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CHEMICAL EFFLUENTS TECHNOLOGY WASTE DISPOSAL INVESTIGATIONS

JANUARY, FEBRUARY, MARCH, 1958

Prepared by Members of the

Chemical Effluents Technology Operation

Edited by: W. H. Bierschenk

April 24, 1958

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CHEMICAL EFFLUENTS TECHNOLOGY WASTE DISPOSAL INVESTIGATIONS

JANUARY, FEBRUARY, MARCH, 1958

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CHEMICAL EFFLUENTS TECHNOLOGY WASTE DISPOSAL INVESTIGATIONS
JANUARY, FEBRUARY, MARCH, 1958

INTRODUCTION

The Chemical Effluents Technology Operation performs research to investigate the chemical and physical aspects of environmental contamination resulting from plant effluents or from potential process disasters. This report is primarily concerned with plant assistance research in the field of waste disposal during the quarter January-March, 1958.

The ground-water monitoring data utilized in this report were obtained from well water samples. These samples are collected routinely by the Regional Monitoring Operation and analyzed by the Radiological Chemical Analysis Operation.

I. INTERPRETATION OF GROUND-WATER MONITORING DATA (W. H. Bierschenk).

Figure 1 shows the probable limits of ground-water contamination based on gross beta activity > 1.5×10^{-7} μc/cc in well water samples. This detection level is approximately 0.15 of the Radiation Protection Standards MPC for Ru^{106}. Also shown on the figure are generalized contours on the water table as of December 1957. The general direction of ground-water movement is normal to the contour lines in the direction of the downward slope.

200-East Area

There are three zones of contaminated ground water beneath 200-East Area. (See Figure 1). The depth to water ranges from 200 feet in the northeast to 340 feet in the southeast. The principal sources of ground-water contamination are the waste effluents disposed to the following three general sites, which are discussed in order.

(1) 216-BY and 241-B cribs. - - During the period of use, ending in December 1955, roughly 430,000 curies of beta particle emitters were discharged to these cribs. Part of these wastes are percolating the 240 feet to the water table and entering the ground water. During the period covered by this report, the maximum concentration of gross beta activity detected was 5.1×10^{-2} μc/cc, reported 1-6-58. The contaminants move westward and southwestward down the hydraulic gradient imposed by the 200-East ground-water mound. See "A", Figure 1. West of 200-East Area the water table occurs in permeable glacio-fluvi[illegible] sands and gravels, and contaminants reaching these sediments t[illegible] move chiefly southward and southeastward. Radioactive contaminati[illegible] [illegible]ed intermittently in three wells located about 11, 12 and 17 mi[illegible] [illegible]east of 200-East Area. The maximum concentration detected in th[illegible] of 3.0×10^{-7} μc/cc (2-19-58) is far below that considered hazardous [illegible] drinking water.

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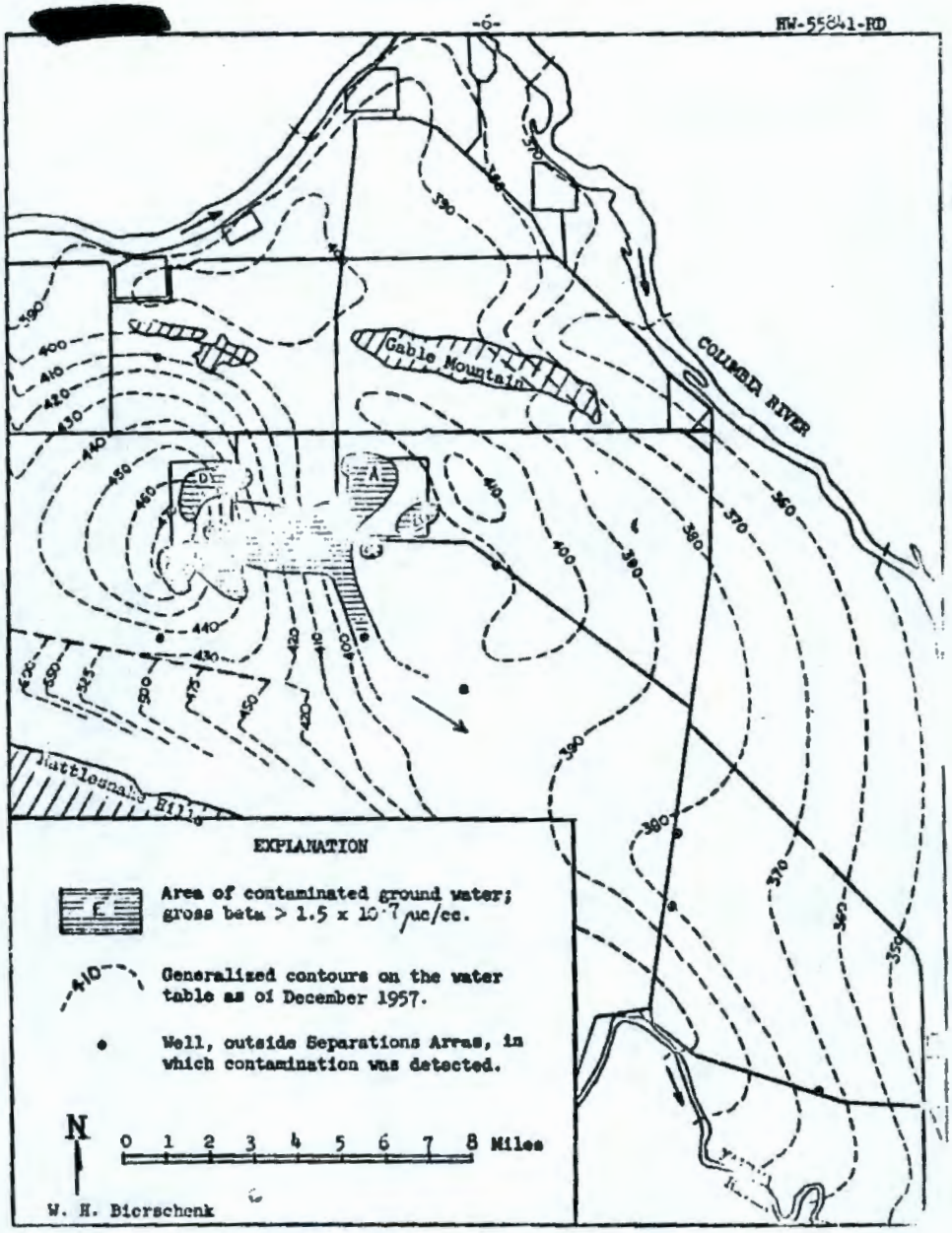

Fig. 1

Map showing probable extent of [illegible]

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(2) 216-A cribs. - - Of the 10,700 beta curies discharged to the 216-A cribs, 85% or 9,000 curies has gone to the A-8 crib. Those Purex process wastes that percolate to the water table contribute to the ground-water contamination zone labeled "B" in Figure 1. The maximum detected gross beta concentration for the period was 5.8×10^{-3} μc/cc, reported 1-13-58. The contaminated ground water is moving southwestward.

Scintillation probe logs of the six monitoring wells at the A-8 site were prepared in a study of the distribution of radioactive material beneath the crib. The data obtained reveal significantly different penetration of wastes in different areas. For example, in one well the tests indicated that wastes had moved the entire 235 feet to the water table, whereas in an adjacent well gamma emitters were detected to a depth of only 125 feet. These data are correlative with the geologic stratigraphy.

(3) 216-BC cribs and trenches. - - Over 912,000 beta curies of TBP scavenged wastes have been discharged to the BC facilities. The intermittent appearance late in December 1957 and in January 1958 of radioactive contamination in the ground water (depth about 340 feet) beneath these sites is interpreted as a definite breakthrough from one or more of the disposal facilities. See "C", Figure 1. The maximum beta concentration detected to date in the ground water was 7.6×10^{-6} μc/cc, reported 12-25-57. This concentration was found at a depth of 10 feet below the water table; the maximum concentration found in samples from the surface of the water was 2.7×10^{-7} μc/cc, reported 1-2-58. The concentrations observed have been very low and the results of repeated sampling not completely consistent. These results may possibly indicate sinking of high-density [illegible] wastes in the ground water.

Isotopic and fission [illegible] - - Results from isotopic analyses made on well water samples [illegible] soluble Co^{60} occurring in the ground water beneath the 216-BY cribs and the 216-A-8 crib. The maximum concentration detected beneath the BY cribs was 8.7×10^{-4} μc/cc, reported 2-10-58. This exceeds the Radiation Protection Standards MPC by a factor of about 2. However, the concentration in samples from this particular well has decreased from the known maximum of 1.3×10^{-3} μc/cc, reported 5-6-57. On 3-10-58 a Co^{60} concentration of 1.95×10^{-6} μc/cc was detected in one well monitoring the A-8 crib. This value is not expected to go much higher because the influent waste to the crib contained only about 3×10^{-6} μc/cc.

200-West Area

There are currently four zones of contaminated ground water beneath the 200-West Area. See Figure 1. The depth to water ranges from about 200 feet in the west to 280 feet in the east. The principal sources of contamination are the wastes of the T-Plant and Redox disposal facilities.

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(1) T-Plant cribs and trenches. - - Disposal of wastes to the T-facilities terminated in mid-year, 1956. A total of 94,000 beta curies had been discharged, roughly 90% of which went to the 216-TY-1 crib, the 241-TX trenches, and the 361-T-1,2 cribs. Those radioactive wastes that have percolated to the water table contribute to zone "D" on Figure 1. For the period of this report, the maximum detected concentration of beta particle emitters in well water samples was 1.2×10^{-4} μc/cc, reported 3-4-58. The contaminated ground water moves generally northeastward in accordance with the prevailing hydraulic gradient.

The ground water underlying the 216-WR crib is contaminated to a detected level of 3.7×10^{-5} μc/cc (1-7-58), and wells to the east beyond 200-West Area have shown beta concentrations as high as 2.2×10^{-5} μc/cc. However, this contaminated zone, "E" (Figure 1), influenced by the prevailing eastward hydraulic gradient, was probably contaminated by wastes from the T-facilities. While the T-Plant was active, the prevailing gradient was southeastward, and wastes moved in that direction. Changes in rates, volumes, and sites of disposal (1) altered directions of ground-water movement, thus zone "E" is believed a remnant of former conditions. A scintillation probe log of the well monitoring the 216-WR crib shows practically no gamma activity at depth.

