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ORNL 643

AEC RESEARCH AND DEVELOPMENT REPORT

LABORATORY RECORDS

OPERATIONS DIVISION

MONTHLY REPORT FOR MONTH
ENDING FEBRUARY 28, 1950

INV. 52

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CARBIDE AND CARBON CHEMICALS DIVISION
UNION CARBIDE AND CARBON CORPORATION
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OPERATIONS DIVISION

MONTHLY REPORT

for

Month Ending February 28, 1950

by

L. B. Emlet

DATE ISSUED

MAR 22 1950

O A K R I D G E N A T I O N A L L A B O R A T O R Y

operated by
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SUMMARY ORNL-643

1. Lost pile operating time averaged 8.3%, compared to 9.1% for January, 1950. (Page 4.)
2. Two ruptured slugs were located and discharged without difficulty. (Pages 4 and 5.)
3. Lightning put the pile exhaust air fans out of operation for several hours. (Page 5.)
4. There were two incidents of high air activity due to the I^{131} process. (Pages 8 and 9.)
5. Modified equipment and processing have resulted in a more rapid P^{32} isolation. (Pages 9, 10, and 11.)
6. Radioactive S^{35} as elemental sulfur prepared by electrical glow discharge tubes has proven satisfactory. (Pages 12 and 13.)
7. The activity discharge into White Oak Creek totaled 11.19 curies, a decrease of 25% from January, 1950. Only 0.78 curie of this total was contributed by the evaporator discharge. (Pages 21, 22, and 23.)
8. No RaLa run was made during February, 1950. Run #40 is scheduled to start March 12, 1950. (Page 25.)
9. There were 548 radioisotope shipments during February, 1950, compared to 633 in January, 1950. (Page 26.)
10. The specific activity of Co^{60} available in this country is not sufficient for proposed teletherapy units so that it will have to be obtained from Chalk River. (Pages 31 and 32.)
11. The Atomic Energy Commission S-F Accountability Office conducted a survey of the Laboratory accounting and handling records. (Page 35.)

[redacted]

A. PILE DEPARTMENT

I. Operating Data:

	FEBRUARY 1950	JANUARY 1950	YEAR-TO-DATE 1950
Total Accumulated KWH	2,165,931	2,439,940	4,605,871
Average KW/operating hour	3516.03	3616.24	3568.42
Average KW/24-hour day	3223.11	3279.49	3252.73
Percent Lost Time	8.3	9.1	8.8
Approx. Excess Pile Reactivity	120-130 inhours	120-130 inhours	
Slugs Charged	237	245	482
Slugs Discharged	237	198	435
Product Made (grams)	79.04	89.05	168.10
Product Discharged (grams)	17.08	13.09	30.17

II. Pile Operations:

The pile-down time was 8.3% for the month, compared to 9.1% for the previous month and 9.4% for the Year 1949.

The permanentization work in the Pile Building and on the new Change House and Storage Room is still progressing slowly. However, all research work has been resumed on the south experimental levels. The painting in the Pile Building is essentially completed. The central air-conditioning unit has been installed and is scheduled for performance tests during March. The Change House is about 90% completed with fixture installation and painting yet to be done.

Two ruptured slugs were detected by visual scanning of the metal channels and discharged without difficulty. The ruptures had not progressed to the point where any appreciable amount of the uranium had oxidized and escaped in the air stream. The probe gave no indication of their presence. The slug failures have brought the total to sixty-eight ruptures since the pile was put in operation during November, 1943.

II. Pile Operations: - (Continued)

These slugs were exposed as follows:

Metal Channel No.	Date Discharged	Days in Pile	Approximate Maximum Metal Temperature in Channel
1165	2-13-50	1984	200°C.
3171	2-13-50	2096	100°C.

The excess pile reactivity at the end of this month remained unchanged at 120 to 130 inhours.

III. Filter House:

The following table compares the pressure drop across the exhaust air filters last month and this month, with that experienced immediately after replacement of filters:

	GLASS WOOL FILTERS		CWS #6 PAPER		ACROSS HOUSE	
Date	Inches w.g.	% Increase	Inches w.g.	% Increase	Inches w.g.	% Increase
Clean Filters	1.1	--	1.0	--	3.3	--
1-31-50	3.2	191	2.6	160	7.0	112
2-28-50	3.3	3	2.6	0	7.1	1

Filter House operation has been normal throughout the month.

IV. Fan House:

Lightning struck the lines supplying power to the two large fans on February 9, 1950. The motor leads to Fan No. 2 were shorted to ground. It required four hours for repair of the motor leads. The No. 3 Fan cubicle was badly damaged by a phase-to-phase short requiring the replacement of all insulators on the oil circuit breaker. The fan was down for fourteen hours for replacement of the damaged parts.

Except for the difficulty due to lightning on February 9th, the fans operated normally throughout the month.

