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ORNL 1010
Progress Report

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AEC RESEARCH AND DEVELOPMENT REPORT

LABORATORY RECORDS 1954

OPERATIONS DIVISION

MONTHLY REPORT

FOR

MONTH ENDING APRIL 30, 1951

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By: A. Goldberg 2.4.71

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OPERATED BY
CARBIDE AND CARBON CHEMICALS COMPANY
A DIVISION OF UNION CARBIDE AND CARBON CORPORATION
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OPERATIONS DIVISION

MONTHLY REPORT

for

Month Ending April 30, 1951

by

M. E. Ramsey

DATE ISSUED

MAY 17 1951

OAK RIDGE NATIONAL LABORATORY
Operated by
CARBIDE AND CARBON CHEMICALS COMPANY
A Division of Union Carbide and Carbon Corporation
Post Office Box P
Oak Ridge, Tennessee

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SUMMARY

1. Lost pile-operating time averaged 13.4%, compared to 11.2% in March and 11.1% for the year-to-date. (Page 4.)
2. One ruptured slug was detected and discharged during the month. (Page 4.)
3. The Low Intensity Training Reactor was operated intermittently during the month. (Pages 5 and 6.)
4. Part of the CWS #6 paper in the Filter House was changed during the month. Practically all the paper has been in service about two and one half years. (Page 7.)
5. Design work for the new I^{131} process is progressing satisfactorily. (Pages 8, 9, and 10.)
6. Work is continuing on the development of process for recovery and reuse of the beryllium from the irradiated Be_3N_2 slugs used in the production of C^{14}. (Pages 11 and 12.)
7. The activity discharged to White Oak Creek was 14.2 curies, compared to 5.1 curies during the previous month. The source of the increased activity has not been located yet. (Page 21.)
8. RaLa Run No. 43 was shipped on April 6, 1951. This was a tracer run for Los Alamos of one hundred and fifty-seven curies. The new equipment, in general, performed well. The next run will be 5,000 curies and is scheduled to begin on May 13, 1951. (Pages 23, 24, and 25.)
9. The second resin cubicle has been completed on the RaLa equipment and shake-down runs started. (Pages 23, 24, and 25.)
10. There were 867 radioisotope shipments, compared to 857 shipments last month. (Page 26.)

[redacted]

A. PILE DEPARTMENT

I. Operating Data:

	APRIL 1951	MARCH 1951	YEAR-TO-DATE 1951
Total Accumulated KWH	2,335,806	2,551,449	10,024,733
Average KW/Operating Hour	3746.7	3860.2	3917.1
Average KW/24-Hour Day	3244.2	3429.4	3480.8
Percent Lost Time	13.4	11.2	11.1
Excess Pile Reactivity	~165 inhours	~165 inhours	
Slugs Discharged	381	369	2550
Slugs Charged	265	369	2538
Product Made (Grams)	85.25	93.12	365.87
Product Discharged (Grams)	36.73	39.03	335.65

II. Pile Operations:

The average pile power per operating hour for the month was 3,746.7 KW, compared with 3,860.2 KW for March, 1951.

The pile-down time was 13.4%, compared with 11.2% in March, 1951, and 11.1% for the year-to-date. The increase in down-time was due to the increased down-time requirements of research personnel, and the changing of the south mattress plate on April 16 and the north mattress plate on April 23, 1951.

A ruptured slug, detected by the probe and located by the scanner, was discharged without difficulty. The slug exposure data are as follows:

Rupture No.	Metal Channel No.	Date of Discharge	Days in Pile	Approximate Maximum Metal Temperature in Channel
87	1574	4-22-51	2,364	200° C.

On the project for producing bonded slugs at Y-12, the possibility of changing the bonding procedure arose due to some recent developments in this process. It was decided, however, that since the new process had not been thoroughly tested, at least the initial production would be done using the standard Hanford process.

II. Pile Operations: - (Continued)

The filter on the canal slug cutter allowed a considerable amount of radioactive materials to pass and contaminate pipe lines in the canal. This necessitated a large amount of decontamination work. Until a more effective filter is available, it will be very difficult to cut Hanford slugs. In the future, it is planned to make service charges for slugs cut for other installations.

The permanentization of the control wiring in the Pile Building is essentially complete. Within a few weeks, it will be possible to finish the installation of panels around the first level, south, permitting access to this level from the east side.

The Low Intensity Training Reactor was operated during the month mainly for training of personnel and for testing equipment.

A five-day run was made from April 6 to 11, 1951, at a power of approximately 700 KW. Water samples were taken and a maximum activity of about 6,000 counts/minute/milliliter beta activity was found to be induced in the reactor cooling water. Complete water analyses indicated that there was no appreciable corrosion in the reactor. Following are analyses obtained after five days of operation with no water addition or purging:

Analyzed For	Results (ppm)
Cr	0.01
Ni	0.03
Al	Be and Al reported as Be
Fe	0.09
H_2O_2	10.7
Soap Hardness	8.0
Cl	1.6
Total Solids	9.9
Non-Vol Solids	8.2
SO_4	2.1
Na	1.0
Be	0.7
pH	6.5
Cond.	9.8×10^{-6} (mhos)
Sp. Res.	1.02×10^{5} (ohms)

II. Pile Operations: - (Continued)

It appears that Be is corroding considerably faster than the Al in the reactor. This will be checked in later runs.

