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ORNL 966, Series A 7
Progress Report

AEC RESEARCH AND DEVELOPMENT REPORT

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LABORATORY RECORDS 1954

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OPERATIONS DIVISION
MONTHLY REPORT
FOR
MONTH ENDING JANUARY 31, 1951

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OPERATIONS DIVISION

MONTHLY REPORT

for

Month Ending January 31, 1951

by

M. E. Ramsey

DATE ISSUED

MAR 8 1951

OAK RIDGE NATIONAL LABORATORY
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SUMMARY

1. Lost pile-operating time averaged 10.4%, compared to 10.2% for December 1950, and 11.1% for the year of 1950. (Page 5)
2. The excess pile reactivity was approximately 155 inhours at the end of the month. The approximately 45 inhour increase during the month was largely due to the replacement of two thorium carbonate channels with uranium slugs. (Page 5)
3. One ruptured slug was located and discharged without difficulty. (Page 6)
4. Delays in obtaining material have made it necessary that the delivery of the first shipment of Al-Si bonded slugs be postponed from April to May or June. (Page 6)
5. The glass-lined P^{32} extraction equipment failed again due to extremely corrosive conditions. (Page 13)
6. Research on the separation of rare earths by ion exchange continued. (Pages 15, 16, and 17)
7. The activity discharged to White Oak Creek was 7.9 curies, compared to 18.8 curies during the previous month. The discharge from the evaporator was 0.08 curie, compared to 0.13 curie for the previous month. The evaporator decontamination factor was 7,015. (Pages 22 and 23)
8. The redesigned RaLa process filters gave satisfactory filtration rates, but the filtration efficiency was low, probably due to a weld leak. (Page 24)

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9. The RaLa product drying was rather slow and the equipment is being revised to shorten the drying time. (Page 24)

10. There were 836 radioisotope shipments, compared to 616 shipments last month. The largest number shipped during any previous month was 791 during May 1950. (Page 26)

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A. PILE DEPARTMENT

I. Operating Data:

	JANUARY 1951	DECEMBER 1950	YEAR 1950
Total Accumulated KWH	2,711,088	2,675,199	26,908,563
Average KW/Operating Hour	4066.4	4002.9	3454.7
Average KW/24-Hour Day	3643.9	3595.7	3071.7
Percent Lost Time	10.4	10.2	11.1
Excess Pile Reactivity	Approx. 155 inhrs.	Approx. 110 inhrs.	
Slugs Discharged	104	124	2859
Slugs Charged	203	124	2987
Product Made (Grams)	98.94	97.64	982.06
Product Discharged (Grams)	6.33	5.96	168.93

II. Pile Operations:

The average pile power per operating hour for the month was 4066.4 KW, compared with 3616.2 KW for January 1950. This increase is approximately the same as that previously noted for December 1950, compared with December 1949. Although part of the increase may be due to the low temperatures experienced in January 1951, it is believed mostly due to the new fans.

The pile down time was 10.4%, compared with 10.2% in December 1950, and 11.1% for the year of 1950.

An increase in reactivity of approximately 45 inhours took place during January. The most obvious removal of absorber occurred on January 22, when two channels containing thorium carbonate were discharged. Following this, a sharp increase of approximately 40 inhours occurred. The gain was partly due to the removal of the thorium carbonate and other absorbers and partly to the addition of uranium slugs to the channels formerly containing thorium carbonate.

II. Pile Operations: - (Continued)

A ruptured slug was located and discharged from Metal Channel No. 2150 on January 15, 1951. This slug was indicated by the probe and located by visual inspection after having failed to locate it by use of the scanner. The slugs had been in the pile 1,279 days in a maximum temperature of approximately 195° C. This is the eightieth slug rupture detected to date.

Examination of a shield containing an NRX irradiated MTR fuel assembly showed surface radiation of only about 5 mr/hr. The cooling liquid inside the container was approximately 0° C, indicating that there was no appreciable heating from the assembly which had cooled for thirty days. It appears that this shield will be suitable for shipment of MTR fuel assemblies.

Eighty-nine slugs containing $CaCO_3$ were loaded into nine of the unused outer metal channels on January 8, 1951. These will serve as a source of low specific activity Ca^{45}.

In order to fill a demand for small sources of Co^{60} in the range of 0.2 to 0.5 curies, arrangements are being made to cut slices from 1/8" diameter cobalt wire. A cutter is being fabricated which will permit these sources to be cut from this wire under water.

Delays in obtaining material have made it necessary that the delivery of the first batch of Al-Si bonded slugs be postponed until May or June instead of April. This will mean that the power of the pile cannot be increased until June or July. It was also learned during the month that dimensional changes in the slugs occur during bonding and, accordingly,

[redacted]

II. Pile Operations: - (Continued)

make it necessary to increase the diameter of the aluminum jackets. Should the diameter of the slugs not increase as expected, this will result in a greater amount of aluminum in the pile and a corresponding decrease in reactivity. On the other hand, it is understood that a grade of aluminum superior to 2-S will be obtained for the jackets and this may decrease the amount of reactivity absorbed.