V. Radioisotopes:

The following is a comparison of the radioisotope and research samples charged into the pile during February, 1950, with those handled in January, 1950:

	JANUARY, 1950		FEBRUARY, 1950	
	Research	Radioisotopes	Research	Radioisotopes
Stringers 13, 14, and 16	58	154	20	157
Hole 22 (Pneumatic Tube)	29	6	41	11
All Other Holes	8	18	9	11
TOTAL BY GROUPS	95	178	70	179
TOTAL FOR MONTH	273		249	

At the end of February, 1950, there were 407 cans of target material in Stringers 13, 14, and 16, compared to 366 cans of target material in these stringers at the end of January, 1950.

VI. Water Demineralization Building:

The operation of the building was normal throughout the month with 498,800 gallons of water being demineralized of which 19,100 gallons were also deaerated.

The cost of producing demineralized deaerated water versus the cost of demineralized water was evaluated during the month. It was found that deaerated demineralized water costs fifty percent more than demineralized water.

The cost of operation of the Water Demineralization Building is out of line at present since the steam cost allocated to this building is several times too high. The steam consumption by the process will be evaluated during March, 1950, and accurate steam allocations made in the future in order to reflect true costs.

[redacted]

VI. Water Demineralization Building: - (Continued)

PRODUCED

	FEBRUARY	JANUARY	TOTAL FOR 1950
Demineralized	498,800 gal.	606,600 gal.	1,105,400 gal.
Deaerated	19,100 gal.	27,700 gal.	46,800 gal.

B. CHEMICAL SEPARATIONS AND RADIOISOTOPE DEVELOPMENT DEPARTMENTS

I. Radioisotopes:

1. General

Work done by construction personnel included the following items:

a. The off-gas blower at the 900 Area stack was repaired and put into operation; it is now operating satisfactorily.

b. Installation of the Trion units and the accompanying power pack was completed, but have not been tested.

c. The 706-DA Building and cell exhaust fan were torn out and installation of the 706-D cell exhaust ducts started; this work is scheduled to be completed and the exhaust system in operation before the next 706-D run.

Work done by ORNL personnel included the following items:

a. Installation of the scatter shields in the west section of the radioisotope storage barricade was completed.

[redacted]

I. Radioisotopes: - (Continued)

1. b. The 706-C cells were tied into the new duct and exhausted to the new stack during the latter part of the month.

c. Some of the coils were burned out in the 706-C and D exhaust blower motor; the motor was returned to the vendor for rewinding.

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

Eighteen ORNL slugs were processed and 21,006 millicuries shipped.

Difficulty was met in transferring crude product from the cell bank to Room 10 during the first run this month. A valve in this line was stuck shut; after persuasion, it was opened and, of necessity, left open. A leak was also found in the weld at this valve, necessitating a special method of transfer to Room 10.

During this run, the off-gas failed during the first cut of the final purification step. This possibly caused some loss in product. The off-gas failure was caused by crystals of NH_4NO_3 growing in the line and restricting the flow. Ammonia is used to neutralize the acid vapors before going into the black iron off-gas line to the 205 stack.

When the dissolving of six slugs was started on February 20, 1950, a high air count was observed in 706-C and 706-D, coincidental with the time of dissolving. This air count was attributed to the fact that an alkaline solution of NaI^{131} had been spilled on the outside of the equipment from the faulty weld in the transfer line to Room 10, and that this leak caused the contamination of the cell air which was discharged over the roof of Building 706-C. [redacted]

[redacted]

I. Radioisotopes: - (Continued)

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

This assumption was later proven to be false when the air again became contaminated on February 27, 1950, after the cell ventilating system was tied into the 900 Area stack. A survey of the off-gas lines then disclosed that an old sampler connection on the pressure side of the off-gas line, north of 706-C Building, had been broken by someone who had failed to report it to the operating personnel. Instead, the broken connection had been covered with lead which made it more difficult to locate. After this leak was repaired, the air activity went down for several hours and again rose to high levels. This time it was discovered that the off-gases were coming out of the 706-D cell block. The gases went through the normal line to the corner of Building 205, then back through the A-16 line used for the 706-D process, through a filter and blower into the 706-D cell vessels, and then through the cell walls into the operating area. The fact that the 706-D blowers were shut down at the time for tie-ins to the new stack permitted the gases to travel in this manner.

It is expected that the probability of similar incidents in the future will be negligible as soon as all of the connections are made to the new stack and the old inadequate off-gas facilities abandoned.

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

Twelve, 2000-gram cans of irradiated sulfur were processed and 7,618 millicuries shipped.

[redacted]

[redacted]

I. Radioisotopes: - (Continued)

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

A minimum of difficulty was experienced this month with the equipment or the process. From the standpoints of radiation exposure, yields, and length of operation, it appears that the new process and equipment for final purification is better than anything previously used.

During the month, the first around-the-clock run was made. It is now the procedure to push cans from the pile on Monday instead of Sunday and the product to be finished on Thursday, thus eliminating one pile shutdown and allowing the product to be ready for shipment one day sooner.

Phosphorus Development Work

Installation of extraction equipment in Building 906 is approximately 50% completed. The completion date of this project is dependent upon the craft manpower which can be put on the job.

Modifications to the hood for finishing operations, piping, and glassware design were completed. Instruments, Vycor flasks, electric heating mantles, and stainless steel needle valves have been ordered. The final purification equipment will be installed by the time the extraction equipment is ready for operation.