The tops of two shim rods had rusted badly and were replaced on April 12, 1951. A shim rod from the Materials Testing Reactor was tested and found to be satisfactory on April 12 and 13, 1951, by dropping one, ten, and one hundred times, respectively, with an examination between each series of drops.

The No. 2 magnet at the LITR was found to be shorted out on April 16, 1951. This was replaced with an MTR magnet and the top from the defective magnet was sent to Westinghouse for building into a new magnet.

A three-day run was made during the week of April 16 to 20, 1951, for the purpose of establishing a heat balance. This work was done as part of an experiment of the MIT Practice School.

It is planned to operate the LITR on a five-day-week, twenty-four hours a day, until additional supervisory personnel have been trained. It is hoped that this can be completed in about a month so that sometime in June it should be possible to begin operation on a seven-day-week basis.

III. Fan House:

The new Allis-Chalmers motor was installed on April 2-4, in place of the old No. 3 motor which had been operating with one of the coils burned out. The oil system in the new motor was completely revamped so that the auxiliary oil pump system could be used similarly to the on the old motor. It was planned to have the old motor repaired at X-10, but after inspection it was decided that it should be sent to an Allis-Chalmers factory for repair. A purchase

III. Fan House: - (Continued)

order has been issued to this effect. Approximately seven weeks will be required to complete the repair of this motor. It is hoped that the repair will be completed by the end of June, 1951. At this time, the repaired motor will be installed in place of the No. 2 motor which will then be repaired and kept as a spare.

IV. 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:

Date	Glass Wool (In. w.g.)	CWS #6 (In. w.g.)	Total Across House
4-30-51	2.6	3.1	7.2
3-31-51	2.6	4.0	8.0
Clean Filters	1.1	1.0	3.3

The decrease was caused by the replacement of one half of the CWS filters in No. 3 cell on April 29, 1951. Except for the removal of a few units for experimental reasons, this is the first change of CWS #6 paper since installation during November, 1948. This reduced the static pressure from 42" to 38.3" w.g.

V. Radioisotopes:

The following table is a comparison of the radioisotope and research samples charged into the pile during April, 1951, with those handled in March, 1951:

	APRIL, 1951		MARCH, 1951	
	Research	Radioisotopes	Research	Radioisotopes
Stringers 13, 14, and 16	22	170	9	185
Hole 22 (Pneumatic Tube)	72	10	64	6
All Other Holes	7	25	7	19
TOTAL BY GROUPS	101	205	80	210
TOTAL FOR MONTH	306		290	

V. Radioisotopes: - (Continued)

At the end of April, 1951, there were 364 cans of target material in Stringers 13, 14, and 16, compared to 386 cans of target material in these stringers at the end of March, 1951.

VI. Water Demineralization Building:

The operation of the building was normal with 625,260 gallons of water being demineralized of which 35,850 gallons were also deaerated.

PRODUCED (Gallons)	APRIL, 1951	MARCH, 1951	YEAR-TO-DATE
Demineralized	625,260	698,760	2,550,320
Deaerated	34,360	49,820	198,600

B. CHEMICAL SEPARATIONS AND RADIOISOTOPE DEVELOPMENT DEPARTMENTS

I. Radioisotopes:

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

Eighty ORNL slugs were processed and approximately 36,339 millicuries were shipped. All products were within specifications.

Low yields were experienced on all runs this month. The cause for the low yields has not yet been determined. Some abnormalities have shown up in these runs, but none that would conclusively explain the low yields. A shutdown and decontamination for inspection and repair of the cell is scheduled to start as soon as a surplus of I^{131} can be

I. Radioisotopes: - (Continued)

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

obtained from the processing of Hanford slugs; this should be accomplished during the latter part of May, 1951.

Iodine Development Work

Three revisions of structural drawings were submitted by Engineering for study. A final structural drawing is being started. The Engineering Department has been working on piping, which is to be divided into three sections for clarity, as follows: (a) drains, (b) process, (c) service (including instrument lines).

Equipment design is underway. The dissolver drawing is about sixty percent complete. The designs of other vessels have been studied and they will be drawn as soon as possible.

Instrumentation problems have been discussed with the Instrument Department. It is believed that satisfactory equipment is available on the market although the prices are high. It is planned to avoid the use of open lines between vessels and instruments by using pneumatic or electric transmitters.

A representative of the Tri-Clover Machine Company demonstrated their quick-opening stainless steel flanges. These units appear to be very promising for use on this project. A sample unit was ordered for testing. At this same interview, two other engineers revealed certain welding problems attending the use of stainless steel clad for our cubicle and cell liners. Consequently, it was decided to consider using regular stainless (304 E.L.C.). Therefore, the study of the 347 stainless steel twenty percent clad specimen was deferred.