(2) Redox cribs. - - More than 850,000 beta curies have been discharged to the "S" disposal facilities, and almost all of this has gone to the 216-S-1,2 and 8-7 cribs. The underlying ground water has been contaminated by some of these wastes, the maximum detected concentration for the period being 3.9×10^{-3} μc/cc (2-17-58). The contamination tends to move southeastward down gradient. See zone "F", (Figure 1).

Scintillation probe logs of the wells monitoring the Redox cribs show that immediately adjacent to the 216-S-1,2 and 7 cribs radioactive wastes have percolated down through the sediments 160 feet to the water table. However the horizontal movement of wastes in the sediments is generally limited to less than 200 feet.

The fourth zone in 200-West Area, "G", lies beneath the 216-S-5, 6 cribs. The maximum beta concentration detected in water samples from monitoring wells was 3.5×10^{-7} μc/cc, reported 1-7-58. This contamination can be expected to move generally southeastward. In the future, some ground water contamination in this zone may be contributed by beta particle emitters present in the Redox swamp waters. In February, unusually high activity was noted in process water discharged to the new Redox swamp. A sample was found to contain 1×10^{-2} μc/cc and investigation of past results indicated an increasing trend by a factor of 2 each month since the end of November 1957.

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Fission product analyses. - - Radiostrontium persisted in the ground water beneath the 216-B-1,2 cribs as indicated by samples from adjacent wells. On 1-14-58 the well water sample contained 1.4×10^{-6} μc/cc; this is an increase from the 8.8×10^{-7} μc/cc reported in the last quarter of 1957 (2). No radiostrontium or radiocesium was found in ground-water samples from any other site.

II. PLANT WASTE DISPOSAL PRACTICE

Chemical Processing Department

Co^{60} use test (W. A. Haney).

The waste scavenging program came to an end following the processing of batches 28 and 29 in January 1958. Although the Co^{60} concentrations in these batches were below the cribbable limit of 4×10^{-4} μc/cc, poor cesium adsorption characteristics made it advisable to discharge the wastes to the specific retention trenches.

The following table summarizes disposal data on wastes discharged to the three major scavenged waste disposal sites.

200 AREAS SCAVENGED WASTE DISPOSALS

Site	Volume (Gallons)	Beta Activity (Curies)	Sr^{90} Activity (Curies)	Cs^{137} Activity (Curies)
216-BY cribs	8,945,000	408,510	14,784	3,141
216-BC cribs	8,657,375	330,255	1,407	1,539
216-BC trenches	17,213,000	500,000	5,380	7,000
Totals	35,015,375	1,238,765	21,571	11,680

The total beta activity in scavenged waste supernatant liquid discharged to ground represents about 55% of the beta activity sent to all ground disposal sites in the 200 Areas.

The second phase of this program, the study of the dispersion of liquids in ground water by means of a "Co^{60} use test" got underway in March with the beginning of the well drilling. All the wells are expected to be completed by the end of June.

Specific retention study (W. A. Haney).

HW-54599 - - "A History and Discussion of Specific Retention Disposal of Radioactive Liquid Wastes in the 200 Areas," was issued January 20, 1958 (3). This report reviews the history and presents tabulated data on specific retention disposals of 200 Areas radioactive liquid wastes. A discussion of the shortcomings and unevaluated features of this disposal method are also presented. Lowering of the capacity factor from 10% (volume basis) to 6% was recommended

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in view of the absence of reliable data defining the extent of underground spreading which occurs at the various disposal sites. An absence of data on long-term migration of radioisotopes in wetted soils also makes it advisable to use a more conservative capacity factor.

Disposal to cribs (W. A. Haney).

On the basis of conservative laboratory data, calculations show that Sr^{90} may enter the regional ground water beneath the 216-A-6 crib within the next few months. Consequently a recommendation was made to Purex Operation to abandon this crib and to activate the 216-A-24 replacement crib on or about May 1, 1958.

Ninety percent of the Sr^{90} discharged to the abandoned 216-S-1 and 2 cribs was accounted for in a cylinder of soil about 120 to 140 feet in diameter and 30 feet deep. The audit of Sr^{90} was calculated using the radioanalysis of soil samples taken from wells located near the circumference of the cylinder. In nearly all these samples, Cs^{137} was not detectable, which prohibited making a Cs^{137} audit. The absence of this radioisotope is evidence that it was removed by the soil before the waste reached the wells. The material balance of long half-life isotopes or "positive" approach method of auditing wastes discharged to the ground appears to be a feasible reinforcement to the present "negative" monitoring method. However, it would be very expensive, requiring a large number of radioisotopic analyses of the effluent to a crib and possibly tripling the number of wells associated with the crib.

The presence of plutonium in the soil at the bottom of a 150-foot well adjacent to the 234-5 Building waste crib was confirmed by laboratory analysis. Six other shallow wells in the immediate vicinity are suspected of containing plutonium contamination. Plutonium contamination at this depth (50 feet above the regional ground water) has resulted in a recommendation to Finished Products Operations that a new crib, with attendant ground-water monitoring wells, be provided in the immediate future.

Coating waste disposal (W. A. Haney).

The moisture content of the aluminosilicate gel in the 300 Area test disposal pit has not changed significantly since the test started. This behavior is in sharp contrast with the data collected from the laboratory soil column test which showed 75% of the moisture was lost to the soil and atmosphere over a period of three months. This difference in experimental findings indicates that concern over loss of moisture from the gel to the soil may have been over-emphasized. Samples of the soil below the test pit are to be taken within a few months. Analysis of these samples will help to clarify the differences in experimental results.

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300 Area waste disposal (W. A. Haney)

A sampling traverse of the Columbia River conducted 1/2 mile below the 300 Area in January 1958 yielded samples which contained uranium in concentrations just slightly above background. This, combined with previous findings, establish... that nearly complete dilution of 300 Area wastes is realized within a short distance downstream of the 300 Area at all times of the year.

Irradiation Processing Department

As^{76} and P^{32} in reactor effluent (W. N. Koop).

The river concentrations of As^{76} and P^{32}, resulting from disposal of reactor coolant, are of serious radiological concern during certain periods of each year. Restricting reactor production, either by limiting power level or operating time, is the only known way of maintaining or reducing the release rate of these two isotopes to the river. Three studies are planned to find alternate methods of inhibiting the formation of As^{76} and P^{32} in the coolant.

The first study was started in January at B-Area where samples and operating data were collected. The object is to determine relationships that may exist between seasonal operating conditions and the coolant concentrations of As^{76} and P^{32}. The correlation of operational data and analytical results will be attempted by graphical methods. This study will probably be completed in about one year.

The object of the second study is to determine the effect a lower pH coolant has on the effluent concentration of the two isotopes. The program of collecting effluent samples from each of six 105-KE experimental tubes was started in March and a comparison of the isotopic concentration of the streams will be made. These six tubes are being operated as part of a corrosion study program. Two of the tubes are cooled with pH 6.0 water, two at pH 6.5, and two at the standard pH level 7.0. This test will probably be completed before the end of the next quarter.

The third study is to be conducted at F-Area in May. The object is to determine whether the effluent concentration of As^{76} and P^{32} can be significantly decreased by avoiding the impurities associated with the use of commercial grade H_2SO_4 for treating coolant. It is planned to add reagent grade sulfuric acid to the water cooling one-half of the reactor, while using commercial grade acid to treat the water cooling the other half. Isotopic analyses of effluent samples of both halves of the reactor will be made and compared.

1957 purges

A review was made of the reactor purges conducted in 1957 to determine if the current limitations on purge effluent disposal are adequate without being unduly restrictive. (The disposal rules are based on estimates of river pollution resulting from the release of purge effluents in the spring of 1955). A comparison

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of the quantities of radioactive material found in 1955 with that found in 1957 purge effluents showed no significant difference. The isotopes of concern (Fe^{59}, P^{32}, and Np^{239}) were all increased by about the amount anticipated and can be traced directly to an increase in operating level. The 1957 effluents, from about 90 purges during reactor operation, were sent to the river and the total time that this material was being released was about 20 hours. The effluents from another 10 purges were sent to cribs. The conclusion was reached that the present disposal rules are needed for preventing undue river pollution from purges and yet permit effective use of this operation. The rules requiring sampling and analyses are still needed to permit periodic appraisal of river pollution from purges.

Retention basins (W. N. Koop).

Document HW-53249 - - "Effects of Direct Disposal of Reactor Effluent Water to the River" - - was issued on March 6, 1958 (4). This document reviews disposal aspects of discontinuing the detention of normal reactor coolant. The conclusions presented were made by the authors after cooperating with project engineers who were preparing plans for modifying the effluent disposal equipment.

Uranium oxidation and fission product volatilization experiments (R. K. Hilliard).

Base-line data were gathered for the uranium oxidation experiments. The slight amount of oxidation which occurred in argon atmospheres was found to be less than 1% of that expected in air and steam atmospheres. Therefore, the proposed technique of heating and cooling the uranium specimens in argon so as to maintain isothermal conditions during the oxidation period appears to be reasonable. The initial reaction in an inert atmosphere is believed to be caused by a combination of reactions with the residual air in the system after degassing and with the combustion boat material. All boats tested showed some degree of reaction with molten uranium.

Tests with air atmospheres were started at the quarter's end. The effect of time and temperature on oxidation rates in air and steam at temperatures up to 1400° C will be investigated during the coming quarter.

The experimental equipment operated satisfactorily and it is expected that only slight revisions will be required for the fission product volatilization experiments.

The literature survey, entitled "The Effect of Heating Irradiated Uranium - - A Literature Survey," HW-52735, was issued in January (5).

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III. LABORATORY EVALUATION OF WASTES (H. L. Brandt).

Redox Operation

241-SX tank farm waste evaluation.- - Multiple soil-column testing started on the 106 Tank and the 401 Building condensates for evaluation of the 216-SX-1 crib capacity. Since March 1958 the condensates were recycled to the boiling tanks in the Farm. Only the excess condensate from the 401 Building is currently pumped to the crib.