Samples were taken from regular P^{32} runs #301 and #303 in Building 204 to determine the efficiency of the resin-Stang reactor method. The samples were removed after the last resin-Stang processing step, (1) before passing through the final resin column, and (2) after passing through the final resin column. [redacted]

I. Radioisotopes: - (Continued)

3. Phosphorus Development Work

Analytical results are as follows:

	BEFORE COLUMN(1)		AFTER COLUMN(2)	
	Run 301	Run 303	Run 301	Run 303
Heavy Metals	< 20 ppm	< 20 ppm	< 20 ppm	< 20 ppm
Total Solids	2.38 mg/ml	1.2 mg/ml	3.1 mg/ml	3.0 mg/ml
Lanthanum	Negative	Negative	Negative	Negative
Aluminum	< 1 ppm	< 1 ppm	< 1 ppm	6.6 ppm

With the exception of the aluminum in Run #303, the spectrographic analyses were about the same. It will be possible to eliminate the final column in the new purification equipment and replace it with a small resin-Stang, thereby further speeding up the process.

Twenty-four slugs were loaded with sulfur and sent to Hanford for irradiation.

4. Carbon (C^{14} - 5,720y)

Four hundred $Ca(NO_3)_2$ slugs were processed to yield 507.9 millicuries. Of this amount, about 125-150 millicuries were C^{14} recovered from contaminated product made several months ago.

Eight hundred $Ca(NO_3)_2$ slugs were processed last month and not reported. It has been determined that the product from these slugs was contaminated with I^{131} from an unknown source. There is no logical answer as to how this product became contaminated, since no iodine is made in the cell where the C^{14} is made, and no equipment from 706-C, where the I^{131} is prepared, was used. In three or four months' decay time, the product will be reanalyzed to be sure all I^{131} is gone.

I. Radioisotopes: - (Continued)

4. Carbon (C^{14} - 5,720y)

The following is a listing of the C^{14} available in the unprocessed Be_3N_2 and $Ca(NO_3)_2$ slugs:

No. of $Ca(NO_3)_2$ Slugs in Pile	2,535	
No. of Ca $(NO_3)_2$ Slugs in Canal	400	
Total C^{14} Content in $Ca(NO_3)_2$(Estimated)		3,377 mc.
No. of Be_3N_2 Slugs on Hand	851	
Total C^{14} Content in Be_3N_2(Estimated)		38,295 mc.
TOTAL C^{14} AVAILABLE--(ESTIMATED)		41,672 mc.

Carbon Development Work

Design work on the Be_3N_2-C^{14} equipment for Building 905 is 95% completed.

A special C^{14} source was prepared for a customer. This contained 5 mc. of C^{14} as $BaCO_3$ compressed into a shallow 1 cm. diameter hole in an aluminum disc. A thin window of rubber hydrochloride, 0.0006 inch thick, was cemented over the source and held in place by a press-fitted aluminum ring. The rubber hydrochloride showed no signs of deterioration under beta irradiation during the week the source was held for observation.

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

A preparation containing 2,965 millicuries of S^{35} as elemental sulfur, with a specific activity of 6.1 curies S^{35}/gram S, was prepared.

The method used was briefly as follows: Carrier-free S^{35} as sulfate was adjusted to the desired specific activity and the sulfate precipitated as $BaSO_4$. The $BaSO_4$ was reduced to

I. Radioisotopes: - (Continued)

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

BaS with hydrogen at 700°C. and H_2S generated with phosphoric acid. The H_2S was frozen out with liquid nitrogen in a vacuum system, then vaporized and passed through electrical glow discharge tubes at low pressure. The H_2S was decomposed to hydrogen and sulfur. The sulfur was condensed in a trap, weighed, and sealed in an ampule for shipment. The glow discharge tube yield was 89% and the overall yield was 86%. This method has proved to be very good and will be used for any future preparations of elemental sulfur.

6. Fission Products

The fission product equipment was not operated during the month, although Run #SS-21 had been scheduled. A still head was fabricated from Teflon so that the still assembly could be removed by remote control in case of a crack developing in the still proper. After fabrication of the still head assembly from a large piece of Teflon, it was found that the five passages drilled through the head all intercommunicated. The piece was X-rayed by the Metallurgy Division and this clearly revealed a large flaw in the upper section of the head. This was a horizontal fissure which extended almost to the edge of the block around the entire circumference. The hidden flaw apparently occurred during the extrusion of the Teflon rod. This incident has caused a two-week delay in our schedule.

I. Radioisotopes: - (Continued)

6. Fission Products

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

Twenty millicuries were purified and shipped in citrate solution. This sample is of interest in that several ORNL scientists have observed gamma-gamma coincidences in it, but the Analytical Division reports it to contain less than 1 p.p.m. of radioactive impurity. Further investigation may reveal some new information on the Nb^{95} decay scheme.

