[redacted]

ORNL-1245
Progress

MARTIN MARIETTA ENERGY SYSTEMS LIBRARIES
3 4456 0360590 8

DECLASSIFIED
Classification Cancelled To:
By Authority Of:
By:

OPERATIONS DIVISION

MONTHLY REPORT

FOR

MONTH ENDING JANUARY 31, 1952

LABORATORY RECORDS 1954

AEC RESEARCH AND DEVELOPMENT REPORT

OAK RIDGE NATIONAL LABORATORY
CENTRAL RESEARCH LIBRARY
CIRCULATION SECTION
4500N ROOM 175
LIBRARY LOAN COPY
DO NOT TRANSFER TO ANOTHER PERSON
If you wish someone else to see this report, send in name with report and the library will arrange a loan.
UCN-7969 (3 9-77)

OAK RIDGE NATIONAL LABORATORY
OPERATED BY
CARBIDE AND CARBON CHEMICALS COMPANY
A DIVISION OF UNION CARBIDE AND CARBON CORPORATION
UCC
POST OFFICE BOX P
OAK RIDGE, TENNESSEE

[redacted]

[redacted]

ORNL 1245

This document consists of 24 pages.

Copy 6 of 54 Series A.

Contract No. W-7405, eng 26

OPERATIONS DIVISION

MONTHLY REPORT

for

Month Ending January 31, 1952

by

M. E. Ramsey

DATE ISSUED:

MAR 31 1952

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]

MARTIN MARIETTA ENERGY SYSTEMS LIBRARIES

3 4456 0360590 8

[redacted]

ORNL-1245
Progress

INTERNAL DISTRIBUTION

1. G. T. Felbeck (C&CCC)
2-3. Chemistry Library
4. Physics Library
5. Biology Library
6-7. Training School Library
8-11. Central Files
12. C. E. Center
13. C. E. Larson
14. P. C. Aebersold
15. E. A. Bagley
16. G. E. Boyd
17. D. W. Cardwell
18. G. H. Clewett
19. D. D. Cowen
20. J. A. Cox
21. J. S. Felton
22. K. A. Fowler
23. J. H. Gillespie
24. C. S. Harrill
25. A. Hollaender
26. H. K. Jackson
27. C. P. Keim
28. M. T. Kelley
29. J. A. Lane
30. R. S. Livingston
31. S. A. Lough
32. H. J. McAlduff
33. K. Z. Morgan
34. E. J. Murphy
35. M. E. Ramsey
36. P. M. Reyling
37. L. P. Riordan
38. A. F. Rupp
39. E. D. Shipley
40. A. H. Snell
41. F. L. Steahly
42. H. F. Stringfield
43. C. D. Susano
44. J. A. Swartout
45. A. M. Weinberg
46. C. E. Winters
47. E. J. Witkowski

EXTERNAL DISTRIBUTION

48-51. AEC, Washington
52. Technical Information Service, Oak Ridge
53-54. Hanford Operations Office

[redacted]

[redacted]

[redacted]

[redacted]

TABLE OF CONTENTS

	PAGE
SUMMARY	1
PILE DEPARTMENT	3
Operating Data	3
Graphite pile	3
Low-intensity test reactor	3
Pile Operations	3
Graphite pile	3
Low-intensity test reactor	4
Filter House	5
Fan House	5
Radioisotopes	5
Water-Demineralization Plant	6
CHEMICAL SEPARATIONS AND RADIOISOTOPE DEVELOPMENT DEPARTMENTS	7
Radioisotopes	7
Iodine (I^{131} - 8d)	7
Iodine development work	7
Phosphorus (P^{32} - 14.3d)	7
Phosphorus development work	7
Carbon (C^{14} - 5740y)	8
Fission products	8
Tritium (H^{3} - 12y)	8
Cyclotron radioisotopes	8
Miscellaneous processed radioisotopes	8
Special preparations	8
Miscellaneous	9
Tank Farm	9
Wastes discharged to White Oak Creek	10
Chemical-waste evaporator	10
Waste-tank inventory	11
RaLa (Ba^{140} - 12.5d)	11

[redacted]

[redacted]

[redacted]

	PAGE
RADIOISOTOPE CONTROL DEPARTMENT	15
Hanford Irradiations	15
Cyclotron Radioisotopes	15
Activation Analyses	17
SF Material Control	18

[redacted]

[redacted]

OPERATIONS DIVISION MONTHLY REPORT

SUMMARY

The activities of the Operations Division for the month ending January 31, 1952 are summarized and indexed in the following list.

1. Lost graphite pile-operating time averaged 13.5% compared with 10.0% for 1951 (p. 3).

2. Three ruptured slugs were located and discharged. Considerable difficulty was encountered in one of the discharges (p. 3).

3. The low-intensity test reactor (LITR) lost operating time was 14.1% compared with 15.0% in December 1951 (p. 3).

4. The use of flux, combined with the lead-dip process, has produced aluminum-silicon bonded slugs markedly improved over those produced by the tin-dip process (p. 4).