At the end of January 1951, future work in the Pile Department included the following important projects:

1. Canal demineralizer: Parts of the apparatus are being fabricated in the shops and will probably be ready for assembly sometime in February.
2. Spare parts list: Due to the anticipated shortage of materials, efforts are being made to obtain a spare parts list and determine what spare parts should be purchased. Very little has been done on this, however, because of the shortage of manpower.
3. Operating manual for the Low Intensity Training Reactor: A start has been made in the writing of an operating manual for the LITR which is expected to come under the supervision of the Pile Department sometime in February. Until personnel have been trained, operation of this reactor will be confined to the day shift.
4. Control system of LITR: No complete report is available on the controls of the LITR. While a general discussion of this will be made in the operating manual discussed in No. 3 above, it is believed that a thorough report should be written which would include the design criteria for the present control system. Unless

[redacted]

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II. Pile Operations: - (Continued)

this is available, changes might be made without giving consideration to the reasons for the present design. This information is quite scattered at present and a thorough report would require considerable effort. Accordingly, it will have to be delayed for several months.

Two channels containing 52 thorium carbonate slugs were discharged. Both rows had been irradiated for more than four years. This material will be especially valuable for studies on the capture cross section of U^{233}.

Boron is no longer kept in solution at the core hole tank. There will, therefore, be less chance of boron contamination entering the pile through the cooling air stream.

Shields were installed over eight holes on the north face of the pile and one shim rod was covered with U-shaped shields to decrease the background at Hole No. 17. A reduction of about 30% was achieved.

On January 29, a bomb containing UF_4-NaF was being removed from Hole No. 12. The bomb had been under a slight vacuum for some time before removal; however, when the vent tube was cut a few inches from the bomb, gaseous fission products leaked. The top of the pile reached an activity level of approximately 100 mr/hr. This required the pile building to be evacuated for approximately two hours.

The four-inch holes in the X pile were divided according to the following manner at the end of January 1951:

[redacted]

[redacted]

II. Pile Operations: - (Continued)

	4" x 4" Holes	Fuel Channels within Metal Zone	Others
Biology	1/2	0	1/2
Chemistry	3	0	0
Health Physics	2	0	0
Operations	*6	1	0
Metallurgy	2	5	0
Physics	12 1/2	0	2 1/2
ANL Power Pile Group	1	5	0
Reactor Technology	3	0	0
Training School	1	0	0

*Three of the six holes contain stringers; the stringers are used for irradiations of target materials for research as well as for radioisotope distribution.

The change house was built for the joint usage of the pile building and the Hot Pilot Plant; however, increased requirements by the Hot Pilot Plant have overloaded the men's locker space available. Therefore, the former women's portion of the change house has been transferred to the use of the pile building personnel, together with thirty-two full-length locker units in the main locker room. These will serve the operating, research, health physics, and pile trainees' requirements for the pile building and the LITR. Lockers and other facilities for women will be supplied in the pile building.

III. Filter House:

The following table compares the pressure drop across the exit air filters last month with this month and that experienced when all filters were clean:

[redacted]

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III. Filter House: - (Continued)

Date	Glass Wool (In. w.g.)	CWS #6 (In. w.g.)	Total Across Filter House
1-31-51	2.4	3.8	7.6
12-31-50	2.4	3.8	7.6
Clean Filters	1.1	1.0	3.3

IV. Fan House:

The installation of the new fan motor is being held up pending a decision as to whether the oil system may be arranged similarly to that on the present motors. This includes an auxiliary oil pump and pressure switches which turn the auxiliary pump on and off according to the pressure delivered by the shaft pump on the motor. It may be necessary to obtain advice from Allis-Chalmers, the motor manufacturer, before putting a similar system on the new motor.

V. Radioisotopes:

The following table is a comparison of the radioisotopes and research samples charged into the pile during January 1951, with those handled in December 1950:

	January 1951		December 1950	
	Research	Radioisotopes	Research	Radioisotopes
Stringers 13, 14, and 16	11	221	5	112
Hole 22 (Pheumatic Tube)	66	5	53	1
All other Holes	6	22	10	17
TOTAL BY GROUPS	83	248	78	130
TOTAL FOR MONTH	331		208	

At the end of January 1951, there were 386 cans of target material in Stringers 13, 14, and 16, compared to 341 cans of target material in these stringers at the end of December 1950.

[redacted]

[redacted]

VI. Water Demineralization Building:

The operation of the building was normal, with 584,840 gallons of water being demineralized.

Produced (Gallons)	January 1951	December 1950	Year to Date
Demineralized	584,840	506,100	584,840
Deaerated	--	90,900	--

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B. CHEMICAL SEPARATIONS AND RADIOISOTOPE DEVELOPMENT DEPARTMENTS

I. Radioisotopes:

1. Iodine (I^{131} - 8d)

Forty-six ORNL slugs were processed and 38,502 millicuries were shipped. All of the product was within specifications.