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

About 575 millicuries of Y^{91} were purified during the month. Raw material was from SS-19.

c. Europium (Eu^{155}-2.5y), Samarium (Sm^{151}-20y)

During January, 1950, Run #RE-I was started to fractionate the rare earth activities separated in SS-20. The first thirty-four cuts of RE-I were combined, since they contained Eu and Sm, and used for Run #Eu-I on another column. The Eu column is four feet long and ten m.m. I.D. with a Dowex 50 resin loading volume of eighty-five milliliters. Elution of the first fractions was done with 0.2 M citrate at pH 2.75; the pH was then changed to 2.90 in order to separate Eu and Sm. The flow rate was 1/5 column volume per hour. The first distinctive activity peak appeared before Y^{91}; absorption curves indicated a very weak beta ($\sim$0.6 mg), a 5 mg., and a 175 mg. (half-thicknesses) components. The Y^{91} peak appeared, and a weak gamma was superimposed on it (presumably Eu^{155}). Later fractions

I. Radioisotopes: - (Continued)

6. Fission Products

c. Europium (Eu^{155}-2.5y), Samarium (Sm^{151}-20y)

indicate a 2 mg. component; the Pm^{147} is still on the column. Chemical analysis will have to be used to evaluate the results of this run so far, since absroption curve data are not sufficient to give a clear picture. The starting solution to Eu-I had the following analysis: gross beta, 80 mc.; Ce, 1.4 mc.; gross alpha (Pu), 3×10^7 counts/min.; Cs, 0.025 mc.; total rare earths minus Ce, 49.8 mc. The major portion of the R.E. is undoubtedly Pm^{147}. These values were not obtained in a low-absorption counter, so the Pm, Sm, and Eu are probably present in an amount greater by a factor of ten than that indicated. The Eu and Sm fractions will be divided for further column fractionation, and a portion will be used to try electrolytic or zinc amalgam reduction to plus two valence as a help to various separation processes. Eu, Sm, and possibly Gd, are the only rare earths in this region that can be reduced.

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

Approximately 600 millicuries were purified during the month. A 7,500-millicurie batch is in process. Most of the back orders were filled and those remaining will be taken care of when the large batch in process is finished.

I. Radioisotopes: - (Continued)

7. Tritium (H^3 - 12.1y)

Installation of packaging equipment in Building 907 awaits the completion of a hood now under construction. Fabrication is about 95% completed.

8. Ruthenium (Ru^{106} - 1y)

The 125-millicurie Ru^{106} plated source was finished and shipped. Silver was chosen as cover plating instead of gold; this technique works very well, and silver will be used for cover plating of Ru sources hereafter. A new technique was used to prevent contamination of the finished surface. Before silver plating, a flash plate of inactive Ru was plated over the active Ru^{106}. This method was successful in keeping surface contamination at a very low level. The radiation from this source was very intense, calculated to be about 6,000 roentgens per hour at one-inch distance.

9. Cesium (Cs^{137} - 33y)

Work continued on the ammonium alum crystallization process for cesium. Solutions of NH_4 alum tend to remain supersaturated for weeks, if covered and unexposed to the dust of the air. Proper formation of alum crystals is necessary for good carrying of cesium. Formation of a copious crop of well-formed crystals occurs when air agitation is used. When this is done, the Cs^{137} activity in the supernatant liquor is reduced to 0.1 mc/liter, irrespective of the amount of Cs^{137} activity originally present. Agitation must be continued for thirty minutes after crystals begin to form in order to attain the equilibrium value.

I. Radioisotopes: - (Continued)

9. Cesium (Cs^{137} - 33y)

After repeated crystallizations, the alum-cesium solution is diluted to 0.1 N in cations and passed through a Dowex 50 ion exchange column in such amount that about 60% of the ion exchange capacity is used. The Al is then complexed and removed from the column with 0.4 M oxalic acid. Cs^{137} starts to break through after about twelve column volumes of eluting solution has passed through. Ninety-nine percent of the Al is removed before the Cs^{137} starts to break through. The loss of Cs^{137} with the Al fraction is $< 0.1\%$.

This process will be installed in a concrete block cubicle in Building 908.

10. Cyclotron Targets

a. Beryllium (Be^{7} - 56d)

A one-hundred beam hour target is now being extracted. A yellow-colored material which extracts into the organic layer is being investigated; it is believed to be a compound of acetyl acetone and an impurity in the lithium target.

b. Sodium (Na^{22} - 3y)

Approximately fifteen millicuries were turned in for analysis. Solutions from two targets and two new targets remain to be processed. The major part of the time was spent on investigating and improving the process. The main difficulty has been caused by the large amount of magnesium present, which interferes with the deposition of Na^{22} on a resin column because of the large amount of H^{+} ion released when Mg^{++} is taken up. Therefore, most of

I. Radioisotopes: - (Continued)

10. b. Sodium (Na^{22} - 3y)

the magnesium will be removed as the magnesium ammonium phosphate and any excess $(NH_4)_3PO_4$ will be precipitated from the evaporated filtrate with 100% alcohol. Na^{22} is not lost in these steps and the magnesium content is lowered to a point where the ions may be absorbed on a resin column without loss of Na^{22}.

c. Iron (Fe^{59} - 45d)

A cobalt target was processed to remove Fe^{59}; 10 mg. of Fe carrier were used. The analysis has not been completed.