I. Radioisotopes: - (Continued)

1. Iodine Development Work

The equipment flowsheet was completed. Glassware for experimental work on cold water scrubbing of iodine vapor was fabricated and installed.

The overall heat transfer coefficients for a stainless steel condenser were experimentally determined to be 240 Btu/ft^{2}hr^{o}F for the condensing section and 40 Btu/ft^{2}hr^{o}F for the cooling section. This condenser had a spiral condensing tube similar to several of our proposed designs.

A full-scale mockup of a cubicle containing a dissolver and piping was fabricated of wood and cardboard to clarify design problems.

Installation of an experimental pulse column in the east wall hood of 3014 Annex was started. Machine and glassware work is in progress. Some experimental work, in addition to that of other Laboratory groups, is necessary because our primary interest is in the fission products, rather than in the U or Pu. Design work on the feed and pulse pumps has been done. It was decided to use a Corson-Cerveny bellows pump for both. A remote-controlled hydraulic drive principle will be used for operating the pumps. This equipment has been designed and will be tested in the near future.

Progress on installation of the 1,000-gallon metal-waste holdup tank appears to be slow. However it was necessary to excavate solid rock to a depth of seventeen and a half feet below street level without blasting.

I. Radioisotopes: - (Continued)

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

Eighteen 2,000-gram cans of irradiated sulfur were processed and about 10,586 millicuries were shipped. All products were within specifications.

Use of the new sulfur irradiation can in the pile was begun; the first new ones will come out of the pile during the latter part of May, 1951.

3. Carbon ($Carbon^{14}$ - 5,700y)

The production of C^{14} for the month was 2,612 millicuries as barium carbonate.

Carbon Development Work

A new copper oxide furnace was installed in the production equipment; this furnace has no gas line through the center. It is an inch and a half in diameter and contains a bed of copper oxide ten inches deep (approximately one pound).

For recovery of the beryllium, a new tank with a conical-shaped bottom and facilities for steam and air sparging has been installed. The outlet pipe on the bottom now has a right angle bend which does not allow the precipitate to be removed easily; this will be corrected by making a straight outlet on the conical bottom.

Several trial runs have been made to produce beryllium chloride for experimentation. The charge in the chlorinator was not made into pellets and this, according to many experiments done by Brush Beryllium, is a very important factor in chlorinating. The low yield experienced in our work attested to this fact. However, there is enough $BeCl_2$ on hand to start

I. Radioisotopes: - (Continued)

3. Carbon Development Work

some of the tests on conversion to Be_3N_2 with ammonia which have been planned. A pellet press will be received soon so that more chloride can be made for more extensive experimental work.

4. Calcium (Ca^{45} - 87.1d)

A calcium product was made from material enriched in calcium 44, irradiated at Hanford. This preparation had the following analysis:

Total Ca^{45}	100 mc
Concentration	1.0 mc/ml
Specific Activity	200 mc/g
Ca	0.5 mg/ml
Heavy Metals	<10 ppm
Acidity	0.948 N (NCl)

Two carrier-free products were made with the following analyses:

Total Ca^{45}	0.366 mc	0.750 mc
Concentration	0.0126 mc/ml	0.0214 mc/ml
Total Solids	0.5 mg/ml	2.0 mg/ml
NVM	0.0 mg/ml	1.8 mg/ml
Acidity	0.0948 N (HCl)	0.145 H (HCl)
Contamination	<0.1%	<0.2%

5. Iron (Fe^{55-59} - 4y, 46.3d)

Iron products were produced with the following analyses:

Total Fe^{59}	13.0 mc	7.78 mc
Total Fe^{55}	9.0 mc	11.6 mc
Concentration Fe^{59}	0.030 mc/ml	0.074 mc/ml
Concentration Fe^{55}	0.09 mc/ml	0.11 mc/ml
Specific Activity Fe^{59}	3.2 mc/g	4.0 mc/g
Specific Activity Fe^{55}	2.2 mc/g	6.0 mc/g
Fe	40.6 mg/ml	18.2 mg/ml
Acidity	0.077 N (HCl)	0.095 N (HCl)
Co^{60}	0.00004 mc/ml	0.0008 mc/ml

I. Radioisotopes: - (Continued)

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

Carrier-free sulfur was produced with the following analysis:

Total S^{35}	25,800 mc
Concentration	152.9 mc/ml
Heavy Metals	10 ppm
Total Solids	0.0 mg/ml
Acidity	0.066 N (HCl)
Contamination	<0.1%

A solution of elemental sulfur in benzene was produced with the following analysis:

Total S^{35}	2286 mc
Concentration	22.86 mc/ml
Specific Activity	9.9 mc/mg

7. Fission Products

Run #SS-27 was made for general separation of short-lived fission products. The small TBP solvent extractor was used successfully for producing several batches of mixed (unseparated) fission products sufficiently low in Pu for general distribution. Silica gel is now being used for zirconium-niobium adsorption instead of ion exchange resin. Thirty curies of rare earths were obtained to be used as starting material for the separation of pure rare earths.