D-2 waste evaluation.- -More than 10 column volumes of Redox D-2 were put through standard soil columns (simulating the 216-S-7 crib) without exceeding 2×10^{-7} $\mu c/cc$ of Sr^{90} in the effluent liquid. This concentration is the current analytical sensitivity. In view of this high capacity special laboratory techniques including the addition of Sr^{90} to the waste samples will be used to calculate column capacities. It appears reasonable to assume, however, that a Sr^{90} breakthrough in the ground water is not imminent since the equivalent of only 4 column volumes was discharged to the 216-S-7 crib to date. An equipment cleanout rinse of 50,000 gallons was pumped to the crib in July 1957. The rinse had a concentration of Sr^{90} 100 times that of regular D-2 and this was equivalent to 0.7 column volumes of the waste stream. It did not, however, have a disproportionate effect on the crib capacity.

Purex Operation

A-8 waste evaluation and equipment test.- - Final soil-column laboratory evaluation tests for the 216-A-8 crib gave a capacity of 13.5 column volumes. This is considered reasonable confirmation of the initial column runs on this waste which indicated a crib capacity of 9-column volumes.

An analysis was made to determine the effect of a spray nozzle for increasing drop size and thus increasing the separation efficiency in the A-8 vapor header. Total strontium was decreased by about one order of magnitude. Of the components analyzed, only Nb^{95} increased. Table 1 summarizes the results.

Table 1

Activity Density of Condensed Purex A-8 Vapor ($\mu c/cc$)

Component	After Nozzle Installation	Before Nozzle Installation
Total Beta	5.1×10^{-1}	9.9×10^{-1}
Ru^{106}	1.8×10^{-1}	6.7×10^{-1}
Total Sr	2.7×10^{-4}	1.3×10^{-3}
Zr^{95}	1.1×10^{-2}	4.6×10^{-2}
Nb^{95}	1.1×10^{-2}	3.6×10^{-3}

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A-5 waste evaluation and special test. - - Experiments to date indicate that the 216-A-5 crib capacity may be as low as 2 column volumes for Sr^{90}. The crib has already received 89 column volumes. The calcium ion in the A-5 waste stream appears to be the major cause of the unusually low crib capacity. The calcium is added to the stream in the limestone bed which neutralizes the waste before disposal. Studies are underway to find a method for increasing the capacity of the soil for the Sr^{90} in this waste.

234-5 Recuplex Investigation

Recuplex waste (CAW). - - Experiments were initiated to determine the flow and the plutonium adsorption characteristics of the CAW waste in the Z-10 crib. These experiments have already shown that an acidified process water (up to 0.05M HNO_3) percolates through the soil at rates up to 0.4 gal/ft^2/hr. The crib soil contains about 4% carbonate. Thus the soil can be "conditioned" to a specified pH before it receives the waste. Tests on synthetic wastes show that the greater the acidity of a solution of high salt content, the slower the flow through the soil. In the case of the actual CAW waste, however, flow rates in preliminary tests have been as high as the equivalent of 8100 gallons per hour through a crib the size of Z-10.

TBP scavenged waste

The final soil column test on scavenged TBP waste (Batch No. 29-108C-109 BX) showed too high a Cs^{137} breakthrough to permit crib disposal. Table 2 summarizes the results.

Table II

Soil Column Test Breakthrough Ratios of TBP Waste No. 29-108C-109BX

Column Volumes	Cs^{137}	Sr^{90}
1	1.34×10^{-1}	6.45×10^{-4}
2	3.75×10^{-1}	3.76×10^{-3}
3	5.4×10^{-1}	2.45×10^{-3}
Limiting breakthrough	3.02×10^{-3}	1.0×10^{-2}

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IV. GROUND-WATER HYDROLOGY (W. H. Bierschenk)

A water-table contour map as of December 1957 revealed additional information regarding Hanford hydrology. The incorporation of data from several recently drilled wells was largely responsible for the development of the new information. It is evident from the map (see Figure 1) that the southern movement of water from the 200-West ground-water mound is restricted by the buried basalt ridge that separates it from Cold Creek valley. A low, flat mound north of Gable Butte is attributed to recharge from the Columbia River during the annual high river stage. This seasonal recharge contributes west-to-east flow of ground water north of Gable Mountain.

Detectable fluorescein has arrived in two wells 11,500 and 13,200 feet from the injection well. The movement of ground water through glacio-fluviatile sediments southeast of 200-East Area thus occurs at average rates of roughly 160 and 150 feet per day, respectively. The fluorescein concentration in observation wells continues to increase, indicating the possibility of estimates of diffusion rates in the ground water.

A research study of the specific retention capacities of Hanford sediments was initiated. Tests were performed and are continuing to evaluate a centrifuge technique for obtaining this data by attempting to establish a gravity-time-specific retention relationship. Touchet sediments averaged about 13% moisture by weight following a 1-hour test at 1,000 gravities. After 4 hours at 1,000 gravities the moisture content was about 5%. This is estimated to be roughly equivalent to 167 days drainage at 1 gravity. The moisture content of the "dry" sediments as obtained in the field averaged about 4% by weight. This is estimated to represent gravity drainage for a period in excess of 5,000 years. It also represents some unknown degree of evaporation, although the samples tested were obtained from buried formations in which evaporation would be minimized. It is hoped that a valid asymptotic curve can be constructed from such data which will give the appropriate specific retention-time relationship.

V. WELL DRILLING SUMMARY (D. J. Brown)

TABLE

First Quarter 1958

Hatch Drilling Company	Ft. Drilled	Finished	Total Feet	To Water?
699-27-E4	261	1-13-58	350	Yes
699- 9-E4	342	1-17-58	454	"
699- 2-17	350	1-31-58	350	"
	953		1154	

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The Hatch Drilling Company completed the AT (45-1) - 1178 drilling contract on schedule. Their completion date was January 31, 1958. Twenty-three wells with a total footage of approximately 7,300 feet were drilled in 299 calendar days; an average of 13 feet drilled per crew calendar day. This is the second highest footage drilled by a fixed-price contractor at Hanford.

VI. REFERENCES

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HW 79768

This document consists of 43 pages. [redacted]

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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT
FOR

NOVEMBER, 1963

HW--79768

DE93 008579

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By Authority of C6-PR-2
Robert M. Ellen 8/24/92
DJ Knicley 10/5/92
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Compiled By
OPERATION MANAGERS

December 20, 1963

HANFORD ATOMIC PRODUCTS OPERATION
RICHLAND, WASHINGTON

Work performed under Contract No. AT(45-1)-1350 between the Atomic Energy Commission and General Electric Company.

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Manager, Power and Crafts	T. G. LaFollette
Manager, Facilities Engineering	H. P. Shaw
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Manager, Finance	K. G. Grimm
Manager, Employee Relations (Acting)	J. H. Warren

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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

NOVEMBER, 1963

I. SUMMARY

Production through November, as compared with the October 25, 1963 HAPO Production Forecast HW-79264, is summarized below:

	Percent of Forecast Achieved	
	November	Fiscal Year To Date
Separated plutonium nitrate	80.6	92.1
Separated uranium nitrate	83.6	90.9
Uranium oxide	78.8	94.2
Plutonium metal buttons	99.3	101.2
Fabricated parts	111.1	103.8

November production rates exceeded forecasted quantities for plutonium metal buttons and fabricated parts. With the Redox plant shutdown most of the month as a result of a fire in the 233-S Plutonium Concentration Building, forecasted quantities were not achieved for separated plutonium nitrate, separated uranium nitrate, and uranium oxide.

At approximately 1:15 a.m. on November 6, a fire of undetermined origin occurred in the Redox 233-S Building, damaging the plutonium anion exchange and concentration systems. No one was injured. The plant was immediately shut down and remained down for the balance of the month. Decontamination and rehabilitation work are now in progress, directed toward getting the final plutonium concentrator in operation so that Redox plant operation can be resumed.

The Purex plant resumed processing on November 4, following a scheduled shutdown which began October 27. Operation was then continuous at an average rate of 29.5 tons per day. Both the plutonium and uranium products met specifications except during the initial startup period.

A Purex plant process test was run to determine the effects of eliminating the feed adjustment step between the dissolvers and the HA first decontamination column feed. Improved HA column control resulted, with no adverse process effects noted.

The HAPO II-1 cask, loaded last month with approximately 140,000 curies of strontium-90, was released to the Commission on November 22 for shipment. Four SIT casks, containing an estimated 189,000 curies of cesium-137, and an ORNL cask, containing approximately 49,000 curies of promethium-147, were released to the Commission on November 27 for shipment. The 1 Kg of technetium-99, recovered last month, was loaded into a cask and shipped to Hanford Laboratories, where it will be converted to the metal.

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A total of eleven direct PuO_2 calcination runs were made during November in the laboratory titanium screw calciner. Approximately 11 Kg of plutonium oxide were produced. The tests indicated that a readily chlorinated oxide is produced with high sulfate ratios. No substantial corrosion of the calciner was evident.

Funds for Project CAC-965, "In-Tank Waste Solidification - 200 East Area", were increased by an interim authorization of $100,000, bringing the total to $280,000.

Directive No. EQT-007 authorized $75,000 to provide necessary facilities, in conjunction with the 242-Z Building Waste Treatment Facility, which will permit the recovery of americium from the solvent extraction waste stream.

A series of engineering studies, to establish a firm basis for Phase III Waste Management design, were completed. The equipment can be designed to accommodate either of two solvent extraction flowsheets. This will permit equipment design to be firmed up now, while preserving flexibility for better choice of the most economical waste management process.

J. N. Warren
for General Manager
Chemical Processing Department

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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

NOVEMBER 1963

II. ACHIEVEMENTS

A. PRODUCTION OPERATION

1. Production Statistics

a. Percent of Forecast(1) Achieved

	November	Fiscal Year to Date
Separated plutonium nitrate	80.6	92.1
Separated uranium nitrate	83.6	90.9
Uranium oxide	78.8	94.2
Plutonium metal buttons	99.3	101.2
Fabricated parts	111.1	103.8

b. Purex

	November	October
Uranium nitrate produced (tons)	721.07	453.56
Average production rate during operation (T/D)	29.5	20.3
Total waste loss (%)		
Plutonium	0.34	0.36
Uranium	0.25	0.25
On-line efficiency (%)	89.7	88.7

c. Redox

Uranium nitrate produced (tons)	10.49	38.41
Average production rate during operation (T/D)	5.3	7.4
Total waste loss (%)		
Plutonium	0.73	0.71
Uranium	0.34	0.29
On-line efficiency (%)	7	25

d. Uranium Reduction (tons)

Normal UO_3 loaded	577	541
Enriched UO_3 loaded	10	55
Normal UO_3 approved for shipment	551.70	648.79
Enriched UO_3 approved for shipment	0	50.80
Normal UO_3 shipped	451.82	648.95
Enriched UO_3 shipped	0	101.66
Normal UNH backlog	370	226
Enriched UNH backlog	120	120

(1) HW-79264, HAPO PRODUCTION FORECAST, dated 10/25/63.