11. Miscellaneous Units

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

About one pound of calcium was purified from the C^{14} waste and prepared as calcium chloride solution. Analysis is not complete.

b. Chromium (Cr^{51} - 26.5d)

A Hanford-irradiated unit was processed to produce chromium chloride for dispensing. Analysis is not complete.

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

Several Hanford-irradiated units were processed to furnish mercuric nitrate for dispensing. Analysis incomplete.

d. Wolfram (W^{185} - 77d)

An X-pile unit, irradiated for several years, was prepared as an alkaline solution of potassium wolframate. Analysis as follows:---

Concentration	-	0.135 mc/ml
Specific Activity	-	11.7 mc/gram W
Total Solids	-	76 mg/ml.

[redacted]

I. Radioisotopes: - (Continued)

12. Miscellaneous Work

a. Plating Co^{60} Sources

It was decided to plate the Co^{60} sources with a flash plate of copper, followed by a heavy coat of silver. The procedure has been worked out, a total of 180 curies of the largest sources plated, and the operation turned over to the Chemical Separations Department.

b. Purification of 105 Canal Water

Design work was finished on the system to be used for removing activity from 105 canal water. A report is being prepared and drawings made for submission to the Pile Department for construction.

c. 900 Area Minor Design

(1) A storage rack was designed for isotope shipping pipets.

(2) Sketches were submitted for fabrication of 200 expendable (tin can) bottle carriers.

(3) Revised design of 902 Analytical Lab sample barricade tongs. The new tong works satisfactorily.

(4) Design completed for balance tables and supports for Cold Lab and Packing Dry Box in Building 902.

(5) Scatter shields for 902 storage barricade were checked and rejected. Corrective work is in progress.

(6) The autoclave in 902 was changed to direct steam. Shipping bottles may now be steam-cleaned.

(7) Zinc bromide windows were prepared for the beta packing hood in 902.

I. Radioisotopes: - (Continued)

12. Miscellaneous Work

d. Strontium Sources

Five Sr^{90} sources were prepared but have not been shipped yet because of surface contamination. Surface contamination is being removed in a continuously circulating Versene bath at pH 7. A sealing device, incorporating increased shielding, was made to seal Sr^{90} sources.

e. Niobium Source

One two-millicurie Nb^{95} source was prepared and shipped.

f. Corrosion Tests

Tests were started on comparative corrosion resistance of Carpenter #20 alloy and stainless 347 in boiling HNO_3. The pieces will be activated in the pile to enable an extremely low corrosion rate to be detected. This work is preparatory to selection of material for the new I^{131} dissolver.

g. Special Packing

A special P^{32} preparation was sealed in an ampule for shipment. Uranium oxide samples were sealed in quartz for the Pile Department.

h. Cobalt Needles

Cobalt wires were inspected, straightened, and placed in the pile for an order of cobalt to be sealed in stainless steel needles.

I. Radioisotopes: - (Continued)

12. Miscellaneous Work

i. Falling Film Evaporator

Tests were started on a small glass falling film evaporator. Preliminary indications are that heat transfer of glass is insufficient to allow a practical evaporator of this type. Tests will be continued with metal.

II. Tank Farm and Burial Ground:

1. General

a. Approximately 49,200 gallons of precipitated uranium supernate were transferred from W-7 to the Chemical Waste System. This contained an average of .004% uranium.

b. The Mechanical Department started the installation of three underground stainless steel tanks in the North Tank Farm. These tanks will hold the hot raffinates from the Chalk River material which the Hot Pilot Plant will process in the near future. Two concrete pads have been poured and two of the three tanks have been set. Two lines have been run to 706-C, where the solution stored in the tanks will be processed. The work is about 40% completed.

c. Work has begun to cover the transfer line from W-5 to the evaporator with a half inch of lead. This is about 90% completed.

2. Wastes Discharged to the White Oak Creek

Approximately 11.02 curies of beta activity were discharged from the Settling Basin this month.

II. Tank Farm and Burial Ground: - (Continued)

2. Wastes Discharged to the White Oak Creek

During the month it was found that the bottles which have been used for Settling Basin and evaporator samples are very difficult to decontaminate to the point that they will not contaminate succeeding samples. To prevent such contamination, cheap bottles are now being utilized, which are thrown away after being used once. The possibility of using waxed cardboard sample containers is being investigated to cut the cost of operation.

ACTIVITY DISCHARGED TO WHITE OAK CREEK

	JANUARY, 1950		FEBRUARY, 1950	
Discharged From	Gallons	Curies	Gallons	Curies
Settling Basin	22,050,000	12.88*	18,998,000	11.02*
Retention Pond	604,727	1.85	388,000	.17
TOTAL		14.73*		11.19*
*Contributed by Evaporator		0.88		0.78

3. Chemical Waste Evaporator

Good operation was maintained over most of the month with evaporation rates well above 300 gallons per hour. An average decontamination factor of 2,821 was obtained for the month.

Due to the sludge in the feed solutions, scale formation on the coils slowed up evaporation, necessitating an increase in steam pressure to maintain a constant evaporation rate. The evaporator was filled with a weak nitric acid solution and boiled for about two hours. After disposal of the acid solution, a regular run was started. Apparently little scale was removed. In the future Versene will be used in an attempt to remove the scale.

