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OPERATIONS DIVISION

MONTHLY REPORT

FOR

MONTH ENDING FEBRUARY 29, 1952

AEC RESEARCH AND DEVELOPMENT REPORT

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OPERATIONS DIVISION

MONTHLY REPORT

for

Month Ending February 29, 1952

by

M. E. Ramsey

DATE ISSUED

APR 28 1952

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operated by
CARBIDE AND CARBON CHEMICALS COMPANY
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OPERATIONS DIVISION MONTHLY REPORT

SUMMARY

The activities of the Operations Division for the month ending February 29, 1952 are summarized and indexed in the following items.

1. Lost graphite pile operating time was 8.6%, compared with 13.5% during January 1952 (p. 3).

2. Production of aluminum-silicon bonded slugs has been resumed at Y-12 by the new process in which a flux over the lead bath is used (p. 3).

3. Three Co^{60} sources of 1000-, 3400-, and 1000-curie activities were loaded. The specific activity of one of the 1000-curie sources was 7.1 curies/g, whereas the specific activities of the other two sources were between 3 and 4 curies/g (p. 4).

4. The Low-intensity Test Reactor (LITR) down time was 37.1%, compared with 14.1% for January. The down time increased because revisions were required to increase the cooling capacity of the LITR (p. 4).

5. The increased cooling-water flow has eliminated the LITR power oscillations (p. 4).

6. Operating difficulties were encountered during four I^{131} runs this month (p. 7).

7. Separations work on the rare earth fraction, obtained from Redox and Purex wastes in past operations in Building 3515, continued by means of the steam-heated ion-exchange column (p. 7).

8. Work on installation of the process for separation of fission products in Building 3515 is continuing at a satisfactory rate (p. 9).

9. A total of 49.5 curies of beta activity was discharged to White Oak Creek, compared with a total of 17.6 curies last month. The increase largely resulted from an accidental discharge of radioactivity into a process drain (p. 12).

10. Tests are being made to determine the nature of minor changes that should be made to the RaLa process (p. 14).

11. There were 902 radioisotope shipments, compared with 903 during the previous month (p. 15).

PILE DEPARTMENT

OPERATING DATA

Graphite Pile

	FEBRUARY 1952	JANUARY 1952	YEAR 1952 TO DATE
Total accumulated kwh	2,338,259	2,430,734	4,768,993
Average kw/operating hr	3677.1	3776.8	3727.2
Average kw/24-hr day	3359.6	3267.1	3311.8
Per cent lost time	8.6	13.5	11.2
Excess pile reactivity (inhr)	130	130	
Slugs discharged	190	213	403
Slugs charged	143	260	403
Product made (g)	85.34	88.71	174.05
Product discharged (g)	2.62	16.34	18.96

Low-Intensity Test Reactor

	FEBRUARY 1952	JANUARY 1952	YEAR 1952 TO DATE
Total accumulated kwh	308,681	489,334	798,015
Average kw/operating hr	705.2	765.7	741.0
Average kw/24-hr day	443.5	657.7	554.2
Per cent lost time	37.1	14.1	25.2
Position of No. 2 shim rod (in. out)	25.542	26.889	

PILE OPERATIONS

Graphite Pile. The average pile power per operating hour for February was 3677.1 kw, compared with 3776.8 kw for January 1952. The pile down time was 8.6%, compared with 13.5% in January and 11.2% for the year to date.

No slug ruptures occurred during February. The rupture on January 28 in channel 1775 resulted in some contamination of the building, which apparently was caused by fission gases emitted from contamination on tools used to discharge the ruptured slugs. This contamination has been cleaned from accessible areas, and that deposited in inaccessible areas has decayed to insignificant levels.

Production of bonded slugs has been resumed at Y-12 by the new process that utilizes a flux over the lead bath. This process produces slugs capable of withstanding the 400°C oven test for one week with essentially no failures. It is planned to test at least a part of each lot of slugs immediately upon production to detect the inferior slug lots as soon as possible. Reclaimed slugs, which had previously been canned by the tin-dip process, were recanned by the new procedure, tested, and found to be satisfactory as far as blisters were concerned. The reclaimed

slugs will be carefully inspected for loss of weight, since a weight loss would decrease the reactivity effects of the slugs when placed in the pile. A loss in weight would indicate that there was less uranium and more aluminum per slug.

