2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (Is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number K-640 Date of document 9/20/51

Title and author (if document is unnumbered)

OREGDP QUARTERLY REPORT 4/1/51 - 6/30/51 - COPY ONLY TAGGED PAGES.

(This section to be completed by Document Center)

Date request received 10/12/95

Date submitted to ADC 11/30/95

Date submitted to HSA Coordinator 10/12/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 11/30/95 1/10/96

Date received from CICO 1/5/96 2-22-96

Date submitted to ChemRisk/Shonka and DOE 2-22-96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

UNCLASSIFIED

K/EM-276

SANITIZED VERSION OF EXTRACT FROM K-25 PLANT QUARTERLY REPORT FOR FOURTH FISCAL QUARTER APRIL 1-JUNE 30, 1951

(EXTRACTED FROM CRD DOCUMENT # K-640)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

November 30, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release to the public by:

Asst [signature] 2/21/96
Technical Information Officer Date
Oak Ridge K-25 Site

UNCLASSIFIED

DOWNGRADED TO CRD: 11/15/93
Sam W. Wolfort (A)
[redacted] CRD 11/15/93
Gary W. Hall ADD

CO[redacted]AL

SECRET

Date of Issue: September 20, 1951 This document consists of 302 pages
No. [redacted] of 62 copies. Series A

Report Number: K-640

INV. JAN 11 1953 By

PLANT RECORDS SECT.

C 55654
D 89213

FILE
X-REF.
X-REF.

K-25 PLANT QUARTERLY REPORT
FOR
FOURTH FISCAL QUARTER

APRIL 1 - JUNE 30, 1951

MAR 7 1953
PLANT RECORDS

K 640 40 A

K 640 40 A

CENTRAL LIBRARY
REC. CD 88776

FILE
X-REF.
X-REF.

CARBIDE AND CARBON CHEMICALS COMPANY
UNION CARBIDE AND CARBON CORPORATION
K-25 Plant
Oak Ridge, Tennessee

RESTRICTED DATA

This document contains restricted data as defined in the Atomic Energy Act of 1946. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.

-2-

[redacted]

RESTRICTED DATA
This document contains Restricted Data as defined in the Atomic Energy Act of 1954. Unauthorized disclosure subject to Administrative and Criminal Sanctions.

[redacted]

ORO 20305

of the 45.4% increase in production. The total, actual processing cost increased 5.1%. This increase was largely influenced by the application of deferred charges which resulted from accumulated costs associated with the July, 1950 power failure. The unit cost experienced during June represents a new record low unit cost at K-25.

Figure C-1 presents a comparison of the monthly unit costs experienced during fiscal year 1951 with the average unit cost for fiscal year 1950.

PRODUCTIVITY - Q AND U

During the current quarter, the value of Q, an approximation of the production of enriched uranium 235 by the cascade, increased 3.4% above that of the last quarter. The value of U, a measure of the upflow of enriched uranium 235 from the feed point, increased 1.9% above that of the previous quarter.

Factors which occurred during the current quarter and which were responsible for the changes in U and Q from last quarter are:

Factor	Effect	
	Q	U
Lack of upflow stimulants	Decrease	Decrease
Longer plant	Increase	Increase
Increased normal feed rates	Increase	Increase
Decreased deficiencies	Increase	Decrease

The lack of large stage pressure increases and a steepened gradient, such as existed during the previous quarter, tended to reduce the values of Q and U toward their equilibrium values. This factor, however, was more than compensated for by the increased normal feed rate in June, and the fact that Building K-502-3 was on stream for the full 91 days of the present quarter as compared to only 66 days during the previous quarter. An additional small increase in Q, and decrease in U, was brought about by the 25.0% reduction in cascade uranium 235 deficiency from last quarter.

CASCADE MATERIAL BALANCE DEFICIENCY

The cascade material balance deficiency decreased 25.0% below that of the previous quarter, and is now more in line with the estimated deficiency for the present plant. The large decrease is caused by the lack of large scale chlorine trifluoride recovery operations in the high assay portion of the plant, the lack of large amounts of material being differentially adsorbed during the stage pressure increase program, and the lack of a large gradient upswing which gives rise to molecular exchange losses. An unusually high uranium 235 deficiency was experienced in May, but this was believed due to the condensation in the waste line when the housing was opened to tie in the K-31 interplant lines. Although heat was restored to the lines before the end of the month, there were indications that not all of the material had been vaporized. This indication

was further substantiated by an unusually low June deficiency figure which was accompanied by indications that all of the material in the waste line had been vaporized.

CASCADE URANIUM 235 GRADIENT

The cascade uranium 235 gradient for the current quarter showed an increase from the bottom of the plant through Building K-301-5, and from Building K-302-4 to the top of the cascade. The major portion of the increased gradient level in the upper part of the cascade occurred in April, followed by a smaller increase in May and a slight decrease in June. The decrease in June is interpreted as the beginning of the shift of the gradient from its present above-equilibrium level toward the equilibrium level. The increased gradient level in the lower portion of the plant is due to the increased normal feed rate which was in effect during the last two weeks of the quarter.

CASCADE CHANGES

Barrier Replacement

The barrier replacement phase of the K-27 cascade improvement program was continued this quarter with the installation of converters in two cells, K-402-1.8 and 10. Forty of the 85 cells included in this program have now been completed. Further installation of high quality in K-27 will be delayed until the barrier manufacturing plant resumes production of seven-foot tubes. This schedule is contingent on new plant requirements and availability of nickel powder.

On June 5 the six plugged converters, which had been removed from K-305-1.2 during the July, 1950 power emergency, were reinstalled for treatment with chlorine trifluoride (see Section G - Cascade Tests and Investigations). The treatment of this barrier was unsuccessful; consequently the converters were removed on June 11 and units were reinstalled.

Figure C-2 shows the current status of the plant barrier locations.

Coolant System Changes

The increased heat loads, which will be experienced in the K-27 cells at the completion of the improvement program, will exceed the capacity of the present dual coolant systems. As a result, the dual coolant systems are being separated concurrent with the cell shutdowns for converter changes. In addition to the four cells (K-402-1.7, 8, 9, and 10), which were returned to single systems during the quarter while converter replacements were made in Cells 8 and 10, the systems of Cells 1 and 3 in Building K-402-3 were also remodeled. These latter changes were effected at the time a coolant leak was being isolated in K-402-3.1 (see Coolant Leaks).

building was again placed in operation at 1450 on May 22, at which time the fluorocarbon concentration measured as C-816 in Cell 4 of Building K-302-5 was 1.25%. The unit was shut down at 0945 on May 23 to replace the bellows on the "W" pump. Building operations were resumed at 1700 on June 24 and continued until 0520 on June 28. The coolant concentration at K-302-5.4 at the time of shutdown was 0.2%. A total of 105.4 pounds of coolant was removed from the column. At 2105 on June 3 the heaters to the coolant removal unit were energized and the unit was placed in operation at 0150 on June 4. At 2030 on June 7 the building was shut down and placed in standby condition. During this period the coolant concentration in K-302-5.4 decreased from 1.90% to 0.25%, and 85.6 pounds of coolant were removed from the column. The K-101 building was again placed in operation at 2050 on June 20, at which time the concentration of coolant in K-302-5.4 was 1.00%. The unit was down for a period of forty-five minutes on July 21 because of a low oil level in the "J" pump. After the coolant concentration in K-302-5.4 had decreased to 0.25%, the unit was shut down at 1645 on June 23. A total withdrawal of 35.3 pounds of coolant resulted from this operation. The final operation of the K-101 building for the quarter was a result of the coolant leak in K-301-1.8. The unit was placed in operation at 1350 on June 26 and continued operating until 1245 on June 28. The coolant concentration in Cell 4 of Building K-302-5 was decreased from 1.65% to 0.19%, while 66.3 pounds of coolant were removed from the column during the two-day period.

Material Releases

Two uranium hexafluoride releases occurred during the quarter. A small release was experienced in Building K-131 when a valve on a partially depleted feed cylinder split. At the time of the failure the cylinder was being valved into the feed header. No personnel exposures resulted and the area was immediately decontaminated.

The second release was experienced in Building K-631. MFL oil was being removed from a Beach-Russ pump in preparation for a seal change when the release occurred. Air samples taken after the release indicated that the atmospheric contamination in the room was 299 alpha counts per minute. Decontamination of the affected area was started soon thereafter.

Material Withdrawal

A total of 1781.79 pounds of uranium hexafluoride at a uranium 235 assay of approximately 5%, uncorrected, was withdrawn from K-303-2.4 and 6, between May 8 and June 7, 1951, for a series of critical mass studies. The material was collected in T.E.C. type cylinders of approximately 30 pounds each. In order to effect this withdrawal, fluorine charging lines on two adjacent cells were joined by 5/8-inch copper tubing and connected to the freeze-out cylinder. The flow through the cylinder was accomplished by establishing a pressure gradient between the adjacent cells. Periodic assay samples were taken to assure that the product uranium 235 assay was within the required limits of 4.90% to 5.10%.

Cascade Stream Efficiency

The cascade operated at an onstream efficiency of 99.28% this quarter. This is approximately 0.2% below the experience of the previous quarter. Table C-7 presents a breakdown of the offstream time for the quarter, while figure C-3 presents the monthly cascade stream efficiencies for fiscal years 1950 and 1951. Figure C-4 shows the monthly values of lost productivity resulting from offstream equipment based on operating costs for the same periods.

PURGE CASCADE OPERATION

Cascade Purge Rate

Buildings K-312-1 and K-312-3 operated as the side and top purge buildings, respectively, during the current quarter. Building K-312-2 was used during April and May for the chlorine trifluoride purging operations, which resulted from the uranium recovery work in the K-302 and K-303 sections and in the K-302-1 test loop. This building was placed in standby condition on May 29, 1951. The total light contaminant purge rate for the quarter averaged 7440 scf per day, which is 4.2% less than that reported for the previous quarter (see figure C-5). The average uranium concentration in the purge gases for the current quarter was 5.9×10^{-6} mol per cent. This relatively high average uranium concentration resulted after the cold traps in the K-312-3 fluorocarbon withdrawal system were removed from service (see Purge System Changes).

Purge System Changes

A special chlorine trifluoride rack was installed in the K-312-3 line recorder station, and a special fluorine rack was installed in Building K-312-1. These racks were used to obtain data during fluorine consumption tests.

A two-inch air ejector was used throughout the quarter to evacuate the side purge gases from K-312-1. As a result, the high side pressure of Cell 2 in Building K-312-1 was [redacted] in order to establish the ejector suction pressure necessary for control of the purge rate.

The line used for the partially depleted feed flow from K-27 to Building K-310-3 was connected by a three-inch monel line to the A spare line at the K-312-3 bullnose. The existing valves in the partially depleted feed line will permit isolation of the line on either the K-27 or the K-310-3 side and thereby facilitate the transfer of gases to K-312-2 during the chlorine trifluoride treatment of buildings below K-302-1.

A nitrogen bleed of 400 scf per day was established on May 23 in K-306-7.10 in an attempt to move freon and C-816 from Building K-306-7 into Building K-312-3. The bleed point was moved to Cell 11 on May 24. The nitrogen bleed was discontinued on May 28 when it became evident that the test results were inconclusive. In a further attempt to

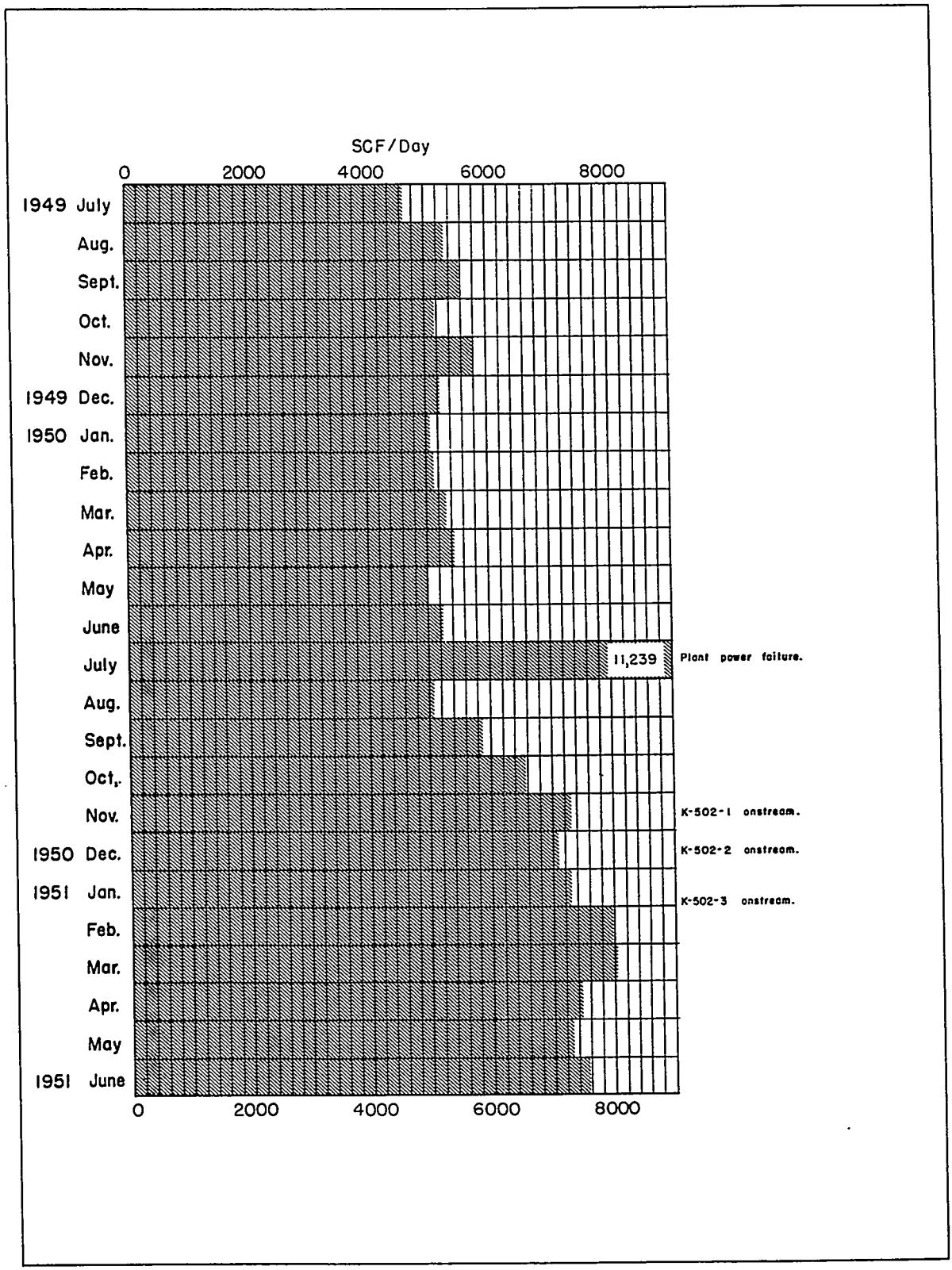


FIGURE C-5

CASCADE PURGE RATE

remove these contaminants, the nitrogen bleed was re-established at K-306-7.8 for a three-day period beginning June 19. With only ten cells operating in K-312-3 the tops concentration of uranium hexafluoride was nil and mass scans showed only traces of contaminants in the top cell. These data also indicated that the nitrogen bleed will not attain the desired results, hence no future work of this nature is contemplated.

The carbon-alumina mixture in the seal exhaust trap in Building K-312-2 was replaced with a 2:1 weight per cent ratio of cadmium-coated alumina and activated alumina. Inasmuch as this mixture has never been used in the purge cascade seal exhaust traps, frequent scans are being made with a high pressure argon probe, and the Kinney pump oil reservoir is being sampled periodically. These checks have revealed no excessive accumulation of uranium.

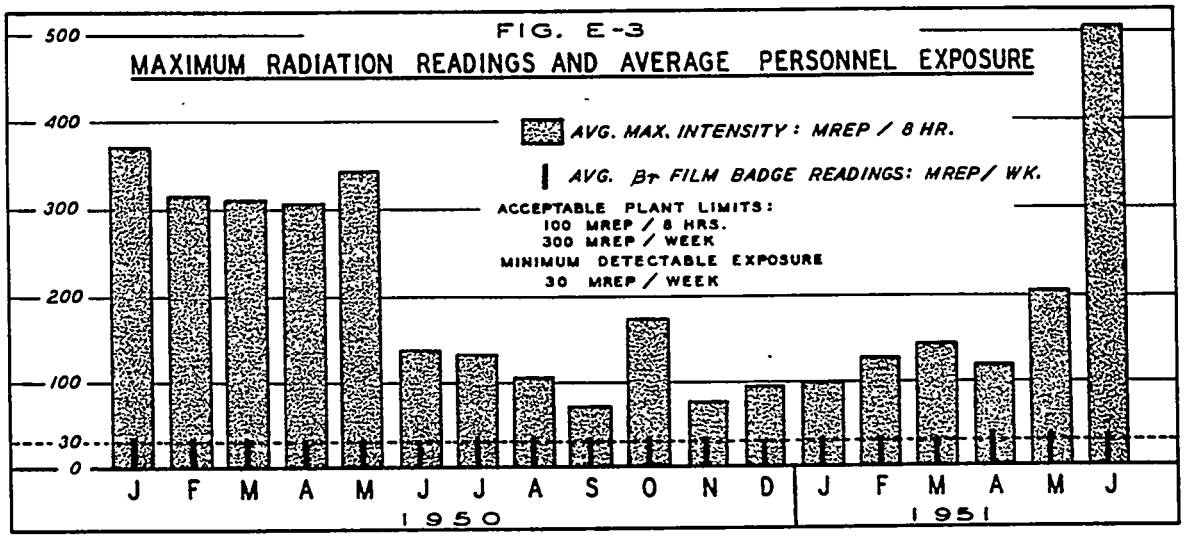
The No. 2 cold trap, which was used in the system for removing fluorocarbons from the K-312-3 surge drum, exploded on May 13, immediately after a quantity of material had been flashed through the alumina traps to the atmosphere. The decomposition of chlorine oxides probably caused the explosion since a gas sample taken from the building surge drum during operating conditions similar to those at the time of the explosion showed large quantities of chlorine oxides and an absence of chlorine trifluoride and fluorine oxides. The cold traps have not been used since the explosion. During the week following the explosion, mass scans indicated that fluorocarbons were peaking in Cell 17. In an effort to remove these contaminants, the number of operating cells was reduced to six in the enriching section and two in the stripping section, while the allowable uranium hexafluoride concentration in the vent gases was increased to 0.0001 mol per cent. This mode of operation, with variations in the number of operating cells, was employed until the week of June 11, at which time the entire building was put into operation to determine if contaminants would again concentrate in Cell 17. It was found that the building gradient remained normal while the major portion of the fluorocarbons had moved downstream to the surge drum. As a result, it is necessary to remove periodically the fluorocarbons from the surge drum by reducing the number of operating cells in the purge cascade. Investigations are now in progress to determine a more suitable method for the disposal of these fluorocarbons.

BARRIER PERMEABILITY SUMMARY

Normal Plugging Status

The barrier installed in K-25 exhibited an average permeability change of 0.60% per month during this quarter as compared to a -0.08 ± 0.06% change per month over the past two years. The increase in barrier permeability experienced in this quarter is primarily due to the chlorine trifluoride operations in Buildings K-303-1 through K-303-6, and in Buildings K-302-1 through K-302-5. The continued increase in permeability of the barrier installed in Buildings K-305-7, K-305-8, and part of K-305-9 also contributed significantly to this trend.

these same locations, as shown by film badge readings, in order to relate maximum potential exposure to actual exposure. The quarterly average maximum radiation intensity is over 3 times as great as the average for the previous quarter, due principally to the build-up of penetrating radiation intensity in localized units of the K-1131 Feed Plant and to high intensities noted in the K-1004-D Radon Plant during operation. However, the average weekly personnel exposure, as shown by film meter readings, remained near 30 mr., which is the lowest level detectable by the film and, as indicated in the section on ACCIDENT EXPERIENCE, there were no incidents of personnel exposure to radiation dosages in excess of the P.A.L.*



Air Sampling Program. During the quarter, the average alpha air activity, as shown by the results of the 2152 shift-length samples reported from the 11 plant locations where such sampling is routinely carried on, decreased from 0.10 counts/min./ft.^{3} to 0.034 counts/min./ft.^{3}, where background activity is approximately 0.01 counts/min./ft.^{3}. This decrease in average air activity was largely a result of curtailed operations in one location and improved dry boxing and hooding facilities in two other locations where large quantities of uranium materials are routinely handled. No shift-length samples showed activity above the P.A.L.* of 2.0 counts/min./ft.^{3} this quarter as compared to the 10 samples above the P.A.L.* last quarter.

Water and Stream Bottom Survey Program. The average beta activity in the K-25 sanitary water remained approximately at the background level of 5 dis./min./100 ml. No significant changes in the uranium concentrations of 0.20 to 10 ppm. in the Clinch River and Poplar Creek mud occurred.

---

* Plant Acceptable Limits

TABLE E-2

URINARY CONTAMINANTS

Contaminant	Maximum Allowable Concentrations	Total No. of Analyses	No. Positive Findings IND.	VMR
Alpha Activity	10 c/min/100 ml. Recalled if above 3 c/min/100 ml.	414	1	3
Fluorides	4 mg/liter. Recalled if above 1.5 mg/liter	299	3	2
Lead	0.10 mg/liter	3	1	0
Mercury	0.10 mg/liter	107	4	0
Plutonium	3.5 c/min/24 hr. specimen	16	0	0
Uranium	Undetermined. Recalled if above 0.005 mg/liter	580	26	4

IND. Urine specimens submitted in scheduled Industrial Health Examinations.

VMR. Urine specimens submitted following suspected material releases.

TABLE E-3

AIRBORNE CONTAMINANTS

Contaminant	Maximum Allowable Concentrations	Total No. of Analyses	No. of Positive Findings
Acetone	500 ppm	6	0
Ammonia	100 ppm	3	0
Carbon Monoxide	100 ppm	12	0
Chlorine	1 ppm	4	0
Fluoride Dusts	2.5 mg/m^3	4	0
Fluorine	1 ppm	20	6
Hydrogen Fluoride	3 ppm	5	3
Hydrogen Chloride	5 ppm	2	2
Mercury	0.10 mg/m^3	71	2
Nickel	0.5 mg/m^3	4	0
Phosgene	1 ppm	358	0
Radon	10^{-11} curies/liter	1	0
Trichloretylene	200 ppm	2	1*
Uranium	0.15 mg/m^3	31	3

* These analyses are not considered positive unless the concentrations in the atmosphere exceed the MAC for at least 50% of the sampling time or are maintained at an extremely high level for considerable but much shorter periods.

UNCLASSIFIED

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

UNCLASSIFIED

ChemRisk/Shonka Research Associates, Inc., Document Request Form < 2539

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number K-802 Date of document 6/6/52

Title and author (if document is unnumbered)

Copy has pgs only

(This section to be completed by Document Center)

Date request received 10/12/95

Date submitted to ADC 11/30/95

Date submitted to HSA Coordinator 10/12/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 11/30/95

Date received from CICO 2-22-96

Date submitted to ChemRisk/Shonka and DOE 2-22-96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

UNCLASSIFIED

K/EM-283

SANITIZED VERSION OF EXTRACT FROM K-25 PLANT QUARTERLY REPORT FOR THIRD FISCAL QUARTER JANUARY 1-MARCH 31, 1952

(EXTRACTED FROM CRD DOCUMENT # K-802)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

November 30, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release to the public by:

7-55T 2/9/96
Classification Officer Date
Oak Ridge K-25 Site

UNCLASSIFIED ~~CONFIDENTIAL~~

K 802 49 A

K 802 49 A

~~SECRET~~
~~SECURITY INFORMATION~~

Date of Issue: June [illegible], 1952
DOWNGRADED TO CRD: 11/15/93
Sam W. Wohlgart (A[illegible])
DOWNGRADED TO CRD 11/15/93
Gary W. Hall A[illegible]

This document consists of [illegible] pages
No. [illegible] of 65 copies. Series A

Report Number: K-802 D-4473

JUN 10 [illegible]
M. F. SCHWENN
[illegible]&CCD

K-25 PLANT QUARTERLY REPORT
FOR
THIRD FISCAL QUARTER
JANUARY 1 - MARCH 31, 1952

CENTRAL LIBRARY
REC. Q88853
FILE
X-REF.
X-REF.

CARBIDE AND CARBON CHEMICALS COMPANY
UNION CARBIDE AND CARBON CORPORATION
K-25 Plant
Oak Ridge, Tennessee

~~RESTRICTED DATA~~
~~This document contains restricted data as defined in the Atomic Energy Act of 1946. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.~~

~~SECRET~~
~~SECURITY INFORMATION~~

~~CONFIDENTIAL~~

~~RESTRICTED DATA~~
~~This document contains Restricted Data as defined in the Atomic Energy Act of 1946. Unauthorized disclosure subject to Administrative and Criminal Sanctions.~~

was condensed. The remaining nitrogen and freon were released to the atmosphere through alumina traps.

Material Releases

Releases of uranium hexafluoride which occurred this quarter are summarized in table C-4. The first release, on January 3, resulted as the oil was being drained from a vacuum-type pump. The drain valve plugged, and the material escaped when the plug was released. The second release occurred on January 7 when a sight glass broke on the acid loop at the K-1303 recovery system. The entire contents of the acid loop spilled as a result.

On January 16, a release occurred in the K-413 building. Normal material was being transferred from small cylinders to a large cylinder for feeding to the cascade. A plug prevented complete closure of the valve and allowed the material to escape. The release lasted about four minutes until the cylinder could be capped.

The three releases which occurred in Vault 15A were of the same type. Material which had been stored in drums for considerable lengths of time caused corrosion of the drums and consequent leaks.

A small quantity of uranium hexafluoride escaped in the K-1413 engineering laboratory on February 1. The material was lost as a result of reaction of a small amount of material with air when the product receiver was removed from the uranium tetrafluoride fluorination pilot plant.

On February 2, a small release occurred from the tower at the uranium hexafluoride reduction pilot plant while the head was removed. There is no estimate of the loss although it is known to be small.

On February 28, a small release occurred at the 20-stage barrier pilot plant in K-1401. Corrosion of a silver-soldered joint on a copper feed line allowed the material to escape.

The losses charged to converter decontamination in the K-1401 building were incurred when fluorine decontamination charges were vented from converters to the atmosphere. The losses are totals for 53 converters decontaminated during the quarter. These losses are based on gas samples taken from nine of the converters before the gases were vented. A cold trap system is currently being constructed and, upon completion, will be used to recover material from this operation.

Two releases occurred in the K-306-7 laboratory this quarter. The first was the result of a broken bellows in a B-4 pump. When the bellows broke, gas was released to the atmosphere for 15 minutes through the oil line and pump housing. The second leak lasted only 30 seconds and occurred when a plug was accidentally removed from a severed line during maintenance repairs.

TABLE C-4

MATERIAL RELEASES

Date	Area	Known Loss	
		Uranium Grams	Uranium-235 Grams
January 3	K-631 Shipping Room	1,165	8
January 7	K-1303	82	0
January 16	K-413	3,665	26
February	Vault 15A	327	3
February 1	K-1413	153	1
February 2	K-1405 Uranium Hexafluoride Reduction Pilot Plant	Small and undetermined	
February 13	Vault 15A	Not yet estimated	
February 28	K-1401 Barrier Pilot Plant	2	0
January, February, March	K-1401 Converter Decontamination	8,586	67
March 1	K-306-7 Field Laboratory	Small and undetermined	
March 3	K-306-7 Field Laboratory	Small and undetermined	
March 24	Vault 15A	18	0

Figure C-4 shows the total cost of lost productivity, by months, resulting from offstream time during the same fiscal years. A breakdown of these productivity losses for the last six months is shown in table C-6. These losses are based on the operating costs for the same periods.

PURGE CASCADE OPERATION

Purge Rate

Buildings K-312-1 and K-312-3 operated as the side and top purge buildings, respectively, during the current quarter. Building K-312-2 was in standby condition during this period except from 0935 to 1830 on March 30 when this building was paralleled with K-312-1 and operated on the side purge. A total of 1855 scf was purged with K-312-2 during this operation.

The average total purge rate for the quarter was 10,129 scf per day at an average uranium hexafluoride concentration in the purge gases of 42×10^{-6} mol per cent. Of the total, the K-312-1 side purge building averaged 8027 scf per day and the remaining 2102 scf per day was purged by K-312-3, the top building. The total purge rate averaged 3.8% above that of the previous quarter (see figure C-5).

Purge System Changes

An investigation was undertaken in the K-312-3 building which led to the operation of this building without C-816 coolant. All the coolant was drained to the building drain drum. The average stage and pump discharge temperatures increased from and respectively. With the exception of Cells 2 and 4, Building K-312-1 can also operate without the C-816 coolant. Plans are under way to make a coolant tie from Cells 2 and 4 in K-312-1 with the K-306-7 coolant system. When this is accomplished, the remaining cells in the K-312-1 building will be operated without coolant. The operation of the purge buildings without C-816 coolant is very desirable from a cost standpoint since these buildings normally sustain large operating losses.

BARRIER PERMEABILITY SUMMARY

General Permeability Status

The barrier permeability in the K-25 cascade indicated a -0.04% change per month during the current quarter as compared to a rate of +0.03 ± 0.10% change per month during the past two-year period. Cell 3 in Building K-309-2 was the only cell in the K-300 section that was treated with chlorine trifluoride during the quarter. Two unsuccessful treatments of chlorine trifluoride were made in an effort to unplug Stages 1 and 3 in this cell. The return to a normal trend of decreasing barrier permeabilities (see table C-7) for the barrier installed in the K-25 cascade is attributed to the fact that chlorine trifluoride activities almost ceased during this period.

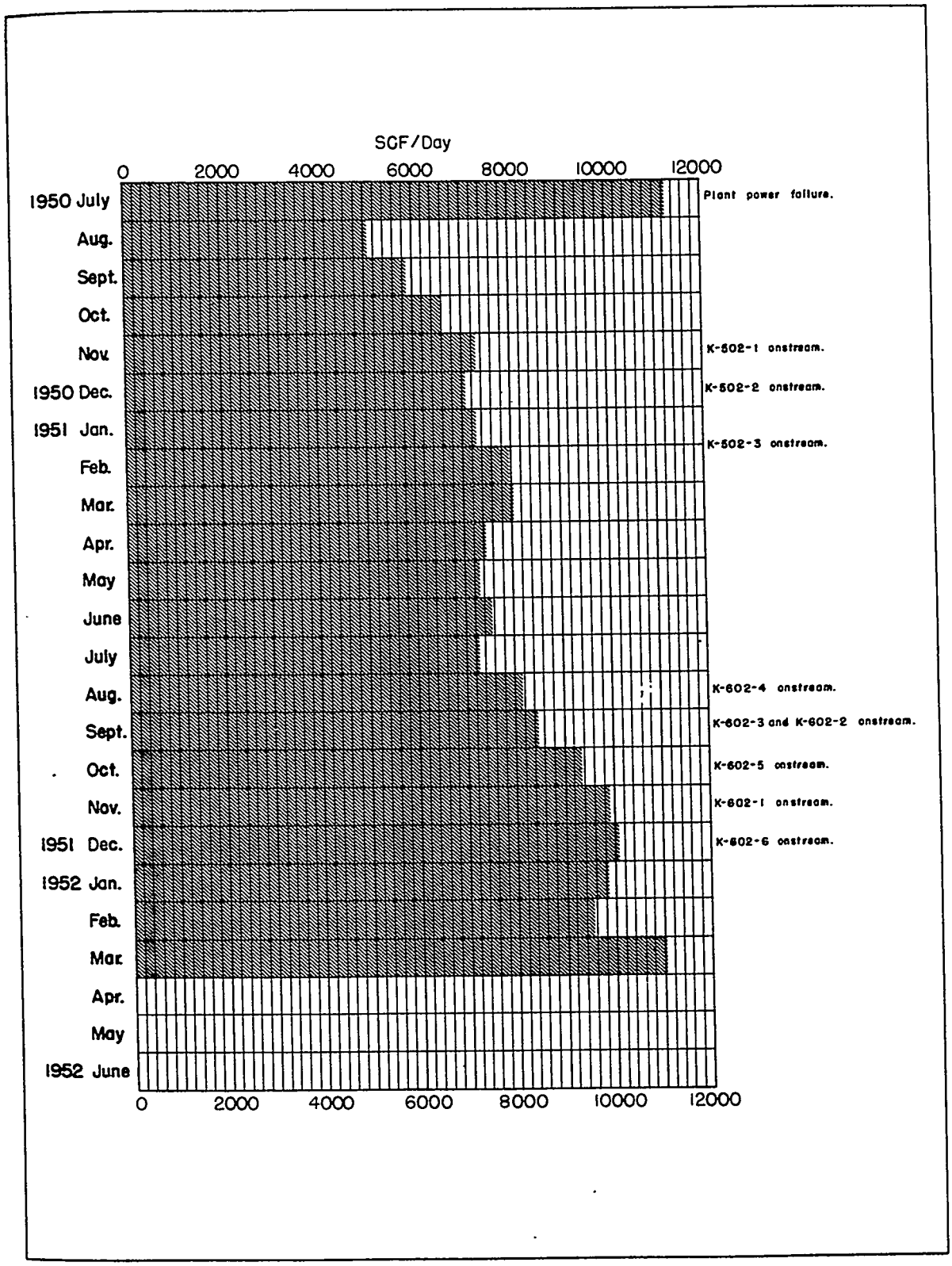
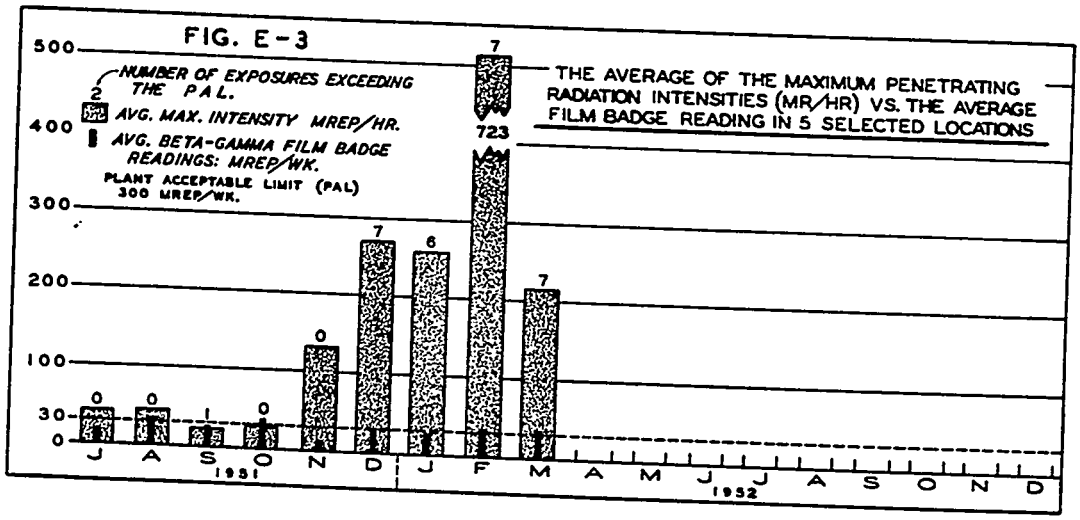


FIGURE C-5

CASCADE PURGE RATE

exposures reported in the section of this report concerning accidents, as well as by higher average exposures for personnel in the locations named, the average badge exposure in these locations being 36 mrep/wk. for this quarter as compared to 27 mrep/wk. for the preceding quarter. Figure E-3 compares the monthly averages of the maximum penetrating radiation dosage rates found on audit surveys of the above locations with the average weekly beta-gamma personnel exposures in the same locations as shown by film badge readings, thus relating the maximum potential hazard to the actual personnel exposure. The decrease in radiation noted for March following the high levels for February is due largely to improved procedures for handling equipment in or removed from the fluorination system of the K-1131 Feed Plant.

Air Activity Levels. The average air activity in the 10 locations where shift-length air samples are routinely taken increased from the 0.072 c./min./ft.^{3} figure of last quarter to 0.14 c./min./ft.^{3}. This 92% increase is primarily attributable to operations and changes in the K-1131 Feed Manufacture Facility and to material pulverizing operations in the K-1231 Building. Of the approximately 1700 shift-length air samples taken, only 1% showed air contamination levels exceeding the P.A.L. of 2 c./min./ft.^{3}.



Water and Stream Bottom Survey Program. The slight increase in the average beta activity of the K-25 sanitary water from 6 c./min./100 ml. last quarter to 10 c./min./100 ml. for this quarter is still only comparatively slightly above the normal background for beta activity in the Clinch River, and is thus not considered significant from a health standpoint. No significant change in the uranium concentration of 0.2 to 10 ppm. in the Clinch River and Poplar Creek mud has occurred.

INDUSTRIAL HYGIENE

Additions to the basic industrial hygiene program consist of:

1. The purchase of a sound survey meter and a sound level meter and octave analyzer.
2. The hiring of an additional laboratory technician which will make possible an increase in the audiometric services, these to be further augumented by the addition of a soundproofed examination room.

TABLE E-2

AIR-BORNE CONTAMINANTS

Contaminant	Maximum Allowable Concentration	Total No. of Analyses	No. of Positive Findings
Acetone	500 ppm.	50	0
Ammonia	100 ppm.	3	0
Carbon Monoxide	100 ppm.	149	3
Carbon Tetrachloride	50 ppm.	10	0
Coolant*Decomposition Products	3 ppm.	3	3
Dust (High Silica)	5 MPPCF	3	0
Freons	1000 ppm.	265	10
Fluoride Dusts	2.5 mg./m.^{3}	13	0
Fluorine	1 ppm.	22	8
Hydrogen Chloride	5 ppm.	1	0
Hydrogen Cyanide	10 ppm.	1	0
Hydrogen Fluoride	3 ppm.	16	14
Lead	0.15 mg./m.^{3}	1	0
Mercury	0.10 mg./m.^{3}	576	2
Nickel	0.5 mg./m.^{3}	20	10
Nickel Carbonyl	1 ppm.	5	0
Nitrogen Oxides	25 ppm.	3	2
Phosgene	1 ppm.	85	10
Radon	10^{-8} curies/m.^{3}	4	0
Trichloroethylene	200 ppm.	13 (Note)	4
Uranium	0.15 mg./m.^{3}	65	13

* Decafluorobis Cyclohexane decomposition products calculated as hydrogen fluoride.

Note: This represents 5-1/2 hours of continuous sampling.

The transfer of 1 piece of equipment to the new Barrier Plant Building has helped reduce the air-borne nickel in 1 area, while a special nickel powder reclaiming operation in an adjoining area produced the most widespread air contamination yet encountered. This operation was suspected as being the main contributing factor in the increase of dermatitis cases from the Barrier Plant. Increased volume of operations in the new building has contributed a few cases of dermatitis because more and newer employees have been involved.

The electric arc furnace for the reclaiming of scrap barrier materials has been completed and put into operation. Air analyses in the work area indicate that the ventilation is not sufficient and recommendations for improved ventilation have been made.

The stepped-up barrier research program has continued to show an increase in the number of positive urinary mercury determinations from Laboratory Division employees.

TABLE E-3

URINARY CONTAMINANTS

Contaminant	Maximum Allowable Concentrations	Total No. of Analyses	No. Positive Findings IND.	VMR.
Alpha Activity	10 c./min./100 ml. Recalled if above 3 c./min./100 ml.	645	29	11
Fluorides	4 mg./liter. Recalled if above 1.5 mg./liter.	566	40	12
Lead	0.10 mg./liter.	1	0	0
Mercury	0.10 mg./liter.	110	16	0
Plutonium	3.5 c./min./24 hr. specimen	17	0	0
Uranium	Undetermined. Recalled if above 0.005 mg./liter.	761	112	30

IND. Urine specimens submitted in scheduled Industrial Health Examinations.
VMR. Urine specimens submitted following suspected material releases or absorption.

The general conditions noted last quarter for the Feed Plant have remained approximately the same even though an increased emphasis on house cleaning has been instituted. The increased capacity resulting from the addition of other fluorination towers and the continued tendency of employees to fail to wear respiratory protection properly have contributed to an increase in the positive urinary uranium findings on routine scheduled examinations. Those detected following suspected and recognized material releases have declined approximately 87%. Positive urinary fluoride determinations have followed a similar pattern on routine scheduled visits. The increased number of positive urinary alpha activity determinations has been influenced most by the adoption of a more efficient method of analysis.

The project for the disposal of the waste fluorine from the Feed Plant has progressed to the point that contracts have been awarded for all of the equipment.

The introduction of basic Feed Plant raw materials, on a small scale, from the Hanford Waste has increased the number of employees who are examined routinely for plutonium and fission products.

UNCLASSIFIED

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

ChemRisk/Shonka Research Associates, Inc., Document Request Form <2539

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A
Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number K-803 Date of document 10/1/52

Title and author (if document is unnumbered) Copy tab pgs only

(This section to be completed by Document Center)

Date request received 10/12/95.

Date submitted to ADC 11/30/95

Date submitted to HSA Coordinator 10/12/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 11/30/95 1/10/96

Date received from CICO 1/5/96 2-22-96

Date submitted to ChemRisk/Shonka and DOE 2-22-96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

UNCLASSIFIED

K/EM-285

SANITIZED VERSION OF K-25 PLANT QUARTERLY REPORT FOR FOURTH FISCAL QUARTER APRIL 1-JUNE 30, 1952

(EXTRACTED FROM CRD DOCUMENT # K-803)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

November 30, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release to the public by:

Asst. [signature] 2/21/96
Technical Information Officer Date
Oak Ridge K-25 Site

Downgraded to CAD: 12/8/93
Sam W. Wohlfort (CAR)
Downgraded to CAD 12/8/93
Gary W. Hall ADD

CONFIDENTIAL

SECRET
SECURITY INFORMATION

Date of Issue: October 1, 1952

This document consists of 212 pages
No. 1 of 65 copies. Series A.

Report Number: K-803

UNCLASSIFIED

K 803 17 A

K 803 17 A

INVENTORIED
NOV 7 1952
By

K-25 PLANT QUARTERLY REPORT
FOR
FOURTH FISCAL QUARTER
APRIL 1 - JUNE 30, 1952

PLANT RECORDS DEPT.
CENTRAL FILES
REC. E24372
FILE
X-
X-

Classification Changed To
CAD
(Insert Appropriate Classification Level and Category)

By authority of: Gary W. Hall 12/8/93
(Authority for Change in Classification) (Date)

By: Sam W. Wohlfort 1/13/94
(Signature of Person Making Change) (Date)

Verified by: Gary W. Hall 2/11/94
(Signature of Person Verifying Change) (Date)

UNCLASSIFIED

CENTRAL LIBRARY
REC. Q 88854
FILE
X-REF.
X-REF.

CARBIDE AND CARBON CHEMICALS COMPANY
UNION CARBIDE AND CARBON CORPORATION
K-25 Plant
Oak Ridge, Tennessee

RESTRICTED DATA
This document contains restricted data as defined in the Atomic Energy Act of 1946. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.

RESTRICTED DATA
This document contains Restricted Data as defined in the Atomic Energy Act of 1954. Unauthorized disclosure subject to Administrative and Criminal Sanctions.

-2-

SECRET
SECURITY INFORMATION

CONFIDENTIAL

The K-101 coolant removal unit was placed on stream again on June 16 when the C-816 concentration at Cell K-302-5.4 reached 7.0%. A leak in the tower reflux drum necessitated the shutdown of the unit for repairs from June 20 until June 22. The unit operated until June 24 and was then taken off stream for maintenance. A total of 208 pounds of C-816 coolant - uranium hexafluoride mixture was drained from the tower during this period of operation. As of June 30 the coolant concentration at the peak point, Cell 4, Building K-302-5, was 1.7%.

Freon-114 Coolant Leaks

A Freon-114 leak to the cascade of 4.1 pounds per day occurred on June 3, in Cell 7, Building K-502-3. A leak was indicated on the Stage 5 gas cooler, and the converter was replaced with another containing a rebuilt gas cooler. The original Stage 5 converter was vacuum-tested in the K-1401 converter shop, and no leak could be found. The search for the leak was continued in the cell, and the leak was isolated to the Stage 4 gas cooler. The Stage 4 converter was also replaced with a converter with a rebuilt gas cooler.

Cascade Stream Efficiency

The cascade operated with an onstream efficiency of 98.92% this quarter, a decrease of 0.43% below that of last quarter. Table C-6 presents a breakdown of the offstream time for this quarter. The monthly cascade onstream efficiencies experienced during fiscal years 1951 and 1952 are shown in figure C-3. Table C-7 presents the cost of offstream time, broken down by causes, for the present and previous quarters.

Material Releases

The releases of uranium hexafluoride occurring in the plant during the quarter and the known losses of uranium and uranium-235 are listed in table C-8. On April 1, a release occurred in Building K-1004-A when a cylinder containing 2,559 grams of uranium became overheated during a material transferring operation, releasing the entire contents of the cylinder. Subsequent decontamination operations recovered 1,451 grams of uranium, resulting in a net loss of 1,108 grams uranium.

A minor release occurred on April 10 in the K-309-3 test loop when a flexible connection to the fluorine charging line became loosened during a pressure testing operation. The duration of the release was only a few seconds and the loss was considered to be very small.

Two minor releases occurred in Vault 15-A on May 4 and May 5. The corrosive action of material contained in two drums caused the drums to develop leaks with the resultant loss of 7 grams of uranium.

On May 19 a release occurred in the K-631 tails withdrawal facility when a faulty gasket on the condenser side of a 10-ton cylinder allowed material to escape for a period of approximately three

TABLE C-8

MATERIAL RELEASES

Date	Location	Known Loss	
		Grams U	Grams U^{235}
4-1	K-1004-A, Room 19	1,108	5
4-10	K-309-3 Test Loop	Minor, undetermined	
5-4	Vault 15-A	1	0
5-5	Vault 15-A	6	0
5-19	K-631	1,533	74
5-23	K-703 Laboratory	Minor, undetermined	
5-27	K-1401	7,668	55
6-52	K-1004-D	564	6
6-8	Vault 15-A	562	3
6-11	K-303-6 Laboratory	2	0
6-23	K-306-7 Product withdrawal	10	9
4,5,6-52	K-1401 Converter decontamination	2,705	19

minutes. The resulting loss was determined to be 1,533 grams uranium and 74 grams uranium-235.

A release of small but unmeasured size occurred May 23, in the K-703 laboratory when a beaker containing a uranyl zinc acetate solution cracked and released the contents.

On May 27, 7,668 grams of uranium and 55 grams of uranium-235 was lost during the disassembly of a pump in the K-1401 building. The pump had become plugged when the flutter valve stuck, necessitating the disassembly of the pump.

During the month of June, a barrel of waste solution in the K-1004-D laboratory developed a leak, releasing part of the contents. The loss was determined to be 564 grams uranium and 6 grams uranium-235.

On June 8, a release occurred in Vault 15-A due to the failure in the plastic liner of a drum by corrosive action. A total of 562 grams uranium and 3 grams uranium-235 was lost.

A sample tube containing an ammoniacal uranium solution was spilled in the K-303-6 control laboratory. The release resulted in a loss of 2 grams of uranium.

On June 23, a leak developed at the plug on the cylinder head of product cylinder No. 349, resulting in an estimated loss of 10 grams uranium and 9 grams uranium-235.