II. Tank Farm and Burial Ground: - (Continued)

3. Chemical Waste Evaporator

The evaporator was shut down twice this month to repair the following damaged equipment:

a. A broken water main which runs underneath the road north of the evaporator. Apparently, the break was caused by the road settling. The shutdown lasted approximately twelve hours.

b. A broken pin in a valve in the line from the evaporator to W-6 tank. About eight hours were required to decontaminate the equipment and to repair this valve.

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.-157,136	6,067	25.9/1	1,346.18	0.88
FEB.-246,757	19,407	11.7/1	2,189.13	0.78

4. Waste Tank Inventory

HOT PILOT PLANT STORAGE

Tanks	Gallons Capacity	Gallons In	Gallons Out	Discharged To	Free Space
W-3	41,300	1,480	-0-	---	3,848
CHEMICAL WASTE STORAGE					
W-5	170,000	211,488	246,757	Evaporator	52,800
EVAPORATOR CONCENTRATE STORAGE					
W-6,8	340,000	18,000	7,200	Evaporator	93,600
METAL WASTE STORAGE					
W-4,7, 9,10	543,000	9,520	49,200	Evaporator	112,896

[redacted]

II. Tank Farm and Burial Ground: - (Continued)

5. Special Wastes

a. Three Dayton and one K-25 shipments were buried.

b. A total of 170,851.87 grams of uranium was received into the Metal System this month. Of this, 706-D transferred 139,687.87 grams; the Chemistry Division, 612 grams; the Chemical Technology Division, 11,896 grams; and the I^{131} process, 18,656 grams.

[redacted]

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

There was no RaLa run during February, 1950. The next one is scheduled to begin on March 12, 1950.

During the latter part of the month, the former fifty-foot cell ventilation stack for 706-D was removed and buried as was a section of the former cell ventilation duct. The cell ventilation fan was removed to the Burial Ground and stored there. The concrete floor, shaft pillar, and parts of Building 706-DA were demolished to make room for the new ventilation duct tie-in to the 900 Area exhaust stack.

One instance of air contamination was noted as coming from the 706-D cells this month. The source of this contamination was determined to be the experimental cubicle which was being de-contaminated. The equipment was found to be leaking active materials into the cell ventilation system.

C. RADIOISOTOPE CONTROL DEPARTMENT

I. General:

During February, 1950, there were 548 isotope shipments compared with 633 during January, 1950, and 430 in December, 1949. In February, 1949, there were 404.

The following table indicates the breakdown between separated and unseparated material:

	JANUARY 1950	FEBRUARY 1950	August, 1946, to February, 1950, Inc.
Separated Material 706-D Area	490	428	9,687
Unseparated Material 100 Area	143	120	2,846
	633	548	12,533

The following table indicates the breakdown between non-project, project, and foreign orders for January and February, 1950:

	JANUARY 1950	FEBRUARY 1950
Non-Project	505	436
Project	104	94
Foreign	24	18

II. Hanford Irradiations:

1. Beryllium Nitride

There are now 256 beryllium nitride slugs charged to the Hanford pile in four channels. According to the last status report, Hanford has only charged eleven inhours per channel compared to about seventeen previously.

2. Cobalt

Approval has been received from the Hanford Office of the Atomic Energy Commission for the irradiation of 220 slugs of cobalt, containing approximately 90 grams per slug. There are only 10 slugs now in the Hanford pile and no more can be

[redacted]

II. Hanford Irradiations: - (Continued)

2. Cobalt

charged until the slugs being prepared in the Oak Ridge National Laboratory machine shop are completed.

3. Miscellaneous Irradiations:

Approval has been received from the Hanford Office of the Atomic Energy Commission for extension of a large number of requests so that we can maintain a steady supply of radio-isotopes from Hanford throughout the next year. There has been a holdup for a month or so in charging some test hole samples at Hanford while cask handling facilities were being installed at the piles, but this work has now been completed and the samples charged. A regular schedule of charging and discharging dates is now being sent by Oak Ridge National Laboratory to General Electric Company and very satisfactory schedules have been developed.

III. Cyclotron Isotopes:

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

Na^{22}	9.18 mc.
Fe^{59}	2.00 mc.
Zn^{65}	1.00 mc.
As^{73}	11.00 mc.
I^{131}	.50 mc.

[redacted]

III. Cyclotron Isotopes: - (Continued)

Following is a table showing bombardments received and requested to date:

BOMBARDMENTS RECEIVED

	M. I. T.		CALIFORNIA		PITTSBURGH		WASHINGTON U.	
	Bombardments	Beam Hours	Bombardments	Beam Hours	Bombardments	Beam Hours	Bombardments	Beam Hours
Be^7					4	160.00		
Na^{22}	1	109.75			5	201.75	4	300.00
Zn^{65}	1	100.00						
Co^{57}							2	50.00
Mn^{54}							1	50.00
Fe^{59}			1	36.50				
I^{125}							1	10.00
TOTAL RECEIVED	2	209.75	1	36.50	9	361.75	8	410.00

REQUESTED BUT NOT RECEIVED

Mn^{52}					1	10.00		
Fe^{59}			1	120.00				
Fe^{59}			1	40.00*				
Zn^{65}			1	40.00				
As^{73}					1	10.00		
I^{125}							1	50.00
TOTAL HOURS OUTSTANDING		540.25		713.50		388.25		340.00

* Bombardment to be shipped directly to Washington University.