The vertical experimental hole, hole 10, made available by replacement of the three small safety rods in holes 7, 8, and 9 with larger rods, will be available for use as soon as the new shield is ready. Since the weight of this shield, together with that of other shields planned for holes 11 and 12, will exceed the permissible loading of the top of the pile, it is planned to support these shields by means of steel beams, the ends of which will rest on the vertical concrete shield around the sides of the pile.

Several large Co^{60} sources were loaded in the pile canal. A 1000-curie source for the Los Angeles Tumor Institute was loaded into a sealed source container, which was decontaminated prior to loading into its shield. In addition, a 3400-curie source was loaded for KAPL, and a 1000-curie source was loaded for the ORNL Chemistry Division; these sources were neither dried nor sealed. The Los Angeles Tumor Institute source has a specific activity of 7.1 curies per gram; the specific activity of the other two sources is between 3 and 4 curies per gram.

The canal demineralizer has continued to operate very satisfactorily; however, some difficulty has been encountered in discharging radioactive water from the canal because of an inaccessible weir box in one of the Building 3019 cells. It is planned to plug the discharge opening in this weir box so that the effluent from the canal can be controlled. The canal is now considered unclassified when classified material is either covered or removed to an inaccessible part of the canal to prevent observance by unclassified visitors.

Low-intensity Test Reactor. The LITR down time increased during February because revision in the water-cooling system was necessary. This involved the installation of 2-in. aluminum pipes through each of the eight A-plug holes on the east side of the reactor. Each set of four 2-in. pipes was connected to a 6-in. pipe, and the two 6-in. pipes were joined in a manifold connected to an 8-in. pipe approximately 6 ft below the top of the reactor tank. The 8-in. pipe was brought out through the northeast diffuser flange and connected to the seal tank. An Allis-Chalmers pump obtained from Y-12 and a hairpin-tube heat exchanger obtained from K-25 were installed. The 3-in. stainless steel pipe section of the inlet line to the reactor was replaced with 8-in. aluminum pipe. Installation of the new system was completed on February 29; the water flow now appears to be in excess of 1000 gallons per minute. It seems that this flow will provide ample cooling capacity for 1500-kw operation and perhaps will be sufficient for even higher powers, provided large amounts of cooling water are used in the shell side of the heat exchanger. Incidentally, the larger pipe lines have also reduced the pressure inside the reactor tank. The pressure with the increased water flow is now less than it was previously at a flow rate of 300 gallons per minute.

The increased water flow results in a shorter decay time in the reactor and increased radiation in the exit water line and the seal tank, therefore, additional shielding for these facilities is required. The activity

is thought to be largely caused by N^{16}, which is formed in the water by (n,p) reaction on oxygen.

The effect of air in the reactor water was tested by putting a water seal on the old circulating pump. Reducing the air reduced the frequency of power oscillations to about one-half the usual value; however, during a 7-hr period approximately 1000 gal of water was sucked into the system and it was necessary to discontinue the test. The oscillations in power have been eliminated by the increased water flow from the new water system for operation at 800 kw; this supports the belief that the oscillations were caused by air bubbles or, possibly, by boiling. The increased water flow should eliminate local boiling and also should carry any air bubbles out the exit line instead of permitting them to rise against the water currents. The Allis-Chalmers pump has water seals that would prevent air being sucked into the system.

An additional fuel element was added on February 15. Additional elements will be added as required until a three-by-nine lattice is reached. When this lattice is reached, further fuel additions will be made by removing a spent fuel piece from the outside of the lattice, by moving a partly spent fuel piece to the outside of the lattice, and by placing the fresh fuel piece near the center of the lattice to give greater reactivity effect.

FILTER HOUSE

Most of the CWS filters procured some time ago had to be released for installation in some of the new buildings; as a consequence, approximately 200 more filters have been ordered.

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

FAN HOUSE

Both fans operated normally throughout the month.

RADIOISOTOPES

At the end of February 1952 there were 386 cans of target material in stringers 13, 14, and 16, compared with 374 cans of target material in these stringers at the end of January 1952.

Table 2 is a comparison of the number of radioisotope and research samples charged into the pile during February 1952 with those handled in January 1952.