On two or three occasions this month, slight air counts were noted in Building 3026 at the beginning of the dissolving step; i.e., just as the temperature was first brought up about 108° C. After the last occurrence, the equipment was washed out and the lines outside the cell pressure tested. A few minor leaks were found and repaired, although it is doubtful that any of those found would explain the air counts noted.

Another half inch of lead was added to the scatter shield about the glassware hood in Building 3026 in an attempt to reduce the background in the operating area.

Iodine Development Work

Information for modifying the preliminary construction sketch of the 3028 Plant was given to the Engineering Department. Some work was done on the chemical flowsheet.

2. Phosphorus (P^{32} - 14.3d)

Twenty 2,000-gram cans of irradiated sulfur were processed and 8,704 millicuries were shipped.

During the month, it was found that the bulk of the material forming the precipitate in the product at pH 7-9 came from the activated carbon (used to remove organic compounds which give the

[redacted]

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I. Radioisotopes: - (Continued)

2. Phosphorus (P^{32} - 14.3d)

product a color) on the final filter. Leaching of the carbon with HCl did not completely remove this material from the carbon and failed to prevent precipitates in the next product; hence, it is now planned to move this step of the process to a point ahead of the caustic precipitation step.

Phosphorus Development Work

Further failures occurred in the glass-lined extraction equipment, due principally to the failure of materials under the extremely corrosive conditions. The leaks in flanges persisted, and the Teflon in the gaskets was found to be embrittled. The cement used to hold the seats in place in the glass-lined valves failed and the seats became loose. One valve was returned for repair and two more were ordered in which a better quality cement will be used.

Installation of the emergency extraction equipment was rushed to completion and operation was started on January 16, 1951.

3. Carbon C^{14} - 5700y)

The following is a list of the C^{14} available in the unprocessed Be_3N_2 slugs:

No. of Be_3N_2 Slugs on Hand	884
Total C^{14} Content in Be_3N_2	39,780 mc
C^{14} in the form of $BaCO_3$ on Hand at End of Month	140 mc
Total	39,920 mc

[redacted]

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I. Radioisotopes: - (Continued)

3. Carbon Development Work

The C^{14} production equipment has been finished and is operating satisfactorily. There have been some troubles with the addition lines, but these are being remedied. Also, the CuO furnace plugged and stopped the flow of gas. For some reason, the inside tube was fused (or appeared to be). This will be checked to determine the cause.

The melting and crushing have been giving some trouble. Several jacket removal tests were made, as follows:

1. 800° C. furnace temperature
2. 700° C. furnace temperature
3. 700° C. in N_2 atmosphere
4. 800° C. in N_2 atmosphere
5. 1000° C.

The slugs taken to 1000°-1100° C. seemed to be almost free of metal. The crust which was left was brittle.

Slug handling techniques have proved inadequate; some changes in equipment are necessary to correct these difficulties.

A check on the corrosion formed on the outside of the Be_3N_2 slugs shows no beryllium. The substance is soluble in 3 N NaOH.

A total of 456.69 millicuries of C^{14} was produced this month.

4. Sulfur (S^{35} - 87.1d)

Carrier-free sulfur was produced with the following analysis:

Total S^{35}	3550 mc
Concentration	28.4 mc/ml
Total Solids	0.0 mg/ml
NVM	0.0 mg/ml
SO_4	0.0 mg/ml
Contamination	$<$ 0.1%

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I. Radioisotopes: - (Continued)

5. Calcium (Ca^{45} - 180d)

A batch of W-irradiated material was processed and had the following analysis:

Total Ca^{45}	252 mc
Concentration	1.44 mc/ml
Specific Activity	74 mc/gm
Heavy Metals	$<$ 10 ppm
Acidity	0.248 N (HCl)

6. Cobalt (Co^{60} - 5.3y)

Cobalt solution was prepared with the following analysis:

Total Co^{60}	524 mc
Concentration	4.19 mc/ml
Specific Activity	472 mc/gm
Acidity	0.59 N (HCl)

7. Mercury (Hg^{203} - 43.5d)

The product reported last month had the following analysis:

Total Hg^{203}	770 mc
Concentration	5.92 mc/ml
Specific Activity	86 mc/gm
Acidity	4.5 N HNO_3
Contamination	$<$ 0.1%

8. Fission Products Development Work

The fission products separations equipment in Building 3026 was decontaminated during the month, and repairs to the equipment should be completed within about three weeks. A shortage of some of the shorter-lived fission products has developed during this period.