Run #SS-28, using three-year-old Hanford slugs cooled four years, is now in progress.

a. Cerium ($Ce^{141-144}$ - 30.6d, 275d)

Cerium products, one high and one low in Ce^{141}, were made with the following analyses:

I. Radioisotopes: - (Continued)

7. Fission Products

a. Cerium ($Ce^{141-144}$ - 30.6d, 275d)

Total Ce^{141}	215 mc	Nil
Total Ce^{144}	53.8 mc	800 mc
Concentration Ce^{141}	2.15 mc/ml	< 10%
Concentration Ce^{144}	0.538 mc/ml	4.0 mc/ml
Heavy Metals	10 ppm	10 ppm
Total Solids	1.25 mg/ml	0.0 mg/ml
NVM	0.0 mg/ml	0.0 mg/ml
Rare Earths other than Ce	< 1.0%	< 0.1%
Gross Alpha	< 10 c/m/ml	< 740 c/m/ml
Pu Alpha	0.0 c/m/ml	500 c/m/ml
Acidity	0.496 N (HCl)	1.46 N (HCl)

b. Praesodymium (Pr^{143} - 13.5d)

Praesodymium products were produced with the following analysis:

Total Pr^{143}	211 mc	97.6 mc
Concentration	2.11 mc/ml	0.976 mc/ml
Heavy Metals	< 10 ppm	< 10 ppm
Total Solids	0.5 mg/ml	0.0 mg/ml
NVM	0.0 mg/ml	0.0 mg/ml
Gross Alpha	0.0 c/m/ml	0.0 c/m/ml

c. Zirconium-Niobium (Zr^{95}-Nb^{95} - 65d, 35d)

Zirconium-niobium mixtures were produced with the following analyses:

Total Zr^{95}	712 mc	1140 mc
Total Nb^{95}	536 mc	865 mc
Concentration Zr^{95}	7.12 mc/ml	11.4 mc/ml
Concentration Nb^{95}	5.36 mc/ml	8.65 mc/ml
Acidity	0.226 N (NNO_3)	0.394 N (HNO_3)
Gross Alpha	1950 c/m/ml	650 c/m/ml
Pu Alpha	144 c/m/ml	40 c/m/ml

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

Barium was produced with the following analysis:

Total Ba^{140}	251 mc
Concentration	2.51 mc/ml
Heavy Metals	20 ppm
Total Solids	2.1 mg/ml
NVM	0.0 mg/ml
Acidity	1.90 N (HCl)
Sr^{89-90}	0.1% of Ba^{140}
Gross Alpha	0.0 c/m/ml

I. Radioisotopes: - (Continued)

7. Fission Products

e. Unseparated Fission Products

Three batches of unseparated fission products were produced with the following analyses:

Total Beta Activity	558 mc	604 mc	1316 mc
Acidity	3.50 N (HNO_3)	4.95 N (HNO_3)	5.44 N (HNO_3)
Gross Beta	2.79 mc/ml	3.02 mc/ml	6.58 mc/ml
Gross Alpha @ 52% Geom.	244 c/m/ml	260 c/m/ml	500 c/m/ml
Pu Alpha @ 52% Geom.	130 c/m/ml	114 c/m/ml	

f. Strontium (Sr^{90} - 25y)

A batch of 7,900 millicuries of Sr^{90} was purified and analyzed during the month. Another batch, which should contain ~ten curies, is ready for analysis.

8. Chalk River Waste Separation

Because of the extensive Plan "H" work in the Tank Farm, it was decided to test the transfer of liquids from W-15 to the 3515 crystallizer. The inlet side of the W-15 jet was connected to water in a fifty-gallon drum above ground. The transfer was made without incident. This test will be repeated in the near future, with the inlet leg extended (down the hill) to test the lift capacity of the jet.

The placement of the glassware and pinchclamps in Cell 2 is complete. Five motorized pinchclamps were installed and tested.

The testing program in Cell 1 was started. Installation of equipment in this cell is complete except for the ion chamber. Tests will be made to determine whether or not the twenty-six liters of resin can be removed and replaced under simulated operating conditions.

I. Radioisotopes: - (Continued)

8. Chalk River Waste Separation

The following work remains to be done:

a. Connect lines to glassware and glass-lined tanks.

b. Install remote controls.

c. Modify piping on alkaline-earth fuming vessel, plus some miscellaneous piping.

d. Install instruments (racks, switches, recorder, two monitron chambers and electrometer, ion chambers and electrometer).

e. Rewire the hot water heater.

f. Complete installation of vacuum trap and sampler stations.

g. Install safety railing stop Building 3515.

h. Design a sample transfer shield.

i. Complete testing program.