TABLE 1
Pressure Drop Data

DATE	PRESSURE DROP (inches water gage)		
	GLASS WOOL	CWS NO. 6	TOTAL ACROSS HOUSE
2/29/52	3.3	1.7	6.2
1/13/52	3.2	1.6	6.1
Clean filters	1.1	1.3	3.3

TABLE 2
Radioisotope and Research Samples

	FEBRUARY 1952		JANUARY 1952	
	RESEARCH	RADIOISOTOPES	RESEARCH	RADIOISOTOPES
Stringers 13, 14, 16	6	121	13	137
Hole 22	49	6	42	4
All other holes	7	12	10	19
Total by groups	62	139	65	160
Total for month	201		225	

WATER DEMINERALIZATION PLANT

Operation of the building was normal except that considerable difficulty was experienced with the deaerator; it is hoped that new resin can be obtained to eliminate the necessity of deaerating the water.

Table 3 shows data for the water produced in February 1952, compared with that of January 1952.

TABLE 3
Water Demineralized and Deaerated

	GALLONS PRODUCED		
	FEBRUARY 1952	JANUARY 1952	YEAR 1952 TO DATE
Demineralized	471,054	474,296	945,350
Deaerated	54,000	20,000	74,000

CHEMICAL SEPARATIONS AND RADIOISOTOPE DEVELOPMENT DEPARTMENTS

RADIOISOTOPES

Iodine (I^{131} - 8d). Seventy ORNL slugs were processed and 44,054 mc of I^{131} was shipped.

Operating difficulties were experienced with four runs this month. The off-gas manometer plugged while the dissolving step was in progress for one run, and during the time required to correct the condition, it was necessary to operate under a high off-gas vacuum to eliminate the possibility of air contamination in the operating area. The resultant air sweep through the equipment during the dissolving and the subsequent sparging steps caused a high loss of product. Product losses were also incurred in two runs when the scrubber solution distillate became acid. In the last troublesome run, the crude product from the scrubber solution was discarded because it contained an excess of salts that plugged up the draw-off line.

Iodine Development Work. No further work was done on the new iodine plant this month; permission has not been received to start construction or procurement of equipment.

Phosphorus (P^{32} - 14.3d). Thirteen 2500-g cans of irradiated sulfur were processed, and 9365 mc of P^{32} was shipped.

It was necessary to reprocess only one run through the glassware this month; the product, initially reprocessed, contained a heavy precipitate at a pH of 7.

In an attempt to eliminate the formation of a precipitate when the product is adjusted to a pH of 7 new resin was put into the cation-exchange column, and the normality of the hydrochloric acid used on this column was lowered. The three runs processed since these changes were made contained only small quantities of precipitate; but this is far from conclusive evidence that these changes will eliminate precipitate formation at a pH of 7, since good products were usually made by the previous system.

Phosphorus Development Work. The investigation to determine the impurities in sulfur that might be responsible for the formation of a precipitate in the P^{32} product solution was continued. Briefly, the commercial sulfur was found to contain large amounts of iron, chromium, silica, and organic matter, plus traces of other cations. Preliminary data indicate that magnesium oxide is effective in removing the impurities from molten sulfur. An aluminum column was designed that will allow molten sulfur to filter through a bed of magnesium oxide particles. This apparatus will be tested during the next period to determine whether it will be satisfactory for purification of sulfur.

Carbon (C^{14} - 5740y). No C^{14} was separated this month, since there was an adequate supply on hand.

Fission-Products Development Work

Separations from Process Waste. Separations work on the rare-earth fraction, which was obtained from Purex and Redox waste in past operations in Building 3515, continued on the steam-heated ion-exchange column.

A sample of the gross rare-earth fraction was analyzed by fractionation on a small analytical type of steam-heated Dowex-50 resin column. Table 4

TABLE 4
Rare-Earth Fractionation Analysis

RARE EARTHS	CONCENTRATION (mc/ml)	TOTAL ACTIVITY (%)
Activity resembling Y^{91}	0.04	0.094
Eu^{155} (not extrapolated)	0.05 to 0.10	0.10 to 0.20
Sm^{151}	Counting technique inaccurate; probably less than Eu^{155}	
Ce^{144}	1.50	3.15
Pm^{147} (extrapolated)	46.09	96.67
Total	47.68	

shows the approximate composition of this fraction.

Approximately 10% of the gross rare-earth fraction was used for a test run on the new steam-heated, 5-ft column in Building 3028. It was necessary to destroy the oxalates present with fuming nitric acid and hydrogen peroxide.

Run summary:

Resin	Nalcite HCR
Temperature	95 to 99°C.
Resin bed volume	60 ml
Flow rate	1.6 to 3.2 column vol/hr
Elutriant	0.2 *M* citrate at pH 3.1

Results: (The starting solution contained 1500 mc, extrapolated.)

