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LABORATORY RECORDS
1954

OPERATIONS DIVISION

MONTHLY REPORT

FOR

MONTH ENDING MARCH 31, 1952

AEC RESEARCH AND DEVELOPMENT REPORT

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OPERATIONS DIVISION

MONTHLY REPORT

for

Month Ending March 31, 1952

by

M. E. Ramsey

DATE ISSUED

MAY 16 1952

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operated by
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TABLE OF CONTENTS

	Page
SUMMARY	1
PILE DEPARTMENT	3
Operating Data	3
Pile Operations	3
Graphite pile	3
Low-intensity test reactor	4
Filter House	5
Fan House	5
Radioisotopes	6
Water-Demineralization Plant	6
CHEMICAL SEPARATIONS AND RADIOISOTOPE DEVELOPMENT DEPARTMENTS	7
Radioisotopes	7
Iodine (I^{131} - 8 d)	7
Iodine development work	7
Phosphorus (P^{32} - 14.3 d)	7
Phosphorus development work	7
Carbon (C^{14} - 5740 y)	7
Fission products	7
Argonne-type cell	9
Special Sr^{90} sources	9
Fission-product purification equipment	9
Processed radioisotopes	10
Cyclotron radioisotopes	10
Special preparations	10
Miscellaneous	10
Waste Disposal	11
Wastes discharged to White Oak Creek	12
Chemical-waste evaporator	12
Waste-tank inventory	13

[redacted]

[redacted]

[redacted]

	Page
RaLa	13
RADIOISOTOPE CONTROL DEPARTMENT	17
Hanford Irradiations	17
Cyclotron Radioisotopes	18
Activation Analyses	19
SF Material Control	20

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OPERATIONS DIVISION MONTHLY REPORT

SUMMARY

The activities of the Operations Division for the month ending March 31, 1952 are summarized and indexed in the following:

1. Lost pile-operating time was 11.6% compared with 8.6% for February and 11.3% for the year to date (p. 3).

2. The discharge of three ruptured slugs from channel 1364 was somewhat difficult (p. 3).

3. Production of aluminum-silicon bonded slugs at Y-12 is progressing satisfactorily. Two thousand of the bonded slugs have been charged into the pile (p. 4).

4. The LITR down time was high this month because of a shutdown for installation of shielding on the exit water line and around the seal tank (p. 4).

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

6. Studies were started on methods of separating the alpha emitters, americium and curium, from the rare earths (p. 8).

7. Engineering design continued on the equipment required for fabrication of a 1500-curie Cs^{137} source (p. 8).

8. Six 1-curie Sr^{90} sources were prepared on an urgent basis for Los Alamos (p. 9).

9. Use of a new and cheaper nonreturnable, radioisotope shipping container was started this month (p. 11).

10. A total of 17.5 curies of beta activity was discharged to White Oak Creek compared with 49.5 curies last month (p. 12).

11. A test RaLa run was made with a revised procedure. The run was not considered satisfactory because of high losses in the wastes (p. 13).

12. There were 1011 radioisotope shipments compared with 902 in February (p. 17).

PILE DEPARTMENT

OPERATING DATA

	MARCH 1952	FEBRUARY 1952	YEAR TO DATE 1952
Graphite Pile			
Total accumulated kwh	2,423,988	2,338,259	7,192,981
Average kw/operating hr	3,685.46	3,677.10	3,713.05
Average kw/24-hr day	3,258.05	3,359.60	3,293.49
Per cent lost time	11.60	8.60	11.30
Excess pile reactivity (inhr)	50	132	
Slugs discharged	270	190	673
Slugs charged	266	143	669
Product made (g)	88.47	85.34	262.52
Product discharged (g)	24.54	2.62	43.50
Low-Intensity Test Reactor			
Total accumulated kwh	521,773	308,681	798,015
Average kw/operating hr	930	705.2	741.0
Average kw/24-hr day	701	443.5	554.2
Per cent lost time	24.6	37.1	25.2
Position of No. 2 shim rod (in. out)	23.4	25.5	

PILE OPERATIONS

Graphite Pile

Evidence of slug rupture was discovered in channel 1364 during the weekly visual inspection, and it was found that three slugs had ruptured. These slugs were difficult to discharge, but the use of improved slug-removal techniques reduced the amount of fission-product contamination of the building to an insignificant level. Smooth-surfaced rods were used in the channel since they could be wiped free of contamination upon removal from the pile, and contaminated tools were wrapped in paper and removed from the building immediately after use. The same general techniques as those used to handle the rupture in channel 1775 in January were used - that is, drilling through the oxide layer above the slug row with a steel bit welded on a long rod and loosening the ruptured slugs from above.

