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OPERATIONS DIVISION MONTHLY REPORT

FOR

MONTH ENDING AUGUST 31, 1952

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OPERATIONS DIVISION MONTHLY REPORT

for

Month Ending August 31, 1952

by

M. E. Ramsey

DATE ISSUED

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OPERATIONS DIVISION MONTHLY REPORT

SUMMARY

The activities of the Operations Division for the month ending August 31, 1952 are summarized below:

1. Lost graphite reactor operating time was 10.14% compared with 6.4% for July and 11.11% for the year to date (p. 3).

2. There were three slug ruptures this month, including one aluminum-silicon bonded slug (p. 3).

3. Some additional slugs were added to the graphite reactor to make up for lost reactivity (p. 4).

4. The LITR down time was 22% compared with 30.2% for July (p. 4).

5. The use of new ion-exchange resins in the demineralizer units is resulting in production of water of improved quality (p. 5).

6. Ordering of equipment for the new I^{131} plant was started (p. 6).

7. Test runs were started in the new fission-product separation unit. Delivery of Vycor process vessels was again delayed (p. 6).

8. Progress was made in the purification of europium target material (p. 7).

9. A total of 104 curies of beta activity was discharged to White Oak Creek, compared with 23.9 curies last month (p. 10).

10. RaLa run No. 49 was completed and 26,615 curies was shipped. RaLa run No. 50 was unsuccessful (p. 11).

11. There were 796 radioisotope shipments made compared with 839 the previous month (p. 13).

REACTOR OPERATIONS DEPARTMENT

OPERATING DATA

	AUGUST 1952	JULY 1952	YEAR TO DATE 1952
ORNL Graphite Reactor			
Total accumulated kwhr	2,324,013	2,472,626	18,945,675
Average kw/operating hr	3,476.02	3,550.49	3,639.62
Average kw/24-hr day	3,123.67	3,323.42	3,235.26
Per cent lost time	10.14	6.40	11.11
Excess reactivity (inhr)	20	27	
Slugs discharged	10,766	34	37,741
Slugs charged	11,302	34	38,424
Product made (g)	84.82	90.24	691.44
Product discharged (g)	1,181.55	0.55	5,982.03
Low-Intensity Test Reactor			
Total accumulated kwhr	868,727	742,930	5,424,832
Average kw/operating hr	1,497	1,430	1,168
Average kw/24-hr day	1,168	998	926
Per cent lost time	22.0	30.2	20.7
Position of No. 2 shim rod (in. out)	27.503*	27.008	

*This corresponds to approximately 0.2% excess reactivity.

REACTOR OPERATIONS

ORNL Graphite Reactor

There were three ruptures during August. Rupture 101 in channel 1556 was discovered August 4. This slug had been in the reactor 2988 days and was at an approximate temperature of 125°C. The rupture had not been discovered by probes or visual inspection, but was found while recharging the channel with bonded slugs.

Rupture 102 in channel 1256 was discovered August 11. This slug had been in the reactor 3024 days and was at an approximate temperature of 100°C. The rupture was found while discharging slugs; it had not been indicated by probes or visual inspection.

Rupture 103 in channel 1568 was also discovered on August 11. This slug had been in the reactor 132 days and was at an approximate temperature of 230°C. The rupture of the seventh slug from the west end of the channel was discovered during visual inspection, but it was not indicated by probes. This was the second rupture of a bonded slug from lot 113. All of the slugs in lot 113 were in the alpha phase.

The aluminum-silicon bonded slug that ruptured this month was not completely oxidized as was the first such ruptured slug detected on June 16, 1952 (rupture number 100).

Inspection of all aluminum-silicon bonded slugs not in the reactor was completed at Y-12 with the slugs being segregated into those in the alpha phase, those in the beta phase, and those partially transformed. All slugs charged into the reactor after June will have been tested for metal phase and records kept of the particular metal charged into each channel. Previously, slugs were not

phase-tested, which resulted in some mixture of alpha and beta material.

A temperature-cycling test is being run by the Metallurgy Division on alpha-phase slugs to determine whether they are more likely to rupture than beta slugs.

On August 27, 30 tantalum slugs were charged into holes A and C for the Army Chemical Corps. These, together with the tantalum slugs previously charged into the reactor, are scheduled to be discharged on September 29, 1952.