9. SF Waste Dissolver Unit, 3053 Annex

The equipment was tested and several dummy runs were made. Because of the variations in the material to be dissolved, it was decided not to write a standard procedure covering all conditions. Consequently, the Chemical Separations Department provided operators and a supervisor who were instructed in the operation, after which the unit was released. The equipment has been in constant use and is giving satisfactory service.

I. Radioisotopes: - (Continued)

10. Beryllium (Be^7 - 57.9d) (Cyclotron)

Beryllium was separated with the following analysis:

Total Be^7----------427.5 mc
Concentration----------4.50 mc/ml
Total Solids----------0.5 mg/ml
Acidity----------0.728 N (HCl)

11. Manganese (Mn^{52-54} - 5.8d, 310d) (Cyclotron)

A manganese product was made in February; the analysis has now been completed, as given below:

Total Mn^{54}----------1.07 mc
Concentration Mn^{54}--------0.011 mc/ml
Concentration Mn^{52}--------2.98 x 10^5 mc/ml
Specific Activity Mn^{54}----12,500 mc/g
Acidity----------0.204 N (HCl)
Contaminant, V^{48}----------2.50 x 10^{-5} mc/ml

12. Chlorine (Cl^{36} - $\sim 10^6$y)

Chlorine was separated with the following analysis:

Total Cl^{36}----------0.286 mc
Concentration----------0.0044 mc/ml
Specific Activity---------0.331 mc/g
Cl----------13.3 mg/ml
Total Solids----------0.0 mg/ml
Acidity----------0.382 N (HCl)

13. Source Preparations

a. Co^{60} sources were loaded in special holders as follows:

Symington Gould Corporation----------2 sources, 1.5 C each
National Bureau of Standards---------1 source, 7 C
Dow Chemical Company----------1 source, 150 mc
State of Maine Civil Defense Office--1 source, 100 mc
UCLA----------13 sources, 1-1C, 2-500mc, 10-100mc
St John's X-Ray Company----------2 sources, 1-500 mc, 1-100mc
National Bureau of Standards---------1 source, 100 mc
U. S. Dept. of Public Health---------1 source, 500 mc
Industrial Gamma Ray & X-Ray Labs.---2 sources, 500 mc each
University of South Dakota----------2 sources, 100 mc each
University of North Dakota----------1 source, 100 mc
Tracerlab, Inc.----------10 sources, 500 mc each
University of Rochester----------3 sources, 1-100mc, 1-500mc, 1-1C
University of West Virginia----------7 sources, 2-500 mc, 5-100 mc
Army Chemical Center----------1 source, 1 C
Ohio State University---------- 6 sources, 100 mc each
Los Alamos Scientific Laboratory-----1 source, 500 mc
Reactor Technology Division, ORNL----2 sources, 1-25 mc, 1-150 mc

I. Radioisotopes: - (Continued)

13. Source Preparations

b. A Cs^{137} source was prepared as follows:

Princeton University----1 source, 60 mc, in stainless steel capsule.

14. Packaging

a. Tritium was packaged for shipment as follows:

University of Arkansas----------10 mc
Ohio State University----------2 cc
Dr. H. M. Chadwell----------1 cc
University of California----------2 cc
Brookhaven National Laboratory---------1 cc
Battelle Memorial Institute----------20 mc

b. Argon 37 was packaged for the University of Illinois.

15. Services

a. Beryllium 7 was prepared as an isotonic solution for the University of North Carolina.

b. Fe^{55} X-Ray Source

Work continued on the preparation of an Fe^{55} source suitable for X-ray diffraction work. Radioactive Fe_2O_3 was placed in a 3/8" diameter depression in a ½" platinum strip and reduced to the metallic state. The heat for the reduction and melting of the iron was obtained by passing the current directly through the platinum strip. This method allows close control of the temperature of the source.

A small ring of porcelain cement was placed around the 3/8" diameter depression to prevent excessive flowing of the molten iron. The cement was previously fused at approximately 1400° C. After the iron is melted, the depression will be cut out and soldered to a 3/8" diameter

I. Radioisotopes: - (Continued)

15. Services

b. Fe^{55} X-Ray Source

brass rod. It is proposed that the completed source be plated with 0.0001" nickel to prevent corrosion of the iron.

16. Design work

a. The design for modification of the pickup truck bed was submitted. Fabrication is complete, but installation has not been started.

b. The bottle-handling station for the twenty-foot hot barricade in Building 3029 is being installed.

c. Advice was given the Analytical Division on the design of a high-level sampling station for Building 3026. Upon approval of the basic ideas, this work was turned over to the Engineering Department.

d. Widening the ledges of semi-hot hoods in the interest of safety continued. Two hoods in Building 3028 were modified.

e. A shielded monster was obtained from the Burial Ground. It was stored for future use.

f. Further investigation of wax coating for cells consisted of requests for information and samples from Innis-Spieden Company, from whom an acknowledgement was received.

g. A magnetically-operated glass valve was designed and a model for testing is being fabricated.