During the quarter, twelve converters were removed from K-31 and sent to K-1401 for decontamination. These converters were fluorinated at a high temperature for several hours and the recovered uranium hexafluoride vented to the atmosphere. It was calculated that 2,705 grams uranium and 19 grams uranium-235 was lost in this manner from these twelve converters. Several other converters were so treated during the quarter but, due to a lack of sample results, the loss for these operations could not be calculated. No estimate of the loss has been made.

PURGE CASCADE OPERATION

Purge Rate

Buildings K-312-1 and K-312-3 operated on the side and top purge, respectively, throughout the current quarter. Building K-312-2 operated on the side purge in parallel with Building K-312-1 a total of 139 hours this quarter, purging a total of 34,388 scf of contaminant gases. The average total purge rate for the quarter was 12,318 scf per day at an average uranium hexafluoride concentration in the purge gases of 137×10^{-6} mol per cent. Of this total, the K-312-1 side purge building averaged 10,035 scf per day and the remaining 2,284 scf per day was purged by K-312-3, the top purge building. The purge rate was 21.6% above the average for the previous quarter. This was mainly due to the large number of equipment changes in the

cascade. Each change requires that considerable amounts of nitrogen be admitted to the cascade in order to remove all traces of uranium hexafluoride from the equipment, thus minimizing the possibility of personnel exposures. In addition, a large number of seal failures occurred in the K-27 and K-31 plants.

Purge System Changes

The feed point in Building K-312-1 was changed from Cell 5 to the B-outlet of Cell 3. This was accomplished by connecting the feed header into the building evacuation header and then into Cell 3. This essentially lengthens the enriching portion of the side purge cascade, thereby permitting higher purge rates to be attained.

BARRIER PERMEABILITY SUMMARY

The barrier permeabilities in the K-25 plant indicated a change of +0.05% per month during the current quarter. The rate of permeability change during the previous two-year period is +0.07 ± 0.09% per month. The unplugging tendency shown in the K-25 plant during the past two years is primarily the result of an extensive chlorine trifluoride treatment program in the plant and therefore does not indicate the actual behavior of the barrier permeabilities in the plant. For the same reason, the permeability change experienced during the current quarter is not comparable with the experience of the past two years. The reason for the increase in the average permeability of the barrier in the K-25 plant during the current quarter is not evident since there was very little chlorine trifluoride unplugging activity during the quarter. Only two cells were treated with chlorine trifluoride for unplugging purposes during the quarter. The rates of permeability change for the current quarter and for the previous two years are shown in table C-9.

The barrier, which constitutes slightly more than 50% of the barrier installed in the K-25 plant, experienced a permeability increase of 0.08% per month during the quarter. The reason for the small permeability increase is not discernible since very little unplugging activity has taken place during the quarter in this type of barrier.

The barrier, which are installed in the lower portions of the K-25 plant, showed permeability changes of +0.07% and -0.20% per month during the quarter.

Reasons for the permeability increase exhibited by the barrier during the quarter are not evident. The permeability change is probably within the limits of normal permeability variations observed in the plant. The permeability decrease exhibited by the barrier is higher than would normally be expected from this barrier. However, again the cause of the permeability change is not discernible.

Air Activity Levels. The average alpha air activity in the 10 locations where shift-length air samples are routinely taken decreased by 42% from the 0.133 c/min./ft.^{3} figure of last quarter to 0.077 c/min./ft.^{3} during this report period. Of approximately 1745 shift-length air samples taken, 11, or 0.63%, exceeded the P.A.L. of 2 c/min./ft.^{3},* the corresponding value for the previous quarter being 0.95%.

Water and Stream Bottom Survey Program. The increase in the average beta activity in the K-25 sanitary water from 10 c/min./100 ml. to 23 c/min./100 ml. this period was due to short intervals of comparatively high activity in the Clinch River resulting from the release of radioactive materials at another installation. At the low levels concerned, which are only slightly above the normal river background of approximately 5 c/min./100 ml., no significant problem was considered to have been produced. No significant change in the uranium concentration of 0.2 to 10 ppm. in the Clinch River and Poplar Creek mud has occurred.

INDUSTRIAL HYGIENE

There have been no changes made in the basic industrial hygiene program during the last quarter. General plant expansion and increased activity have been responsible for an increase in the number of employees involved and the average number of visits per employee.

There was an over-all drop of approximately 50% in positive urinary uranium findings for the whole plant. Forty-eight per cent of all positive urinary uranium and a similar proportion of positive urinary alpha activity findings came from the Feed Plant, in spite of the increased program of cleanliness there. Twenty-eight per cent of all positive urinary uranium findings were the result of 9 laboratory employees being in the vicinity of material releases. Eight other work areas contributed 24% of the positive urinary uranium findings with approximately the same number from each area.

The number of positive urinary fluoride determinations has remained about the same as that from the previous quarter; however, there was an increase in the average value determined. This is the result of an increase in the magnitude and frequency of individual exposure to fluoride and fluorinated compounds in the Feed Plant.

An increased number of positive findings from analyses of community pollution air samples for fluorine occurred near the end of the quarter. The new mechanism for the removal of fluorine from the waste gases from the Feed Plant is in the final stages of installation and adjustment.

The melter in the Barrier Plant is now on a continuously operating basis which is regulated by furnace conditions only and the nickel carbonyl level during the charging of larger batches has caused some concern. Dangerous concentrations of nickel and nickel carbonyl have been detected in the atmosphere of this room. Detailed recommendations have been made for correcting this situation.

-7-

* At the end of this report period, the P.A.L. for alpha air contamination was reduced to 1 c/min./ft.^{3} in order to conform with recent recommendations of the Subcommittee on Internal Dose of the National Committee on Radiation Protection.

TABLE E-2

URINARY CONTAMINANTS

Contaminant	Maximum Allowable Concentrations	Total No. of Analyses	Positive Findings IND.	Positive Findings VMR.
Alpha Activity	10 c/min./100 ml. Recalled if above 3 c/min./100 ml.	638	4	19
Fission Products	200 c/min./24 hr. specimen.*	2	0	0
Fluorides	4 mg./liter. Recalled if 2.0 mg./liter.**	535	45	13
Lead	0.10 mg./liter.	4	0	0
Mercury	0.10 mg./liter.	132	0	0
Plutonium	3.5 c/min./24 hr. specimen.	47	0	0
T.C.A. ***	75 mg./liter.	2	0	2
Uranium	Not determined. Recalled if above 0.005 mg./liter.	787	58	51

* Maximum permissible limit for continuous exposure in use at Oak Ridge National Laboratories.

** This limit is being increased as of this quarter.

*** Trichloroacetic acid. Level at which some narcosis from trichloroethylene has been detected.

IND. Urine specimens submitted in scheduled Industrial Health Examinations.

VMR. Urine specimens submitted following suspected material releases or absorption.

TABLE E-3

AIR-BORNE CONTAMINANTS

Contaminant	Maximum Allowable Concentrations	Total No. of Analyses	Positive Findings
Acetone	500 ppm.	41	1
Aldehydes	5 ppm.	1	0
Ammonia	100 ppm.	14	5
Carbon Monoxides	100 ppm.	159	3
Dust (High Silica)	5 MPPCF	1	1
Dust (Non Silica)	15 mg./m.^{3}*	12	0
Freons	1000 ppm.	264	0
Fluoride Dusts	2.5 mg./m.^{3}	20	0
Fluorine	1 ppm.	69	38
Hydrogen Chloride	5 ppm.	4	0
Hydrogen Fluoride	3 ppm.	19	9
Mercury	0.10 mg./m.^{3}	462	20
Nickel	0.5 mg./m.^{3}	15	7
Nickel Carbonyl	1 ppm.	5	1
Nitrogen Oxides	25 ppm.	10	5
Phosgene	1 ppm.	52	0
Radon	10^{-8} curies/m.^{3}	5	0
Trichloroethylene	200 ppm.	25**	4
Uranium	0.15 mg./m.^{3}	49	11

* Recommended at 1952 meeting of Governmental Industrial Hygienists.

** This represents a total of greater than 345 minutes of continuously recorded air sampling. The MAC was exceeded for 120 minutes of this time.

Eighteen cases of dermatitis were directly traceable to employment in the Barrier Plant.

An elevated alpha activity determination with a negative uranium finding from a urine specimen submitted by an employee working with Hanford Waste materials and 1 puncture wound, involving similar materials, were followed up with urinary plutonium and fission products analyses. All results were negative.

Two breath radon determinations were made on samples submitted by employees who had been exposed to radium salts while drilling holes through the edges of commercially supplied radiation sources. All results were negative.

The determination of trichloroacetic acid in urine as suggested by several authorities was applied to 2 employees working in air concentrations of trichloroethylene in excess of the MAC. The results indicate that we now have a useful method for evaluating the magnitude of future trichloroethylene exposures.

There was no clinical evidence of permanent damage having been suffered by any employee during the quarter as a result of exposure to atmospheric contaminants, high environmental temperatures, or high sound levels.

EMERGENCY PLANNING AND ACTIVITIES

Six surprise plant-wide emergency drills including 2 on gas releases, 2 on fire, 1 on critical reactions, and 1 on a combination of fire and sabotage were held. These simulated emergencies involved various emergency aspects including area evacuation, personnel rescue and treatment, operational shutdown and control, communications, and security control. In addition to these drills, the various shift organizations planned and took part in 31 other emergency simulations which also involved a wide variety of topics. The increased efficiency with which employees handle these drills indicates their value in the plant preparedness program.

The plant emergency public address system was completed and provides the plant with a convenient, efficient method of personnel control in handling emergencies.

Work has continued on the installation of diesel-powered electrical generating equipment for providing emergency power to certain plant systems, and such installation is now practically completed.

The fire department responded to 32 calls which were not connected with the emergency drill program. The plant emergency squad responded to 31 calls, most of which were associated with the various drills.

PLANT SECURITY

SECURITY PRACTICES

Clearances

Security clearances for 773 prospective K-25 employees and 118

adjusted observed deficiency. (The unadjusted observed deficiency is that deficiency which is reported in the SF Material Accountability Report and is a statement of the experience for the monthly time interval involved at that time.) The adjustment for recoveries from chlorine trifluoride treatment was excluded from the adjusted observed deficiency in order to make a consistent comparison between this deficiency and the estimated deficiency which did not include such adjustment. The adjusted observed deficiency included two corrections - the first is a correction for an improved method of determining K-31 inventories; the second is a correction for the difference between theoretical and observed waste purities.

By comparing the estimated deficiency with the observed adjusted deficiency it was found that the total estimated uranium and uranium 235 deficiencies accounted for 99.6 and 51.1 per cent respectively, of the corresponding observed adjusted deficiencies.

THE EFFECT OF THE NON-IDEALITY OF URANIUM HEXAFLUORIDE VAPOR ON CASCADE INVENTORY DETERMINATIONS

In view of the higher operating pressures in the K-27 and K-31 plants, a study was made to determine the deviation of uranium hexafluoride vapor from ideal behavior at these higher pressures and the effect of such deviation upon building and cell inventories. The modified van der Waals

equation* for pressures up to one atmosphere is

$$P(1 + AP)\ V = nRT$$

where A is a function of temperature only, and the term (1 + AP) represents the correction factor applied to the inventory as calculated by the ideal gas law.

Values of A were obtained from laboratory data* as follows:

Temperature, °F.	A, atm.$^{-1}$

The correction factor to be applied to process gas inventory at these two temperatures is then,

and

where P is in units of psia.

Since ideal behavior is assumed in calculating process gas inventories, these calculated inventories understate the inventories which are based upon the non-ideality of process gas by the following percentages:

and

where P is in units of psia.

The above expressions were used to determine the inventory correction factor and per cent understatement of inventory at the above two temperatures and at pressures of psia, as follows:

---

* Ackley, R. D., and Magnuson, D. W., Non-Ideality of Uranium Hexafluoride Vapor, Parts I and II, Carbide and Carbon Chemicals Company, K-25 Plant, December 28, 1951, (K-840) Secret.

11

HYDROGEN FLUORIDE SCANNING IN K-31

Scans were made in the K-31 plant on three cells which were on stream for the presence of hydrogen fluoride and other light gases. These cells were K-602-2.3, K-602-3.8, and K-602-3.10. For this purpose, a chlorine trifluoride type tube rack calibrated for hydrogen fluoride analysis was used.

The observed data, obtained on May 19, 1952, is tabulated below for two of the three cells. The data for Cell K-602-2.3 were too erratic to be of value.

		Mass Units		
Location	Mass	Rack Residual Observed Before Placing On Stream	Observed On Stream	Rack Residual Observed After Taking Off Stream
K-602-3.10	19	9	118	10
	20	40	84	41
	28	2	7.9	2.7
	32	0	14.6	1
K-602-3.8	19	10	120	10.4
	20	41	84	42
	28	2.7	3	2.3
	32	1	10.3	1

The difference between the first and second columns shown under "Mass Units" represents the true on stream signal while the third column is included to show the degree to which the rack returned to its original residual reading. The rack in use had a calibration constant of 0.04 for hydrogen fluoride. This would indicate concentrations of 1.76 and 1.72 per cent hydrogen fluoride respectively for the two cells enumerated above.

UNCLASSIFIED

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number K-960 Date of document 7/3/53

Title and author (if document is unnumbered)

Please copy Tab pages only

(This section to be completed by Document Center)

Date request received 10/12/95.

Date submitted to ADC 11/30/95

Date submitted to HSA Coordinator 10/12/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 11/30/95 1/10/96

Date received from CICO 1/5/96 2-22-96

Date submitted to ChemRisk/Shonka and DOE 2-22-96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

UNCLASSIFIED

K/EM-286

SANITIZED VERSION OF K-25 PLANT QUARTERLY REPORT THIRD FISCAL QUARTER JANUARY 1, THRU MARCH 31, 1953

(EXTRACTED FROM CRD DOCUMENT # K-960)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

November 30, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release to the public by:

A21 [signature] 2/21/96
Technical Information Officer Date
Oak Ridge K-25 Site

[redacted]AL

[redacted]

[redacted]

This [redacted]ent consist[redacted] 256 pages
N[redacted] 40 of [redacted] copies, Series A.

DATE OF ISSUE: July 3, 1953

REPORT NO. K-960

UNCLASSIFIED

E65/18

K-25 PLANT QUARTERLY REPORT
THIRD FISCAL QUARTER
January 1, thru March 31, 1953

Clas[redacted]ication Ch[redacted]ged To
CRD
(Insert Appr[redacted]riate Classif[redacted]ation Level [redacted]d Category)

By auth[redacted]ity of: Sam W. Hall 12/8/[redacted]
([redacted]uthority fo[redacted]hange in Cl[redacted]sification) ([redacted]te)

B[redacted] Sam W. Wohlfort [redacted]/8/94
(Sig[redacted]ure of Pers[redacted] Making Chan[redacted]) (Date)

Verified [redacted] Sam W. Hall 2/11/94
([redacted]gnature of P[redacted]son Verifying [redacted]ange) (Date)

CENTRAL LIBRARY
REC. W 40480
FILE
X-REF.
X-REF.

K-25 PLANT
CARBIDE AND CARBON CHEMICALS COMPANY
A DIVISION OF UNION CARBIDE AND CARBON CORPORATION
OAK RIDGE, TENNESSEE

K 960 40 A

UNCLASSIFIED

K 960 40 A

[redacted]

This document [redacted]ata [redacted] the Atomic Energy Act of 1946. Its transmittal or the disclosure of its [redacted]uthorized person is prohibited.

RES[redacted]D DATA
This d[redacted] Act of [redacted] subject to [redacted]ministrat[redacted] Crimi[redacted] Sanctions.

-2-

[redacted]

[redacted]

TABLE C-5
Coolant Withdrawal Operations

On Stream		Off Stream		Pounds C-816 - Uranium Hexafluoride Removed
Date	C-816 Concentration	Date	C-816 Concentration	
January 8	3.50%	January 13	0.13%	75.0
March 2	3.30%	March 9	0.10%	902.5
March 15	4.54%	March 18	0.24%	97.7
March 27	1.76%	Still on stream		591.7*
			Total	1,666.9

*This amount was removed by March 31, although the withdrawal operations were not completed

TABLE C-6
Freon-114 Coolant Inleakages

Date	Rate of Inleakage, Pounds per Day	Total Inleakage, Pounds	Converter Replaced, Location
January 18	6.2	0.8	K-502-3.6.3
January 20	58.0	4.4	K-502-3.6.2
January 30	283.0	61.9	K-502-2.9.8
February 4	34.5	7.0	K-502-1.5.2
February 9	2.9	8.0	K-502-1.5.2
February 17	12.0	2.1	K-502-2.9.8
March 2	-	5.0	K-502-3.8.3
March 9	-	350.0	K-502-2.2.6
March 17	1,944.0	133.0	K-502-1.9.1
Total		572.2	

Material Releases

Three process gas releases occurred at the K-25 plant during the third quarter of fiscal year 1953. On January 8, 1953, approximately 193 pounds of uranium hexafluoride was released to the atmosphere from a Paducah product cylinder. The release resulted from a valve-gasket failure on the cylinder while the cylinder was being heated in the steam bath of Building K-131.

The second process gas release occurred in Building K-631 on January 13, 1953. An estimated 450 pounds of material was released when a drain hose to the reservoir of a Beach-Russ compressor became detached during maintenance operations.

The last process gas release during the quarter occurred in the K-1401 building on January 30, 1953. An estimated 0.28 pounds of uranium hexafluoride was lost to the atmosphere from the 20-stage pilot plant. A summary of the material releases, which occurred during this quarter, is shown in table C-7, and includes the material lost during converter decontamination at Building K-1401.

TABLE C-7
Material Releases

Date	Location	Loss: Grams U	Loss: Grams U^{235}
1-8-53	K-131	59,193	473.5
1-13-53	K-631	138,015	793.6
1-30-53	K-1401	86	0.6
1-1 to 3-31-53	K-1401 compressor and converter decontamination	29,913	353.0
Totals		227,307	1,620.7

Cascade Stream Efficiency

The entire K-25 cascade operated with an onstream efficiency of 99.09% during this quarter, a decrease of 0.26% below that of the preceding quarter. The building onstream efficiencies were

97.15%, 97.62%, and 99.37% for K-31, K-29, and K-25-27, respectively. The decreased efficiency this quarter resulted largely from an intensive inleakage control program and from a number of engineering tests.

The monthly cascade onstream efficiencies experienced during the 1952 and 1953 fiscal years are shown in figure C-3. The cost of offstream time, broken down by causes, for the present and preceding quarters is presented in table C-9. Figure C-4 shows a tabulation of the monthly offstream costs for fiscal years 1952 and 1953 to date. The cost of offstream time for Building K-31 during this quarter was 71.9% of the total offstream cost while the cost of offstream time charged to Building K-29 was 16.8%

TABLE C-8
Separating Cascade Cell Offstream Time

	Offstream Time, hours	% of Total Offstream Time	Increase in Offstream Time Over Previous Quarter, hours	No. of Times Offstream	% of Total No. of Times off Stream	Increase in no. of Times Offstream Over Previous Qtr.
Pump Seal Repairs	3,845.13	29.67	1,404.32	375	18.08	+122
Stage Motor Repairs	968.61	7.47	682.27	102	4.92	+63
Stage Pump Repairs	887.54	6.85	129.34	31	1.49	+4
Converter Replacement	1,518.99	11.72	-104.75	46	2.22	-12
Electrical Equipment Repairs	358.60	2.77	172.23	352	16.97	+155
Light Contaminant Inleakage Checks	614.62	4.74	144.13	590	28.45	+139
Control Valve Repairs	519.29	4.01	117.40	179	8.63	+30
Coolant Inleakage Checks	271.29	2.09	187.05	26	1.25	+1
Instrumentation Repairs	223.60	1.72	140.55	46	2.22	+29
Lube System Repairs	25.28	0.19	-43.73	33	1.59	-3
Coolant System Repairs	639.26	4.93	423.35	75	3.62	+49
Engineering Tests	576.22	4.44	558.85	50	2.41	+43
Chlorine Trifluoride Operations	962.53	7.42	234.00	47	2.27	-1
K-27 Improvement Program	1,258.23	9.70	-573.84	19	0.91	-26
Miscellaneous	295.89	2.28	178.87	103	4.97	+67
Special Coolant Leak	-	-	-27.16	-	-	-1
Totals	12,965.08	100.00	3,622.88	2,074	100.00	+659

Stream Efficiency This Quarter 99.09%

Stream Efficiency Last Quarter 99.35%

TABLE C-9
Cost of Offstream Time

	October 1952	November 1952	December 1952	January 1953	February 1953	March 1953
Pump Seal Repairs	71,276.24	73,643.10	71,211.77	89,366.45	110,605.63	94,582.08
Stage Motor Repairs	5,186.63	4,465.44	23,508.83	23,320.45	8,015.67	9,516.40
Stage Pump Repairs	49,856.15	53,664.70	31,549.48	58,829.97	46,327.31	41,879.10
Converter Replacement	133,451.72	76,820.85	108,847.37	77,892.47	85,735.12	74,524.94
Electrical Equipment Repairs	267.64	1,294.15	3,217.61	4,081.58	-	459.47
Light Contaminant Inleakage Checks	16,734.11	28,603.63	16,008.37	25,420.27	23,302.94	26,137.07
Control Valve Repairs	20,454.73	31,713.11	19,346.41	38,563.47	34,902.60	14,163.55
Coolant Inleakage Checks	1,091.43	1,770.24	5,669.53	240.61	3,390.85	7,336.12
Instrumentation Repairs	568.16	1,309.12	7,777.03	774.98	4,748.61	5,592.99
Lube System Repairs	1,759.69	623.33	2,119.37	674.62	847.28	241.30
Coolant System Repairs	554.75	1,815.00	7,196.24	1,625.91	2,888.89	4,714.57
Engineering Tests	156.42	82.76	298.47	105,858.84	17,800.59	11,983.07
Chlorine Trifluoride Operations	33,174.18	29,633.42	17,831.44	73,507.40	51,712.65	26,534.73
K-27 Improvement Program	14,602.30	7,848.35	10,942.51	5,456.18	7,568.11	9,407.10
Miscellaneous	10,505.15	398.59	4,406.41	6,150.26	904.74	4,241.36
Special Coolant Leaks	278.39	-	-	-	-	-
Totals	359,917.69	313,685.79	329,930.84	511,763.46	398,750.99	331,313.85

PURGE CASCADE OPERATIONS

Purge Rates

Units K-312-1 and K-312-3 operated as the side and top purge units, respectively, during this quarter. Unit K-312-2 was not placed into operation throughout the quarter.

Unit K-312-1 purged an average of 10,076 scf. per day and unit K-312-3 purged an additional 1,909 scf. per day. The average total purge rate was 11,985 scf. per day at an average uranium hexafluoride concentration of 66.65 x 10^{-5} mol per cent. This was an increase of 3.28% over the total purge for the preceding quarter. The monthly purge rates and uranium hexafluoride concentrations for the preceding quarter are presented in table C-10.

TABLE C-10
Total Purge Rates

Month	Average Purge Rate, scf./day	Uranium Hexafluoride Concentration, mol per cent x 10^5
October, 1952	12,121	5.25
November, 1952	11,681	4.12
December, 1952	11,010	19.85
January, 1953	11,584	20.02
February, 1953	11,782	30.61
March, 1953	12,589	149.33

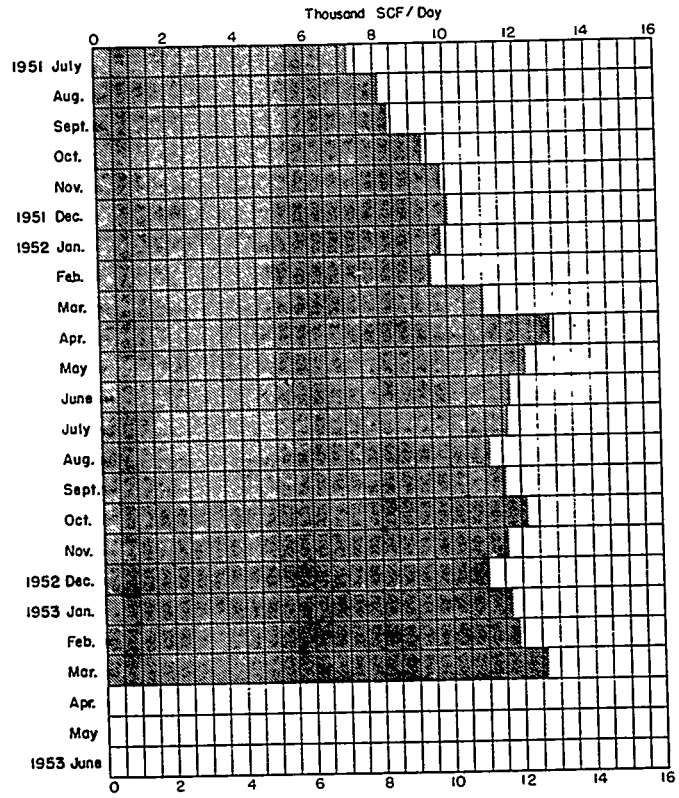


FIGURE C-5
Cascade Purge Rate

The high purge rate and uranium hexafluoride concentrations for the month of March were caused by extremely high values for a few days during the month. On March 11, the K-312-1 unit purged 10,761 scf. at a concentration of 109.9 x 10^{-5} mol per cent. This was attributed to large quantities

of Freon and nitrogen which entered the cascade on March 9 and 10 during a Freon inleakage and subsequent purging in Cell 2 of Unit K-502-2.

The K-312-1 unit purged 13,459 scf. on March 23 at a concentration of 756.5 x 10^{-5} mol per cent. During one 8-hour period on March 23, light contaminants were purged at a rate of over 15,000 scf. per day and a uranium concentration of more than 1,000 x 10^{-5} mol per cent in the K-312-1 unit. The high purge rate was caused by a leak of over 2,000 scf. per day in Cell 6 of Unit K-402-8, as well as by an unusual number of purging operations.

During the period from March 28 through March 30, the purge rates and concentrations were 11,459 scf., and 13,466 scf. at 199.7 x 10^{-5}, 1,583.4 x 10^{-5}, and 520.2 x 10^{-5} mol per cent, respectively. Two large inleakages were the main causes of these increased purge rates. On March 27, a light contaminant inleakage of 75,000 scf. per day was incurred along with the compressor failure in Stage 10 of Cell K-502-2.5. On the same date, a C-816 coolant leak of 600 pounds occurred at Stage 5 of Cell K-402-5.1 which also affected purge cascade operations.

Major Freon leaks occurred in the Paducah cascade during March and most of the Freon was withdrawn into product cylinders along with Paducah product. The cylinders containing the Freon were fed to the K-25 cascade alternately with cylinders containing normal Freon concentrations in order to maintain a minimum cascade Freon level. The Freon was subsequently collected at the K-312-1 and K-312-3 purge units. This added appreciably to the purging required during the latter half of March.

BARRIER PERMEABILITY SUMMARY

The general barrier permeability status of the barrier installed in the K-25 plant was very good with the exception of that in the K-31 building. The permeabilities in this building experienced a plugging rate almost as great as was experienced during the first fiscal quarter of 1953. This was somewhat disturbing since, during the second fiscal quarter, the barrier permeabilities decreased only slightly.

The barrier permeabilities in the K-29 building indicated a significant increase during the quarter. This increase was due to the correction of errors in the low pressure datum system of two of the units in the K-29 building.

The barrier permeabilities in the K-25 building increased approximately 0.01% per month during the quarter. The rate of permeability change during the preceding two-year period was + 0.06 ± 0.05% per month, which resulted from numerous chlorine trifluoride treatments and, therefore, does not represent the natural trend of permeabilities. The small permeability increase during the quarter can be considered to be a normal permeability fluctuation since only one chlorine trifluoride treatment was made during the report period; this treatment resulted in no measurable permeability change.

The permeabilities of the barrier installed in the K-25 building increased 0.03%, 0.03%, and 0.01%, respectively. These three types of barrier represent about 93% of all the barrier installed in the K-25 building. Although the permeability change rates in barrier all showed an increase, the changes are all within the limits of normal variation of the barrier permeabilities.

The permeabilities of the barrier decreased 0.03% and 0.05%, respectively, during the quarter, while that barrier increased 0.01%. The reason for these changes is not evident; however, all are considered to be normal variations.

Portsmouth Site. Nine approval letters covering these operations and 1 significant incident report concerning UF_6 condensation were issued during the quarter.

Special Hazards Consultants. At the annual meeting of the Special Hazards Consultant's Committee, the plant was commended for the progress made in its program of installing "always-safe" equipment in cascade auxiliary facilities, for revising the feed bath heating methods, and for the general plant awareness of critical mass hazards as evidenced by the various plant programs designed to lessen the probability of the occurrence of a critical reaction. However, it was also noted that changes in the plant assay gradient as contemplated under the production expansion program would pose new criticality problems, among them being the possibility of accidental accumulations of material during non-routine operations in additional plant locations.

Health Physics

Alpha Contamination. The alpha contamination problem in the plant as reflected by surveys of the 30 locations having major contamination problems increased considerably, the average contamination area and hazard indices* being 46 and 388 respectively as compared with respective averages for the preceding period of 38 and 330. The principal cause for this rise is attributed to the release of radioactive material following disassembly of equipment for repair or cleaning in the K-1131 Feed Plant coupled with more widespread contamination in the K-1231 Equipment Dismantling Building during the testing of new equipment. The upward trend in contamination for plant locations having major contamination problems is shown in figure E-2, where both the area index and the hazard index are indicated.

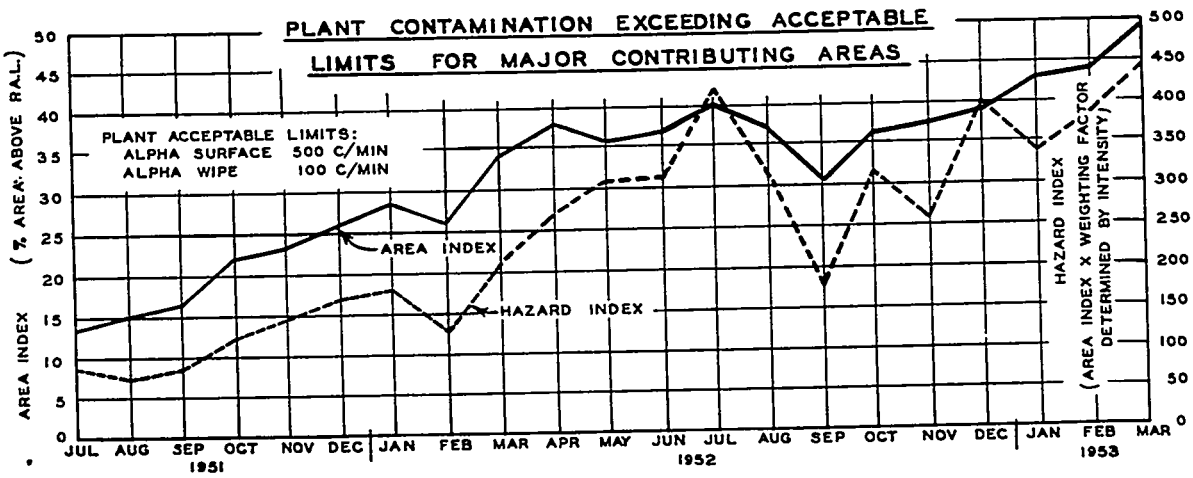


FIGURE E-2

Penetrating Radiation Levels. Penetrating radiation levels remained relatively the same, the average of the maximum readings in the 5 locations having the highest radiation intensities being 838 mr/hr as compared with 835 mr/hr for the preceding period. High radiation fields were encountered at the barrier filters in the K-1131 Feed Plant and at the storage of barrier material in the K-1231 Equipment Dismantling Building. Although the average badge exposure of 36 mrep/week is higher than the 32 mrep/week of last period, the fact that there were only 3 over-P.A.L. badges, as reported in the section on Accident Experience, indicates that adequate protective measures are being taken. Figure E-3 relates the maximum potential radiation hazard to the actual personnel exposure by comparing the averages of the maximum penetrating radiation dosage rates found on

* The alpha contamination hazard index is a figure which reflects the product of the extent and the intensity of contamination exceeding the P.A.L.; the alpha contamination area index is essentially the fraction of the area which is contaminated in excess of the P.A.L. and thus reflects the extent of contamination only.

audit surveys of the above 5 locations with the average weekly beta-gamma personnel exposures in the same locations as shown by film badge readings.

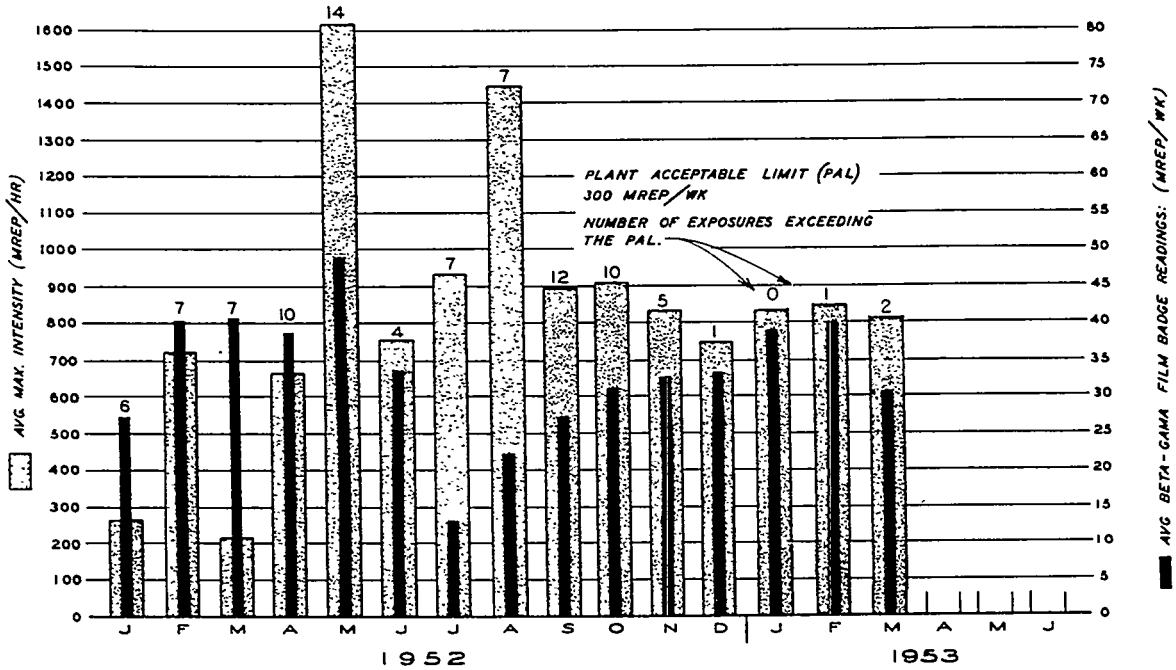


FIGURE E-3
The Average of the Maximum Penetrating Radiation Intensities and the Average Film Badge Reading in 5 Selected Locations

Air Activity Levels. The average air activity in the 9 locations where shift-length air samples are routinely taken decreased from 0.09 counts/min./ft.^{3} to 0.07 counts/min./ft.^{3}. Only 6, or 0.29%, of the 2,091 samples taken exceeded the P.A.L., the corresponding fraction from last quarter being 1.29%. This decrease is due primarily to the cessation of an experimental recovery system in K-1413 and to more efficient operation in the K-306-7 Product Withdrawal station.

Water and Stream Bottom Survey Program. The average beta activity in the treated sanitary water supply was 73 dis./min./100 ml. as compared to 38 dis./min./100 ml. reported last quarter. This level of activity, while showing a considerable increase, is not considered to present an immediate health problem. The peak activity, 219 dis./min./100 ml., was reached in January, and the level steadily declined during February and March. The increased activity may be attributed to the overflow of the storage lake into which fission products from another installation had been dumped upstream.

The average uranium concentration increase in Poplar Creek mud from 14.7 ppm. for last quarter to 23.1 ppm. is not considered to represent a significant trend. The concentration in the Clinch River remained unchanged at about 0.70 ppm.

Industrial Hygiene

The over-all increase in the urinalysis program continued to rise to a level approximately 5% above that of the previous quarter, with an accompanying increase in the positive uranium findings. An increase in the percent of positive urinary uranium findings directly traceable to the K-1131 Feed Plant was evident in spite of the bias for a lower figure as a result of 2 large material releases in

other areas. The more efficient method for determination of urinary alpha activity has continued to show an even greater increase in the number of positive findings, with a slight improvement in correlation of results. A large material release in the closing days of the previous quarter and a somewhat smaller one during the first month of this quarter had the greatest influence on the total number of positive urine findings attributable to specific instances. The principal areas contributing the greatest number of positive urinary findings continued to be the Production Division's numerous feed points and the Chemical Division's Feed Plant. The wearing of respiratory equipment at the proper time and in the proper manner still needs improvement, as borne out by the fact that approximately 20% of individuals sampled contributed all the positive findings.

The only significant finding in the urinary fluoride program was a trend toward a decrease in the percentage of positives.

A summary of the findings this quarter in the urinary contaminants program is given in table E-2.

TABLE E-2
Urinary Contaminants

Contaminant	Maximum Allowable Concentrations	Total No. of Analyses	Positive Findings	
			IND	VMR
Alpha Activity	10 c./min./100 ml. Recalled if above 3 c./min./100 ml.	1,623	50	55
Fluorides	4 mg./liter. Recalled if 2.0 mg./liter	1,032	20	19
Lead	0.10 mg./liter	9	0	0
Mercury	0.10 mg./liter	148	2	0
Plutonium	3.5 c./min./24 hr. specimen	28	0	0
Uranium	Not determined. Recalled if above 0.005 mg./liter	1,659	280	146

IND. Urine specimens submitted in scheduled Industrial Health Examinations.
VMR. Urine specimens submitted following suspected material releases or absorption.

The air sampling and analysis program has continued somewhat below the estimated optimum level, occasioned in part by the decrease in the available effective sampling time of the personnel responsible for its execution.

The mechanism for the removal of the fluorine from the exhaust gases of the Feed Plant will not be repaired and put back into operation as it has adverse effects on the operation of the plant. This will necessitate another approach to the problem of environmental air pollution.

Results of the air-borne contaminants sampling program for this quarter are summarized in table E-3.

TABLE E-3
Air-Borne Contaminants

Contaminant	Maximum Allowable Concentrations	Total No. of Analyses	Positive Findings
Ammonia	100 ppm.	2	0
Carbon Monoxide	100 ppm.	31	0
Carbon Tetrachloride	50 ppm.	2	2
Dusts (non-silica)	50 MPPCF	2	0
Fluorine	1 ppm.	42	10
Hydrogen Fluoride	3 ppm.	27	10
Mercury	0.10 mg./m.^{3}	35	4
Nickel	0.50 mg./m.^{3}	32	9
Nitrogen Oxides	25 ppm.	6	1
Radon	10^{-8} curies/m.^{3}	1	0
Trichloroethylene	200 ppm.	7	1
Uranium	0.15 mg./m.^{3}	76	15

Special projects covered included air analysis during grinding of contaminated barrier, and a survey of the former machine shop area of the Aircraft Nuclear Propulsion project in the Power House area for beryllium. Results from the former project support recommendations for special ventilation in the melter room of the Barrier Plant. Recommendation for an extensive cleanup of the machine shop area prior to occupancy was made following the survey of that location.

EMERGENCY PLANNING AND ACTIVITIES

The 6 surprise plant-wide emergency drills conducted included problems involving fire, corrosive material releases, critical reactions, loss of power, and 2 utilities breakdowns. In addition, 19 local emergency drills were conducted by shift personnel consisting of 3 radiation emergencies, 6 toxic gas releases, 2 rescue and first aid problems, and 1 utility breakdown, 2 combined sabotage and fire situations, and 5 fire drills. These simulated emergencies were designed to include area evacuation, communications and security control, personnel rescue and treatment, and operational shutdown and control. Increased efficiency in handling emergencies continues to highlight further improvement in the plant preparedness program.

The Fire Department had 425 requests for transportation due to accidents or illness this period, while the fire truck responded to 46 alarms and 19 plant or local emergency drills and the emergency truck responded to 1 emergency alarm and 21 emergency drills.

Arrangements have been completed for taking photographs in the plant under emergency conditions with Guard Department shift personnel.

PLANT SECURITY

SECURITY PRACTICES

Clearances

Security clearances were obtained for 247 prospective K-25 employees with 419 requests pending; 351 clearances were obtained for subcontractors and vendors with 607 pending.

An emergency clearance was requested and obtained for an alien employed by a subcontractor.

Subcontractors

The Federal Bureau of Investigation was called upon by a subcontractor to investigate 2 possibly significant incidents, but evidence in neither case indicated that they were due to subversive activities.

Three classified subcontracts were awarded in connection with the expansion program.

Revisions and Changes

Arrangements have been established whereby properly coded badges issued by the Atomic Energy Commission will provide access to the K-25 limited area and properly coded badges issued by K-25 will provide access to the Atomic Energy Commission administrative areas.

PLANT SECURITY EVALUATION

Significant Items

Seventy-nine classified repositories were found open and unattended by spot checks, compared

UNCLASSIFIED

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number ~~K-1050~~ K/EM-305 Date of document 11/4/53

Title and author (if document is unnumbered)

(This section to be completed by Document Center)

Date request received 10/20/95

Date submitted to ADC 12/19/95

Date submitted to HSA Coordinator 10/20/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 12/19/95 1/22/96

Date received from CICO 1/5/96 2/26/96

Date submitted to ChemRisk/Shonka and DOE 2/26/96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

K/EM-305

SANITIZED VERSION OF EXTRACT FROM K-25 PLANT QUARTERLY REPORT FIRST FISCAL QUARTER JULY 1 THRU SEPTEMBER 30, 1953

(EXTRACTED FROM SRD DOCUMENT # K-1050)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

December 18, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release to the public by:

2/23/96

Technical Information Officer — Date
Oak Ridge K-25 Site

~~SECRET~~ AEC RESEARCH AND DEVELOPMENT REPORT K-1050

SECURITY INFORMATION ~~CONFIDENTIAL~~

~~SECRET~~

PROPERTY OF
ORGDP LIBRARY

JAN 22 9 a 11 '53

K-25 PLANT QUARTERLY REPORT

FIRST FISCAL QUARTER

July 1, thru September 30, 1953

K-25 PLANT
CARBIDE AND CARBON CHEMICALS COMPANY
DIVISION OF UNION CARBIDE AND CARBON CORPORATION
OAK RIDGE, TENNESSEE

[illegible] Under U.S. Government Contract W7405-Eng-26
[illegible]
[illegible] Administrative and Control Sanctions

RESTRICTED DATA
This document contains restricted data as defined in the Atomic Energy Act of 1946. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.

~~SECRET~~

~~CONFIDENTIAL~~

~~SECRET~~

SECURITY INFORMATION

~~CONFIDENTIAL~~

~~SECRET~~

~~SECURITY INFORMATION~~

~~SECRET~~

REMAINS SRD 12/8/93
Gary W. Wahlfort (AE)
REMAINS SRD 12/8/93
Gary W. Hall ADD

This document consists of 226 pages
No. 42 of 76 copies, Series A.

DATE OF ISSUE: November 4, 1953

REPORT NO. K-1050

K 1050 42 A

K 1050 42 A

K-25 PLANT QUARTERLY REPORT

FIRST FISCAL QUARTER

July 1, thru September 30, 1953

E6568

CENTRAL LIBRARY
REC. W 405 43
FILE
X-REF
X-REF.

K-25 PLANT
CARBIDE AND CARBON CHEMICALS COMPANY
A DIVISION OF UNION CARBIDE AND CARBON CORPORATION
OAK RIDGE, TENNESSEE

~~RESTRICTED DATA~~
~~This document contains Restricted Data as defined in the Atomic Energy Act of 1954. Unauthorized disclosure subject to Administrative and Criminal Sanctions.~~

RESTRICTED DATA

This document contains restricted data as defined in the Atomic Energy Act of 1946. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.

~~SECRET~~

~~CONFIDENTIAL~~

DOCUMENT INVENTORIED
Date Initials
6/25/85 CES

SECRET
SECURITY INFORMATION

TABLE C-5
C-816 Coolant Inleakages
(Continued)

Date	Rate of Inleakage, pounds/day	Total Inleakage, pounds	Coolant Source, Cell Location	Gas Cooler Tubes Plugged Stage	Tubes
August 7	20	6	K-402-5.2	3, 5, 6	A and B rows
August 7	36	10	K-301-1.1	2	Leaking tube
August 10	43	17	K-402-3.1	2	Converter replaced
August 23	215	45	K-309-2.2	All	A and B rows
August 24	1,000	40	K-402-3.4	All	A and B rows
August 28	176	22	K-402-4.9	All	A and B rows
September 2	200	90	K-402-3.8	All	A and B rows
September 10	36	10	K-301-3.7	All	A and B rows
September 13	96	44	K-301-1.4	All	A and B rows
September 26	514	60	K-301-3.3	5	A and B rows
Total		2,102			

At the beginning of the quarter, material from the K-1413 pilot plant was processed to recover the uranium hexafluoride from C-816-uranium hexafluoride mixtures. Approximately 2,236 pounds of uranium hexafluoride and 500 pounds of C-816 coolant were thus obtained. The uranium hexafluoride was fed directly to the cascade in the K-311-1 unit. The K-101 coolant removal facilities were placed in onstream operation when the C-816 concentration at the peak point (Cell K-302-5.4) exceeded 4%. The periods of operation and the amounts of C-816 coolant withdrawn are shown in table C-6.

Freon-114 Coolant Leaks to the Cascade

A total of four Freon-114 leaks to the cascade occurred this quarter, representing a decrease of two as compared with the preceding quarter. The amount of Freon-114 which entered the cascade during this quarter decreased almost 80% as compared with the total inleakage during the preceding quarter. Table C-7 presents the Freon-114 coolant inleakages including the rates, the dates, and the locations involved.

Material Releases

On July 18 and September 13, material releases occurred in storage vault 16A. About 46 pounds of laboratory waste solution was lost when the storage containers corroded and released the material.

Approximately 15 pounds of tails material was released to the atmosphere on August 2. This occurred at Building K-413 while the alumina traps were being emptied. No employees were exposed.

TABLE C-6
Coolant Removal Facilities Withdrawal Operations

Date On	Feed Source	Date Off	Pounds C-816 Withdrawn
In operation on July 1	K-1413 material	July 3	503
July 3	Cascade	August 30	5,177
September 5	Cascade	September 10	246
September 15	Cascade	September 21	202
September 27	Cascade	Still in operation	57*
		Cascade total	5,682
		K-1413 material	503
		Total	6,185

*This amount withdrawn by September 30.

TABLE C-7
Freon-114 Coolant Inleakages

Date	Rate of Inleakage, pounds/day	Total Inleakage, pounds	Converter Replaced, Location
July 18	59	13	K-502-2.1.4 & K-502-2.1.5
August 2	107	5	K-502-1.5.3
September 13	8	2	K-502-1.10.9
September 16	4	1	K-502-2.1.9
Total		21	

A one-pound release took place in Building K-1131 on August 13. A powder seal failed on a fluorine scrubber and resulted in this release.

Two material releases occurred in the K-27 building this quarter. The first incident involved the loss of 75 pounds of process gas. On September 6, a cylinder was being heated in Unit K-402-4 prior to sampling when the contained material vaporized and escaped through an open valve. The other release occurred in Unit K-402-8 on September 30. Material was being cold trapped when a large demand for refrigerant in Building K-1131 caused the cold trap to become warm. The process gas passed through the cold trap to the atmosphere. Almost 100 pounds of material was vented from the system.

About 10 pounds of Paducah product material was lost on September 7 when a cylinder valve broke. The valve was being replaced on the cylinder in Building K-131 when the incident was incurred.