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e. Plutonium Metal Processing

	November	October
Reduction yield (%)	97.7	98.24
Product recovery output (Kgs)	79.02	213
Product recovery backlog (Kgs)	1387	1388
Waste disposal (grams)	260	241

f. Power

	200-East	200-West
Raw water pumped (gpm)	11,336	4,504
Filtered water pumped (gpm)	1,199	1,159
Maximum steam generated (lbs./hr.)	250,000	96,000
Average steam generated (lbs./hr.)	206,881	89,490
Total steam generated (M lbs.)	134,059	57,944
Coal consumed (tons)	7,150	3,116

November production met or exceeded forecasted quantities for plutonium metal buttons and fabricated parts. With the Redox plant shutdown most of the month as a result of a fire in the 233-S Plutonium Concentration Building, forecasted quantities were not achieved for separated plutonium nitrate, separated uranium nitrate, and uranium oxide.

R. E. Smith
for Manager, Production

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2. FISSION PRODUCT DATA

	PUREX* RECOVERY	244-CR* INVENTORY	B-CANYON* INVENTORY	SEMIWORKS PRODUCTION	PRODUCT INVENTORY	PRODUCT IN CASK	PRODUCT SHIPPED	CUSTOMER	REMARKS
Sr-90 (Kilocuries)	56	300	1800	--	1830	--	140	ORNL	HAPO II-1 11-22-63
Cs-137 (Kilocuries)							189	ORNL	11-29-63
Ce-144 (Kilocuries)									
Pm-147 (Kilocuries)							49	ORNL	11-29-63

* Estimated figures based on Cs. calculations

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CHEMICAL PROCESSING DEPARTMENT
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NOVEMBER, 1963

II. ACHIEVEMENTS (Continued)

B. PUREX OPERATION

1. Operating Continuity

Purex operation resumed November 4, 1963 after a plant outage which began October 27, 1963. By November 11, a capacity factor of 3.6 was reached and maintained the balance of the month.

A second B Plant oxalate run for Strontium-90 recovery was completed and preparations made for a peroxyacetate run for cerium-rare earth separation.

The C3 dissolver was reactivated on November 5. The unit contained three buckets of approximately 84-day-old metal and had been in stand-by since September 2.

2. Processing

Both uranium and plutonium have met product specifications except during the initial startup period.

Neptunium recovery during the month was satisfactory. No neptunium purification runs were completed.

Waste losses to underground storage during the period were .27 percent uranium and .37 percent plutonium.

The cask loading status is as follows:

Cask	Quantity(Approx.)	Destination	Status
ORNL Pm	49 Kc Pm-147	ORNL	Loaded in October. Released to AEC for shipment 11-27-63
STT's (4)	189 Kc Cs-137	ORNL	Loaded in October. Released to AEC for shipment 11-27-63
HAPO II-1	140 Kc Sr-90	ORNL	Loaded in October. Released to AEC for shipment 11-22-63
HL 40-Gal	~1025 Grams Tc-99	HL	Loaded in November. Sent to Hanford Labs on 11-18-63

HAPO I-B-1 and HAPO II-2 are off site.

Approximately 170 Kc of high nitrate strontium was reworked at Strontium Semiworks with very good results. Waste losses were about 2 percent.

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The elution of the technetium cask at Semiworks was completed and the 1025 grams of Tc-99 product was loaded into a Hanford Laboratories 4C-gallon cask. Overall waste losses were about one percent. The cask was shipped to HL on November 18.

In connection with the sluicing program at 241-A Tank Farm, the supernate from Tank 102-A was transferred to Tanks 105-C, 106-C, and 101-C. Tanks 105-C and 106-C are now full and an approximate five foot pump heel was left in 102-A. The pump from 102-A was moved to 103-A and the supernate from this tank will be pumped to 101-C.

3. Equipment Experience

Two equipment failures were experienced on the east canyon crane in the Purex Plant. These failures involved the charging impact wrench and right hand optic head. Reconditioned replacement spares were installed.

The two cables on the railroad car puller, located in the Purex Building railroad tunnel, failed through normal wear and long service. New replacement cables were installed and the equipment returned to service.

Two Purex canyon pump failures were experienced during the current production run period. Reconditioned spare pumps were installed as replacements.

There were three canyon agitator failures this report period. These failures involved agitators F-7, F-13, and F-16. Cause of the failures is unknown at the present time. New replacements from Spare Equipment were installed.

The 6-1 cesium-rare earth storage tank in B Plant developed a leak in the coil on 11-6-63. The product was transferred to 7-1 tank. Piping modifications have been made to permit flushing tank 6-1 prior to replacement with a tank from U Plant.

4. Radiation Experience

The retention basins north of B Plant became contaminated due to the failure of the coil in the B Plant cesium-rare earth 6-1 storage tank on 11-6-63. General dose rates around the basins were 500 mrads/hr. with tumbleweeds reading up to 50 rads/hr. at surface. The wind carried a few highly contaminated tumbleweeds to the north perimeter fence. Contamination was also experienced around the basins, in the area northeast of the basins, and in the first 1000 feet of the drainage ditch leading to the swamp. The following work was accomplished to restore the area to near normal:

a. The basins and adjacent areas were decontaminated.
b. The inside of the north basin was coated with a sealer.
c. A fence was erected around the basins.
d. Approximately 1000 feet of the old ditch was backfilled and a new ditch was dug to replace this portion.

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Manager-Purex

WM Harty:OVB:gt

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CHEMICAL PROCESSING DEPARTMENT
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II. ACHIEVEMENTS (Continued)

C. REDOX OPERATION

1. Operating Continuity

At approximately 1:15 a.m. on November 6, 1963, a fire of undetermined origin occurred in the 233-S Building and damaged the plutonium anion exchange and concentration systems. The Redox plant was immediately shut down and remained so for the balance of the month. Decontamination and rehabilitation work are now in progress and are directed toward getting the final plutonium concentrator in operation so that Redox plant operation can be resumed.

The Uranium Oxide plant operated at satisfactory rates throughout the month. Enriched uranium processing was discontinued following the 233-S fire at the Redox plant, and the calciner normally used for this material was converted to depleted uranium processing.

2. Processing Operations

a. Redox Processing

The fire in the 233-S Building occurred in the process area, near the ion-exchange contactor, but is believed to have started outside the process equipment enclosure part of which was rigid, transparent plastic panelling. The enclosure was breached by the fire and subsequent smoke "flashback", thus allowing the spread of alpha contamination from the interior of the grossly contaminated plutonium concentration "cell".

No one was injured. A total of thirteen people received skin or clothing contamination. Skin contamination, which to some individuals exceeded 4×10^4 d/m, was subsequently reduced to non-detectable during the shift on which the fire occurred. Nasal smears taken were negative.

Plutonium released from the processing cell grossly contaminated areas in the 233-S Building and nearby ground and building surfaces outside the building. Actual physical damage was confined to the viewing room and process area in the vicinity of the L-18 plutonium anion exchanger. Plastic hood panels and electrical wiring, including lights, were extensively damaged in the north end of the viewing room. The contactor loop itself does not appear to be damaged; however, gaskets, pumps, valves and electrical wiring to the equipment in the contactor enclosure are damaged. None of the process equipment other than the L-18 anion exchange contactor

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appears to have been damaged.

Action plans were formulated at once and all resources possible in men, materials, and services were directed toward decontaminating and rehabilitating the 233-S Building. Loose contamination was removed from the exterior surface of the building and the surfaces of the walkways and grounds immediately adjacent. Contamination which could not be removed from exteriors of the buildings and ground areas has been "fixed" with tar, paint, roofing compound, or masonry sealer, as appropriate to the surface.

Decontamination of all contaminated areas in the normal "cold side" areas of the building was completed, and such areas were restored to occupancy in less than two weeks.

Clean-up of the viewing room and stairwell proceeded less rapidly although good progress has been made. By month-end all viewing room and stairwell levels had been cleaned of loose contamination and given two coats of paint to "fix", as much as possible, any residual contamination.

Also by month-end, the plutonium solutions in the L-3 concentrator, the L-4 product receiver, the L-6 sampler and L-7 loadout tanks had been emptied into PR cans for storage. At the end of the month, plastic windows were re-installed in front of the L-18 contactor in preparation for the initial leach of the resin, and a complete barrier had been reestablished (on a temporary basis) between viewing room and the process cell. In general, good progress was made in decontaminating the service areas of the 233-S Building and concurrent action has been started to reactivate the concentration and loadout equipment in this building. The goal date of December 15 was established for the start of limited production in the Redox plant.

b. Uranium Oxide Processing

Processing operations in the Uranium Oxide plant were started on November 6, as scheduled, following replacement of the jacket on the X-30 calciner feed tank (concentrated, depleted uranyl nitrate). Dilute feed plus a filter plugging problem curtailed initial production rates, but these problems were subsequently resolved and full rates were restored by November 11.

Due to the Redox plant shutdown on November 6, the G-cell calciner was converted to depleted uranium production and remained on this type feed for the balance of the month.

3. Mechanical Experience

a. Redox Plant

The major portion of the maintenance activity this month was in

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direct support of the accelerated program to restore the Redox plant to operational status.

Concurrent with the 233-S Building decontamination, work was started to return the Redox 202-S canyon system to an earlier process flow scheme employing three solvent extraction cycles for plutonium decontamination and accumulating neptunium for recovery and decontamination on a campaign basis. Major work in the canyon involved the installation of a tower and 15 new jumpers for the E-4 tank. A mock-up of this installation was made in the 200-W shops and work in the cell was nearing completion at month end. Related work in F and G cells was also essentially completed.

Re-routing of the vessel vent system (from 233-S Building ventilation discharge to the 202-S Building ventilation discharge) was completed during the latter part of the month.

Other significant 233-S Building rehabilitation work included: 1) replacement of electrical wiring leading into the viewing room to replace that burned out, and reestablishing receptacle circuits; 2) repair and calibration of all process instruments needed for the revised process flow scheme.