I. Radioisotopes: - (Continued)

16. General

One bearing on the hot off-gas blower at the Radioisotope Area stack was replaced because of a broken retainer ring.

Construction of a platform around the hot off-gas electrical precipitator was started to facilitate the periodic inspection of the large electrical insulators in the top of the unit.

II. Tank Farm:

1. General

a. Installation of the three stainless tanks in the northeast corner of the South Tank Farm is approximately 90% complete.

b. The transfer of precipitated uranium from W-7 to W-10 via an electric pump appears to be progressing very well. Three times this month, supernate from W-10 was sent back to W-7 to agitate the sludge in W-7 and be used to carry the precipitate to W-10. By a repetition of this procedure, an essentially complete transfer of the precipitate is expected.

c. The rails around the diversion box and the Settling Basin catwalks were painted this month.

d. Enough caustic supernate from W-10 tank was jetted to W-4 to precipitate the uranium in W-4. This supernate will be jetted from W-4 to the chemical waste system after settling.

II. Tank Farm: - (Continued)

2. Wastes Discharged to the White Oak Creek

Approximately 13.95 curies of beta activity were discharged from the Settling Basin this month. This activity is more than twice the discharge from the Basin last month. The source of this activity has not been found, inasmuch as adequate sampling devices for all manholes in the waste streams are not available.

An increase was also noted this month in the activity discharged from the Retention Pond. The source of this activity was found to be in a valve pit in the South Tank Farm. A bad weld located in the line from W1-W2 to W-5, which caused the trouble, has been repaired.

ACTIVITY DISCHARGED TO WHITE OAK CREEK

	APRIL, 1951		MARCH, 1951	
Discharged From	Gallons	Beta Curies	Gallons	Beta Curies
Settling Basin	20,794,000	13.95*	21,209,000	5.02*
Retention Pond	465,161	0.22	630,513	0.10
		14.17		5.12
* Contributed by Evaporator		1.37		0.05

3. Chemical Waste Evaporator

At the end of the month, the evaporation rate had been increased from about 350 gallons per hour to 500 in an effort to increase the free space in both the metal and chemical waste systems. Decontamination factors have been lower and will probably continue to be lower as long as this rate of evaporation is continued.

II. Tank Farm: - (Continued)

3. Chemical Waste Evaporator

The following is a listing of the work done at the evaporator this month:

a. The new multiple liquid level probe was installed in addition to the existing single probe, in order to be able to locate the foam level at all times. This multiple probe contains seven single probes spaced six inches apart. Thus far, excellent results have been obtained in determining the optimum liquid level for efficient operation.

b. The sample blister was repaired.

c. The evaporator sampler line was removed and repaired.

WASTE EVAPORATOR OPERATION

Gallons Fed to Evaporator	Gallons of Concentrate to W-6	Volume Reduction	Beta Curies to Evaporator	Beta Curies to Settling Basin
APR. - 213,422	12,461	16.1:1	2,355.77	1.37
MAR. - 181,228	23,420	6.7:1	610.61	0.05

Due to misnumbering of sample bottles, the "Beta Curies to Evaporator" and "Beta Curies to Settling Basin" figures in the above table do not include results of two runs made this month.

4. Waste Tank Inventory

HOT PILOT PLANT STORAGE

Tanks	Gallons Capacity	Gallons In	Gallons Out	Discharged To	Free Space
W-3, 13, 14, 15	48,500	360	110	706-C	8,290
CHEMICAL WASTE STORAGE					
W-5	170,000	187,022	213,422	Evaporator	82,800
EVAPORATOR CONCENTRATE STORAGE					
W-6, 8	340,000	18,000	4,800	Evaporator	66,000
METAL WASTE STORAGE				[redacted]	
W-4, 7, 9, 10	543,000	40,752	3,600	- - -	198,240

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

RaLa Run No. 43 was begun on April 2, 1951, and shipped on April 6, 1951.

Sixty-nine ORNL slugs were loaded, dissolved, and extracted as a one-batch run. Operations progressed satisfactorily and gave no unusual difficulties with either the process or equipment. A portion of the product was temporarily lost in the fuming nitric precipitation step because the batch was very small and contained too little inactive barium for efficient precipitation. A large portion of the lost product was recovered by adding carrier barium and reprocessing the fuming nitric waste.

The product drying time was twenty hours instead of seven hours, as was expected. It is thought that this difficulty can be eliminated in the future by minor alterations to the product cone.

Slugs Loaded: - 69 Clinton Slugs
Slugs Dissolved: - 70.5 (by analysis)*

	Curies	Percent
Total Product Dissolved	329	100.0
Cell A Losses	96	29.2
Resin Cubicle Losses	37	11.2
Total Losses Accounted For	133	40.4
Product Shipped	157	47.7
Losses Unaccounted For	39	11.9
Material Balance		88.1

* Dissolver contained unirradiated slug heels.

Last separation time was reached at 1415 on April 5, 1951, and the product was shipped at 1730 on April 6, 1951. A water rinse of the new equipment was made available for small shipments to radioisotope customers.