A small aluminum cylinder ruptured in Building K-1401 on September 9. A plug developed in the discharge line beyond the cylinder valve and continued heating built up sufficient pressure to rupture the cylinder and release 18 pounds of process gas to the atmosphere.

Table C-8 summarizes the amounts of material lost and the locations and dates of the releases. The material lost in Building K-1401 during equipment decontaminations also is shown.

TABLE C-8
Material Releases

Date	Location	Loss	
		Grams U	Grams U-235
7-18	Vault 16A	78	2.2
8-2	K-413	5,000	40.0
8-13	K-1131	300	2.4
9-6	K-402-4	23,003	163.7
9-7	K-131	3,067	36.8
9-9	K-1401	5,521	39.3
9-13	Vault 6A	14,156	95.0
9-30	K-402-8	29,730	262.2
7-1 to 9-30	K-1401 Equipment Decontamination	3,512	66.0
Totals		84,367	707.6

Material Withdrawals

A withdrawal of 20,031 pounds of 2.0% material was initiated on August 13 and completed on August 18. This material was used for a criticality experiment and was fed back to the cascade on September 5, 6, and 7.

The withdrawal of 37.5% material for the was begun on September 8. By the close of the quarter, a total of kilograms uranium had been withdrawn at the rate of kilograms of uranium-235 per day. The average assay of this material was 37.68%.

PURGE CASCADE OPERATIONS

Purge Rates

Units 1 and 3 of Section K-312 operated as the side and top purge units, respectively, during the first quarter of fiscal year 1954. Several cells in Unit 2 of Section K-312 were placed into operation as an auxiliary purge unit four times during the quarter. However, each time, Unit 2 operated for only two hours.

Unit K-312-1 purged an average of 9,816 scf. per day and K-312-3 purged an additional 2,382 scf. per day. The total purge rate was 12,198 scf. per day at an average of 14.12×10^{-5} mol per cent. This was an increase of 0.15% above the purge rate experienced during the preceding quarter. The monthly purge rates for fiscal years 1953 and 1954 are shown in figure C-5. Table C-11 shows the average daily purge rates and uranium hexafluoride concentrations for this and the preceding quarters.

TABLE C-11
Total Purge Rate

Month	Average Daily Purge Rate, scf/day	Uranium Hexafluoride Concentration, mol per cent x 10^5
April, 1953	12,542	70.75
May	12,293	68.31
June	11,706	37.11
July	11,591	15.32
August	11,129	8.98
September	13,875	18.07

BARRIER PERMEABILITY SUMMARY

The status of the barrier permeabilities in the K-25 plant during the first quarter of fiscal year 1954 was generally improved over that experienced in recent quarters. The permeabilities in the K-27 and K-29 buildings showed small increases, while those in the K-25 and K-31 buildings indicated only slight decreases.

is possibly the chief reason for the encouraging status of the plant barrier permeabilities. Continued refinement in the technique of barrier unplugging was probably an additional contributing factor in the overall increase of barrier permeabilities. The status of the barrier in the K-29 and K-31 buildings was particularly encouraging in view of previous unplugging difficulties encountered in this part of the plant.

The barrier permeabilities in the K-25 building decreased 0.04% per month during the report period, as compared with a decrease of 0.03% per month during the preceding quarter. This change compares favorably with the rate for the past two years of 0.00 ± 0.01% per month. The rate of permeability change for the quarter represents essentially a normal trend, since only one chlorine trifluoride treatment was effected in the building during the period.

The permeabilities of the barrier installed in the K-25 building decreased 0.08%, 0.07%, and 0.03%, respectively, during the first quarter of 1954. These barrier represent about 93% of the total installed in the building. All of these rates of permeability decreases are slightly higher than those experienced during the past two years. The reason for the decreases is not discernible from available data; however, such variations are not considered excessive.

The permeabilities of barrier in the K-25 building increased 0.05% per month during the report period, while that of barrier did not change. All of these rates were considered normal, based on previous experience in this section of the building.

Accident Causes

No significant change in accident causes was noted; approximately 83% of the injuries incurred resulted primarily from unsafe acts by the employees.

Radiation Exposure

Weekly averages of 618 film badges and 185 film rings were used, with only 6 badges indicating exposures above the P.A.L. as compared with 8 badges for the previous period. All current exposures occurred during the performance of maintenance work in the K-1131 Feed Plant and no significant changes in the hazards of this location were noted although one badge reading of over 6 rep., the highest ever encountered at K-25, was reported.

Although the average number of daily hand checks for alpha contamination decreased slightly from 665 to 606, the 2 over-P.A.L. hand counts reported represent a marked decrease from the 13 similar over-P.A.L. conditions experienced last quarter.

PROPERTY DAMAGE

Fourteen property damage incidents, including 2 minor fires and 9 motor vehicle accidents, resulted in a total property loss of approximately $2,000, with the fire loss being about $500 and that due to motor vehicle accidents nearly $1,100. Of the other property damage accidents, the only incident of note was an instance where an almost empty UF_6 cylinder was overheated and exploded. The total loss represents a marked decrease in costs from the experience of last quarter when 17 incidents resulted in a total property loss of about $10,000.

MATERIAL RELEASES

One hydrogen fluoride and four radioactive material releases were experienced; all releases occurred during normal operations and were considered insignificant in their effect on working conditions.

ACCIDENT PREVENTION ACTIVITIES

PROTECTIVE EQUIPMENT AND FACILITIES

Personnel

In the interests of economy and uniformity, revised specifications for protective coveralls have been adopted for all Carbide Oak Ridge operations.

Property

Permanent Fixtures. The installation of a constant water sampler unit at the junction of Poplar Creek and the Clinch River completed the program of installing automatic equipment for securing samples required for detection of releases of radioactive materials in adjacent streams.

New items of protective equipment added to the plant include a 1,000 gpm. centrifugal fire pump, and fire alarm equipment for the new K-1400 Maintenance Office Building. Alterations or additions to plant buildings and the installation of new equipment necessitated changes in sprinkler systems and the relocation of a number of fire alarm boxes and fire alarm circuits.

Equipment Failure. There were 25 interruptions with 759 hours outage time affecting the plant fire

EDUCATION AND PROMOTION

Accident prevention activities emphasized this period were good housekeeping practices within the plant and safe driving practices on the highway.

Standard Reference Information on all plant radiation detection instruments has been issued.

Two hundred and eighteen safety meetings covering all shifts were held throughout the plant during the quarter.

PLANT EVALUATION

ROUTINE INSPECTION

Mechanical Inspection

Recently completed annual inspection examinations, including hydrostatic tests, of the six K-1501 Steam Plant boilers revealed a few plugged tubes on two boilers, one instance of tube bulging, minor leakage, and general sludge conditions.

The annual inspection and overhaul of the K-701 Power House boilers now in progress has revealed no unusual conditions in the No. 1 boiler except for two ruptured superheater elements; however, major equipment changes which were required for boiler No. 2 included replacement of the entire lower bank of superheater elements, the superheater outlet header, and a number of valves

Sufficient deterioration of the shell of a feed water heater had occurred to warrant replacement.

Audigage inspection of the walls of the No. 1 hydrogen fluoride storage tank revealed no noticeable decrease in wall thickness.

Fire Protection

In the routine field and inspection tests of fire alarm boxes, coded signaling devices, and sprinkler system alarms, 4 master alarm boxes were found to be inoperable; of these, one required replacement. Additional minor mechanical or electrical difficulties in other units were immediately corrected.

Radium Source Checks

Routine checks of the 24 radium sources in the K-25 Plant showed no evidence of radon leakage.

PLANT CONDITION AND AUDIT

Fire Protection

Major changes in security fencing recently completed have made various areas more readily accessible to plant emergency groups.

Improvement in the methods used for storage of materials in the K-27 Process Building continued as it became possible to return to the normal plant practice of providing assigned floor space for specific items, maintaining adequate aisle clearance, and segregating areas by fences where necessary.

A daily usage of approximately 500,000 gallons of water from the fire mains for construction of the

Penetrating Radiation Levels. Penetrating radiation levels increased primarily as a result of increases in maintenance operations in the K-631 Waste Building on equipment containing beta-gamma emitting materials and in the storage of similar materials in the K-1231 Equipment Dismantling Building; the personnel-exposure potential* increased from 1.04 to 2.50 and the average film badge reading indicated a slight increase from 28 mrep./wk. to 30 mrep./wk.

Although slightly increased radiation fields seem to be indicated by the higher average reading, the adequacy of protective measures in force is indicated by the reduction of over-P.A.L. film badges as noted in the section on Accident and Injury Experience.

The personnel-exposure potential and the actual personnel exposure as indicated by film badge readings are shown in Figure E-3.

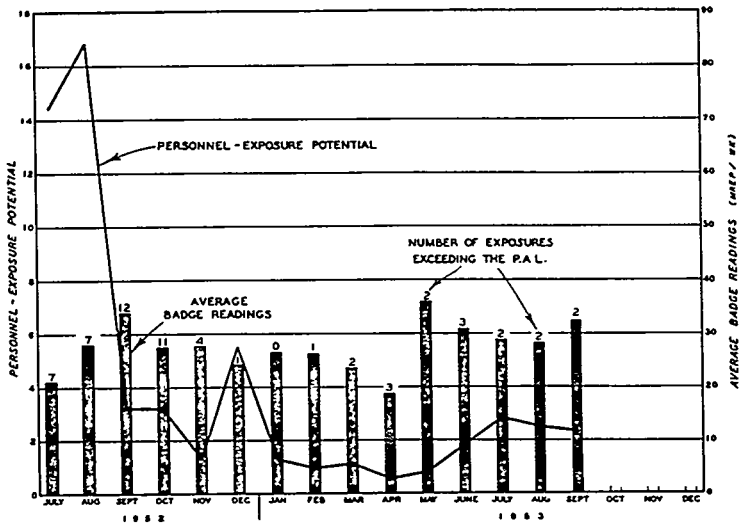


FIGURE E-3
The Average of the Maximum Penetrating Radiation Intensities and the Average Film Badge Reading in 5 Selected Locations

Air Activity Levels. The average air-borne alpha contamination in the 10 locations where shift-length air samples are routinely taken increased from 0.05 counts/min./ft.^{3} to 0.09 counts/min./ft.^{3}. Only 17, or 0.79%, of the 2,143 samples taken exceeded the P.A.L., the corresponding fraction last quarter being 0.11%. This increase is attributed to increased efficiency in air sampling methods at the K-1131 Feed Plant, and to a small release of material in the K-306-7 Product Withdrawal Station.

Water and Stream Bottom Survey Program. The average beta activity in the treated sanitary water supply was 7 dis./min./100 ml., this representing a significant decrease from the average of 26 dis./min./100 ml. reported last quarter and being only slightly higher than the 5 dis./min./100 ml. background activity found in the Clinch River. The peak of activity, reached during July, was 23 dis./min./100 ml. which is considerably lower than the maximum 62 dis./min./100 ml. recorded last quarter. The decrease in activity is due to the lower activity of the fissionable material released to the Clinch River from the storage lake of an installation upstream from K-25, and to an increased flow of the Clinch River.

The average uranium concentrations in the Poplar Creek mud decreased only slightly to 43 ppm. from the 48 ppm. recorded last quarter. This slight drop is attributed to the movement of silt

* The personnel-exposure potential is a figure reflecting the average radiation dose rate in the highest level locations and the number of personnel assigned to those locations.

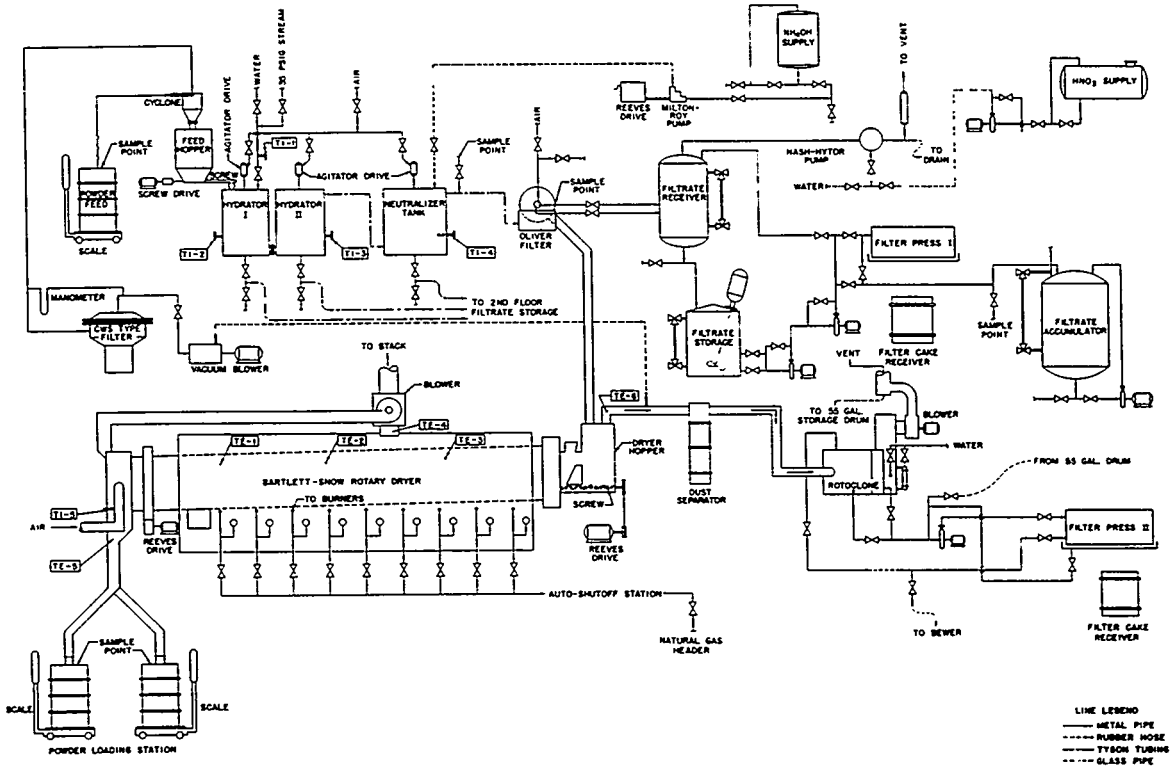


FIGURE G-8
Flow and Piping Diagram
9211 Hydrate Manufacture Facilities

Figure G-8 is a flow sheet of the Y-12 oxide activation facility including both the equipment supplied by K-25 and that already installed. Briefly, the plant consists of the following equipment:

1. A pneumatic powder loader which transfers bulk powder from the shipping drum to the hydrator feeder.

2. A hopper and screw which feeds the uranium trioxide into the hydrator at the desired rate.

3. The hydrator assembly which accomplishes the suspension of the oxide in water and holds the oxide in suspension until hydration and neutralization are complete.

4. The Oliver rotary filter which separates the neutralized slurry into water and a wet hydrate cake.

5. The Bartlett-Snow rotary kiln which dries and dehydrates the wet cake.

6. Various items of auxiliary equipment such as the "polishing" filter which removes the last traces of oxide from the rotary filter filtrates and the rotoclone dust separator which removes the dust from the vent gases leaving the drier.

The installation of the various items of equipment supplied by K-25 is completed and the production of activated oxide should start during the week of October 5, 1953.

prepared.

Seals for Purge Cascade

A study was made to determine what kind of seal system would be needed for the compressors in the purge cascade as well as to determine the pressure required at the entrance of the seal in order to insure proper seal feed flow. As a result of this examination it was found that a single feed system would meet all the requirements of the cascade. Use of a single feed facility is considerably less expensive in that only one set of controls and one set of pipes are needed. The calculations were based upon a minimum cascade nitrogen inleakage of 10 sccm. per seal. A daily inleakage was found to be 53 scf. for the side purge system and 53 scf. for the top purge system. With these figures, the architect-engineer can size the piping to insure adequate pressure on the nitrogen lines.

Communications

As the design effort for the expansion programs at both Paducah and Oak Ridge neared completion, a transition to work on the subject systems for Portsmouth could be made this quarter. Essentially all of Carbide's design criteria for the various systems have been submitted to the architect-engineer. These criteria detail the types and amount of communications required. In order to complete the design criteria, Carbide will furnish the exact location of the various instruments as that information is determined. The over-all design effort for the communications in the plant is 20% complete. For the X-330 process building, the design is approximately 65% complete.

Whether or not an individual facility will have underground or overhead communication lines was decided to be left on an individual basis. It was determined that communication lines for the fire headquarters building will have underground entrance. Such things as economy of design and equipment, lack of sufficient building height, and location of parking areas in close proximity to the building so that telephone poles could not be erected near the building were factors which contributed to the decision being made for underground communications entrances.

Space has been provided for offices within the receiving and shipping building. However, the exact location of desks has not been decided. To provide for communications within the offices at this time without need for extensive alterations after the offices have been constructed, a Walker type duct arrangement will be installed under the floor in the office area. Such a provision, whereby a labyrinthian network of ducts is placed beneath a floor, insures that wherever a desk is placed, there will be only a short distance required for tie-in to a telephone line. As desk locations are determined, the communications cable can then be run through the ducts to the required situations.

Several decisions were made regarding the individual antennas in the radio network. All fixed auxiliary radio stations will have antennas which are 30 feet high. These stations are to have a power of 30 watts. The antenna for the repeater station will be 150 feet high. This antenna will transmit the signals for the repeater station which will have a power of 250 watts. Through this arrangement, outside braodcasting from the plant to Chillicothe and Portsmouth areas is possible. Either the process-maintenance or the security radio system can switch into the repeater station and utilize it for broadcasting to either fixed or mobile receiving stations outside the plant areas.

Giffels and Vallet was given the design criteria for the communication systems in the raw water pump house for X-326 and for the plant control facility. Design data for the communication systems in the switchhouse and the switchyard for X-333 were given to Sargent and Lundy. Information included in these criteria was the location of fire alarm boxes, location of telephones for the various communication systems, the types of instruments to be installed, the number of lines for each type of network, and the number of lines in each building or office. In addition, the location of the

four consoles (1 power, 1 emergency, and 2 masters) in the plant control facility was given. Design data for the administrative system in the X-330 process building were also submitted to Giffels and Vallet.

Cylinders for Portsmouth Plant

The withdrawal of uranium hexafluoride from the plant requires that four different types of cylinders be used. One size cylinder will be employed for the withdrawal of tails from the bottom of the cascade. A total of 365 cylinders having a capacity of 10 tons using fluorine will be provided. These are identical with the waste cylinders being used at K-25 and Paducah.

During the interim operating conditions from the time the first cell comes on stream until the entire plant is operating normally, it will be necessary to utilize three different types of cylinders. The need for having the various sizes of cylinders during interim operations in order to withdraw product is based upon critical hazards limitations. For product material with an assay of less than 1.015, a cylinder with a diameter of 30 in. and having a uranium hexafluoride capacity of two and one-half tons is to be obtained from K-25 and returned when they are no longer required at Portsmouth. A 10 in. diameter cylinder with a capacity of 430 pounds of uranium hexafluoride is to be utilized for holding product material with an assay of 1.015 through 5.0. This cylinder must meet the specifications of a working pressure of 480 psig. and test pressure of 800 psig. A minimum of 300 such cylinders are required for this function. At all assays greater than 5.0, a cylinder with a capacity of 65 pounds of uranium hexafluoride and having a diameter of 5 in. will be employed. The 2-1/2 ton cylinder is a conventional one of the type being used for Paducah product. The 430 pound cylinder is a standard 150 pound steel chlorine cylinder. The 5 in. diameter cylinder is a new Monel unit of the same type to be used at K-25 for product shipments in the near future. After the plant is completely on stream and operating normally producing top product level material, the same 5 in. diameter cylinder which is used during the interim period will be used to hold the top assay level product.

Heating Requirements for Purge Cascade Cell and Piping Enclosures

Design information concerning the heating requirements for the purge cascades cell and piping enclosures has been submitted to the artchiect-engineer. Cells 2, 4, 18, and 20 are to be provided with electric heat to hold the cell ambient temperature Electric heat will also be required in the intercell compartments adjacent to these cells to hold ambient temperature. The cell by-pass housing in the purge cascade will also be held at this temperature. Only the wing by-pass piping associated with the aforementioned zones will require heat to the same temperature. All other cells and piping housings are to be held at 100°F. This will not require electric heat after the cells are operating. Nor will it be necessary to provide heaters to bring these 100°F. zones up to temperature prior to cell start up. Housings of all the purge cascade cells, however, will be designed with access panels to permit connection of the oil-fired cell emergency heaters. These heaters are used to heat a cell, which has been taken off stream, to the desired temperature before it is placed on stream again.

X-326 PROCESS BUILDING DESIGN

X-326 Compressors

Early in the quarter, the aerodynamic design of the size 7B compressor had been reviewed and approved by Carbide engineers. The principle work on the size 7 machine is now directed toward the design of the mechanical features. It is believed that this should be essentially complete early in October.

X-33 PROCESS BUILDING DESIGN

X-33 A Booster Station

The purpose of the A booster station in X-33 is to pump the uranium hexafluoride from X-33 to X-330. To accomplish this, two 33-type flow compressors modified for no B side stream and each driven by a 1750 horsepower motor will be installed. Two size 950 E-A gas coolers are to be provided to remove the heat of compression. Two size 1750 S-B separators and two size 940 C-A condensers are other major items of equipment which will be part of the coolant system. Under normal operating conditions, one compressor, one motor, and one evaporator will operate, and the other equipment will be in standby condition.

X-33 Cold Recovery System

The subject system will be identical to the same system in K-33 with the exception that there will be an air jet exhaust station with the X-33 facility, and 8 in. headers instead of 12 in. headers. The principle components of the X-33 station are three 8 in. cold traps and three 200 cfm. Kinney vacuum pumps driven by 15 horsepower motors. A space recorder will also be installed in order to monitor the vent gases from the equipment in the cold trap room.

After solidified uranium hexafluoride has been removed by the cold trap, the latter must be heated to liquefy the uranium hexafluoride so that it can be poured into storage cylinders. From these storage cylinders, the uranium hexafluoride is vaporized back to the cascade at the point where the assay is the same as that of the material in the cylinder. In transferring the liquefied uranium hexafluoride from the cold trap to the special withdrawal cylinders, the principle difficulty is the uranium hexafluoride solidifying while in the process of being removed. To alleviate this condition, the cylinders will be surrounded by a heated box which will warm the cylinders sufficiently to prevent the uranium hexafluoride from condensing during the removal operation. These heated boxes are identical with the ones being installed for the same operation at K-33.

X-33 Cell Freon Condenser

Carbide's design and specifications for this particular equipment have been completed. There will be two sizes of condensers installed in the process building. One size called 7000 C-C will be located in units 1, 6, 7, and 8 while the other size, 8000 C-C, will be in units 2, 3, 4, and 5. Condenser 7000 C-C will have 10,258 sq. ft. of heat transfer area and be capable of removing 20,563,600 Btu. per hour at a vaporization temperature _____ with a maximum pressure drop of 17.0 psi. Condenser 8000 C-C is designed to remove 23,414,000 Btu. per hour through 12,438 sq. ft. of area at 17.0 psi. maximum pressure drop with a vaporization temperature It is not feasible to use units similar to those in C-33 because the operating temperature is to be in X-33 whereas it is _____ in C-33. The design of the condensers is identical to the corresponding sizes in C-37 and K-33. Because there are two horsepower levels in X-33, it is desirable to have the two sizes of condensers corresponding to the operating levels.

X-33 B Booster Station

Design criteria for the subject system have been completed and forwarded. This station is used to pump the process gas from X-33 to X-330 through a 24 in. line. The facility will consist of two A-C size 92K centrifugal compressors each of which is driven by a 500 horsepower motor. To remove the heat of compression, two size 600 E-A evaporators which are installed in line will be provided. Other items of equipment in the coolant system are two size 200 C-B condensers and two size 400 S-A Freon separators. Control of the operation of the station is such that either or both of the compressors and their associated motor can operate. Each gas cooler is capable of

handling the entire load, and piping is provided so that either can be used regardless of the number of pumps operating.

X-33 Coolant Drain and Recovery System

Whenever a cell is taken off stream for maintenance, it requires that the coolant system be opened and that all the Freon be removed from the coolant system before the piping is opened. To hold the cell coolant inventory, the subject system is provided. Essentially, it will consist of two 11,000-gallon storage tanks which will hold the Freon drained from the cells. The vapor which remains in the coolant volume will be recovered using the method as described previously.* Since the vapor recovery system is not capable of removing all the vapor present, the remaining Freon vapor is pumped from the system using a Kinney vacuum pump which discharges to atmosphere. It is not feasible to save the remaining vapor which goes through the Kinney pump because pump lubrication oil is mixed with the Freon. The need for removing practically all of the coolant vapor prior to cutting into the piping is predicated on the fact that phosgene is formed when a flame comes in contact with Freon. To remove the last bit of Freon vapor in the piping, the Kinney vacuum pumps are provided. When the cell is ready to go back on stream, two 50-gallon/minute pumps, each driven by a 15 horsepower motor, will be used to pump the liquid Freon up to the cell coolant system. These criteria which are identical to those to be used in the subject system in K-33 have been submitted to Giffels and Vallet.

Size 33 Converter Overlapped Tube Sheet Design

Size 33 converters will be built with a modified tube sheet design in which the smaller bundle fixed end tube sheet is lapped over the larger fixed tube sheet inner diameter. Also the outside diameter of the larger tube sheet will bolt into a continuous flange in the converter shell. This design has advantages in stiffening of the tube sheets in the assembled converter, in eliminating a large number of parts, and in simplifying converter assembly.

PLANT AUXILIARY BUILDINGS

Due to the construction contractor's procedure in which a great deal of subcontracting is done, it is necessary that the design of all structures be kept up to date. For this reason, effort to conclude the final design for various auxiliary buildings has been intensified. As there are several architect-engineers employed on the subject facilities, it is possible for the work to be spread out and noticeable progress can be reported. By the end of the quarter, in addition to those buildings mentioned in previous quarterly reports, the design of the following was essentially complete:

- Chemical Engineering Building
- Mechanical Engineering Building
- Entrance Portal
- Main Bus Shelters
- Guard Posts
- X-330 Recirculating Water System
  - Pump House
  - Cooling Towers
  - Acid Handling Station
- Maintenance and Stores Building

Utility Building Group

An equalizing basin has been added to the original design of the water treatment plant to act as a

*Ibid. p. I-2

surge and storage reservoir. This feature will provide for variations in demand by creating a time element necessary to adjust the rate of chemical feed to the change in make-up water demands. As a result, the system is more flexible and better control can be maintained.

One of the first buildings to be designed and constructed at Portsmouth is the steam plant. Inasmuch as preliminary data had to be given at a very early date, exact information could not be stated because the entire Portsmouth plant was then in a planning stage. An estimate of conditions as to the treatment required for the water going to the boilers of the steam plant was given to the architect-engineer designing the steam plant. In the course of events as more detailed information was received concerning the water conditions at Portsmouth and actual treatment required, it was learned that some of the preliminary information would have to be modified to meet the known conditions. It has been found necessary to provide both hydrogen zeolite and sodium zeolite treating facilities for boiler feed water treatment.

Services Building Group

As mentioned previously,* the design of the decontamination building had been divided into two packages. Recently, it was found that the project could be expedited better if the three-package procedure were followed. Packages 1 and 2 will remain as stated previously. Package three will consist of the construction, procurement, and installation of all materials and equipment of the spray booth in the decontamination building. All design criteria for the three packages have been submitted to the architect-engineer and all drawings have been certified by Carbide for construction for the three groups.

Liquid storage volume for the spray booths of package three will consist of vertical banks of interconnected 5 in. pipes.** Because of criticality considerations due to the presence of fissionable materials, the pipes will be individually shielded with 12 in. slabs of paraffin. The neutron-absorbing properties of the paraffin permit closer spacing of the 5 in. pipes with better utilization of available space.

The procurement of certain special items of equipment peculiar to the operation of the Portsmouth decontamination facilities are being made by Carbide for reasons of economy, standardization, and delivery time. It was imperative that these items be placed on order prior to awarding a contract to a construction contractor in order to meet construction schedules.

Previously it was reported*** that 70,000 sq. ft. of space would be provided in bulk storage buildings to be used for the storage of slow moving spare parts and other equipment which does not require heated facilities. A detailed study was made to determine whether or not some other means could be provided to furnish the necessary space. It was found that several of the construction buildings which the prime construction contractor has erected are suitable for this purpose and would be available to the operating contractor. The AEC, Goodyear Atomic Corporation, and Carbide have agreed to this new scheme and will cancel those structures previously contemplated for such storage.

A survey of spare equipment available at K-25 which could be used in the cleaning building has shown that the main components for the ac/A and the slope factor test stand can be supplied from K-25 surplus. These pieces of equipment include:

---

*Ibid. , p. I-37

**K-25 Plant Quarterly Report, 3rd Fiscal Quarter, January 1, thru March 31, 1953, Carbide and Carbon Chemicals Company, K-25 Plant, July 3, 1953, (K-960) p. I-41.

***K-25 Plant Quarterly Report, 2nd Fiscal Quarter, October 1, thru December 31, 1952, Carbide and Carbon Chemicals Company, K-25 Plant, June 1, 1953, (K-959) p. I-22.

special valves
vacuum pumps
gas heaters
all instruments and instrument cubicles
centrifugal A.C.-38 pump with 50 hp. motor and base

The use of this spare equipment will result in a marked monetary saving.

A compressor turnover fixture will be installed in the decontamination building for use in the disassembly of compressors which have been removed from process and which are to be sent through the decontaminating procedure.

Upon completion of the decontamination treatment, the compressors will be sent to the maintenance building where they will be repaired and reassembled utilizing another compressor turnover fixture similar to the one in the decontamination building. A rotor and stator assembly fixture will be installed in an area adjacent to the compressor turnover fixtures in the maintenance building.

Blading fixtures for the installation of blades to the rotors and the stators of the axial flow compressors are to be provided in the maintenance building. These fixtures are used in attaching the blades to either the rotor or the stator and include a gauge device for accurately setting the blades in the correct position and at the desired pitch.

Approximately 20% of the machine tools required for the maintenance building have been received at the plant site.

EXPERIMENTAL INVESTIGATIONS

X-27 Prototype Converter Test

A new converter, designed for use in the X-27 building at Portsmouth, is being tested for crossover leakage, assembly troubles, tube strain, and other defects which may show up under operating conditions. The crossover leak tests have been completed and slight revisions have been made which permit easier assembly. The converter is now ready to have non-porous tubes installed in preparation for the vacuum loading tests.

The crossover leak tests showed that improvements could be made by remachining the clamping ring flat and also by grooving its edge. The improvement in leak rate is shown in table I-2.

TABLE I-2
Comparison of Leak Rate Tests*

	As Received	Flat Edge	Grooved Edge
1-2 crossover	13.95	5.26	1.63
2-3	8.91	3.98	4.11

*Leak rate in scfm. of air at 8 psig. and 40 ft./lb. torque on studs.

An examination showed some nicks in the sealing edges of the 32-inch clamp ring used with the 2-3 crossover, probably made during assembly, through which most of the leakage occurred. The results of the grooved edge tests are being studied to determine if the extra machining operation is warranted on the basis of the decrease in leak flow.

The assembly problems encountered in the tests to date are probably unique with the prototype since jigs and fixtures normally used in production runs will result in more accurate location of bolting rings and bosses in the shell. However, even with jigs, a more flexible transition-to-shell

support bracket would certainly simplify assembly. Carbide is investigating the possibility of changing the bracket method of transition mounting and is studying a method of avoiding the narrow clearance available for bolting the clamping bars on the braced transition.

Restaggered K-31 Compressor for X-29 Conditions

As a result of two unsuccessful attempts to restagger the blade angles of a K-31 axial-flow compressor to obtain X-29 conditions (CR_A of 4.62, CR_B of 1.40) in a stable operating range, a third restagger was attempted. An evaluation of the test data indicates that, at the second alternate design conditions of an A barrel compression ratio of 4.30 and a B barrel ratio of 1.51, the B/A weight flow ratio is approximately 0.91 with surge occurring at a CR_B of 1.60. Since the third restagger was not satisfactory, a fourth will be attempted.

PORTSMOUTH PROCUREMENT

During the first quarter, major procurement activities for the Portsmouth requirements have consisted of placing contracts and orders for other major process items and giving special expediting assistance to vendors on contracts and orders awarded during previous quarters.

On September 9, 1953, AEC contract AT-(40-1)-1657 was awarded to General Electric Company for the entire mass spectrometer requirements for Portsmouth. Delivery is scheduled to start in July, 1954, and the contract is scheduled to be completed by January, 1955.

AEC definitive contract AT-(40-1)-1651 was awarded to CEC Instrument on September 4, 1953, for the leak detector requirements for Portsmouth.

Welding Engineers is supplying the fluorine generators to Portsmouth on AEC contract AT-(40-1)-1558 in addition to the Paducah requirements on the same contract.

Instruments

At the end of the first quarter, Taylor Instrument Companies had delivered forty transmitters and one controller required for Portsmouth on contract AT-(40-1)-1525. Taylor was behind schedule on the contract.

Fulton-Sylphon Division, supplying special instrument valves to Portsmouth on contract AT-(40-1)-1549, was behind contract delivery schedule at the end of the quarter. By the end of September, 874 HGP valves and 36 HTP valves had been delivered to Portsmouth.

Taylor Instrument Companies had supplied 192 of the water control valves for Portsmouth by the end of September, 1953. Delivery of these valves was ahead of schedule requirements.

Globe Valves, Type "S"

At the end of the quarter Crane Company was behind schedule in delivery of the type "S" globe valves but it is anticipated that delivery requirements will be met by the end of the coming quarter. By the end of September, the following amounts of globe valves, by sizes, had been delivered to Portsmouth:

Size	SCBD	SMMD	SMD
2"	9	0	9
1 1/2"	61	0	0

Size	SCBD	SMMD	SMD
1"	2	17	22
3/4"	24	2	-
1/2"	214	95	53
1/4"	46	-	-

Block Valves

At the end of the quarter no deliveries of block valves required for Portsmouth had been made by Crane Company or by Fulton-Sylphon Division. Both vendors were behind contract delivery schedule.

X-326 Process Building

AEC definitive contract AT-(40-1)-1652 was awarded to A. O. Smith Corporation on August 24, 1953, for the X-25 and X-27 evaporators. Delivery of the X-27 evaporators is scheduled to start in March, 1954, and delivery of the X-25 evaporators is scheduled to begin in September, 1954.

At the end of the quarter negotiations were being conducted with low bidders for the X-25 and X-27 tube sheets and gussets, and shell and head assemblies prior to the signing of AEC definitive contracts. It is expected that these contracts will be fully negotiated in the early part of the coming quarter.

The major seal parts for the X-326 process building have been placed on Carbide purchase orders as follows:

Delivery of most of the above items for the X-326 process building is scheduled to start January 1, 1954.

Fairchild Engine and Airplane Corporation has the entire requirements for the 25 - 27 type process compressors under AEC contract AT-(40-1)-1543. The new production facilities under construction by Fairchild are behind schedule.

In addition to this delay, delivery of Fairchild's first prototype unit will be delayed from September to December due to difficulties in design. Production is scheduled to start in January, 1954.

The PC-9 process compressor prototype unit was scheduled for delivery, from Cooper-Bessemer Corporation, September 30, 1953, and production was scheduled to begin in January, 1954. Cooper-Bessemer is having difficulty securing materials and has requested that a directive be issued to enable them to obtain the necessary material. In addition to difficulties in securing materials, the Cooper-Bessemer plant went out on strike on August 31, 1953. Production of these compressors

will probably be delayed one or two months beyond the original starting date.

X-330 Process Building

Assembly of the 29 - 31 type converters and seals for the X-330 process building is scheduled to begin at K-25 after completion of the Paducah requirements. Vendors of the major parts for the 31 type converter were meeting schedule requirements at the end of the quarter and indications were that Portsmouth requirements would be met. Assembly of the 31 type seals may be delayed unless vendors of major parts improve deliveries as promised.

During the first quarter York Corporation was awarded supplement #1 to AEC contract AT-(40-1)-1538 for the 29 size converter evaporators. Delivery is scheduled to begin by June 1, 1954.

At the end of the quarter supplement #1 to AEC contract AT-(40-1)-1365 was in the process of being awarded to Newport News Shipbuilding and Drydock Company for the size 29 shell and head assemblies for the X-330 process building.

Vendors of other major parts for the 29 size converter for Portsmouth are as follows:

Item	Vendor	Contract
Bellows	Fulton-Sylphon	W32C-30236
Bundle to Shell Transitions	Cincinnati Ventilating Co.	W32C-30246
Combination 2-3 Crossover & Cooler to Bundle Transition	Capitol Metals Specialty Company	W32C-3025/

During the quarter A. O. Smith Corporation was awarded AEC contract AT-(40-1)-1634 for the waste condensers for the X-330 process building. This contract is scheduled for completion by March 1, 1954.

For the most part, delivery of the major process items for the X-330 building are not scheduled to begin until about June 1, 1954, or after completion of the Paducah requirements.

X-33 Process Building

The major portion of the options placed with vendors of the type 33 converters and seals requirements for Oak Ridge and Paducah have been exercised to supply these items for the X-33 process building. Assembly and shipment of converters and seals for Portsmouth will be determined by the requirements for the K-33 expansion program.

During the quarter an addition to AEC contract AT-(40-1)-1522 was negotiated with Carrier Corporation for the 33 type converters for the X-33 process building.

At the end of the quarter bids were being evaluated for the Freon separators required for the X-33 process building.

Major process items for the X-33 process building are to be supplied largely by the vendors of the 33 type items for K-33 and Paducah.

R&D REPORT LIBRARY 66

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (Is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number ~~K-1920~~ K/EM-328 Date of document 9/17/76

Title and author (if document is unnumbered)

(This section to be completed by Document Center)

Date request received 10/20/95

Date submitted to ADC 12/19/95

Date submitted to HSA Coordinator 10/20/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 12/19/95 1/22/96

Date received from CICO 1/5/96 2/26/96

Date submitted to ChemRisk/Shonka and DOE 2/26/96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

K/EM-328

SANITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT FOURTH FISCAL QUARTER APRIL 1 THRU JUNE 30, 1976

(EXTRACTED FROM SRD DOCUMENT # K-1920)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

December 18, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release to the public by:

2/22/96

Technical Information Officer — Date
Oak Ridge K-25 Site

~~SECRET~~

K-1920

cy 27-A

OAK RIDGE GASEOUS DIFFUSION PLANT

QUARTERLY REPORT (U)

FOURTH QUARTER FISCAL YEAR 1976
April 1, 1976 through June 30, 1976

UNION CARBIDE

OAK RIDGE GASEOUS DIFFUSION PLANT
OAK RIDGE, TENNESSEE

prepared for the U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
under U.S. GOVERNMENT *Contract W-7405 eng 26*

RESTRICTED DATA
This document contains Restricted Data as defined in the Atomic Energy Act of 1954. Its dissemination or disclosure to any unauthorized person is prohibited.

~~SECRET~~

2

[redacted]

3

This document consists of 168 *pages,*
No. 27 *of* 54 *copies, Series* A.

Date of Issuance: September 17, 1976

K-1920

K 1920 27 A

K 1920 27 A

Y07549

OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT (U)

FOURTH QUARTER FISCAL YEAR 1976
April 1, 1976 through June 30, 1976

DOCUMENT UNCLASSIFIED
By Initials
9-17-84 gmt

P. S. Cates
P. S. Cates
Classifying Official
Superintendent, Operations Planning Department
Title

RESTRICTED DATA
This document contains Restricted Data as defined in the Atomic Energy Act of 1954. Dissemination or disclosure to any unauthorized person is prohibited.

[redacted]

3

Table C-8 -- CASCADE INVENTORY CHANGE (continued)

	Fourth Quarter FY 1976			
	Uranium-235		Enriched U-235	
Month	Ending Inventory	Δ	Ending Inventory	Δ
April	1,865	-102.51	346	-69.03
June	1,863	-1.88	323	-23.07
July	1,745	-117.55	345	-21.82
Total		-221.94		-113.92

EFFICIENCIES AND PURGE RATES (u).

1. PURGE RATES
2. SEPARATION EFFICIENCY
3. SEPARATIVE WORK

Cascade Efficiency

Based on the separative work concept, the April, May, and June cascade efficiencies were 99.65%, 99.70%, and 99.50%, respectively, for a quarterly average of 99.62%.

On-Stream Efficiency

The cascade on-stream efficiency during the fourth quarter FY 1976 averaged 99.12%. Excluding time attributable to the plant test program and power control, the efficiency averaged 99.12%.

The quarterly efficiency for each of the cascade buildings averaged 98.91% for K-33, 99.13% for K-31, and 100% for K-29.

PURGE CASCADE (u).

1. PURGE CASCADE

The average normal purge rate at K-311-1 during the fourth quarter FY 1976 was 15,255 scf per day. The highest monthly average during the quarter was in May when 15,823 scf per day was purged. The April and June rates were 14,493 and 15,450 scf per day, respectively.

New Purge Cascade - K-402-9

The new purge cascade was placed on-stream on April 20 after several weeks of operational testing and debugging. K-311-1 purge unit was isolated and placed in standby. The new unit purged lites satisfactorily.

Table E-2

CONTAMINATION SURVEYS

Area surveys	94
Motors for shipment to National Electric Coil Company	37
Pieces of decontaminated equipment	7709
Miscellaneous items	2530
Trailers and railcars handling uranium hexafluoride	215
Shipping cylinders and/or shipping packages	513

Personnel Radiation Monitoring

Analyses of 846 urine specimens for uranium and alpha activity for the period April 1 through June 30, 1976 identified 17 samples that exceeded the plant action guide (PAG) for a single sample. These samples were from 3 chemical Operators involved in transferring and sampling UF_6 cylinders in Building K-1423, a chemical Operator involved in field decontamination in Building K-1420, a cascade Operator and a supervisor in Building K-413 when a UF_6 release occurred in a product withdrawal pump, 2 chemical Operators and 3 supervisors in Building K-1420 when a UF_6 release occurred from a block valve, and 3 Maintenance Mechanics involved in a UF_6 release from a K-31 compressor. Follow-up samples in all cases showed that the excretion rates decreased to levels well below the PAG, indicating no significant body retention of uranium.

Airborne Uranium Alpha Activity

The average alpha activity levels reflected by 1929 shift-length air samples, recorded by continuous monitoring units in locations where air contamination is suspected, remained essentially unchanged and low, representing about 8% of the ERDA Radiation Protection Standard (RPS) of 10^{-10} μCi uranium/cc of air. The average alpha activity from 882 shift-length air samples, taken at four outdoor locations around the plant perimeter downwind from major stack discharges, was less than 4% of the RPS.

ENVIRONMENTAL MANAGEMENT (4).

Administrative Reporting Limits For Radioactive Discharges

In order to provide more effective control of ORGDP effluents emitting radioactive wastes, a system has been established, in accordance with ERDA Manual Chapter 0511, Radioactive Waste Management, to allow for nonroutine reporting of abnormal releases. The system consists of the establishment of administrative limits for each radionuclide discharged from each effluent and the subsequent review of sampling data related to these limits on a routine basis. In the event any limit is found to be exceeded, it will be reported to the ORO Environmental Protection Branch, and steps will be taken to determine the cause of the increase. Should the increased level be determined to be excessive, actions will be immediately initiated to reduce the discharge to an acceptable level.

Steam Plant

Procurement of the electrostatic precipitators is still on schedule, and it appears that the installation deadline of October 1, 1977, can still be met.

On June 3, 1976, representatives from the Environmental Protection Agency and the State of Tennessee Department of Air Pollution Control visited the ORGDP. The primary purpose of this visit was to fulfill their obligations which are outlined in the State Implementation Plan (SIP). This plan requires that they visit at least three pollution sources within their region each year.

K-1515 Sampling Station

Modifications to correct infiltration problems were completed, the flow measuring device was installed at the weir, and the station is presently operable.

Containment of Oil and Hazardous Materials

The portion of this project requiring modifications at the HF tank farm has been submitted to Rust, but Carbide has not received a schedule specifying when the work will begin. The remainder of the project will be completed by another contractor. This contractor should be selected and construction initiated during the next six weeks.

K-1203 Sewage Treatment Plant

Union Carbide received beneficial occupancy of the new sewage plant on June 11, 1976. A rainstorm which occurred on June 18 resulted in excessive flows within the sewage plant, thus upsetting the stability of the system. As a result of this incident, an extensive survey is underway to identify and eliminate sources of storm drain run-off and ground water

infiltration which are entering the system. In addition to the above problems, once-through cooling water is also recognized as a potential contributor of routine excess flows. A detailed survey is being conducted to locate air conditioning units, refrigeration units, and other units requiring once-through cooling water and to re-route drains to the storm drain system when necessary to eliminate excessive flows.

Disposal of Equipment Containing Mercury

A meeting was held with representatives of the ERDA Environmental Protection Branch to discuss disposal of high intensity mercury vapor lamps and other mercury containing equipment. Due to the relatively small quantities of mercury contained in light bulbs, it was decided that they present minimal potential for harming the environment. The mercury vapor bulbs and fluorescent lamps will still be deposited in the sanitary landfill. Other items which contain larger quantities and exhibit greater potential harm to the environment are mercury switches, thermometers, gages, thermostats, etc. These items will be collected in appropriately marked drums and an alternate procedure selected for their disposal. This information was transmitted to appropriate K-25 personnel in Maintenance Bulletin No. 79 on June 17, 1976.

Major Equipment Purchases

During the report period, a booster pump was procured which will be used in association with the oil skimming equipment. The skimming pump does not provide sufficient head to pump oil into a truck for disposal; the booster pump will provide the head needed. This pump will be stored in the trailer which contains the other oil skimming equipment.

Two flow-proportional refrigerated composite samplers for the new sewage plant were procured. These samplers are needed to meet EPA requirements and will be installed as soon as work being performed by the construction contractor is complete.

Four of eight new air samplers have been received and are presently in storage. The samplers will be installed as soon as the remaining four are received. These samplers will be spaced incrementally between existing stations and will operate on a continuous basis, thus supplying more reliable data collection during times when accidental releases occur.

Fish Sampling

The Environmental Sciences Division of ORNL with support from ORGDP's Environmental Management Group began an extensive fish sampling program in May, 1976. Previous analyses of fish from the ORGDP environs indicated abnormally high concentrations of mercury. Several species of fish at varying stages of development are being sampled from Poplar Creek and the Clinch River. The samples are being prepared and analyzed at Y-12.

Quarterly EPA Report

The EPA liquid effluent report for the first quarter of CY-1976 was submitted to ERDA on April 27. The report covered the effluent monitoring data from January 1, 1976 through March 31, 1976. During this period, abnormally high pH values continued to be observed at Discharge Point 007 (K-901-A holding pond). Low chlorine residual values were again recorded at Discharge Points 005 and 008 (K-1203 sewage treatment facility and K-710-A sewage treatment facility, respectively). High pH values were recorded at Discharge Point 006 (K-1007-B holding pond). At Discharge Point 002 (K-1410 Nickel Plating Facility) pH values exceeded the 6.0-9.0 range. High chromium values were recorded at Discharge Point 007 (K-901-A holding pond).

NPDES Noncompliance Situations - April 1 - June 30, 1976

The pH at K-1007-B holding pond continued to exceed 9.0 on an intermittent basis. Further investigation of the problem indicated that the high pH values were probably a result of biological activity related to the presence of algae and/or the rinsing of concrete trucks in and around the pond by outside concrete suppliers. With a decline in the growth of algae and the abatement of the truck rinsing operation, the pH correspondingly declined. At the present time, pH violations have been reduced to one or two per week.