5. The cooling system of the LITR is being reworked to permit operation at higher power levels (p. 4).

6. The I^{131} off-gas scrubber plugged during one run and caused contamination of the equipment and parts of the building (p. 7).

7. The ion-exchange equipment in the fission-product separations plant in Building 3515 was removed, and decontamination is in progress prior to installation of precipitation equipment (p. 8).

8. The beta-curie discharge to White Oak Creek was 17.4 compared with 12.4 in December 1951. The increase came largely from the Building 3001 canal (p. 10).

9. RaLa run No. 46 was shipped on January 19, 1952. This run was the largest to date; it contained over 22,000 curies (p. 12).

[redacted]

10. The plastic distribution valve on RaLa cubicle No. 300 failed during the month. No decisions have been reached regarding the modifications to be made to this cubicle (p. 14).

11. There were 903 radioisotope shipments compared with 749 shipments in December 1951. This was the largest number of shipments in any month since the start of the radioisotope program (p. 15).

PILE DEPARTMENT
OPERATING DATA

Graphite Pile

	JANUARY 1952	DECEMBER 1951	YEAR 1951
Total accumulated kwhr	2,430,734	2,461,386	29,997,102
Average kw/operating hr	3776.8	3863.6	3806.7
Average kw/24-hr day	3267.1	3308.3	3424.3
Per cent lost time	13.5	14.4	10.0
Excess pile reactivity (inhr)	130	170	
Slugs discharged	213	223	3544
Slugs charged	260	223	3657
Product made (grams)	88.71	89.83	1094.78
Product discharged (grams)	16.34	30.48	416.24

Low-Intensity Test Reactor

	JANUARY 1952	DECEMBER 1951
Total accumulated kwhr	489,334	480,857
Average kw/operating hr	765.7	760.5
Average kw/24-hr day	657.7	646.3
Per cent lost time	14.1	15.0
Position of No. 2 shim rod	26.889*	27.363

*One fuel element added January 15, 1952.

PILE OPERATIONS

Graphite Pile. The average pile power per operating hour for January 1952 was 3776.8 kw compared with 3863.6 kw for December 1951.

The pile-down time was 13.5% compared with 14.4% in December 1951 and 11.1% for the year 1951.

Three metal channels containing ruptured jackets were detected and the slugs were discharged during the month. The slugs discharged from metal channels 1370 and 1274 had been in the pile only about two weeks. The failures were attributed to a new type of aluminum solder used to fasten thermocouples to the slug jackets. Another channel containing a thermocouple attached to a slug by the new solder was discharged before jacket failure occurred. Use of the new type of aluminum solder has been discontinued.

The third breakdown, in metal channel 1775 in which there were eight ruptured jackets, was the third most serious failure that has occurred to date. Since the channel was completely plugged with uranium oxide, it was necessary to drill through the oxide above the slug row and discharge the slugs beyond those that had ruptured.

A hook was then inserted above the slug row, and the ruptured slugs were loosened and discharged; discharge required about 16 hours. There was no damage to the channel, which has been reloaded. Minor contamination of the building occurred, apparently caused by fission-product gas emitted from contamination on tools removed from the channel. Most of the contamination of accessible areas has been removed; the radioactive contamination in areas of difficult access is decaying with an apparent half life of several days.

Data on the jacket ruptures follows:

DATE	JAN. 2	JAN. 15	JAN. 28
Rupture No.	95	96	97
Channel No.	1370	1274	1775
Days in pile	16	15	2649
Approx. temp.	240°C	180°C	220°C

The use of flux, combined with the lead-dip process, has produced aluminum-silicon bonded slugs markedly improved over those produced by the tin-dip process. The addition of a flux over the lead bath appears to have eliminated trouble caused by failure of the aluminum-silicon mixture to wet the uranium completely. A batch of approximately 500 slugs, produced by the new process, has been in an oven at 400°C for three weeks and has not developed blisters. Another batch of approximately 1000 slugs developed no blisters in two weeks of testing at 400°C. If tests continue to be favorable, large-scale production of bonded slugs can be resumed shortly. A test batch of tin-dipped slugs will be decanned and recanned by the lead-dip process to determine whether such slugs can be used.

The third safety rod was replaced by one of the new-type of safety rods, and the remaining safety rod in hole 10 will be removed as soon as a special shield is built for the hole. This will provide another badly needed hole for experimental work.

A Co^{60} source of about 1000 curies is being loaded for the Los Angeles Tumor Institute. Equipment is being built to dry and seal this unplated source to prevent the spreading of particles.

The canal demineralizer has operated satisfactorily, and has reduced the activity in the effluent to less than one-tenth that of the canal water.

Low-Intensity Test Reactor. There were three unscheduled shutdowns for a total of 2.550 hr during the month. All three were indicated by the pile-period amplifier scram light, and it is thought that they were caused by faulty connections in a junction box.

Work is under way to increase the cooling water flow through the LITR so that its power can be raised. A larger pump and another heat exchanger will be installed to provide for an increase in water circulation to approximately 800 gal/min compared with 300 at present. In order to handle the higher water flow at reasonable pressure losses, 8-in. aluminum lines are being substituted for the 3-in. stainless steel lines on the inlet and outlet to the reactor tank. Also, a larger outlet line is being installed inside the reactor tank through the eight *A*-plug holes on the east side.

