenon fraction separated was determined to be 131.76. This agrees fairly well with the theoretical molecular weight (131.37) calculated from fission yields and is within the experimental error of the method used to determine the molecular weight. Some residual radioactivity was found in the xenon fraction, but analysis indicates that this activity is not Kr^{85} or any known xenon radioisotope. Further studies will be made of this activity to identify it and to determine whether it is a previously unknown fission product.

The krypton fraction contains stable krypton, Kr^{85}, and argon; therefore further purification work will be necessary on this fraction. Work is also in progress to establish a counting method to assay the Kr^{85} activity.

Fission-Product Precipitation Process, Building 3515

Two hundred eighty liters of W-20 waste was processed for the recovery of fission products; no operational difficulties were encountered. The removal of large amounts of iron by selective precipitation of $Fe(OH)_3$ by hydrolysis of urea was successful. Various product fractions are being accumulated in recycle tanks within the unit and, to facilitate storage, will be withdrawn only in highly concentrated form in large batches.

Miscellaneous

Among the Co^{60} sources loaded this month was a 1300-curie source for the Air Force. This is a somewhat larger source than should be normally loaded in the present facilities; however, the loading was accomplished with no overexposure.

Several batches of Ru^{106}, totaling 3796 mc, were prepared for the Chemical Technology Division and will be used in Thorex research work.

The transfer of Co^{60} from the reactor canal to the Isotope Area underground storage was continued. Approximately 40% of the stock has now been transferred.

RADIOISOTOPE SALES

Radioisotope shipments made during November 1953 are compared in Table 7 with those made during October 1953 and November 1952. A breakdown according to separated and unseparated material (including totals for August 1946 through November 1953) and for project, nonproject, and foreign shipments is also shown.

RADIOACTIVE-WASTE DISPOSAL

A total of 48.0 curies of beta activity was discharged to White Oak Creek from the settling basin and the retention pond (see Table 8); this discharge is 29% greater than the average for the year to date and was the result of two leaks in the waste lines (in the pit west of Building 3026-C) which carried the wastes from the Rala run. Necessary repairs will be made as soon as the pit is decontaminated sufficiently to allow an adequate amount of working time.

TABLE 7. RADIOISOTOPE SHIPMENTS

	NOVEMBER 1953	OCTOBER 1953	NOVEMBER 1952	AUGUST 1946 THROUGH NOVEMBER 1953
Separated material	807	857	670	39,923
Unseparated material	237	203	165	10,694
Total	1044	1060	835	50,617
Nonproject	943	931	745	
Project	79	105	19	
Foreign	22	24	71	
Total	1044	1060	835	

TABLE 8. ACTIVITY DISCHARGED TO WHITE OAK CREEK

DISCHARGED FROM	NOVEMBER 1953		AVERAGE PER MONTH 1953 TO DATE		AVERAGE PER MONTH 1952	
	Gallons	Beta Curies	Gallons	Beta Curies	Gallons	Beta Curies
Settling basin	16,484,000	47.37	19,738,000	24.63	21,963,000	34.25
Retention pond	338,000	0.61	498,000	12.66	385,000	7.25
Total	16,822,000	47.98	20,236,000	37.29	22,348,000	41.50

The evaporator operated satisfactorily throughout the month, but the evaporation rate was not permitted to exceed 200 gph during the Rala run because of the high activity content of Rala wastes. Significant evaporator operating data are shown in Table 9.

The free space in both the uranium-waste and chemical-waste storage tanks appears to be adequate for current and anticipated Laboratory usage.

MISCELLANEOUS OPERATIONS

Hanford Irradiations

The radioisotope samples listed in Table 10 were received from Hanford on November 10.

Activation Analyses

A total of 138 requests for information concerning activation analyses has been received; 52 have developed into requests for analyses, 42 of which have been completed.

Decontamination

An automatic washing machine and a drier were installed in the decontamination building for the decontamination of rubber and cotton gloves and for plastic shoe covers. The first several days of operation indicated that several thousand dollars may be saved each year in the Operations Division alone by re-using these materials.

Water Demineralization

Demineralized water production was 339,600 gal, compared with 459,000 gal last month.

TABLE 9. WASTE-EVAPORATOR OPERATION

	SOLUTION FED TO EVAPORATOR (gal)	CONCENTRATE PRODUCED (gal)	VOLUME REDUCTION	BETA CURIES IN FEED	BETA CURIES IN CONDENSATE
November 1953	172,100	17,500	9.85:1	15,519	0.62
Average per month 1953 to date	189,126	18,016	10.50:1	12,479	1.76
Average per month 1952	188,180	13,010	14.46:1	18,123	1.98

TABLE 10. RADIOISOTOPES RECEIVED FROM HANFORD

SAMPLE NUMBER	MATERIAL	NUMBER OF PIECES	DATE DISCHARGED
ORNL-81	Zinc	1	10/12/53
ORNL-113	Scandium oxide	4	9/19/53
ORNL-118	Tantalum	1	10/12/53
ORNL-129	Calcium	1	10/12/53
ORNL-149	Mercuric oxide	1	10/12/53
ORNL-150	Zinc	1	10/12/53
ORNL-151	Nickel	1	10/12/53
ORNL-153	Selenium	1	10/12/53
ORNL-156	Cadmium	1	10/12/53
ORNL-157	Calcium carbonate	2	10/12/53
ORNL-166	Tool steels	4	9/16/53
ORNL-167	Ceramic materials	4	9/16/53

RALA

Rala run 54, which was begun on November 4, was unsuccessful because the bulk of the product was lost as a result of equipment failure and continuous processing difficulties, as well as decay; therefore the run was concluded on November 24.

