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1954

OPERATIONS DIVISION MONTHLY REPORT

FOR

MONTH ENDING JULY 31, 1953

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OPERATIONS DIVISION MONTHLY REPORT

for

Month Ending July 31, 1953

by

M. E. Ramsey

DATE ISSUED

SEP 15 1953

OAK RIDGE NATIONAL LABORATORY
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OPERATIONS DIVISION MONTHLY REPORT

SUMMARY

The activities of the Operations Division for the month ending July 31, 1953 are summarized and indexed below:

1. Lost graphite reactor operating time averaged 6.7%, compared with 7.9% for June (p. 3).
2. Three ruptured slugs were detected and discharged without difficulty (p. 3).
3. The LITR down time was 7.7%, compared with 10.7% for June (p. 3).
4. Low I^{131} yields were encountered during the month; the reason for the low yield is not yet known (p. 11).
5. The increase in the corrosion rates of types 347 and 309 stainless steel owing to the presence of small amounts of reducing agents in boiling uranyl nitrate solution was measured (p. 11).
6. A total of 21.3 curies of beta activity was discharged to White Oak Creek, compared with 14.9 curies last month (p. 13).
7. A total of approximately 51,000 curies of RaLa was shipped to Los Alamos in two batches from a double run – 53 and 53A (p. 14).
8. Minor repairs to the RaLa equipment are being made (p. 15).
9. There were 948 radioisotope shipments made this month, compared with 1075 during June (p. 17).

REACTOR OPERATIONS DEPARTMENT

OPERATING DATA

	JULY 1953	JUNE 1953	YEAR TO DATE 1953
ORNL Graphite Reactor			
Reactor power			
Total accumulated (kwhr)	2,554,807	2,484,101	17,660,106
Average kw/operating hr	3,680	3,745	3,780
Average kw/24-hr day	3,433	3,450	3,471
Lost time (%)	6.69	7.87	8.19
Excess reactivity (inhr)	75	80	
Slugs discharged	124	159	730
Slugs charged	124	158	673
Product made (g)	93.24	89.84	643.71
Product discharged (g)	5.04	4.90	19.80
Low-Intensity Test Reactor			
Reactor power			
Total accumulated (kwhr)	1,030,422	944,566	6,496,315
Average kw/operating hr	1,500	1,469	1,462
Average kw/24-hr day	1,385	1,312	1,277
Lost time (%)	7.7	10.7	12.7
Position of No. 2 shim rod (in. out)	26.635*	22.429	

*Equivalent to approximately 0.4% excess reactivity.

REACTOR OPERATIONS

ORNL Graphite Reactor

There were three slug ruptures during the month; two were of aluminum-silicon bonded slugs, and one was of a slug not beta transformed. Measurements made by the Metallurgy Division on the slugs discharged, along with those ruptured, showed a jacket growth of as much as $^3/_{16}$ in. in the alpha-phase slugs from channel 1872. Pertinent data on the ruptures are shown in Table 1. Because of the large increase in rupture rate, the maximum metal temperature has been decreased from 300 to 280°C.

The Army Chemical Corps has indicated that the tantalum which has been irradiated in the ORNL graphite reactor since July 1952 cannot be used because of program changes; therefore, whenever more excess reactivity is needed, portions of this material will be discharged and buried.

The hydrogen liquefier operated satisfactorily, and three successful runs were made which produced 6 liters of liquid hydrogen.

The usage of experimental facilities in the ORNL graphite reactor is shown in Table 2.

Low-Intensity Test Reactor

The LITR operated normally during July except for the turbidity of the water system, which should be corrected by means of the large filter that is being installed.

Engineering studies are being made on the increased shielding required to operate at a 3000-kw power level.