SHIPMENTS OF CYCLOTRON-PROCESSED ISOTOPES:

Be^7 - 31.673 mc.

Na^{22} - 2.81 mc.

[redacted]

[redacted]

III. Cyclotron Isotopes: - (Continued)

As shown on the table, 1,018.00 beam hours have been obtained from the four institutions now supplying us with cyclotron isotopes and 270 beam hours have been ordered but not received. This leaves a balance of 1,982.00 beam hours outstanding.

About 100 millicuries of Sodium 22 are estimated to be on hand, plus at least 50 millicuries of Be^7 and the following unseparated targets:

Zn^{65} - 100 beam hours

Mn^{54} - 50 beam hours

Na^{22} - 109.75 beam hours.

It appears that there will be little need for further bombardments during the balance of the fiscal year.

Washington University and the University of California have requested a schedule of bombardments which would enable them to complete the whole 750 beam hours by June 30, 1950. If the outstanding cyclotron time is used, it will be necessary to stockpile some of the long-lived isotopes such as Sodium 22. It would be wasteful to obtain any of the short-lived isotopes, such as Beryllium 7, for which orders are not on hand since most of the material would then be lost through decay. A policy on this matter has been requested from the Isotopes Division of the Atomic Energy Commission.

IV. Activation Analyses:

At present there are the following samples on hand:

1. Bentonite submitted by the California Research Corporation December 2, 1949. Analysis was requested to determine if a long-lived activity exists which would be suitable for making

[redacted]

IV. Activation Analyses: - (Continued)

1. Bentonite

radiographs of bentonite mud penetration in different strata.

Present Status:

Analytical data now being reviewed before final report.

2. Vinylite Resins submitted by Carbide and Carbon Chemicals Division, UCC, November 25, 1949. One set of these samples was submitted for analysis of cadmium and other trace metals, and one set for iron and other trace metals.

Present Status:

Some samples ready for pile bombardment, others in process of preparation. It is expected that most of the analytical work on these can be completed or or about March 20, 1950.

3. Magnesium Metal Alloys submitted by the Dow Chemical Company, December 22, 1949, for analysis for trace elements.

Present Status:

Samples are now in a three-week bombardment period. Analytical work on long-lived components to begin March 6, 1950. Work on short-lived components to begin shortly thereafter.

4. Stainless Steel, Ni-Cr-Mo-W-Alloy, and Ferrous Material submitted by Carbide and Carbon Chemicals Division, UCC, Niagara Falls, New York, February 13, 1950.

a. Stainless Steel for analysis of columbium and tantalum.

Present Status:

To be put in pile on or about March 13, 1950, for bombardment.

IV. Activation Analyses: - (Continued)

4. b. Ni-Cr-Mo-W-Alloy for analytis of calcium.

Present Status:

Samples being prepared for spectrographic analysis and bombardment. To be put in pile on or about March 4, 1950, for bombardment.

c. Ferrous Material for analysis of calcium.

Present Status:

Samples being prepared for spectrographic analysis and bombardment. To be put in pile on or about March 11, 1950, for bombardment.

V. Biological Irradiations:

A verbal request has been received from the Atomic Energy Commission for price estimates on a number of biological irradiations including irradiation of seeds, small animals (including mice, rats, and rabbits), bacteria, etc. Irradiations are expected to be mainly X or gamma, but there will probably be some neutron irradiations requested. The amounts of radiation for each sample would vary from a few roentgens to 10,000 roentgens or more.

VI. Radioiodine:

During the month the amounts of radioiodine produced were slightly below demand for the weeks ending February 17 and 24, 1950. The amounts of this isotope sold appear to be increasing steadily.

VII. Cobalt 60:

Radiocobalt is being used mainly for the following applications:

1. A considerable number of sources for industrial radiography of metal castings, welds, etc., have been distributed.

VII. Cobalt 60: - (Continued)

2. Small sources encased in stainless steel needles have been prepared for medical use. These usually are in the neighborhood of 1-10 mc. each.

3. Large teletherapy units designed to take the place of high voltage X-ray machines in medical applications are being designed by several institutions. Very high specific activity cobalt is needed which is not available in the United States. In a meeting held February 13, 1950, between the Atomic Energy Commission and interested suppliers, and medical institutions, it was decided that the minimum specific activity which would be useful should be approximately ten curies per gram and the maximum size of the source should be approximately 2 cm. square x 1 to 2 cm. thick. Since the maximum specific activity which has been possible to obtain at Hanford has been approximately 2 to 3 curies/gram/year's irradiation, a specific activity of ten curies appears to be out of the question and all such sources will have to be supplied by the Canadian pile at Chalk River.