The basic trouble, underlying all others encountered during this run, was the plugging of the process filters. Complete filtration of the sulfate extractions and metatheses was impossible in almost every case, and it became necessary to resort to many changes in the operating procedures, including separations by decantation. Because of frequent unplugging operations on the process filters by the use of air and water under pressure, serious leaks developed in the equipment in the filter cubicle which resulted in very high product losses.

The special procedures followed during this run also resulted in high waste losses. A great deal of time was spent in attempting to recover the product in the wastes, but eventually all these efforts failed. About one half of the product was lost by decay during the extra time spent in processing this run. After 20 days of operating, so little product was left that not even an attempt at a shipment was made; therefore the run was discontinued.

A series of coating-removal and filtration tests is now being made in an effort to establish some process changes which may eliminate a repetition of similar filtration difficulties in the future.

A detailed technical report of this run may be found in a memorandum (ORNL CF-53-12-19) to A. F. Rupp by E. J. Witkowski.

SF MATERIAL CONTROL

Three shipments consisting of 82 drums containing UNH solutions of depleted uranium were made to Carbide and Carbon Chemicals Company, Y-12, during the month. The total uranium content of the 82 drums was 6959 kg. These shipments, numbered 32 through 34, were of uranium recovered under the Metal Recovery Program and make a total of 76,966 kg shipped to date.

A fourth shipment of six, spent, LITR, radioactive fuel elements was made during November to Phillips Petroleum Company, Scoville, Idaho, for recovery.

Two hundred ninety-three grams of U^{233} as $UO_2(NO_3)_2$ solution was shipped to the Los Alamos Scientific Laboratory.

Two carload-lot shipments were received from Hanford. One shipment consisted of 577 irradiated thorium slugs for the Thorex process, and the other was of 276 irradiated uranium slugs for the Rala process.

During November, the SF Accountability Control Office completed and distributed the *SF Procedures Manual for Oak Ridge National Laboratory X-10 Area*, with the exception of Section 4, "Measurement Procedure," which will be issued shortly after the first of next year.

The SF Accountability Control Office completed the report on outstanding isotope control requests, and it will be issued early in December.

One holder of SF material was visited and the material in his possession was checked and weighed; no discrepancies were noted. The records of three analytical laboratories also were audited and found to be in good order.

During November, there were 25 receipts and 27 outgoing shipments, compared with 21 receipts and 29 shipments last month. Tables 11 and 12 are summaries of receipts and shipments for November.

TABLE 11. SF MATERIALS RECEIVED

FROM	MATERIAL	NUMBER OF SHIPMENTS	AMOUNT (g)
Battelle Memorial Institute, BMI	Normal uranium	1	0.07
Brookhaven National Laboratory, BNL	Depleted uranium	2	1,694,000.00
	Plutonium		4.00
Carbide and Carbon Chemicals Co., K-25, CCC	Depleted uranium	1	34.00
Carbide and Carbon Chemicals Co., Y-12, CYT	Enriched uranium	2	92.17
	Normal uranium	7	10,522.00
General Electric Co., HGE	Depleted uranium	1	658,087.00
	Plutonium	1	199.50
	Thorium	1	969,249.84
	U^{233}		1,274.00
Harshaw Chemical Co., MHR	Depleted uranium	3	5,667,000.00
Iowa State College, ISC	Normal uranium	1	146.30
	Thorium	1	1,293.00
Los Alamos Scientific Laboratory, SFC	U^{233}	1	142.10
Phillips Petroleum Co., MTI	Enriched uranium	1	0.07
University of Arkansas	Normal uranium	1	0.27
U.S. Naval Radiological Defense Laboratory, NHP	Normal uranium	1	1.28

TABLE 12. SF MATERIALS SHIPPED

TO	MATERIAL	NUMBER OF SHIPMENTS	AMOUNT (g)
Carbide and Carbon Chemicals Co., Y-12, CYT	Enriched uranium	11	518.54
	Thorium	1	34,428.00
	Normal uranium	3	840.26
	Depleted uranium	4	6,959,185.06
Iowa State College, ISC	Normal uranium	1	146.30
Los Alamos Scientific Laboratory, SFC	U^{233}	1	293.26
North American Aviation, Inc., DNA	Normal uranium	1	20.00
Phillips Petroleum Co., CPI	Enriched uranium	1	660.28
Phillips Petroleum Co., MTI	Enriched uranium	1	0.20
USAEC, Oak Ridge Operations Office, CPA	Normal uranium	1	0.27
U.S. Naval Radiological Defense Laboratory, NHP	Normal uranium	1	0.26
Westinghouse Electric Corp., WEM	Normal uranium	1	539.00