Systematic research on the separation of rare earths by ion exchange continued. Two runs were made on solutions of mixed rare earths, using the heated ion exchange column. Appreciable amounts of Y^{91}, $Ce^{141-140}$ and Sr^{89} were fractionated to give products which

[redacted]

I. Radioisotopes: - Continued)

8. Fission Products Development Work

met specifications. Very little Pr and Nd remain in the solutions from Separation System No. 26.

One separation was made by using 3.0% tartaric acid at a pH of 3.2. Results of this run indicate that the concentration of the complexing solution was too high. The tartaric complexes of the rare earths can be broken to concentrate the final product in the same manner as with citric acid. The 3.0% tartaric acid crystallized out of the solution, which caused some difficulties with column operation.

a. TBP Process

Solutions of relatively pure fission products containing traces of Pu were decontaminated by extraction of Pu with 15% TBP and benzene. At 5.2 N HNO_3, the Pu extracted, giving decontamination factors ranging from 5 to 250. Nitric acid also extracted into the TBP solution very rapidly, and this changed extraction conditions from the optimum. A Y^{91} product was purified to meet specifications, and the Pu was extracted from a solution to be used as a starting solution for column separation RE-XI.

An attempt was made to separate americium from Pm^{147}, using the same method; no separation was observed.

b. Ba^{140} Purification

Barium from SS-26 was fractionated crudely from the Sr and rare earths by boiling the acid solution to dryness and

[redacted]

I. Radioisotopes: - (Continued)

8. Fission Products Development Work

leaching off the rare earths and Sr with H_2O. A wash of the still with 0.1 N HCl contained the Ba^{140} with a small amount of Sr^{89}.

The Ba^{140} products from SS-26 were contaminated with heavy metals (Pb, Cu, etc.) and Pu. The heavy metals could be washed from a resin column with citrate pH 3.5 or NH_4 Versene at a pH of 5.7. Difficulty was experienced in the removal of Ba^{140} from surfaces such as glass or from Dowex-50 resin. Traces of sulfate ion from the resin (a sulfonated polymer) are thought to be partly responsible for this difficulty.

9. Strontium (Sr^{89} - 55d)

Strontium 89 was produced with the following analysis:

Total Sr^{89}	119 mc
Concentration	1.41 mc/ml
Acidity	0.015 N (HCl)
Heavy Metals	10 ppm
Total Solids	0.0 mg/ml
NVM	0.0 mg/ml
Sr^{90}	$<$0.1%

10. Yttrium (Y^{91} - 57d)

Yttrium 91 was produced with the following analysis:

Total Y^{91}	91.0 mc
Concentration	1.30 mc/ml
Acidity	1.17 N (HCl)
Heavy Metals	$<$10 ppm
Total Solids	0.6 mg/ml
NVM	0.0 mg/ml

[redacted]

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I. Radioisotopes: - (Continued)

11. Niobium (Nb^{95} - 35d)

Niobium 95 was produced with the following analysis:

Total Nb^{95}	105 mc
Concentration	3.0 mc/ml
Acidity	0.385 N (citric acid)
NVM	0.0 mg/ml
Zr^{95}	< 1.0%
$Ru^{103-106}$	< 0.01%
Alpha	<10 c/m/ml
Pu	None

12. Barium (Ba^{140} - 308h)

Barium 140 was produced with the following analysis:

Total Ba^{140}	49.5 mc
Concentration	0.55 mc/ml
Acidity	0.073 N (HCl)
Total Solids	0.6 mg/ml
NVM	0.0 mg/ml
Heavy Metals	< 10 ppm
Sr Activity	< 0.01%
Alpha	145 c/m/ml

13. Chalk River Waste Separations

Construction work on the cells and the operating gallery (in 3515) was completed. About fifty control-rod holes were drilled. Several large pieces of equipment were installed and piping work was started. Some of the glassware was received but not installed. Of the equipment ordered from outside ORNL, all but the special pump and four-way stopcocks have been received.

14. F. P. Purification Cell (3028)

The east wall and ceiling of the cell were poured, using high-density concrete in the ceiling. Laying of the concrete blocks was started this week. A layout sketch showing locations

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I. Radioisotopes: - (Continued)

14. F. P. Purification Cell (3028)

of cell openings, control-rod holes, tracks, $ZnBr_2$ windows, and periscopes was given to the Mechanical Department. The Instrument Department submitted a tentative cost estimate of $1,100 for each automatic turntable. A total of $4,400 for four of these devices will probably necessitate installation of manually-operated turntables. Design of equipment inside the cell has not been started yet. This will include vessels, turntables, tracks, column-shield extensions, lead doors, and possibly special tongs.

15. SF Waste Dissolver Unit (3053 Annex)

Design work on the unit for dissolving waste SF material was started January 2, 1951, and completed during the month. Most of the equipment to be used was salvaged from Cell 5, Building 205. Progress of equipment installation has been very slow.

16. Cyclotron Targets

Two targets were processed as follows:

a. A germanium target was processed for As^{73}. Analysis of the product is not yet complete.

b. A rubidium target was processed for Sr^{85}. Analysis of the product is not yet complete.