The fuel-element carrier was returned from Arco and has been loaded with seven elements. It will be shipped the next time that an escorted shipment

TABLE 1. SLUG RUPTURES DURING JULY

NUMBER	CHANNEL	DATE DISCOVERED	DAYS IN REACTOR	APPROXIMATE TEMPERATURE (°C)	POSITION*	REMARKS
118	1872	7/9/53	464	270	13	From batch 113; was 100% alpha phase
119	1362	7/20/53	455	160	9	From batch 129; was beta transformed
120	0968	7/20/53	245	175	36	From lot 6123, all of which were beta transformed

*Determined by counting from west end of row.

leaves Oak Ridge for Arco, and the carrier will be used on the return trip from Arco to Oak Ridge to carry a specimen desired by the Solid State Division.

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

FILTER HOUSE

Table 4 shows a comparison of the pressure drop across the exit air filters last month with the pressure drop this month and that experienced with clean filters.

FAN HOUSE

Operation was normal during the month except for a solenoid switch in the No. 3 fan that required adjustment on July 6.

RADIOISOTOPES

Stringers 13, 14, and 16 contained 202 cans of target material at the end of July, as compared with 231 cans of target material at the end of June.

Table 5 shows a comparison of the radioisotope and research samples charged into the ORNL graphite reactor during July with those handled in June.

WATER-DEMINERALIZATION PLANT

A comparison of the amount of water demineralized during July and June is given below:

	July 1953	June 1953
Water demineralized (gal)	401,400	372,500

TABLE 2. 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 by 4			Regulating rod
2, north and south	4 by 4			Regulating rod
3, north and south	4 by 4	Operations	J. A. Cox	Sulfur exposure for radio-phosphorus production
4, north and south	4 by 4	Operations	J. A. Cox	Miscellaneous exposures of special samples
5, north and south	4 by 4			Shim rod
6, north and south	4 by 4			Shim rod
7, vertical	4 by 4			Safety rod
8, vertical	4 by 4			Safety rod
9, vertical	4 by 4			Safety rod
10, vertical	4 by 4	Solid State	J. H. Crawford	Low-temperature sample-exposure facility (not yet installed)
11, vertical	4 by 4	Operations and Chemical Technology	J. P. McBride	Boron shot safety tube and HRP fuel studies (no samples during month)
12, vertical	4 by 4	Chemistry	H. F. McDuffie	HRP fuel studies and general exposures
13, north and south	4 by 4	Operations	J. A. Cox	Target exposures for radio-isotopes and research
14, north and south	4 by 4	Operations	J. A. Cox	Target exposures for radio-isotopes and research
15, north	4 by 4	Solid State (G.E.)	L. E. Stanford (G.E.)	Miscellaneous large-sample exposures
15, south	4 by 4	Solid State	J. C. Wilson	Creep of metals
16, north and south	4 by 4	Operations	J. A. Cox	Target exposures for radio-isotopes and research
17, north	4 by 4	Unassigned		Empty
17, south	4 by 4	Physics	E. O. Wollan	Neutron polarization
18, north and south	4 by 4	Analytical Chemistry	G. W. Leddicotte	Empty
19, north and south	4 by 4	Solid State	O. Sisman	Water-cooled exposure facility
20, north	4 by 4			Graphite temperature thermocouples
20, south	4 by 4	Solid State	J. C. Wilson	Creep of metals
21, north and south	4 by 4	Operations	J. A. Cox	Sulfur exposure for radio-phosphorus production
22, north	4 by 4	Unassigned		Empty

TABLE 2 (continued)

HOLE NUMBER AND ORIENTATION	DIMENSIONS (in.)	DIVISION ASSIGNED TO	PERSON IN CHARGE	TYPE OF EXPERIMENT OR USAGE
22, south	4 by 4	Operations	J. A. Cox	Two pneumatic tubes for general usage
30	9 by 9	Solid State (G.E.)	L. E. Stanford (G.E.)	Life tests of equipment in radiation (no tests during month)
31	9 by 9			Blocked by one end of air seal H beam across top of graphite
32	9 by 9			Contains chamber for high-power-level trip circuit
33	9 by 9			Contains chamber for high-power-level trip circuit
34	9 by 9			Contains chamber for No. 2 power-level galvanometer
35	9 by 9			Blocked by one end of air seal H beam across top of graphite
36	9 by 9			Contains chamber for high-power-level trip circuit
37	9 by 9	Training School	H. S. Pomerance	Contains chamber for reactor kinetics study
40	9 by 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
47	6-in. dia			Used for viewing west end of graphite with periscope; vertical hole into west plenum