An increase in the amount of research material and tantalum loaded into the reactor during August resulted in a shortage of reactivity. Approximately 50 inhr were gained by the additional loading of 536 slugs on August 25 to zones 1 through 6, which made the total in the reactor 41,531 X-slugs, 21 donut slugs, and 15 experimental slugs that are in channel 1866. The additional loading was accomplished by adding 2 slugs to each row through zone 6, thereby making the rows 41-, 45-, and 49-slugs long instead of 39, 43, and 47, respectively, in these zones.

The slug cutter has been repaired and all outstanding orders for sliced slugs filled.

During the month the wooden dam in the canal was damaged and a new one inserted. This is now functioning very well in keeping most of the Co^{60} activity below the dam.

Two runs were made to produce approximately 4 liters of liquid hydrogen. Because of the small demand during the month, the storage vessel was not used. It is expected that the demand will increase shortly so that the storage vessel will be needed.

Low-Intensity Test Reactor

The LITR operated satisfactorily during August. The 22% down time was caused by shutdown of the reactor the first week of August for a boiling test performed on August 4.

Two safety rod bearings are being purchased to replace the graphite bearings now in the upper grid assembly. Since the new shim rods are made of aluminum, which corrodes when in contact with graphite, the graphite bearings are no longer suitable.

Tentative designs for a spent-fuel-element carrier have been completed and will be submitted to Arco for approval. This carrier will be used to transfer spent fuel elements from Oak Ridge to Arco for processing.

The pneumatic tube has been completed and irradiations are now being made. Special magnesium rabbits instead of micarta rabbits are being used because of the high flux.

Changing the location of the 2-in. tube used by General Electric personnel from C-46 to C-42 reduced the reactivity loss.

The resin baskets for the bypass demineralizer have been ordered and are expected in October.

FILTER HOUSE

In Table 1, the pressure drop across the exit air filter for last month is compared with this month's; a comparison is also given for the pressure drop experienced when all filters are clean.

TABLE 1

PRESSURE-DROP DATA

DATE	PRESSURE DROP (in. water gage)		
	Glass Wool	CWS No. 6	Total Across House
8/31/52	2.9	2.0	6.0
7/31/52	3.0	2.1	6.3
Clean filters	1.1	1.3	3.3

FAN HOUSE

The bearings on both fans were rolled out and inspected during the month. The bearings on No. 3 fan were in good condition; the bearings on No. 2 fan were badly wiped and the journal was pitted. It is believed that the pitting of the journal is because of stress corrosion or some other such defect in the steel from which the shaft was machined. The Sturtevant Company, the fan manufacturer, has been sent photographs of the bearings and journal and asked to advise as to the cause of the difficulty. The wiped bearings were scraped and reinstalled. They appear to be giving satisfactory service currently.

RADIOISOTOPES

Stringers 13, 14, and 16 contained 367 cans of target material at the end of August compared with 367 cans of target material in these stringers at the end of July. Table 2 is a comparison of the radioisotope and research samples charged into the ORNL graphite reactor during July and August.

WATER-DEMINERALIZATION BUILDING

Table 3 gives comparison data for July and August.

The Zeo-Karb H and De-Acidite resins in the east unit were replaced on August 27 with Rohm and Haas resins. Preliminary runs have been made and it appears that it is possible to produce demineralized water with a specific resistance of a million ohms compared with about 100,000 ohms in water produced by the old unit. The new resin has the advantage of removing carbon dioxide from the water and also giving much higher purity with respect to other contaminants.

TABLE 2

RADIOISOTOPE AND RESEARCH SAMPLES

	AUGUST 1952		JULY 1952	
	Research	Radioisotopes	Research	Radioisotopes
Stringers 13, 14, and 16	32	119	44	125
Hole 22	72	6	61	8
All other holes	2	16	4	28
Total by groups	106	141	109	161
Total for month	247		270	

TABLE 3

WATER DEMINERALIZED AND DEAERATED

	GALLONS PRODUCED		
	August 1952	July 1952	Year to Date 1952
Demineralized	338,850	375,252	3,292,010
Degasified	34,600	40,620	323,120

CHEMICAL SEPARATIONS AND RADIOISOTOPE DEVELOPMENT DEPARTMENTS

RADIOISOTOPES

Iodine (I^{131} – 8 d)

Twenty-four ORNL I^{131} slugs, two 4-in. Hanford slugs, and one 8-in. Hanford slug were processed this month. About 33,880 mc of product was shipped.

A low yield was experienced when one of the 4-in. Hanford slugs, which had a two weeks' decay time, was processed; all other yields were good. The 66 curies of iodine produced from the 8-in. Hanford slug was more than has ever been made from an equivalent amount of uranium.