The process filters are fast and efficient; the resin cubicle operated well, and the loading cubicle leaves nothing to be desired. However, two radioactive back-ups occurred because of leaking lines.

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

This condition has since been corrected by tightening connections, moving valves closer to operating equipment and shields, and by changing the operating procedure.

The crud filters gave very poor filtration rates during several dummy runs, as well as during the "hot" run. After the shipment was made, an investigation proved that the crud filters were not at fault but that there were several valves which were leaking around the body parts, as well as two bad weld leaks in the line from tank A-11 to the crud filters. These valves were replaced or repaired as necessary and the weld leaks repaired. The crud filters were tested and the flow rates were found to be satisfactory once more.

Los Alamos reported that the product contained some foreign material which was suspected to be silica. They were again requested to permit this material to decay sufficiently so that it could be accurately analyzed.

The next run, Run No. 44, is scheduled to begin on May 13, 1951. This will be a 5,000-curie shipment.

Resin cubicle #300 was completed and temporary service tie-ins above the ground were made in order to make dummy shake-down runs. To date, many leaks in lines and valves were found and repaired. The tanks are being calibrated and flowrates being observed. As soon as the equipment is determined to be in working condition, test dummy runs will be started.

Lead sheeting was placed over the lead brick cubicle floor at the resin cubicle to prevent contamination from getting between the bricks.

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

A spare crud filter was received, tested, and stored.

An additional alarm horn connecting to the 900 Area stack fans was installed in Building 3026 to insure warning to operating personnel.

Comments and suggestions have been received from Hanford on the design of the 148-slug Tucson carriers. As a result of these comments, the Engineering design is now being modified. No formal Atomic Energy Commission approval has yet been received to build these carriers.

C. RADIOISOTOPE CONTROL DEPARTMENT

I. General:

During April, 1951, there were 867 radioisotope shipments, compared with 857 during March, 1951, and 635 during April, 1950.

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

	April 1951	March 1951	April 1950	August, 1946, to April, 1951, Inclusive
Separated Material 706-D Area	679	628	467	17,418
Unseparated Material 100 Area	188	229	168	5,362
TOTAL SHIPMENTS	867	857	635	22,780

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

	April 1951	March 1951	April 1950
Non-Project	665	678	504
Project	169	163	118
Foreign	33	16	13
	867	857	635

II. Hanford Irradiations:

The following radioisotope samples were received from Hanford during April, 1951:

Sample No.	Material	Date Discharged	Date Received
ORNL-119	Sulfur (8 pieces)	2-19-51	4-16-51
ORNL- 80	Mercury (1 piece)	3-27-51	4-16-51
ORNL-114	KCl (16 pieces)	3-7-51	4-16-51
ORNL-101	Antimony (1 piece)	3-7-51	4-16-51
ORNL-100	Calcium Carbonate (2pcs)	3-7-51	4-16-51
ORNL-110	Enriched Fe^{58} (1 piece)	April, 1951	4-16-51
ORNL-119	Sulfur (8 pieces)	April, 1951	4-26-51

III. Cyclotron Radioisotopes:

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

Material	Amount	Status
Na 22	3 mc	Material has been requested.
Mn 54	4 mc	Material has been requested.
Co 57	1.1 mc	Material in process.

BOMBARDMENTS 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
Be 7					9	285.00		
Na 22		109.75			5	201.75	4	300.00
Mn 52					2	20.00		
Mn 54							3	150.00
Co 57							3	100.00
Fe 59			5	255.60				
Zn 65	1	100.00						
Sr 85	2	59.75			1	10.00		
As 73					1	10.00		
I 125							2	60.00
Molybdenum Metal					1	13.00	3	30.00
Sulfur					1	2.00		
TOTAL RECEIVED	4	269.50	5	255.60	20	541.75	15	640.00
REQUESTED BUT NOT RECEIVED								
Na 22	1	100.00						
Zn 65			1	40.00				
Mn 54			1	50.00				
TOTAL HOURS OUTSTANDING (Not Received or Requested)		380.50		404.40		208.25		110.00

III. Cyclotron Radioisotopes: - (Continued)

SHIPMENTS OF CYCLOTRON-PROCESSED RADIOISOTOPES

Material	No. Shipments April, 1951	No. Millicuries April, 1951	No. Millicuries To Date
Be 7	2	35.00	201.073
Na 22	3	4.82	41.873
Mn 52	-	-	9.991
Co 57	-	-	2.0
Fe 59	-	-	1.5 mc and 1 S.I.
Zn 65	1	0.5	7.0
Mn 54	1	1.0	1.92
Fe 55-59	-	-	1.0
As 73	-	-	0.650
Sr 85	-	-	6.0

IV. Activation Analyses:

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

M. E. Ramsey

M. E. Ramsey, Superintendent
Operations Division

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V. S-F Material Control:

1. During the month, 17.08 kilograms of 90-95% enriched uranium metal were received from Y-12 for use in connection with the ANP disc fabrication program. The number of discs fabricated and shipped to Y-12 amounted to 417, containing 7.431 kilograms of 90-95% enriched uranium. This raises the total number of discs shipped to date to 4,176, representing 47.866 kilograms of enriched uranium.