Data on the rupture are as follows:

Rupture No.	98
Channel	1364
Date discovered	3/17/52
Days in pile	2744
Temperature	220°C
Remarks	Three slugs in rupture 2 ft west of center

Bonded-slug production continued at Y-12, and a portion of each batch of slugs was oven tested at 400°C for one week. No indication of failure occurred until lot 123 was tested. Seven slugs of this batch of approximately 500 slugs ruptured and all ruptures occurred in the end cap. The end caps were examined by a representative of the Metallurgy Division, and it was revealed that the failures resulted from oxidation; apparently, a porous grade of aluminum had been used for the caps. One blister also occurred in lot 127.

Approximately 2000 aluminum-silicon bonded slugs were charged into the pile on March 31 and April 1, 1952; this was the first loading of the new slugs.

The canal demineralizer has operated satisfactorily during the month, and activity in the canal water discharge has been reduced from approximately 300 to 10 beta counts per minute per milliliter. In an effort to reduce the amount of Co^{60} contamination in the canal water, beakers containing the cobalt were filled with carbon tetrachloride, but at present it has not been possible to determine whether this has reduced the amount of contamination.

Thirty slugs, each containing 1 lb of tantalum, were charged into the pile in hole A and channel 1964 on March 10. One of these slugs was discharged on March 31 for monitoring and the remainder were pulled back to the bridge tubes. Monitoring of the one discharged slug indicated an activity of approximately 20 curies per pound of tantalum, which was the desired activity. The tantalum still in the pile will be kept near the edge of the graphite until April 28, at which time the slugs will be discharged and shipped. The discharge is being delayed to shorten the time spent in the canal, since it is not definitely known that all cans are waterproof. On March 31, 280 slugs, each containing 2 lb of tantalum, were charged into the peripheral channels for a four-week irradiation.

The approximately 130 inhr of excess reactivity were reduced to about 40 inhr by the tantalum charged to metal channel 1364 and hole A early in the month. The warmer weather near the end of the month resulted in loss of most of the remaining excess reactivity. The relocation of tantalum in metal channel 1364 and hole A, in addition to the warmer weather and the charging of tantalum in the outer metal channels, gave an excess reactivity of approximately 50 inhr at the end of the month.

Three liquid-hydrogen runs were made for research purposes during the month; 4 liters were produced in one of these runs. As soon as the liquid-hydrogen storage vessel, which is on order, is received, it will be possible to keep on hand a stock of liquid hydrogen. It is anticipated that more than one liter per day will be needed for future use by the Solid State Division.

Low-Intensity Test Reactor

The LITR down time was very high this month because the reactor was down for the first week of the month for installation of shielding on the exit water line and the seal tank. The shielding was required because the new exit water lines collect water immediately underneath the core of the reactor, which, coupled with a higher water circulation rate, results in a much greater quantity of short-lived N^{16} being present in the exit water system.

The new water system operates satisfactorily; however, a minor difficulty was encountered shortly after its initial use. Some paint from valves and from inaccessible parts of the piping flaked off in large pieces and was removed by a strainer. The presence of small paint particles, as well as other extraneous matter in the circulation system, is believed to have caused the appreciable increase in radioactivity; i.e., the radioactivity with a half life longer than a few minutes. The radioactivity of the water has steadily decreased, but it remains somewhat higher than levels experienced prior to installation of the new water system.

Careful checks are being made of the old fuel elements, some of which have been in the reactor about two years, to determine whether any fission products are leaking through the aluminum cladding. Because of the long exposure in the reactor, it is possible that some corrosion of the aluminum has taken place.

An air cooler has been ordered that will be installed in the LITR water system. The cooler will permit a saving of plant cooling water of approximately 500,000 gal per day, which would have to be circulated through the shell side of the heat exchanger during summer weather to remove the heat produced at the proposed operating power level of 1500 kw. The air cooler will be more satisfactory than a cooling tower because it can be easily moved; also, a cooling tower would be unsatisfactory because the water vapor produced would damage nearby research equipment and reactor instruments.

The instrument chambers have been pulled out slightly in their tubes in order that power levels of 1500 kw can be measured. However, AEC approval for operation at 1500 kw has not yet been received.

FILTER HOUSE

Table 1 is a comparison of 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

The shaft pump on the No. 2 compressor failed on March 26. The key, which locked the pump shaft to the impeller gears, was bent and allowed the shaft to turn without turning the impeller. The pump is being completely overhauled; meanwhile, the compressor is being run with the use of the auxiliary lubricating system.