Iodine Development Work

Permission has been received to complete the engineering design and to order the equipment for the new I^{131} plant. This work is now in progress. Permission has not been granted to start actual construction.

Phosphorus (P^{32} – 14.3 d)

Thirteen, 2500-g cans of sulfur were processed and 8943 mc of P^{32} was shipped. All runs were satisfactory with no difficulties encountered.

Carbon (C^{14} – 5740 y)

No production runs of C^{14} were made this month, there being an adequate supply on hand.

Analysis is being made of the gases from two Be_3N_2 pellets of which the irradiation history is well known. The pellets were dissolved according to standard procedure, and all the gas evolved was collected in one-liter flasks. More hydrogen was formed than expected (by action of unconverted beryllium metal and acid), and a total of 10 liters of gas at standard conditions was collected. A careful assay of the C^{14} in the various fractions collected is the next step to be taken.

Tritium (H^3 – 12.4 y)

Five packages of tritium that contained a total of 13.11 curies of H^3 were prepared during the month.

A special chamber source filled with one curie of H^3 and argon at atmospheric pressure was prepared for the Instrument Department.

Two liters of 4% He^3 was packaged.

Fission Products

Precipitation Process, Building 3515. The first cold chemical run was started for checking operating procedures and equipment. During this run, it was demonstrated that air agitation is insufficient for producing the proper type of crystals in the final cesium crystallizer and a power-driven, propeller-type agitator will have to be used.

The delivery date of the Vycor vessels has been changed to September 19.

Source Assembly Station, Building 3013. Design drawings were finished and orders for the fabrication of equipment were issued. Work on minor cell modifications continued.

Strontium (Sr^{90} – 25 y). One batch of Sr^{90} that contained 920 mc at a concentration of 18.4 mc/ml was produced. The Sr^{89} content of this batch (produced from accumulated residues of old material) was notably low – below the assay limits of the analytical methods used.

Quantitative data on the solubility of $BaCl_2$ in various strengths of HCl up to 13 *N* (saturated with HCl gas) at temperatures down to 0°C are being obtained, using Ba^{131} tracer. These data are necessary for finishing the design work on the new Sr^{90} purification unit.

Six 1000-mc Sr^{90} sources were prepared in stainless steel holders and shipped to Los Alamos.

The Sr^{90} for these sources was obtained by recovery from sources returned from Los Alamos.

Purified Fission Products. The following fission products were produced:

Cerium (Ce^{144} – 275 d)	483.6 mc carrier free
Niobium (Nb^{95} – 35 d)	175 mc carrier free
Strontium (Sr^{89} – 53 d)	112 mc carrier free
Ruthenium (Ru^{103} – 42 d)	95.2 mc at 254 curies/g Ru

Zirconium-Niobium (Zr^{95}, Nb^{95} – 65 d, 35 d). Eight liters of uranyl nitrate solution that contained one-half a W-slug was processed to obtain 60 curies of zirconium-niobium in 200 ml of 5% oxalic acid solution. This yield is much higher than any previously obtained.

Tracer experiments are being made to determine the capacity of silica gel for zirconium under processing conditions. These experiments are being made by using amounts of inactive zirconium 100 to 1000 times the concentration in normal W-dissolver solution.

Mixed Fission Products. Residues obtained upon evaporation of some mixed fission product solution, prepared by uranium and plutonium extraction with tributyl phosphate (TBP), were found to be excessive. Only traces of calcium, iron, and chromium were found upon spectrographic analysis, but a large amount of phosphorus was detected, indicating that extensive washing of the aqueous phase with solvent is necessary to remove TBP and its decomposition products. Other mixed fission product fractions were obtained with much less residue upon evaporation and could be dissolved satisfactorily in water, followed by dilute HNO_3 for clean up. Approximately 10% of the activity remained in the flask after the dissolving steps. The fission products in the aqueous solution will be fractionated in a heated ion-exchange column. This procedure of TBP extraction, evaporation, and fractionation in a heated column closely approximates the procedure to be used routinely in processing fission products with short half lives in conjunction with the new I^{131} plant. A 10-curie batch of mixed fission products is available for fractionation at the present time.

Processed Radioisotopes

Table 4 lists the radioisotope product solutions that were made from reactor-irradiated targets.