TABLE 2 (continued)

HOLE NUMBER AND ORIENTATION	DIMENSIONS (in.)	DIVISION ASSIGNED TO	PERSON IN CHARGE	TYPE OF EXPERIMENT OR USAGE
50, north	4 by 4	Solid State	J. H. Crawford	Empty
50, south	4 by 4	Physics	E. O. Wollan	Neutron spectrometer
51, north	4 by 4	Solid State	J. H. Crawford	Water-cooled U^{235} neutron converter
51, south	4 by 4	Physics	C. G. Shull	Neutron spectrometer
52, north	4 by 4	Solid State	J. H. Crawford	Facility for exposing samples at the temperature of liquid nitrogen
53	4 by 4	Solid State (G.E.)	L. E. Stanford (G.E.)	Half-hole for miscellaneous large-sample exposures
54	4 by 4	Solid State (G.E.)	L. E. Stanford (G.E.)	Half-hole for miscellaneous large-sample exposures
55	4 by 4	Solid State (G.E.)	L. E. Stanford (G.E.)	Half-hole for miscellaneous large-sample exposures
56, north	4 by 4	Physics	E. C. Campbell	Fast pneumatic tube
56, south	4 by 4	Physics	H. S. Pomerance	Oscillator for measuring neutron absorption cross sections
57, north	4 by 4	Training School	H. S. Pomerance	General purpose neutron collimator
57, south	4 by 4	Physics	S. Bernstein	Neutron polarization
58, north	4 by 4	Solid State	O. Sisman	Circulating loops of Na and NaK
58, south	4 by 4	Chemistry	H. Levy	Neutron spectrometer
59	4 by 4	Unassigned		Half-hole blocked by work at hole 17, south
60	4 by 4	Chemistry	H. F. McDuffie	Half-hole; empty
61	4 by 4	Biology and Operations		Half-hole used for activation of phosphorus sources and general large-sample exposures
East animal tunnel				General exposures of large samples to low flux
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				Infrequent exposures of biological specimens

TABLE 2 (continued)

HOLE NUMBER AND ORIENTATION	DIMENSIONS (in.)	DIVISION ASSIGNED TO	PERSON IN CHARGE	TYPE OF EXPERIMENT OR USAGE
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	Unassigned		Charging-face hole – empty
C	1.68-in. dia	Unassigned		Charging-face hole – empty
D	1.68-in. dia	Unassigned		Charging-face hole – empty
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
1069	1.5-in. dia	Unassigned		Charging hole containing an aluminum liner; used for general exposure of suitable samples
2079	1.5-in. dia	Transferred from Solid State to Operations during May 1953	J. A. Cox	Charging hole containing pneumatic tube; used for exposure of research and radioisotope samples
0857, 0880, 1484, 1853, 2857, 2880				Charging-face holes containing boron-coated thermopiles for reactor instrumentation
Others				Thirty-four uncharged peripheral holes contain tantalum slugs for the Army; seven uncharged peripheral holes contain $CaCO_3$ for radioisotope production; 375 uncharged peripheral holes remain unused

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. C. 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	H. F. McDuffie	Empty
HB-5	6-in.-ID beam hole	Chemistry	H. F. McDuffie	HRP fuel stability and corrosion tests
HB-6	6-in.-ID beam hole	Transferred from Solid State to Chemistry in May 1953	H. F. McDuffie	Empty
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 (no samples during month)
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; tube developed water leak and has been removed for repairs
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	Empty
C-48	Hollow Be core piece with access tube from top plug	Solid State	G. W. Keilholtz	Empty
C-53	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
C-57	Mg tray in core space	Operations	J. A. Cox	Exposures of research and radioisotope samples
C-59	Be core piece with four vertical holes	Operations	J. A. Cox	Exposures of research and radioisotope samples
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