PRODUCT	MILLICURIES	AMOUNT EXPECTED FROM ANALYSIS (mc)
$Pm^{147}Cl_3$	410)	
	)1430	1450
$Pm^{147}Cl_3$	1020)	
$Eu^{155}Cl_3$	12.2	7.7

The figure on the amount of Eu^{155} can be estimated to be in error by -10%. The Ce^{144} from this fractionation was discarded. The decay scheme for Sm^{151} is not well known. The half life has been given to be from 200 years (M. G. Ingram) to 1000 ± 350 years (J. A. Marinsky).[1] G. W. Parker and P. M. Lantz have characterized one maximum energy beta to be about 65 kev. Nothing has been published concerning the possibility of other beta or gamma activities.

The percentage of backscattering on various mountings of the weak beta of Sm^{151} is not known. It is estimated to be as great as 70% from a platinum backing. By study of the region of the elution curve between Eu^{155} and Pm^{147}, an estimate of the amount of Sm^{151} was made in the following manner.

From a study of the Eu^{155} absorption curve, the ratio between the gamma count and the gross beta count for the beta proportional counter and the

[1] G. W. Parker and B. H. Kettelle, "Samarium^{151} Beta Ray Spectrum," *Phys. Rev.* **76**, 1416-17, (November 1949).

Geiger-Mueller counter was determined; this figure is about 3.8×10^{-3}. The ratios for beta proportional count and the Geiger-Mueller gross beta were also established for Eu^{155} and Pm^{147}. From these figures the amount of Sm^{151} was determined. The amount is not accurate, but it is probably within a factor of 3. By assuming that the peak of Sm^{151} occurred in the fraction examined and making no correction for backscattering, the amount of Sm^{151} present is about 0.04% of the total activity.

A full-scale run was made next with the remaining 90% of the rare-earth mixture, which contained approximately 17,100 millicuries. The Eu^{155} and Pm^{147} have been separated and are now being concentrated. Some difficulty is being experienced in concentrating the Pm^{147}; the column becomes saturated and a portion of the activity passes. The active and inactive materials present between the start of the elution and the appearance of the activity Y^{91} (?) have been concentrated for a spectrographic analysis to determine whether detectable amounts of the heavy rare earths terbium and gadolinium are present.

Certain short-lived materials that were removed before Eu^{155} was removed are being studied by means of decay and absorption curves.

Building 3026 Processing. Operations continued on the processing of old W-slugs for Sr^{90} production.

Purified Products. The following purified fission products were produced:

Pm^{147} - 2.7y	1,770 mc, carrier-free
Sr^{90} - 25y	2,291 mc, carrier-free

Precipitation Process, Building 3515. Thirteen drawings for the precipitation process were completed during the month; this makes a total of 27 completed to date. It is estimated that eight drawings remain to be made to finish the design of the project. The design is about 80% complete.

Additional shielding for cell II was constructed and three stainless steel vessels were fabricated and tested. Work on all drawings submitted is in progress.

One purchase requisition was written to complete the purchases necessary. About one-half these items have been received. The latest promised delivery date is May 30, 1952 for three Vycor vessels. It is planned to use pyrex vessels during the process test period to prevent delay.

Decontamination of the cells in Building 3515 is approximately 75% complete. Work was delayed by highly contaminated fluid leaking into the partly decontaminated floor from a bad weld on the hot drain header. To make decontamination easier in the future, it was decided to install lead floors in both cells in Building 3515. The revised estimated date for the completion of construction sufficient for testing is April 18, 1952.

Fission-Product Purification Cell, Building 3028. A low-level run was made on the new steam-heated column and then several days were spent in making final adjustments and modifications to the equipment. A full-scale run was also made, as reported previously; both runs were considered successful. An equipment operating manual was prepared.

Cs^{137} Source Assembly Station, Building 3013. The following facilities were studied by the Engineering Department at the Cs^{137} source

assembly station and tentatively approved by the Radioisotope Development Department: (1) method of introducing source material into cell, (2) pipet station, (3) bottle turntable, (4) decapper, (5) waste funnel, and (6) evaporator-furnace. The following studies are now in progress: (1) electric heater for stainless steel evaporator; (2) source container; (3) hydraulic press and associated equipment; and (4) a source capping, soldering, and rinsing station.