Europium Target Material

The solvent-extraction method for separating rare earths as given in the June report was applied to the separation of a samarium-europium mixture that analyzed 19.90% Eu_2O_3 and 75.71% Sm_2O_3 and was reported to contain 1.007 g Eu_2O_3 in a

TABLE 4

RADIOISOTOPES PRODUCED FROM REACTOR-IRRADIATED TARGETS

PRODUCT SOLUTION	AMOUNT (mc)	SPECIFIC ACTIVITY (mc/g)
Calcium (Ca^{45} – 180 d)	144	0.74
	820	31.5
Cadmium (Cd^{115} – 43 d)	23.6	25.5
Chromium (Cr^{51} – 26 d)	793	1130
Iron (Fe^{59} – 46.3 d)	Enriched, 44.3	1970
	Normal, 18.2	7.8
Potassium (K^{42} – 12.4 h) (from LITR)	550	266

total of 5.26 g of the mixture. The head fractions contained from 12 to 21% Eu_2O_3, but indications are that this method is not practical for small-scale purifications of europium. Therefore, a chemical method was used, which utilized the divalent state of europium as a basis for separation.

The most direct method for separating europium from samarium and other rare earths, except ytterbium, is the precipitation of divalent europium sulfate. The method consists of passing a 0.1 *N* HCl solution containing europium through an amalgamated zinc column. The effluent containing divalent europium is passed into 18 *N* H_2SO_4 under a CO_2 atmosphere where the alpha form of $EuSO_4$ precipitates. On heating to 80°C, the more stable beta form of $EuSO_4$ results, which may be filtered and washed in air without significant oxidation.

A preliminary test of this method was made, using 1.007 g of the Sm_2O_3-Eu_2O_3 mixture. The weight of the two fractions obtained was as follows:

$$Eu_2O_3 = 0.1775 \text{ g}$$

$$Sm_2O_3 = 0.9480 \text{ g}$$

The Sm_2O_3 was contaminated with ZnO, which follows Sm in an oxalate precipitation.

The Eu_2O_3 and Sm_2O_3 were analyzed spectrophotometrically and were shown to be free of Sm_2O_3 and Eu_2O_3, respectively. A spectrographic analysis, however, indicated 1 to 2% Sm_2O_3 in the Eu_2O_3.

A 10-mg sample of the Eu_2O_3 was sealed in a quartz tube and placed in the LITR for one week. The resulting activities will be studied and the results reported next month.

The remaining 4.25 g of Sm_2O_3-Eu_2O_3 mixture was separated by this method and the following amounts were obtained:

$$Eu_2O_3 = 0.8443 \text{ g}$$

$$Sm_2O_3 = 3.3869 \text{ g}$$

The two Eu_2O_3 fractions, totaling 0.9968 g, were processed on the zinc amalgam column to further reduce Sm_2O_3 contamination in the Eu_2O_3. The weights of the europium obtained from the $EuSO_4$ precipitate and the filtrate were:

Eu_2O_3 (from $EuSO_4$)	=	0.8700 g
Eu_2O_3 (from filtrate)	=	0.1180 g
Total		0.9880 g
Loss		0.0088 g

A sample of the europium from the $EuSO_4$ was submitted for spectrographic analysis. An accurate analysis will have to await a refinement of the spectrographic analytical method, but a qualitative comparison of the sample with standards indicated good purity.

Special Preparations

Eighty-four Co^{60} sources were loaded with a total of 205.6 curies.

A source containing two curies of AgI^{131} was prepared.

An electroplated plaque containing 6 mc of Ru^{106} was prepared.

Miscellaneous Work

Experiments are in progress to find a suitable paint to label storage bottles containing large amounts of radioactivity.

A technique for opening rabbits (sample containers) from the LITR is being developed.

A design was made and drawings were issued for a 40-hole underground storage facility.

Certain units of the refrigeration equipment for use in the new instrument room were inspected and rejected.

The following locations were inspected for corrosion and leaks: (1) hot off-gas drain trap located near hot-waste tank west of Building 3037, (2) dry wells on hot drain and hot off-gas lines (total 24), and (3) P-traps on hot drains. All were found to be in satisfactory condition.

Two screw-type beta source sheaths were designed and fabricated.

Six Hi-D Penberthy windows were received and inspected; all were approved.

Abstract of a report on a general purpose hot chemistry cell, to be presented at the October Information Meeting, was prepared.

The increase in capacity of the Decontamination Building crane from 5 to 10 tons has been completed.

RADIOACTIVE WASTE DISPOSAL

Monitoring pumps together with integrating flowmeters have been installed in process waste manholes No. 25, which services the north part of the Laboratory, and No. 139, which services Buildings 2000, 2001, 3017, and 2005. Samples taken daily for a month have shown that a minimum flow of 75,000 gal/day with an average activity of 1 count/min/ml courses through manhole No. 139, and a minimum flow of 300,000 gal/day with a minimum activity of 10 counts/min/ml courses through manhole No. 25.