TABLE 4. PRESSURE-DROP DATA

DATE	PRESSURE DROP (in. water gage)		
	Glass Wool	CWS No. 6	Total Across House
7/31/53	2.4	2.7	6.4
6/30/53	2.4	2.7	6.4
Clean filters	1.1	1.3	3.3

TABLE 5. RADIOISOTOPE AND RESEARCH SAMPLES

	JULY 1953		JUNE 1953	
	Research	Radioisotopes	Research	Radioisotopes
Stringers 13, 14, 16	4	148	4	148
Hole 22	44	6	153	8
All other holes	5	21	3	18
Total by groups	53	175	160	174
Total for month	228		334	

CHEMICAL SEPARATIONS AND RADIOISOTOPE DEVELOPMENT DEPARTMENTS

RADIOISOTOPES

Iodine (I^{131} – 8 d)

One Hanford slug and 36 ORNL slugs were processed this month and yielded 106,400 mc of I^{131}. The Hanford slug run yielded 90,120 mc, which was sufficient to fill the orders received during a three-week period and was the highest yield ever received from a Hanford slug. The 36 ORNL slugs were processed in five runs, all of which gave poor yields. The reason for the low yield is not yet known.

In attempting to free a glass stopcock on the distillation flask in the purification equipment, the head was broken, and this necessitated the installation of a new flask and head. The new head does not fit the flask properly and will be changed as soon as another is available because it is thought that some of the poor yields might possibly be a result of the leakage permitted by the deficient head.

Iodine Development Work, Building 3028

Types 347 and 309 stainless steel were tested for acceleration of corrosion rates in boiling uranyl nitrate solution in the presence of small amounts of added reducing agents, hydroxylamine sulfate and SO_2 gas. The use of these reagents is contemplated in the iodine production process for reduction of iodate formed during the uranium dissolving cycle. With hydroxylamine, the corrosion rate was 44.3 mdd (milligrams per square decimeter per day) for type 309, 150% of normal, and 105.5 mdd for type 347, which is the normal rate. With SO_2 gas, the corrosion rate was 87 mdd for type 309, three times the normal rate, and 188 mdd for type 347, 1.8 times the normal rate. The dissolvers for the iodine plant are made of type 309 stainless steel, therefore the data indicate that reducing agents should be used with caution, if at all. Work continues on methods of reducing iodate in the dissolver solution with minimum effect on the solution or the dissolving equipment.

Phosphorus (P^{32} – 14.3 d)

Twenty 2500-g cans of bombarded sulfur were processed and yielded 14,959 mc of P^{32}. Except for one run in which a high loss was incurred in the glassware purification step when the crude product was put through the first resin bed and the first precipitation steps, all runs were satisfactory. The loss was caused by the formation of a very insoluble hydroxide precipitate, which was possibly caused by cations that leaked through the first resin bed.

In an effort to reduce the precipitate which often occurs in the final product when the pH is adjusted to 7, the products have been changed from hydrochloric acid solutions to nitric acid solutions.

Precipitation Process, Building 3515

Repair work was started in the precipitation process cells and should be finished about the last of September. The services of one pipe fitter have been obtained for approximately full-time work on this job.

Teflon packing removed from valves was found to be almost completely decomposed. Confirmatory radiation-damage tests on Teflon V-ring packing showed severe damage at 3×10^8 r, especially in the presence of water and HNO_3 vapor. The packing was replaced with pure graphite–asbestos fiber packing compounded by the Development Group. The performance of this packing will be observed during the next series of runs.

A sudden increase in the volume of liquid in tank W-20 was traced to a leaking valve in the jet discharge manifold in the waste-metal recovery plant. The valve was replaced and valves are being installed in the transfer lines to tanks W-19 and W-20. The excess liquid in W-20 was jetted to W-12 through a temporary line above ground.