It is expected that an air cooler will be installed in the LITR cooling system to permit the saving of large amounts of plant water now used in the shell side of the heat exchanger. The cost of the air cooler would be almost the same as that of a cooling

tower, it would be simple to operate, and it would not give off large quantities of water vapor. The latter would be objectionable in the proximity of research and reactor control instruments and would cause deterioration of adjacent equipment.

A few days prior to January 15 it was noted that full power could not be maintained even with all shim rods completely withdrawn. Therefore, because of insufficient reactivity it was necessary to reduce power to 600 kw until a fuel element could be added.

The addition of fuel increases the size of the active core, and to maintain the same neutron flux the total heat power must be increased accordingly. When a three by nine lattice is reached, the addition of further fuel will require removal of depleted elements. There are only five more spaces for fuel addition.

The oscillations of LITR power mentioned last month continued. A slight vacuum on the seal tank had no effect in eliminating the power oscillations, which are believed to be caused by air in the reactor cooling water. It is suspected that air may be drawn in by the pump, and a water seal is being installed around the cooling-water pump shaft. An increase in the temperature differential across the fuel elements occurred at about the time the oscillations were first noticed. It is thought that increased water flow in the near future will essentially eliminate oscillations since gas bubbles will probably be carried out with the water rather than rise through the lattice.

Bubbles coming from the antimony-beryllium source in the LITR indicated that corrosion was taking place, probably as a result of a leak in the aluminum container. The source was removed and a new one will be fabricated.

The total down time decreased slightly again this month; however, considerable difficulty is still being experienced with instruments. Many of the control instruments need maintenance, but shortage of maintenance personnel has not permitted adequate repair work.

Two more shim-rod magnets have been received from Westinghouse. If these prove to be satisfactory, the last of the MTR magnets can be released and sent to Arco.

FILTER HOUSE

About 120 filters were accepted on the order with Flanders Mills, Riverhead, N.Y. These filters were originally scheduled to be produced with the new paper developed by Arthur D. Little, Inc. Because of fabrication difficulties, however, CWS No. 6 paper was used and the filters appear to be entirely satisfactory.

Table 1 compares the pressure drop across the exit air filters last month with the pressure drop this month and that experienced when all filters were clean.

FAN HOUSE

Both fans operated normally throughout the month.

RADIOISOTOPES

At the end of January 1952, there were 374 cans of target material in stringers 13, 14, and 16 compared with 376 cans at the end of December 1951.

Table 2 is a comparison of the radioisotopes and research samples charged into the pile during January 1952 with those handled in December 1951.

TABLE 1
Pressure-Drop Data

DATE	PRESSURE-DROP (inches water gage)		
	GLASS WOOL	CWS NO. 6	TOTAL ACROSS HOUSE
1/31/52	3.2	1.6	6.1
12/31/51	3.2	1.5	6.0
Clean filters	1.1	1.3	3.3

TABLE 2
Radioisotope and Research Samples

	JANUARY 1952		DECEMBER 1951	
	RESEARCH	RADIOISOTOPES	RESEARCH	RADIOISOTOPES
Stringers 13, 14, and 16	13	137	7	121
Hole 22	42	4	73	1
All other holes	10	19	7	30
Total by groups	65	160	87	152
Total for month	225		239	

WATER-DEMINERALIZATION PLANT

On January 13, the deaerator had to be opened and a patch on the rubber lining replaced. This failure prevented deaerated water of sufficient purity from being supplied to the LITR for a short period.

The deaerator has been giving considerable trouble recently. To eliminate this, investigation was begun on a new anion-exchange resin that operates on a sodium hydroxide cycle instead of the sodium carbonate cycle, which leaves CO_2 in the water and requires deaeration.

Table 3 shows data for the water produced in January 1952 compared with December 1951.

TABLE 3
Water Demineralized and Deaerated

	GALLONS PRODUCED		
	JANUARY 1952	DECEMBER 1951	YEAR 1951
Demineralized	474,296	463,920	6,750,085
Deaerated	20,000	13,066	492,121

CHEMICAL SEPARATIONS AND RADIOISOTOPE DEVELOPMENT DEPARTMENTS

RADIOISOTOPES

Iodine (I^{131} - 8d). Thirty-six ORNL and three Hanford slugs were processed and 48,998 mc was shipped. Processing difficulties were encountered in five runs this month.

In one run, the I^{131} equipment and parts of the building were contaminated during the dissolving step when the off-gas scrubber plugged. The operator noticed that the vacuum on the equipment began to decrease and attempted to unplug the scrubber by adding a small amount of water. Before he could accomplish this, however, the equipment became pressurized, and when he opened the funnel to the scrubber, radioactive vapors were blown out into the building. At the same time, the dissolver solution was blown into the liquid-level, specific-gravity instrument and contaminated the panel-board equipment to a level of 120 r/hr at 1 foot.

The equipment was put back into operation 30 hr after the incident occurred. A large portion of the contaminated panel-board equipment had to be cut out and replaced. The decontamination of the building required almost two days with full-shift coverage.