Undoubtedly, much of this flow through both manholes consists of uncontaminated water from air-conditioners, condensers, cooling coils, etc. An effort will be made to divert as much water as possible from these sources to storm drains to alleviate the load on the process waste system.

The cooling water to the air-conditioning condensers of Building 3026-C was diverted from the process waste drain to the storm drain.

The W-7 slurry pump continued to break down during the month. At the end of the month, it was out of service for bearing repairs.

The cable to the telemetering system for the tanks on the south side of the plant was replaced. Following this revision, the operation of the chemical- and metal-waste collection tanks servicing Buildings 4500, 4501, and 4505 were added to the tank farm operations.

An inspection for leaks was made in the radioisotope area ductwork which had been caulked and repaired six months ago. The duct is still in good condition.

The radioisotope area exhaust system was shut down for 48 hr to permit revisions which would accommodate the passage of the new 4500 Area ductwork immediately over the radioisotope area duct.

An extension of the concrete pad, complete with water and drain services, was built adjacent to the Cottrell precipitator at the 3039 stack area. This pad will contain the ventilation fans to service the off-gas and hood ventilation of Buildings 4500, 4501, and 4505.

Nine pots and two drums of waste were received from Argonne National Laboratory.

Waste Discharge to White Oak Creek

The beta activity discharged to White Oak Creek from the settling basin and retention pond (see Table 5) is greater than that of last month and is attributable principally to two leaking waste lines in a pit west of Building 3026-C. The leaking material was the highly radioactive waste from the RaLa runs.

Chemical-Waste Evaporator

The evaporator operations were normal, although two of the six steam coils were shut off because of bad leaks. Repairs will be made as soon as practical. Operations and inventory are given in Tables 6 and 7.

TABLE 5

ACTIVITY DISCHARGED TO WHITE OAK CREEK

DISCHARGED FROM	AUGUST 1952		JULY 1952	
	Gallons	Beta Curies	Gallons	Beta Curies
Settling basin	23,170,000	103.68*	24,885,650	23.71
Retention pond	368,500	0.21	365,600	0.17
Total	23,538,500	103.89	25,251,250	23.88

*Less than 3.8 curies contributed by normal evaporator operation.

TABLE 6

WASTE-EVAPORATOR OPERATION

MONTH	SOLUTION FED TO EVAPORATOR (gal)	CONCENTRATE TO W-6 (gal)	VOLUME REDUCTION	BETA CURIES TO EVAPORATOR	BETA CURIES TO SETTLING BASIN
August 1952	147,360	7,800	18.9:1	13,697.6	3.71
July 1952	177,960	11,890	15:1	39,179.0	1.27

TABLE 7

WASTE-TANK INVENTORY

TANKS	CAPACITY (gal)	FREE SPACE (gal)	
		August	July
Hot-Pilot-Plant Storage			
W-3, 13, 14, 15	48,500	30,970	31,560
Chemical-Waste Storage			
W-5	170,000	39,500	65,000
Evaporator-Concentrate Storage			
W-6, 8	340,000	52,300	57,500
Metal-Waste Storage			
W-4, 7, 9, 10	543,000	243,200	261,500

RaLa (Ba^{140} – 12.5 d)

An attempt was made to ship two batches this month, but only one run was successfully completed. RaLa run No. 49 yielded 26,615 curies for shipment on August 3. RaLa run No. 50, started on August 18, ended in complete failure as a result of difficulties with process and equipment.

Run No. 49 was made from 226 4-in. Hanford slugs processed through the dissolving and extraction in six batches. The process was identical to that used in run No. 48, except that the dry product was boiled in fuming HNO_3 in the shipping cone prior to removal from the cubicle.

The run proceeded smoothly with only minor difficulties, such as two failures of valve-extension handles and slow filtration rates during two extractions.

The product removal was accomplished with a minimum of difficulty and exposure. The building was not appreciably contaminated nor was the carrier when removed from the loading cubicle.

A measurement of the product by use of the fission-counting chamber was impossible because the chamber failed to operate when needed. However, an ionization-chamber reading confirmed the quantity as measured by chemical analysis.

The analytical results of the run follow and all values are corrected to last separation time 0825 on August 3, 1952:

Slugs loaded	226 Hanford 4-in. slugs	
Slugs dissolved	222.2 (by analysis)	
	Curies	Per Cent
Product dissolved	40,396	100.00
Cell A losses	1,584	3.92
Resin cubicle losses	7,670	18.99
Total losses accounted for	9,254	22.91
Product shipped	26,615	65.90
Material balance		88.80

The resin-cubicle loss includes 2264 curies that remained in the column after the product-elution step. This loss was not discovered until the resin was titrated after the shipment was made; the reason for the loss is not known.