Purification of Rare-Earth Fractions

Tank W-20 rare-earth fractions separated from iron by the oxalate process described last month are being refractionated on the heated ion-exchange columns. This run contains about 48 curies of rare earths, mostly Ce^{144}, and approximately 1 curie of Sr^{90}. It was noted that the Eu^{155} and Pm^{147} peaks are very difficult to detect in the presence of such a large amount of Ce^{144}. Prior separation of the Ce^{144} by precipitation as the iodate will be made in the next run to alleviate this difficulty.

Processed Radioisotope Production

Table 6 is a list of radioisotope product solutions that were prepared during July.

Special Preparations

The following special preparations were made:

	Number	Total Amount
Co^{60} sources	51	2769 curies
Cs^{137} sources	4	3.5 curies
H^3 ampoules	5	11.03 curies
H^3-Zr targets	2	7.8 curies
96% He^3 ampoule	1	1 cc
5% He^3 ampoule	1	400 cc
A^{37} ampoule	1	2 mc
Be^7SO_4 solution		40 mc
$Na_2^{22}CO_3$ solution		2 mc

RADIOACTIVE-WASTE DISPOSAL

Six pots and twenty-six drums of waste were received from Argonne National Laboratory. The contents of four pots were jetted to metal-waste tank W-7, and the contents of two pots and five drums were jetted to chemical-waste tank W-5. Eight drums and their contents, together with the contents of thirteen other drums, were sent to the burial ground. The material in these drums consisted principally of solvents which would have interfered with waste-evaporator operations had the drums been jetted to the chemical-waste system.

Four 6-in. holes were drilled on 17.7-ft centers on a radius of about 12.5 ft from the center of tank W-10. The purpose of this revision was to allow more advantageous insertion of air spargers into the tank to facilitate the removal of uranium sludge to the metal-recovery building. Air spargers were installed in tanks W-3 and W-4 for the future transfer of uranium sludge to the metal-recovery building. The transfer of uranium sludge from tank W-7 to tank W-10 was resumed but is progressing very slowly.

Excavation for the removal of the valve group No. 1 diversion box at the north tank farm was started.

The temporary bypass wiring for the tank W-16 automatic jet was replaced with a permanent system. The component parts are now above ground and are easily accessible.

The corrosion test coupons removed from the stainless steel tanks of the tank farm during June were reinstalled. They will be removed again in about six months for evaluation of the corrosion rate. New coupons were installed in tank WC-5 because the original set fell into the tank when its supporting wire corroded and failed. No report

TABLE 6. RADIOISOTOPES PRODUCED DURING JULY

PRODUCT SOLUTION	SOURCE	AMOUNT (mc)	SPECIFIC ACTIVITY (mc/g)
Barium (Ba^{140} – 12.8 d)	Fission products, Hanford reactors	2009	Carrier-free
Beryllium (Be^7 – 52.9 d)	86-in. cyclotron	72.5	Carrier-free
Calcium (Ca^{45} – 152 d)	Hanford reactors	291	22.7
Carbon (C^{14} – 5720 y)	Hanford reactors	426	580
Carbon (C^{14} – 5720 y)	Hanford reactors	347	1055
Chromium (Cr^{51} – 26.5 d)	LITR	1890	2423
Iron (Fe^{59} – 46.3 d)	LITR	61	4100
Sodium (Na^{24} – 14.9 h)	LITR	1136	1300
Sodium (Na^{24} – 14.9 h)	LITR	322	500
Strontium (Sr^{89} – 53 d)	ORNL graphite reactor	57	Carrier-free
Yttrium (Y^{91} – 57 d)	ORNL graphite reactor	47	Carrier-free

has yet been received on the corrosion data determined from the first inspection of the test pieces.

Bearings on the steam-driven, hot off-gas blower were replaced as a result of the failure of the inside bearing.

The Cottrell precipitator was shut down for 15 min to replace a burned-out rectifying tube.

Waste Discharged to White Oak Creek

A total of 21.34 curies of beta activity was discharged to White Oak Creek from the settling basin and the retention pond (see Table 7). This discharge is 50% higher than that of last month; much of the increase was the result of troublesome waste-evaporator operation.