MK Harmon
Manager - Redox

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II. ACHIEVEMENTS (Continued)

D. WEAPONS MANUFACTURING OPERATION

1. Operating Continuity

Fabrication of weapons models 1807 and 74-C continued during the month. Unfabricated plutonium production was limited by the availability of feed from the primary plants. The plutonium dissolvers were shut down for a portion of the month because of the lack of primary plant feed which could be used for blending dissolved scrap. The incinerator was operated when manpower was available.

2. Processing Operations

a. Plutonium Fabrication

Information on fabrication activities is presented in Document HW-79922 (Atomic Weapon Data).

b. Plutonium Reduction

Unclassified plutonium and scrap powder processing occupied the Button Line during the early part of November, with weapons grade plutonium being processed during the remainder of the month. At first, the Pu-240 content of the latter material was above the specification, but a gradual decreasing trend resulted in an acceptable Pu-240 concentration being reached by month end.

The negative MUF (material unaccounted for) across the Button Line for the month of October was under investigation during the entire month. Principal items still under study at month end are: possible overstatement of receipts from primary plants; possible overstatement of slag and crucible account (based on neutron count); calculations of reduction yields; and vessel holdup.

c. Plutonium Reclamation

The dissolvers operated satisfactorily on normal weapon grade material.

Incinerator operation was also satisfactory with 27 boxes of scrap being processed.

In the new recovery facility, primary calibration of the tanks was completed. However, rechecks will be required at a later date when instrument facilities become available. Panel board activation has

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c. Plutonium Reclamation (Continued)

been delayed pending completion of modifications required to correct sub-standard work by the Phase II contractor. Delay resulting from this is currently estimated at two weeks.

Removal of sludge from the floor of the RB (reception and blending) hood of the old Recuplex facility was started during the month.

3. Mechanical Performance

The fabrication equipment on both the RMA and RMC lines operated well during November.

The Button Line equipment continued to require considerable maintenance attention. Principal difficulty involved plugging of the vacuum drum filter by oxalate from the processing of metal recovery solutions and ion exchange product solution. Improved operation was experienced when the processing of normal feed was resumed at mid-month.

The new double-ball valve between the calciner and fluorinator has been removed for further development work. It has been replaced temporarily by one of the former "B" valves.

4. Radiation Experience

Radiation and contamination control statistics revealed satisfactory performance in November.

During the extinguishment of a fire in a process hood in Room 227, the hood was pressurized during the use of a dry chemical extinguisher. As a result, the room was contaminated but no plutonium deposition to the three employees involved was experienced as they were all equipped with proper respiratory protection.

5. Analytical Experience

	November
Number of Samples Received	2,292
Number of Determinations	17,715

The Weapons Manufacturing Analytical Laboratory, in cooperation with the Purex Analytical Laboratory, is engaged in a study to define the accuracy of the plutonium concentration determination for Purex L-10 solutions.

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5. Analytical Experience (Continued)

	November		
	Weapons Grade	Special**	Unclass.
Total Impurities, Buttons (Avg.)	3100	3660	3250
Buttons Rejected for Impurities	12%	20%	10%
Pu-240 Content*	6.095%	6.515%	8.54%***

*Based on Neutron Counter Method.
**Above weapon grade specifications for Pu-240.
***Average for October applies.

W J Gartin
Manager
Weapons Manufacturing

WJ Gartin:csj

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CHEMICAL PROCESSING DEPARTMENT
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II. ACHIEVEMENTS (Continued)

E. POWER AND CRAFTS OPERATION

1. Operating Continuity

There were no interruptions of steam, water or electrical services to the production facilities that affected continuity of operation during this report period.

2. Inspection, Maintenance and Repair

Ten electrical housing castings were machined, on a priority basis, for Spare Parts Records Operation. These parts are normally purchased off-site from a vendor whose business is closed down at this time. The subject castings are used on electrical cell pipe jumpers and on process pumps and agitators.

Special emphasis was placed on modifications to the conveyor rollers in Weapons Manufacturing Operation's sprue removal hood. The urgency was necessary to meet scheduled project completion dates.

Fabrication of a spare D-12, D-14 Concentrator for the Redox facility continued to progress and was an estimated 55% complete at month's end.

A feed tank (F-1), complete with coil, was mocked up and made ready for service at the Redox facility.

New plexiglass panels were installed in hoods 41, 45 and 46 at Weapons Manufacturing Operation, as replacements for panels which were no longer transparent.

A temporary air exhaust system, including a blower, ductwork, exhaust filters, etc., was installed as required in the decontamination and reactivation of the 233-S Building, following the November 6 fire at that location.

Semi-permanent air locks were fabricated and installed at the 233-S Building for entry into and exit from certain areas in the building, as an aid to contamination control.

Alterations to the Weapons Manufacturing Operation's comparator hood are in progress. Work on the indicator holders, face plates and six jaw chucks was complete at month's end.

Thirty-eight pipe jumpers were fabricated during this report period. All were replacement requirements, 23 for Purex and 15 for Redox.

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Craft assistance was provided Hanford Laboratories personnel at 231-Z in placing in operation the "Instron," a mechanical testing apparatus for use in tensile compression and hardness testing of plutonium pieces. Included in the craft work was the checking out of a furnace in the new hood and a new instrument console located in close proximity to the hood.

An open circuit in the 200-West Area fire alarm loop was traced out and repaired, on an emergency call-out basis, November 14.

A 3,000' ditch was excavated to accommodate the B-Plant settling basins. A portion of the original drainage ditch for this facility had become contaminated as the result of a leaking coil in a process vessel at the Fission Products Processing Operation, 221-B. The original ditch was backfilled to prevent further spread of contamination.

Renovation of the 200 Area elevated water tanks by Jones forces is in progress. The 2901-B tank is out of service at this time, for installation of a new standpipe, heating element, frost box, etc.

At the request of IPD Engineering, 4" orifices have been installed in the bypass lines in both 200-East and West raw-water inlet houses. According to test data, this particular size orifice should prevent excessive surge pressures.

Assistance rendered other departments included balancing work on the ventilation systems in the N-Reactor Department's 105-N Building. The work was an estimated 55% complete at month's end.

Manager-Power & Crafts

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CHEMICAL PROCESSING DEPARTMENT
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II. ACHIEVEMENTS (continued)

F. FACILITIES ENGINEERING OPERATION

1. Purex

a. Process Design Engineering

Multipurpose Dissolvers

The program to increase processing flexibility at Purex has advanced with completion of the following designs: "A" Cell Arrangement, Side Elevation of "A" Cell, Annular Dissolver Assembly, Annular Dissolver Details, and Plan of Scrubber Solution Catch Tank. Scope design of a critically safe 2AF Tank (feed for 2AF Column) for Purex use is nearing completion. The engineering flow diagram was completed.

X-Ray Photometer

Performance of the X-ray photometer used in the Purex laboratory for final product analysis has declined beyond permissible limits. Failure has been attributed to the thyrite non-linear resistor in the amplifier. Since this HAPO-developed item is not available commercially, a replacement is being fabricated in the Instrument Development Shop.

b. Project Engineering

CAC-965 - In-Tank Waste Solidification - 200 East Area

Additional interim funds of $100,000 authorized by Directive No. EQT-004, Mod. No. 1, dated November 12, have been allocated to the J. A. Jones Company ($95,000) and to Vitro Engineering Corporation ($5,000 for Title III work). Interim authorizations now total $280,000.

CAC-970 - Purex Essential Waste Routings System

Bid opening for the fixed-price work, consisting of the piping systems and a diverter station, is scheduled for December 3.

c. Manufacturing Engineering

F-6 Concentrator

A remotely-operated television was used to view the Purex "F" Cell area adjacent to the GG Nozzle, which has been leaking and

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causing some corrosion to the dunnage. The TV inspection permitted an evaluation of damage to supporting structures and it has been concluded that the structure has not been significantly affected. However, the TV inspections are being planned for 6-month intervals to discover any damage which might affect the integrity of the unit.

2. Redox

a. Process Design Engineering

233-S Incident

A decision has been reached to start the Redox Plant up using a three cycle flow sheet. In support of this decision, 18 new jumpers have been designed for the installation of a new ozone stripper and process re-routings.

Several additional items of engineering assistance were provided for safe entry and clean-up of the 233-S Building. Decontamination work has progressed to the stage of painting within the building viewing room.

Filter Box Survey

The ducts and filters of the 233-S Building exhaust were surveyed for evidence of plutonium accumulations. The readings taken, using the 380 KEV gamma method showed the sludge in the bottom of the filter box to contain approximately one gram of plutonium per pound. Measurements have been resumed since the fire.

b. Project Engineering

CGC-122 - Exhaust Ventilation System - 233-S Building

Directive No. HW-553, dated November 5, authorized interim funds of $14,400 to the General Electric Company for the new exhaust ventilation facility at the 233-S Building

3. Weapons Manufacturing

a. Process Design Engineering

Recoverable Plutonium Partitioning Facilities

A design criteria document and drawings were prepared on the basis of a rough draft flowsheet, the feasibility of which has been demonstrated in the laboratory. Design criteria will now await completion and issuance of an approved flowsheet, tentatively set for February 1, 1964.

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"A" Fabrication Line

Installation of equipment and services in the blank preparation glove box (HA-29-BP) is being completed. The target date for "going hot" is December 2. Drawings for modifications of the optical comparator and its glove box were released to the 200 West Shops. Design criteria were completed for the plutonium thermal treatment facilities. This equipment is planned for hot-and-cold cycle treatment of the machining blanks to promote metal movement before machining and thereby improve dimensional stability. The facility will replace the temporary one now installed on the "A" Fabrication Line.

Survey of Vacuum Lines for Plutonium

Certain of the vacuum lines in the 234-5 Building were surveyed by the 380 KEV method to determine any increase of plutonium deposits in the past year. The quantity in the regions checked has not increased significantly.

b. Project Engineering

CAC-880 - Plutonium Reclamation Facility - "Z" Plant

The service contractor has begun making necessary piping and electrical modifications required before the plant can start up. Work is being directed toward completion in early January, 1964.

CAC-987 - Metal Stabilization Facility - 234-5 Building

The design criteria have been issued to the Architect-Engineer who has begun work on Title I Design. The isostatic press and its associated equipment is being fabricated.

CAC-102 - New Standards Laboratory - "Z" Plant

The Commission has stated that funds are not available in the budgets for FY-1964 and FY-1965, but can be provided for in the FY-1966 Budget. The Commission will hold the proposal for action, however, if funds should become available before that time.