[redacted]

[redacted]

I. Radioisotopes: - (Continued)

17. Miscellaneous Work

a. Source Preparations

Cobalt 60 sources were loaded in special holders as follows:

University of California, Los Alamos	- 2 sources, 1 curie each
Pipeline Maintenance Corporation	- 4 sources, 1 curie each
Precision Inspection Service	- 4 sources, 1 curie, 1 curie, 450 mc, 450 mc
University of Iowa	- 5 sources, 200 mc each
Sam Tour & Co., Inc.	- 6 sources, 450 mc, 450 mc, 150 mc, 150 mc, 150 mc, 150 mc.
University of Wyoming	- 4 sources, 100-200 mc each
Nuclear Research & Development, Inc.	- 3 sources, 1 curie, 500 mc, 200 mc.
Aircraft X-Ray Company	- 2 sources, 450 mc each
Louisiana State University	- 10 sources, 400 mc, 400 mc, remaining eight 100 mc each
Civilian Defense Training Course Stockpile	- 10 sources, 200 mc each
National Bureau of Standards	- 61 pieces of irradiated material prepared for shipment.

Two S^{35} sources were made for Barat College containing 5 mc each.

Two Sr^{90} sources were made for Los Alamos, 1 curie and 500 mc.

A 2-curie tritium-zirconium source was prepared for Sloane Physics Laboratory.

A neutron source was loaded for the Bulk Shielding Program.

A 100-curie Co^{60} source was re-checked for the Air Forces.

b. Hydraulic Press

A hydraulic press was modified and installed in Building 3032.

II. Tank Farm:

1. General

a. No work was done on the proportional sampler on the new weir box at the discharge side of the Settling Basin. The weir box is

[redacted]

[redacted]

II. Tank Farm: - (Continued)

1. General

complete with exception of the sampler. Health-Physics has not put the weir into use as yet.

b. A six-inch opening was cut into the top of W-10 tank this month to facilitate the removal of the uranium precipitate from this tank to the Metal Recovery Building. The hole was cut with a core drill and is on the opposite side of the large manholes on the tank.

c. A program of replacement of wooden manhole covers with iron covers has been started.

d. A new steam line with metal supports has been installed in the north Tank Farm. The old line has been removed and some of the old supporting poles have been removed. This new steam line is now tied into the plant 250 p.s.i. main.

e. A weir has been installed in a manhole of the 15-inch process waste line in the north Tank Farm. This is part of the Plan H program to determine the source and flow of activity to the Settling Basin.

f. Two new 2-inch stainless steel lines are being run to W-5 tank. One is from the Metal Recovery Building and the other from the new Health Physics Liquid Waste Building.

g. Work was begun this month to raise the 36-inch manhole on W-10 to ground level. Formerly, this manhole was covered with about five feet of earth. A pump will be installed in the tank through this manhole.

h. The 36-inch manhole on W-5 tank is also being unearthed. This

[redacted]

[redacted]

II. Tank Farm: - (Continued)

1. General

manhole will not be extended to the surface, but the manhole cover will be replaced with a cover through which multiple pipes have been cast. These pipes will be used as locations of entry into the tank from various new sources, such as the Metal Recovery Building.

i. A new underground steam line has been run from the header to the A6 to W9 jet.

2. Wastes Discharged to White Oak Creek

Approximately 7.82 curies of beta activity were discharged from the Settling Basin this month.

ACTIVITY DISCHARGED TO WHITE OAK CREEK

	JANUARY 1951		DECEMBER 1950	
Discharged From	Gallons	Beta Curies	Gallons	Beta Curies
Settling Basin	21,790,000	7.82*	23,002,000	18.07*
Retention Pond	491,743	.06	508,608	.77
TOTAL		7.88		18.84
*Contributed by Evaporator		.08		.13

3. Chemical Waste Evaporator

Volume reductions and evaporation rates were low this month, due to the reconcentration of the solution from W-8 tank which contains the concentrate from previous evaporator runs. This solution was saturated with salts which made the evaporation difficult. In spite of the difficulties involved in reconcentration, it has been calculated that by re-running this material through the evaporator,

[redacted]

[redacted]

II. Tank Farm: - (Continued)

3. Chemical Waste Evaporator

about 20,000 gallons more free space was made available.

An average decontamination factor of 7,015 was obtained for the month.

A new electrical probe foam level indication with Teflon insulation was installed in the evaporator. Operation of this probe has been satisfactory thus far. The operator is now able to anticipate a foam-over and be able to cut down on the evaporation rate before the foam-over actually occurs.