VIII. Carbon 14:

Information has been received that the Bureau of Standards intends to distribute C^{14} samples to serve as tentative standards. The activity of these standards would be approximately 2% higher than the original analysis made at Oak Ridge National Laboratory and this may require a slight change in ORNL standards. Also, the isotopic ratio determined from mass spectrographic data is higher than the original analysis on which ORNL standards are now based. Since all sales are made on the basis of the activity,

VIII. Carbon 14: - (Continued)

however, a change to conform to the new standards would only entail approximately a 2% increase in our present standards. This would also mean a slight gain in our inventory.

Logan B. Emlet

Logan B. Emlet, Director
Operations Division

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IX. S-F Material Control:

1. Two shipments of highly-irradiated fuel rods were received from Chalk River, Canada, during the month. The first shipment consisted of fifty pieces, and the second shipment consisted of fifty-four pieces. To date we have received 154 of the scheduled 260 pieces on order. Material is being held in the storage canal pending completion of rebuilding and rearranging of Pilot Plant facilities preparatory to processing.

   It is expected that this order will be completed in March, 1950, subsequent to the receipt of two carload-lot shipments.

   In connection with the procurement of this material and by AEC directive, a purchase requisition, in the form of a secret letter, was initiated during the month to cover payment for the material. The total cost of the 260 pieces of fuel rods has been affixed at $162,000.00. Data for receiving reports, covering the 154 pieces received thus far, have been furnished the X-10 Receiving Department.

2. On February 24, 1950, one Hanford car was received. This car contained 200 gallons of 103-U supernate and twelve kilograms of uranium sludge. The material was for the Chemistry Division's Semi-Works operation and will be used in connection with continued development of the tributyl-phosphate process for metal recovery.

[redacted]

IX. S-F Material Control: (Continued)

3. In connection with a recently approved procedure change, entitled "Transfer of Uranium Between Carbide Oak Ridge Plants", and in accordance with recently established fissionable material basic and special quotas, the S-F accountability records have been extended to include controlling accounts for such quotas.

   These accounts not only indicate the approved basic or special quotas but also reflect the material control balances. In carrying these accounts, it is rather easy to make comparisons between approved quotas and material balances, thus assisting the S-F Control Office in its task of preventing over-runs of approved quotas.

4. During the month, fifty-one U^{235} aluminum alloy slugs were fabricated and shipped to Hanford, thus filling the request referred to in last month's report.

5. The revised and supplemented S-F Accounting Procedure Manuals, referred to in last month's report, were completed and issued during February, 1950.

6. Members of the Atomic Energy Commission, Oak Ridge Operations, S-F Accountability Office are currently conducting a quarterly S-F survey at the Laboratory. Thus far, this survey has consisted of a review of the records, discussion of procedures, and visits with several personnel possessing S-F materials. It is expected the survey will be completed shortly after March 1, 1950.

[redacted]

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

7. The analysis records of four analytical laboratories were audited during the month, which concluded our first cycle audit for the laboratories doing analytical work. The audit consisted of inspecting and comparing all requests for analysis against the analytical results obtained, verifying each result sheet in connection with disposition and spot-checking repositories when disposition reflected material was stored in analytical laboratory's safe. All records were in good order and no irregularities appeared to exist.

8. Following is a summary of shipments and receipts of S-F materials for the month of February, 1950:

SHIPMENTS

To	Material	Content
Argonne National Lab.	Plutonium Samples	1.2940 mg. Pu
Batelle Memorial Inst.	Thorium	39.20 gm.
Brookhaven National Lab.	Irradiated Thorium Pellets	27.71 gm.
" " "	Thorium Fluoride Pellets	2.50 gm.
C&CCC, Y-12 Area	UO_2F_2 (normal)	4,554.00 gm.
" " "	U-233	.1266 gm.
" " "	Enriched Uranium	278.53 gm.
" " "	U-233	0.104 gm.
General Electric Co.	U-Al Alloy (normal)	22.92 gm.
" " "	Enriched U/Al Slugs	584.33 gm.

 [redacted]

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

8.

RECEIPTS

From	Material	Content
Argonne National Lab.	U-Zr Alloy Punchings (normal)	Negligible
Chalk River	Slugs (depleted)	195,950.88 gm. 70.00 gm. Pu
" "	Slugs (depleted)	181,436.00 gm. 115.00 gm. Pu
C&CCC, K-25 Area	Normal Uranium	4.00 gm.
" " "	Normal Uranium	8.00 gm.
C&CCC, Y-12 Area	U_3O_8 (enriched)	107.72 gm.
" " "	U_3O_8 (enriched)	107.79 gm.
" " "	Uranium Metal (enriched)	3.05 gm.
General Electric Co.	Metal Waste Supernatant (depleted)	22,200.00 gm. 38.00 mg. Pu
" " "	Metal Waste Sludge (depleted)	12,375.00 gm. 37.00 mg. Pu
Tracerlab Inc.	Normal Uranium	.76 gm.
Westinghouse Electric Co.	Westinghouse Thorium Bars	140.00 gm.
" " "	Thorium and Thorium Oxide	649,100.00 gm.

[redacted]