On June 1, 1976 a composite sample taken at K-1007-B holding pond revealed a chromium level of 0.10 mg/l, which exceeded the NPDES permit limit of 0.05 mg/l. Air filters in the K-29 building were washed with fire water containing chromium, with the resulting effluent being discharged to the K-1007-B holding pond. This operation had been postponed well beyond the scheduled date while awaiting completion of a nonchromated fire water system. However, when slippage of this project became evident, it was apparent that further postponement of the filter cleaning could result in extensive problems with process equipment. Therefore, in view of the negligible environmental impact of such a small, short-term release, the decision was made, with the concurrence of the ORGDP Environmental Management Group, to clean the filters with a minimum quantity of fire water. The aforementioned project to provide for nonchromated fire water should be completed by January 1, 1977, so that future uses of this water system, including filter washing, should not present an environmental problem.

As of January 1, 1976, new limits went into effect for two discharge points, resulting in further violations due to incomplete pollution abatement projects. At the K-901-A holding pond the chromium limit was exceeded. The Recycle/Resoften Blowdown Project (GPP 1973) will hopefully alleviate this problem; it is scheduled for completion in July, 1976. At the K-1410 nickel plating facility pH values have exceeded the NPDES permit range. An In-line Equalization and Neutralization Basin (GPP 1974) is scheduled for completion by January 1, 1977. This should eliminate further pH violations.

ORGDP effluent data for March, April, and May, 1976, are presented in Tables E-7 through E-14.

Table E-7

EMISSION DATA AT ORGDP EFFLUENTS

Location: K-1131 STEAM CONDENSATE DISCHARGE

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	MAR. APR. MAY MIN.	AVERAGE	MAX.	PROPOSED EFFLUENT STANDARD Daily Min.	Daily Avg.	Daily Max.
Flow (MGD)	(2)	0.0036	(2)		0.005	0.008[1]
Chemical Oxygen Demand, mg/1	(2)	5	(2)			
Conductivity, µmhos	(2)	190	(2)			
pH	(2)	7.9	(2)	6.0		9.0[1]
Temperature, (°F)	(2)	99°	(2)			

(1) NPDES Discharge Permit No. TN0002950 effective now.

(2) Only one quarterly sample taken.

Table E-8

EMISSION DATA AT ORGDP EFFLUENTS

Location: K-1700 HOLDING POND

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	MAR. MIN.	APR. AVERAGE	MAY MAX.	PROPOSED EFFLUENT STANDARD Daily Min.	Daily Avg.	Daily Max.
Flow (MGD)	0.968	1.523	2.701			
Aluminum, mg/1	0.20	0.23	0.28			1.0 mg/1 (1)
Chemical Oxygen Demand, mg/1	3	11	27			
Chromium, mg/1	0.01	0.11	0.25		0.05 mg/1	0.08 mg/1 (1)
Dissolved Solids, mg/1	227	337	439			
Fluoride, mg/1	0.94	1.2	1.7			
Nitrate	27.4	45.7	70.8			90 mg/1 (1)
Oil and Grease, mg/1	<1	<1	2		10 mg/1	15 mg/1 (2)
pH	5.5	7.2	9.6	6.0		9.0 (1)
Suspended Solids, mg/1	5	8	10		30 mg/1	50 mg/1 (1)
Temperature (°F)	52	63	70			
Turbidity, JTU	1	6	42			

(1) NPDES Discharge Permit No. TN0002950 effective January 1, 1977.

(2) NPDES Discharge Permit No. TN0002950 effective now.

Table E-9

EMISSION DATA AT ORGDP EFFLUENTS

Location: K-710 SANITARY TREATMENT FACILITY

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	MAR. APR. MAY MIN.	AVERAGE	MAX.	PROPOSED EFFLUENT STANDARD Monthly Avg.	Weekly Avg.
Flow (MGD)	0.012	0.019	0.032		
Biochemical Oxygen Demand, mg/1	1	<3	25	30	45(1)
Suspended Solids, mg/1	<1	<5	9	30	45(1)
Fecal Coliform Bacteria (No. per 100 milliliter)	0	0	0	200	400(1)
pH	6.5	7.3	8.3	The pH shall not be less than 6.0 nor greater than 9.0(1).	
Chlorine Residual, mg/1	0.0	1.3	>2	The chlorine residual shall not be less than 0.5 mg/1 nor greater than 2.0 mg/1.(1)	
Settleable Solids (ml/1)	<0.1	<0.1	<0.1		1.0(1)

(1) NPDES Discharge Permit No. TN0002950 effective now.

SECRET

SECRET

Table E-10

EMISSION DATA AT ORGDP EFFLUENTS

Location: K-1515 SANITARY WATER PLANT

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	MAR. APR. MAY MIN.	AVERAGE	MAX.	PROPOSED EFFLUENT STANDARD Daily Min.	Daily Avg.	Daily Max.
Flow (MGD)	0.065	0.087	0.108			
Suspended Solids, mg/1	<5	10	17		30 mg/1	50 mg/1 (1)
Aluminum, mg/1	0.22	1.29	3.0			250 mg/1 (1)
Sulfate, mg/1	13	15	17			1400 mg/1 (1)
Chemical Oxygen Demand, mg/1	3	7	14			
pH	7.0	7.2	7.3			

(1) NPDES Discharge Permit No. TN0002950 effective July 1, 1976

SECRET

Table E-11

EMISSION DATA AT ORGDP EFFLUENTS

Location: K-901-A HOLDING POND

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	MAR. MIN.	APR. AVERAGE	MAY MAX.	PROPOSED EFFLUENT STANDARD Daily Min.	Daily Avg.	Daily Max.
Flow (MGD)	0.914	>2.397	>13.392			
Chemical Oxygen Demand, mg/1	13	16	19			
Chromium	3.7	4.5	6.2			0.05 mg/1[1]
Dissolved Oxygen, mg/1	12	14	17			
Fluoride	0.30	0.33	0.35		1.0 mg/1	1.5 mg/1[1]
Oil and Grease, mg/1[2]		2.9			10 mg/1	15 mg/1[1]
Suspended Solids, mg/1	6	15	27		30 mg/1	50 mg/1[1]
Turbidity, JTU	1	5	11			
pH	7.6	9.5	10.7	6.0		9.0[1]

[1] NPDES Discharge Permit No. TN0002950 effective now.

[2] Only one quarterly sample taken.

SECRET

SECRET

13

Table E-12

EMISSION DATA AT ORGDP EFFLUENTS

Location: K-1007-B HOLDING POND

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	MAR. APR. MAY MIN.	AVERAGE	MAX.	PROPOSED EFFLUENT STANDARD Daily Min.	Daily Avg.	Daily Max.
Flow (MGD)	1.025	>1.745	>5.707			
Suspended Solids, mg/1	5	24	78		30 mg/1	45 mg/1 (1)
Chemical Oxygen Demand, mg/1	3	10	16		20 mg/1	25 mg/1 (1)
Chromium	0.02	0.03	0.04			0.05 mg/1 (1)
Dissolved Oxygen	4.0	9.2	14.7	5.0 mg/1 (1)		
Fluoride	0.37	0.58	0.76		1.0 mg/1	1.5 mg/1 (1)
Oil and Grease, mg/1	<1	<1	<1		10 mg/1	15 mg/1 (1)
pH	6.0	8.4	10.2	6.0		9.0 (1)

(1) NPDES Discharge Permit No. TN0002950 effective now.

SECRET

SECRET

14

Table E-13

EMISSION DATA AT ORGDP EFFLUENTS

Location: K-1203 SANITARY TREATMENT FACILITY

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	MAR. APR. MAY MIN.	AVERAGE	MAX.	PROPOSED EFFLUENT STANDARD Monthly Avg.	Weekly Avg.
Flow (MGD)	0.317	0.638	1.738		
Biochemical Oxygen Demand, mg/l	2	16	45	15	20[1]
Suspended Solids, mg/l	5	16	48	30	45[1]
Chlorine Residual, mg/l	0	0.8	2.0	The chlorine residual shall not be less than 0.5 mg/l nor greater than 2.0 mg/l.[2]	
pH	6.1	6.7	7.4	The pH shall not be less than 6.0 nor greater than 9.0.[2]	
Fecal Coliform Bacteria (No. per 100 milliliter)	0	0	0	200	400[1]
Settleable Solids, ml/l	<0.1	<0.3	2.0	The settleable solids shall not exceed 0.5 ml/l.	
Ammonia Nitrogen, mg/l	0.17	3.4	5.3	5	7[1]

[1] NPDES Permit No. TN0002950 effective July 1, 1976.

[2] NPDES Permit No. TN0002950 effective now.

SECRET

SECRET

Table E-14

EMISSION DATA AT ORGDP EFFLUENTS

Location: K-1410 NICKEL PLATING FACILITY

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	MAR. APR. MAY. MIN.	AVERAGE	MAX.	PROPOSED EFFLUENT STANDARD Daily Min.	Daily Avg.	Daily Max.
Flow (MGD)		0.0072				
Cyanide, mg/1		0.005		< 0.0005 mg/1		0.011(2)
Oil and Grease, mg/1	<1	9	24		10 mg/1	15(1) mg/1
Nickel, mg/1	0.005	0.23	0.55			
pH	2.4	8.5	11.8	6.0		9.0(1)

(1) NPDES Discharge Permit No. TN0002950 effective now.

(2) Background concentration determined from Clinch River Samples.

SECRET

SECRET

16

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number ~~K-1919~~ K/EM-327 Date of document 5/28/96

Title and author (if document is unnumbered)

(This section to be completed by Document Center)

Date request received 10/20/95

Date submitted to ADC 12/19/95

Date submitted to HSA Coordinator 10/20/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 12/19/95 1/22/96

Date received from CICO 1/5/96 2/26/96

Date submitted to ChemRisk/Shonka and DOE 2/26/96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

K/EM-327

SANITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT THIRD FISCAL QUARTER JANUARY 1 THRU MARCH 31, 1976

(EXTRACTED FROM SRD DOCUMENT # K-1919)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

December 18, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release to the public by:

2/22/96

Technical Information Officer Date
Oak Ridge K-25 Site

[redacted]

K-1919

26A

OAK RIDGE GASEOUS DIFFUSION PLANT

QUARTERLY REPORT (U)

UNION CARBIDE

OAK RIDGE GASEOUS DIFFUSION PLANT
OAK RIDGE, TENNESSEE

prepared for the U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
under U.S. GOVERNMENT *Contract W-7405 eng 26*

RESTRICTED DATA
This doc[redacted] cont[redacted] Restrict[redacted]ata as defin[redacted] the [redacted]ic Ene[redacted]ct of 1954. [redacted] dissem[redacted]on or dis[redacted]re to any unauthorized per[redacted]on is prohibited.

[redacted]

2

[redacted]

3

This document consists of 158 *pages,*
No. 26 *of* 52 *copies, Series* A.

Date of Issuance: May 28, 1976

K 1919 26 A

K-1919

K 1919 26 A

X91767

OAK RIDGE GASEOUS DIFFUSION PLANT
QUARTERLY REPORT (U)

THIRD QUARTER FISCAL YEAR 1976
January 1, 1976 through March 31, 1976

P. S. Cates

P. S. Cates
Classifying Official
Superintendent, Operations Planning Department
Title

RES[redacted] DAT[redacted]
Thi[redacted]tains R[redacted]ed Data as [redacted] Atomic[redacted]gy Act of 19[redacted]ination [redacted]closure to any [redacted]thorize[redacted] person [redacted]hibited.

[redacted] 3

EFFICIENCIES AND PURGE RATES (U).

1. CASCADE OPERATIONS 4. PURGE CASCADE--OPERATIONS
2. CONVERTERS--FLUORINATION
3. PURGE CASCADE

Cascade Efficiency

Based on the separative work concept, the January, February, and March cascade efficiencies were 99.75%, 99.80%, and 99.70%, respectively, for a quarterly average of 99.75%.

On-Stream Efficiency

The cascade on-stream efficiency during the third quarter of FY 1976 averaged 99.44%. Excluding off-stream time attributable to the plant test program and power control, the efficiency averaged 99.47%. Cascade off-stream hours are given in Table C-9.

The quarterly efficiency for the cascade buildings averaged 99.43% for K-33, 99.29% for K-31, and 99.97% for K-29.

PURGE CASCADE

The normal purge rate at K-311-1 during the third quarter, FY 1976 averaged 14,037 scf per day. The highest monthly average was in February when 14,207 scf per day was purged. The January and March rates were 14,177 and 13,726, respectively.

New Purge Cascade - K-402-9

At the end of February, operational checks had been completed on all cells and booster stations, the instrument and electrical systems had been checked out, and the hoist for the top booster had been installed. The project was completed within the authorized funding.

An attempt to place the new purge cascade on-stream in early March was unsuccessful. The cell instruments and controls were rechecked and an intensive training program for Operations and Maintenance personnel was 75% complete at the end of March.

On March 11, the inadvertent opening of the K-402-9.6 evacuation valve resulted in the release of less than 225 grams uranium.* The alumina traps aided in reducing the quantity of the release. No significant health physics or environmental impact resulted.

---

*J. C. Bailey, et al, *UF_6 Release at K-402-9 March 11, 1976*, May 14, 1976, K-P-6257, UNCLASSIFIED.

the new K-1203 sewage treatment facility. Until such time as this new sewage plant is operational, the wastes have been divided into a relatively concentrated stream that is being treated and/or stored on site and a less concentrated stream that is being discharged to Poplar Creek via the K-1007-B holding pond. The various treatments afforded different segments of the concentrated stream include: (1) concentration by an evaporator, with the concentrate being stored in the K-1407-C retention basin, (2) biodegradation in the K-710 sewage plant, (3) concentration by a reverse osmosis unit, and (4) storage in the K-802-H cooling tower basin, with the K-1407-C retention basin as a backup.

As of April 1, 1976, the K-802-H cooling tower basin had a capability of containing approximately 250,000 additional gallons of waste. This capability would have provided most of the storage capacity needed prior to initiation of treatment in the new sewage plant which was scheduled for completion by April 15, 1976. However, with the slippage of the completion date to mid or late May, additional storage capacity was required. To provide this capacity, the K-1407-C retention basin was enlarged and upgraded, primarily by increasing the height and width of the berm around the basin.

The capacity of the K-1407-C basin should provide the storage volume needed until such time as the new sewage plant is capable of handling the waste stream (probably around the first to middle of July, 1976). However, it will be utilized only after the K-802-H basin has been filled.

Steam Plant - Electrostatic Precipitators 1. ELECTROSTATIC PRECIPITATION 2. ENVIRONMENTAL MANAGEMENT

Bids on the ORGDP precipitators were opened on February 24, 1976. The bids were reviewed by ERDA and UCC-ND personnel and the contract for approximately $775,000 was awarded to Envirotec Engineering on March 30, 1976. Barring any further delays in procurement, it appears that the installation deadline of October 1, 1977 can still be met.

1. EFFLUENTS 2. ENVIRONMENTAL MANAGEMENT

Sampling Program (U). 3. SAMPLING

The Environmental and Effluent Sampling Program for ORGDP was revised during this quarter. The program was updated to include additional parameters as required by NPDES Permit No. TN0002950. Several sampling changes recommended by the Ecological Sciences Division of ORNL in the Environmental Assessment of the Oak Ridge facilities were also included in the new program. These include additional vegetation and soil sampling and periodic sampling of the biota in the ambient water systems.

Because of the increase in activity at ORGDP, vegetation surrounding the plant is being sampled at a higher frequency. Once a month samples are collected at six different locations (at various distances from the plant) and, subsequently, analyzed for fluoride content. These data will be useful in evaluating the effect of gaseous fluoride releases, specifically those of a seasonal nature.

1. AIR SAMPLING
2. ENVIRONMENTAL MANAGEMENT
3. URANIUM HEXAFLUORIDE--RELEASES

UF_6 Test Releases (U).

The first of a series of UF_6 test releases was made in the ventilation system in the K-33 building. These tests are expected to furnish the critical design criteria for the location, mounting arrangement, and quantity of UF_6 detectors needed for CIP/CUP operating conditions.

Numerous environmental air samples were taken during the first week of test releases. The maximum release rate encountered was 8.5 g/min for a total of 15 minutes. There was a total of 17 tests made between February 25 and March 25 with a total amount of 1,189.0 grams of UF_6 released. During the first thirteen tests, three air samplers were triggered during the time period of each test; one was located on the roof of K-33 and the other downwind of the release point. In addition, ambient air samplers located around ORGDP were operated. The parameters monitored were fluorides and uranium. It was ascertained that at these release rates the environmental impact of the UF_6 was negligible. Additional environmental samples will be taken when the test release rates are above 8.5 g/min.

Cascade Sampling (U).

1. CASCADE OPERATIONS
2. NEPTUNIUM
3. PLUTONIUM
4. SAMPLING

An investigation is under way to determine the quantity of transuranics (neptunium and plutonium) deposited within the cascade. Several converters, removed from the cascade for decontamination and modification, have been sampled for the deposited material. The results thus far are incomplete. A statistical analysis is expected to indicate the location and minimum number of cells that must be sampled in order to ascertain the total quantity of deposited transuranics throughout the cascade. In addition, samples will be taken to trace the flow of this material through the decontamination and recovery process. This information will be instrumental in projecting the behavior of transuranics in the cascade. The presence of these transuranics is expected to increase in the future due to the increased feed of reactor returns material.

K-1515 Sampling Station (U). 1. SAMPLING

While construction of the sampling station has been completed, infiltration around the dam and leaks in the culvert which passes under Bear Creek Road have made the system inoperable. Modifications are in progress to correct these problems and there is no anticipated delay in meeting the NPDES discharge permit requirements of June 30, 1976.

New SO_2 Emission Standards (U.) SULFUR DIOXIDE

The SO_2 emission standards which were approved by the State of Tennessee Air Pollution Control Board on October 23, 1975 became effective on March 20, 1976. The State has submitted these regulations to EPA but official approval has not yet been received.

Procedure for Disposal of Mercury Vapor Lamps (U) MERCURY VAPOR LAMPS

Increased usage of mercury vapor lamps and ultimate disposal of failed lamps have resulted in the need for an environmentally-acceptable collection and disposal method. A procedure is being prepared.

NPDES NonCompliance Situations (U). 1. HOLDING POND 2. PH

The pH of K-1007-B holding pond exceeded the NPDES Discharge Permit upper limit of 9.0 on January 31, 1976. Intermittent violations of this nature continued to occur until the middle of March.

Instrumentation has been installed to automatically recycle this waste stream if the effluent exceeds the 6.0-9.0 range. This has effectively reduced the pH values at the outfall of K-1007-B. However, periodic high pH values are still being observed, and investigation of the cause is under way.

Quarterly EPA Report (U) ENVIRONMENTAL MANAGEMENT

The fourth quarterly EPA liquid effluent report was submitted to ERDA on January 20, 1976. The report covers the effluent monitoring data from October 1, 1975 through December 31, 1975. During this period, abnormally high pH values continued to be observed at Discharge Point 007 (K-901-A holding pond). Low chlorine residual values were again recorded at Discharge Points 005 and 008 (K-1203 sewage treatment facility and K-710-A sewage treatment facility, respectively). In addition, one low pH value was recorded at Discharge Point 008.

Emission Data (U) 1. EFFLUENTS 2. HOLDING POND

Tables E-5 through E-11 give emission data at the various ORGDP effluent locations. 3. NICKEL PLATING FACILITY 4. SANITARY TREATMENT FACILITY 5. STEAM

SECRET

Table E-6

EMISSION DATA AT ORGDP EFFLUENTS

Location: K-1700 HOLDING POND

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	DEC. MIN.	JAN. AVERAGE	FEB. MAX.	PROPOSED EFFLUENT STANDARD Daily Min.	Daily Avg.	Daily Max.
Flow (MGD)	0.7978	1.6274	Flooded			
Aluminum, mg/1	0.28	0.39	0.60			1.0 mg/1 (1)
Chemical Oxygen Demand, mg/1	12	22	32			
Chromium, mg/1	0.03	0.10	.22		0.05 mg/1	0.08 mg/1 (1)
Dissolved Solids, mg/1	307	409	501			
Fluoride, mg/1	0.4	0.8	1.1			
Nitrate	54.9	60.8	70.8			90 mg/1 (1)
Oil and Grease, mg/1	<1	<1	<1		10 mg/1	15 mg/1 (2)
pH	5.6	7.2	9.8	6.0		9.0 (1)
Suspended Solids, mg/1	<5	10	18		30 mg/1	50 mg/1 (1)
Temperature (°F)	30	41	52			
Turbidity, JTU	2	9	23			

(1) NPDES Discharge Permit No. TN0002950 effective January 1, 1977.

(2) NPDES Discharge Permit No. TN0002950 effective now.

SECRET

Table E-5

EMISSION DATA AT ORGDP EFFLUENTS

Location: K-1131 STEAM CONDENSATE DISCHARGE

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	DEC. JAN. FEB. MIN.	AVERAGE	MAX.	PROPOSED EFFLUENT STANDARD Daily Min.	Daily Avg.	Daily Max.
Flow (MGD)	(2)	0.0036	(2)		0.005 mg/1	0.008 mg/1 (1)
Chemical Oxygen Demand, mg/1	(2)	40	(2)			
Conductivity µmhos	(2)	140	(2)			
pH	(2)	7.04	(2)	6.0		9.0 (1)
Temperature (°F)	(2)	102°	(2)			

(1) NPDES Discharge Permit No. TN0002950 effective now.

(2) Only one quarterly sample taken.

SECRET

SECRET

Table E-7

EMISSION DATA AT ORGDP EFFLUENTS

Location: K-710 SANITARY TREATMENT FACILITY

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	DEC. JAN. FEB. MIN.	AVERAGE	MAX.	PROPOSED EFFLUENT STANDARD Monthly Avg.	Weekly Avg.
Flow (MGD)	0.00116	0.0181	0.0333		
Biochemical Oxygen Demand, mg/l	2	10	25	30	45(1)
Suspended Solids, mg/l	<5	<13	26	30	45(1)
Fecal Coliform Bacteria (No. per 100 milliliter)		0		200	400(1)
pH	6.7	7.4	8.6	The pH shall not be less than 6.0 nor greater than 9.0(1).	
Chlorine Residual, mg/l	0.0	.8	2.0	The chlorine residual shall not be less than 0.5 mg/l nor greater than 2.0 mg/l.(1)	
Settleable Solids (ml/l)	<0.1	<0.1	<0.1		1.0(1)

(1) NPDES Discharge Permit No. TN0002950 effective now.

SECRET

SECRET

Table E-8

EMISSION DATA AT ORGDP EFFLUENTS

Location: K-1515 SANITARY WATER PLANT

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	DEC. JAN. FEB. MIN.	AVERAGE	MAX.	PROPOSED EFFLUENT STANDARD Daily Min.	Daily Avg.	Daily Max.
Flow (MGD)	0.054	0.108	0.216			
Suspended Solids, mg/1	<5	34	156		30 mg/1	50 mg/1 (1)
Aluminum, mg/1	0.32	3.2	6.0			250 mg/1 (1)
Sulfate, mg/1	15	21	26			1400 mg/1 (1)
Chemical Oxygen Demand, mg/1	7	12	19			
pH	6.7	7.2	7.6			

(1) NPDES Discharge Permit No. TN0002950 effective July 1, 1976.

(2) NPDES Discharge Permit No. TN0002950 effective now.

SECRET

SECRET

Table E-9

EMISSION DATA AT ORGDP EFFLUENTS

Location: K-901-A HOLDING POND

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	DEC. JAN. FEB. MIN.	AVERAGE	MAX.	PROPOSED EFFLUENT STANDARD Daily Min.	Daily Avg.	Daily Max.
Flow (MGD)	1.204	2.399	4.988			
Chemical Oxygen Demand, mg/1	19	22	26			
Chromium, mg/1	3.2	3.5	3.8			0.05 mg/1[1]
Dissolved Oxygen, mg/1	12.0	13.6	15.4			
Fluoride	0.19	0.23	.30		1.0 mg/1	1.5 mg/1[1]
Oil and Grease, mg/1[2]		<1			10 mg/1	15 mg/1[1]
Suspended Solids, mg/1	<5	<7.5	13		30 mg/1	50 mg/1[1]
Turbidity, JTU	2	7	20			
pH	8.4	9.1	10.7	6.0		9.0[1]

(1) NPDES Discharge Permit No. TN0002950 effective now.

(2) Only one quarterly sample taken.

Table E-10

EMISSION DATA AT ORGDP EFFLUENTS

Location: K-1007-B HOLDING POND

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	DEC. JAN. FEB. MIN.	AVERAGE	MAX.	PROPOSED EFFLUENT STANDARD Daily Min.	Daily Avg.	Daily Max.
Flow (MGD)	1.454	>2.739	>5.707			
Suspended Solids, mg/1	<5	<8	11		30 mg/1	45 mg/1 (1)
Chemical Oxygen Demand, mg/1	4	10	13		20 mg/1	25 mg/1 (1)
Chromium, mg/1	0.02	0.03	0.05			0.05 mg/1 (1)
Dissolved Oxygen, mg/1	6.0	12.0	17.0	5.0 mg/1 (1)		
Fluoride, mg/1	0.30	.44	0.56			
Oil and Grease, mg/1	<1	<1	<1		10 mg/1	15 mg/1 (1)
pH	7.3	8.2	10.0	6.0		9.0 (1)

(1) NPDES Discharge Permit No. TN0002950 effective now.

SECRET

Table E-11

EMISSION DATA AT ORGDP EFFLUENTS

Location: K-1203 SANITARY TREATMENT FACILITY

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	DEC. JAN. FEB. MIN.	AVERAGE	MAX.	PROPOSED EFFLUENT STANDARD Monthly Avg.	Weekly Avg.
Flow (MGD)	0.370	0.518	1.040		
Biochemical Oxygen Demand, mg/l	3	25	57	15	20[1]
Suspended Solids, mg/l	<5	<17	42	30	45[1]
Chlorine Residual, mg/l	0	0.9	2.0	The chlorine residual shall not be less than 0.5 mg/l nor greater than 2.0 mg/l.[2]	
pH	6.2	6.9	7.7	The pH shall not be less than 6.0 nor greater than 9.0.[2]	
Fecal Coliform Bacteria (No. per 100 milliliter)	0	0	0	200	400[1]
Settleable Solids, ml/l	<0.1	<0.2	<0.5	The settleable solids shall not exceed 0.5 ml/l.	
Ammonia Nitrogen, mg/l	2.6	3.8	5.5	5	7[1]

(1) NPDES Permit No. TN0002950 effective July 1, 1976.

(2) NPDES Permit No. TN0002950 effective now.

SECRET

14

Table E-12

EMISSION DATA AT ORGDP EFFLUENTS

Location: K-1410 NICKEL PLATING FACILITY

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	DEC. JAN. FEB. MIN.	AVERAGE	MAX.	PROPOSED EFFLUENT STANDARD Daily Min.	Daily Avg.	Daily Max.
Flow (MGD)		0.0072				
Cyanide, mg/l		0.002				0.001
Oil and Grease, mg/l	<1	<1	<1		10	15[1]
Nickel, mg/l		5.0				
pH	6.6	7.2	10.6	6.0		9.0[1]

[1] NPDES Discharge Permit No. TN0002950 effective now.

[redacted]

[redacted]

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number ~~K-1918~~ KEM-326 Date of document 2/27/76

Title and author (if document is unnumbered)

(This section to be completed by Document Center)

Date request received 10/20/95

Date submitted to ADC 12/19/95

Date submitted to HSA Coordinator 10/20/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 12/19/95 1/22/96

Date received from CICO 1/5/96 2/26/96

Date submitted to ChemRisk/Shonka and DOE 2/26/96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

K/EM-326

SANITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT SECOND FISCAL QUARTER OCTOBER 1 THRU DECEMBER 31, 1975

(EXTRACTED FROM SRD DOCUMENT # K-1918)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

December 18, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release to the public by:

Technical Information Officer 2/22/96
Oak Ridge K-25 Site Date

~~SECRET~~

cy 21A

K-1918

PROPERTY OF
ORNGDP LIBRARY

QUARTERLY REPORT (U)
OAK RIDGE GASEOUS DIFFUSION PLANT

SECOND QUARTER FISCAL YEAR 1976
October 1, 1975 through December 31, 1975

UNION CARBIDE

OAK RIDGE GASEOUS DIFFUSION PLANT
OAK RIDGE, TENNESSEE

prepared for the U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
under U.S. GOVERNMENT *Contract W-7405 eng 26*

RESTRICTED DATA
This document contains Restricted Data as defined in the Atomic Energy Act of 1954. Its dissemination or disclosure to any unauthorized person is prohibited.

~~SECRET~~

2

[redacted]

3

This document consists of 154 *pages,*
No. 24 *of* 53 *copies, Series* A.

Date of Issuance: February 27, 1976

K-1918

CENTRAL LIBRARY
REC. X04881
FILE
X-REF.
X-REF.

K 1918 24 A
K 1918 24 A

OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT (U)

SECOND QUARTER FISCAL YEAR 1976
October 1, 1975 through December 31, 1975

RESTRI[redacted]A
This do[redacted] cont[redacted]estricted [redacted]
as defi[redacted] the [redacted] Energy [redacted] of
1954 [redacted]ssemi[redacted] or discl[redacted]to any
una[redacted]rized pers[redacted] is prohib[redacted]d.

P. S. Cates
P. S. Cates
Classifying Official
Superintendent, Operations Planning Department
Title

[redacted] 3

K-1131 Feed and Tails

The new PPF autoclaves have been installed, leak tested, and sanitary water and air tie-ins have been made. Leak testing and checkout of the electrical and instrument systems on the new tails withdrawal system are in progress.

EFFICIENCIES AND PURGE RATES (U).

1. PURGE RATES 2. SEPARATION EFFICIENCY

Cascade Efficiency

Based on the separative work concept, the October, November, and December cascade efficiencies wer 99.82%, 99.93%, and 99.75%, respectively, for a quarterly average of 99.83%.

On-Stream Efficiency

The cascade on-stream efficiency during the FY 1976 second quarter averaged 99.82%. Excluding off-stream time attributable to the Plant Test Program and power control, the efficiency averaged 99.82%. Cascade off-stream hours are given in Table C-9. The quarterly efficiency for each of the cascade buildings averaged 99.95% for K-33, 99.61% for K-31, and 99.95% for K-29.

PURGE CASCADE (U).

1. CONVERTERS (PURGE CASCADE) 2. PURGE CASCADE 3. PURGE SYSTEMS

The normal purge rate at K-311-1 during the FY 1976 first quarter averaged 18,958 scf per day. The highest monthly average during the quarter was in October when 19,452 scf per day was purged. The November and December rates were 18,617 and 18,806, respectively.

New Purge Cascade

The assembly of the second high-speed cell was completed during November. Assembly of the third, and last, high-speed cell is 80 percent complete.

Operations completed mechanical check runs on three of the seven low-speed cells. The cells are being conditioned in preparation for charging with UF_6. The other four low-speed cells are being checked for start-up. Testing and debugging are in progress on the purge unit electrical and instrument control systems.

Completion of the CPFF phase of the project is still contingent on delivery of the top booster hoist, which is scheduled to arrive late in January.

Because of the recent OCAW month-long strike, the project directive was modified to extend the completion date to February 28, 1976, and to allocate the authorized funds as per the October, 1975 Best Efforts review.

HEALTH PHYSICS (2).

Personnel Radiation Monitoring

Analyses of 486 urine specimens for uranium and alpha activity for the period October 1 through December 31, 1975, identified eight employees that exceeded the plant control guide for a single sample. Included were (1) five maintenance employees involved in a UF_6 release when starting removal of a control valve in K-31, (2) two chemical operators in K-1423 who were involved in the transfer of a ruptured 2-1/2-ton cylinder to K-29 on September 26, 1975, and (3) a chemical operations supervisor who was handling product cylinder pigtails and other routine sampling work in K-1423.

Subsequent follow-up specimens showed that the uranium excretion rates had decreased in each instance to levels below the plant control guide and that there was no significant retention of uranium.

Airborne Uranium Alpha Activity

The average alpha activity levels reflected by 1585 routine shift-length samples, recorded by continuous monitoring units in locations where air contamination is suspected, remained essentially unchanged and low, representing about 12% of the U.S. Energy Research and Development Administration (ERDA) Radiation Protection Standard (RPS) of 10^{-10} μCi uranium/cc of air. The average alpha activity from 837 shift-length air samples, taken at four outdoor locations around the plant perimeter downwind from major stack discharges, was less than 7% of the RPS.

Plant Procedures and Standards

Two Standard Practice Procedures dealing with the ORGDP radiation control program were issued:

1. SPP-B-340, *Scrap Metal Control Program*, and

2. SPP-B-391, *Installation, Use and Storage of X-Ray Equipment and Radioactive Sources.*

X-Ray Generator Evaluation

The uprating design review of the X-ray generators and radiation sources, initiated last quarter, was brought to 87% completion. Associated with this review was the decision to adopt the comprehensive Y-12 standards for X-ray machines and sources rather than limit the evaluation to the minimum required by the corresponding ANSI standards. Complete designs are being developed for all operating units and were completed for 12 out of 15 units.

Emergency Preparedness

Simulation of a criticality accident held at the Oak Ridge National

The results showed that at pH 3.4, on an average, the plate hardness increased 20 DPH units for each ppm increase in dioctylphthalate concentration. Plates prepared at pH 3.4 and at current densities in the range of 10-20 A/ft^2 exhibited stress cracks. In general, plate hardness decreased as pH decreased or as current density increased.

ROCKY FLATS AIR FILTERS (4).

[Keywords: Filter Paper Composition; Asbestos Content]

The Rocky Flats Plant (Rockwell International, Golden, Colorado), which processes plutonium, employs large high efficiency particulate (HEPA) air-filtration systems in each process building. One building alone contains a six-stage plenum with 30 filters per stage, with each filter being 4 ft^2 in area. The service life of a conventional glass filter in these buildings is approximately two weeks. This low life represents a very high cost for filter replacement and disposal.

Flanders Filters, Inc., Washington, North Carolina, manufactures a filter paper which nominally contains 95 wt % glass fiber and 5 wt % asbestos and has in-service life at Rocky Flats of 10-12 weeks. The Rocky Flats Filter Testing Facility is now preparing handsheets of varying asbestos content (1 to 8 wt % asbestos) for environmental testing to determine the optimum asbestos content, which will provide the longest filter paper life.

It is apparent from weight tests that some of the asbestos added to the original slurry is being lost by passing through a 100-mesh screen used in the handsheet preparation.

The ORGDP Laboratory was asked to assist in developing an analytical technique to determine the asbestos concentration in the handsheets and in the commercial filter papers. Samples of the crocidolite asbestos and JM-475 type glass fiber to be used in the handsheets have been analyzed spectrochemically and chemically at ORGDP. The iron contents of the glass fiber and asbestos were found to be 1 ppm and 30.2 wt %, respectively. Other major constituents of the asbestos are also present in the glass fiber in concentrations which are too high to be used as a means of differentiating between asbestos and glass fiber. An analytical procedure based on the iron content in the paper appears to be feasible and attractive for determining its asbestos content.

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (Is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number ~~K-1917~~ KEM-325 Date of document 11-21-75

Title and author (if document is unnumbered)

(This section to be completed by Document Center)

Date request received 10/20/95

Date submitted to ADC 12/19/95

Date submitted to HSA Coordinator 10/20/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 12/19/95 1/22/96

Date received from CICO 1/5/96 2/26/96

Date submitted to ChemRisk/Shonka and DOE 2/26/96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

K/EM-325

SANITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT FIRST FISCAL QUARTER JULY 1 THRU SEPTEMBER 30, 1975

(EXTRACTED FROM SRD DOCUMENT # K-1917)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

December 18, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release to the public by:

2/22/96

Technical Information Officer Date
Oak Ridge K-25 Site

[redacted]

Cy 24 A

K-1917

X 04738

QUARTERLY REPORT (U)
OAK RIDGE GASEOUS DIFFUSION PLANT

FIRST QUARTER FISCAL YEAR 1976
July 1, 1975 through September 30, 1975

UNION CARBIDE

OAK RIDGE GASEOUS DIFFUSION PLANT
OAK RIDGE, TENNESSEE

prepared for the U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
under U.S. GOVERNMENT *Contract W-7405 eng 26*

RESTRICTED DATA

This document contains Restricted Data as defined in the Atomic Energy Act of 1954. Dissemination or disclosure to any unauthorized person is prohibited.

[redacted]

2

[redacted]

This document consists of 186 pages,
No. 24 of 53 copies, Series A.

Date of Issuance: November 21, 1975

K 1917 24 A

K-1917

K 1917 24 A

OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT (U)

FIRST QUARTER FISCAL YEAR 1976
July 1, 1975 through September 30, 1975

RESTRICTED DATA

This document contains Restricted Data as defined in the Atomic Energy Act of 1954. Its dissemination or disclosure to any unauthorized person is prohibited.

P. S. Cates
Classifying Official
Superintendent, Operations Planning Department
Title

[redacted] 3

Table C-6 presents feed stream totals for the fourth and first quarters. Table C-7 is a summary of the average daily U-235 input during the quarter. Cascade inventory changes are given in Table C-8.

K-1131 Feed and Tails

Essentially all piping work for the new feed systems is complete. Feed jets have not been delivered, and electrical and instrument work remains to be completed. Construction forces have concentrated on piping for the tails withdrawal facility. All equipment has been placed, and at the end of September, piping was about 75% complete. Tie-in to the nitrogen header has been made and a nitrogen buffer has been placed on the four compressor seals.

EFFICIENCIES AND PURGE RATES (u).

Cascade Efficiency

Based on the separative work concept, the July, August, and September cascade efficiencies were 99.86%, 99.96%, and 99.93%, respectively, for a quarterly average of 99.92%.

On-Stream Efficiency

The cascade on-stream efficiency during the FY 1976 first quarter averaged 99.81%. Excluding off-stream time attributable to the Plant Test Program and power control, the efficiency averaged 99.81%. Cascade off-stream hours are given in Table C-9.

The quarterly efficiency for each of the cascade buildings averaged 99.76% for K-33, 99.86% for K-31, and 99.87% for K-29.

PURGE CASCADE (u).

The average normal purge rate at K-311-1 during the FY 1976 first quarter was 11,010 scf per day. The highest monthly average during the quarter was during August when 11,806 scf per day was purged. The July and September rates were 10,866 and 10,339, respectively.

New Purge Cascade

Construction at the end of September is about 93% complete compared with a scheduled 100%. Because of procurement delays and diversion of UCC maintenance manpower to higher priority work, a directive modification has been issued requesting a three-month extension on the completion date to December 31, 1975.

Of the 38 high-speed impellers scheduled for installation in the cells and booster station, approximately 30 were on site at the end of September with the remainder due before the end of October. All speed increaser have been received except the two 9,000-rpm units for the Top Booster Station which are due the first week in October.

TABLE C-20

MATERIAL WITHDRAWN AWAITING SHIPMENT
AT END OF FIRST QUARTER

K-ES Request Number	Reactor/Processor	Target Wt. % U-235	Kilograms Uranium
NC-1847	Tarapur/India	2.66	9,180
227	Three Mile Island 2/Babcock & Wilcox	2.96	9,998
231	Diablo Canyon 2/Westinghouse	2.10	29,996
233	Tokai 2/General Electric	2.50	13,244
234	Almaraz 1/Westinghouse	2.60	6,000
234	Almaraz 1/Westinghouse	3.10*	12,001
237	Turkey Point 4/Westinghouse	3.00	11,352
241	Ginna/Westinghouse	3.10*	12,659
242	Turkey Point 4/Westinghouse	3.10	18,360
243	Pilgrim 1/General Electric	2.87	3,242
244	Vermont Yankee/General Electric	3.01	15,032
244	Vermont Yankee/General Electric	3.30*	6,000
248	Surry 2/Westinghouse	3.10*	10,112
250	Ringhals 2/RBU	3.25*	20,760

*From preproduction

TOLL ENRICHMENT

Toll enrichment shipments and cylinder handling activities at the toll enrichment facility, K-1423, are summarized in Table C-21.

UF_6 Release at K-1423

A UF_6 release occurred on September 17, when a 2-1/2 ton cylinder, which had just been filled with liquid UF_6, was being placed on a storage pad outside the K-1423 transfer room. Two employees were injured; one was treated at K-25 Medical Center and the other at the Oak Ridge Hospital and released. The Emergency Squads reacted promptly and the release was controlled within 10 minutes and secured within 20 minutes of the release. Four days cooldown time was allowed to assure solidification prior to handling the cylinder. Cylinder examination by Metallurgy personnel revealed that additional support to the end of the cylinder is needed prior to handling.

On September 27, the cylinder was secured inside a containment vessel and moved to an area north of K-29. A protective wood and plastic enclosure was built around the containment vessel and gentle heat was applied to the area inside the enclosure by alloying waste heat from K-29 to enter the enclosure. A pigtail was fabricated from copper tubing and ran from the cylinder valve to a connection leading to the No. 1 surge drum in K-29. A slight nitrogen buffer is being maintained between the containment vessel and the cylinder wall.

The results from gas samples which were obtained from the pigtail prior to initiation of feeding indicated that a reaction with hydrocarbon oil definitely occurred within the cylinder. Feeding to the No. 1 surge drum began at 1020 on October 2. As soon as the surge drum pressure equalizes with the cylinder pressure, a sample will be taken of the surge drum contents. Current plans are to then evacuate the drum to the K-310-3 unit, which is that portion of the purge cascade used to remove intermediate molecular weight compounds. After passing through this unit, the flow will pass through chemical traps which will retain the UF_6 and allow the other compounds to pass on to atmosphere. No disruption of normal operations and no exposure of the separating cascade barrier will occur with this procedure.

TABLE C-21

TOLL ENRICHMENT ACTIVITIES SUMMARY

	Toll Shipments		Number of Cylinders			
	Kilograms Uranium	Separative Work Value	Shipped	Received*	Weighed	Sampled
July	44,611	$ 8,840,052	31	42	136	57
August	130,756	27,214,535	91	17	199	70
September	76,832	15,450,476	53	24	243	47
FY 1976	252,199	$ 51,505,063	175	83	578	174

*Full feed cylinders

HEALTH PHYSICS (6).

Personnel Radiation Monitoring

Personnel radiation exposures as determined from dosimeter films for the period April 1 through June 30, 1975 remained relatively low. The maximum penetrating radiation dose of 184 mrem for a single individual was less than 7% of the Radiation Protection Guide (RPG) of 3,000 mrem per quarter. The maximum skin dose of 630 mrem for a single individual was less than 7% of the RPG of 10,000 mrem per quarter.

Analyses of 746 urine specimens, 722 from Union Carbide and 24 from contractor employees, for uranium and alpha activity for the period July 1 through September 30, 1975, identified 28 employees (35 samples) that exceeded the plant control guide for a single sample. Involved were (1) employees at K-1423 in the vicinity of a ruptured UF_6 cylinder, (2) a Laboratory Analyst exposed to a leaking UF_6 sample tube in K-1004-C, (3) a Machinist in K-1401 while machining cascade valve disks, (4) a Chemical Operator decontaminating seal parts in K-1420, (5) two Chemical Operators in K-1423 performing routine sampling of UF_6 cylinders, and (6) a Cascade Operator while disconnecting a pigtail from a faulty valve on a UF_6 cylinder in K-413.

Subsequent follow-up specimens showed that the uranium excretion rates had decreased in each instance to levels below the plant control guide and that there was no significant retention of uranium.

Airborne Uranium Alpha Activity

The average alpha activity levels reflected by 662 routine shift-length samples, recorded by continuous monitoring units in locations where air contamination is suspected, remained essentially unchanged and low, representing about 10% of the RPG of 10^{-10} μCi/cc uranium in air. The average alpha activity from 930 shift-length air samples, taken at four outdoor locations around the plant perimeter downwind from major stack discharges, was less than 10% of the RPG.

Cascade Improvement and Uprating Program Activities

CIP/CUP health physics activities were directed toward developing precise criteria for the shipment of motors to the contractor for rewinding. Also, special emphasis was placed on licensing by Kentucky of the National Electric Coil Company for receipt of contaminated motors, and on the preparation of these motors for shipment.

Plant Procedures and Standards

Three Standard Practice Procedures dealing with various aspects of radiation and radioactive contamination were issued. These included SPP-B-392, *Radiation Control and Reporting*; SPP-B-393, *Labeling for Radiation and Radioactive Contamination Control*; and SPP-B-396, *Transfer Regulations Pertaining to Radioactive Contamination.*

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 — Expected receipt of document 1 MONTH

Document number ~~IC-1904~~ XEM-324 — Date of document 11/17/72

Title and author (if document is unnumbered)

(This section to be completed by Document Center)

Date request received 10/20/95

Date submitted to ADC 12/19/95

Date submitted to HSA Coordinator 10/20/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 12/19/95 1/22/96

Date received from CICO 1/5/96 2/26/96

Date submitted to ChemRisk/Shonka and DOE 2/26/96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

K/EM-324

SANITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT FOURTH FISCAL QUARTER APRIL 1 THRU JUNE 30, 1972

(EXTRACTED FROM SRD DOCUMENT # K-1904)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

December 18, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release to the public by:

2/23/96

Technical Information Officer Date
Oak Ridge K-25 Site

[redacted]

Sadoped 2-20-73

28A

K-1904

OAK RIDGE GASEOUS DIFFUSION PLANT
QUARTERLY REPORT (U)
FOURTH QUARTER FY 1972
April 1, 1972 thru June 30, 1972

PROPERTY OF
ORGDP LIBRARY
NOV 29 1972

UNION CARBIDE

OAK RIDGE GASEOUS DIFFUSION PLANT
OAK RIDGE, TENNESSEE

prepared for the U.S. ATOMIC ENERGY COMMISSION
under U.S. GOVERNMENT *Contract W-7405 eng 26*

RESTR[redacted]ED [redacted]DATA[redacted]
This docum[redacted] cont[redacted] Restri[redacted] Data as defined [redacted] the [redacted]mic Ec[redacted] Act of 1954. Its [redacted]semi[redacted]on or di[redacted]sure to any unautho[redacted]d person is prohibited.

[redacted]

2

[redacted]

This document consists of 170 pages,
No. 28 of 64 copies, Series A.

DATE OF ISSUE: November 17, 1972

K-1904

K 1904 28 A

K 1904 28 A

CENTRAL LIBRARY
FILE
X-REF.
X-REF.

OAK RIDGE GASEOUS DIFFUSION PLANT
QUARTERLY REPORT (U)
FOURTH QUARTER FY 1972
April 1, 1972 thru June 30, 1972

DOCUMENT INVENTORIED
Date Initials
4/28/85 CLS

OAK RIDGE GASEOUS DIFFUSION PLANT
OAK RIDGE, TENNESSEE

E. H. Krieg, Jr., Superintendent
Operations Planning Department
Classifying Official

RESTRICTED DATA
This doc[redacted] con[redacted]ins Res[redacted]ted Data as defin[redacted] the [redacted]hic E[redacted] Act of 1954. [redacted]ssemi[redacted]on or [redacted]osure to any una[redacted]zed p[redacted] is pro[redacted]ited.

3

[redacted]

Table C-8 presents the cascade inventory change for the third and fourth quarters.