This incident resulted from operating the equipment far above the designed capacity in order to satisfy the ever-increasing demand for radioiodine. A nine-slug batch was being processed in equipment designed to handle only three. To proportionately increase the capacity of the scrubber, the concentration of the caustic solution was increased from 20% as called for by the flow sheet to 35%. The high concentration of caustic, together with the salts formed during the dissolving, plugged the small openings in the scrubber.

Another run yielded a product unacceptable for shipment because of its milky appearance. One Hanford slug yielded practically no product; radiation readings throughout the run indicated that the slug contained little product and must have been shipped by mistake. During two other runs, the product was lost when the caustic scrubber-solution distillates became acid.

Iodine Development Work. Approval for the new I^{131} plant is expected soon and a construction request is now being prepared by the Engineering Department. About 90% of the design work is finished and it is planned to complete the remaining 10% within the next two months.

Phosphorus (P^{32} - 14.3d). Eleven 2500-g cans of irradiated sulfur were processed and 10,809 mc was shipped. It was necessary to reprocess three runs through the glassware to remove a precipitate that was present when a sample was adjusted to a pH of 7. One run was re-evaporated to reduce the high acid content.

Phosphorus Development Work. Examination of impurities extracted from molten sulfur with weak acid and water was started. A series of extractions with 0.2*N* HNO_3 and with distilled water was made on sulfur that had been previously heated with with MgO to remove tars and silica. The extracts were high in Mg and contained traces of Al, B, Ca, Cr, Cu, Fe, Mn, Ni, Pb, Si, and Zn. The starting material was resublimed flowers of sulfur. Tests for traces of organic matter were inconclusive. A similar series of extractions was made on sulfur not treated with MgO; in addition to much larger amounts of the same elements, silver and titanium were also detected. Evidence of

organic matter was found in the second and third extracts, but not in the first extract. These preliminary results give no indication of the nature of the white precipitate encountered in P^{32} products.

Carbon (C^{14} - 5740y). Fifteen Be_3N_2 slugs were processed during the month; the analysis of the product is not complete. Equipment for gas analysis of C^{14} fractions has been completed.

Fission Products

Separations from Process Waste. The rare-earth fraction, which was separated from the gross rare earths by precipitation of 140 curies of $Ce^{144}(IO_3)_4$ was precipitated as the oxalates without addition of carrier. The precipitate is being analyzed by fractionation of an aliquot on a steam-heated ion-exchange column. After operating data are obtained, the entire batch will be fractioned on the large steam-heated ion-exchange column in Building 3028.

Building 3026 Processing. The Building 3026 processing equipment is being operated routinely on a two-shift basis. UNH from old "W" slugs prepared in the iodine plant dissolver are being processed principally to obtain Sr^{90}.

Purified Products

1. Strontium (Sr^{90} - 25y). Approximately 10 curies of Sr^{90} containing 25% Sr^{89} was purified. One curie of similar crude material is being purified. About 5 curies of Sr^{90} containing Sr^{89} ranging from 10 to 20% is on hand from Building 3026 operations.

2. Niobium (Nb^{95} - 35d). 520 mc, carrier-free.

3. Yttrium (Y^{91} - 57d). 204 mc, carrier-free.

Precipitation Process, Building 3515. Operations were closed down in the precipitation process, the ion-exchange equipment was removed, and decontamination is in progress. Alterations were started to prepare for the installation of the precipitation process for recovery of Purex-waste fission products. An additional layer of concrete 18 in. thick was added to the outer cell walls. Building 3515 off-gas underground lines were altered to eliminate low points in the line and provide adequate drainage to the waste tank. Process design work is about 30% complete and many parts of the equipment are on order or are being fabricated in the shops.

Fission-Product Purification Cell, Building 3028. Installation of the large steam-heated ion-exchange column equipment was completed and tracer tests have been started. This equipment should be in full operation by the end of February.

Tritium (H^3 - 12y). Thirteen packages containing a total of 4826 mc of H^3 were made this month. Work continued on the all-metal tritium system.

Cyclotron Radioisotopes. The following cyclotron radioisotopes were produced this month:

Mn^{52} - 58d,	0.268 mc	
Mn^{54} - 310d,	2.4 mc,	carrier-free
As^{73} - 90d,	0.297 mc	
As^{74} - 17.5d,	0.398 mc,	carrier-free

Miscellaneous Processed Radioisotopes. Table 4 is a list of radioisotope products made during the month.

Special Preparations. Fifty Co^{60} sources, ranging in strength from 1 to 12,000 mc, were encapsulated or loaded into special source holders. The total

TABLE 4

Radioisotopes Processed During January

PRODUCT	AMOUNT (mc)	SPECIFIC ACTIVITY (mc/g)
Iron (Fe^{55} - 2.9y)		
Sample 1		
Enriched Fe^{54} target	130.5	873
Fe^{59} contamination	0.05	
Sample 2		
Enriched Fe^{54} target	92.5	891
Fe^{59} contamination	0.05	
Iron ($Fe^{55,59}$ - 2.9y, 47d)		
Sample 1		
Normal Fe target	21.2 (Fe^{59})	4.03
Fe^{55}	21.2	
Sample 2		
Normal Fe target	13.6 (Fe^{59})	4.19
Fe^{55}	16.2	
Sulfur (S^{35} - 87.1d)		
As sulfate	2730 (carrier-free)	

amount of Co^{60} loaded with 26,546 mc. Two 10-mc Sr^{90} sources and one 4-mc Nb^{95} source were prepared.