Chemical-Waste Evaporator

The waste evaporator contributed more than the usual amount of activity to the settling basin because of foaming and occasional periods when the pH of the feed to the evaporator was too low. Evaporator operation is shown in Table 8; waste-tank inventory is shown in Table 9.

TABLE 7. ACTIVITY DISCHARGED TO WHITE OAK CREEK

DISCHARGED FROM	JULY 1953		JUNE 1953	
	Gallons	Beta Curies	Gallons	Beta Curies
Settling basin	21,299,000	19.61*	21,226,000	13.00
Retention pond	432,000	1.73	423,000	1.94
Total	21,731,000	21.34	21,649,000	14.94

*9.10 curies contributed by the evaporator.

TABLE 8. WASTE-EVAPORATOR OPERATION

MONTH	SOLUTION FED TO EVAPORATOR (gal)	CONCENTRATE TO W-6 (gal)	VOLUME REDUCTION	BETA CURIES TO EVAPORATOR	BETA CURIES TO SETTLING BASIN
July 1953	208,755	20,417	10.22:1	15,697	9.10
June 1953	199,133	16,229	12.27:1	9,571	1.14

Waste-Tank Inventory

TABLE 9. WASTE-TANK INVENTORY

TANKS	CAPACITY (gal)	FREE SPACE (gal)	
		July 1953	June 1953
Hot-Pilot-Plant Storage			
W-3, 13, 14, 15	48,500	32,320	32,340
Chemical-Waste Storage			
W-5	170,000	80,000	74,000
Evaporator-Concentrate Storage			
W-6, 8	340,000	80,800	104,000
Metal-Waste Storage			
W-4, 7, 9, 10	543,000	271,900	242,000

RaLa (Ba^{140} – 12.5 d)

A total of approximately 51,000 curies of product was shipped to Los Alamos in two batches from a double run (53 and 53A). The first batch, which contained 17,000 curies, was shipped on July 8; the second batch, which contained 34,000 curies, was shipped on July 13.

The product from run 53 was very clean and was reported by Los Alamos as being of excellent quality; however, the product of run 53A appeared to be dirty – almost black in appearance, except for a 2-in. white band at the top of the cone. The foreign matter in the product did not interfere with the work at Los Alamos, since the product was not put through the usual process.

The runs were started on July 1, with the loading of 125, 8-in. Hanford slugs. A delay of 37 hr was caused by the jamming of the slug chute, which occurred twice. The jams were broken by a combination of the following efforts: six slugs were removed from the chute, replaced into the carrier, and returned to the pile canal; coating-removal solution was passed down the jammed chute to remove the aluminum jackets from the slugs, thereby allowing more room for them to pass each other; and finally, a harpoon-shaped rod was worked under the key slug and raised by use of the building electric hoist.

In an effort to determine the reason for the slug-loading difficulties, the slug charger was thoroughly checked. Since it was found to be in good operating condition, the only plausible explanation seems to be that the chute is damaged at the dissolver end where the jams occurred. No inspection of the chute can be made, however, without a thorough decontamination of the cell, which is not practical at this time.

No other unusual operating difficulties were encountered; however, in processing run 53, only about 50% of the product received in the resin cubicle from the extraction cell progressed to the product tank, but about half the material that had been lost reappeared in the feed tank during the processing of run 53A. Undoubtedly the material had been in an insoluble form and had remained undiscovered because the feed tank could not be rinsed following run 53 without interfering with the operation of run 53A.

The usually high fuming HNO_3 waste loss was reduced in both runs by the addition of 2.5 g of inactive barium as $Ba(NO_3)_2$ to the product prior to the fuming nitric precipitation separation.

Following the shipment of run 53, the remaining slugs were dissolved and extracted with the recoverable wastes of this run. A separate extraction was made of the metatheses wastes of run 53.

No operating difficulties were encountered in processing run 53A. The acetate feed contained a relatively small portion of the feed-tank product (about 40%), and the Versene feed contained the remainder.