WASTE EVAPORATOR OPERATION

Gallons Fed to Evaporator	Gallons of Concentrate to W-6	Volume Reduction	Beta Curies to Evaporator	Beta Curies to Settling Basin
JAN. - 164,348	39,086	3.2:1	540.50	.08
DEC. - 156,831	24,124	5.5:1	769.33	.13

4. Waste Tank Inventory

Tanks	Gallons Capacity	Gallons In	Gallons Out	Discharged To	Free Space
HOT PILOT PLANT STORAGE					
W-3,13,14,15	48,500	0	0	---	9,374
CHEMICAL WASTE STORAGE					
W-5	170,000	163,148	164,348	Evaporator	25,200
EVAPORATOR CONCENTRATE STORAGE					
W-6, 8	340,000	80,400	44,400	Evaporator	108,000
METAL WASTE STORAGE					
W-4,7,9,10	543,000	8,976	0	---	262,616

[redacted]

[redacted]

III. RaLa (Ba^{140} - 12.5d)

Three dummy runs, consisting of five separate batches of dissolved unirradiated Hanford slugs, were made through the redesigned 3-square-foot filter. The tests were made and lead losses were used to determine the material balance. The results indicated that the filtration rate was satisfactory, although the lead losses were consistently higher than was desired. It is believed that these losses were caused by a hole in the weld. Two commercially-made filters based on the new design are now on order. It is believed that these will give satisfactory filtration.

The operating procedure was revised to include recent recommendations of the Chemical Technology Division to eliminate the silica before it reaches and plugs the process filters. These changes include the replacement of the second caustic aluminum coating removal solution with HNO_3 and $Hg(NO_3)_2$ for removal of the bonding material.

A product drying test was made using the new type of cone and drying equipment. The test employed approximately 5 C.F.M. air flow at 340° C. at the discharge of the heater. The test ran 14 hours before complete dryness of product was obtained.

To obtain greater heating from the electrical heater, the wiring is being changed from a 440-volt, 15-ampere, single-phase series hook-up to a 220-volt, 15-ampere, three-phase delta hook-up. This should increase the power output by at least a factor of two and reduce the time of evaporation considerably.

A Phoenix carrier of a new design was completed and is being shipped to Hanford Engineer Works for their appraisal and approval.

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III. RaLa (Ba^{140} - 12.5d): - (Continued)

The following work was done on the new RaLa equipment:

1. Further adjustments were made on the cone manipulator and charging head shield.
2. The building woodwork painting was completed.
3. Piping work was continued on the new resin cubicle panel boards.
4. Electrical services were run to the new panel board and several instruments were installed.
5. The fluorescent lights and product viewing mirror were installed in the loading cubicle.
6. Piping from the product charging heads to the off gas line was completed. The piping in the channel was also completed.
7. The air heater and filter were installed and electrically connected.
8. The loading cubicle plug was installed.
9. One tantalum-lined evaporator was received and mounted.

The latest information from Los Alamos is that the next run will not be needed there until April 1, 1951.

The acid-proof floor in the decontamination room of Building 3026 is being replaced with new brick.

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C. RADIOISOTOPE CONTROL DEPARTMENT

I. General

During January 1951, there were 836 radioisotope shipments, compared with 616 during December and 661 during November 1950. In January 1950, there were 633. The largest number shipped during any previous month was 791 during May 1950.

The breakdown according to separated and unseparated material is as follows:

	January 1951	December 1950	January 1950	August 1946 to January 1951, Inclusive
Separated Material 706-D Area	652	498	490	15,513
Unseparated Material 100 Area	184	118	143	4,750
TOTAL SHIPMENTS	836	616	633	20,263

The breakdown of shipments according to non-project, project, and foreign shipments is as follows:

	January 1951	December 1950	January 1950
Non-Project	680	510	505
Project	146	93	104
Foreign	10	13	24
	836	616	633

II. Hanford Irradiations:

The following radioisotope samples were received from Hanford during January 1951:

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Sample No.	Material	Date Discharged	Date Received
ORNL-117	Enriched Tin Oxide	-	January 5, 1951
ORNL-59	Antimony	-	January 5, 1951
ORNL-126	Cesium 134	-	January 5, 1951
ORNL-130	Enriched Fe^{54}	-	January 5, 1951
ORNL-60	KCl	-	January 5, 1951
ORNL-111	Metallic Cobalt (11 pcs)	-	January 5, 1951
ORNL-109	Chromium (4 pcs)	-	January 5, 1951
ORNL-131	Cobalt (2 pcs)	-	January 26, 1951

III. Cyclotron Radioisotopes:

Following is a list of the outstanding orders for cyclotron radioisotopes now on hand:

Material	Amount	Status
Mn 54	2 mc	Material in process
As 73	11 mc	Material in process

BOMBARDMENTS RECEIVED

	M. I. T.		U. of CALIF.		U. of PITTSBURGH		WASHINGTON U.	
	Bombardments	Beam Hours	Bombardments	Beam Hours	Bombardments	Beam Hours	Bombardments	Beam Hours
Be 7					8	235.00		
Na 22	1	109.75			5	201.75	4	300.00
Mn 52					2	20.00		
Mn 54							2	100.00
Co 57							2	50.00
Fe 59			5	255.6				
Zn 65	1	100.00						
Sr 85	1	51.75			1	10.00		
As 73					1	10.00		
I 125							2	60.00
Molybdenum Metal					1	13.00	2	20.00
TOTAL RECEIVED	3	261.50	5	255.6	18	489.75	12	530.00