Miscellaneous. The bearings on the large ventilation system blower shaft had to be scraped when they became excessively warm during operation. Following this repair, the bearings on the turbine off-gas blower shaft had to be replaced when they failed.

TANK FARM

New gage boards, for use with the telemetering system, have been installed at tanks W-1 and W-2; they have not yet been calibrated.

It was necessary to add 500 gal of 50% caustic to tank W-10 to completely precipitate all uranium from the solution. As soon as space becomes available in tank W-5, the solution will be decanted.

The WC-2 tank, pump pit filled with water again because of failure of the sump pump. Both the tank pump motor and the sump pump motor were inundated. The large motor was salvable after being dried and the small pump and motor were repaired.

A portion of the off-gas line tied into Building 3505 was excavated to correct improper drainage, which frequently caused off-gas vacuum

failures. This line is now pitched to drain toward tank W-16 and is connected to this tank through a water-leg trap.

The steam valve and pipe to the W-9 jet pit were highly contaminated by waste that backed up the line from Building 3026, and flowed out through the vent valve. This area is being decontaminated and new piping is being installed with an air purge to eliminate similar occurrences in the future.

Wastes Discharged to White Oak Creek. A total of 17.4 curies of beta activity was discharged from the settling basin this month (see Table 5). This discharge is 46% higher than that of December 1951. Much of the activity came from the canal at Building 3001 as a result of slug ruptures. The waste evaporator also contributed more than a normal share of activity because of high-level processing in Building 3026.

The retention pond discharge activity decreased to 39% of that in December after a leaking flange in the W-12 jet pit had been repaired.

Chemical-Waste Evaporator (see Table 6). The evaporator was shut down for 14 hr this month to repair a faulty valve on the concentrate drain line to W-6 and to install throttling globe valves on water inlet lines to the four condensers. The installation of these valves has permitted finer control of the condenser water flow, and as a result the temperature of the exit water could be raised to 72 ± 2°C. This effort should conserve about 70,000 gal of water per day.

TABLE 5
Activity Discharged to White Oak Creek

DISCHARGED FROM	JANUARY 1952		DECEMBER 1951	
	GALLONS	BETA CURIES	GALLONS	BETA CURIES
Settling basin	24,841,000	17.37*	25,147,000	11.87
Retention pond	516,000	0.19	623,000	0.49
Total	25,357,000	17.56	25,770,000	12.36

*Less than 1.03 curies contributed by the evaporator.

TABLE 6
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
January	180,500	13,000*	13.5:1	5,207	1.03
December	219,500	16,000	13.7:1	1,614	0.07

*411 gal of concentrate was sent back to W-5 because of a broken valve to W-6. This volume is not included in the gallons of concentrate to W-6.

Waste-Tank Inventory

TABLE 7

Waste-Tank Inventory

TANKS	CAPACITY (gal)	FREE SPACE	
		JANUARY (gal)	DECEMBER (gal)
HOT-PILOT-PLANT STORAGE			
W-3, 13, 14, 15	48,500	34,800	34,800
CHEMICAL-WASTE STORAGE			
W-5	170,000	62,500	108,500
EVAPORATOR-CONCENTRATE STORAGE			
W-6, 8	340,000	95,000	101,000
METAL-WASTE STORAGE			
W-4, 7, 9, 10	543,000	239,000	239,000

RaLa (Ba^{140} - 12.5d)

Run No. 46 was started on January 12, 1952 one week behind schedule as a result of operating difficulties at Hanford. One hundred seventy-six Hanford slugs were dissolved and extracted in five batches. The only difficulties encountered were the crosswise lodging of three slugs in the loading chute, and a slow transfer of the product to the resin cubicle because of a partially plugged process filter. The extraction and metathesis losses were very low.

Processing through the resin-column cubicle progressed satisfactorily through the fuming nitric acid precipitation step, just prior to the transfer of the product to the shipping cone. Erratic analyses of the feed solutions, however, gave no indication of this success; a loss of about 10,000 curies was shown. The facts did not become apparent until the solution was analyzed after the resin-column processing was completed. Considerable effort was spent in trying to locate the supposedly lost product.

Analyses of the feed solutions, although in error, gave some indication that the product was not distributed between the two feeds in the proportion anticipated. The acetate feed, which was expected to carry 90% of the product, contained only 16% according to these analyses. The balance was picked up in the Versene feed. The pH adjustment of the Versene feed, which presented a major obstacle in the previous run because of a constant

rise believed to be a result of high radiation, gave no difficulty during this run.