Fission-Product Finishing Equipment, Building 3030. Recent experimental work has shown that it is feasible to evaporate fission-product fractions in the citrate eluting solution to dryness and then to burn the citrate and other organic matter at 700°C. Evaporation and burning are done in a Vycor beaker. Radiant heating is used for the evaporation, and a special electric furnace is used for burning in air. The fumes from this operation are carefully controlled and passed into the hot off-gas system. Equipment for performing the operation routinely will be installed in Building 3030.

Argonne-type Cell, Building 3029. Preliminary proposal No. 178 for an Argonne-type cell was completed at the beginning of this report period. A supplementary justification was submitted February 13, 1952. To date, approval by the U. S. Atomic Energy Commission to proceed with construction has not been received.

A study of the large transparent shield in the front face of the cell was made. The concrete wall density is about 3.5, whereas the density of zinc bromide solution is 2.5. At present, "Ceriba" (nonbrowning) glass is offered in densities of approximately 2.5, with the possibility that some will be developed with densities as high as 3.2. "Hi-D" glass, made by the same company, has a density of about 6.2.

Good design necessitates uniform densities in walls and windows. Since this condition is impossible to obtain at present, some compromise was necessary. It was decided to make the walls of high-density concrete and to design a tank for holding solutions. It is planned to use zinc bromide and to continue the search for solutions or liquids of higher density. If and when such a liquid is found, the cell can then operate at the levels originally planned.

This study also included calculations and field work in an attempt to fix the optimum window dimensions and location. It was decided to make the window 24 in. high, 36 in. wide, and 24 in. thick.

A test hole was made in the floor of Building 3029 to determine data for designing the cell foundation; the cell walls will impress a load of about 1 ton/ft^2 of floor surface.

Europium Target Material. Several inquiries were made in an effort to locate a source of europium concentrates from which europium could be separated inexpensively enough for possible use as target material for commercial gamma sources. Two companies, Lindsay Light and Chemical Company and Rare Earths, Inc., offered rare-earth concentrates (from which europium oxide may be obtained) for about $100 per gram, which is from $200 to $300 below the average industrial price. Samples were ordered from each company for testing and evaluation.

Processed Radioisotopes. Table 5 lists radioisotope product solutions made from pile-irradiated targets.

TABLE 5

Radioisotope Product Solutions Produced from Pile Irradiated Targets

PRODUCT SOLUTIONS	AMOUNT (curies)	AMOUNT (mc)	SPECIFIC ACTIVITY (curies/g)	SPECIFIC ACTIVITY (mc/g)	ELEMENT
Cadmium (Cd - 43d)		22.7		22.7	Cd
Calcium (Ca^{45} - 180d)		266		66.2	Ca
Iron (Fe^{59} - 46.3d)					
From enriched Fe^{58} target		44		1,530	Fe*
Nickel (Ni^{63} - 85y)		51.2		17	Ni
Sulfur (S^{35} - 87.1d)					
As carrier-free sulfate	5.7				
Cobalt (Co^{60} - 5.2y)	7		4.94		Co

*Fe^{55}, less than 1%.

Tritium (H^3 - 12.1y). No tritium was packaged this month, and except a special purification of approximately 120 cc of He^3 for the Physics Division no He^3 was packaged. The helium was purified in the analytical system by fractionating on a low-temperature carbon column. The helium was passed through the carbon (three times) until no radioactivity was observed when the gas obtained by outgassing the column was passed through a sensitive ion chamber. When the ion chamber was filled with product, He^3, no reading was observed. The helium could not be counted in the 100% geometry Geiger-Mueller tube because the system was contaminated with tritium.

Cyclotron Radioisotopes. The following radioisotope product solutions were prepared from cyclotron targets:

Na^{22} - 2.6y 12.8 mc, carrier-free

As^{73-74} - 90d, 17.5d

As^{73} 4.45 mc, carrier-free

As^{74} 5.0 mc, carrier-free

Special Preparations

Cobalt Sources. Thirty-seven Co^{60} sources containing a total of 31.8 curies were packaged. Thirty-five Co^{60} pieces, 3 to 4 mc each, were sealed into stainless steel radium-type needles.

General. A new type of disposable radioisotope shipping container for gamma emitters, which will eliminate the use of concrete around the lead shield, has been approved by the Bureau of Explosives. The cost of

the new containers will be approximately one-half that of the old type of containers.

RADIOACTIVE WASTE HANDLING

The ball bearings on the electric off-gas blower shaft failed and were replaced.

The installation of the fence around the Cottrell precipitator, complete with interlocks to the precipitator, was completed. This system will prevent unauthorized entry into the operating area while the equipment is operating at high voltage.