While attempting to perform the titration of the resin to determine the extent of resin breakdown, a backup of radioactive resin occurred to the operating panelboard and succeeded in plugging the eluate line to the column. It became necessary to discard the resin without completing the titration to unplug the line.

During the run the metal-waste discharge line from Building 3026 started leaking into the valve pit west of Building 3026-C. This leak accounts for most of the excess activity discharged into White Oak Creek this month.

Run No. 50, started on August 18, was a complete failure; no product was shipped. The main difficulties that account for the failure of this run were the plugging of the process filters, leaking process filter lines, leaking thermocouple well in the product evaporator, and the loss of product from the shipping cone into the off-gas line during the product-drying operation.

The filtration through the process filters became progressively slower with each of the six batches extracted. The rate became so poor in the first metathesis filtration that it became necessary to revert to the old method of decantation to remove the waste supernatant from the product precipitate. This step resulted in a product loss of almost 25%.

Another high loss of approximately 25% was experienced between the dissolving operation and the sampling of the product in the resin column cubicle feed tank. It now appears that this loss was caused by leaks around the process-filter equipment. Similar losses, although never as large, had also been experienced in previous runs; they could never be accounted for by analyses of the wastes.

The operations through the resin-column cubicle appeared to progress with practically no difficulty.

A reddish-brown color was observed in the product sample prior to the transfer to the product-shipping cone; but at this point the run was too far behind schedule and there was too little product left to attempt to purify it.

The batch prior to the transfer to the cone contained approximately 20,000 curies of product. After drying, however, the radiation readings indicated only about 8000 curies were present in the cone. The shipping cone was placed back on the charging head while a search was made for the missing product. The search through the equipment proved futile; about 8 hr later when the product radiation was again measured, it was discovered that practically all 8000 curies that had been in the cone had also disappeared.

It was now evident that the dry product had been lost from the cone into the off-gas line. At this point, Los Alamos agreed to accept as low as 7000 curies if it could be recovered from the 10,000 curies held by the metathesis and fuming nitric wastes.

The recovery of the wastes proceeded satisfactorily to the fuming nitric precipitation step prior to the transfer of the product to the cone. The product was again reddish brown. Approximately 50% was lost in fuming nitric waste, 25% was left behind in the product evaporator, and 25% was transferred to the shipping cone.

The small amount of product (2000 curies) was too small to be of any use to Los Alamos, so it was used to prove that it was possible for the product to be drawn into the off-gas line from the shipping cone. Approximately 90% of the dry product was again lost to the off-gas line by keeping it under the charging head for several hours and by repeating the movements the cone was put through during the main part of the run.

Further investigation, after the run was discontinued, revealed a bad leak in the thermocouple well, which explained the presence of iron in the product. It is suspected that the presence of iron may have changed the physical properties of the dry product in such a way as to enable it to be swept out of the cone into the off-gas line.

The next run is scheduled to be made early in October. It will be impossible to get the equipment repaired by that time, but it is believed that a successful run may be made by making alterations to the operating procedures which will avoid the difficulties experienced in run No. 50.

RADIOISOTOPE SALES DEPARTMENT

Table 8 shows a breakdown of the radioisotope shipments.

HANFORD IRRADIATIONS

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

CYCLOTRON RADIOISOTOPES

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

Table 11 lists the number of radioisotope bombardments received and requested through August.

Table 12 lists the number of cyclotron-processed radioisotopes.

ACTIVATION ANALYSES

A total of 37 requests has been received for information concerning activation analyses. Ten of these have developed into requests for analyses, five of which have been completed.

TABLE 8

RADIOISOTOPE SHIPMENTS

SHIPMENTS	AUGUST 1952	JULY 1952	AUGUST 1951	AUGUST 1946 TO AUGUST 1952, INCLUSIVE
Separated material	664	671	616	28,280
Unseparated material	132	168	143	7,819
Total	796	839	759	36,099
Nonproject	698	732	633	
Project	82	97	114	
Foreign	16	10	12	
Total	796	839	759	