TABLE C-8

CASCADE INVENTORY CHANGE
(Kilograms)

	Third Quarter, FY 1972			
	^{235}Uranium		Xe	
	Ending Inventory	Δ	Ending Inventory	Δ
January	933.0	-52.486	427.0	-35.425
February	914.1	-18.877	418.2	- 8.826
March	905.3	- 8.775	405.9	-12.301
Total		-80.138		-56.552

	Fourth Quarter, FY 1972			
	^{235}Uranium		Xe	
	Ending Inventory	Δ	Ending Inventory	Δ
April	921.0	15.650	414.8	8.889
May	899.7	-31.301	398.1	-16.718
June	1054.0	164.351	325.2	-72.874
Total		148.700		-80.703

EFFICIENCIES AND PURGE RATES

Cascade Efficiency

Based on the separative work concept, cascade efficiency for April, May, and June were 99.99%, 99.93%, and 99.94%, respectively, for a quarterly average efficiency of 99.95%.

On-Stream Efficiency

The Cascade on-stream efficiency during the fourth quarter of fiscal year 1972 averaged 99.84%. Excluding off-stream time attributable to the Plant Test Program and power control, the efficiency also averaged 99.84%. The quarterly efficiency for each of the cascade buildings averaged 99.93% for K-33, 99.81% for K-31, and 99.67% for K-29. Hours off-stream are summarized in Table C-9.

TABLE C-9

HOURS OFF-STREAM

	April	May	June	FY 1972 4th Qtr.	FY 1972 3rd Qtr.
Compressor Seal	0	42.07	0	42.07	975.39
Stage Motor	0	0	61.37	61.37	55.58
Stage Compressor	0	0	0	0	249.13
Converter	0	0	0	0	21.00
Instrumentation	0	54.67	0	54.67	16.00
Coolant System	0	0	6.17	6.17	1.05
Inleakage Checks	1.41	0.75	0	2.16	23.09
Treatment Operation	4.25	19.00	37.83	61.08	0.10
Power Control	0	0	0	0	0
Power Interruptions	0	0	1.75	1.75	0
Plant Test	0	0	16.75	16.75	0
Miscellaneous	0	53.43	6.75	60.18	77.77
Econ. Scheduling	0	0	0	0	0
Total	5.66	169.92	130.62	306.20	1419.11

PURGE CASCADE

[Keywords: Purge Systems--Control]

The average normal purge rate at K-311-1 during the fourth quarter was 10,246 scf per day. The highest monthly average during the quarter was in April when 12,067 scf per day was purged. The May and June rates were 9,903 and 8,767 scf per day, respectively.

Relocation of Purge Cascade to K-402-9

Both the Project Data Sheet and the Major Program Issue Analysis have been issued for the construction of a new purge cascade in the K-402-9 unit of the standby K-27 building at a cost of $5.9 million. This proposal, a FY 1974 project, is the final recommendation of the New Purge Facility Committee. The details of this recommendation along with alternatives considered are presented in K-D-2765, the full report of the committee. The committee will remain functional throughout conceptual design of the new purge to study the problems and make recommendations concerning details of the process.

2. Two of the electrical transformers located at the south-east end of K-1131 have been relocated, and electrical tie-ins have been completed. This was necessary to allow for a passageway between K-1131 and K-1231 after the K-1231 north addition had been started.

3. The hydrofluoric acid vent line and demineralized water line located between the K-1131 and K-1231 buildings have been relocated.

4. A new recirculating water line leading from K-402-9 to the K-413 building via K-1231 has been installed.

5. Demolition of the abandoned equipment in the south cell room in K-1131 will begin on May 1. A new water demineralizer, and the two old units from the K-1231 building are to be located in this room.

The Rust Engineering Company has completed their work associated with the demineralized water units. They have begun fabricating the duct work necessary to install the new back-up filter system which is on order and is to replace the present inefficient filter

Effort is being made to release to the Rust Engineering Company, some of the demolition work inside the K-1231 building, change house, lunch room, and restroom.

NUCLEAR MATERIALS MANAGEMENT

[Keywords: Uranium Accountability]

The nuclear material management program is designed to exercise suitable controls over the movement of source and special nuclear materials. This involves surveillance of material balance experience by individual process and maintenance of necessary quality control systems for weights and analyses of samples.

MATERIAL BALANCES

Cascade

The cascade material balance experience for April, May, and June is presented in Table C-18. No significance is associated with the gains or the loss.

TABLE C-18

CASCADE MATERIAL BALANCE SUMMARY
(Kilograms)

Fourth Quarter FY 1972	Uranium		^{235}Uranium	
	Gain	Loss	Gain	Loss
April	-	503	-	4
May	749	-	6	-
June	414.6	-	3.8	-

Personnel Radiation Monitoring

[Keywords: Radiation Effects]

The average film badge exposure of eleven mRem for the 111 persons monitored quarterly compares favorably with the low values reported for recent years. The maximum exposure to a single individual in the plant population considered to have some potential exposure to penetrating radiation approximated ten percent of the radiation protection guide of 3,000 mRem/quarter.

Similarly, random sampling of the general plant population not normally considered to be *at risk* was continued on a quarterly schedule. These results revealed no personnel exposure to penetrating radiation of as much as ten percent of the quarterly guide values.

Analyses of 169 urine specimens for uranium mass and alpha activity this period revealed four instances of exposure that exceeded the radiation protection guide for a single sample and were recalled for follow-up urinalysis. The uranium excretion rates promptly returned to a level below the radiation protection guide.

Industrial Health Examinations and Clinical Urinalysis

Six chest and/or sinus X-rays were made on the six employees scheduled for industrial health examinations; no findings of clinical significance were revealed. Thirty-seven employees on the routine programs submitted urine specimens for chemical analysis at the field collection stations; none of the laboratory tests indicated results above the threshold limit value for the material of concern.

Radiation Sources

There were no new radiation sources registered during the period and routine checks of the eight radium sources at the ORGDP revealed no radon leakage.

Airborne Uranium Alpha Activity

The average total alpha activity levels reflected by the 1,543 routine shift-length samples recorded by the continuous monitoring units in locations where air contamination is suspected remained essentially unchanged and low, representing approximately seven percent of the radiation concentration guide of 10^{-10} μCi/cc uranium in air. The 662 shift-length air samples taken at four outdoor locations around the plant perimeter reflected an average total alpha activity downwind from major stack discharges of approximately two percent of the radiation concentration guide for a forty-hour occupational exposure period.

Only about one-tenth of this total alpha activity is contributed by uranium; the major portion is attributed to natural radiation and fallout from previous nuclear weapons testing.

Potable Water Supply

[Keywords: Water Treatment]

The beta activity of radioactive contaminants in the plant potable water supply, which is taken from the Clinch River, reflects the effect of the discharge of mixed fission product waste material from another installation up-stream.

Analyses of the Clinch River samples at CRM-14.5 (ORGDP Sanitary Water Treatment Plant raw water intake), performed by ORNL for their control purposes, are also being used by the ORGDP. There was no indication that peak activity during the weekly sampling periods exceeded the long-term radiation protection guide values, and the thirteen-week average in plant potable water supply continues to be less than ten percent of the maxiumun permissible concentration in water for the mixture of radionuclides involved.

Water Pollutants

The average uranium concentration for the current period in the Clinch River, sampled approximately one mile below the plant and reflecting the contribution of all the Oak Ridge Operations, remained less than 0.1 percent of the appropriate guide values for discharge of natural uranium materials to uncontrolled surface water bodies.

EMPLOYEE AND LABOR RELATIONS

Arbitration

Of the seven grievances pending at the end of the third quarter, six, 168-K, 170-K, 171-K, 173-K, 178-K, and 180-K have been withdrawn by mutual consent.

LRG 81-G, appealed to arbitration 3-17-72, is scheduled for hearing July 26, 1972. No decision has yet been rendered by the Arbitrator in LRG 134-K which was heard on March 17, 1972.

During the quarter, eight additional grievances were appealed to arbitration as follows:

LRG 183-K: Machinists allege unilateral and prejudiced practices in assigning overtime.

LRG 184-K: Electrical Mechanics protest the assigning of work to outside contractors.

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number K-1902 Date of document 4/27/72

Title and author (if document is unnumbered)

OREDP QUARTERLY REPORT 10/1/71-12/31/71 COPY ONLY TAGGED PAGES

(This section to be completed by Document Center)

Date request received 10/12/95

Date submitted to ADC 11/30/95

Date submitted to HSA Coordinator 10/12/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 11/30/95 1/10/96

Date received from CICO 1/5/96 2-22-96

Date submitted to ChemRisk/Shonka and DOE 2-22-96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

UNCLASSIFIED

K/EM-280

SANITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT SECOND QUARTER FISCAL YEAR 1972

(EXTRACTED FROM CRD DOCUMENT # K-1902)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

November 30, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

... has been approved for release
the public by:
Asst. John F. Patton 2/21/96
... Officer Date

~~SECRET~~ ~~CONFIDENTIAL~~

This document consists of 166 pages,
No. 1 of 64 copies, Series A.

DATE OF ISSUE: April 27, 1972

REPORT NO. K-1902

UNCLASSIFIED

K 1902 28 A

K 1902 28 A

CENTRAL LIBRARY
REC.
FILE
X-REF.
X-REF.

OAK RIDGE GASEOUS DIFFUSION PLANT
QUARTERLY REPORT (U)
SECOND QUARTER FISCAL YEAR 1972
October 1, 1971 thru December 31, 1971

OAK RIDGE GASEOUS DIFFUSION PLANT
Oak Ridge, Tennessee

2

RESTRICTED DATA This document contains restricted data as defined in the Atomic Energy Act of 1954. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.
GROUP 1 Excluded from automatic downgrading and declassification

~~SECRET~~ ~~CONFIDENTIAL~~

Table C-8 presents cascade inventory change during the second quarter.

TABLE C-8

CASCADE INVENTORY CHANGE
(Kilograms)

	First Quarter, FY 1972			
	Uranium-235		Xe	
	Ending Inventory	Δ	Ending Inventory	Δ
July	675.4	-10.054	251.5	23.042
August	876.2	200.825	397.3	145.751
September	893.5	17.221	400.7	3.382
Total		207.992		172.175

	Second Quarter, FY 1972			
	Uranium-235		Xe	
	Ending Inventory	Δ	Ending Inventory	Δ
October	922.1	28.583	412.2	11.562
November	912.3	-9.724	400.7	-11.558
December	985.5	73.127	462.4	61.750
Total		91.986		61.754

EFFICIENCIES AND PURGE RATES

Cascade Efficiency

Based on the separative work concept, cascade efficiencies for October, November, and December were 99.85%, 99.91%, and 99.91% respectively, for a quarterly average efficiency of 99.89%.

On-Stream Efficiency

The cascade on-stream efficiency during the second quarter of fiscal year 1972 averaged 98.94%. Excluding off-stream time attributable to the Plant Test Program and power control, the efficiency averaged 98.94%. The quarterly efficiency for each of the cascade buildings averaged 99.85% for K-33, 99.19% for K-31, and 95.61% for K-29.

PURGE CASCADE

The average normal purge rate at K-311-1 during the second quarter of FY 1972 was 9,561 scf per day. The highest monthly average during the quarter

was in October when 11,870 scf per day was purged. The November and December rates were 8,217 and 8,597, respectively.

Purge Cascade Studies

Maintenance work is underway in K-311-1 and K-310-3 to improve process monitoring and control systems. The mimic piping diagram on the central graphic panel has been brought up to date and color coded, individual K-311-1 cell layouts have been posted on the panel, additional valve position indicating lights have been installed, instruments which are no longer used have been removed, the remaining instruments have been relocated to their correct positions on the piping layout, and the entire graphic panel has been freshly painted. There are several valve position indicating lights which remain to be installed, and additional process controls and monitors will be installed.

Work is in progress to install motor operators on several key valves in K-311-1 and K-310-3. The K-311-1.6 and K-311-1.4 block and bypass valves will be motor operated, thereby completing MOV installation for the cells in K-311-1. In addition, motor operators will be installed on those valves which are used in setting up K-310-3 and K-311-1 in series. The motor operators are being transferred to the purge cascade from standby equipment in K-25.

The mimic piping diagram on the K-311-1 operating floor has been repainted and color coded. A mimic piping diagram, which did not previously exist, has been painted in K-310-3. Signs have been installed on key valves on the operating floor of K-310-3 and K-311-1 for instant identification. A continuous maintenance effort is also being made to eliminate oil leaks in the purge cascade. When a cell is shut down, the known oil leaks are repaired and the cell is checked thoroughly for other leaks.

Engineering Division is currently working on several additions to the central graphic panel. A vibration detection system with automatic cell isolation and shutdown options is being designed for the three high-speed cells and the two top booster compressors. A panel containing individual vibration alarm lights for each high-speed compressor will be installed adjacent to the present graphic panel. The vibration detection system should result in reduced maintenance costs since impending failures can be identified before serious equipment losses occur. Additionally, a control panel for the B-booster station from K-311-1 to K-29 will be fabricated and installed near the present graphic panel. Engineering work is also progressing on new centrally located cell instrument panels for the purge cascade. These panels will contain the following alarms and controls:

1. An indicating ammeter for total cell motor load with adjustable high and low alarm contacts.

2. Pressure indication from stage 3 high-side pressure transmitter.

3. Cell block and bypass valve controls.

4. Cell motor shutdown switch.

5. An annunciator panel and/or lights to alarm:
   a. High or low cell total motor load.
   b. Low coolant temperature.
   c. Low seal exhaust alarm.
   d. Cell motor power failure.
   e. Vibration alarm.

In addition to the above items, each high-speed cell in K-311-1 will be equipped with a panel containing individual stage pump ammeters.

Engineering work is in progress to replace the existing single stage air jets in K-311-1 with two-stage jets similar to those in use at Paducah. These jets are used to exhaust the tops purge gas to atmosphere. The feasibility of installing a high temperature Freon degrader in K-311-1 is also being investigated.

The purge cascade, including all three high-speed cells, is once again operationally sound. All cells are running smoothly except for minor routine problems such as oil leaks and seal failures. During the coming months several tests will be run to determine the optimum method of operation. Also, work will continue to improve the present purge cascade.

TABLE C-9

HOURS OFF-STREAM

	October	November	December	FY 1972 2nd Qtr.	FY 1972 1st Qtr.
Compressor Seal	522.58	324.54	168.00	1015.12	416.33
Stage Motor*	23.41	54.85	0	78.26	13.50
Stage Compressor**	77.50	42.00	150.38	269.88	224.20
Coolant System	23.17	0	0	23.17	17.25
Inleakage Checks	2.26	8.37	0.58	11.21	19.65
Treatment Operation	31.37	31.33	34.32	97.02	64.95
Power Interruptions	0.00	8.00	0	8.00	0
Miscellaneous	203.80	59.17	191.01	453.98	46.33
Economic Scheduling	0	73.58	22.08	95.66	44.00
Total	884.09	601.84	566.37	2052.30	846.21

* Reference page 54.
** Reference page 53.

Essentially all of the compressor seal failures occurred directly or indirectly as a result of the K-311-1 purge cascade failure on August 24, 1971. Subsequent to on-stream operation following the purge cascade failure, all of the motor end seals in K-29 and cells 4 and 8 in K-311-1 were replaced. Although

MATERIAL BALANCES [redacted]

Cascade

The cascade material balance experience for October, November, and December is presented in Table C-18. The gains for October and November are primarily attributed to the clean-up of cells that were shut down due to inleakage of wet air associated with the cascade disturbance in the purge facility the last week in August. The losses for December are due mainly to the overstating of a cylinder weight in November and the correcting of that cylinder weight in December.

TABLE C-18

CASCADE MATERIAL BALANCE SUMMARY
(Kilograms)

Second Quarter FY 1972	Uranium		Uranium-235	
	Gain	Loss	Gain	Loss
October	185	-	17	-
November	84	-	10	-
December	-	394	-	20

Controlled UF_6 Release Study

No controlled UF_6 release tests were conducted during the second quarter FY 1972.

Cumulative Plant Account Efficiency

Estimated quantities of material representing the hidden inventory are shown by categories in Table C-19. The plant efficiency was 99.90% for uranium and 99.81% for uranium-235. Cumulative plant uranium and uranium-235 material balance data are shown in Figure C-3.

NUCLEAR MATERIALS HANDLING OPERATION

Responsibility of the material handling functions involves the weighing, sampling, and storage of major material quantities received at or shipped from the plant site, as well as internal material transfers. Table C-20 is a summary of Commission contractor requests. Material on hand awaiting shipment is shown in Table C-21. Weight control data are presented in Table C-22. A summary of cylinder handling operations is presented in Table C-23.

DWG. NO. G-71-848

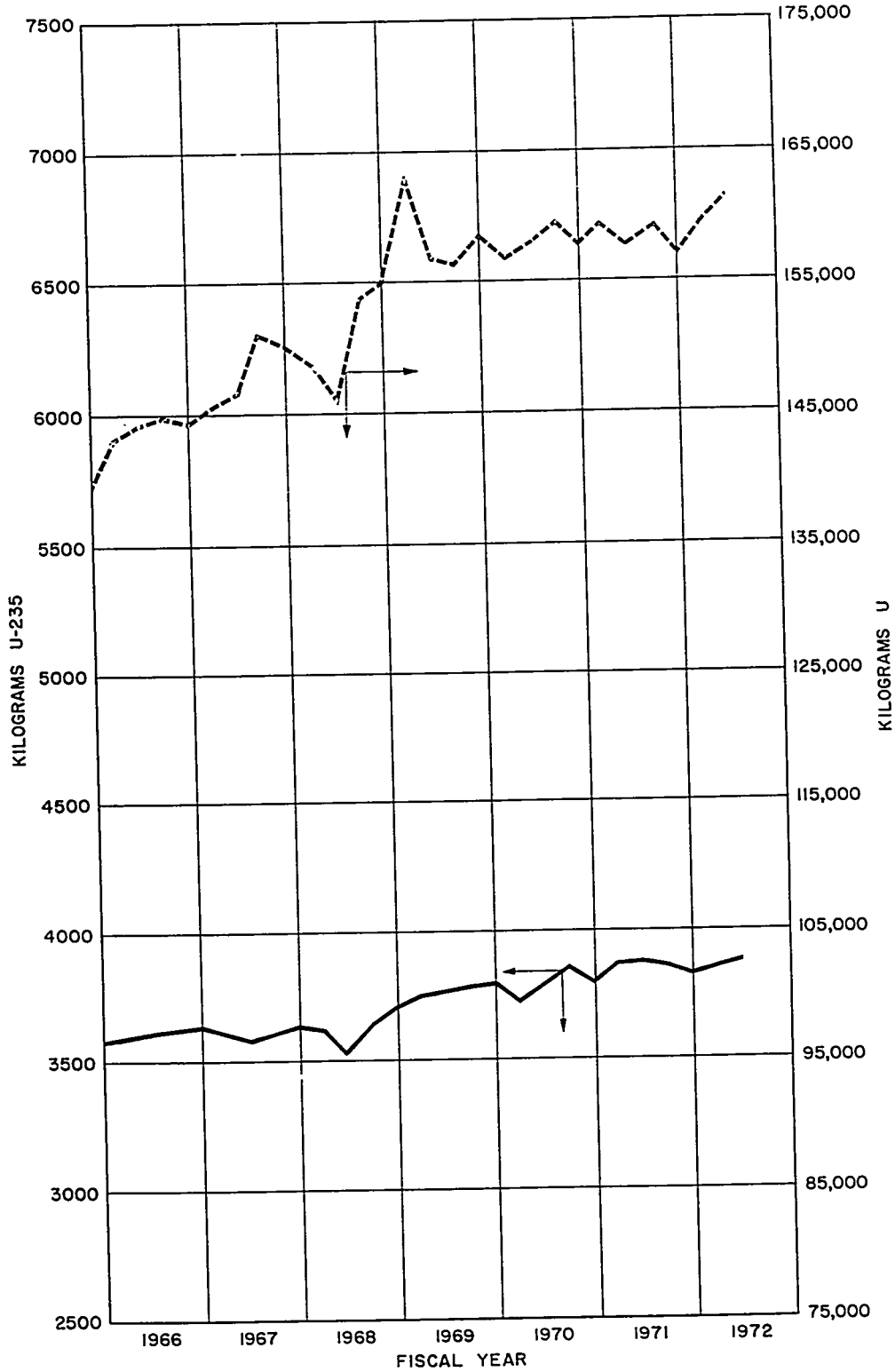


Figure C-3

U AND U-235 DEFICIENCIES

TABLE C-19

ACCOUNTING MEMORANDUM

Location of Deposit or Source of Hidden Inventory	2nd Qtr. FY 1971 Kilograms Uranium	2nd Qtr. FY 1971 Kilograms Uranium-235	2nd Qtr. FY 1972 Kilograms Uranium	2nd Qtr. FY 1972 Kilograms Uranium-235
Cascade:				
Inactive Consumption	12,879.5	1336.4	13,582.2	1357.5
Active Chemisorption	665.7	55.0	665.7	55.7
Physical Absorption	625.3	8.0	625.3	8.8
Inactive Converters	93.1	2.9	92.8	2.7
K-1405 Holding Pond*	254.8	5.3	254.8	5.3
Uncredited Contamination on Drums	225.0	1.5	225.0	1.5
Poplar Creek Bed Contamination	6,594.0	53.1	6,594.0	53.1
Ground near Feed Plant	191.0	1.3	191.0	1.3
Losses by Vent to Atmosphere	6,778.0	47.7	6,778.0	47.7
ORGDP - Paducah Interplant Cylinder (Heels)	--	--	--	--
Dilution before July 1955	--	179.2	--	179.2
Total	28,306.4	1,690.4	29,008.8	1,712.8

*Includes 152.4 kilograms uranium and 2.5 kilograms uranium-235 removed in residue on 10-26-61.

TABLE C-20

MATERIAL SHIPMENTS

Processor-Reactor	Kg. U	Kg. U-235	% Assay
October			
Dresden 2; General Electric	14,797	367	2.47
November			
Big Rock Point; General Electric	1,360	45	3.30
Robert E. Ginna 1; Westinghouse	8,802	257	2.90
Oyster Creek 1; General Electric	16,230	478	2.94
December			
Ringhals 1; Germany	4,482	112	2.50
Browns Ferry 2; G.E.	35,011	865	2.47
Tarapur Reactor; G.E.	3,841	81	2.10
Tarapur Reactor; G.E.	7,701	207	2.66
Selni Reactor; Westinghouse	6,029	242	4.05

Personnel Radiation Monitoring

The average film badge exposure of 3.5 mRem for the 107 persons monitored quarterly compares favorably with the low values reported for recent years. The maximum exposure to a single individual in the plant population considered to have some potential exposure to penetrating radiation approximated three percent of the radiation protection guide of 3,000 mRem/quarter.

Similarly, random sampling of the general plant population not normally considered to be *at risk* was continued on a quarterly schedule. These results revealed no personnel exposure to penetrating radiation of as much as ten percent of the quarterly guide values.

Analyses of 285 urine specimens for uranium mass and alpha activity this period revealed four instances of exposure that exceeded the radiation protection guide for a single sample. Follow-up urinalysis indicated that the uranium excretion rates promptly returned to a level below the radiation protection guide.

Industrial Health Examinations and Clinical Urinalysis

Chest and/or sinus X-rays were made on the nine employees scheduled for industrial health examinations; no findings of clinical significance were revealed. Sixty-four employees on the routine programs submitted urine specimens for chemical analysis at the field collection stations; none of the laboratory tests indicated results above the threshold limit value for the material of concern for a single sample.

Radiation Sources

No new radiation sources were registered, and routine checks of the eight radium sources at the ORGDP revealed no radon leakage.

Airborne Uranium Alpha Activity

The average total alpha activity levels, reflected by the 1,075 routine shift-length samples recorded by the continuous monitoring units in locations where air contamination is suspected, remained essentially unchanged and low, representing approximately five percent of the radiation concentration guide of 10^{-10} μCi/cc uranium in air. The 495 shift-length air samples taken at four outdoor locations around the plant perimeter reflected an average total alpha activity downwind from major stack discharges of about five percent of the radiation concentration guide for a forty-hour occupational exposure period. Only about one-tenth of this total alpha activity is contributed by uranium; the major portion is attributed to natural radiation and fallout from previous nuclear weapons testing.

Potable Water Supply

The beta activity of radioactive contaminants in the plant potable water supply, which is taken from the Clinch River, reflects the effect of the

UNCLASSIFIED

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number ~~K-1901~~ K/EM-323 Date of document 12/16/71

Title and author (if document is unnumbered)

(This section to be completed by Document Center)

Date request received 10/20/95

Date submitted to ADC 12/19/95

Date submitted to HSA Coordinator 10/20/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 12/19/95 1/22/96

Date received from CICO 1/5/96 2/26/96

Date submitted to ChemRisk/Shonka and DOE 2/26/96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

K/EM-323

SANITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT FIRST FISCAL QUARTER JULY 1 THRU SEPTEMBER 30, 1971

(EXTRACTED FROM SRD DOCUMENT # K-1901)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

December 18, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release
to the public by:
2/22/96
Technical Information Officer
Date
Oak Ridge K-25 Site

[redacted]

K-1901

27-A

OAK RIDGE GASEOUS DIFFUSION PLANT
QUARTERLY REPORT (U)
FIRST QUARTER FISCAL YEAR 1972
July 1, 1971 thru September 30, 1971

UNION CARBIDE CORPORATION
NUCLEAR DIVISION
OAK RIDGE GASEOUS DIFFUSION PLANT

operated for the ATOMIC ENERGY COMMISSION *under* U. S. GOVERNMENT Contract W-7405 eng 26

UNION CARBIDE
OAK RIDGE GASEOUS DIFFUSION PLANT
P. O. Box P
Oak Ridge, Tennessee 37830

RESTRICTED DAT[redacted]s docu[redacted]nt contains [redacted]ted data as define[redacted] Atom[redacted]ergy Act[redacted]. Its transmittal [redacted] disc[redacted]of its [redacted]s in any manner t[redacted]nautho[redacted]erson is [redacted]ited.
GRO[redacted]xcluded[redacted]h automatic downgrading and de[redacted]tication.

[redacted]

2

[redacted]

This document consists of 170 pages,
No. 27 of 64 copies, Series A.

DATE OF ISSUE: December 16, 1971

K-1901

K 1901 27 A

K 1901 27 A

CENTRAL LIBRARY
REC.
FILE
X-REF.
X-REF.

OAK RIDGE GASEOUS DIFFUSION PLANT
QUARTERLY REPORT (U)
FIRST QUARTER FISCAL YEAR 1972
July 1, 1971 thru September 30, 1971

OAK RIDGE GASEOUS DIFFUSION PLANT
Oak Ridge, Tennessee

RESTRICTED DATA [redacted] docum[redacted] contains [redacted]ted data as defined [redacted]tomi[redacted]y Act [redacted] Its transmittal [redacted] disclo[redacted] its [redacted] in any manner to [redacted] authoriz[redacted]on is p[redacted]ted.
GROU[redacted]cluded fr[redacted] automatic downgrading and declas[redacted]cation.

[redacted]

3

PURGE CASCADE

The average normal purge rate at K-311-1 during the first quarter of FY 1972 was 8843 scf per day. The highest monthly average during the quarter was in September when 15,035 scf per day was purged. The July and August rates were 5813 and 5680 scf per day, respectively.

Purge Cascade Failure

On August 23, 1971, the purge cascade was in normal operation. Power for purge cascade equipment is supplied by two sources, one located in Vault 2 and the other in Vault 1. At 4:15 a.m. on August 24, cell 8 was shut down for a planned routine 3B pump seal change. Repairs were also planned to the 2A pump speed increaser which had significant oil leaks. Cell 8 was purged of all UF_6 prior to shutdown, and cell motor electrical breakers were locked open. Normal maintenance began at 8:00 a.m. on August 24.

Preparations were also under way on the previous day for the installation and tie-in of a new 480-volt feeder cable recently installed to supply power for use elsewhere in the plant. It was necessary to make this connection to the constant frequency bus in Vault 2, which supplies power to components of the purge cascade. About 9:05 a.m. the constant frequency power in Vault 2 of the K-25 building was de-energized to effect the hook-up. This resulted in a momentary interruption of constant frequency power to the motor operated valves in K-311-1. The emergency diesel generator located adjacent to Vault 2 started automatically and isolated the purge cascade through relay action which closed five key valves. Before Vault 2 was de-energized, the diesel electric generator could have been locked-out to prevent its starting; however, this was not effected.

These key valves separated the low and high-speed equipment and blocked the flow of lites from K-29 through the purge cascade thus preventing gases from flowing to the atmosphere. The object of this automatic closure system is to minimize disturbances to the separating cascade in the event of a power failure in K-311-1. As a result of isolating K-311-1, the upper stages of K-29 were subjected to non-standard operating conditions, i.e., compressor surging, pressure variations, etc.* Figures 3 through 8 depict some of the equipment failures associated with the purge cascade failure.

When it became apparent that purging operations at K-311-1 were unlikely to be restarted within a reasonable time, a temporary purge facility was established. This consisted of the top two units of the K-31 building together with booster pumps and an air jet for evacuation of the lites to the atmosphere. Samples were withdrawn on a continuing frequency to assure that no appreciable levels of UF_6 were being vented to atmosphere. Coincident with this, a product flow was established from K-31 to the normal product withdrawal facility. The product enrichment level was maintained at about 2.0% until K-311-1 was returned to service.

**Preliminary Report of Cascade Disturbance, Unit K-311-1* (U), K-PC-621, September 27, 1971, Secret.

Personnel Radiation Monitoring

The average film badge exposure of ten mRem for the 107 persons monitored quarterly compares favorably with the low values reported for recent years. The maximum exposure to a single individual in the plant population considered to have some potential exposure to penetrating radiation approximated five percent of the radiation protection guide of 3,000 mRem/quarter.

Similarly, random sampling of the general plant population not normally considered to be *at risk* was continued on a quarterly schedule. These results revealed no personnel exposure to penetrating radiation of as much as ten percent of the quarterly guide values.

Analyses of 376 urine specimens for uranium mass and alpha activity this period revealed seventeen instances of exposure that exceeded the radiation protection guide for a single sample and were recalled for follow-up urinalysis. The uranium excretion rates promptly returned to a level below the radiation protection guide.

Industrial Health Examination and Clinical Urinalysis

Seven chest and/or sinus X-rays were made on the six employees scheduled for industrial health examinations; no findings of clinical significance were revealed. Thirty-five employees on the routine programs submitted urine specimens for chemical analysis at the field collection stations; none of the laboratory tests indicated results above the threshold limit value for the material of concern for a single sample.

Plant Toxicants

In addition to field monitoring by the operating departments, staff personnel collected eight samples for airborne contaminants. Three samples exceeded the radiation concentration guide for a portion of a shift during transfer of UF_6; appropriate respiratory protection was worn.

Radiation Sources

There were no new radiation sources registered during the period and routine checks of the eight radium sources at the ORGDP revealed no radon leakage.

Airborne Uranium Alpha Activity

The average total alpha activity levels reflected by the 1,407 routine shift-length samples recorded by the continuous monitoring units in locations where air contamination is suspected remained essentially unchanged and low, representing approximately six percent of the radiation concentration guide of 10^{-10} μCi/cc uranium in air. The 1,003 shift-length air samples taken at four outdoor locations around the plant perimeter

reflected an average total alpha activity downwind from major stack discharges of approximately five percent of the radiation concentration guide for a forty-hour occupational exposure period. Only about one-tenth of this total alpha activity is contributed by uranium; the major portion is attributed to natural radiation and fallout from previous nuclear weapons testing.

Potable Water Supply

The beta activity of radioactive contaminants in the plant potable water supply, which is taken from the Clinch River, reflects the effect of the discharge of mixed fission product waste material from another installation upstream. Analyses of the Clinch River samples at CRM-14.5 (ORGDP Sanitary Water Treatment Plant raw water intake), performed by ORNL for their control purposes, are also being used by the ORGDP. There was no indication that peak activity during the weekly sampling periods exceeded the long-term radiation protection guide values, and the thirteen-week average in plant potable water supply continues to be less than ten percent of the maximum permissible concentration in water for the mixture of radionuclides involved.

Water Pollutants

The average uranium concentration for the current period in the Clinch River, sampled approximately one mile below the plant and reflecting the contribution of all of the Oak Ridge Operations, remained less than 0.1 percent of the appropriate guide values for discharge of natural uranium materials to uncontrolled surface water bodies.

EMPLOYEE AND LABOR RELATIONS

ARBITRATION

Of the fourteen grievances pending in the arbitration procedure at the end of the fourth quarter, eleven (101-K, 105-K, 106-K, 107-K, 108-K, 109-K, 110-K, 111-K, 113-K, 117-K, and 119-K) have been withdrawn by mutual consent.

During the first quarter, eight additional grievances were appealed to arbitration as follows:

LRG 123-K: Maintenance Mechanics protest the Company assigning work incidental to core drilling operations to the Laborer classification, contending this work should be assigned to Maintenance Mechanics.

LRG 131-K: A Helper-T (Electrical) protests the assignment of certain electrical work to outside contractors.

LRG 134-K: Instrument Mechanics request that they be permitted to use government vehicles for transportation to the Cafeteria, alleging that the Company is making such transportation available to some and not to others.

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number ~~K-1808~~ K/EM-322 Date of document 12/19/69

Title and author (if document is unnumbered)

(This section to be completed by Document Center)

Date request received 10/20/95

Date submitted to ADC 12/19/95

Date submitted to HSA Coordinator 10/20/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 12/19/95 1/22/96

Date received from CICO 1/5/96 2/26/96

Date submitted to ChemRisk/Shonka and DOE 2/26/96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

K/EM-322

SANITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT FOURTH FISCAL QUARTER APRIL 1 THRU JUNE 30, 1969

(EXTRACTED FROM SRD DOCUMENT # K-1808)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

December 18, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for public release by:

2/23/96

Technical Information Officer — Date
Oak Ridge K-25 Site

[redacted]

PROPERTY OF
ORGDP LIBRARY

Cy 27
K-1808

CENTRAL LIBRARY
REC. X04167
FILE
X-REF.
X-REF.

OAK RIDGE GASEOUS DIFFUSION PLANT
QUARTERLY REPORT
FOURTH QUARTER FISCAL YEAR 1969
April 1, 1969 thru June 30, 1969

UNION CARBIDE CORPORATION
NUCLEAR DIVISION
OAK RIDGE GASEOUS DIFFUSION PLANT

operated for the ATOMIC ENERGY COMMISSION *under* U. S. GOVERNMENT Contract W-7405 eng 26

UNION CARBIDE
OAK RIDGE GASEOUS DIFFUSION PLANT
P. O. Box P
Oak Ridge, Tennessee 37830

RESTRICTED DA[redacted] doc[redacted]ontains [redacted] data as defi[redacted]ne A[redacted]ergy Act[redacted]. Its transmitt[redacted]ne [redacted]e of its [redacted]s in any manne[redacted]n unau[redacted]ed person[redacted]ibited.
G[redacted] Exclu[redacted] from automatic downgrading and [redacted]assification.

[redacted]

2

[redacted]

This document consists of 176 pages,
No. 27 of 70 copies, Series A.

REPORT NO. K-1808

DATE OF ISSUE: December 19, 1969

K 1808 27 A

K 1808 27 A

~~K-26516~~

OAK RIDGE GASEOUS DIFFUSION PLANT
QUARTERLY REPORT
FOURTH QUARTER FISCAL YEAR 1969
April 1, 1969 thru June 30, 1969

OAK RIDGE GASEOUS DIFFUSION PLANT
Oak Ridge, Tennessee

RESTRICTED DA[redacted] doc[redacted] contai[redacted]icted data as defin[redacted]he Ato[redacted]ergy [redacted]954. Its transmittal [redacted]e arsa[redacted] of [redacted]ents in any manner [redacted] unauth[redacted] perso[redacted]hibited.
GR[redacted] Exclud[redacted]om autom[redacted]ic downgrading and d[redacted]sification.

[redacted] 3

On Stream Efficiency

The Cascade onstream efficiency during the fourth quarter of fiscal year 1969 averaged 99.81%. Excluding off stream time attributable to the Plant Test Program and power control, the efficiency averaged 99.85%.

The quarterly efficiency for each of the cascade buildings averaged 99.86% for K-33, 99.84% for K-31, and 99.63% for K-29.

The major causes of offstream time are tabulated in Table C-10. The data are presented by months for the current quarter; totals are given for the current and previous quarter for comparison.

TABLE C-10

HOURS OFF STREAM

	April	May	June	FY 1969 4th Qtr.	FY 1969 3rd Qtr.
Compressor Seal	57.88	5.41	20.50	83.79	63.04
Stage Motor	6.62	0.0			
Stage Compressor	0	0	23.40	23.40	32.86
Converter	0	0	0	0	0
Instrumentation	0	0	0	0	8.17
Coolant System	0.28	16.66	5.92	22.86	4.26
Inleakage Checks	0	3.09	1.11	4.20	2.68
Treatment Operation	0	20.67	6.48	27.15	12.91
Power Control	0.73	0.40	0.17	1.30	4.07
Power Interruptions	0	0	1.49	1.49	0
Plant Test	11.58	64.00	0	75.58	22.76
Miscellaneous	83.06	15.04	24.50	122.60	104.44
Econ. Scheduling	30.67	0	0	30.67	31.62
Spares Unavailable	0	0	0	0	0
Total	190.82	125.27	83.57	399.66	286.81

PURGE CASCADE

The average normal purge rate at K-311-1 during the fourth quarter was 9,928 scf per day. The highest monthly average during the quarter was in June when 10,339 scf per day was purged. The April and May rates were 9,917 and 9,529 scf per day, respectively.

POWER OPERATIONS

Power Usage and Distribution

The TVA contract demand of 575 mw remained in effect during this quarter. A peak demand of 575 mw was established on April 12, 1969. The average demand usage was 567.55 mw constituting an area load factor of 98.70% for this quarter. Transmission losses averaged 8.24 mw, leaving 559.31 mw for distribution as follows: Y-12, 58.79 mw; X-10, 21.95 mw; and

Personnel Radiation Monitoring

The average film badge exposure of ten mRem for the 115 persons monitored quarterly compares favorably with the low values reported for recent years. The maximum exposure to a single individual in the plant population considered to have some potential exposure to penetrating radiation approximated five percent of the radiation protection guide of 3,000 mRem/quarter.

Similarly, random sampling of the general plant population not normally considered to be "at risk" was continued on a quarterly schedule. These results revealed no personnel exposure to penetrating radiation of as much as ten percent of the quarterly guide values.

Analyses of 306 urine specimens for uranium mass and alpha activity this period revealed two instances of exposure that exceeded the radiation protection guide for a single sample and were recalled for follow-up urinalysis. In both instances, the uranium excretion rate promptly returned to a level below the radiation protection guide.

Industrial Health Examinations and Clinical Urinalysis

Sixteen chest and/or sinus X-rays were made on the thirteen employees scheduled for industrial health examinations. No findings of clinical significance were revealed. Thirty-nine employees on the routine programs submitted urine specimens for chemical analysis at the field collection stations. None of the thirty-nine laboratory tests indicated results above the threshold limit value for the material of concern.

Plant Toxicants

Of the thirty-six analyses made for airborne contaminants, none exceeded the threshold limit value of the materials concerned.

Work Environs Surveillance

Efforts to assure safe and healthful work environs included the monitoring of noise pressure levels in cascade and research locations, and the thermal stress measurements in cascade and fluorine production facilities. To verify our maintaining the plant's contribution to the pollution of local streams at a minimum, the plant waste streams were checked for pH and temperature, with results reflecting negligible alteration of existing pH and ambient temperatures. In addition to the routine radioactivity environmental monitoring, water samples from Poplar Creek, Clinch River, potable water, and holding ponds were analyzed for seventeen potential chemical contaminants; in all cases, levels were below recommended guide values.

Airborne Uranium Alpha Activity

The average alpha activity levels reflected by the 2,602 routine shift-length samples recorded by the continuous monitoring units in locations where air contamination is suspected remained essentially unchanged and low, representing less than ten percent of the radiation concentration guide of

10^{-10} μCi/cc uranium in air. The 951 shift-length air samples taken at four outdoor locations around the plant perimeter reflected an average gross alpha activity downwind from major stack discharges of approximately seven percent of the radiation concentration guide for a forty-hour occupational exposure period.

Radiation Source

There were no new radioactive sources registered during the period, and routine checks of the fifteen radium sources at ORGDP revealed no radon leakage.

Potable Water Supply

The beta activity of radioactive contaminants in the plant potable water supply, which is taken from the Clinch River, reflects the effect of the discharge of mixed fission product waste material from another installation upstream. Analyses of the Clinch River samples at CRM-14.5 (ORGDP Sanitary Water Treatment Plant raw water intake), performed by ORNL for their control purposes, are also being used by the ORGDP. There was no indication that peak activity during the weekly sampling periods exceeded the long-term radiation protection guides values, and the thirteen-week average in plant potable water supply continues to be less than ten percent of the maximum permissible concentration in water for the mixture of radionuclides involved.

Water Pollutants

The average uranium concentration for the current period in the Clinch River, sampled approximately one mile below the plant and reflecting the contribution of all of the Oak Ridge Operations, remained less than 0.1 percent of the appropriate guide values for discharge of natural uranium materials to uncontrolled surface water bodies.

EMPLOYEE AND LABOR RELATIONS

Arbitration

1. The grievance wherein a Helper Trainee protested the denial of his merit progression increase was heard in arbitration on June 6, 1969. The award has not yet been received.

2. The grievance wherein a Welder protested the refusal of a Company doctor to authorize insurance payment has been withdrawn by the Union prior to a hearing. The Mediation Service and the arbitrator have been so notified.

3. Of the five grievances appealed to arbitration on March 13, one case, involving vacation schedules for Operators, was withdrawn by the Union prior to the selection of an arbitrator. Arbitrator Carroll R. Daugherty has been selected to hear the four remaining cases, but a hearing date has not been set.

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2532

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 — Expected receipt of document 1 MONTH

Document number ~~K-1807~~ K/EM-321 — Date of document 9/10/69

Title and author (if document is unnumbered)

(This section to be completed by Document Center)

Date request received 10/20/95

Date submitted to ADC 12/19/95

Date submitted to HSA Coordinator 10/20/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 12/19/95 1/22/96

Date received from CICO 1/5/96 2/26/96

Date submitted to ChemRisk/Shonka and DOE 2/26/96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

K/EM-321

SANITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT THIRD FISCAL QUARTER JANUARY 1 THRU MARCH 31, 1969

(EXTRACTED FROM SRD DOCUMENT # K-1807)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

December 18, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for public release by:
2/23/96
Technical Information Officer
Date
Oak Ridge K-25 Site

SECRET

G 264

K-1807

PROPERTY OF
CRGDP LIBRARY

CENTRAL LIBRARY
REC. X04169
FILE
X-REF.
X-REF.

OAK RIDGE GASEOUS DIFFUSION PLANT
QUARTERLY REPORT
THIRD QUARTER FISCAL YEAR 1969
January 1, 1969 thru March 31, 1969

UNION CARBIDE CORPORATION
NUCLEAR DIVISION
OAK RIDGE GASEOUS DIFFUSION PLANT

operated for the ATOMIC ENERGY COMMISSION *under* U. S. GOVERNMENT Contract W-7405 eng 26

OAK RIDGE GASEOUS DIFFUSION PLANT
P. O. Box P
Oak Ridge, Tennessee 37830

RESTRICTED DATA This document contains restricted data as defined in the Atomic Energy Act of 1954. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.
GROUP 1 Excluded from automatic downgrading and declassification.

SECRET

2

[redacted]

This document consists of 172 pages,
No. 26 of 67 copies, Series A.

DATE OF ISSUE: September 10, 1969

REPORT NO. K-1807

K 1807 26 A

K 1807 26 A

Q-93525

OAK RIDGE GASEOUS DIFFUSION PLANT
QUARTERLY REPORT
THIRD QUARTER FISCAL YEAR 1969
January 1, 1969 thru March 31, 1969

OAK RIDGE GASEOUS DIFFUSION PLANT
Oak Ridge, Tennessee

RESTRICTED DATA This document contains restricted data as defined in the Atomic Energy Act of 1954. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.
GROUP 1
Excluded from automatic downgrading and declassification.

~~SECRET~~ 3

On Stream Efficiency

The Cascade onstream efficiency during the third quarter of fiscal year 1969 averaged 99.87%. Excluding off stream time attributable to the Plant Test Program and power control, the efficiency averaged 99.88%.

The quarterly efficiency for each of the cascade buildings averaged 99.86% for K-33, 99.81% for K-31, and 99.99% for K-29.

The major causes of offstream time are tabulated in Table C-10. The data are presented by months for the current quarter; totals are given for the current and previous quarter for comparison.

TABLE C-10

HOURS OFF STREAM

				FY 1969	
	January	February	March	3rd Qtr.	2nd Qtr.
Compressor Seal	5.29	27.36	30.41	63.04	105.08
Stage Motor	0	0	0	0	9.67
Stage Compressor	26.28	6.58	0	32.86	58.33
Instrumentation	4.92	3.25	0	8.17	0
Coolant System	1.25	3.01	0	4.26	8.58
Inleakage Checks	1.50	0.50	0.68	2.68	5.86
Treatment Operation	6.83	6.08	0	12.91	62.82
Power Control	0	0	4.07	4.07	0.53
Power Interruptions	0	0	0	0	66.10
Plant Test	22.76	0	0	22.76	148.90
Miscellaneous	35.08	23.17	46.19	104.44	107.40
Econ. Scheduling	0	26.12	5.50	31.62	508.67
Total	103.89	96.07	86.85	286.81	1,081.94

PURGE CASCADE

The average normal purge rate at K-311-1 during the third quarter was 8,726 scf per day. The highest monthly average during the quarter was in February when 9,758 scf per day was purged. The January and March rates were 8,000 and 8,419 scf per day, respectively.

Plant Toxicants

Of the thirty-five analyses made for airborne contaminants, six exceeded the threshold limit value of the materials concerned. Four samples involved carbon monoxide during a study of the operation of a malfunctioning industrial vehicle, and two were for uranium during a cascade cell cleanup operation while appropriate respiratory protection devices were being worn.

Airborne Uranium Alpha Activity

The average alpha activity levels reflected by the 2,424 routine shift-length samples recorded by the continuous monitoring units in locations where air contamination is suspected remained essentially unchanged and low, representing less than ten percent of the radiation concentration guide of 10^{-10} μCi/cc uranium in air. The 907 shift-length air samples taken at four outdoor locations around the plant perimeter reflected an average gross alpha activity downwind from major stack discharges of approximately 7% of the radiation concentration guide for a 40-hour occupational exposure period.

Radiation Source

There were two new radioactive sources registered during the period (six curies of Cobalt-60 and one hundred curies of Iridium-192), and routine checks of the fifteen radium sources at ORGDP revealed no radon leakage.

Potable Water Supply

The beta activity of radioactive contaminants in the plant potable water supply, which is taken from the Clinch River, reflects the effect of the discharge of mixed fission product waste material from an installation upstream. Analyses of the Clinch River samples at CRM-14.5 (ORGDP Sanitary Water Treatment Plant raw water intake), performed by ORNL for their control purposes, are also being used by the ORGDP. There was no indication that peak activity during the weekly sampling periods exceeded the long-term radiation protection guides values, and the 13-week average in plant potable water supply continues to be less than ten percent of the maximum permissible concentration in water for the mixture of radionuclides involved.

Water Pollutants

The average uranium concentration in the Clinch River, sampled approximately one mile below the plant and reflecting the contribution of all of the Oak Ridge Operations, remained less than 0.1% of the appropriate guide values for discharge of natural uranium materials to uncontrolled surface water bodies.