CAC-121 - Americium Recovery Facility - "Z" Plant

Directive No. EQT-007, dated November 15, authorized $75,000 for providing necessary facilities in conjunction with the Waste Treatment Facility, 242-Z Building, which will permit the recovery of americium from the solvent extraction waste (CWW) stream. The Architect-Engineer was given an interim authorization for $31,000 to begin design. Work Authorization No. CAC-121(1), dated November 18, authorized $44,000 to the Company

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c. Manufacturing Engineering

Power-rolled Model

Recent efforts have been directed toward improved design of the administrative forms and faster process information feedback. The following forms have been designed and approved: (1) 74-C - Machining, (2) 74-C - Stabilization, (3) Ingot Melting for 74-C and 1807, (4) 74-C Power-rolled Forming, and (5) 1807 Inspection Forms.

4. General

a. Process Design Engineering

Waste Management - Phase III

A series of engineering studies to establish a firm basis for Phase III Waste Management design have been completed. These studies have resulted in the development of a very attractive concept. The equipment can be designed to accommodate either of two solvent extraction flowsheets. This will permit equipment design to be firmed up now, while preserving flexibility for better choice of the most economical waste management process. In addition, the concept offers the potential for reducing later investments which might be required to add fission product purification facilities in B-Plant. Specific changes would include: (1) extraction equipment that could be operated on the flowsheet of either CSREX or D_2EHPA extraction, (2) Cs precipitation equipment, and (3) a storage tank for virgin Cs solution. These changes and additions increase the estimated construction cost from $3,900,000 to $4,200,000, but provide a potential savings of approximately $1,000,000 on the future isotope packaging plant. The estimated scoping time will be extended approximately two months, or to June 1964.

244-AX Circulator Prototype

A prototype of the 244-AX Tank Farm waste circulator was completed by the Shops early in November. Preliminary calibration runs have been completed. Further design verification tests are planned to determine the hydraulic, solid carrying, and solid suspension characteristics.

"Plastic Man" Suits

A jacket assembly which employs the vortex cooling tube, and which has been used in the General Electric Lamp Department, was adapted for use with the tunnel-type plastic suit. Tests on-site have indicated that personnel can work several hours in the suit without overheating. Two jacket cooling assemblies are in use, and six more have been ordered.

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b. Project Engineering

Project Cost Information

Total Authorized Funds - 19 Active Projects	$ 4 208 000
Total Cost-to-date	3 117 000
Commitments and Oper. Work Releases	318 000
Unencumbered Balance	773 000
Costs Charged to Above Projects (10/20/63 to 11/17/63)	65 000

CAC-117 - Modification of Steam Lines

Directive No. AEC-229, dated November 15, authorized $200,000 for modification of steam lines in the 200 East and West Areas, of which $4,700 was allocated to the Company. The Commission is preparing the bid package for this work.

Manager - Facilities Engineering

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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

NOVEMBER, 1963

II. ACHIEVEMENTS (Continued)

G. RESEARCH AND ENGINEERING OPERATION

1. Purex Process Engineering

(a) Dissolver Charging Tests

Proposals have been made to use longer enriched fuel elements in the Hanford reactors. Simulated charging tests were made in a mocked-up dissolver annulus that has an OD of 70 inches and an annulus width of 10.5 inches. One thousand steel slugs measuring 1.5" x 12.565" were charged with no jamming or other difficulties noted.

(b) Solvent Extraction

The plant process test to determine the effect of eliminating the feed adjustment step between the dissolvers and the HA Column was continued during the month. The HAF uranium concentration was diluted by extensive rework of plutonium product solutions, but averaged ten per cent higher than the former adjusted feed concentration. Improved HA Column control has resulted because of more uniform concentration feed and no adverse process effects have been noted.

(c) Product Treatment

The resin lost from the neptunium purification unit to the waste tank last month was discarded and the unit charged with fresh resin. Miscellaneous neptunium rework solutions were combined with a small batch of virgin feed and processed through the unit. The run was unsuccessful with loss of essentially all of the neptunium to the backcycle system. The poor process performance is believed due to neptunium valence control difficulties. At month end, about two kilograms of neptunium was transferred from the in-canyon recovery system to the purification unit for the next purification run.

(d) Waste Processing

The addition of sugar to the IWF Tank for ruthenium control in the high level waste concentrator continued. A special sampling and analytical program was initiated to determine changes in the amount and spectrum of fission products in the acid absorber overheads resulting from sugar additions.

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The effect of Demister water in the acid absorber acid activity was studied. A two-fold increase in acid gamma activity occurred without water flow to the Demister. Activity levels returned to normal when water flow was restored.

A new direct-drive slow speed agitator was tested for mixing performance in a system simulating trilaurylamine treatment of high level waste. Excellent mixing was achieved and the unit has since been installed in the plant for additional trilaurylamine extraction studies.

About 660,000 gallons of supernatant solution was transferred from TK-102-A in the 241-A Tank Farm to non-boiling storage in 241-C Farm in preparation for sluice-mixing tests in TK-103-A. Water is being added to TK-102-A to soften the sludge in the tank and serve as a hot water supply for a sluice nozzle assembly in TK-103-A. Installation of special pumps and transfer lines for the test are underway.

(e) Fission Product Recovery

The modified Oak Ridge cesium cask containing technetium recovered from the October cesium loadout reported last month was transferred to the Strontium Semiworks for elution. The anion exchange bed in the cask was washed with four bed volumes of 0.5 M sodium nitrate, 1.5 bed volumes of 0.25 M nitric acid and eluted with eight bed volumes of 6.0 M nitric acid. The eluted nitric acid stream was steam stripped and concentrated to a volume of 25 gallons and shipped to Hanford Laboratories. The cask contained slightly in excess of one kilogram of technetium.

A coil leak occurred in a B-Plant vessel used for storing concentrated cerium-rare earth crudes. The tank was a reclaimed vessel from U-Plant and the leak was noted three days after it was placed in service. The leak was detected promptly by the cooling water header scintillation counter and the tank contents transferred to another vessel. Contaminated water was segregated in the retention basin and later routed to a ditch that was subsequently backfilled. Pond water radiation levels were as high as 2 R/hr at 2 feet above the liquid. Approximately 30 curies of cerium-144 and 0.05 curies of strontium-90 were contained in the contaminated water.

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2. Redox Process Engineering

a. Fire in the 233-S Facility

A fire occurred in the 233-S Facility on November 6, 1963. The fire was restricted to the viewing room and process area in the vicinity of the L-18 Plutonium Anion Exchanger. Plastic hood panels and electrical wiring including lights were extensively damaged in the north end of the viewing room. The four-inch pipe which makes up the contactor loop does not appear to be damaged. However, the gaskets at the flanges leak; the pumps, valves, and instruments are charred; and all of the electrical wiring to the equipment in the contactor enclosure is shorted out. None of the process equipment other than the L-18 Contactor appears to be damaged. While the viewing room, stairwells, and load-out room were grossly contaminated, the contamination was confined to the 233-S Facility and immediate vicinity.

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3. Plutonium Process Engineering Operation

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a. Button Line

The sintered stainless steel calciner blow-back filter elements that were found destroyed by corrosion after two months of service were replaced with the same kind of filter elements. These new elements were inspected twice this month at approximately 2-week intervals. No corrosion was detected on either inspection. Inspections will continue at the same frequency.

The difference between the physical inventory and the book inventory at the end of October was approximately 33 kilograms of plutonium. In order to establish that this amount of plutonium had not accumulated in the button line and created a critical mass problem, the button line was shut down for a thorough inspection of the system, both visually and with the aid of gamma and neutron detection instruments. In addition, another physical inventory was performed. No unusual accumulation was found, nor did the inventory indicate any change. Operation was resumed, but the discrepancy still could not be explained at month's end.

b. PuO_2 Teflon-Lined Dissolvers

The prototype teflon-lined plutonium oxide dissolvers were provided with Kel-F coated spool pieces connecting the dissolver with a new Kel-F coated reflux condenser. Since the installation of these spool pieces, the dissolution rate in these dissolvers has decreased to 1/3 the maximum rate (from 300 to 100 g/hr) obtained previously. It appears that considerable vapor escaped into the hood through the badly corroded stainless steel spool pieces, which changed the solution composition and resulted in the higher dissolution rates.

c. Plutonium Reclamation Facility - Project CAC-880

HW-79534, "Plutonium Reclamation Facility Operating Specification", was issued during the month. The document defines process conditions and limits for initial operation of the Plutonium Reclamation Facility.

HW-79586, "Start-Up Flowsheets for the Plutonium Reclamation Facility (CAC-880) - Edition I", also issued this month, provides the basis for "cold" and initial "hot" run plans. Initial cold runs will simulate flowsheets given in this document.

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4. Separations Chemistry Laboratory

a. Purex Process Improvement

Several types of additives including mono and di-ketones, mono and di-oximes, and dibasic acids have been evaluated in the laboratory in a search for materials to increase decontamination of ZrNb across both the HA and the 2D columns. Although many of the compounds tested show some improvement, oxalic acid addition was best. The ZrNb DF was improved by a factor of 3 across the HA column when the HAF was 9×10^{-4} in oxalate and the 2D ZrNb DF was improved by a factor of 2 when the 2DS was made 9×10^{-4}M in oxalate. Increases in Ru DF during these tests were not considered to be significant. The side effects of adding oxalic acid to the process streams are being quantitatively evaluated.

b. Redox Process Improvement

Mesityl oxide was evaluated in the laboratory as a possible solvent in a thorium recovery process. Multiple batch counter current extraction runs under acid deficient conditions gave thorium distribution ratios in mesityl oxide that were a factor of 4 higher than those achieved using hexone. However, the ruthenium arithmetic decontamination factor was three compared to nine for hexone. Decontamination from ZrNb and rare earths was only slightly lower in the mesityl oxide system.