   In addition, there were 9.954 kilograms of uranium scrap returned to production channels. To date, there have been 67.752 kilograms of uranium scrap returned to Y-12 resulting from the disc fabrication job.

2. On April 14, 1951, an express car was received from Hanford. The carload lot consisted of 108 eight-inch irradiated slugs for Sr^{90} extraction and several smaller containers loaded with non-SF material for radioisotope separation.

3. There were 2,683.7 pounds of normal uranium rods and billets received from Simonds Saw and Steel Company for use in connection with the MTA Program.

4. Preparations were begun to ship eleven tons of normal uranium rods to Y-12 for use in fabricating slugs for the X-10 graphite pile. This shipment will be effected the first week of May, 1951.

5. Two trailer-loads of SF waste solutions were received from Argonne for disposal into the waste storage tanks. Thirteen of the drums contained solvents and were buried.

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

6. Another shipment of Chalk-River-extracted plutonium was made to Los Alamos Scientific Laboratory. This shipment contained 161.41 grams of plutonium.

In connection with the Chalk River plutonium, the USAEC SF Accountability Office made verbal inquiry regarding expected completion date on this work. Personnel of the Chemical Technology Division indicated they would be finished with their work by July 1, 1951.

7. The SF Office continued its program of surveying material balance areas within the Laboratory. During the month, five persons possessing SF material were visited and their material inspected and weighed where feasible. No apparent discrepancies were encountered.

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

9. During April, there were sixteen receipts and eighteen outgoing shipments, compared with thirty-three receipts and seventeen shipments last month.

10. Following is a summary of receipts and shipments of SF material for the month of April, 1951:

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

10. Summary of receipts and shipments for April, 1951:

RECEIPTS

From	Material	Content	
Argonne National Laboratory	Normal U waste solutions	4,530.00	gm
Argonne National Laboratory	Normal U waste solutions	15,370.00	gm
Argonne National Laboratory	Depleted U waste solutions	28,310.00	gm
Argonne National Laboratory	Depleted U waste solutions	8,380.00	gm
Argonne National Laboratory	Pu in waste solutions	1.55	gm
Battelle Memorial Institute	U-Be compounds	1.00	gm
Battelle Memorial Institute	Thorium metal	520.00	gm
Battelle Memorial Institute	Thorium metal	200.00	gm
C&CCC, Y-12 Area	Enriched uranium metal	15,941.75	gm
C&CCC, Y-12 Area	Normal uranium metal	888.00	gm
C&CCC, Y-12 Area	Normal uranium tubes	2,891.70	gm
C&CCC, Y-12 Area	Thorium tubes	336.36	gm
General Electric Co., Hanford	Depleted uranium slugs	367,002.00	gm
General Electric Co., Hanford	Plutonium in slugs	189.00	gm
General Elec. Co., Schenectady	Normal UO_2	185.23	gm
Iowa State College	Thorium billets	34,560.00	gm
Iowa State College	Thorium billets	13,150.00	gm
Iowa State College	Thorium billets	39,640.00	gm
Iowa State College	Thorium billets	38,460.00	gm
Iowa State College	Thorium billets	40,520.00	gm
A. D. Mackay	Throium metal	114.00	gm
Simonds Saw & Steel Company	Normal uranium metal	1,217,299.48	gm

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

10. Summary of receipts and shipments for April, 1951:

SHIPMENTS

Argonne National Laboratory	Enriched U-U Al	0.003	gm
Battelle Memorial Institute	Thorium tubes	1,897.00	gm
C&CCC, K-25 Area	Depleted U, 3 slices of X-slug	164.00	gm
	Pu in slices of X-slug	0.02	gm
C&CCC, Y-12 Area	Normal uranium rods	2,925.00	gm
C&CCC, Y-12 Area	Normal uranium plates	1,500.58	gm
C&CCC, Y-12 Area	U-233 in solution	0.0012	gm
C&CCC, Y-12 Area	Enriched uranium metal	6,936.01	gm
C&CCC, Y-12 Area	Enriched U metal scrap	121.37	gm
C&CCC, Y-12 Area	Enriched U metal scrap	8,334.65	gm
C&CCC, Y-12 Area	Enriched U metal scrap	835.90	gm
General Elec. Co., Schenectady	Normal UO_2	185.23	gm
General Elec. Co., Schenectady	Depleted U sliced slug	338.00	gm
General Elec. Co., Schenectady	Pu in sliced slug	0.19	gm
Los Alamos Scientific Laboratory	Plutonium solutions (NRX)	161.41	gm
New Brunswick Laboratory	Normal uranium solutions	2,480.50	gm
Tracerlab, Inc.	Normal U_3O_8	0.44	gm
Tracerlab, Inc.	Normal U_3O_8	0.41	gm