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number K-1806 K/EM-320 Date of document 6/10/69

Title and author (if document is unnumbered)

(This section to be completed by Document Center)

Date request received 10/20/95

Date submitted to ADC 12/19/95

Date submitted to HSA Coordinator 10/20/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 12/19/95 1/22/96

Date received from CICO 1/5/96 2/26/96

Date submitted to ChemRisk/Shonka and DOE 2/26/96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

K/EM-320

SANITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT SECOND FISCAL QUARTER OCTOBER 1 THRU DECEMBER 31, 1968

(EXTRACTED FROM SRD DOCUMENT # K-1806)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

December 18, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release by:
2/23/96
Technical Information Officer
Date
Oak Ridge K-25 Site

[redacted]

PROPERTY OF
ORGDP LIBRARY

K-1806

Cy 62 A

CENTRAL LIBRARY
REC. X04665
FILE
X-REF.
X-REF.

OAK RIDGE GASEOUS DIFFUSION PLANT
QUARTERLY REPORT
SECOND QUARTER FISCAL YEAR 1969
October 1, 1968 thru December 31, 1968

UNION CARBIDE CORPORATION
NUCLEAR DIVISION
OAK RIDGE GASEOUS DIFFUSION PLANT

operated for the ATOMIC ENERGY COMMISSION *under* U. S. GOVERNMENT Contract W-7405 eng 26

UNION CARBIDE
OAK RIDGE GASEOUS DIFFUSION PLANT
P. O. Box P
Oak Ridge, Tennessee 37830

RESTRICTED D[redacted]s documen[redacted] contains re[redacted]icted data as def[redacted] the Atomic [redacted]y Act of [redacted]. Its transmitt[redacted] the disclos[redacted] its con[redacted] in any manne[redacted] unauthorize[redacted]on is pr[redacted]ed.
GR[redacted] Excluded [redacted] automatic [redacted]ngrading and [redacted]ssification.

[redacted]

2

R0146676

[redacted]

This document consists of 162 pages,
No. 62 of 67 copies, Series A.

DATE OF ISSUE: June 10, 1969

REPORT NO. K-1806

K 1806 62 A

K 1806 62 A

OAK RIDGE GASEOUS DIFFUSION PLANT
QUARTERLY REPORT
SECOND QUARTER FISCAL YEAR 1969
October 1, 1968 thru December 31, 1968

OAK RIDGE GASEOUS DIFFUSION PLANT
Oak Ridge, Tennessee

RESTRICTED DAT[redacted] contains re[redacted] data as defined [redacted] Ato[redacted]gy Act of [redacted] transmittal [redacted] of its co[redacted] any manner to [redacted] person is p[redacted]
GROUP [redacted]cluded [redacted] automati[redacted]grading and decla[redacted]ation.

[redacted] 3

TABLE C-10

HOURS OFF STREAM

	Oct. 68	Nov. 68	Dec. 68	FY-1969 2nd Qtr. 69	FY-1969 1st Qtr. 69
Compressor Seal	19.74	23.45	61.89	105.08	380.26
Stage Motor	9.67	0	0	9.67	175.25
Stage Compressor	29.83	0	28.50	58.33	425.44
Converter	0	0	0	0	1.50
Instrumentation	0	0	0	0	4.55
Coolant System	0	0	8.58	8.58	0.83
Inleakage Checks	5.44	0.42	0	5.86	48.83
Treatment Operation	29.08	21.91	11.83	62.82	103.32
Power Control	0.30	0	0.23	0.53	16.09
Power Interruptions	66.10	0	0	66.10	23.65
Plant Test	139.07	0	9.83	148.90	1,572.16
Miscellaneous	44.36	8.83	54.21	107.40	40.85
Economic Scheduling	420.67	0	88.00	508.67	1,158.28
Spares Unavailable	0	0	0	0	24.00
Total	764.26	54.61	263.07	1,081.94	4,026.54

Purge Cascade

The average normal purge rate at K-311-1 during the second quarter was 7,344 scf per day. The highest monthly average during the quarter was in December when 8,098 scf per day was purged. The October and November rates were 6,882 and 7,052 scf per day, respectively.

POWER OPERATIONS

Power Usage and Distribution

The TVA contract demand of 575 mw remained in effect during this quarter. A peak demand of 574 mw was established on October 1, 1968. The average demand usage was 567.81 mw constituting an area load factor of 98.74% for this quarter. Transmission losses averaged 9.79 mw, leaving 558.02 mw for distribution as follows: Y-12, 52.23 mw; X-10, 20.21 mw; and ORGDP, 485.58 mw.

During the quarter, 1,253,721 kwh of power was purchased from TVA at an average cost of $4.2935 per mwh. The average cost of power distributed to the Oak Ridge Area was $4.5688 per mwh.

Table C-11 shows the ORGDP cascade power average usage and the net change from the previous quarter.

Airborne Uranium Alpha Activity

The average alpha activity levels reflected by the 2,847 routine shift-length samples recorded by the continuous monitoring units in locations where air contamination is suspected remained essentially unchanged and low, representing less than ten percent of the radiation concentration guide of 10^{-10} μCi/cc uranium in air. The 1,326 shift-length air samples taken at four outdoor locations around the plant perimeter reflected an average gross alpha activity downwind from major stack discharges of approximately six percent of the radiation concentration guide for a 40-hour occupational exposure period.

Radiation Source

There were no new radioactive sources registered during the period, and routine checks of the fifteen radium sources at ORGDP revealed no radon leakage.

Potable Water Supply

The beta activity of radioactive contaminants in the plant potable water supply, which is taken from the Clinch River, reflects the effect of the discharge of mixed fission product waste material from an installation upstream. Analyses of the Clinch River samples at the ORGDP Sanitary Water Treatment Plant raw water intake, performed by ORNL for their control purposes, are also being used by the ORGDP. There was no indication that peak activity during the weekly sampling periods exceeded the long-term radiation protection guides values, and the 13-week average in plant potable water supply continues to be less than ten percent of the maximum permissible concentration in water for the mixture of radionuclides involved.

Water Pollutants

The average uranium concentration in the Clinch River, sampled approximately one mile below the plant and reflecting the contribution of all of the Oak Ridge Operations, remained less than 0.1% of the appropriate guide values for discharge of natural uranium materials to uncontrolled surface water bodies.

EMPLOYEE AND LABOR RELATIONS

Arbitration

1. In his award of October 23, the Arbitrator sustained the position of the Company in the three grievances heard on September 19. He stated that the Company did not violate the contract by not considering seniority in the transfer of the aggrieved employees from one shift to another to cover the jobs of absent employees.

2. Concerning the grievance wherein an operator protests a Supervisor's Report containing a summary of a discussion regarding the lifting of

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2531

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 — Expected receipt of document 1 MONTH

Document number ~~K-1865~~ K/EM-319 — Date of document 3/26/69

Title and author (if document is unnumbered)

Copy Tab pgs only

(This section to be completed by Document Center)

Date request received 10/20/95

Date submitted to ADC 12/19/95

Date submitted to HSA Coordinator 10/20/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 12/19/95 1/22/96

Date received from CICO 1/5/96 2/26/96

Date submitted to ChemRisk/Shonka and DOE 2/26/96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

K/EM-319

SANITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT FIRST FISCAL QUARTER JULY 1 THRU SEPTEMBER 30, 1968

(EXTRACTED FROM SRD DOCUMENT # K-1805)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

December 18, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release to the public by:

2/23/96

Technical Information Officer Date
Oak Ridge K-25 Site

[redacted]

K-1805

Cy. 37-A

OAK RIDGE GASEOUS DIFFUSION PLANT
QUARTERLY REPORT
FIRST QUARTER FISCAL YEAR 1969
July 1, 1968 thru September 30, 1968

Property of
ORGDP Library
1969 MAR 26 PM 12 47
Union Carbide Corp.
Nuclear Division

UNION CARBIDE CORPORATION
NUCLEAR DIVISION
OAK RIDGE GASEOUS DIFFUSION PLANT

operated for the ATOMIC ENERGY COMMISSION *under* U. S. GOVERNMENT Contract W-7405 eng 26

UNION CARBIDE
OAK RIDGE GASEOUS DIFFUSION PLANT
P. O. Box P
Oak Ridge, Tennessee 37830

RESTRICTED [redacted] This [redacted]ment contains [redacted] data as de[redacted] in the [redacted]c Energy Act [redacted] Its transmi[redacted] the [redacted]sure of its [redacted]s in any man[redacted] an unau[redacted]ized person [redacted]bited.
[redacted]P 1 Ex[redacted] from automatic downgrading and declassifica[redacted]

[redacted]

2

[redacted]

This document consists of 154 pages,
No. 37 of 67 copies, Series A.

DATE OF ISSUE: March 26, 1969

REPORT NO. K-1805

K 1805 37 A

K 1805 37 A

CENTRAL LIBRARY
REC.
FILE
X-REF.
%-REF.

OAK RIDGE GASEOUS DIFFUSION PLANT
QUARTERLY REPORT
FIRST QUARTER FISCAL YEAR 1969
July 1, 1968 thru September 30, 1968

OAK RIDGE GASEOUS DIFFUSION PLANT
Oak Ridge, Tennessee

RESTRICTED DA[redacted] This do[redacted]nt conta[redacted] restricted [redacted] as defi[redacted]n the [redacted]c Energy [redacted] of 1954. [redacted]ansmitt[redacted]he disc[redacted]e of its co[redacted]s in an[redacted]ner to a[redacted]uthoriz[redacted]erson is pr[redacted]ited.
GROUP [redacted]
E[redacted]ded fro[redacted]omatic [redacted]grading a[redacted]eclassification.

[redacted]

3

TABLE C-14

AIR, WATER, AND STEAM REQUIREMENTS

	Fourth Quarter, FY 1968 Average Monthly		First Quarter, FY 1969 Average Monthly	
	Production	Unit Cost	Production	Unit Cost
Dry Air, Mcf	525,730	$0.050	512,049	$0.047
Sanitary Water, M Gals.	70,968	0.090	79,841	0.105
Cooling Water, M Gals.	6,460,974	0.012	4,338,451	0.014
Steam, M Lbs.	32,869	0.960	24,610	1.481

EFFICIENCIES AND PURGE RATES

Operating Efficiencies

Based upon the separative work concept, the cascade efficiencies for July, August, and September were 99.96%, 99.94%, and 99.89%, respectively. The average for the quarter was 99.93%.

On Stream Efficiency

The Cascade onstream efficiency during the first quarter of fiscal year 1969 averaged 98.65%. Excluding off stream time attributable to the Plant Test Program, the efficiency averaged 99.18%. Including power control the efficiency averaged 99.19%.

The quarterly efficiency for each of the cascade buildings averaged 97.57% for K-33, 99.02% for K-31, and 99.86% for K-29.

The major causes of offstream time are tabulated in Table C-15. The data are presented by months for the current quarter; totals are given for the current and previous quarter for comparison.

TABLE C-15

HOURS OFF STREAM

	July 68	Aug. 68	Sept. 68	FY 1968-1969 1st Qtr. 69	FY 1968-1969 4th Qtr 68
Compressor Seal	288.88	54.01	37.37	380.26	207.40
Stage Motor	54.93	90.82	29.50	175.25	3.50
Stage Compressor	361.49	32.58	31.37	425.44	1,403.19
Converter	0	1.50	0	1.50	0
Instrumentation	0	0	4.55	4.55	7.92
Coolant System	0	0	0.83	0.83	5.50
Inleakage Checks	43.04	5.32	0.47	48.83	1.65
Treatment Operation	55.35	17.09	30.88	103.32	10.58
Power Control	2.72	8.84	4.53	16.09	0
Power Interruptions	1.02	0	22.63	23.65	32.58
Plant Test	840.00	552.91	179.25	1,572.16	2,184.00
Miscellaneous	0	32.85	8.00	40.85	170.22
Economic Scheduling	0	369.75	788.53	1,158.28	0
Spares Unavailable	0	16.00	8.00	24.00	0
Total	1,647.43	1,181.67	1,145.91	3,975.01	4,026.54

Purge Cascade

The average normal purge rate at K-311-1 during the first quarter 1969 was 9,290 scf per day. The highest monthly average during the quarter was in July when 10,688 scf per day was purged. The August and September rates were 8,500 and 8,681 scf per day, respectively.

BARRIER OPERATIONS

Production

Furnace Tests

Further tests were made on the reverse draft, self-atmosphere on the No. 3 furnace to evaluate the effect of introducing air and reducing gas to different locations at the muffles and to locate the best position along the muffle for removal of exhaust gases. The best results were obtained by introducing air and cracked reducing gas separately at the muffle entrance and removing the exhaust at the center of the water bath cooler. The ratio of gas to air was about 2:1.

results revealed no personnel exposures to penetrating radiation of as much as 10% of the quarterly guide values.

Analyses of 335 urine specimens for uranium mass and alpha activity this period revealed no instances of exposure approaching the radiation protection guide. One chemical operator who had been previously reported as having attained a body burden approximating the annual guide value remained on restriction with continuing bioassay and in vivo monitoring. There were no new internal exposures of significance this period.

Industrial Health Examinations and Clinical Urinalysis

Twenty-two chest and/or sinus x-rays were made on the fourteen employees scheduled for industrial health examinations. There were no findings of clinical significance. Thirty-four employees on the routine programs submitted urine specimens for chemical analysis at the field collection stations. None of the thirty-nine laboratory tests indicated results above the threshold limit value for the material of concern.

Plant Toxicants

Of the six air analyses made for airborne contaminants, one temporarily exceeded the threshold limit value. The sample involved iron oxide near a metal buffing operation, which posed no health problem.

Work Environs Surveillance

Efforts to assure safe and healthful work environs included monitoring of noise pressure levels in cascade, research, and development locations; thermal stress measurements in cascade and fluorine production facilities; and air flow evaluation of laboratory hoods and chemical recovery exhausts. Air sampling in cascade vaults assigned to long-term storage of uranium oxides revealed levels of uranium decay chain radioactive series no greater than background radioactivity levels. The plant waste streams were checked for pH and temperature, with results reflecting negligible alteration of existing pH and ambient temperatures. In addition to the routine radioactivity environmental monitoring, water samples from Poplar Creek, Clinch River, potable water, and holding ponds were analyzed for seventeen potential chemical contaminants; in all cases, levels were below recommended guide values.

Airborne Uranium Alpha Activity

The average alpha activity levels reflected by the 2,447 routine shift-length samples recorded by the continuous monitoring units in locations where air contamination is suspected remained essentially unchanged and low, representing less than 10% of the radiation concentration guide of 10^{-10} μCi/cc uranium in air. The 1,024 shift-length air samples taken at four outdoor locations around the plant perimeter reflected an average gross alpha activity downwind from major stack discharges of approximately 4% of the radiation concentration guide for a 40-hour occupational exposure period.

Radiation Sources

There were no new radioactive sources registered during the period, and routine checks of the fifteen radium sources at ORGDP revealed no radon leakage.

Potable Water Supply

The beta activity of radioactive contaminants in the plant potable water supply, which is taken from the Clinch River, reflects the effect of the discharge of mixed fission product waste material from an installation upstream. Analyses of the Clinch River samples at the ORGDP Sanitary Water Treatment Plant raw water intake, performed by ORNL for their control purposes, also were used by the ORGDP. There was no indication that peak activity during the weekly sampling periods exceeded the long-term radiation protection guides values, and the 13-week average in plant potable water supply continues to be less than 10% of the maximum permissible concentration in water for the mixture of radionuclides involved.

Water Pollutants

The average uranium concentration in the Clinch River, sampled approximately one mile below the plant and reflecting the contribution of all of the Oak Ridge Operations, remained less than 0.1% of the appropriate guide values for discharge of natural uranium materials to uncontrolled surface water bodies.

EMPLOYEE AND LABOR RELATIONS

Arbitration

1. In his award of August 7, 1968, the Arbitrator sustained the Company's issuance of a 3-day suspension to a Machinist for negligence resulting in damage to a machine.

2. On September 10, the Local CIO Union appealed two grievances to arbitration. One case concerned the shift transfer of an Operator without considering his seniority and in the other case, Electrical Mechanics protested the manner of overtime assignments. Both of these cases were withdrawn by the Union prior to the selection of an arbitrator.

3. An arbitration hearing was held on September 19, 1968, for the three grievances wherein three Operators claim that they were transferred from one shift to another without regard to their seniority. The decision has not been received.

4. At the close of the quarter, four grievances were pending in the arbitration procedure.

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2539.

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number K-1708 Date of document 12/20/66

Title and author (if document is unnumbered)

BREDP QUARTERLY REPORT 7/1/66-9/30/66 — COPY ONLY TAGGED PAGES.

(This section to be completed by Document Center)

Date request received 10/12/95

Date submitted to ADC 11/30/95

Date submitted to HSA Coordinator 10/12/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 11/30/95

Date received from CICO 2-22-96

Date submitted to ChemRisk/Shonka and DOE 2-22-96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

UNCLASSIFIED

K/EM-277

SANITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT FOR FIRST QUARTER FISCAL YEAR 1967

(EXTRACTED FROM CRD DOCUMENT # K-1708)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

November 30, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release to the public by:

Asst. John Theiter 2/21/96
Technical Information Officer Date
Oak Ridge K-25 Site

UNCLASSIFIED ~~SECRET~~

~~CONFIDENTIAL~~ This document consists of 136 pages

No. 8 of 64 copies, Series A.

DATE OF ISSUE: December 20, 1966

REPORT NO. K-1708

K 1708 8 A

K 1708 8 A

CLASSIFICATION CHANGED TO CONFIDENTIAL

By authority of Gary W. Hall 8/3/94

CG-PGD-4 Classification Specialist

Oak Ridge K-25 Site Class. Office

By [signature] Date 8/4/94

Verified by: [signature]

OAK RIDGE GASEOUS DIFFUSION PLANT
QUARTERLY REPORT

FIRST QUARTER FISCAL YEAR 1967
July 1, 1966 thru September 30, 1966

Classification changed to: CONFIDENTIAL

By authority of: CG-PGD-4

[signature] 8/3/94

ADD signature (first reviewer) Date

Gary W. Hall 8/3/94

signature (final reviewer) Date

LIBRARY
X-REF.

UNCLASSIFIED

UNION CARBIDE CORPORATION
NUCLEAR DIVISION

OAK RIDGE GASEOUS DIFFUSION PLANT
Oak Ridge, Tennessee

RESTRICTED DATA This document contains restricted data as defined in the Atomic Energy Act of 1954. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.
GROUP 1 Excluded from automatic downgrading and declassification

~~SECRET~~

TABLE C-8

URANIUM-235 INPUT

4th Quarter, FY 1966				1st Quarter, FY 1967			
	Kilograms U-235				Kilograms U-235		
Month	Total	Daily Rate	% Change	Month	Total	Daily Rate	% Change
April	2,170.2	72.3	0.6	July	2,118.3	68.3	-2.3
May	2,187.7	70.6	-2.4	August	2,182.0	72.7	6.4
June	2,095.8	69.9	-1.0	September	1,933.4	64.5	-11.3
Total	6,453.7			Total	6,233.7		
Average		70.9	-0.7	Average		67.8	-4.4

TABLE C-9

CASCADE INVENTORY CHANGE

	4th Quarter, FY 1966			
	Kilograms Uranium-235		Kilograms Xe	
Month	Ending Inventory	Δ	Ending Inventory	Δ
April	1,045.6	0.4	202.9	-3.4
May	1,165.7	120.1	287.9	84.9
June	1,093.5	-72.2	245.4	-42.4
Total		48.3		39.1

	1st Quarter, FY 1967			
	Kilograms Uranium-235		Kilograms Xe	
	Ending Inventory	Δ	Ending Inventory	Δ
July	1,088.8	-4.8	241.6	-3.8
August	1,042.6	-46.1	221.8	-19.8
September	1,123.5	80.9	292.3	70.5
Total		30.0		46.9

The offstream time for the Plant Test Program fluctuates in response to activity demands. Various phases of the program in progress are discussed on page C-29.

TABLE C-10

HOURS OFF STREAM

	July	August	September	1st Qtr. FY 1967	4th Qtr. FY 1966
Compressor Seal	220.53	182.71	167.94	571.18	110.62
Stage Motor	0.0	981.11	6.33	987.44	0.0
Stage Compressor	34.34	465.68	264.47	764.49	672.93
Converter	0.0	35.42	0.0	35.42	0.0
Instrumentation	0.0	0.17	0.0	0.17	0.0
Coolant System	18.55	3.55	3.77	25.87	13.45
Inleakage Checks	1.66	1.05	26.60	29.31	7.25
Treatment Operation	126.33	0.0	0.0	126.33	0.0
Power Control	27.61	178.47	0.08	206.16	10.05
Power Interruptions	8.21	0.0	0.0	8.21	2.88
Plant Test	0.0	164.00	672.00	836.00	2,646.54
Miscellaneous	75.75	110.13	1,126.08	1,311.96	51.05
Total	512.98	2,122.29	2,267.27	4,902.54	3,514.77

PURGE CASCADE

The average normal purge rate at K-311-1 during the first quarter was 11,478 Scf per day. The highest monthly average during the quarter was in September when 12,110 Scf per day was purged. The July and August rates were 11,119 and 11,204 Scf per day, respectively.

POWER OPERATIONS

Power Usage and Distribution

The TVA contract demand of 1,220 Mw remained in effect during the quarter and was reduced to the new contract demand level of 1,130 Mw at 12:00 p.m. CST September 30, 1966. The average demand usage was 1,211.47 Mw constituting an area load factor of 99.30% for this quarter. Transmission losses averaged 17.06 Mw leaving 1,194.41 Mw for distribution as follows: Y-12, 58.14; X-10, 20.94 Mw; ORGDP, 1,115.33 Mw.

During the quarter 2,674,921 Kwh of power was purchased from TVA at an average cost of $4.1582 per Mwh. The average cost of power distributed to the Oak Ridge Area was $4.3305 per Mwh.

NUCLEAR MATERIALS MANAGEMENT

The nuclear materials management program is designed to exercise suitable controls over the movement of source and special nuclear materials. This involves surveillance of material balance experience by individual process and maintenance of necessary quality control systems for weights and analyses of samples.

MATERIAL BALANCES

Cascade

Material unaccounted for (MUF) in the cascade during July, August, and September, respectively, was -1,642.6, 2,484.5, and 1,171.5 kilograms of uranium; and -31.9, 29.6, and 17.0 kilograms of uranium-235.

A credit to prior fiscal years of 60.8 kilograms of uranium and 13.7 kilograms of uranium-235 was included in the August figures. Actual balance experience was, therefore, 2,545.3 kilograms of uranium and 43.3 kilograms uranium-235 which compensate for the gains in July. Material losses for the two months were 902.6 kilograms of uranium and 11.4 kilograms uranium-235, which are reasonable.

During September, 51 cylinders of 2% stockpile material were sampled with a net reduction in the previous estimated inventory of 166.4 kilograms of uranium and 7.5 kilograms uranium-235. These amounts were included in the September figures. The adjusted losses for September were, therefore, 1,005.1 kilograms of uranium and 9.6 kilograms of uranium-235.

Cumulative Plant Accounting Efficiency

Estimated quantities of material representing the hidden inventory are shown by categories in Table C-18. The plant efficiency was 99.88% for uranium and 99.78% for uranium-235. Cumulative plant uranium and uranium-235 material balance data are shown in Figure C-2.

Nuclear Materials Handling Operation

Responsibility of the material handling functions involves the weighing, sampling, and storage of major material quantities received at or shipped from the plant site, as well as internal material transfers. The material flows include both Commission and Licensee nuclear materials. Table C-19 is a summary of shipments for the Civilian Application Program requests and Table C-20 is a summary of Commission contractor requests. Material on hand awaiting shipment is shown in Table C-21.

38

TABLE C-18

ACCOUNTING MEMORANDUM

Location of Deposits or Source of Material Unaccounted For	Kilograms Uranium	Kilograms Uranium-235
Cascade:		
Inactive Consumption	9,900.0	1,305.6
Active Chemisorption	665.7	53.3
Physical Adsorption	1,134.0	9.3
Inactive Converters	101.1	3.1
K-1405 Holding Pond*	254.8	5.3
Uncredited Contamination on Drums	225.0	1.5
Poplar Creek Bed Contamination	6,594.0	53.1
Ground Near Feed Plant	191.0	1.3
Losses by Vent to Atmosphere	6,778.0	47.7
ORGDP-Paducah Interplant Cylinder "Heels" Dilution before July 1955	-	179.2
Total	25,843.6	1,659.4

* Includes 152.4 kilograms uranium and 2.5 kilograms uranium-235 removed in residue on 10-26-61.

K-601 Operations

A total of 142 cylinders of enriched uranium hexafluoride was sampled. Shipments included 111 cylinders to licensees, 22 ten-ton cylinders of 2.1% material to NLO, 9 cylinders of 4% enriched material to the Portsmouth site, and 41,723 pounds of depleted oxides in 129 containers to McGean Chemical Company.

Cylinders received included 428 from licensees, 28 ten-ton from NLO, and 84 of product from Paducah. Thirty-six containers were buried during the quarter.

Receipts of UNH received from Y-12 consisted of 12 kilograms of uranium with an enrichment greater than 5% and 38 kilograms with less than 5% enrichment.

Nickel residue on hand is 434,198 pounds.

INDUSTRIAL RELATIONS

SAFETY AND HEALTH

SAFETY

Injury Experience

Four major injuries were experienced during the quarter, resulting in a frequency rate of 3.44 and a severity rate of 141. This brings the number of disabling injuries to 8 for the year, with an accompanying frequency rate of 2.27 and a severity rate of 152, as compared with rates of 1.75 and 180 for the same period last year. The serious injury frequency rate of 11.18 represents an increase of about 32% over the corresponding value for the previous quarter; however, the frequency rate for the 9-month period is about 18% lower than that for a similar period last year.

Property Damage Accidents

Eleven incidents resulting in property damage were experienced during the quarter, with an associated loss of $2,359, as compared with 13 incidents and $990 loss during the previous period. Two of these incidents resulted in disabling injuries, and two other accidents involved non-Government or third-party vehicles.

Material Releases

There were two material releases reported during the quarter, one of which involved uranium material during the transfer of UF_6. The other incident involved a release of fluorine when a 3/8" copper line was broken while a furnace was being moved. Both releases were confined to the laboratory rooms involved, were promptly controlled by the local operators, and no personnel injuries occurred.

Safety Improvements

1. A mechanical device to stop leaks in 10-ton and 14-ton material cylinders was designed and fabricated. The fixtures are maintained in the K-413 and K-1131 emergency equipment storage areas.

2. Hydraulically operated tube-clamping devices were assembled and placed in the K-413, K-631, and K-1131 material withdrawal areas for clamping copper tubing in the event a leak develops.

3. An audible alarm and flashing lights were installed in the K-1401 Machine Shop in order that the operator of the Betts boring mill in the pit can alert other employees in the event of an emergency.

4. Foot-high numerals were painted over the vehicular doors in K-1401 to permit simpler and more exact location identification when reporting and responding to emergencies in that facility.

analyses were made for potentially injurious materials. In no instance did the concentration exceed the plant action point.

Work Environs Surveillance

In addition to field monitoring by the operating departments, staff personnel collected 19 air samples to determine concentrations of airborne contaminants. Continuous sampling over 24-hour periods was conducted in 6 locations for fluorine, and in 7 locations for ozone. The remaining 6 were spot samples which were checked for cadmium or trichloroethylene. In no instance was the threshold limit value exceeded.

A study is being made to determine if cadmium-free silver solder would be a satisfactory substitute for the cadmium-bearing silver solder now specified for certain plant work. Until this study is completed, adequate measures, including ventilation and respiratory protection, are being taken to protect employees from possible cadmium exposure.

Prior to seasonal operation of the steam plant, background environmental air concentrations were determined for sulfur dioxide, which is generated by the oxidation of sulfur compounds in all types of fuel combustion. None of the 144 hour-long samples exceeded the human threshold value level of 5 parts per million. Concentrations varied from about 1/10 to 3-1/2 parts per million, with the higher levels occurring during periods of weather favorable to inversion rather than dispersion.

Airborne Uranium Alpha Activity

The average alpha activity levels reflected by the 2,603 routine shift-length samples recorded by the continuous monitoring units in locations where air contamination is suspected remained essentially unchanged and low, representing less than 10% of the plant control value of 10^{-10} μCi/cc uranium in air. The 906 shift-length air samples taken at four outdoor locations around the plant perimeter reflected an average gross alpha activity downwind from major stack discharges of approximately 3% of the radiation protection guide value for a 40-hour occupational exposure period.

Area Dosimetry

The installation of the locally developed units for use in evaluating personnel exposure in the event of a nuclear accident was completed this period. These relatively inexpensive units, costing about $20, provide monitoring data approximating that from previously available detectors costing more than $1,000 each.

Radiation Sources

There was one new radioactive source (Ir-192) registered during the period, and routine checks of the 15 radium sources at ORGDP revealed no radon leakage.

UNCLASSIFIED

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

ChemRisk/Shonka Research Associates, Inc., Document Request Form

2539

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number K-1701 Date of document 3/15/65

Title and author (if document is unnumbered)

* Copy only marked pages

(This section to be completed by Document Center)

Date request received 10/12/95

Date submitted to ADC 10/30/95

Date submitted to HSA Coordinator 10/12/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 11/30/95 1/10/96

Date received from CICO 1/5/96 2-22-96

Date submitted to ChemRisk/Shonka and DOE 2-22-96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

UNCLASSIFIED

K/EM-273

SANITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT SECOND QUARTER FISCAL YEAR 1965

(EXTRACTED FROM SRD DOCUMENT # K-1701)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

November 30, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release to the public by:

Asst John Thorton 2/21/96
Technical Information Officer Date
Oak Ridge K-25 Site

UNCLASSIFIED

SECRET

SHS
PO 3950

This document consists of 154 pages,
No. 35 of 65 copies, Series A.

REPORT NO. K-1701

DATE OF ISSUE: March 15, 1965

K 1701 35 A

K 1701 35 A

P 55305

OAK RIDGE GASEOUS DIFFUSION PLANT
QUARTERLY REPORT

SECOND QUARTER FISCAL YEAR 1965
October 1, 1964 thru December 31, 1964

UNION CARBIDE CORPORATION
NUCLEAR DIVISION

OAK RIDGE GASEOUS DIFFUSION PLANT
Oak Ridge, Tennessee

RESTRICTED DATA This document contains restricted data as defined in the Atomic Energy Act of 1954. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.
GROUP 1 Excluded from automatic downgrading and declassification.

SECRET

Cascade Input and Tails Production

The Paducah product fed to the ORGDP cascade totaled 541,910 kilograms of uranium with an average uranium-235 enrichment of 0.950%. Partially depleted material fed totaled 1,225,283 kilograms of uranium at an average assay of 0.294%. Enriched material fed to the cascade totaled 40.6 kilograms of uranium with an average assay of 2.907%.

Tails production during the report period totaled 1,587,321 kilograms of uranium at an average assay of 0.196 weight per cent uranium-235. The combined feeds less the tails material yielded an average net input of 61.5 kilograms of uranium-235, 3.9% below that of the first quarter.

The major feed streams and the tails production are shown in table C-5. The monthly input rates and the cascade inventory change are presented in tables C-6 and C-7, respectively.

TABLE C-5

FEED STREAMS AND TAILS PRODUCTION
Kilograms Per Day

	1st Quarter FY 1965				2nd Quarter FY 1965		
Month	Uranium	U-235	Assay	Month	Uranium	U-235	Assay
			Paducah Product				
July	163,574	1,782	1.089	Oct.	186,297	1,770	0.950
August	202,860	1,927	0.950	Nov.	175,987	1,672	0.950
Sept.	177,562	1,686	0.949	Dec.	179,626	1,706	0.949
Daily Avg.	5,913	58.6	0.991	Daily Avg.	5,890	56.0	0.950
			Partially Depleted				
July	434,489.9	1,330.7	0.306	Oct.	472,496.4	1,385.5	0.293
August	397,032.2	1,160.9	0.292	Nov.	343,889.9	1,036.6	0.301
Sept.	421,303.4	1,240.2	0.294	Dec.	408,897.1	1,187.5	0.290
Daily Avg.	13,617.7	40.6	0.298	Daily Avg.	13,318.3	39.2	0.294
			Tails Production				
July	556,194.2	1,103.8	0.198	Oct.	584,363.7	1,143.8	0.196
August	533,450.0	1,077.1	0.202	Nov.	473,622.9	936.0	0.198
Sept.	534,167.6	1,060.3	0.198	Dec.	529,333.9	1,021.7	0.193
Daily Avg.	17,650.1	35.2	0.199	Daily Avg.	17,253.5	33.7	0.196

TABLE C-6

URANIUM-235 INPUT

1st Quarter FY 1965				2nd Quarter FY 1965			
	Kilograms X				Kilograms X		
Month	Total	Daily Rate	% Change	Month	Total	Daily Rate	% Change
July	2,010.1	64.8	-40.4	October	2,012.2	64.9	+4.3
August	2,011.5	64.9	+ 0.1	November	1,774.4	59.2	-8.8
September	1,866.1	62.2	- 4.1	December	1,871.9	60.4	+2.0
Total	5,887.7			Total	5,658.5		
Average		64.0	-	Average		61.5	-3.9

TABLE C-7

CASCADE INVENTORY CHANGE

	1st Quarter FY 1965			
	Kilograms Uranium-235		Kilograms Xe	
	Ending Inventory	Δ	Ending Inventory	Δ
July	1,236.0	- 62.8	358.9	-18.1
August	1,222.8	- 13.2	330.6	-28.3
September	1,192.9	- 30.0	319.6	-11.0
Total		-106.0		-57.4

	2nd Quarter FY 1965			
	Kilograms Uranium-235		Kilograms Xe	
	Ending Inventory	Δ	Ending Inventory	Δ
October	1,193.7	+ 0.9	315.8	- 3.9
November	1,242.5	+48.7	354.4	+38.6
December	1,161.1	-81.3	293.6	-60.8
Total		-31.7		-26.1

CASCADE EFFICIENCY

Onstream Efficiency

The onstream efficiency of the cascade during the second quarter was 99.35%. This efficiency reflects the monthly rates of 99.30%, 99.39%, and 99.35% for October, November, and December, respectively. The quarterly efficiency for each of the cascade buildings averaged 99.13% for K-33, 99.42% for K-31, and 99.78% for K-29.

Offstream Time

The major sources of offstream time are tabulated in table C-8. Total offstream time was 30.2% less than that of the first fiscal quarter with the major reduction occurring in the compressor seal category. The greatest amount of offstream time during the current quarter occurred during October; the largest single cause of offstream time was that associated with stage compressor work.

TABLE C-8

HOURS OFF STREAM

	October	November	December	FY 1965 2nd Qtr.	FY 1965 1st Qtr.
Compressor Seal	66.87	137.28	205.79	409.94	1,548.75
Stage Motor	91.83	3.25	0	95.08	250.72
Stage Compressor	314.07	250.50	308.19	872.76	989.98
Converter	0	214.03	80.42	294.45	176.33
Instrumentation	0	13.70	0	13.70	113.20
Coolant System	11.75	1.58	9.92	23.25	44.35
Inleakage Checks	0	4.44	49.60	54.04	27.23
Treatment Operation	0	0	0	0	179.00
Power Control	11.87	0.67	0	12.54	11.91
Power Interruptions	66.86	0	135.86	202.72	-
Improvement	300.50	115.50	0	416.00	93.17
Miscellaneous	22.27	5.08	28.54	55.89	74.72
Total	886.02	746.03	818.32	2,450.37	3,509.36

PURGE CASCADE

An average of 7,080 scf per day was purged at K-311-1 during the second fiscal quarter. The highest monthly average during the quarter was in October when 7,923 scf per day was purged. The November and December rates were 6,627 and 6,691 scf per day, respectively. The highest purge rate experienced during the report period was 78,000 scf per day.

TABLE C-17

NITROGEN USAGE

	October	November	December
Nitrogen, 1,000 Scf/Day:			
Liquid	22.469	29.945	15.973
Gaseous:			
Cascade	68.017	73.308	57.139
Barrier	16.500	16.549	21.729
Feed	0.330	0.323	0.659
Other	51.579	38.433	52.904
Total Gaseous	136.426	128.613	132.431

NUCLEAR MATERIALS MANAGEMENT

MATERIAL RELEASES

There was one material release in the second quarter of fiscal year 1965. This release occurred in building K-1131 in the east tails drain position. The total release to the atmosphere was 613 grams uranium and 1 gram uranium-235.

DECONTAMINATION, RECOVERY, AND CONVERSION - K-1420 OPERATIONS

Decontamination

Five size 000 converters were decontaminated during the quarter.

Recovery

A quantity amounting to 13,866 liters of solution was processed through the K-1420 recovery facility. This solution has two general sources: (1) that originated at ORGDP amounting to 120 liters; and (2) that received from Y-12, amounting to 13,746 liters. The processing of these solutions produced 2,504 pounds of uranium oxide (U_3O_8), which represents total production.

Conversion

The K-1420 fluorinating facility was operated December 2 through December 31. A total of 1,408 pounds of uranium as uranium hexafluoride was produced. All production was at isotopic enrichments greater than 5%.

ACCOUNTING EVALUATIONS

Cumulative Plant Accounting Efficiency

Estimated quantities of material representing the hidden inventory are shown by categories in table C-18. The plant accounting efficiency was 99.87% for uranium and 99.80% for uranium-235. Cumulative plant uranium and uranium-235 material balance data are shown in figure C-2.

TABLE C-18

ACCOUNTING MEMORANDUM

Location of Deposit or Source of Material Unaccounted For	Kilograms Uranium	Kilograms Uranium-235
Cascade:		
Inactive Consumption	8,277.4	1,369.0
Active Chemisorption	665.7	53.8
Physical Adsorption	1,134.0	10.4
Inactive Converters	45.5	2.7
K-1405 Holding Pond*	254.8	5.3
Uncredited Contamination on Drums	225.0	1.5
Poplar Creek Bed Contamination	6,594.0	53.1
Ground Near Feed Plant	191.0	1.3
Losses by Vent to Atmosphere	6,778.0	47.7
ORGDP-Paducah Interplant Cylinder "Heels" Dilution Before July, 1955	-	179.2
Total	24,165.4	1,724.0

* Includes 152.4 kilograms uranium and 2.5 kilograms uranium-235 removed in residue on 10-26-61.

Cascade Material Balance Area

The reported material unaccounted for (MUF) in this balance area for October, November, and December, respectively, is -577.6 kilograms, 2,142.3 kilograms, and -2,166.4 kilograms uranium; and 41.6 kilograms, 85.1 kilograms, and -78.8 kilograms uranium-235.

Factors affecting this balance include the special withdrawals amounting to 817 kilograms of uranium-235 withdrawn in November and December. During the quarter, a condensation of material in the K-310-2 bypass lines was found; revaporization of the condensed material resulted in the recovery

of 3,225 kilograms uranium and 100.5 kilograms uranium-235. Revaluation of the 4% production from prior months is included in the balance for this period. The material balance experience for this area is considered satisfactory.

NUCLEAR MATERIALS HANDLING OPERATION

The nuclear materials handling operation at ORGDP covers the weighing, sampling, and storage of major material quantities received at or shipped from the plant site, as well as internal material transfers. The material flows include both Commission and Licensee nuclear materials. Table C-19 is a summary of Civilian Application Program requests and table C-20 is a summary of Commission contractor requests. Material on hand awaiting shipment is shown in table C-21.

TABLE C-19

CIVILIAN APPLICATION REQUESTS

Request No.	Quantity Kgs. UF_6	Enrichment, Wt. % U-235	Company	Date
NC-1166	1,216.5	1.77	Nuclear Fuel Services	10- 2-64
NC-1154	1,203.0	2.35	General Electric Company	10- 2-64
NC-1167	2,437.4	2.34	Nuclear Fuel Services	10- 9-64
NC-1167	2,440.1	2.34	Nuclear Fuel Services	10-15-64
NC-1167	2,032.1	2.34	Nuclear Fuel Services	10-22-64
NC-1154	2,412.4	2.35	General Electric Company	10-23-64
NC-1167	2,239.1	2.34	Nuclear Fuel Services	10-29-64
NC-1154	1,208.0	2.35	General Electric Company	11- 3-64
NC-1167	1,630.2	2.34	Nuclear Fuel Services	11- 4-64
NC-1167	2,023.9	2.34	Nuclear Fuel Services	11- 6-64
NC-1154	802.4	2.35	General Electric Company	11-11-64
NC-1180	180.9	0.22	NUMEC	11-17-64
NC-1165	1,428.2	2.34	General Electric Company	11-19-64
NC-1071	7.9	89.85	EURATOM	11-20-64
NC-1183	1,628.0	3.4	Nuclear Fuel Services	12- 1-64
NC-1183	2,434.8	3.4	Nuclear Fuel Services	12- 7-64
NC-1184	158.9*	93.15	France	12- 9-64
NC-1183	2,430.5	3.4	Nuclear Fuel Services	12-11-64
NC-1183	2,441.4	3.4	Nuclear Fuel Services	12-17-64
NC-1183	2,442.5	3.4	Nuclear Fuel Services	12-28-64
NC-1183	2,444.2	3.4	Nuclear Fuel Services	12-31-64

* This material was withdrawn at GAT.

TABLE E-8

URINE ANALYSES FOR RADIOACTIVE MATERIALS

	This Quarter	Last Quarter	1964[a]	1963[a]
Alpha Activity				
No. Analyses	380	418	450	517
No. Positive Results[b]	13	8	14	25
Uranium				
No. Analyses	380	418	450	517
No. Positive Results[b]	3	1	2	1
Neptunium				
No. Analyses	0	0	0	10
No. Positive Results[b]	0	0	0	0
Plutonium				
No. Analyses	0	0	0	1
No. Positive Results[b]	0	0	0	0

a) Quarterly averages.
b) Positive results are those equal to or greater than control values used at ORGDP.

Industrial Health Examinations and Clinical Urinalysis

There were 19 industrial health examinations completed during visits to the dispensary. None of the 58 checks made, which included mainly chest and sinus x-rays, revealed findings of clinical significance.

Plant experience permitted a reduction of 44% in the number of urine samples necessary without impairing the effectiveness of the health protection program. This reduction became effective October 1, 1964. Reductions were made in samples taken for barium, cadmium, fluorides, lead, and trichloroacetic acid. The results of chemical urinalyses are summarized in table E-9.

Plant Toxicants

There were 2 positive findings resulting from 14 air analyses for airborne contaminants, none of which revealed a significant problem.

TABLE E-9

CHEMICAL URINALYSES

	This Quarter	Last Quarter	1964[a]	1963[a]	1959-1963[a]
Barium					
No. Analyses	0	3	3	3	-
No. Positive Results[b]	0	0	0	0	-
Cadmium					
No. Analyses	0	2	2	4	-
No. Positive Results[b]	0	0	0	0	-
Fluorides					
No. Analyses	36	133	115	117	661
No. Positive Results[b]	0	0	0	<1	3
Lead					
No. Analyses	1	13	14	8	8
No. Positive Results[b]	0	1	2	1	<1
Mercury					
No. Analyses	17	23	22	27	108
No. Positive Results[b]	0	0	0	0	<1
Nickel					
No. Analyses[c]	15	24	24	22	48
Trichloroaecetic Acid					
No. Analyses	0	9	7	7	15
No. Positive Results[b]	0	0	0	0	0

a) Where totals are concerned, figures refer to quarterly averages.
b) Positive results are those equal to or greater than control values used at ORGDP.
c) No established maximum allowable concentrations.

Air-Borne Uranium Alpha Activity

The average alpha activity levels for shift-length air sampling in locations where such contamination may routinely be anticipated increased somewhat but remained below the value for the 5-year base period, representing only about 20% of the plant acceptable limit of 10^{-10} μc/cc (MPC_a). The plant-wide 1964 average was about 20% less than the similar value for 1963. Spot air samples are also taken during audits of special jobs or during the periodic evaluation of specific operations within the various processing areas. The relatively small number taken this year

reflects the reduction in this type of activity and was obtained primarily during checks of new uranium pulverizing equipment in a specially enclosed area. The probability of relatively high air activity had been recognized, and the use of adequate respiratory equipment was mandatory.

Results of air-borne alpha activity samples are summarized in table E-10 and are shown graphically in figure E-3.

TABLE E-10

ENVIRONMENTAL RADIATION AND RADIOACTIVE MATERIALS

	Current Quarter	Previous Quarter	1964[a]	1963[a]	1959-1963[a]
Air Activity (Shift Length)					
Samples Taken	1,661	2,480	2,659	3,678	3,402
No. Above Plant Acceptable Limit	55	1	31	61	242
Av. Activity/Sample (c/m/ft^3)	0.40	0.15	0.23	0.29	0.50
Air Activity (Spot)					
Samples Taken	27	4	20	28	115
No. Above Plant Acceptable Limit	6	0	2.8	1.3	11
Av. Activity/Sample (c/m/ft^3)	1.73	0.20	22.66	5.66	2.0
Alpha Contamination					
Plant Contamination Index[b]	324	267	286	257	345
No. Locations Included	24	24	30	39	32
% Total Plant Area Surveyed	0.9	0.9	1.0	1.2	1.2
Plant Sanitary Water					
Av. Gross Beta Activity ($\mu c/cc \times 10^{-7}$)	0.21	0.08	0.9	1.8	4.9
Av. U Concentration ($\mu c/cc \times 10^{-7}$) in Sanitary Water Influent	0.00	0.01	<0.01	0.05	0.02

a) Quarterly averages.
b) The contamination index is a figure which reflects the product of the extent and intensity of alpha contamination exceeding the plant acceptable limit. Values include those plant locations with a 6-month average contamination index of 10 or greater.