Product measurements on both runs were based on radiochemical analyses rather than on ionization measurements for the following reasons: In run 53, the separation of lanthanum from the product was incomplete in the fuming nitric precipitation step, and the presence of lanthanum interfered with the radiation measurement; in run 53A, the quantity of product present exceeded the limits of the instrument at the time the measurement was made. The product drying time for both runs was very short (about 4 hr) because of the heat generated by the large amount of product present.

The combined analytical summary and material balance for both runs are listed below.

Following the run shipment, the building and the equipment were decontaminated wherever it was necessary. An attempt was made to decontaminate the "crud" filters. Tests of both filters showed the presence of leaking disconnect gaskets and valve packings. Efforts to decontaminate the filters, while in position, to a practical working level for repairs were not successful.

"Crud" filter No. 1 was removed from the shield and was taken to the decontamination building for possible decontamination by other methods. Mean-

	Run No. 53	Run No. 53A	Total	Per Cent
Last Separation Time	July 7, 6:20AM	July 9, 9:15AM		
Total curies dissolved	43,838	23,922	67,760	100.00
Extraction-cell losses				
Extraction losses	495	424	919	1.36
Metathesis losses	1,819*	734	734	1.08
Recovery of metathesis wastes from run 53		294	294	0.43
Extractor-tank and process-filter rinse		955	955	1.41
Total extraction-cell loss			2,902	4.28
Resin-cubicle feed solutions	41,004	32,320		
Resin-cubicle losses				
Feed-tank rinse		1,887	1,887	2.78
Combined acetate, Versene, and NaOH wastes	783	292	1,075	1.59
HCl effluent	40	88	128	0.19
Fuming HNO_3 waste	3,310*	821	821	1.21
$NaNO_3$ regeneration waste	56	295	351	0.52
Product-evaporator rinse	3,068*	1,830	1,830	2.70
Total resin-cubicle loss			6,092	8.99
Product				
Product analysis (before transfer to shipping cone)	20,000	35,632		
Product shipped (analyzed value – evaporator rinse)	16,932	33,802	50,734	74.87
Material balance				88.15

* These losses are not included in the total column since they were recovered in run No. 53A.

while, two new filters will be made to be used if the existing filters cannot be decontaminated to a low level in a reasonable time. The "crud" filter manifold valves were removed, decontaminated, and sent to the shop for repairs. The valve gates will be lapped in an attempt to prevent leakage; the gaskets from these valves were destroyed by radiation.

The loading cubicle was decontaminated to allow the replacement of the product-viewing mirror, which has become useless as a result of darkening from radiation. The prism and the lens of the periscope used in conjunction with this mirror were removed and annealed to remove the dark color also caused by intense product radiation.

RADIOISOTOPE SALES DEPARTMENT

Radioisotope shipments made during July 1953 are compared in Table 10 with those made during June 1953 and July 1952. A breakdown according to separated and unseparated material (including totals for August 1946 through July 1953) and for project, nonproject, and foreign shipments is also shown.

HANFORD IRRADIATIONS

The radioisotope samples listed in Table 11 were received from Hanford during the month.

ACTIVATION ANALYSES

A total of 124 requests has been received for information concerning activation analyses; 44 have developed into requests for analyses, 31 of which have been completed.

SF MATERIAL CONTROL

Five shipments consisting of 140 drums containing depleted UNH solutions were sent to Mallinckrodt Chemical Works, St. Louis, Missouri, during the month. The total uranium content of the 140 drums was 11,406 kg. These were the thirteenth through seventeenth shipments of uranium recovered under the Metal Recovery Program and make a total of 37,115 kg shipped to date.