After it was determined that the product was successfully processed through the fuming nitric acid precipitation step, 500 ml of water was used to dissolve and transfer the product from the tank into the shipping cone. The analysis of a water rinse of the product tank, after the transfer, indicated that the transfer was essentially complete; therefore, the material in the shipping cone was evaporated and shipped. According to the analytical results, the shipment contained 28,000 curies.

Although the analytical results showed that a satisfactory quantity of product had been shipped, the appearance of the product in the shipping cone and the radiation reading did not confirm this. Although there was a slight doubt concerning the analyses, they checked so well that they were used as a basis for making the shipment in preference to observation and radiation reading of which there was little past experience.

After the truck left for Los Alamos, the product tank was again rinsed and sampled; weak nitric acid instead of water was used. Although no appreciable quantity of product was expected to be found, the analysis showed that between 17,000 and 18,000 curies remained in the tank. It is now suspected that the product failed to dissolve in water following the fuming nitric acid precipitation, either because of the presence of organic matter or because the product had been converted to an oxide by the high levels of radiation. The correct reason is not known, and there is at present no way to prove either supposition.

The truck was stopped before it reached Memphis and was brought back to Oak Ridge. The portion of the product remaining in the cubicle was again precipitated in fuming nitric acid, dissolved, and added to the first portion of the shipment already in the cone. This time, weak nitric acid instead of water was used to dissolve and transfer the product. It is estimated that about 22,000 curies was shipped, which is the largest RaLa shipment ever made.

During this run, the product carrier was covered with a Cocoon-coated, Kraft-paper mask to reduce the contamination generally encountered in loading the carrier. This covering permitted the washing of the lower part of the carrier prior to its removal from the loading cubicle. The carrier was the cleanest one ever shipped, and building contamination was eliminated.

Sampling presented the greatest difficulty during this run; two of the three sample carriers broke down and had to be repaired. The poor alignment of the various sampler parts made the sampling procedure erratic in controlling the volume of the sample taken and in controlling the spread of contamination in the sampling area.

The equipment, as a whole, gave the best performance to date and did not require any emergency shielding because of backup of hot solutions into the operating area.

The analytical summary of the run follows, with all results corrected to the local standard time of the second product transfer to the cone which was 0500 on January 19, 1952. The shipment left the plant on January 19, 1952, at 2130.

Analytical Summary of Run No. 46	CURIES	PER CENT
Dissolver solution (176 Hanford slugs)	30,841	100.00
Cell A losses		
Extraction and wash loss	75	0.24
Metathesis and wash loss	148	0.48
Extraction-tank and filter rinse	1,132	3.67
Total cell A losses	1,355	4.39
Resin-cubicle losses		
Acetate feed effluent	0	0.00
NaOH elution	17	0.06
Versene feed effluent	2	0.01
Sodium versenate elution	13	0.04
HCl elution	3	0.01
Feed-tank rinse	144	0.47
Fuming nitric precipitation (twice)	213	0.69
Product-tank rinse (not recovered)	820	2.65
Total resin-cubicle losses	1,212	3.93
Total process loss	2,567	8.32
Product shipped	22,368	72.53
Material balance		80.85

Measurements at Los Alamos indicated that about 34,000 curies was in the shipment when it left Oak Ridge. They have no explanation for these results, which are known to be too high. They have not processed the material as yet, but expect to do so beginning February 4, 1952.

Following the RaLa shipment, a run was made to recover the radioactive strontium from the Versene feed effluent by a process especially developed for this recovery. During the strontium separation, a backup of radioactive solution into the feed-tank instrument lines and bellows occurred that necessitated emergency shielding. This was the same condition that had occurred in past RaLa runs, but had been avoided in run No. 46. With the exception of this incident, the operation progressed satisfactorily.

Further purification of this material is required before shipments are made. The product solution containing 513 curies of strontium, mostly Sr^{89}, was contaminated with 118 curies of radioactive barium and 1.9 curies of cerium in addition to all the stainless steel corrosion products. The material will be purified after the radioactive contaminants are given sufficient time to decay to low levels.

The remainder of the month was spend in cleaning equipment contaminated during the run. All sampling equipment was repaired with the exception of the isotope tank sampler,

which has failed to operate since the last run. The Moore transmitter, after being decontaminated, is being removed for repair or replacement, if necessary.

During the prerun equipment check, it was found that the plastic distribution plug valve at the outlet of the column in cubicle No. 300 had failed, and thus this cubicle was useless for RaLa separation. This failure is similar to the failure of the first valve in the original No. 200 equipment; regardless of the position of this valve, there is flow to some other tank as well as to the tank intended. No decision has been made relative to the modifications to be made to this cubicle. Meanwhile, decontamination is being performed as spare-time effort.

RADIOISOTOPE CONTROL DEPARTMENT

During January 1952 there was a record number of radioisotope shipments. Nine hundred three shipments were made compared with 749 during December 1951 and 836 during January 1951. Table 8 shows a breakdown according to separated, unseparated, project, nonproject, and foreign shipments.