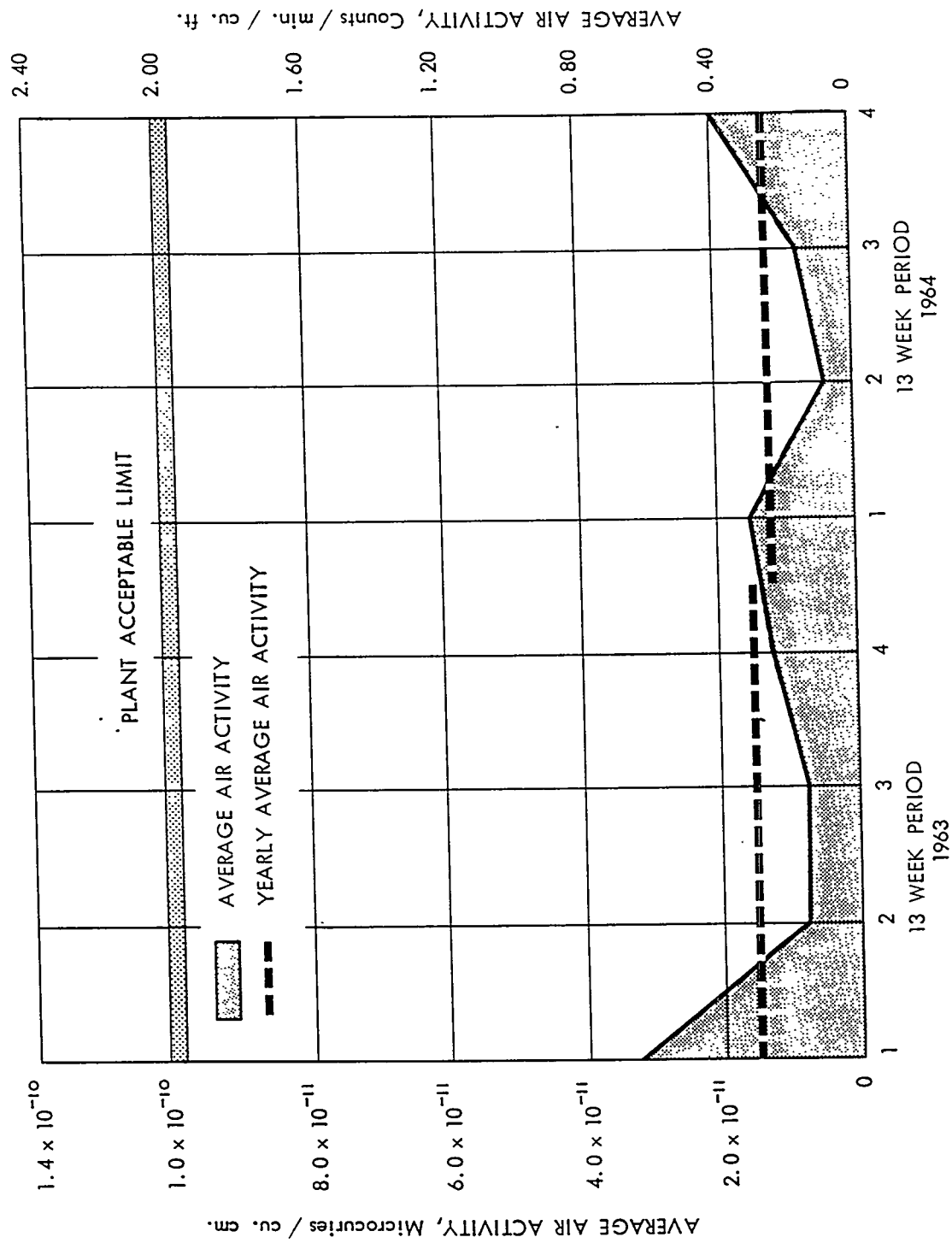


FIGURE E-3

PLANT AIR ACTIVITY

Alpha Contamination

The plant alpha contamination levels of 324 for the quarter and 286 for the year represent increases of about 10% from the correspondingly low values of 1963. This reflects primarily the problems associated with the containment and control techniques during the processing of enriched uranium materials. Plant contamination levels are established from audit surveys by staff personnel in those 24 plant locations where significant contamination may periodically be encountered. Survey results are summarized in table E-10 and are shown graphically in figure E-4.

Radiation Sources

Routine monthly checks of the 17 radium sources at ORGDP revealed no radon leakage. In addition, the annual inspection of all plant radiation sources used in research, nondestructive testing, and instrument calibration or checking revealed no leakage or other radiation safety problem. Four sources included in the previous annual summary have been delivered to the Oak Ridge National Laboratory for permanent ground storage, and 7 radium sources have been scheduled for surplus.

Potable Water Supply

The beta activity of radioactive contaminants in the plant sanitary water, which is taken from the Clinch River, reflects the discharge of mixed fission product waste material from another installation upstream. The average for the year decreased to 0.9×10^{-7} μc/cc, approximating the low value of 1.8×10^{-7} μc/cc recorded during 1963. None of the sampling periods showed peak activity exceeding the long-term maximum permissible concentration; in fact, the 13-week averages were all less than 10% of the appropriate guide values for 40-hour week occupational exposure to the mixture of radionuclides involved. Monitoring results are summarized in table E-10 and are shown graphically in figure E-5.

Air Pollutants

The 617 shift-length air samples taken at 7 outdoor locations around the plant perimeter reflected an average gross alpha activity downwind from major stack discharges of approximately 5% of the radiation protection guide values for a 40-hour occupational exposure period. Similar average activity levels for locations at 5 miles from the center of the plant reflected concentrations of about 8% of the corresponding guide values established for exposure of the general population, reflecting the negligible contribution of the plant operations upon surrounding environs.

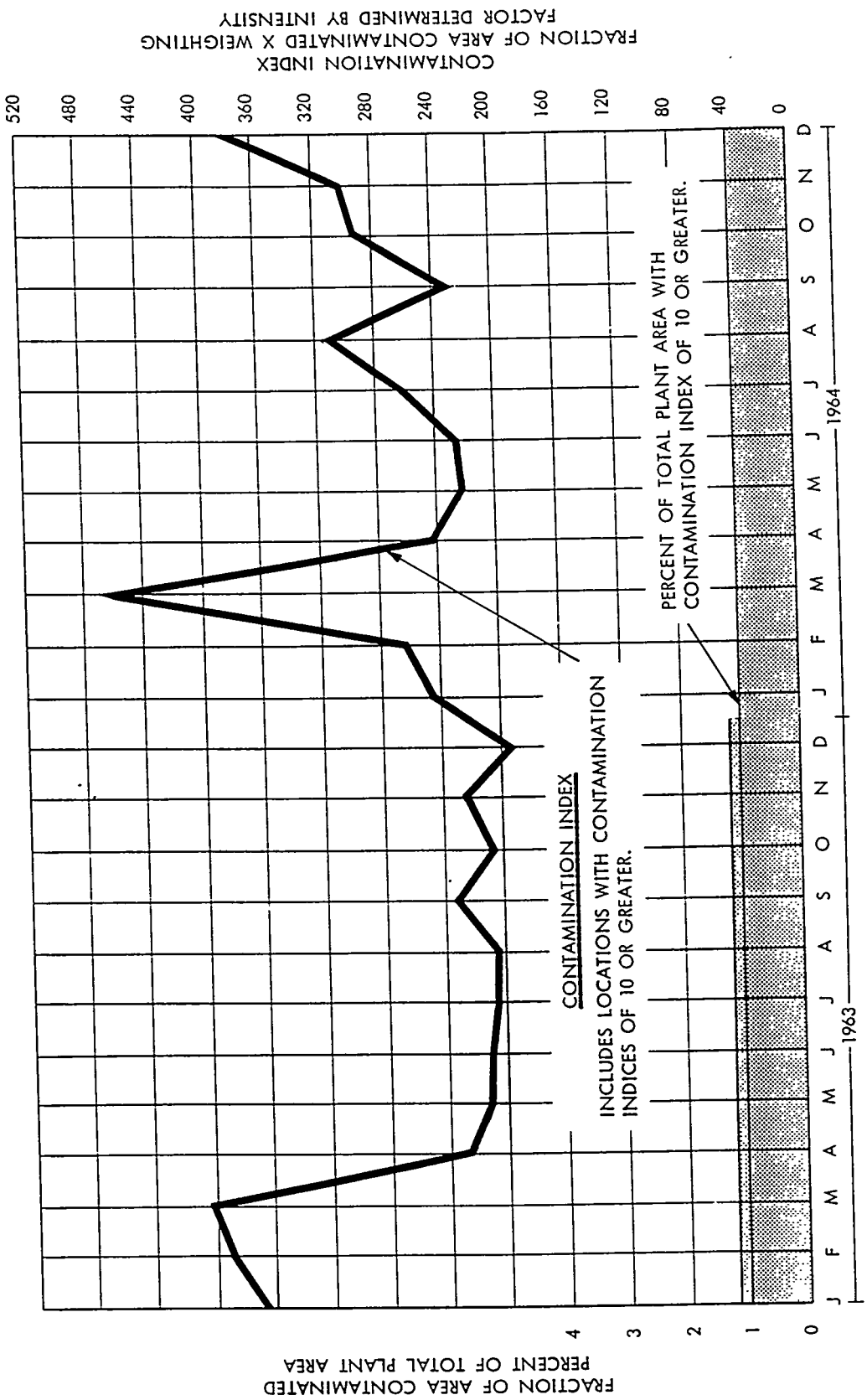
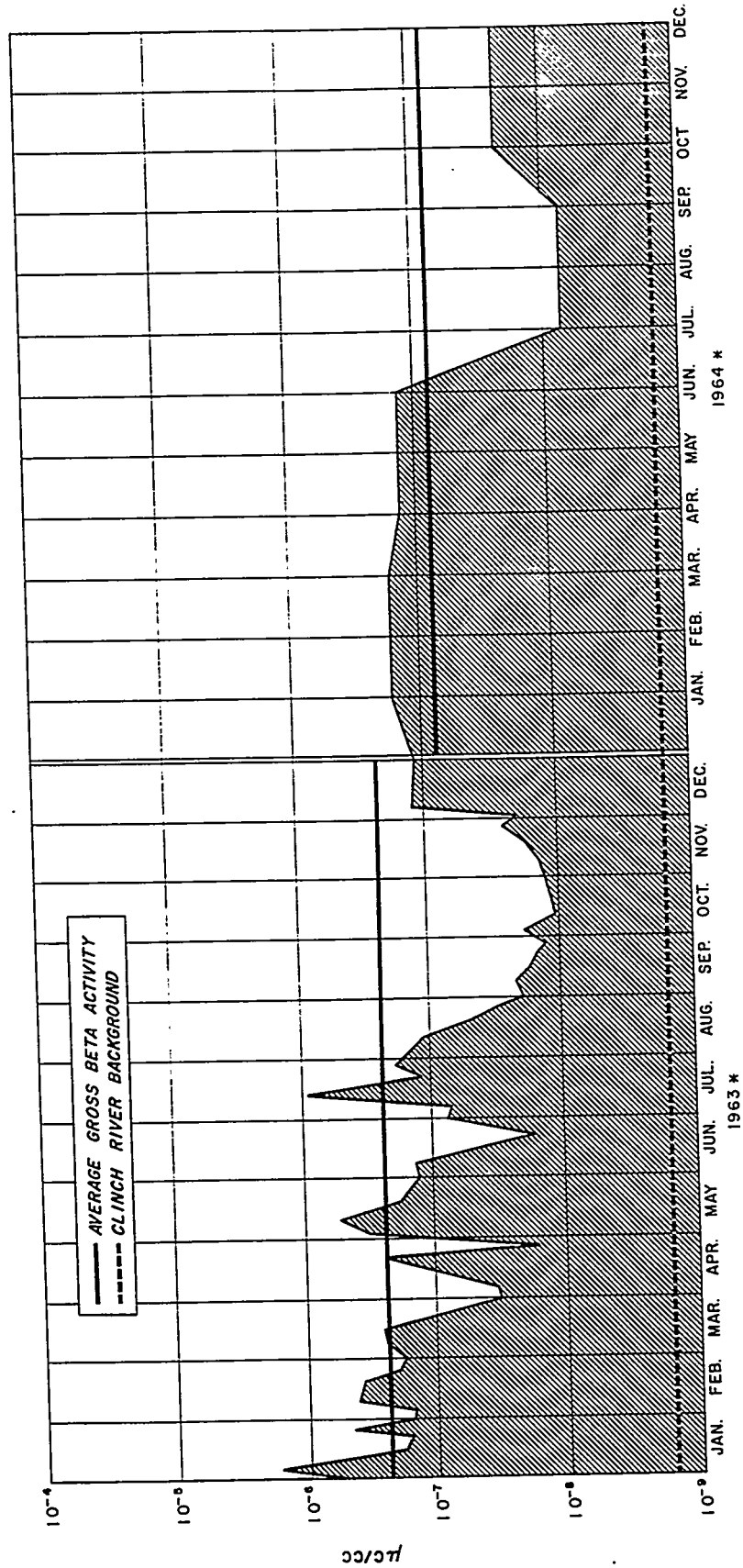


FIGURE E-4

PLANT CONTAMINATION LEVELS



* FREQUENCY OF ANALYSIS: 1963, WEEKLY; 1964, WEEKLY OR QUARTERLY

FIGURE E-5

BETA ACTIVITY LEVELS IN THE POTABLE WATER SYSTEM

Water Pollutants

While the quarterly average uranium concentration in Poplar Creek above the plant increased from 0.2 to 0.5 x 10^{-7} μc/cc as a result of operations at another installation upstream, the average levels for both the current period and for the year in the Clinch River one mile below the plant, which reflect the contribution of all the Oak Ridge operations, were less than 0.1% of the appropriate guide values for discharge of natural uranium materials to uncontrolled waterways. Stream monitoring results are shown in table E-11.

TABLE E-11

URANIUM CONCENTRATION IN STREAMS

Sampling Locations	Average U Concentrations (μc/cc x 10^{-7}) Current Quarter	Previous Quarter	1964	1963	1959-1963
East Fork at Poplar Creek	0.45	0.16	0.39	0.37	0.50
Poplar Creek at Clinch River	0.14	0.14	0.09	0.27	0.12
Clinch River 1 Mile Below Plant	0.00	0.00	0.01	0.03	0.03

EMPLOYEE AND LABOR RELATIONS

Arbitration

During the quarter, the Union withdrew five grievances from arbitration. All of these cases were concerned with the issue of bargaining-unit work being performed by supervisory personnel.

On December 22, the Local CIO Union appealed an additional grievance to arbitration. The case concerns the Union's protest of a reprimand issued to a machinist for his general attitude toward his work and supervision.

The other grievance pending in the arbitration procedure concerns the assignment of certain machinists to perform work on the Memorial Day holiday. Professor A. C. Russell, of Louisville, Kentucky, has been selected as the Arbitrator to hear this grievance but no hearing date has been set.

Negotiations

After twelve meetings, a formal Memorandum of Agreement was signed on October 16, 1964, containing the provisions for a new contract with the Local CIO Union.

UNCLASSIFIED

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

UNCLASSIFIED

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number K-1602 Date of document 7/29/63

Title and author (if document is unnumbered)

* Copy only marked pages.

(This section to be completed by Document Center)

Date request received 10/12/95

Date submitted to ADC 10/30/95

Date submitted to HSA Coordinator 10/12/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 11/30/95 1/10/96

Date received from CICO 1/5/96 2-22-96

Date submitted to ChemRisk/Shonka and DOE 2-22-96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

UNCLASSIFIED

K/EM-281

SANITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT THIRD QUARTER FISCAL YEAR 1963

(EXTRACTED FROM CRD DOCUMENT # K-1602)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

November 30, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release to the public by:

Asst [signature] 2/21/96
[illegible] Information Officer Date
[illegible] Sites

[redacted]

UNCLASSIFIED

This document consists of [redacted] pages,
No. [redacted] of [redacted] 77 [redacted]ies, Series A.

Date of Issue: July 29, 1963

REPORT NO. K-1602

K 1602 11 A

K 1602 11 A

OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT

THIRD QUARTER FISCAL YEAR 1963

January 1, 1963 thru March 31, 1963

UNION CARBIDE NUCLEAR COMPANY

DIVISION OF UNION CARBIDE CORPORATION

Operating

- OAK RIDGE GASEOUS DIFFUSION PLANT
- OAK RIDGE Y-12 PLANT
- OAK RIDGE NATIONAL LABORATORY
- PADUCAH GASEOUS DIFFUSION PLANT

for the Atomic Energy Commission

Under U. S. Government Contract W7405 eng 26

UNION CARBIDE

RESTRICTED DATA This document contains restricted data as defined in the Atomic Energy Act of 1954. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.

2

[redacted]

contain this barrier, and the data obtained from these cells are very erratic. The changes, therefore, are not considered serious. The remainder of the barrier installed in the K-25 building experienced normal permeability changes during the report period.

The majority of the barrier installed in the K-33 building experienced very small permeability changes during the past two quarters; however, several classifications of barrier did experience unusual changes. The installed in two cells is the last of the original barrier installed in K-33, and is being changed out as part of the improvement program. The permeability change in this barrier during the second quarter is the result of plugging following the replacement of two stages

The permeability change in the during the third quarter (0.13% per month) was the result of changes in the datum system; the same is apparently the reason for the changes in the The permeability on one cell containing this barrier increased 4%, apparently due to instrument changes.

The permeability of the installed in the K-33 building decreased 0.44% during the second quarter and 0.48% during the third quarter. Since some of this barrier has been installed recently, the barrier is expected to show a relatively high plugging rate. During the third quarter, three of the four cells containing this barrier plugged in a predictable manner; the fourth cell, however, showed a significant permeability decrease of approximately 2%. This decrease became apparent following an instrument calibration preceding a separation test. An investigation is continuing to determine the reason for the permeability decrease.

TABLE C-14

PURGE CASCADE OPERATIONS

The K-311-1 side purge facility removed an average of 15,561 standard cubic feet per day of light contaminants from the cascade stream during the third quarter of fiscal year 1963. The K-312-1 top purge facility removed an average of 5,451 standard cubic feet per day of light contaminants from the cascade during the quarter. This latter amount is approximately 11% below that purged during the second quarter as a result of several seal replacements in the top purge facility itself. The combined purge rate for the two purge facilities averaged 21,012 standard cubic feet per day, 2.8% below that of the previous quarter. The average daily purge rates are presented in table C-15 for the second and third quarters of fiscal year 1963.

TABLE C-15

Cascade Purge Rates

Second Quarter, FY 1963				Third Quarter, FY 1963			
	Average Purge Rates, Scf per Day				Average Purge Rates, Scf per Day		
	Purge Facilities				Purge Facilities		
Month	Top	Side	Combined	Month	Top	Side	Combined
October	6,155	16,473	22,628	January	5,694	15,193	20,887
November	6,028	15,138	21,166	February	5,281	15,595	20,876
December	6,123	14,961	21,084	March	5,379	15,894	21,273

ELECTRICAL POWER

POWER DISTRIBUTION

In the third quarter of fiscal year 1963, all electric power requirements of the Oak Ridge Area were supplied by the TVA. The TVA contract demand was 1580 mw in this period, and the average TVA delivery was 1571.97 mw. The transmission losses were 16.32 mw, leaving 1555.65 mw distribution to the Oak Ridge Area. The Y-12 average usage was 59.40 mw and the ORNL average usage was 12.13 mw. The remainder, 1484.12 mw, was distributed to the ORGDP.

POWER UNIT COSTS

A total of 3,395,454 mwh of power was purchased from the TVA at an average cost of $3.9860 per mwh.

The unit cost of power distributed to the Oak Ridge Area was $4.0836 per mwh, and the unit cost of power distributed to the ORGDP was $4.1143 per mwh. Distribution unit costs were slightly higher than those of the previous quarter due to the higher unit cost of purchased power during February, 1963.

The ORGDP cascade average usage and net change from the previous quarter are shown in table C-16. Table C-17 summarizes the electrical operations and natural gas distribution of the Oak Ridge Area. Table C-18 presents the electrical power supply and distribution data for the Oak Ridge Area together with the associated costs. Table C-19 gives a detailed usage and cost analysis of the ORGDP operations.

TABLE C-16

[redacted]

During the record cold weather of January 23-35, when temperatures dropped to -8°F., six "freeze-ups" occurred in sprinkler systems; each of these involved only one sprinkler or fitting. On January 17 and February 23 two additional sprinklers froze. No water was released in five of the incidents and no water damage was sustained in the remaining three.

Other faults to fixed fire protection systems included:

Failure of six 12-volt batteries on proprietary alarm system in the K-29 production building, requiring replacement. Break in underground supervisory signal circuit, involving PVC-covered wires, the fourth such failure apparently from electrolysis. Samples of the defective wire were sent to the laboratory for tests, and replacements are being made with polyethylene-covered wire which has greater resistance to this type corrosive action.

Ruptures in one 10-inch and two 6-inch underground fire mains which were promptly isolated without water damage.

MECHANICAL SAFETY

Routine inspection and test of 785 pressure relief devices, 109 pressure vessels, 364 units of hoisting equipment, and 264 compressed gas and UF_6 cylinders showed that the high level of operational safety was continued. When inspections or tests disclosed unsafe or significantly faulty conditions, repairs or replacements were promptly made. Examples include: replacement of 5 inoperative relief valves; repair of two boiler feed pump turbines which would not trip out when overspeed tested; replacement of an excessively corroded water heater in K-1008-C; and repair or replacement of fault cables, brakes, or interlocks on 12 cranes, lifts, or elevators.

HEALTH PHYSICS

Personnel Radiation Monitoring

The average film badge reading per person monitored increased from 2.2 mrem to 11.0 mrem during this period. The increase reflects the processing of high assay material in the K-1420 recovery area. The maximum exposure to a single individual was less than one-fourth the quarterly permissible value.

Air-Borne Alpha Activity

The average air-borne alpha activity reflected by the more than 3800 routine shift-length samples taken in locations where such activity may be encountered, increased somewhat but remains low, representing only about one-third of the plant acceptable limit of 10^{-10} μc/cc.

The 54 spot air samples taken in conjunction with audit surveys indicated decreases in both the per cent of samples exceeding the plant acceptable limit and the average air activity; the latter decreased to about 7% of the appropriate MPC_a.

These conditions were noted primarily in chemical recovery operations where the potential of high air activity is recognized, and the use of adequate respiratory protection devices is required.

Alpha Contamination

The plant alpha contamination level of 385, which is determined through scheduled surveys by the Health Physics staff group and includes 38 plant locations where contamination is routinely encountered, represents an increase of about 25% over the corresponding value for last quarter. This primarily reflects the processing of uranium of higher enrichments in recovery operations. These facilities are currently under study to better contain the materials currently being processed. No significant health problems are indicated.

Industrial Environment

The analyses of 747 air samples for 20 nonradioactive contaminants gave 95 significant results. There were 53 other miscellaneous air analyses of an operational nature.

[redacted]

Sanitary Water

The beta activity of radioactive contaminants in the plant sanitary water, which is taken from the Clinch River, is influenced by the discharge of mixed fission product waste materials from another installation upstream. The average concentration for the quarter continued low at a value of $3.8 \times 10^{-7}\mu c/cc$. The peak activity of $7.6 \times 10^{-7}\mu c/cc$. for a one-week sampling period did not approach the long-term maximum permissible concentration specified by the National Committee on Radiation Protection for 40-hour week occupational exposure to the mixture of radionuclides involved. Even during the dredging of a channel in the Clinch River above the plant when silt was being disturbed and water flows were low, the average beta activity due to fission products ($4.0 \times 10^{-7}\mu c/cc.$) and specifically Sr^{90} ($1.1 \times 10^{-8}\mu c/cc.$) showed no significant increase over the levels normally encountered at the K-1515 sanitary water plant.

Plant Environment

The average uranium concentration in Poplar Creek water above the plant remained essentially unchanged at $5 \times 10^{-9}\mu c/cc.$, reflecting the influence of another installation upstream from the ORGDP. The average uranium result for water samples taken from the Clinch River one mile below the plant, which includes the contribution of all UCNC operations, was only 0.03% of the NCRP maximum permissible concentration for the discharge of natural uranium materials to uncontrolled surface waterways.

NUCLEAR SAFETY

Plant evaluation activities included the issuance of 1 departmental approval letter; 7 clearance approvals of minor equipment or operational changes; and a formal report of a significant noncritical incident involving uranium accumulation in a vent stack.

The annual plant nuclear safety review by the AEC-ORO was held the week of March 18. Methods of operation and records maintained, as well as the type of plant drills and emergency control methods and equipment, were reviewed. Field inspections of various plant areas were also made.

Education

A color film on criticality and criticality control measures normally employed in uranium separation and processing operations was shown to plant personnel and numerous talks on this subject, illustrated with slides of specific plant equipment, were given at plant safety meetings. In addition, two color films depicting clean-up operations following the SL-1 reactor incident in Idaho in 1961 were shown to about 200 supervisors of the various plant divisions.

INDUSTRIAL HYGIENE

Bio-Assay Results

The collection of urine specimens for uranium and alpha activity, formerly done as part of the dispensary's industrial health examination, was transferred to the new field urinary sampling stations during this quarter. To provide base-line data, analyses of this type are also being performed on all specimens submitted during periodic examinations by employees who are not included in the urinary uranium program.

Analyses of 559 urine specimens for uranium were reported during the period; 59 of these specimens were recalls since the initial results were greater than the plant control level of 10 dis/min/100 ml, and 8 of these recall specimens remained above the control limit. However, subsequent analyses indicated excretion rates for these employees <5 dis/min/100 ml, thus indicating that there was no body burden of significance for the involved individuals. No restrictions were placed during this quarter, and the 3 restrictions in effect prior to January 1, 1963, were removed which resulted in an average of 68 days work restriction.

A complete review of the industrial health examination program has been started with the intent of using the field sampling stations, set up for the urinary uranium program, when Medical Department services are not required. There were 488 industrial health examinations completed during the quarter; 317 of these were part of the periodic examination. The results of analyses of 504 urine specimens for industrial toxicants were reported. None of the results were considered clinically significant.

Hearing Protection

Audiometric examination was also made a part of the routine periodic examination during this quarter. Under the new arrangement, 344 employees were given threshold audiometric tests. An additional 38 tests were given during pre-employment, rehire, and termination physical examinations.

Medical Activities

The medical case load for the quarter, classified by type of service, is presented in table E-1.

TABLE E-1

Medical Case Load

Type of Case	This Quarter	Last Quarter
Industrial Injuries and Illnesses	1,080	1,019
Non-industrial Injuries and Illnesses	2,854	2,472
Pre-employment and Rehire Examinations*	14	44
Pre-employment Rejects	1	2
Terminations	24	61
Periodic Examinations	344	189
Interim Examinations	0	45
Industrial Health Examinations	160	674
Optometric Visits	466	534
Returns to Work, Recalls, and Miscellaneous	1,494	1,815
Total Case Load	6,436	6,853
Services to Outside Parties (included in Total Case Load)	34	14
Laboratory Procedures Completed	4,890	4,713
Electrocardiograms	297	207
X-rays Made	847	677

*Included in Pre-employment and Rehire Examinations.

EMERGENCY ACTIVITIES

Emergency Planning and Organization

The Plant Emergency Manual was thoroughly reviewed, updated where necessary, and reissued with individual procedures tabbed for ready reference.

Special consideration was given to available methods and procedures for coping with interior fires and exterior roof fires, such as occurred in December, 1962, involving cascade building C-337 at Paducah. In the case of exterior roof fires requiring roof-top hose lines, it appears that permanently affixed hose rollers, appropriately spaced at intervals along the roof edge of the cascade buildings, would permit a six-man crew to advance a hose line from a pumper to any part of the roof and have it charged in ten minutes. The foregoing presumes that sprinklers have controlled or extinguished any interior fires, making it feasible to put men on the roof.

NUCLEAR MATERIAL CONTROL

INTRODUCTION

The nuclear material control program at the Oak Ridge Gaseous Diffusion Plant is concerned with maintaining accurate measurements of uranium inventories and flows. Efforts toward improving material measurements are made on a continuing basis. The status of various activities concerned with the Civilian Application Program is summarized.

GENERAL STUDIES ON MATERIAL CONTROL

OMIT

IBM 7090 APPLICATIONS

A program has been written to process all cascade data from the mark sense card to final reports for distribution. The program utilizes as input a reproduced deck of cards made from the original mark sense card data form. Processing of the data consists of converting pressure indicator readings to absolute pressures, averaging pressures, temperatures, control valve angles, and pressure drops across control valves on a cell basis. The cell data averages are compared to operating targets - those data deviating from the targets are tagged with an asterisk as out-of-range data. Output from the program will consist of lists of data for distribution to the various plant areas concerned as well as punched card output for utilization in cascade inventory, permeability calculations, and coolant level plot 7090 programs.

MATERIAL RELEASES 1. URANIUM--RELEASES 2. URANIUM-235--RELEASES

Table G-1 presents a tabulation of material releases which have occurred through March 31, 1963, and have not previously been reported. Material release reports 370 through 372 accounted for the release of 67 grams uranium and 14 grams uranium-235 to the atmosphere as uranium hexafluoride.

TABLE G-1

Material Releases

Report No.	Date of Release	Location	Balance Area	Equipment Involved	Material Class	Grams Uranium	Grams U-235
370	January, 1963	K-1420	410	Conversion Vent Stack	F	11	1
371	February, 1963	K-1420	410	Conversion Vent Stack	G	20	6
372	March, 1963	K-1420	410	Conversion Vent Stack	F	36	7
				Total Released		67	14

DECONTAMINATION, RECOVERY, AND CONVERSION - K-1420 OPERATIONS 1. URANIUM RECOVERY

Decontamination

Converter decontamination in the K-1420 building during the third quarter of fiscal year 1963 amounted to four size 1 converters and one batch of size 000 converter spools, the recovery from which was calculated to be 8,181 grams uranium and 145.63 grams uranium-235. Also decontaminated were two size 000 converters (000-4 and 000-871) on which no accountability measurements were made because the operating control samples indicated them to be below the established ORGDP economic recovery limits. This material was drained to the K-1405 holding pond.

Recovery

A quantity amounting to 19,584 liters of solution was processed through the K-1420 recovery system during the third quarter of fiscal year 1963. This solution has two general sources: (1) those solutions that were originated at ORGDP and amounted to 11,248 liters, and (2) those

solutions that were received from Y-12 and amounted to 8,336 liters. The processing of these solutions produced 1,585 pounds of uranium as oxide (U_3O_8).

Conversion

The K-1420 conversion facility operated for a total of 1,293.2 hours during the quarter. Operations during this quarter produced 13,964 pounds of uranium as uranium hexafluoride with a product value estimated to be $11,435,000.

ACCOUNTING EVALUATION STUDIES

CUMULATIVE PLANT ACCOUNTING EFFICIENCY 1. URANIUM ACCOUNTABILITY

Estimated quantities of material representing the hidden inventory are shown in table G-2 by categories. The plant accounting efficiency is 99.87% for uranium and 99.77% for uranium-235. Cumulative plant uranium and uranium-235 material balance data are shown in figure G-1.

TABLE G-2

Accounting Memorandum

Location of Deposit or Source of Material Unaccounted for	Kilograms Uranium	Kilograms Uranium-235
Cascade:		
Inactive Consumption	6,214.2	1,097.4
Active Chemisorption	665.7	73.5
Physical Adsorption	1,420.9	114.0
Inventory Understatement	862.5	288.8
K-311 and K-312 Sections	19.1	6.8
Inactive Converters	70.9	3.1
K-1405 Holding Pond*	254.8	5.3
Uncredited Materials Sent to Hot Salvage on Contaminated Drums	225.0	1.5
Poplar Creek Bed Contamination	6,594.0	53.1
Ground Near Feed Plant	191.0	1.3
Losses by Vent to Atmosphere	6,778.0	47.7
ORGDP-Paducah Interplant Cylinders "Heels" Dilution Before July, 1955	-	179.2
TOTAL	23,296.1	1,871.7

*Includes 152.4 kilograms uranium and 2.5 kilograms uranium-235 removed in residue on 10-26-61.

BALANCE AREA ACCOUNTING EVALUATION 1. MATERIAL BALANCE

A discussion of significant operating conditions which affect the uranium and uranium-235 material balances is reported.

Cascade Balance Area

The reported material unaccounted for (MUF) in this balance area for January, February, and March, 1963, is, respectively, -161.3 kilograms, -82.0 kilograms, and 135.9 kilograms uranium; and 14.9 kilograms, -13.0 kilograms, and 29.9 kilograms uranium-235.

During the quarter, the cascade uranium-235 inventory decreased by 24.5 kilograms and the special withdrawals amounted to 1,037 kilograms uranium-235.

The reported material balance experience for this report period is considered reasonable.

Feed Manufacture Balance Area

The reported MUF for this area is -74.8 kilograms, 0.0 kilograms, and 962.6 kilograms uranium; and 1.1 kilograms, 0.0 kilograms, and 12.1 kilograms uranium-235, respectively, for the months of January, February, and March, 1963.

The March MUF is significant only in that it is the result of correcting entries for overcharges on scrap materials previously transferred to Paducah.

The reported MUF is considered reasonable.

Recovery Balance Area

For the months of January, February, and March, the respective reported MUF for this balance area is 56.9 kilograms, 46.4 kilograms, and -70.6 kilograms uranium; and 13.9 kilograms, 11.2 kilograms, and -6.3 kilograms uranium-235.

The reported MUF, 22.7 kilograms uranium and 18.8 kilograms uranium-235, for this balance area is considered reasonable.

Conversion Balance Area

During the months of January, February, and March, the MUF in this balance area is, respectively, 899.2 kilograms, -146.4 kilograms, and 1.9 kilograms uranium; and 32.1 kilograms, -24.7 kilograms, and 3.5 kilograms uranium-235.

The January MUF is significant only in that it is the result of correcting entries for inventory overcharges for that month.

The reported MUF for this balance area is considered reasonable.

OMIT NUCLEAR MATERIALS HANDLING OPERATION

The nuclear materials handling operation at ORGDP covers the weighing, sampling and storage of major material quantities received at or shipped from the plant site, as well as internal material transfers. The material flows include both Commission and Licensee nuclear materials. Table G-3 is a summary of Civilian Application Program requests and table G-4 is a summary of Commission contractor requests. Material on hand awaiting shipment is shown in table G-5.

ROUTINE PLANT MATERIALS

Feed Materials

The following quantities of feed materials were received during the period:

	Kgs. Uranium
Y-12 UNH Solution (< 5% U-235)	94.60
Y-12 UNH Solution (> 5% U-235)	171.20
Y-12 U_3O_8 (> 5% U-235)	879.80
Paducah Product UF_6	712,833.08
Paducah Normal UF_6	466,630.88
Total Feed Materials Received	1,180,609.56

The following quantities of feed materials were shipped during the period:

	Kgs. Uranium
Cascade Tails UF_6 to Paducah	1,213,775.99
Scrap Material to Paducah	21,786.90
Scrap Material to Y-12	253.90
Total Feed Materials Shipped	1,235,816.79

UNCLASSIFIED

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

UNCLASSIFIED

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (Is requested to provide the following document)

Date of request 10/12/95 — Expected receipt of document 1 MONTH

Document number K-1507 — Date of document 10/31/62

Title and author (if document is unnumbered)

~~Daily Process Report~~

* Copy the marked pages

(This section to be completed by Document Center)

Date request received 10/12/95

Date submitted to ADC 11/30/95

Date submitted to HSA Coordinator 10/12/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 11/30/95 1/10/96

Date received from CICO 1/5/96 2-22-96

Date submitted to ChemRisk/Shonka and DOE 2-22-96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

UNCLASSIFIED

K/EM-271

SANITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT FOURTH QUARTER FISCAL YEAR 1962

(EXTRACTED FROM SRD DOCUMENT # K-1507)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

November 30, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release to the public by:

Asst John Preston 2/21/96
Technical Information Officer Date
Oak Ridge K-25 Site

SECRET

UNCLASSIFIED

This document consists of 116 pages,
No. ~ of 77 copies, Series A.

~~REPORT NO. K-1507~~

DATE OF ISSUE: October 31, 1962

K 1507 8 A

K 1507 8 A

OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT

FOURTH QUARTER FISCAL YEAR 1962

April 1, 1962 thru June 30, 1962

UNION CARBIDE NUCLEAR COMPANY
DIVISION OF UNION CARBIDE CORPORATION

Operating

- OAK RIDGE GASEOUS DIFFUSION PLANT
- OAK RIDGE Y-12 PLANT
- OAK RIDGE NATIONAL LABORATORY
- PADUCAH GASEOUS DIFFUSION PLANT

for the Atomic Energy Commission

Under U. S. Government Contract W7405 eng 2

UNION CARBID

RESTRICTED DATA This document contains restricted data as defined in the Atomic Energy Act of 1954. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.

SECRET

PURGE CASCADE OPERATIONS

Unit K-312-1 was operated as the cascade top purge facility, and unit K-311-1 was operated as the cascade side purge during the fourth quarter of fiscal year 1962. The purge facility in unit K-311-1 purged an average of 16,743 standard cubic feet per day; the rate in unit K-312-1 averaged 6,777 standard cubic feet per day. The total purge rate during the quarter averaged 23,521 standard cubic feet per day, 0.1% below that of the previous quarter. The average daily purge rates are presented in table C-13 for the third and fourth quarters of fiscal year 1962.

TABLE C-13

Cascade Purge Rates

Third Quarter, FY 1962				Fourth Quarter, FY 1962			
	Average Purge Rates, Scf/Day				Average Purge Rates, Scf/Day		
	Purge Facilities				Purge Facilities		
Month	Top	Side	Combined	Month	Top	Side	Combined
January	7,172	16,665	23,837	April	6,620	16,642	23,262
February	6,831	16,339	23,170	May	6,852	16,355	23,207
March	6,713	16,866	23,579	June	6,860	17,233	24,093

ELECTRICAL POWER

The ORGDP generation station produced 179,108 mwh of electrical power during the fourth quarter of fiscal year 1962, an average generation of 82.0 mw. The plant operated with one boiler, utilizing natural gas as fuel. The average cost of the generated power was $4.1997 per mwh.

Power purchased from TVA totaled 3,441,308 mwh at an average unit cost of $3.951 per mwh. This power, with the ORGDP generation, represents a total of 3,620,416 mwh, an average load of 1657.7 mw for the Oak Ridge area, of which 46,182 mwh (1.28%) was credited to losses. The average cost of all power acquired for the Oak Ridge area was $3.9633 per mwh as compared to a unit cost of $3.9461 per mwh during the third quarter. This increase stems from a higher generation cost because of gas fuel.

The 1601 and 1612 distribution cost accounts increased over the previous quarter at about the same percentage as the acquisition costs. The cost of power distributed through the 1601 account was $4.0653 per mwh as compared to $4.0434 per mwh in the previous quarter, and the 1612 average distributed power cost was $4.1043 per mwh as compared to $4.0890 per mwh previously.

The average usage of TVA power was approximately 2.0 mw higher and the ORGDP generation 7.5 mw higher than the previous quarterly average. The Y-12 average load increased approximately 4.5 mw, and the ORNL average load increased approximately 2.0 mw so that there was only a slight increase in the ORGDP loads.

The ORGDP power station operations, Electrical Operations, and natural gas distribution, are summarized in table C-14 for the third and fourth quarters of fiscal year 1962. Table C-16 presents the electrical power supply and the distribution data for the Oak Ridge area along with the associated costs. A detailed usage and cost analysis for the ORGDP power operations is presented in table C-17.

MECHANICAL SAFETY

Mechanical Inspection and Tests

Routine inspections and tests included 575 pressure relieving devices, 214 pressure vessels, 378 units of hoisting equipment, and 233 cylinders. Relief valve vent line plugging was found and eliminated on 4% of the safety valves inspected. Five of 15 steam plant safety valves required cleaning to insure satisfactory operation. Five fluorine and acid transport storage tank inspections were satisfactory.

Annual inspection of 5 of 6 steam plant boilers was completed. Four tubes in two boilers, which were thinned by fuel erosion, were re-ended. Annual overspeed and drop test of 9 traction elevators showed satisfactory governor action. Crane rail improvement continued, with 50% completion of rail replacement in H bay of K-1401. New crane wheels were installed to accommodate new rails installed in J bay over the acid cleaning vats.

HEALTH PHYSICS

Personnel Radiation Monitoring

The average film badge reading increased from 3.8 mrem to 7 mrem. The increase was due to radiation received under controlled conditions during plant drills and emergency radiation training. No personnel exposures in excess of plant acceptable limits were recorded, with the maximum exposure being less than 5% of the quarterly permissible dose.

Air-Borne Alpha Activity

The average air-borne alpha activity reflected by the more than 3,600 routine shift-length and spot samples taken during surveys of feed manufacturing and uranium recovery operations remained essentially unchanged at about one-fourth of the plant acceptable limit of $10^{-10}\mu c/cc$. In areas where the potential of relatively high activity is recognized, the use of adequate respiratory equipment is mandatory.

Alpha Contamination

The plant alpha contamination level of 289, which is determined through audit surveys by both staff and operating groups in those locations where contamination is routinely encountered, remained essentially unchanged from that of the previous period and continues to reflect no significant health hazard.

Penetrating Radiation Levels

The plant radiation index of 0.5, which indicates both the magnitude and the extent of the penetrating radiation fields encountered during staff and operating group surveys, indicates that comparatively minor routine exposures are being experienced due to personnel exposure to beta-gamma penetrating radiation from uranium daughters or other radioactive materials used for research and development purposes.

NUCLEAR SAFETY

Two deviations from acceptable practices on storing and labeling of uranium materials were noted on field audits.

One technical report was issued, "The Effect of Density on the Safe U-235 Enrichment Criterion," in which the greater reactivity of high density nonhomogeneous uranium systems is evaluated. Quantitative bases are given for the determination of the degree of nonhomogeneity which may be acceptable in a nominally homogeneous system without significantly affecting its over-all criticality.

INDUSTRIAL HYGIENE

Bio-Assay Results

Industrial health examinations and subsequent recalls included chemical analysis of 797 urine specimens. None of the results were considered clinically significant. Eleven specimens were submitted during supervisory visits and 12 during termination examinations. There was a 5% increase in the number of analyses completed and a 36% increase in the number of positive findings. Of these, activities in the K-1420 building contributed 49%, an additional 8% involved the K-1413 building, and the remainder came from 23 other plant areas.

Industrial Environment

The results of 1,449 routine air analyses for 26 nonradioactive contaminants and uranium gave 64 significant results. There were 29 other miscellaneous air analyses for special problems.

A continuously recording oxygen analyzer has been operating since the start of this quarter in the K-1004-J centrifuge facility. The analyzer samples the atmosphere at the bottom of the large centrifuge silo.

Plant Environment

The results of 696 analyses of air pollution-type samples for 4 nonradioactive contaminants and uranium indicated that concentrations of fluorides and nitrogen dioxide sufficient to mark the most sensitive vegetation occurred at the plant perimeter. A 41% increase in the number of fluoride results in this category was noted; however, all of the results were significantly less than the threshold values suggested for the protection of employees in the industrial environment.

Audiometric Program

Eighty-three employees, or approximately 20% of those employees in the routine audiometric program, were examined.

MEDICAL ACTIVITIES

Equipment to permit thorough pulmonary function tests on all periodic examinations is now fully operational and over 500 such examinations have been completed. The great majority of these have been normal and the continuation of this study should eventually provide a body of knowledge of real epidemiological and legal value, particularly in the defense of claims of occupational etiology for emphysema.

The medical case load for the quarter, classified by the type of service, is presented in table E-1.

EMERGENCY ACTIVITIES

Emergency Planning Activities

Included among the special considerations given to emergency planning were the assignment and training of additional employees for emergency preparedness. One hundred and eight employees were trained in the use of hose streams in fire fighting, eighty-three employees were trained in the use of emergency protective devices and equipment, and 127 employees were trained in the various aspects of radiation monitoring and control in the event of a criticality excursion.

The plant radiation alarm system was placed in service which in the event of a radiation emergency gives audible and visual radiation alarms demanding immediate response of all personnel to evacuate involved areas.

Evidence presented herein indicates that the composite production sample method now being used is adequate for accountability purposes. The details of this test are presented in table G-1.

WEIGHING OF Y-12 UNH SOLUTION

At the present time, the flow of Y-12 uranyl nitrate hexahydrate solution to ORGDP has reached substantial proportions (approximately 70 to 100 containers per week). These are received in 14 container lots. Weighing is accomplished at K-601 prior to delivery at K-1420, which means that the containers have to be unloaded and reloaded. A weighing scheme has been instituted which will require weighing all containers of the first shipment of five lots. If weight differences between the shipper and receiver do not exceed 100 grams, the shipping weights will be accepted. Where a container weight difference does exceed 100 grams, all containers of succeeding shipments will be weighed until the difference disappears. The solution ranges between 5% and 10% uranium. For the first three months of the calendar year, the average weight difference per container has been 3.3 grams.

SIDE FEED ACCOUNTABILITY

Several procedural changes have been made by production personnel which will assist the accountability group in maintaining more adequate records of auxiliary feeds to the cascade. Storage locations for full and empty cylinders will be centralized in the vicinity of elevators, excluding K-303-9, in the K-25 and K-27 areas. This procedure will facilitate the inventory of cylinders in these areas.

The Central Control Room will maintain a log sheet on a current basis listing cylinder number, net weight in pounds, sample transfer number, time and date on and time and date off. This log sheet will be picked up by accountability personnel and will be used to determine side feed quantities to the cascade during an accounting period.

IBM 7090 APPLICATIONS

The cascade inventory change sheet program was revised during the quarter to utilize a double precision feature of Fortran programming. Normally, Fortran programming provides for only 8 significant digits of data. In costing inventory quantities and in the total of the cascade uranium inventory, nine digits are nearly always required. The double precision program will provide for adequate numerical accuracy, removing the necessity for a manual reconciliation of total inventory and total dollar value of inventory.

A revised flow calculation program for size 1 and size 2 cascade equipment will be incorporated into the main programs during the next quarter. Work has also begun on programming the accounting system for the IBM 7090 computer. When complete, this program will compute the net weight, uranium, uranium-235, and dollar value for each container transferred during the month. After calculation, the beginning inventory will be updated to represent an ending inventory. The ending inventory, a book inventory, will then be compared to a physical inventory. Totals of uranium, uranium-235, and dollar values will be collected on an account basis, balance area basis, plant basis, and for those accountability stations foreign to station CCC with which business has been transacted during an accounting period. Files will be maintained to reflect the monthly activity and the cumulative year-to-date activity.

MATERIAL RELEASES 1. URANIUM--RELEASES 2. URANIUM HEXA-FLUORIDE--RELEASES

Table G-2 presents a breakdown of releases which have occurred through May, 1962, and have not previously been reported. Material release reports 361 through 363 account for the release of 3,955 grams of uranium and 11 grams of uranium-235 to the atmosphere as uranium hexafluoride.

TABLE G-2

Material Releases

Report No.	Date of Release	Location	Balance Area	Equipment Involved	Material Class	Grams Uranium	Grams U-235
361	March 2, 1962	K-1413	510	Process Lines	F	2,681	3
362	April, 1962	K-1420	410	Vent Stack	F	39	[illegible]
363	May, 1962	K-1420	410	Vent Stack	F	234	2
					Total Released	3,955	11

OMIT DECONTAMINATION, RECOVERY, AND CONVERSION - K-1420 BUILDING

Decontamination

Converter decontamination in the K-1420 building amounted to seven size 000 converters and one batch of size 000 converter spools, whose recovery is calculated to be 30,664 grams uranium and 485 grams uranium-235.

Recovery

A quantity amounting to 39,189 liters of solution was processed through the K-1420 recovery system with a removal of 879 kilograms of uranium as impure oxide (U_3O_8) from the calciners.

Conversion

The K-1420 conversion facility operated for a total of 937.8 hours. Production totaled 13,521 kilograms uranium as uranium hexafluoride, having a product value of $2,940,848.

ACCOUNTING EVALUATION STUDIES

1. MATERIAL BALANCE

CUMULATIVE PLANT ACCOUNTING EFFICIENCY

Estimated quantities of material representing the hidden inventory are shown in table G-3 by categories. The plant accounting efficiency is 99.86% for uranium and 99.75% for uranium-235. This has been determined by dividing the amount which can be accounted for (hidden inventory, inventory on hand, and shipments) by the total plant receipts, and multiplying by 100. (Cumulative plant uranium and uranium-235 book-physical inventory differences are shown in figure G-1.)

BALANCE AREA ACCOUNTING EVALUATION

Cascade Balance Area

The reported book-physical inventory differences for April, May, and June are, respectively, -257.1 kilograms, 332.5 kilograms, and -498.2 kilograms uranium; and 38.2 kilograms, -0.3 kilograms, and -14.2 kilograms uranium-235.

During the quarter, the cascade uranium-235 inventory increased by 122 kilograms and special withdrawals amounted to 1,195.9 kilograms uranium-235.

The reported book-physical inventory differences for this balance area are considered reasonable.

Feed Manufacture Balance Area

The reported book-physical inventory differences are 28.9 kilograms, 84.0 kilograms, and 14,560.1 kilograms uranium; and 1.0 kilograms, 0.8 kilograms, and 112.6 kilograms uranium-235, respectively, for the months of April, May, and June.