TABLE 1

Pressure-Drop Data

DATE	PRESSURE DROP (in. water gage)		
	GLASS WOOL	CWS NO. 6	TOTAL ACROSS HOUSE
3/31/52	3.3	1.8	6.4
2/29/52	3.3	1.7	6.2
Clean filters	1.1	1.3	3.3

RADIOISOTOPES

At the end of March there were 380 cans of target material in stringers 13, 14, and 16 compared with 386 cans of target material in these stringers at the end of February.

Table 2 shows a comparison of the radioisotope and research samples charged into the pile during March with those handled in February.

Since December 3, 1948, 90 slugs containing about 900 curies of cobalt have been discharged after irradiation for the U. S. Navy. After monitoring, slugs with the lowest activity will be eliminated and replaced with specially loaded ones to raise the total to about 1200 curies.

WATER-DEMINERALIZATION PLANT

New resins to replace those in the present columns are being investigated for the water-demineralization plant. It is believed that by changing resins it will be possible to eliminate the use of the deaerator and conserve a considerable amount of labor and steam. Table 3 shows water demineralization data for March compared with that of February.

TABLE 2

Radioisotope and Research Samples

	MARCH 1952		FEBRUARY 1952	
	RESEARCH	RADIOISOTOPES	RESEARCH	RADIOISOTOPES
Stringers 13, 14, and 16	9	252	6	121
Hole 22	39	6	49	6
All other holes	14	18	7	12
Total by groups	62	276	62	139
Total for month	338		201	

TABLE 3

Water Demineralized and Deaerated

	GALLONS PRODUCED		
	MARCH 1952	FEBRUARY 1952	YEAR TO DATE 1952
Demineralized	508,200	471,054	1,453,550
Deaerated	60,000	54,000	134,000

CHEMICAL SEPARATIONS AND RADIOISOTOPE DEVELOPMENT DEPARTMENTS

RADIOISOTOPES

Iodine (I^{131} - 8 d)

Eighty-eight ORNL slugs were processed and 44,344 mc of product was shipped. Difficulties were encountered during processing of two runs this month. The product from one run contained a white precipitate that had to be removed by reprocessing through the purification steps. The electrical probe in the receiving vessel of the glassware hood failed during the other run and resulted in an overflow of the vessel as the crude product was being transferred from the cell. Removal of the excess solution from the overflow pot required direct handling with beaker and tongs and caused considerable exposure to operating personnel.

The hot drain in the glassware hood, which leaked as a result of deterioration from past decontaminations, was repaired this month.

Iodine Development Work

No further work was done on the new iodine plant this month. Permission has not been received to start construction.

Phosphorus (P^{32} - 14.3 d)

Nineteen 2500-g cans of irradiated sulfur were processed and 12,416 mc was shipped. These figures include one carrier-free batch containing approximately 140 millicuries.

It appears that the replacement, made last month, of the old resin in the first bed of the glassware equipment, along with the reduction of hydrochloric acid concentration put on this bed, has reduced the amount of precipitate formed in the product when the pH is adjusted to 7. It was not necessary to reprocess any runs this month.

Phosphorus Development Work

Tests were conducted in which molten sulfur was allowed to pass through a bed of magnesium oxide particles. Results indicated that most of the important impurities, such as organic matter, silica, iron, chromium, nickel, and lead, can be removed. Enough sulfur was purified with the small test unit to load four irradiation cans. This amount is sufficient for a full-scale test run through the regular production equipment. If all tests indicate that sulfur of sufficient purity can be obtained by this method, full-sized equipment will be designed to purify sulfur on a production basis.

It is believed that sulfur that has passed through the production process may be re-used even though it contains a large quantity of S^{35} and residual traces of P^{32}. Consideration is being given to the design of equipment that will allow the safe loading of irradiation cans containing re-used sulfur.

Carbon (C^{14} - 5740 y)

No C^{14} was separated this month since an adequate supply was on hand.

Fission Products

Separations from Process Waste. A run to produce short-lived fission products, primarily Nd^{147} and Pr^{143}, was made on the steam-heated ion-exchange column. Y^{91} and Ce^{141} were also separated. The separations obtained during this run were very

good. Since only one steam-heated unit is now available, and this is primarily used for long-lived materials, it is planned to construct a similar unit to be used exclusively for short-lived radioisotopes to prevent cross contamination.

Since americium and curium occur as contaminants in a number of the rare-earth products, studies were started on methods to separate these alpha emitters from the rare earths. The method being used is to oxidize americium to the highest valence level and separate the rare earths by TTA extraction. Oxidation of the americium was carried out with potassium chlorate in 40% potassium carbonate solution. Americium is soluble in this solution, and preliminary indications are that it can be extracted into the TTA with fair efficiency.

The 140-curie batch of Ce^{144} that was previously reported as being precipitated as the iodate with no additional carrier was found to have coprecipitated americium and curium. Analyses made on an alpha pulse analyzer indicate that the alpha activity present is principally curium. This result does not agree with that predicted by calculation, therefore further checks are being run.