During July, 38 fuel assemblies and 2 shim safety-control rods were shipped to Phillips Petroleum Company, Scoville, Idaho. This makes a

TABLE 10. RADIOISOTOPE SHIPMENTS

	JULY 1953	JUNE 1953	JULY 1952	AUGUST 1946 TO JULY 1953, INCLUSIVE
Separated material	759	881	671	36,723
Unseparated material	189	194	168	9,861
Total	948	1075	839	46,584
Nonproject	832	946	732	
Project	96	101	97	
Foreign	20	28	10	
Total	948	1075	839	

TABLE 11. RADIOISOTOPES RECEIVED FROM HANFORD

SAMPLE NUMBER	MATERIAL	NUMBER OF PIECES	DATE DISCHARGED	DATE RECEIVED
ORNL-146	Cobalt	2	6/9/53	7/14/53
ORNL-165	Calcium carbonate	1	5/28/53	7/14/53
		1	6/26/53	7/14/53
		2	July 1953	7/30/53
ORNL-147	Normal iron oxide	1	5/28/53	7/14/53
		1	July 1953	7/30/53
ORNL-148	KCl	2	July 1953	7/30/53
ORNL-130	Fe^{54}	2	July 1953	7/30/53
ORNL-161	Iron oxide	1	July 1953	7/30/53

total of 475 fuel assemblies and 54 control rods shipped to date.

Important quantities of fissionable material were received from Y-12 during July, namely, 10 kg of contained U^{235} in the form of metal to be used in fabricating MTR fuel assemblies.

During July, one shipment of 140 g of high g/t plutonium in the form of plutonium nitrate was received from Chalk River for use in the ORNL Electromagnetic Separations Program. This material was transferred to Y-12.

On July 1, a carload-lot shipment which consisted of 126 irradiated uranium slugs for the RaLa process was received from Hanford.

In formulating the new *SF Accountability Manual*, rough drafts have been prepared for sections 1, 2, and 3 of volume I.

SF surveys during the month consisted in visiting nine persons possessing SF material. The material in their possession was checked and weighed when feasible, and no apparent discrepancies were encountered. In addition, the records of four analytical laboratories were audited; this disclosed that all records were in good order and that proper accounting had been made for all samples.

During July, there were 25 receipts and 33 outgoing shipments, compared with 31 receipts and 39 shipments last month. Tables 12 and 13 are summaries of receipts and shipments for July.

TABLE 12. SF MATERIAL RECEIVED

FROM	MATERIAL	NUMBER OF SHIPMENTS	AMOUNT (g)
Air Force Cambridge Research Center	Normal uranium	1	0.84
Argonne National Laboratory, ANL	Depleted uranium	2	26,270.00
	Plutonium		8.93
Battelle Memorial Institute, BMI	Normal uranium	1	0.02
Carbide and Carbon Chemicals Co., K-25, CCC	U^{233}	1	0.01
Carbide and Carbon Chemicals Co., Y-12, CYT	Enriched uranium	2	9,999.93
	Normal uranium	9	7,864.00
	Thorium	1	376.00
Chalk River, EVG	Plutonium	2	140.56
General Electric Co., HGE	Depleted uranium	1	453,218.00
	Plutonium		106.00
Los Alamos Scientific Laboratory, SFC	Tritium	1	200.00 cc
North American Aviation, Inc., DNA	Normal uranium	3	62.00
Phillips Petroleum Co., MTI	Enriched uranium	1	0.02

TABLE 13. SF MATERIAL SHIPPED

TO	MATERIAL	NUMBER OF SHIPMENTS	AMOUNT (g)
Battelle Memorial Institute, BMI	Normal uranium	1	2.14
Carbide and Carban Chemicals Co., Y-12, CYT	Normal uranium	2	4,127.89
	Enriched uranium	8	24.56
	Plutonium	1	140.00
	Depleted uranium	1	17.60
Iowa State College, ISC	Normal uranium	1	118.50
Mallinckrodt Chemical Works, MCW	Depleted uranium	5	11,405,896.00
Naval Radiological Laboratory, NDL	Normal uranium	1	2.55
North American Aviation, Inc., DNA	Normal uranium	1	18.00
Phillips Petroleum Co., MTI	Enriched uranium	10	6,649.95
USAEC, Chicago Operations Office, CHA	Enriched uranium	1	0.17
Westinghouse Electric Corp., WEM	Normal uranium	1	30.00