TABLE 9

RADIOISOTOPES RECEIVED FROM HANFORD

SAMPLE NO.	MATERIAL	NO. OF PIECES	DATE DISCHARGED	DATE RECEIVED
ORNL-158	Antimony	1	7/15/52	8/13/52
ORNL-164	Hafnium oxide	1	August 1952	8/30/52
ORNL-165	Calcium carbonate	2	August 1952	8/30/52
ORNL-149	Mercuric oxide	1	August 1952	8/30/52
ORNL-60	Potassium chloride	1	August 1952	8/30/52

TABLE 10

CYCLOTRON RADIOISOTOPE ORDERS

MATERIAL	AMOUNT OF MATERIAL (mc)	NUMBER OF SERVICE IRRADIATIONS	STATUS
Be^{7}	2		Material to be requested
Na^{22}	18.2		Material has been requested
Mg^{28}		1	Material has been requested
Ti^{44}		1	Material has been requested
Cr^{48}		1	Material has been requested
Mn^{54}	2		Material has been requested
Fe^{59}	300 μc		Material to be requested
As^{73}	1.5		Material in process
Sr^{85}	5.0		Material in process

TABLE 11

BOMBARDMENTS RECEIVED AND REQUESTED

MATERIAL	MASS. INSTITUTE OF TECHNOLOGY		UNIVERSITY OF CALIFORNIA		UNIVERSITY OF PITTSBURGH		WASHINGTON UNIVERSITY	
	Bombard-ments	Beam Hours	Bombard-ments	Beam Hours	Bombard-ments	Beam Hours	Bombard-ments	Beam Hours
Bombardments Received								
Be^{7}			1	47.20	15	342.00		
Na^{22}	2	190.00			9	400.25	4	300.00
Mn^{52}					2	20.00		
Mn^{53}			1	8.00				
Mn^{54}	1	50.00	1	95.00			7	400.00
Fe^{54}			1	18.70				
Co^{57}	1	10.00					4	140.00
Fe^{59}			7	332.80	2	80.60	1	34.00
Zn^{65}	1	100.00	1	47.80				
Ga^{67}					11	77.75		
As^{73}			1	10.50	3	30.50		
As^{74}	1	5.00						
Sr^{85}	3	89.75			1	10.00		
Y^{88}	1	10.00						
I^{125}							2	60.00
Molybdenum metal			1	10.00	2	15.70	5	50.40
KCl	1	1.00						
Sulfur					1	2.00		
Total Received	11	455.75	14	570.00	46	978.80	23	984.40

TABLE 11 (continued)

MATERIAL	MASS. INSTITUTE OF TECHNOLOGY		UNIVERSITY OF CALIFORNIA		UNIVERSITY OF PITTSBURGH		WASHINGTON UNIVERSITY	
	Bombard-ments	Beam Hours	Bombard-ments	Beam Hours	Bombard-ments	Beam Hours	Bombard-ments	Beam Hours
Requested but not Received								
Ti^{44}			1	10.00				
Na^{22}					1	100.00		
Mg^{28}			1	10.00				
Cr^{48}			1	10.00				
Mn^{54}			1	100.00				
Total hours outstanding (not received or requested)		1,044.25		800.00		421.20		515.60

TABLE 12

SHIPMENTS OF CYCLOTRON-PROCESSED RADIOISOTOPES

MATERIAL	NO. SHIPMENTS	TOTAL PRODUCT (mc)		NO. OF SERVICE IRRADIATIONS	
		August 1952	To Date	August 1952	To Date
Be^{7}			368.743		4
Na^{22}			84.154		
Mn^{52}			10.991		
Mn^{54}	1	3.5	19.22		
$Fe^{55,59}$			63.64		4
Co^{57}			4.144		
Zn^{65}			42		4
Ga^{67}					20
As^{73}			4.760		
As^{74}	1			1	1
Sr^{85}			6		
Sr^{88}			25		
Sr^{90}					1
Mo^{95}	2			2	9
KCl	1			1	1

SF MATERIAL CONTROL

Five carload-lot shipments were received from Hanford during the month. Two cars contained irradiated thorium slugs for the U^{233} separation process; two were loaded with irradiated uranium slugs for the Purex process development runs; and one contained irradiated uranium slugs for the RaLa process.

An additional 18,247 silicon-bonded, aluminum-jacketed, normal uranium slugs were received from Y-12 during August for use in reloading the graphite reactor.

Significant quantities of fissionable material were received from Y-12 – namely, 2.27 kg of 93% enriched uranium for use in fabricating additional fuel elements for the LITR and 6.44 kg of 93% enriched uranium for use in fabricating fuel elements for the MTR.

Shipment of MTR fuel assemblies and control rods to Phillips Petroleum Company, Scoville, Idaho, was accelerated during August. There were 37 assemblies and 4 control rods shipped, making the total number shipped to date 151 and 27, respectively.