A small batch containing a mixture of Eu^{155}, Sm, and Pm^{147} was fractionated on a heated ion-exchange column and a definite alpha peak was noted that was identified as curium.

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

Purified Products. The following carrier-free, purified fission products were produced during the month.

PRODUCT	HALF LIFE	MILLICURIES
Eu^{155}	2 to 3 y	262
Nd^{147}	11 d	6
Pm^{147}	2 to 4 y	1035
Sr^{90}	25 y	8000

Precipitation Process (Building 3515). Design work and some equipment fabrication continued on the precipitation process. Four shop drawings were made, and the design of the product- and sample-removal station was completed. The data concerning the vacuum vessel, safety circuits, and the manometer system were submitted to the Instrument Department; they will proceed with the design and fabrication of these parts. Fabrication of the main vessels by the Mechanical Department is approximately 80% complete.

Decontamination has been completed in the cells and gallery of Building 3515, and the lead floor has been installed in cell No. 2. The lead floor in cell No. 1 should be installed within two weeks, after which vessel installation and piping work may proceed.

Cs^{137} Source Assembly Station (Building 3013). Engineering design continued on the alterations required for fabrication of the 1500-curie Cs^{137} source. A test model of the source itself was fabricated, and pure, nonradioactive cesium salts were obtained for tests on compressing the material into the source. The design for the final source was reviewed and approved by the Medical Division of ORINS.

The designs of the soldering station and the funnel and press unit were discussed with the Engineering Department. Development work on the

conversion of cesium nitrate to cesium sulphate and the densities of the sulphate at various pressures is in progress. Approximately 25 drawings have been completed by the Engineering Department.

Fission-Product Preparation Cell (Building 3030). Cubicles 1 and 2 were decontaminated and strip-coated. The glassware assembly rack was installed in cubicle 2. Wiring, piping, and tubing were connected. This job is about 90% complete.

Argonne-Type Cell (Building 3029)

Approval has been obtained for the construction of the Argonne-type cell. All design drawings and the bill of materials have been completed by the Engineering Department. Construction should start during the week of April 6.

Special Sr^{90} Sources

An order for six 1-curie Sr^{90} sources was received from the Los Alamos Scientific Laboratory with a requested shipping date of April 1, 1952. To complete this order, a source-assembly station was built in Building 3028. A special source sheath was designed and a test sample was fabricated, assembled, and sent to Los Alamos for inspection. No stainless steel foil of the necessary thickness (0.0007 to 0.001 in.) was available, so the material on hand (0.0015 to 0.0017 in.) was reduced in thickness by an electropolishing technique and then checked for uniformity and pinholes.

The first batch of active material was excessively high in solids and organic material. A spectrographic analysis identified the solids in the following approximate proportions: Sr, 1.0; Ca, 5.0; Ba, 0.5; Fe, 0.5; Pb, 0.5; Al, 0.1; Na, 0.1. This batch was reprocessed; the subsequent batches were satisfactory.

Sealing the source sheaths proved difficult. Four of the first six produced leaked. These four sheaths were opened and the product was dissolved with weak HNO_3, transferred to new inserts, evaporated to dryness, ignited, soldered, and tested for leaks. All six sheaths were then decontaminated to less than 250 counts/min and packaged. They were ready for shipment at about 9:00 AM, April 7, 1952. Los Alamos indicated that this delay of six days did not seriously hold up their work.

A measurement of each source was made with a cutie pie to determine the distance at which a reading of 10 r/hr was attained, with the following results:

SOURCE NO.	Sr^{90} BATCH NO.	APPROXIMATE DISTANCE (ft)
1	96	5
2	96	4
3	99 and 98	4
4	100	5
5	100	6
6	101 and 98	5

Fission-Product Purification Equipment (Citrate Incinerator, Building 3030)

A model snare for handling the 400-ml beakers was fabricated and tested. This tool, with minor revisions, should prove to be satisfactory. A low-cost evaporator furnace was built and given preliminary tests. Its performance justifies replacing the original and more costly

type designed previously. Evaporation tests indicate that heat lamps may not be necessary for the preliminary evaporation and drying.

Processed Radioisotopes

Table 4 is a list of radioisotope product solutions that were made from pile-irradiated targets.

Cyclotron Radioisotopes

The following carrier-free, radioisotope product solutions were prepared from cyclotron targets.

PRODUCT	HALF LIFE	MILLICURIES
Be^{7}	52.9 d	132
Mn^{52}	58 d	0.44
Mn^{54}	310 d	4.0

Special Preparations

Sixteen Co^{60} sources were loaded that contained a total of 23.4 curies.