Installation of the automatic damper and steam turbine control system on the hot off-gas blowers was essentially completed. Minor adjustments and instrument checks remain to be done. This system will permit an automatic change from the electric off-gas blower to the steam blower in the event of a power outage.

Extension handles were provided for the wash-down valves at the Cottrell precipitator to allow space shielding against the high radiation encountered when the equipment in Building 3026 is being operated.

The installation of the new jet service lines to the W-9 jet from Building 3026 has been completed. The removal of contaminated pipe from this area remains to be done before the concrete pit can be repoured.

Installation of the telemetering system at W-1 W-2, and WC-1 tanks was continued.

About 43,000 gal of metal waste supernatant was transferred from W-10 tank to W-5 tank in the chemical waste system.

A new dip-leg to the decant jet was installed in W-4 tank to replace the leg which failed because of corrosion by the acidic contents of the tank. After the supernatant liquor was decanted, the material remaining in the tank was made basic.

The removal of the metal precipitate from W-7 tank was resumed by recirculating the W-10 tank solution through W-7 tank.

Wastes Discharged to White Oak Creek. A total of 49.5 curies of beta activity was discharged from the settling basin and the retention pond this month, as shown in Table 6. This

TABLE 6

Activity Discharged to White Oak Creek

DISCHARGED FROM	FEBRUARY 1952		JANUARY 1952	
	GALLONS	BETA CURIES	GALLONS	BETA CURIES
Settling basin	23,428,000	49.43*	24,841,000	17.37
Retention pond	390,000	0.11	516,000	0.19
Total	23,818,000	49.54	25,357,000	17.56

*Less than 0.33 curies contributed by the evaporator.

discharge was 32 curies higher than that in January. The increase resulted from operations and the purging of canals in Buildings 3001 and 3505.

Chemical-Waste Evaporator (see Table 7). The evaporator was shut down for 1 hr this month for repair of leaks in condensate lines from steam coils N and L and the water addition line inside the cell.

Table 8 compares the amount of radioactive waste accumulated during February 1952 with that of the previous month.

TABLE 7

Waste-Evaporator Operation

MONTH 1952	SOLUTION FED TO EVAPORATOR (gal)	CONCENTRATE TO W-6 (gal)	VOLUME REDUCTION	BETA CURIES TO EVAPORATOR	BETA CURIES TO SETTLING BASIN
February	227,000	13,100	17.3:1	1,569.1	0.33
January	180,500	13,000	13.5:1	5,207.0	1.03

TABLE 8

Waste Tank Inventory

TANKS	CAPACITY (gal)	FREE SPACE	
		FEBRUARY (gal)	JANUARY (gal)
HOT PILOT PLANT STORAGE			
W-3, 13, 14, 15	48,500	34,100	34,800
CHEMICAL-WASTE STORAGE			
W-5	170,000	93,000	62,500
EVAPORATOR-CONCENTRATE STORAGE			
W-6, 8	340,000	82,500	95,000
METAL-WASTE STORAGE			
W-4, 7, 9, 10	543,000	270,000	239,000

RaLa (Ba^{140} - 12.5d)

The decontamination of cubicle 300 was continued as a spare-time effort until the radiation level was brought down to an average of about 4 roentgens per hour. The cubicle was then removed to the decontamination building, where the radiation level was reduced to approximately 100 milliroentgens per hour. It was then sent to the burial ground for above-ground storage until a decision is made relative to the nature of alterations to be made to it.

The contaminated Moore transmitter, which was part of the liquid level instrumentation for the cubicle 200 feed tank, was partly decontaminated and removed. Upon inspection, a broken weld was found between the bellows and the case. This instrument was replaced with a spare instrument that was available for the rebuilding of cubicle 300. The new instrument has been calibrated and placed in service.

Tests were run on the cubicle 200 product evaporator to determine its operating characteristics in order to revise the existing RaLa procedure. It is hoped that a more complete transfer of the final product to the cone can be made as a result of these tests. Preparations are in progress to make a relatively low-level, one-batch run, to test a newly developed procedure that will substitute a nitric acid metathesis for the third potassium carbonate metathesis and will eliminate the Versene feed with its pH adjustment, which presented a major problem during previous runs. A fourth sample carrier for RaLa cubicle 200 was received and aligned with the equipment.

The shells of the two Tucson slug carriers were received from the fabricator. Heat transfer tests, run on the carriers before the pouring of the lead was begun, showed that the carriers will be able to dissipate the heat generated by the slugs for which they were designed. The pouring of the shield is now in progress.