On August 11, 13 samples of depleted uranium and plutonium contained in UNH solutions from the Scrup process were shipped to Chalk River, Canada, for check analyses in accordance with the agreement negotiated between the USAEC and the National Research Council of Canada relative to purchase of Chalk River fuel rods.

Shipments of separated plutonium to Los Alamos consisted of 182.49 g of Purex material and 216.72 g of Scrup material. It is anticipated that plutonium shipments will rise sharply during September, continuing through October. This is based on the tentative assumption that both programs (Purex, Scrup) will be completed in September.

Relative to a recent USAEC request to prepare standard SF procedure manuals that would be applicable to all Carbide-operated plants, the

TABLE 13

SF MATERIALS SHIPPED

FROM	MATERIAL	NO. SHIPMENTS	QUANTITY (g)
Argonne National Laboratory	U^{234}	1	0.309
	Depleted uranium	1	40.00
Brookhaven National Laboratory	Depleted uranium	1	17.83
Carbide and Carbon Chemicals Co., K-25	Depleted uranium	1	18,470.00
Carbide and Carbon Chemicals Co., Y-12	Enriched uranium	3	8,122.03
	Normal uranium	12	23,354,762.55
	U^{233}	1	To be determined
General Electric Co., AGT	Enriched uranium	1	0.03
General Electric Co, Hanford	Depleted uranium	3	886,333.00
	Plutonium in depleted uranium		374.00
	Thorium	2	1,356,624.37
	U^{233} in thorium		1,220.00
General Electric Co., Schenectady	Normal uranium	1	64,100.00
Los Alamos Scientific Laboratory	Plutonium	1	1.00
National Lead Co.	Normal uranium	1	453,590.00

ORNL SF accountability representative attended a meeting held in Paducah on August 12 for the purpose of discussing the feasibility of including ORNL procedures along with production plant procedures. As a result, it was decided that an ORNL SF procedure manual should be handled separately from the manuals of the three production plants. However, it was decided that ORNL in preparing its manual would follow the format and outlines developed for the production plants as much as possible.

USAEC SF Accountability Manual, GM-PRO-2, revised July 7, 1952, was received by the ORNL SF Accountability Office on August 29. A complete adoption of all the provisions contained in the manual will increase the workload of the ORNL SF Accountability Office appreciably and an increase in personnel will be required. In addition, it will increase the amount of work of each scientist and researcher possessing SF material, particularly from the standpoint of inventory submissions wherein material must not only be segregated on the reports by material type and chemical formula but it is requested that it also be segregated by basic or special quota allocation numbers. Also, it is necessary to indicate the reliability of the various items in the inventory by showing probable limits of recognized uncertainty, and such limits must be expressed in metric weight units and not in percentages. Likewise, each transfer involving an external shipment or receipt must reflect the limits of recognized uncertainty; and such data must be shown on all AEC 101 forms, by line item, for receipts and shipments.

SF surveys during the month consisted of auditing the records of three analytical laboratories and disclosed that all records were in good order and proper accounting had been made for all samples submitted for analysis.

There were 29 receipts and 56 outgoing shipments during August, compared with 20 receipts and 43 outgoing shipments last month. Tables 13 and 14 show a summary of receipts and shipments during the month.

TABLE 14

SF MATERIALS SHIPPED

TO	MATERIAL	NO. SHIPMENTS	QUANTITY (g)
American Cyanamid Co.	Plutonium	1	0.001
Argonne National Laboratory	Plutonium	1	0.01
	Depleted uranium	1	370.00
Carbide and Carbon Chemicals Co., K-25	Thorium	1	0.88
Carbide and Carbon Chemicals Co., Y-12	Enriched uranium	17	1,035.98
	Plutonium	1	0.01
	Normal uranium	11	10,342,085.15
	U^{233}	1	To be determined
	U^{234}	1	0.308
General Electric Co., AGT	Enriched uranium	1	0.03
General Electric Co., Hanford	Normal uranium	2	48,104.72
Los Alamos Scientific Laboratory	Plutonium	3	399.21
Mallinckrodt Chemical Works	Normal Uranium	3	190,503.00
Phillips Petroleum Co.	Enriched uranium	8	6,810.82
USAEC Liaison Office, Chalk River Canada	Depleted uranium	1	576.78
	Plutonium	1	0.25
USAEC, Oak Ridge Operations Office	U^{233}	1	0.256
University of California Radiation Laboratory	Depleted uranium	2	76.64