A gas chromatographic method was developed for determining the presence of hexone in nitric acid and plutonium process solutions down to 0.005 v/o. The method has been applied to several Redox samples, some of which are representative of streams at the time of the 233 incident. In no case was a significant amount of hexone detected in the feed to the 233 Bldg. The method is outlined in HW-79703.

c. Fission Product Process Improvement

Laboratory studies on methods of removing lead from the rare earths and sulfate crudes led to a recommendation that the crude solution be first precipitated as the hydroxide which removes 88% of the lead from the product stream. The rare earths and strontium can then be dissolved in a reasonable volume of nitric acid, and oxalate precipitation to separate the rare earths and strontium can proceed normally. Under the old method the early oxalate precipitation resulted in a precipitate loaded with lead which responded poorly to caustic metathesis with the result that dissolution and hydroxide precipitation of the rare earths was still required. The recommended method had a measured rare earths waste loss of only 0.3%.

The effect of peroxide addition on the pH during peroxy-acetate precipitation was also measured and found to have only a slight downward effect once the pH has been adjusted to the desired 4.1. Therefore, it would be desirable to work on the high side during pH adjustment.

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The extraction and stripping characteristics of semiworks solvent were evaluated during the month and found to be comparable to fresh solvent. The used solvent analyzed 0.16 curies/l $ZrNb^{95}$, 0.19 curies/l $CePr^{144}$, and 0.51 curies/l Y^{91}.

d. Laboratory Improvement

A spectrophotometric method has been developed to detect traces of tri lauryl amine in Purex solvent. The method utilizes the high molar absorptivity of TLA at the 259 mu maxima. TBP interference is removed by the use of a blank and nitrate interference is removed by carbonate washing. The lower detection limit was found to be 0.035 v/o.

The X-ray emission spectrometer was calibrated for iron, chromium, and nickel and applied to the determination of these elements in UO_3 powder samples after dissolution in nitric acid and TBP separation. The lower limits of detection are in the 1-2 ppm range. Work is continuing on the application of the X-ray unit to the measurement of tungsten, tantalum, and titanium in plutonium metal.

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5. Plutonium Chemistry Laboratory

a. Direct Calcination Of Plutonium Nitrate

A total of 11 runs were made in the titanium screw calciner and approximately 11 kilograms of plutonium oxide were produced. Use of a high sulfate-plutonium ratio (0.3 - 0.5) produced a readily-chlorinated oxide. Visual inspection of the calciner and chemical analysis of the oxide produced failed to indicate any substantial corrosion.

A series of runs was made at various sulfate - Pu ratios with all other conditions being held as constant as possible. Chlorination results indicate that a readily-chlorinated oxide is produced with high sulfate ratios.

TABLE I

CONVERSION VERSUS SULFATE RATIO

$SO_4^{=}$/Pu	% Oxide Chlorinated
0.0	76
0.04	80
0.07	84
0.30*	96
0.50	90
0.50*	97

(*) High screw speed to prevent sticking, resulting in lower residence time.

Work is now under way to determine more accurately the effect of $SO_4^{=}$/Pu and residence time on reactivity.

Thermobalance studies are now under way in the Separations Chemistry Laboratory to measure reactivity. Initial results on duplicate samples indicate a reliability of about ± 3 percent for the instrument. Results to date check very closely with results obtained in the batch chlorination work.

The calciner operated satisfactorily during the month with only minor operating problems. Some leakage of solution was encountered through certain gaskets, but this should be eliminated when the gaskets are replaced. Wear on the bearings is becoming excessive and the bearings probably will have to be replaced in the near future. To date there has been no indication of excessive corrosion of the calciner. Analysis of the oxide produced shows only nominal amounts of titanium in the product. No corrosion was detected by visual observations after each calcination run.

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b. Chlorination Of Plutonium Oxide

Work with a stirred-bed batch reactor was continued and chlorination of direct calcined oxide was begun on a large scale.

The stirred-bed batch reactor consists of a filter funnel to which a top has been attached and fitted with a stirrer. The gas comes up through the frit and reacts with the bed of agitated oxide powder. About 500 g feed PuO_2 are used and reaction occurs over a 120-minute period at 450 C. Only a slight excess of phosgene (or CCl_4) is used.

The work was started with a low sulfate ratio (0.05) based on earlier results. Various changes were made in the chlorination parameters (bed temperature, rate of chlorination, length of chlorination, and chlorinating agents) without improving the percent conversion appreciably from the 70 - 80 percent range.

After observing very little difference with the low-level sulfate, the higher ratio 0.5 was tried. This made a marked improvement as shown by conversions of 90 and 91 percent. Two runs were then made to see if the sulfate requirements could be reduced to 0.3 or 0.15. At present it appears as though 0.3 mol ratio is about right.

Tap densities for some typical oxide feeds and product chlorides were determined and are shown in Table II.

TABLE II

EFFECT OF SULFATE IN OXIDE FEED ON CHLORIDE DENSITY AND CHLORINATION EFFICIENCY

Sulfate/Pu	Tap Densities g/cc Oxide	Tap Densities g/cc Chloride	% Conversion
0.05	3.9	3.9	76
0.15	2.3	2.8	92
0.3	1.5	2.9	96
0.5		2.3	97

Sulfate removal has been essentially 100 percent except for one run. In this case about 20 percent of the original sulfur remained in the chloride. This was attributed to a low bed temperature (440 C) during chlorination.

The product chloride from the above runs is a granular free-flowing powder.

On the basis of the limited number of runs that were made, the following conclusions are drawn:

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(1) A mol ratio of sulfate-to-plutonium of 0.3 with a minimum residence time in the calciner is required for adequate chlorination.

(2) Bulk density is the criterion that determines percent total conversion.

(3) Bed temperature in the chlorinator in excess of 450 C and less than 500 C is required for adequate sulfate removal.

(4) The reaction is essentially instantaneous; very high rates should be obtainable in the proper continuous equipment.

c. Americium Recovery

Distribution measurements have been made to aid in defining the americium recovery flow sheet.

Stripping of americium from 30 v/o dibutyl butyl phosphonate - 70 v/o CCl_4 with water results in an E_s^o of 0.08. The equilibrium aqueous phase has an acidity of 0.6 M H^+ at an L/V of one. Impurities in the strip solution in ppm will approximate 115 Ca, 130 Fe, and 120 Mg, relative to the solution. These, together with plutonium and aluminum, are the principal impurities to be separated.

Contact time variations from one-half to five minutes had no effect on extraction or stripping coefficients. Likewise, the use of vacuum-distilled DBBP vs. the commercial product resulted in no differences.

A steady-state extraction stripping flow sheet has been demonstrated. With one stage of extraction and one of stripping with equal volumes, over 95 percent recovery was demonstrated.

The use of 50 v/o DBBP was briefly tested. Lower than expected distributions for americium were observed in extraction stages, apparently due to the higher tendency of this solvent to complex with nitric acid.

F. S. Orth

Manager
Research and Engineering

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CHEMICAL PROCESSING DEPARTMENT
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II. ACHIEVEMENTS (Continued)

H. FINANCIAL OPERATION

1. Production Cost Accounting

The Company recently determined that a substantial over-accrual of pension costs currently exists and has passed a pro rata share of this credit to HAPO of which approximately $500,000 is applicable to CPD. This amount is being credited to cost over the balance of FY 1964. The midyear budget is being reworked to reflect this change and recent organization changes. (The former Power and Crafts Operation was dissolved on December 1, 1963 with most of its functions being transferred to Facilities Engineering Operation.)

Following the 234-5 incident, coding and instructions were issued for segregation of these costs from normal production. Informal approval was obtained from AEC for use of a shutdown account in which to accumulate costs of the incident.

During the month, the AEC advised HAPO of substantial cuts in Isotope Inventory balances allocated as of June 30, 1964 and June 30, 1965. Also, a reduction of $2,000,000 was made in the Sr-90 shipping schedules for these two periods.

Special requests handled during the month included:

Services provided APED by R. E. Tomlinson and E. O. Swain.

12 grams Pu nitrate sent to APED.

Preparation of blueprints for Bechtel Corporation.

Plutonium scrap reclamation activity for other sites during the month included receipt of 2546 grams from Hanford Laboratories (Project Whitney).

CPD's investment in inventories at October 31, 1963, compared with budgeted amounts, is as follows:

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(in thousands)	Balance 10-31-63	Control Allocation	Surplus (Deficit)
Inventories			
Essential Materials	$ 911	$ 815	$(96)
Spare Parts & Standby	1 621	1 615	(6)
Special Materials	85	103	18
Yttrium	153	150	(3)
Gross Inventories	2 770	2 683	(87)
Reserves			
Essential Materials	42	59	(17)
Spare Parts & Standby	562	404	158
Yttrium	153	150	3
Total Reserves	757	613	144
Net Investment	$2 013	$2 070	$ 57

2. General Accounting

As of October 31, 1963, seventeen active projects had incurred costs of $3,078,036 against authorized funds of $4,096,100. Outstanding commitments totaled $182,852.

During November one work authority and one directive was received from the AEC: Directive No. EQT-007, Work Authority No. 1, Project CAC-121, Americium Recovery Facility-Z Plant, interim authorization of $44,000; Directive No. HW-553, Project No. CGC-122, Exhaust Ventilation Facility - 233-S Building, interim authorization of $14,4[illegible].

During the month five appropriation requests were processed authorizing expenditures of $17,000.

3. Business Programs

A cost distribution model was developed and issued during the month which more adequately displays the financial impact of various types feed on chemical separations. This was prepared in collaboration with representatives of Contract Accounting and was reviewed by them with other financial organizations before issuance.

Manager - Finance

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CHEMICAL PROCESSING DEPARTMENT
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III. PERSONNEL ACTIVITIES

A. FORCE SUMMARY

Operation	Monthly Salaried 10-27-63	Monthly Salaried 11-30-63	Weekly Salaried 10-27-63	Weekly Salaried 11-30-63	Total 10-27-63	Total 11-30-63
General Manager's Group	10	9	2	2	12	11
Financial	13	13	13	13	26	26
Research & Engineering	67	69	30	30	97	99
Facilities Engineering	71	71	23	23	94	94
Power & Crafts Operation	36	36	230	231	266	267
Production	6	6	4	4	10	10
Redox	63	62	222	223	285	285
Purex	70	71	258	262	328	333
Weapons Manufacturing	55	56	227	239	282	295
Total	391	393	1009	1027	1400	1420

B. PERSONNEL CHANGES

W. M. Barty, formerly Manager, Process Design, N-Reactor Department, was appointed to the position Manager, Purex Operation, effective November 15.