RADIOISOTOPE CONTROL DEPARTMENT

There were 902 radioisotope shipments during February 1952, compared with 903 during January 1952 and 793 during February 1951. Table 9 shows a breakdown of shipments according to separated and unseparated shipments and project, nonproject, and foreign shipments.

TABLE 9

Radioisotope Shipments

SHIPMENTS	FEBRUARY 1952	JANUARY 1952	FEBRUARY 1951	AUGUST 1946 TO FEBRUARY 1952, INCLUSIVE
Separated material	762	752	598	23,964
Unseparated material	140	151	195	6,759
Total	902	903	793	30,723
Nonproject	776	773	621	
Project	108	115	155	
Foreign	18	15	17	
Total	902	903	793	

HANFORD IRRADIATIONS

No samples were received during the month of February.

CYCLOTRON RADIOISOTOPES

Table 10 is a list of the orders now on hand for cyclotron radioisotopes:

TABLE 10

Cyclotron Radioisotope Orders

MATERIAL	AMOUNT (mc)	STATUS
Be^{7}	9.5	Material has been requested
Mn^{54}	10.5	Material in process
Co^{57}	6.0	Material in process
Fe^{59}	3.0	Substitution of pile irradiated iron suggested by the Laboratory

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Table 11 lists the number of radioisotope bombardments received and/or requested during February 1952.

TABLE 11

Bombardments Received and Requested

MATERIAL	MASS. INSTITUTE OF 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	309.00		
Na^{22}	2	190.00			9	400.25	4	300.00
Mn^{52}					2	20.00		
Mn^{54}	1	50.00					7	400.00
Fe^{54}			1	18.7				
Co^{57}	1	10.00					4	140.00
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	3	30.50		
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	42	939.80	21	964.00
REQUESTED BUT NOT RECEIVED								
Ti^{46}			1	3.0				
Ti^{48}			1	3.0				
Fe^{57}			1	3.0				
As^{74}	1	5.00						
Total hours outstanding (not received or requested)		1075.25		1034.00		560.20		536.00

TABLE 12

Shipments of Cyclotron-Processed Radioisotopes

MATERIAL	NO. SHIPMENTS FEB. 1952	TOTAL MILLICURIES AND SERVICE IRRADIATIONS			
		FEB. 1952		TO DATE	
		mc	S.I.	mc	S.I.
Be^{7}				276.243	3
Na^{22}	6	6		61.944	
Mn^{52}				10.991	
Mn^{54}	2	1		3.72	
$Fe^{55,59}$				63.64	4
Co^{57}				3.1	
Zn^{65}				39.0	4
Ga^{67}					12
As^{73}				1.560	
Sr^{85}				6.	
Sr^{90}	1		1		1
Mo^{95}					6

Table 12 lists the number of the radioisotopes cyclotron-processed during February 1952, as divided into millicurie and service irradiation amounts.

ACTIVATION ANALYSES

The status of activation analyses remains the same as in the previous report.

SF MATERIAL CONTROL

Two carload-lot shipments of SF material were received from Hanford during the month. The first car was received on February 15, 1952, and the second car was received on February 26, 1952. The shipments consisted of 280 irradiated uranium slugs for the Purex process and 756 thorium slugs for the U^{233} separations program.

An additional 2849 aluminum-silicon-bonded, normal uranium slugs were received from Y-12 during February. These slugs are for testing and subsequent loading into the X-10 graphite pile.

A total of 15,768 aluminum-silicon-bonded X slugs, canned by the bronze-dip method with no flux over the bath, was returned to Y-12 for dejacketing and recanning because of the high rejection rate of approximately 20% by the 400°C heat test.

The USAEC, ORO, SF Accountability Office submitted a rough draft report covering SF accountability procedures

and practices at the Laboratory for review to determine whether it contained errors in fact. As a result of discussions between personnel of the USAEC, ORO, SF Accountability Office and the Laboratory, several items were shown to contain errors in fact, and a formal reply was made noting these items. Later in the month the formal survey report, containing eight recommendations for supplemental changes to the ORNL SF accountability system, was received. As yet, no reply has been made regarding these recommendations, since sufficient time to prepare it has not been available.

The SF Accountability Office conducted a survey among the various Laboratory divisions to determine special materials requirements for the next three years, by quarter years, beginning with July 1952. The resulting data were consolidated and submitted to K-25 for transmittal to the USAEC.