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III. Cyclotron Radioisotopes: - (Continued)

BOMBARDMENTS REQUESTED BUT NOT RECEIVED

	M. I. T.		U. of CALIF.		U. of PITTSBURGH		WASHINGTON U.	
	Bombard-ments	Beam Hours	Bombard-ments	Beam Hours	Bombard-ments	Beam Hours	Bombard-ments	Beam Hours
Zn 65			1	40.00				
Mn 54							1	50.00
Co 56-57							1	40.00
Sr 85	1	50.00						
TOTAL HOURS OUTSTANDING (Not Received or Requested)		438.50		454.40		260.25		130.00

SHIPMENTS OF CYCLOTRON-PROCESSED RADIOISOTOPES

Material	No. Shipments January 1951	No. Millicuries January 1951	No. Millicuries To Date
Be 7	1	5	164.073
Na 22	2	2.15	31.097
Mn 52			9.991
Co 57			2.0
Fe 59			1.5 mc and 1 S.I.
Zn 65	1	5	6.5
Mn 54	1	.92	.92
Fe 55-59	1	1	1.0

IV. Activation Analyses:

The status of the activation work remains the same as shown in the October report.

M. E. Ramsey

M. E. Ramsey, Director
Operations Division

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V. S-F Material Control:

1. During the month, an additional 58.57 kilograms of 90-95% enriched uranium metal was received from Y-12 for disc fabrication work associated with the ANP program. By the end of January, 1,391 discs, representing 26.58 kilograms of 93.25% enriched uranium, had been fabricated and returned to Y-12. In addition 36.23 kilograms were returned to production channels as scrap for reprocessing.

2. On January 26, a special express car from Hanford was received. The SF content contained in this shipment consisted of 42 eight-inch Hanford slugs for use in connection with long life fission product separation work, particularly Sr^{90} extraction.

3. On January 5, two specially-built containers were shipped to Chalk River, Canada, for the purpose of loading an MTR fuel assembly and an eight-foot aluminum tube containing 10 J slugs. Both of these assemblies have undergone irradiation in the Chalk River pile. The MTR assembly was delivered to Oak Ridge National Laboratory during the latter part of January.

4. On January 29, an SF survey was begun by the AEC, Oak Ridge Operations survey group. This survey will consist largely of an audit of the SF office records and a spot check of material balance areas. Additional data regarding findings will be included in the February report.

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V. S-F Material Control: - (Continued)

5. The SF office continued its program of surveying material balance areas within the Laboratory. During the month six persons possessing SF material were visited and their material was inspected and weighed where feasible. No apparent discrepancies were encountered.

6. Records of three analytical laboratories were audited during January. Results of this audit disclosed that all records were in good order and proper accounting had been made for all samples.

7. During January the Atomic Energy Commission modified the procedure for obtaining special materials such as beryllium, zirconium, etc. The resulting change entails the issuance of a certificate allocating quantities of special material based upon ORNL submission of requirements by quarter years. ORNL estimated requirements are submitted semi-annually; namely, in September and March. Approved allocation certificates then permit the Laboratory to direct firmed requests directly to the Atomic Energy Commission, New York Operations Office, thus eliminating the necessity of submitting individual requests by letter to the Atomic Energy Commission, Office of Research and Medicine, ORO. Future requests will not be processed by the AEC Materials Branch, ORO. Cost arising in the procurement of special materials will continue to be back-charged to the Laboratory through Atomic Energy Commission channels.

8. During the month, there were 19 shipments received and 40 shipments made, compared with 16 receipts and 21 shipments last month.

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V. S-F Material Control: - (Continued)