Thirteen ampoules of tritium were prepared that contained a total of 7702 millicuries.

Three ampoules of He^{3} were prepared that contained a total of 1.25 cubic centimeter.

Eight curies of carrier-free $P^{32,33}$ was prepared on special order for Brookhaven to investigate the use of P^{33}, which is a 23-day weak beta emitter discovered recently.

Miscellaneous

Ten curies of Ce^{144} was removed from the 140-curie batch that had been held in storage to be used by

TABLE 4

Radioisotopes Produced During March

PRODUCT	AMOUNT (mc)	SPECIFIC ACTIVITY (mc/g)
Chromium (Cr^{51} - 26d)	1132	434 to 762
Iron ($Fe^{55,59}$ - 2.9y, 46.3d)		
Batch 1		
Fe^{55}	41.8	5.86
Fe^{59}	29	4.07
Batch 2		
Fe^{55}	77.7	5.5
Fe^{59}	51	3.6
Batch 3 (enriched Fe^{58})		
Fe^{59}	15.2	950
Sulfur (S^{35} - 87.1d)		
As sulfide	2500	27.8 curies/g

the Chemical Technology Division in studying radiation damage to ion-exchange resin.

Work is in progress on the preparation of reports on the design of a bottle-handling snare, the darkening of Ceriba glass, and the production process for Cs^{137}. A memorandum report was issued that gave preliminary data on the design of a kilocurie fission-product plant.

Water has been accumulating in air lines in various process buildings and a thorough survey was made of the traps that are used to remove the water; a design was made that will aid in alleviating this condition.

Shipment of the new type of non-returnable lead containers was started after receiving approval from the Bureau of Explosives. The concrete is eliminated in the new type of container and crepe-paper wadding is used as a spacing material. This change reduces the cost of each new container to about one-half the cost of its earlier equivalent.

The north vacuum pump in Building 3034 was overhauled, and new rings and inserts were installed. As yet, the pump fails to operate normally because of a damaged crank shaft for which a replacement was not available.

WASTE DISPOSAL

The slurrying of metal precipitate from tank W-7 to tank W-10 was discontinued; sufficient sodium hydroxide was added to W-10 to precipitate uranium and plutonium from the solution. The contents of tank W-10 were allowed to settle and the approximately 55,000 gal of supernatant, containing 27,787.95 g of uranium and 14.71 mg of plutonium, was jetted to W-5.

During the heavy rains a leak, as yet not located, was found to exist into tanks W-17 and W-18 through a common line between the tanks. A leak of ground water into tank W-8 was discovered and stopped by eliminating the heavy wash-downs that drained toward this tank from the north operating area of Building 3505.

All flanges in the W-12 jet pit were tightened to eliminate a source of activity to the retention pond.

Work is progressing slowly on the process-waste monitoring system.

New gage boards at tanks W-1 and W-2 were put into service after completion of installation and calibration.

The telemetering system is now ready to be connected to the central recording instruments in Building 3506.

The automatic damper and steam turbine system on the hot off-gas blowers is now in service and operates as soon as the off-gas falls below a 35-in. H_2O vacuum.

Buildings 4500 and 4501 were connected to the waste monitoring tanks behind Building 3573.

The overflow alarm connected to the Cottrell precipitator wash-down tank is now in service.

The air flow, volume, temperature, and pressure instrument at the 3039 stack will be placed in service as soon as calibrations are completed.

Construction of a new chemical-waste storage pit for hot chemical waste was about 50% complete at the end of the month.

Wastes Discharged to White Oak Creek

A total of 17.5 curies of beta activity was discharged from the settling basin and retention pond this month (see Table 5). The canals at Buildings 3001 and 3505, as well as decontamination work at Building 3515, contributed much of the activity.

Chemical-Waste Evaporator (see Table 6)

The evaporator was shut down twice this month for a total of 28 hours. Leaking welds in both the process and condensate return lines of coil C in the cell and two leaking condensate return lines in the gallery were repaired. A decontamination made with sodium Versene to compare its efficiency with that of HNO_3 resulted in the conclusion that HNO_3 is more economical and effective.