TABLE 8

Radioisotope Shipments

	JANUARY 1952	DECEMBER 1951	JANUARY 1951	AUGUST 1946 TO JANUARY 1952, INCLUSIVE
Separated material	752	622	652	23,202
Unseparated material	151	127	184	6,619
Total shipments	903	749	836	29,821
Nonproject	773	627	680	
Project	115	104	146	
Foreign	15	18	10	
Total shipments	903	749	836	

HANFORD IRRADIATIONS

The radioisotope samples listed in Table 9 were received from Hanford during January 1952.

TABLE 9

Radioisotopes Received from Hanford

SAMPLE NO.	MATERIAL	NO. OF PIECES	DATE DISCHARGED	DATE RECEIVED
ORNL-145	Enriched Fe^{58}	1	January 1952	1/29/52
ORNL-144	Chromium	1	January 1952	1/29/52
ORNL-89	Cadmium	1	January 1952	1/29/52
ORNL-100	Calcium Carbonate	1	January 1952	1/29/52
ORNL-28	Iron (normal)	2	December 1951	1/29/52
ORNL-111	Cobalt	11	January 1952	1/29/52

CYCLOTRON RADIOISOTOPES

Table 10 is a list of the outstanding orders for cyclotron radioisotopes now on hand (see also Tables 11 and 12).

TABLE 10

Cyclotron Radioisotope Orders

MATERIAL	AMOUNT (mc)	STATUS
Na^{22}	13.5	Material in process
Mn^{54}	9.5	Material has been requested
Co^{57}	5.5	Material has been requested
Fe^{59}	4	Substitution of pile irradiated iron to be requested
As^{73}	2	Material has been requested

TABLE 11

Bombardments Received and Requested

MATERIAL	MASS. INSTITUTE TECHNOLOGY		UNIVERSITY OF CALIFORNIA		UNIVERSITY OF PITTSBURGH		WASHINGTON UNIVERSITY	
	BOMBARD-MENTS	BEAM HOURS	BOMBARD-MENTS	BEAM HOURS	BOMBARD-MENTS	BEAM HOURS	BOMBARD-MENTS	BEAM HOURS
BOMBARDMENTS RECEIVED								
Be^{7}			1	47.2	12	309.0		
Na^{22}	2	190.00			9	400.25	4	300.00
Mn^{52}					2	20.00		
Mn^{54}	1	50.00					5	250.00
Fe^{54}			1	18.7				
Co^{57}	1	10.00					3	100.00
Fe^{59}			7	332.8	2	80.60	1	34.00
Zn^{65}	1	100.00	1	47.8				
Ga^{67}					10	71.75		
Sr^{85}	2	59.75			1	10.00		
As^{73}			1	10.5	2	20.50		
I^{125}							2	60.00
Molybdenum metal					2	15.70	3	30.00
Sulfur					1	2.00		
Y^{88}	1	10.00						
Total received	8	419.75	11	457.0	41	929.80	18	774.00

TABLE 11 (Continued)

REQUESTED BUT NOT RECEIVED

Mn^{54}							2	150.00
Ti^{46}			1	3.00				
Ti^{48}			1	3.00				
Fe^{57}			1	3.00				
Co^{57}							1	40.00
As^{74}	1	5.00			1	10.00		
Total hours outstanding (not received or requested)		1,075.25		1,034.00		560.20		536.00

TABLE 12

Shipments of Cyclotron-Processed Radioisotopes

MATERIAL	NO. SHIPMENTS JANUARY 1952	TOTAL MILLICURIES AND SERVICE IRRADIATIONS			
		JANUARY 1952		TO DATE	
		mc	S.I.	mc	S.I.
Be^{7}	2	6		276,243	3
Na^{22}				55.944	
Mn^{52}	1	1		10.991	
Mn^{54}				2.72	
$Fe^{55,59}$				63.64	4
Co^{57}				3.1	
Zn^{65}				39	4
Ga^{67}	2		2		12
As^{73}				1.560	
Sr^{85}				6	
Mo^{95}	2		2		6

ACTIVATION ANALYSES

At the present time, work is being done on activation analyses for five organizations.

SF MATERIAL CONTROL

Two carload-lot shipments were received from Hanford, one on January 12, 1952 and another on January 29, 1952. The shipments consisted of 280 irradiated uranium slugs for the Purex process, two slugs for K-25, and 203 irradiated thorium slugs for the U^{233} separations program. Also, several containers were received of miscellaneous irradiated units for radioisotope production work.