9. Following is a summary of receipts and shipments of SF materials for the month of January 1951:

RECEIPTS

From	Material	Content
Argonne National Laboratory	Normal U-Mo Rod	5,720.00 gm
Argonne National Laboratory	Depleted uranium (waste)	35,870.00 gm
Argonne National Laboratory	Plutonium (waste)	0.23 gm
Argonne National Laboratory	Depleted uranium (U_3O_8)	2.00 gm
Argonne National Laboratory	Normal uranium (U_3O_8)	2.00 gm
C&CCD, K-25 Area	Normal uranium (UO_2)	4,406.00 gm
C&CCD, K-25 Area	Normal uranium (UF_6)	1,314.00 gm
C&CCD, Y-12 Area	Enriched uranium (ANP)	9,693.20 gm
C&CCD, Y-12 Area	Enriched uranium (ANP)	15,725.14 gm
C&CCD, Y-12 Area	Enriched uranium (ANP)	17,851.43 gm
C&CCD, Y-12 Area	Enriched uranium (ANP)	15,309.25 gm
C&CCD, Y-12 Area	Normal uranium (UO_2SO_4)	262.70 gm
C&CCD, Y-12 Area	Normal uranium (UO_2SO_4)	525.40 gm
C&CCD, Y-12 Area	Enriched uranium (U-sulfate)	3.40 gm
General Electric, Hanford	Normal uranium (cold slugs)	394,732.16 gm
General Electric, Hanford	Thorium (metal)	5,284.32 gm
General Electric, Hanford	Normal uranium (fuel plates)	2.59 gm
General Electric, Hanford	Depleted uranium (slugs)	148,405.59 gm
General Electric, Hanford	Plutonium (slugs)	71.28 gm
Iowa State College	Thorium metal billets	37,730.00 gm
Eimer & Amend (Purchase)	Thorium tetrachloride	62.36 gm
A. D. MacKay (Purchase)	Thorium ($Th(OH)F_3.H_2O$)	324.77 gm

SHIPMENTS

To	Material	Content
Argonne National Lab.	Enriched U-Zr Alloy (fuel plates)	12.18 gm
Brookhaven National Lab.	Normal uranium foil	0.09 gm
Brookhaven National Lab.	Normal uranium foil	0.10 gm
Brookhaven National Lab.	Normal uranium foil	0.10 gm
Brookhaven National Lab.	Normal uranium foil	0.10 gm
Brookhaven National Lab.	Normal uranium foil	0.11 gm

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V. S-F Material Control: - (Continued)

9. Summary of receipts and shipments for January 1951.

SHIPMENTS

To	Material	Content
C&CCD, Y-12 Area	Enriched uranium (misc.)	163.79 gm
C&CCD, Y-12 Area	Normal uranium (Al-alloy)	16,781.70 gm
C&CCD, Y-12 Area	Enriched uranium (misc.)	6.42 gm
C&CCD, Y-12 Area	Enriched uranium (bulk shielding)	0.72 gm
C&CCD, Y-12 Area	Enriched uranium (ANP)	74.60 gm
C&CCD, Y-12 Area	Enriched uranium (ANP)	3,456.86 gm
C&CCD, Y-12 Area	Enriched uranium (ANP)	8,441.13 gm
C&CCD, Y-12 Area	Enriched uranium (ANP)	3,492.90 gm
C&CCD, Y-12 Area	Normal uranium (tubes)	1,080.00 gm
C&CCD, Y-12 Area	Normal uranium ($UO_2(NO_3)_2$)	0.60 gm
C&CCD, Y-12 Area	Depleted uranium ($UO_2(NO_3)_2$)	0.23 gm
C&CCD, Y-12 Area	Normal uranium (tubes)	1,120.00 gm
C&CCD, Y-12 Area	Thorium (tubes)	1,850.00 gm
C&CCD, Y-12 Area	Enriched uranium (ANP)	65.28 gm
C&CCD, Y-12 Area	Enriched uranium (ANP)	7,044.33 gm
C&CCD, Y-12 Area	Enriched uranium (ANP)	3,403.62 gm
C&CCD, Y-12 Area	Enriched uranium (ANP)	3,723.06 gm
C&CCD, Y-12 Area	Normal uranium foil	5.40 gm
C&CCD, Y-12 Area	Normal uranium (UO_3)	3,390.00 gm
C&CCD, Y-12 Area	Enriched uranium (ANP)	3,509.86 gm
C&CCD, Y-12 Area	Enriched uranium (ANP)	111.86 gm
C&CCD, Y-12 Area	Enriched uranium (ANP)	5,903.11 gm
C&CCD, Y-12 Area	Normal uranium (rod)	213.00 gm
C&CCD, Y-12 Area	Enriched uranium (Al-alloy)	0.93 gm
C&CCD, Y-12 Area	Depleted uranium metal	4.94 gm
C&CCD, Y-12 Area	Enriched uranium (Al-alloy)	0.35 gm
C&CCD, Y-12 Area	Enriched uranium (ANP)	3,586.14 gm
C&CCD, Y-12 Area	Enriched uranium (ANP)	6,325.43 gm
C&CCD, Y-12 Area	Normal uranium (rod)	213.00 gm
C&CCD, Y-12 Area	Enriched uranium (ANP)	5,820.62 gm
C&CCD, Y-12 Area	Enriched uranium (ANP)	3,618.57 gm
C&CCD, Y-12 Area	Normal uranium (rods)	639.00 gm
Fairchild (NEPA)	Normal uranium metal	190.00 gm
Fairchild (NEPA)	Thorium metal	111.00 gm
Tracerlab, Inc.	Normal uranium (U_3O_8)	0.41 gm
Tracerlab, Inc.	Normal uranium (U_3O_8)	0.41 gm
Tracerlab, Inc.	Normal uranium (U_3O_8)	0.44 gm

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