TABLE 5

Activity Discharged to White Oak Creek

DISCHARGED FROM	MARCH 1952		FEBRUARY 1952	
	GALLONS	BETA CURIES	GALLONS	BETA CURIES
Settling basin	26,168,000	17.31*	23,428,000	49.43
Retention pond	579,000	0.16	390,000	0.11
Total	26,747,000	17.47	23,818,000	49.54

*Less than 1.25 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
March 1952	224,200	16,300	13.8:1	7598	1.24
February 1952	227,000	13,100	17.3:1	1569	0.33

Waste-Tank Inventory

TABLE 7

Waste-Tank Inventory

TANKS	CAPACITY (gal)	FREE SPACE (gal)	
		MARCH	FEBRUARY
Hot-Pilot-Plant Storage			
W-3, 13, 14, 15	48,500	31,000	34,100
Chemical-Waste Storage			
W-5	170,000	45,000	93,000
Evaporator-Concentrate Storage			
W-6, 8	340,000	67,500	82,500
Metal-Waste Storage			
W-4, 7, 9, 10	543,000	316,000	270,000

RaLa

A test run, utilizing 65 "X" slugs of which 29 were recently pushed from the pile, was made to check the newly developed procedure mentioned in last month's report. An additional 5 g of barium, as $Ba(NO_3)_2$, was added to the run in the extraction step to simulate the amount of barium that should be present in a 30,000-curie run. The run proceeded to the point at which the product would normally be transferred to the cone before the product was discarded.

The revised procedure was not a success because of high losses in the wastes. The fuming nitric acid metathesis waste loss was 4.8%, and the losses in the extractor rinse and sodium Versene elution were 32 and 28%, respectively. It was assumed that an incomplete K_2CO_3 metathesis (less than 90%), resulting in partial sulfate ion removal by the fuming nitric acid metathesis, constituted the high loss in cell A; this allowed insoluble barium sulfate to remain in the extraction tank.

Deposition of product near the bottom of the resin, caused by acidification of column feed by acid remaining in the extraction tank, filters, and pipe lines, was considered to account for the high column loss. The position of the product made it possible for the sodium Versene elution, which normally would strip off only the strontium, to strip off a good portion of the product.

The analytical results of the run follow:

	CURIES	PER CENT
Dissolver solution (65 ORNL slugs)	200.0	100.0
Cell A losses		
Extraction and washes	0.7	0.4
K_2CO_3 metatheses and washes	0.9	0.5
Fuming nitric metatheses and washes	9.6	4.8
Extractor rinse	64.0	32.0
Total cell A losses	75.2	37.7
Resin-cubicle losses		
Feed-tank rinse	1.8	0.9
Feed effluent	0.1	0.1
NaOH elution	0.1	0.1
Sodium versenate elution	56.0	28.0
HCl elution	3.8	1.9
Fuming nitric precipitation	0.6	0.3
Total cubicles losses	62.4	31.3
Total process loss	137.6	69.0
Product	17.0	8.5
Material balance		77.5

Following completion of this run, tests simulating run conditions were made on the filter operation to determine the amount of residual acid left in the system following a filtration of the HNO_3 metathesized product cake. Results indicated that 4.5 moles of acid, which is considerably above the 3-mole limit allowable for the success of this procedure, remained in the system.

Analysis of the sulfate ion content of the A-9 rinse indicated that a total of 13.4 g remained after the metatheses and definitely ensured the failure of this run.

It was noted during the active run that the filters were operating much below normal filtration rates. After run completion, investigation disclosed several leaks in the valve packings and filter assemblies. To eliminate the leaks it was necessary to fabricate and install a new disconnect for process filter No. 2 and to change gaskets and packings in all valves and the filter assembly.

Following repair of the filter assemblies, another run was made to check the heel of HNO_3 after a fuming nitric acid metathesis. The only change noted in this test was that

the manifold lines at the filter assemblies were washed out prior to dissolving of the metathesis cake. Results indicated that 2.53 moles of HNO_3, which is believed to be too near the 3-mole maximum permissible in the proposed procedure, would remain in the system. Even if this procedure could be made to work satisfactorily, it is believed doubtful that it could be considered adequately reliable in existing equipment.

An inspection made of "crud" filters and the valve assembly to detect leaks revealed none and the system is again in operating condition.

All the resin cubicle No. 200 sample carriers were repaired, realigned, and tested and are now in operating condition.

Lead was poured into the Tucson carriers and only small jobs such as tapping test holes, weighing, and marking the carriers remain to be done.

The evaluation of product from RaLa run No. 46 has not been received from Los Alamos. There is no definite date for the next RaLa run.

RADIOISOTOPE CONTROL DEPARTMENT

During March 1952 there were 1011 radioisotope shipments compared with 902 during February 1952 and 857 during March 1951. This was the first month in which the shipments exceeded 1000.

Table 8 shows a breakdown according to separated, unseparated, nonproject, project, and foreign shipments.