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

There were 27 receipts and 22 outgoing shipments during the month, compared with 28 receipts and 25 outgoing shipments last month.

Tables 13 and 14 are summaries of receipts and shipments, respectively, of SF materials for the month of February 1952.

TABLE 13

SF Materials Received

FROM	MATERIAL	AMOUNT (g)
Argonne National Laboratory	Enriched uranium (U-Zr)	1.96
Battelle Memorial Institute	Thorium metal (bar)	230.00
C&CCC, K-25	Normal uranium (U-acetate)	255.00
C&CCC, Y-12	Enriched uranium (metal)	7.70
C&CCC, Y-12	Enriched uranium (UF_4)	0.26
C&CCC, Y-12	Enriched uranium (UF_4)	0.90
C&CCC, Y-12	Enriched uranium (UF_4)	0.502
C&CCC, Y-12	Enriched uranium (thermopile)	0.000073
C&CCC, Y-12	Enriched uranium (UF_4)	0.753
C&CCC, Y-12	Normal uranium (UO_2)	3,504.90
C&CCC, Y-12	Normal uranium (slugs)	580,192.20
C&CCC, Y-12	Normal uranium (U-sulfate)	2,143.10
C&CCC, Y-12	Normal uranium (UF_4)	1.43
C&CCC, Y-12	Normal uranium (slugs)	2,007,850.00
C&CCC, Y-12	Normal uranium (slugs) net	1,446,550.00
C&CCC, Y-12	Normal uranium (slugs) net	1,446,000.00
General Electric Co.-AGT	Normal uranium (UO_2)	16.90
General Electric Co.-AGT	Enriched uranium (UO_2)	0.5729

TABLE 13 (continued)

FROM	MATERIAL	AMOUNT (g)
General Electric Co.-HGE	Thorium (slugs)	148,759.00
General Electric Co.-HGE	Depleted uranium (slugs)	3,556.00
General Electric Co.-HGE	Plutonium (slugs)	2.00
General Electric Co.-HGE	Depleted uranium (slugs)	248,930.00
General Electric Co.-HGE	Plutonium (slugs)	136.00
General Electric Co.-HGE	Depleted uranium (slugs)	248,930.00
General Electric Co.-HGE	Plutonium (slugs)	135.00
General Electric Co.-HGE	Thorium (slugs)	1,250,643.24
General Electric Co.-HGE	Uranium^{233} (in Th slugs)	993.00
Mallinckrodt Chemical Works	Depleted uranium (Purex)	5,683.00
Sylvania Electric Products, Inc.	Normal uranium (metal)	901.00
United Lead Co.	Thorium ($Th(NO_3)_4$)	34,473.00
Westinghouse Electric Corp.	Enriched uranium (U_3O_8)	3.23

TABLE 14

SF Materials Shipped

TO	MATERIAL	AMOUNT (g)
Argonne National Laboratory	Depleted uranium (slugs)	758.00
Argonne National Laboratory	Plutonium (slugs)	0.01
Argonne National Laboratory	Depleted uranium (slugs)	20,988.00
Argonne National Laboratory	Plutonium (slugs)	0.40
C&CCC, K-25	Plutonium (nitrate solution)	0.0003
C&CCC, Y-12	Enriched uranium (U-Al Alloy)	0.0456
C&CCC, Y-12	U^{233} ($UO_2(NO_3)_2$)	0.021
C&CCC, Y-12	Normal uranium (slugs)	2,819,760.00
C&CCC, Y-12	Normal uranium (slugs)	3,383,712.00
C&CCC, Y-12	Normal uranium (slugs)	3,383,568.00
C&CCC, Y-12	Normal uranium (slugs)	3,383,424.00
C&CCC, Y-12	Normal uranium (slugs)	3,383,454.00
C&CCC, Y-12	Normal uranium (slugs)	2,171,049.00
C&CCC, Y-12	Thorium oxide	1,197.30
General Electric Co.-AGT	Enriched uranium (UO_2)	0.2876
General Electric Co.-HGE	Normal uranium (J-slugs) net	108,430.00
Phillips Petroleum Co.	Enriched uranium (MTR)	435.00
Phillips Petroleum Co.	Enriched uranium (fission chambers)	0.1403
Phillips Petroleum Co.	Enriched uranium (MTR)	839.00
University of California	Thorium nitrate	4.80
University of California	Enriched uranium (foil)	9.31
Westinghouse Electric Corp.	Enriched uranium (U_3O_8)	3.23