On January 15, 1952, 99 thorium slugs were received from Iowa State

TABLE 13

SF Materials Received

FROM	MATERIAL	AMOUNT (g)
Battelle Memorial Institute	Thorium (bar)	370.00
C&CCC, K-25	Depleted uranium (metal)	111.00
C&CCC, K-25	Plutonium (slugs)	0.06
C&CCC, Y-12	Enriched uranium (UF_4)	0.35
C&CCC, Y-12	Enriched uranium (UF_4)	0.81
C&CCC, Y-12	Enriched uranium (metal)	180.17
C&CCC, Y-12	Enriched uranium (UF_4)	0.26
C&CCC, Y-12	Enriched uranium (UF_4)	0.13
C&CCC, Y-12	Enriched uranium (cylinder)	0.0556
C&CCC, Y-12	Normal uranium (U-sulfate)	7,684.00
C&CCC, Y-12	Normal uranium (UF_4)	4.20
C&CCC, Y-12	Normal uranium (UF_3 and UF_4)	84.50
C&CCC, Y-12	Normal uranium (UF_4)	52.00
C&CCC, Y-12	Normal uranium (slugs) net	677,350.00
C&CCC, Y-12	Normal uranium (slugs) net	13,225.00
C&CCC, Y-12	Normal uranium (U-sulfate)	2,152.20
C&CCC, Y-12	Thorium (rod)	239.00
C&CCC, Y-12	Normal uranium (slugs) net	3,672.00
C&CCC, Y-12	Normal uranium (slugs) net	1,178,500.00
C&CCC, Y-12	Uranium^{236} (U_3O_8)	0.225
C&CCC, Y-12	Normal uranium (UF_4)	29.40
General Electric Co.-AGT	Enriched uranium (UO_2)	0.2876
General Electric Co.-HGE	Depleted uranium (slugs)	318,275.00
General Electric Co.-HGE	Plutonium (slugs)	62.00
General Electric Co.-HGE	Depleted uranium (slugs)	3,602.00
General Electric Co.-HGE	Plutonium (slugs)	2.00
General Electric Co.-HGE	Depleted uranium (slugs)	248,930.00
General Electric Co.-HGE	Plutonium (slugs)	133.00
General Electric Co.-HGE	Thorium slugs (irradiated)	135,902.00
General Electric Co.-HGE	Uranium^{233} (slugs)	185.00
Iowa State College	Thorium (slugs)	163,660.00
Los Alamos Scientific Lab.	Tritium	101.10 (cc)
University of Calif. Rad. Lab.	Thorium nitrate	4.80

College and on January 18, 1952 they were shipped to Hanford for canning. They will be returned to ORNL for testing purposes in the U^{233} separations program.

On January 4, 1952 two aluminum sheaths consisting of 20 "J" slugs containing 770.13 g of U^{235}, 90.1 to 95% enrichment, were shipped to Chalk River, Canada, for irradiation.

Four batches of aluminum-silicon bonded slugs, amounting to 1554 pieces, were received from Y-12 for testing and subsequent loading into the 3001 pile.

On January 7, 1952, 20 "dummy", MTR (normal uranium) fuel assemblies were shipped to the Idaho Operations Office.

SF surveys during the month included visits to 23 persons possessing SF material. Material in their possession was inspected and weighed, when feasible, and no apparent discrepancies were encountered. In addition, the records of three analytical laboratories were audited. Results of the audit disclosed that all records were in good order and proper accounting had been made for all samples.

During the month, there were 28 receipts and 25 outgoing shipments compared with 31 receipts and 13 outgoing shipments in December 1951.

Tables 13 and 14 are summaries of receipts and shipments of SF material for the month of January 1952.

TABLE 14

SF Materials Shipped

TO	MATERIAL	AMOUNT (g)
American Cyanamid Co.	Normal uranium (source)	2.30
Argonne National Laboratory	Enriched uranium (U-Al Alloy) net	2,638.00
C&CCC, K-25	Normal uranium (UO_3)	121.60
C&CCC, K-25	Depleted uranium (UF_4)	25.10
C&CCC, K-25	Plutonium (nitrate)	0.00025
C&CCC, K-25	Depleted uranium (slugs)	2,631.44
C&CCC, K-25	Plutonium (slugs)	1.48
C&CCC, Y-12	Uranium^{233} (UF_4)	0.502
C&CCC, Y-12	Enriched uranium (UO_2SO_4)	0.599
C&CCC, Y-12	Plutonium (HNO_3)	0.012
C&CCC, Y-12	Normal uranium (U_3O_8)	20,891.20
C&CCC, Y-12	Depleted uranium (Purex)	55.60
C&CCC, Y-12	Uranium^{233} (U-chloride)	0.016
C&CCC, Y-12	Plutonium (sources)	0.31948 (μg)
C&CCC, Y-12	Enriched uranium (MTR)	4.1398
C&CCC, Y-12	Enriched uranium (alloy)	0.5690
C&CCC, Y-12	Enriched uranium (MTR)	7.4120
E. I. du Pont de Nemours & Co.	Normal uranium (disks)	19,400.00
General Electric Co.-AGT	Enriched uranium (UO_2)	0.7904
General Electric Co.-AGT	Enriched uranium (UO_2)	0.5260
General Electric Co.-HGE	Thorium (slugs)	148,846.00

[redacted]

TABLE 14 (Continued)

TO	MATERIAL	AMOUNT (g)
General Electric Co.-SGE	Plutonium (nitrate solution)	0.267
National Research Council	Enriched uranium (alloy)	770.13
University of Calif. Rad. Lab.	Normal uranium (plates)	55,965.00
University of Calif. Rad. Lab.	Normal uranium (foil)	1,660.00
USAEC, Idaho Operations Office	Normal uranium (fuel assemblies)	2,800.00
USAEC, New York Operations Office	Enriched uranium (source)	0.0015
USAEC, New York Operations Office	$Uranium^{233}$ (source)	0.00026

[redacted]