TABLE 8

Radioisotope Shipments

	MARCH 1952	FEBRUARY 1952	MARCH 1951	AUGUST 1946 TO MARCH 1952, INCLUSIVE
Separated material	788	762	628	24,752
Unseparated material	223	140	229	6,982
Total shipments	1011	902	857	31,734
Nonproject	860	776	678	
Project	135	108	163	
Foreign	16	18	16	
Total shipments	1011	902	857	

HANFORD IRRADIATIONS

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

TABLE 9

Radioisotopes Received from Hanford

SAMPLE NO.	MATERIAL	NO. OF PIECES	DATE DISCHARGED	DATE RECEIVED
ORNL-87	Tungsten	1	1/18/52	3/28/52
ORNL-111	Cobalt metal	15	2/15/52	3/28/52
ORNL-126	Cesium^{134}	1	1/24/52	3/28/52
ORNL-139	Indium metal	1	March 1952	3/28/52

CYCLOTRON RADIOISOTOPES

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

TABLE 10

Cyclotron Radioisotope Orders

MATERIAL	AMOUNT (mc)	STATUS
Co^{57}	6.0	Material in process
Fe^{59}	3.0	Substitution of pile irradiated iron to be requested
Na^{22}	2.0	Material in process

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	47.20	14	327.00		
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	18.70				
Co^{57}	1	10.00					4	140.00
Fe^{59}			7	332.80	2	80.60	1	34.00
Zn^{65}	1	100.00	1	47.80				
Ga^{67}					10	71.75		
Sr^{85}	2	59.75			1	10.00		
As^{73}			1	10.50	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	457.00	44	957.80	21	964.00

TABLE 11 (continued)

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
REQUESTED BUT NOT RECEIVED								
Ti^{46}			1	3.00				
Ti^{48}			1	3.00				
Fe^{57}			1	3.00				
As^{74}	1	5.00						
Total hours outstanding (not received or requested)		1075.25		1034.00		542.20		536.00

TABLE 12

Shipments of Cyclotron-Processed Radioisotopes

MATERIAL	NO. SHIPMENTS MARCH 1952	TOTAL MILLICURIES AND SERVICE IRRADIATIONS			
		MARCH 1952		TO DATE	
		mc	S.I.	mc	S.I.
Be^{7}	1		1	276.243	4
Na^{22}	3	5.36		67.304	
Mn^{52}				10.991	
Mn^{54}				3.72	
$Fe^{55,59}$				63.64	4
Co^{57}				3.1	
Zn^{65}	2	3		42	4
Ga^{67}					12
As^{73}	3	2.5		4.060	
Sr^{85}				6	
Sr^{90}					1
Mo^{95}					6

ACTIVATION ANALYSES

Work continued at a normal rate on making activation analyses.

SF MATERIAL CONTROL

A boxcar shipment received from Hanford on March 27 consisted of 140 irradiated uranium slugs for the Purex process, 2 slugs for K-25, and several miscellaneous irradiated units for radioisotope separation. The car was stopped inbound at Chicago to unload some material for ANL and to load six empty Sugarman containers destined for ORNL. The car was found to be badly contaminated upon arrival in Oak Ridge and approximately 3 days were required for decontamination.

An additional 16,244 aluminum-silicon bonded, normal uranium slugs for testing and subsequent loading into the X-10 graphite pile were received from Y-12 during March.

Thirty MTR fuel assemblies were shipped during the month to Phillips Petroleum Company, National Reactor Testing Station, Scoville, Idaho. The total number of shipments is now 36 fuel assemblies and 4 shim control rods.

The Oak Ridge AEC SF Accountability Office formally submitted SF accountability survey report No. 35, which covered review of SF accountability procedures and practices at ORNL. The report was essentially the same in content as the rough-draft report referred to last month. The recommendations are under study and a reply to the AEC is being prepared.

The Oak Ridge AEC SF Accountability Office informally forwarded a revised draft of Bulletin GM-PRO-2, Serial No. 95, on SF accountability to the X-10 SF office. If the procedures contained in this draft are adopted, the work load will be increased appreciably; i.e., the composition of the ending inventory must clearly indicate the amount of irradiated SF materials and, if possible, an opinion as to "how hot" they are.

Surveys during the month consisted of visiting 11 persons possessing SF material, which was inspected and no apparent discrepancies were encountered. In addition, the records of three analytical laboratories were audited and results disclosed all records to be in good order with proper accounting made for all samples.

During the month there were 32 receipts and 22 outgoing shipments compared with 27 receipts and 22 outgoing shipments last month. Tables 13 and 14 are summaries of receipts and shipments for the month of March 1952.