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C. TRIPS

Visitor	To	Nature of Discussion
To Other G.E. Components		
P. H. Reinker	Palo Alto, California	Business Review. (11/6 - 7/63)
J. J. Shefcik C. W. Smith	Shelbyville, Indiana	Heaters for in-tank solidification systems. (11/12/63)
J. W. Kolb	Evendale, Ohio	Electron beam welding. (11/13 - 14/63)
P. H. Reinker	San Jose, California	Business Review. (11/13 - 14/63)
To AEC and Other AEC Contractors		
A. E. Barber	Rocky Flats Plant Denver, Colorado	Follow-up on 74 shipment (11/7/63)
R. Y. Lyon	Mallinckrodt Chemical Works Weldon Springs Plant St. Charles, Missouri	Uranium and thorium denitration tests. (11/15 - 19/63)
S. J. Beard W. L. Godfrey W. C. Schmidt P. W. Smith S. G. Smolen	Phillips Petroleum Co. Idaho Falls, Idaho	Fuel processing and tour ICPP and WPF facilities. (11/18/63)
B. M. Dobbs	Albuquerque, New Mexico	03 Budget Program (11/18 - 20/63)
H. A. Clark	U. S. AEC New York Operations Office New York, New York	Filter testing workshop. (11/18 - 22/63)
To General Industry		
J. J. Shefcik C. W. Smith	Watlow Electric Co. St. Louis, Missouri	Heaters for in-tank solidification systems. (11/11/63)
	W. L. Wiegand Co. Pittsburgh, Pennsylvania	" " (11/13/63)
	Vulcan Electric Co. Danvers, Massachusetts	" " (11/14/63)

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C. TRIPS (Continued)

Visitor	To	Nature of Discussion
To General Industry (Continued)		
A. J. Waligura	Union Carbide Nuclear Div. Sterling Forest, N. Y.	Tour radiochemical lab and Isotope service facilities. (11/19/63)
	Isotopes, Inc. Westwood, New Jersey	Tour high and low radiochemical labs and counting system facilities. (11/21/63)
To Conventions and General Meetings		
E. M. Johnston	Philadelphia, Pennsylvania	Attend American Society of Mechanical Engineers meeting. (11/14/63)
A. J. Waligura	New York, New York	Attend ANS meeting and Hot Lab and Equipment Conference. (11/18 - 21/63)

D. VISITORS

Visitor	From	Nature of Discussion
From Other G.E. Components		
Howard Zellinger	St. Louis, Missouri	Cooling Vest for Decontamination Work. (11/12 - 14/63)
Dr. J. V. Grimaldi	New York, New York	Accident prevention. (11/20 - 22/63)
From AEC and Other AEC Contractors		
W. P. Bebbington	E. I. duPont de Nemours Savannah River Plant Aiken, South Carolina	Fission products and waste management. (11/7/63)
Dr. M. T. Kelley L. T. Corbin	Analytical Division Oak Ridge National Lab. Oak Ridge, Tennessee	To discuss high-level cell fission product analysis and measurements. (11/8/63)
T. R. Workinger	Division of Production US-AEC Headquarters Washington, D. C.	Purex Tour. (11/19/63)

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D. VISITORS (Continued)

Visitor	From	Nature of Discussion
From AEC and Other AEC Contractors (Continued)		
Dale Singleton	E. I. duPont de Nemours Savannah River Plant Aiken, South Carolina	Repair of "D" Cell - Redox. (11/21/63)
J. Daniledes W. H. Johnson	Lawrence Radiation Lab. Livermore, California	Plutonium specifications. (11/21/63)
C. W. Barrett	Rocky Flats Plant Denver, Colorado	Plutonium specifications. (11/21/63)
From General Industry		
T. F. D'Muhala	General Dynamics Groton, Connecticut	Decontamination. (11/5 - 6/63)
Norman Hart	Columbia-Geneva Steel Seattle, Washington	Tube bundle fabrication and performance. (11/5/63)
M. M. Braidech	National Bureau of Fire Underwriters New York, New York	Investigate 233-S incident. (11/11 - 12/63)
S. W. Silverman	Boeing Company Seattle, Washington	Discuss waste management, fission products and encapsulation. (11/19/63)
R. Wischow	Martin-Marietta Co. Nuclear Division Baltimore, Maryland	Fission product recovery. (11/22/63)
R. L. Meyer	Betz Laboratories Seattle, Washington	Filming amine; inert gas system. (11/26/63)
From Other Government Agencies		
Major J. E. Wassiac Captain R. J. Thomas	Department of Defense	Tour facilities. (11/19/63)

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CHEMICAL PROCESSING DEPARTMENT

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IV. SAFETY AND SECURITY

Operation	General	FED	Finance	WMO	P&CO	Purex	Redox	Prod.	R&E	Total	YTD
Dis. Injuries										-	6
Ser. Accidents										-	3
Med. Treat. Inj.		2		4	12	10	7			35	451
Rad. Occur.				3		5	1			9	131
Contam. Wds.										-	20
Pu Depositions										-	20
Fires				2*			1**			3	9
Sec. Viol.				1						1	21

* - November 4, Fire 62-8 - Rags and resin in hood in Room 227 - Damage, $1686.40.
- November 10, Fire 62-9 - Material in chopper hood in 232-Z Bldg. - Damage, $10.00.

** - November 6, Fire 62-7 - 233-S Bldg., believed to be started from causes external to the process. Preliminary estimate of damage, $310,000.00.

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V. REPORTS

A. PREPARED AND ISSUED

HW-79147, Unclassified, "Critical Mass Control Specification - 232-Z Contaminated Waste Recovery Facility", dated November 8, 1963, by R. J. Sloat.

HW-79219 RD, Secret, "Product Specifications - Hanford Uranium Trioxide (From Depleted E-Metal) for Off-Site Shipment", dated November 6, 1963, by R. J. Sloat.

HW-79241, Official Use Only, "Increased Processing Flexibility - Purex, Project CGC-124", dated November 14, 1963, by L. W. Finch.

HW-79276, Unclassified, "Recommended Improvements to the Dry Air System - 234-5 Building", dated October 23, 1963, by D. D. Wodrich.

HW-79363, Secret AWD, "Model 74-C Shipping Problem Status", dated October 24, 1963, by A. E. Barber.

HW-79369, Unclassified, "Design Scope, Americium Recovery Facility", dated October 31, 1963, by D. E. Braden and R. A. Ciccarelli.

HW-79384, Secret AWD, "Quarterly Summary Report and Associated Data for 234-5 Building Final Product Shipped During the Third Quarter of Calendar Year 1963", dated October 28, 1963, by A. E. Smith.

HW-79385, Secret AWD, "Statistical Statements and Associated Data for 234-5 Building Final Product Shipped During the Third Quarter of Calendar Year 1963", dated October 28, 1963, by A. E. Smith.

HW-79428, Confidential AWD, "FPT-63-27, Dimensional Stability, Model 1807 Shape Castings", dated October 18, 1963, by C. M. Walker.

HW-79470 RD, Secret, "Purex Plant Production Schedule - November 1963", dated November 4, 1963, by D. McDonald.

HW-79471 RD, Secret, "Redox Plant Production Schedule - November 1963", dated November 4, 1963, by D. McDonald.

HW-79472 RD, Secret, "UO_3 Plant Production Schedule - November 1963", dated November 4, 1963, by D. McDonald.

HW-79473 RD, Secret, "234-5 Plant Production Schedule - November 1963", dated November 4, 1963, by D. McDonald.

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HW-79496, Secret AWD, "Progress Report, Weapons Process Engineering, October, 1963", dated November 5, 1963, compiled by Members of the Weapons Process Engineering Operation, Research and Engineering.

HW-79534, Confidential, "Plutonium Reclamation Facility Operating Specifications", dated November 11, 1963, by L. E. Bruns

HW-79577, Secret AWD, "Fabrication Process Test Evaluation, Shipping HI-74-SL", dated November 8, 1963, by A. E. Barber.

HW-79578, Unclassified, "Critical Mass Control Specification - The Storage and Handling of Plutonium Solutions in the PR Room (Room 19) of the 236-Z Building", dated November 15, 1963, by R. J. Sloat.

HW-79586, Confidential, "Start-Up Flowsheets for the Plutonium Reclamation Facility (CAC-880) Edition I", dated November 18, 1963, by L. E. Bruns.

HW-79645, Secret, "Process Design Scope Criteria, Purex Multi-purpose Dissolvers", dated October 15, 1963, by R. D. Ehrlich and J. R. LaRiviere.

HW-79703, Unclassified, "Quantitative Determination of Hexone in Aqueous Solutions by Gas Chromatography", dated November 25, 1963, by C. A. Colvin and R. J. Sorenson.

HW-79714, Official Use Only, "Redox Operation Planning - Task Force Interim Report", dated November 20, 1963, by J. B. Fecht, M. K. Harmon, B. F. Judson and J. H. Warren.

HW-79733, Unclassified, "Critical Mass Control Specification - PR and SN Can Transportation", dated November 26, 1963, by R. J. Sloat.

HW-79745, Secret AWD, "A-Line Product Characteristics, October 1963", dated November 26, 1963, by A. E. Smith.

B. <u>PREPARED FOR SIGNATURE AND ISSUANCE</u>

HW-79479, Secret, "Production - October 1963", dated November 1, 1963, by W. E. Johnson.

HW-79605, Secret, "Production of Zirconium-Niobium-95 and Scandium-46 at Hanford - Addendum to HW-79404", dated November 15, 1963, by W. E. Johnson.

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VI. PATENT SUMMARY

All persons engaged in work that might reasonably be expected to result in inventions or discoveries advise that, to the best of their knowledge and belief, no inventions or discoveries were made in the course of their work during the period covered by this report, except as listed below. Such persons further advise that, for the period therein covered by this report, notebook records, if any, kept in the course of their work have been examined for possible inventions or discoveries.

INVENTOR	TITLE
R. W. Lambert	The Use of Sugar for Suppressing Ruthenium Volatilization in Nitric Acid Concentrators
J. S. Buckingham	The Destruction of Citric Acid with Hydrogen Peroxide
A. W. Hildebrandt	Automatic Compression Clamp For Holding Pieces For Presentation For Gaging
W. P. Ingalls (CPD) and C. L. Brown (HLO)	A Design For a Neutron Shielded (Class I) Shipping Container For Unirradiated Fissile Materials. (The neutron shield precludes a nuclear chain reaction between the fissile materials in two or more adjacent containers by preventing the exchange of neutrons between containers.)

J. N. Warner
General Manager
Chemical Processing Department

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