TABLE 13

SF Materials Received

FROM	MATERIAL	AMOUNT (g)
Argonne National Laboratory	Depleted uranium (slugs)	3,498.00
Argonne National Laboratory	Plutonium (slugs)	0.05
Battelle Memorial Institute	Thorium (metal)	339.00
C&CCC, K-25 Area	Plutonium $[Pu(NO_3)_3]$	0.003
C&CCC, K-25 Area	Depleted uranium (waste)	5,869.00
C&CCC, K-25 Area	Plutonium (waste)	0.04
C&CCC, Y-12 Area	Enriched uranium (metal)	841.22
C&CCC, Y-12 Area	Enriched uranium (metal)	5,929.42
C&CCC, Y-12 Area	Enriched uranium (metal)	1,449.84
C&CCC, Y-12 Area	Enriched uranium (UF_4)	18.65
C&CCC, Y-12 Area	Enriched uranium (UF_4)	0.35
C&CCC, Y-12 Area	Enriched uranium (UF_4)	0.62
C&CCC, Y-12 Area	U^{233} $[UO_2(NO_3)_2]$	0.021
C&CCC, Y-12 Area	Normal uranium (slugs)	387,850.00
C&CCC, Y-12 Area	Normal uranium (slugs) net	1,389,300.00
C&CCC, Y-12 Area	Normal uranium (UF_4)	211.95
C&CCC, Y-12 Area	Normal uranium (slugs) net	1,621,700.00
C&CCC, Y-12 Area	Normal uranium (slugs)	332,600.00
C&CCC, Y-12 Area	Normal uranium (slugs) net	2,196,950.00
C&CCC, Y-12 Area	Normal uranium (slugs) net	2,317,250.00
C&CCC, Y-12 Area	Normal uranium (slugs) net	1,564,150.00
C&CCC, Y-12 Area	Normal uranium (slugs) net	3,121,300.00
C&CCC, Y-12 Area	Normal uranium (slugs) net	2,019,050.00
C&CCC, Y-12 Area	Normal uranium (slugs) net	3,689,800.00
C&CCC, Y-12 Area	Normal uranium (slugs) net	1,616,216.00
C&CCC, Y-12 Area	Normal uranium (UF_4)	13.70
C&CCC, Y-12 Area	Normal uranium (UF_4)	11.40
C&CCC, Y-12 Area	Normal uranium (sulfate)	7,731.40
General Electric Co. HGE	Depleted uranium (slugs)	248,930.00
General Electric Co. HGE	Plutonium (slugs)	132.00
General Electric Co. HGE	Depleted uranium (slugs)	3,556.00
General Electric Co. HGE	Plutonium (slugs)	2.00
Los Alamos Scientific Lab.	Plutonium (nitrate)	0.34
United Lead Co.	Thorium $[Th(NO_3)_4]$	98,755.61
University of Calif. Rad. Lab.	Depleted uranium (metal)	20.00
Westinghouse Electric Corp.	Enriched uranium (U_3O_8)	3.23
Westinghouse Electric Corp.	Enriched uranium (U_3O_8)	1.64

[redacted]

TABLE 14

SF Materials Shipped

TO	MATERIAL	AMOUNT (g)
Argonne National Laboratory	Depleted uranium (slugs)	34,980.00
Argonne National Laboratory	Plutonium (slugs)	0.57
Argonne National Laboratory	Enriched uranium (alloy)	1.96
Battelle Memorial Institute	Thorium $[Th(NO_3)_4]$	563.60
C&CCC, K-25 Area	Depleted uranium (slugs)	2,596.00
C&CCC, K-25 Area	Plutonium (slugs)	1.46
C&CCC, Y-12 Area	Normal uranium (UNH)	60,750.62
C&CCC, Y-12 Area	Enriched uranium (MTR)	2.14
C&CCC, Y-12 Area	Enriched uranium (MTR)	10.94
C&CCC, Y-12 Area	Normal uranium (slug)	1,174.80
C&CCC, Y-12 Area	U^{236} (U_3O_8)	218.70
C&CCC, Y-12 Area	Depleted uranium (U_3O_8)	4,359.70
C&CCC, Y-12 Area	Normal uranium (metal)	1,232.75
C&CCC, Y-12 Area	Plutonium (nitrate)	0.34
General Electric Co. AGT	Normal uranium (UO_2)	5.11
General Electric Co. AGT	Enriched uranium (UO_2)	0.5729
General Electric Co. AGT	Thorium (ThO_2)	10.00
General Electric Co. HGE	Normal uranium (slugs)	12,932.82
Phillips Petroleum Co.	Enriched uranium (MTR)	836.11
Phillips Petroleum Co.	Enriched uranium (MTR)	840.62
Phillips Petroleum Co.	Enriched uranium (MTR)	842.32
Phillips Petroleum Co.	Enriched uranium (MTR)	838.83
Phillips Petroleum Co.	Enriched uranium (MTR)	838.97
University of Calif. Rad. Lab.	Depleted uranium (metal)	20.00
Westinghouse Electric Corp.	Enriched uranium (U_3O_8)	3.23
Westinghouse Electric Corp.	Enriched uranium (U_3O_8)	1.64

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