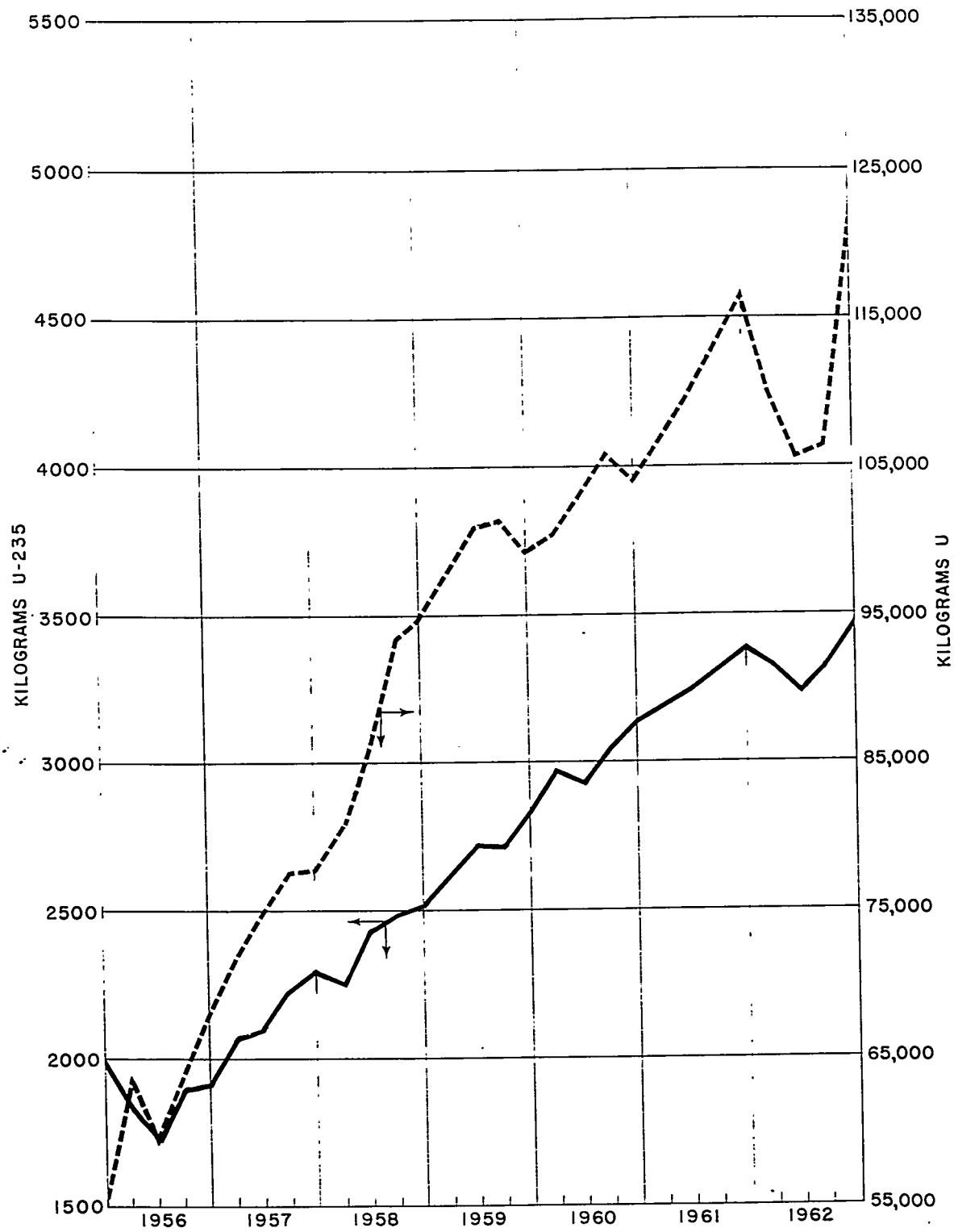


FIGURE G-1

Plant Uranium and U-235 Deficiencies

Cumulative from September 1944

TABLE G-3

Accounting Memorandum

Location of Deposit or Source of B.P.I.D.	Kilograms Uranium	Kilograms Uranium-235
Cascade:		
Inactive Consumption	6,128.5	955.6
Active Chemisorption	665.7	75.8
Physical Adsorption	1,420.9	117.9
Inventory Understatement	959.1	339.3
K-311 and K-312 Sections	19.9	7.5
Inactive Converters	39.8	2.7
K-1405 Holding Pond	102.3	2.8
Sludge Storage from Holding Pond	171.2	2.9
Uncredited Materials Sent to Hot Salvage as Contaminated Drums	225.0	1.5
Poplar Creek Bed Contamination	6,594.0	53.1
Ground Near Feed Plant	191.0	1.3
Losses by Vent to Atmosphere	6,778.0	47.7
ORGDP-Paducah Interplant Cylinders "Heels" Dilution Before July, 1955	-	179.2
Total	23,295.4	1,787.3

The June experience is of historial significance only, representing the difference in estimated content less actual recovery in scrap materials shipped to Paducah in the period September through December, 1961, but accumulated over several years of feed plant operation.

OMIT

NUCLEAR MATERIALS HANDLING OPERATION

The nuclear material handling operation at ORGDP covers the weighing, sampling, and storage of major material quantities received into or shipped from the plant site, as well as internal material transfers. The material flows include both Commission and licensee nuclear materials. Table G-4 is a summary of Civilian Application Program requests, and table G-5 is a summary of Commission Contractor requests which have been shipped. Table G-6 is a summary of Civilian Application Program request (NC) and Commission Contractor requests (K) which are awaiting shipment.

ROUTINE PLANT MATERIALS

Feed Materials

The following quantities of feed materials were shipped during the period:

Cascade Tails UF_6 to Paducah	828,023 kilograms

The following quantities of feed materials were received during the period:

Enriched U_3O_8 from Y-12 at 1.2% U-235	22,916 kilograms
Enriched U_3O_8 from Y-12 at 38.0% U-235	249 kilograms
UNH Solution from Y-12 (3.5% through 60% U-235)	8,290 kilograms

K-601 Operations

The following sampling was accomplished during the period:

Product level uranium hexafluoride	459 cylinders
level uranium hexafluoride	
Uranium hexafluoride of varying enhancements	439 cylinders

UNCLASSIFIED

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number K/EM-317 Date of document 1/30/62

Title and author (if document is unnumbered)

(This section to be completed by Document Center)

Date request received 10/20/95

Date submitted to ADC 12/19/95

Date submitted to HSA Coordinator 10/20/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 12/19/95 1/22/96

Date received from CICO 1/5/96 2/26/96

Date submitted to ChemRisk/Shonka and DOE 2/26/96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

K/EM-317

SANITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT FIRST FISCAL QUARTER JULY 1 THRU SEPTEMBER 30, 1961

(EXTRACTED FROM SRD DOCUMENT # K-1504)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

December 18, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release
to the public by:

2/23/96

Classification Officer Date
Oak Ridge K-25 Site

[redacted]

TECHNICAL DIVISION
D. M. LANG
1962 FEB 1 AM 11:12

K-1504

46-A

OAK RIDGE GASEOUS DIFFUSION PLANT
QUARTERLY REPORT

FIRST QUARTER FISCAL YEAR 1962

July 1, 1961 thru September 30, 1961

UNION CARBIDE NUCLEAR COMPANY
DIVISION OF UNION CARBIDE CORPORATION

Operating

• OAK RIDGE GASEOUS DIFFUSION PLANT • OAK RIDGE Y-12 PLANT
• OAK RIDGE NATIONAL LABORATORY • PADUCAH GASEOUS DIFFUSION PLANT

for the Atomic Energy Commission

Under U. S. Government Contract W7405 eng-26

UNION CARBIDE

RESTRICTED DATA This document contains restricted data as defined in the Atomic Energy Act of 1954. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.

CENTRAL LIBRARY
K1004

[redacted]

[redacted]

This document consists of 112 pages

No. 46 of 81 copies, Series A.

DATE OF ISSUE: January 30, 1962

REPORT NO. K-1504

M62372

K 1504 46 A

K 1504 46 A

OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT

FIRST QUARTER FISCAL YEAR 1962

July 1, 1961 thru September 30, 1961

DOCUMENT INVENTORIED
Date Initials
6/26/85 CLS

UNION CARBIDE NUCLEAR COMPANY
DIVISION OF UNION CARBIDE CORPORATION

Operating

- OAK RIDGE GASEOUS DIFFUSION PLANT
- OAK RIDGE Y-12 PLANT
- OAK RIDGE NATIONAL LABORATORY
- PADUCAH GASEOUS DIFFUSION PLANT

for the Atomic Energy Commission

Under U. S. Government Contract W7405 eng 26

UNION CARBIDE

RESTRICTED DATA This document contains restricted data as defined in the Atomic Energy Act of 1954. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.

[redacted]

3

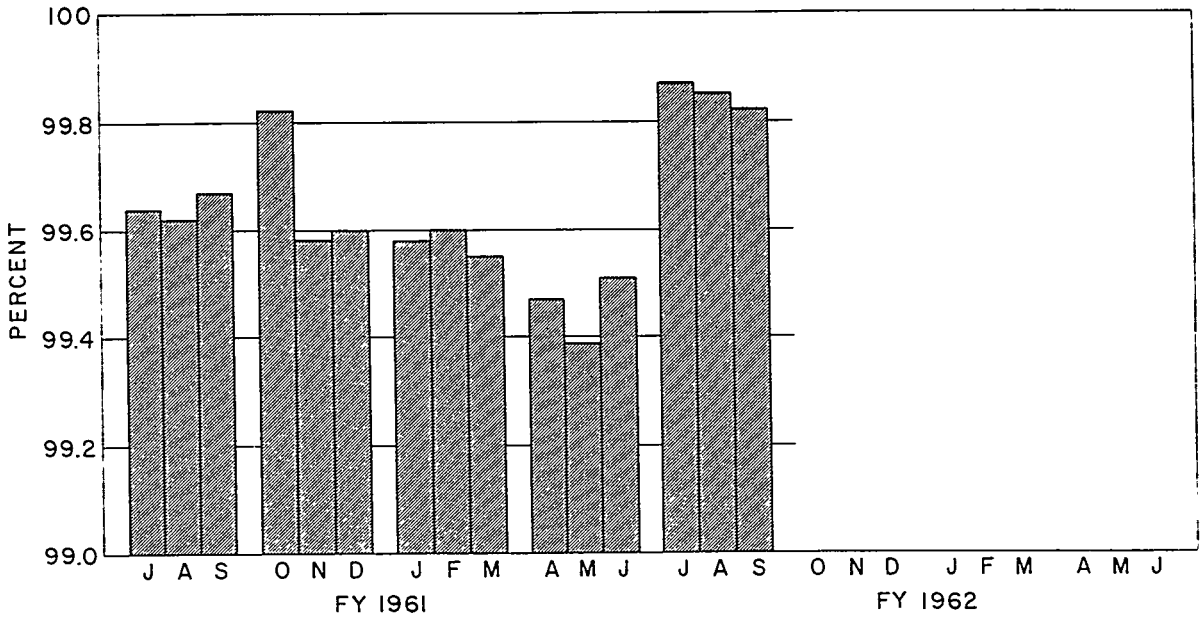


FIGURE C-5

Cascade Stream Efficiency

PURGE CASCADE OPERATIONS

Unit K-312-1 was operated as the cascade top purge facility, and unit K-311-1 was operated as the cascade side purge during the first quarter of fiscal year 1962. The purge facility in unit K-311-1 purged an average of 17,159 scf per day; the rate in unit K-312-1 averaged 7,966 scf per day. The total purge rate during the quarter averaged 25,119 scf per day, 7.42 per cent above that of the previous quarter. The average daily purge rates are presented in table C-13 for the first quarter of fiscal year 1962 and the fourth quarter of fiscal year 1961.

TABLE C-13

Cascade Purge Rates

Fourth Quarter, FY 1961				First Quarter, FY 1962			
	Average Rates, Scf/Day Purge Facilities				Average Rates, Scf/Day Purge Facilities		
Month	Top	Side	Combined	Month	Top	Side	Combined
April	6,860	16,073	22,933	July	7,191	16,681	23,872
May	7,029	17,008	24,037	August	8,589	17,197	25,786
June	7,000	16,162	23,162	September	8,119	17,599	25,718

4

two 50, and one 20 horsepower units. The reasons for the removal were insulation failures (10), bearing failures (3), pump failure (1), and one unrepairable oil leak.

Two, 300 horsepower, K-29, axial-flow compressor motors were replaced during the three-month period, compared to ten for the previous quarter. A bearing failure occurred in one unit; the other involved a ground fault. It will be necessary to rewind both motors.

Three of the four K-31, axial-flow compressor, 500 horsepower motor failures occurred as the result of a cascade disturbance during an emergency outage of the K-33 B-booster station. The other replacement was necessitated by a bearing failure.

Five, 1750 horsepower, axial-flow compressor motor failures occurred in K-33. Ground faults were involved in each case, and it will be necessary to rewind all five motors.

Heat Recovery Turbines

The Allis-Chalmers turbine in cell K-902-4.6 was inoperative on two occasions: once for replacement of the liquid coolant pump motor after a load bearing failure, and later for the installation of high temperature piston cups in the turbine bypass valve actuating cylinder. The Thompson turbine in cell K-902-4.8 was inoperative from May 16, 1961, through July 12, 1961. During this period, new tandem Cartriseals were installed on both ends of the turbine shaft and in the one position on the pump shaft; in addition, high temperature piston cups were inserted in the bypass valve actuating cylinder. The turbine has performed satisfactorily since startup on July 13, 1961.

Persistent difficulty has been experienced with the solenoid valves which control the air supply to the actuating cylinder for the bypass valve associated with each turbine. A new four-way valve has been ordered from the Automatic Switch Company for evaluation as a replacement unit. This assembly provides positive sealing of the port which controls the actuating air; this should eliminate the pressure leakage encountered with the existing Hannifin valves.

Stage Gas Coolers

Nine stage gas coolers were removed from K-33 because of evaporative coolant leakage; two units were replaced during the previous period. As in the past, these leaks were eliminated by plugging the two outside tubes in the innermost coils.

ALTERATIONS

Plant Radiation Detection

The Howard P. Foley Company was awarded lump-sum subcontract No. 5278 for $298,700 to install a plant-wide, dose-sensitive, low-level radiation detection system to complement the existing rate-sensitive argon gammagraphs. The combined installation will immediately define the location of a nuclear excursion, provide audible and visual signals to personnel in the vicinity to evacuate and avoid the area, and facilitate the evaluation of biological effects. A total of 106 clusters will be installed, each involving three radiation detection instruments. In the event of a nuclear incident, a response from any two of the three instruments will actuate a local evacuation signal horn and flashing lights on the outside of the affected buildings to warn against re-entry. Concurrently, appropriate alarms and indications will be energized at the graphic panels in the Plant Emergency Director's office and in the alternate Director location in the K-33 area control room.

K-312 Top Purge

The centralized trapping facilities in building K-312-1 for removal of uranium hexafluoride from the top purge gas are operating satisfactorily. The flow from the purge cascade is routed through four of the eight sodium fluoride traps, which operate in a controlled ambient temperature of 200°F.

INSTRUMENTAL AND CHEMICAL ANALYSIS

This section describes development work to improve both instruments and analytical methods controlling the gaseous diffusion process.

INSTRUMENTAL METHODS

Instrumentation for the Measurement of Uranium Deposits

A neutron-sensitive instrument has been developed for the measurement of the size of deposits of uranium material in process equipment. This instrument measures the neutron radiation which results in these deposits from the reaction between the uranium alpha particle and the fluorine atom. Therefore, it is primarily of value only in plants where uranium-fluorine compounds are present.

The instrument consists of a paraffin moderated boron trifluoride detector weighing 22 pounds and battery operated transistorized electronic circuitry weighing 14 pounds. A neutron flux of 5×10^{-3} n/sq.cm./sec. will result in a significant reading; this sensitivity level is several orders of magnitude below that normally of interest in health physics instrumentation.

The minimum size deposit that can be accurately measured is approximately inversely proportional to the amount of enrichment. Deposits of normal uranium of about 5-10 pounds are measurable. With lumped deposits, the accuracy of measurement is within 25% and with diffuse or distributed deposits 50%. The special techniques required in the operation of the instrument and in the interpretation of data have been developed for most of the plant equipment geometries.

Spectrophotometric Fluorine Analyzer for Stabilization Operations

An automatic continuous fluorine analyzer* is applied routinely as a control guide in the conditioning and stabilization treatment of converters containing K-1420 furnace stand. The analyzer is based on the displacement of chlorine by fluorine in a hot sodium chloride bed, followed by spectrophotometric measurement of the chlorine at 360 mμ in an optical cell.

The normal range is 0.05 to 15% fluorine. Agreement with chemical analyses of bulb samples is within 0.04% in the range 0.1 to 0.5%, and 0.2% in the range 2 to 8% fluorine. The instrument operates essentially unattended for long periods and has significantly reduced analytical costs previously associated with stabilization. Construction costs for the analyzer are less than $2500. Maintenance and servicing labor is about 1 man hour per converter conditioned.

Errors in Sampling Cascade Gases

Significant sampling errors have been demonstrated to occur when gas samples are transferred from the cascade to sampling containers. The resulting analytical errors are of two kinds: negative bias compared with direct cascade analysis, and systematic variations in analysis of the sub-samples removed from the sampling containers.

The study was made by comparing the direct analysis of gas in K-305-9, cell 2, with analysis of samples withdrawn in "dead-end" and in "flow-through" types of containers. The nickel sample containers were well conditioned. The "dead-end" containers were flushed twice with gas prior to taking the samples. The "flow-through" type was exposed to the cascade stream for 16 hours prior to sample removal.

The tabulated determinations of uranium hexafluoride and coolants, obtained with the Corrosive Gas Chromatograph,* reveal significant differences between direct cascade

---

*K-1503, loc. cit.

TABLE F-9

Comparison of Cascade Sampling Techniques

	Absolute Molar %			
	UF_6	F-114	C-816	C-437
Comparison of Direct and "Dead-end" Container Sampling				
Direct from Cascade*	3.7	22	4.3	0.46
First Sub-sample from Container	3.0	18.0	3.4	0.36
Average of Container Sub-samples**	1.8 ± 1.3	21 ± 2.8	3.4 ± 0.2	0.37 ± 0.03
Comparison of Direct and "Flow-through" Container Sampling				
Direct from Cascade*	2.0	25	3.8	0.82
First Sub-sample from Container	1.5	22.0	3.5	0.76
Average of Container Sub-samples**	1.9 ± 0.2	22.6 ± 1.1	3.2 ± 0.2	0.72 ± 0.05

*Single samples.

**Average of 3 sub-samples each from 2 containers, with average deviation.

samples and samples simultaneously withdrawn in containers. The negative biases observed in the first sub-samples from a container are greater for all constituents when using "dead-end" containers. The precisions of replicate sub-sample analyses are better for uranium hexafluoride and Freon-114 when using "flow-through" containers, evidently a result of better equilibrium with the can and any deposits in them. The effects are less pronounced for Coolant-816 and Coolant-437. Although the use of "flow-through" containers is better than "dead-end" sampling, it is apparent that direct cascade analysis would be preferred.

MASS SPECTROMETRY

Boron Isotope Analysis

Procedures for measuring the relative isotopic enrichments of pairs of boron samples have been developed. The highly abundant BF_2^+ ions from boron trifluoride samples are measured in a uranium-type section spectrometer equipped with a dual-collector system modified to accept ion masses 48 and 49 simultaneously, a ratio-recorder measuring circuit, and automatic sample inlet and leak controls. Two boron trifluoride materials whose isotopic enrichments are to be compared are admitted alternately to the spectrometer and their mass 48/mass 49 ratios measured. Standards containing approximately 20 and 25% boron-10 have

*K-1502 and K-1501, loc. cit.

been prepared, so their ratio may be measured periodically and used in correcting other observed ratios for memory.

Surface Ionization Spectrometry

The vacuum system, source assembly, and operating techniques for the surface ionization spectrometer have been improved. The highly porous boron nitride source insulators were replaced with conventional glass and ceramic, and a liquid nitrogen cold "finger" was installed in the source region to reduce background effects while the filaments are heated. A system for injecting organic vapors into the filament region* has been installed in order to increase the U^+/UO_2^+ ion ratio.

*This procedure is similar to that used by A. E. Cameron, ORNL, and by ANL. (Studier, M. H., Sloth, E. N., and Moore, L. P., "The Chemistry of Uranium in Surface Ionization Sources," ASTM Committee E-14 on Mass Spectrometry, Ninth Annual Meeting, Chicago, June 8, 1961.)

Cascade Tails

A further economy has been effected in the analytical services of the cascade tails stream. This flow is shipped at a fixed purity which is monitored by control samples. There have been 5 samples per week analyzed by freeze-point depression. The samples have been analyzed singly in order to avoid disturbing the purity through a gas phase subsampling for uranium-235 analysis. A liquid subsampling technique was developed by the Works Laboratory to eliminate the need for immediate purity analysis. By reducing the number of control samples from 5 to 3 per week, one analytical procedure per week can be followed to provide the three control results simultaneously. The freeze-point depression analysis is determined from the cooling curve of liquid UF_6. In direct labor, this change should result in a savings of $1,866 per year. With a plant expense rate at 125%, this amounts to $4,200 per year.

UNH Samples

UNH solution being returned from Y-12 will have one sample per 21 containers rather than the 14 formerly represented. In addition, the Laboratory will run these in groups of from 8 to 16 or approximately once or twice per month. The purpose is to reduce the number of analyst manhours per sample by approximately one-half.

MATERIAL RELEASES

During the first quarter of fiscal year 1962, material release reports 341 through 350 were issued. These reports covered the release of 184,196 grams uranium and 1,475 grams uranium-235 as uranium hexafluoride to the atmosphere. Table G-1 presents a breakdown of the releases.

TABLE G-1

Material Releases

Report No.	Date of Release	Location	Balance Area	Equipment Involved	Material Class	Grams Uranium	Grams U-235
341	June, 1961	K-1131	550	Vent Stack	B, D	89,967	613
342	June, 1961	K-1420	410	Vent Stack	E	738	27
343	June 3, 1961	K-33	115	PPF Feed Vaporizer	E	1,840	29
344	May 10, 1961	K-1004-A	810	Harshaw Sample Bomb	C	1,152	8
345	July, 1961	K-1420	410	Vent Stack	E	907	35
346	July, 1961	K-1131	550	Vent Stack	B, D	23,308	190
347	August, 1961	K-1420	410	Vent Stack	E	582	18
348	August, 1961	K-1131	550	Vent Stack	B, D	41,324	330
349	September, 1961	K-1420	410	Vent Stack	E	31	1
350	September, 1961	K-1131	550	Vent Stack	E	24,347	224
					Total Released	184,196	1,475

DECONTAMINATION, RECOVERY, AND CONVERSION - K-1420 OPERATIONS

Decontamination

During the first quarter of fiscal year 1962, there were no converters decontaminated in the K-1420 building.

Recovery

A quantity amounting to 61,399 liters of solution was processed through the K-1420 recovery system during the first quarter of fiscal year 1962, with a removal of 1,902 pounds of impure oxide (U_3O_8) from the drum driers and calciners.

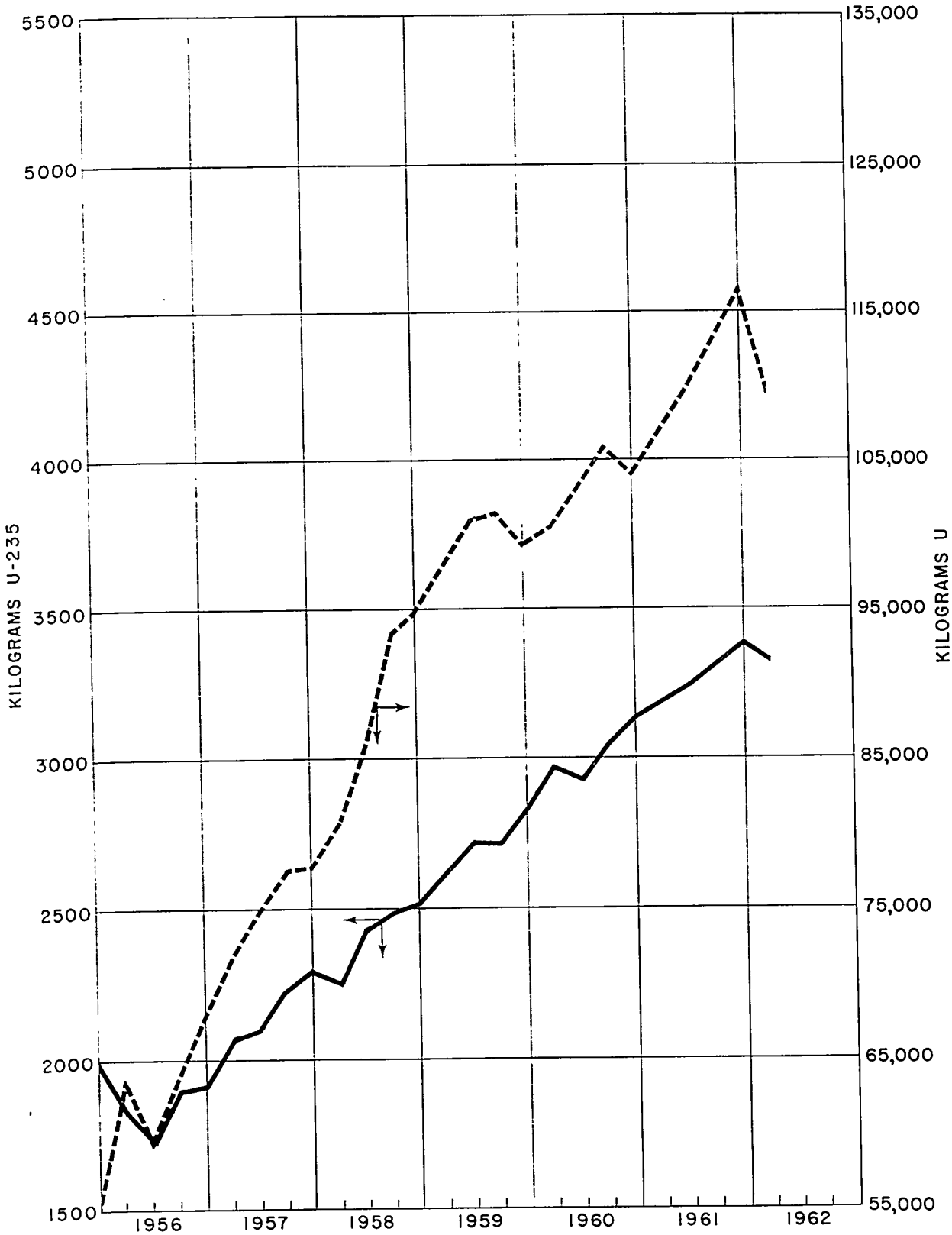


FIGURE G-1

Plant Uranium and U-235 Deficiencies

Cumulative from September 1944

Conversion

The K-1420 conversion facility operated for a total of 684.86 hours during this report period. While operating during this period, 10,793 pounds of uranium as uranium hexafluoride was produced with a product value of approximately $1,467,687.

ACCOUNTING EVALUATION STUDIES

CUMULATIVE PLANT ACCOUNTING EFFICIENCY

Estimated quantities of material representing the hidden inventory are shown in table G-2 by categories. The plant accounting efficiency is 99.87% for uranium and 99.76% for uranium-235. This has been determined by dividing the sum of the hidden inventory, the plant quarterly ending inventory, and the shipments by the total plant receipts, and multiplying by 100. Cumulative plant uranium and uranium-235 book-physical inventory differences are shown in figure G-1.

TABLE G-2

Accounting Memorandum

Location of Deposit or Source of B.P.I.D.	Kilograms Uranium	Kilograms Uranium-235
Cascade:		
Inactive Consumption	5,091.1	950.9
Active Chemisorption	665.7	73.8
Physical Adsorption	1,420.9	117.6
Inventory Understatement	1,104.3	362.8
K-311 and K-312 Sections	16.5	5.8
Inactive Converters	29.0	2.4
K-1405 Holding Pond	273.5	5.7
Uncredited Materials Sent to Hot Salvage on Contaminated Drums	225.0	1.5
Poplar Creek Bed Contamination	6,594.0	53.1
Ground Near Feed Plant	191.0	1.3
Losses by Vent to Atmosphere	6,778.0	47.7
ORGDP-Paducah Interplant Cylinders "Heels" Dilution Before July, 1955	-	179.2
Total	22,389.0	1,801.8

BOOK-PHYSICAL INVENTORY DIFFERENCE BALANCE AREA LIMITS OF ERROR

The deficiency experience for four balance areas together with the calculated limits of measurement uncertainty are presented in control chart form in figure G-2 for uranium and figure G-3 for uranium-235. A discussion of the book-physical inventory differences relative to these calculated limits of measurement uncertainty is included. It should be noted that the limits of error are reported for June, July, and August.

Cascade Balance Area

The reported book-physical inventory differences for this balance area for June, July, and August are, respectively, -369.9 kilograms, -684.1 kilograms, -138.9 kilograms uranium; and 1.3 kilograms, 0.1 kilogram, and 30.0 kilograms uranium-235.

Significant cascade operating conditions experienced during the quarter affecting the material balance of this area were special withdrawal activity amounting to 1,819 kilograms uranium-235 and a net uranium-235 inventory decrease of 519 kilograms. When assessed with respect to the noted operating conditions, the reported book-physical inventory differences are considered satisfactory.

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number ~~K-1503~~ K/EM-316 Date of document 10/3/61

Title and author (if document is unnumbered)

(This section to be completed by Document Center)

Date request received 10/20/95

Date submitted to ADC 12/19/95

Date submitted to HSA Coordinator 10/20/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 12/19/95 1/22/96

Date received from CICO 1/5/96 2/26/96

Date submitted to ChemRisk/Shonka and DOE 2/26/96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

K/EM-316

SANITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT FOURTH FISCAL QUARTER APRIL 1 THRU JUNE 30, 1961

(EXTRACTED FROM SRD DOCUMENT # K-1503)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

December 18, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release to the public by:

2/23/96
Technical Information Officer Date
Oak Ridge K-25 Site

[redacted]

K-1503

OAK RIDGE GASEOUS DIFFUSION PLANT

QUARTERLY REPORT

FOURTH QUARTER FISCAL [illegible]

April 1, 1961 thru June [illegible]

UNION CARBIDE NUCLEAR COMPANY

DIVISION OF UNION CARBIDE CORPORATION

[illegible]

[illegible] Government Contract W7405 eng 2

UNION CARBID

RESTRICTED DATA [illegible] contains restricted [illegible] of 1954 [illegible] transmitted [illegible] the disclosure of its contents in any manner to an unauthorized person is prohibited.

CENTRAL LIBRARY

[redacted]

[redacted]

This document consists of 108 pages

No. 45 of 81 copies, Series A.

DATE OF ISSUE: October 3, 1961

REPORT NO. K-1503

K 1503 45 A

K 1503 45 A

OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT

FOURTH QUARTER FISCAL YEAR 1961

April 1, 1961 thru June 30, 1961

UNION CARBIDE NUCLEAR COMPANY

DIVISION OF UNION CARBIDE CORPORATION

Operating

- OAK RIDGE GASEOUS DIFFUSION PLANT
- OAK RIDGE Y-12 PLANT
- OAK RIDGE NATIONAL LABORATORY
- PADUCAH GASEOUS DIFFUSION PLANT

for the Atomic Energy Commission

Under U. S. Government Contract W7405 eng 2

UNION CARBI

RESTRI[redacted]D DA[redacted] This doc[redacted] contains restrict[redacted]a as d[redacted] in the At[redacted] Energy Act of 1[redacted] Its tran[redacted] or the dis[redacted] of its contents [redacted]y manne[redacted]n unauthori[redacted]erson is prohibited.

3

[redacted]

PURGE CASCADE OPERATIONS

Unit K-312-1 was operated as the cascade top purge facility, and unit K-311-1 was operated as the cascade side purge during the fourth quarter of fiscal year 1961. The purge facility in unit K-311-1 purged an average of 16,414 scf per day; the rate in unit K-312-1 averaged 6,963 scf per day. The total purge rate during the quarter averaged 23,385 scf per day, 16.4 per cent above that of the previous quarter. The average daily purge rates are presented in table C-13 for the third and fourth quarters of fiscal year 1961.

TABLE C-13

Cascade Purge Rates

Third Quarter, FY 1961				Fourth Quarter, FY 1961			
	Average Purge Rates, Scf/Day				Average Purge Rates, Scf/Day		
	Purge Facilities				Purge Facilities		
Month	Top	Side	Combined	Month	Top	Side	Combined
January	6,289	13,176	19,465	April	6,860	16,073	22,933
February	6,302	13,127	19,429	May	7,029	17,008	24,037
March	6,310	13,439	19,749	June	7,000	16,162	23,162

ELECTRICAL POWER

The electrical power production totaled 343,233 mwh at the ORGDP generating station during the fourth quarter of fiscal year 1961. This total output represents an average generation rate of 157.2 mw. The generating station operated 2,031 hours of the report period at a generation schedule of approximately 160 mw and operated 153 hours of the period with the generation level reduced to approximately 80 mw. The ORGDP power production cost during the report period averaged $4.7713 per mwh as compared with the average cost of $3.0625 per mwh during the third fiscal quarter. The lower electrical output during the quarter was the major cause of the increased unit cost, although fuel and maintenance costs were contributing factors.

The electrical power acquired from all sources for the Oak Ridge area totaled 4,105,195 mwh, including ORGDP generation. This total represents an average area load of 1,879.7 mw. Electrical energy purchased from the TVA system during the fourth fiscal quarter totaled 3,761,962 mwh at an average cost of $3.8855 per mwh.

The average costs of power distributed through the 1601 account and the 1612 account were $4.0666 and $4.1121 per mwh, respectively. These costs represent increases of 2.6 per cent above the corresponding costs during the preceding quarter. These higher total costs were the result of higher production costs, higher operating costs, and greater power loss than during the previous period, which offset the lower cost of power purchased from TVA.

The average power consumption at the ORGDP was 2.4 per cent below that of the previous quarter. All of the ORGDP building process loads decreased below the corresponding loads of the third fiscal quarter as follows: K-25, 5.23 per cent; K-27, 0.07 per cent; K-29, 0.34 per cent; K-31, 1.98 per cent; and K-33, 2.98 per cent.

The ORGDP power station operations, electrical operations, and natural gas distribution are summarized in table C-14 for the third and fourth quarters of fiscal year 1961. Table C-16 presents the electrical power supply and distribution data for the Oak Ridge area, along with the associated costs; a detailed usage and cost analysis for the ORGDP power operations is presented in table C-17.

NUCLEAR MATERIAL CONTROL

INTRODUCTION

The nuclear material control program at the Oak Ridge Gaseous Diffusion Plant is concerned with maintaining accurate measurements of uranium inventories and flows. Efforts toward improving material measurements are made on a continuing basis. The status of various activities concerned with the Civilian Application Program are summarized.

GENERAL STUDIES ON MATERIAL CONTROL

K-631 MASS SPECTROMETER

The ORGDP waste withdrawal facility tests performed previously to evaluate the feasibility of using the K-631 mass spectrometer for cascade tails material shipping assays in lieu of analyses of cylinder samples, have indicated that the machine could economically be used for this purpose. Soon after being put into service, the machine developed a bias greater than the mean difference and limit of error found (0.00022 ± 0.00026 weight per cent uranium-235) between cylinders analyzed during the test. This necessitated a return to cylinder sampling. Thus far, the bias has not been completely eliminated.

IBM 7090 APPLICATIONS

Programs have been written and are in use for computing the K-29, K-31, K-304, and K-305, K-310, K-309, K-303, K-302, and K-301 uranium inventories on the IBM 7090 computer. These programs are being written to produce punched card output as well as printed output to facilitate re-entry to the computer for application to the gradient and inventory change sheet calculation. Computer time for each program costs approximately $1.75.

A Fortran program has been written and checked out for the evaluation of polynomials with ten independent variables. Specifically, this program is used to check the goodness of fit for fitted gamma equations. Output from the program provides point differences for the fitted equations, per cent differences, the total difference, and the average difference.

CASCADE HIDDEN INVENTORY CALCULATIONS

It has been the practice in the past to calculate the cascade uranium consumption inventory quarterly on IBM equipment recognizing changes in equipment, conditioning techniques, and use of cascade conditioning gas. With anticipated operating conditions, this effort is not believed to be warranted. Therefore, a simplified method of allowing a fixed quarterly growth rate in the inactive consumption has been initiated for the fiscal year 1962. This is based upon the same rates which have been used in the past, but will not consider in detail the cascade conditioning gas usage. In essence, there will be a constant rate growth in uranium at the prevailing assay except for those equipment changes which are made.

CASCADE INVENTORY LINE RECORDER DATA

The recording of all line recorder data for the separating cascade inventory has been transferred to the Central Control Room. This procedure provides for a more efficient means of recording data for entry to the computing facility and greatly reduces the number of data forms required to obtain these data.

MATERIAL RELEASES

During the fourth quarter of fiscal year 1961, material release reports 333 through 344 were issued. These reports covered the release of 348,085 grams uranium and 2,526 grams uranium-235 as uranium hexafluoride to the atmosphere. Table G-1 presents a breakdown of the releases.

TABLE G-1

Material Releases

Report No.	Date of Release	Location	Balance Area	Equipment Involved	Material Class	Grams Uranium	Grams Uranium-235
333	April, 1961	K-1420	410	Vent Stack	E	2,171	33
334	April, 1961	K-1131	550	Vent Stack	B, C, D	64,842	491
335	April, 1961	K-1004-J	560	Glass Traps	C	200	3
336	May 13, 1961	K-1131	550	UF_6 Cold Trap	B	92,015	598
337	May 19, 1961	K-1131	550	UF_6 Piping	B	6,134	40
338	May, 1961	K-1131	550	Vent Stack	B, D	87,280	658
339	May, 1961	K-1420	410	Vent Stack	E	1,396	21
340	May 23, 1961	K-1004-J	560	Glass Trap	E	350	5
341	June, 1961	K-1131	550	Vent Stack	B, D	89,967	613
342	June, 1961	K-1420	410	Vent Stack	E	738	27
343	June 3, 1961	K-33	115	PPF Feed Vaporizer	E	1,840	29
344	May 10, 1961	K-1004-A	810	Harshaw Sample Bomb	C	1,152	8
					Total Released	348,085	2,526

DECONTAMINATION, RECOVERY, AND CONVERSION

Decontamination

On March 24, 1961, the converter decontamination facility of the K-1420 building was placed on a standby status and remained inactive for the fourth quarter of fiscal year 1961.

Recovery

A quantity amounting to 38,784 liters of solution was processed through the K-1420 recovery system during this report period, with a removal of 1,131 pounds of uranium as impure oxide (U_3O_8) from the drum driers and calciners.

Conversion

The K-1420 conversion facility operated for a total of 1,079.76 hours during this report period. While operating during this period, 23,533 pounds of uranium as uranium hexafluoride was produced with a product value of approximately $1,467,771.

ACCOUNTING EVALUATION STUDIES

CUMULATIVE PLANT ACCOUNTING EFFICIENCY

Estimated quantities of material representing the hidden inventory are shown in table G-2 by categories. The plant accounting efficiency is 99.86% for uranium and 99.75% for uranium-235. This has been determined by dividing the sum of the hidden inventory, the plant quarterly ending inventory, and the shipments by the total plant receipts, and multiplying by 100. Cumulative plant uranium and uranium-235 book-physical inventory differences are shown in figure G-1.

BOOK-PHYSICAL INVENTORY DIFFERENCE BALANCE AREA LIMITS OF ERROR

The deficiency experience for four balance areas together with the calculated limits of measurement uncertainty are presented in control chart form in figure G-2. A discussion of the book-physical inventory differences relative to these calculated limits of measurement uncertainty is included. It should be noted that the limits of error are reported for March, April, and May. This adjustment reflects a transition in reporting book-physical inventory difference limits of error one month out of phase with the current quarter.

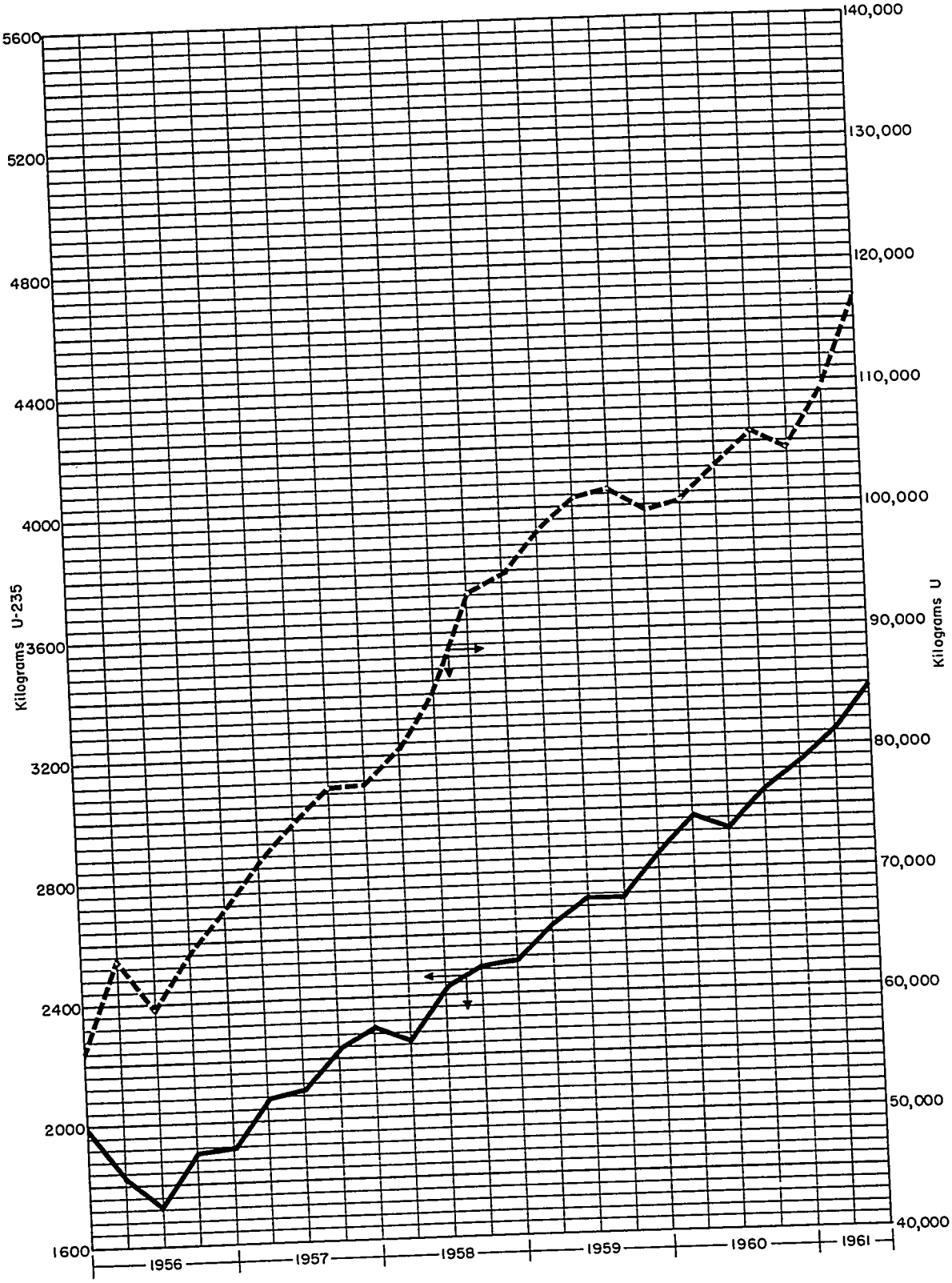


FIGURE G-1

Plant Uranium and U-235 Deficiencies - Cumulative from September 1944

TABLE G-2

Accounting Memorandum

Location of Deposit or Source of B.P.I.D.	Kilograms Uranium	Kilograms Uranium-235
Cascade:		
Inactive Consumption	5,143.7	955.8
Active Chemisorption	665.7	76.2
Physical Adsorption	1,420.9	117.6
Inventory Understatement	1,096.0	386.7
K-311 and K-312 Sections	16.5	5.8
Inactive Converters	31.9	2.3
K-1405 Holding Pond	273.5	5.7
Uncredited Materials Sent to Hot Salvage on Contaminated Drums	225.0	1.5
Poplar Creek Bed Contamination	6,594.0	53.1
Ground Near Feed Plant	191.0	1.3
Losses by Vent to Atmosphere	6,778.0	47.7
ORGDP-Paducah Interplant Cylinders "Heels" Dilution Before July, 1955	-	179.2
Total	22,436.2	1,832.9

Cascade Balance Area

The reported book-physical inventory differences for this balance area for March, April, and May are, respectively, 558.6 kilograms, 678.6 kilograms, 626.4 kilograms uranium; and -9.6 kilograms, 57.1 kilograms, and 13.4 kilograms uranium-235.

Significant cascade operating conditions experienced during the quarter affecting the material balance of this area were special withdrawal activity amounting to 1,714 kilograms uranium-235 and a net uranium-235 inventory increase of 305 kilograms.

When assessed with respect to the noted operating conditions, the reported book-physical inventory differences are considered satisfactory.

Feed Manufacture Balance Area

The reported book-physical inventory differences for this area for March, April, and May are, respectively, 2,038.3 kilograms, -1,103.5 kilograms, and -1,107.2 kilograms uranium; and 18.9 kilograms, 0.5 kilogram, and 9.7 kilograms uranium-235. The monthly book-physical inventory differences exceeded the limits of measurement uncertainty, with the month of March exceeding the upper limits and April and May exceeding the lower limits. When the total quarterly balance area experience is combined, it reflects a compensating condition which does not exceed the combined limits of measurement uncertainty for the quarter. Accounting experience for this balance area for the quarter is considered satisfactory.

Recovery Balance Area

The reported quarterly book-physical inventory differences for this area are 23.1 kilograms, 3.6 kilograms, and 163.5 kilograms uranium; 0.3 kilogram, 0.1 kilogram, and 2.0 kilograms uranium-235.

The apparent loss of material in this balance area during the quarter is basically the result of an inventory omission for the May ending inventory. The material balance experience for this period, including the month of June, is compensating and, therefore, the balances are not assessed as significant with respect to the calculated limits of measurement uncertainty.

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number K-1502 Date of document 7/24/61

Title and author (if document is unnumbered)

Copy the marked pages

(This section to be completed by Document Center)

Date request received 10/12/95

Date submitted to ADC 11/30/95

Date submitted to HSA Coordinator 10/12/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 11/30/95 1/10/96

Date received from CICO 1/5/96 2/22/96

Date submitted to ChemRisk/Shonka and DOE 2-22-96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

UNCLASSIFIED

K/EM-272

SANITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT THIRD QUARTER FISCAL YEAR 1961

(EXTRACTED FROM SRD DOCUMENT # K-1502)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

November 30, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release to the public by:

Asst John Thrasher 4/21/96
Technical Information Officer Date
Oak Ridge K-25 Site

[redacted]

UNCLASSIFIED

This docum[redacted]nsists of 114 pages

No. [redacted] of 8[redacted]copies, [redacted]es A.

DATE OF ISSUE: July 24, 1961

REPORT NO. K-1502

M-08138

OAK RIDGE GASEOUS DIFFUSION PLANT
QUARTERLY REPORT

THIRD QUARTER FISCAL YEAR 1961

January 1, 1961 thru March 31, 1961

K 1502 24 A

K 1502 24 A

UNION CARBIDE NUCLEAR COMPANY
DIVISION OF UNION CARBIDE CORPORATION

Operating

- OAK RIDGE GASEOUS DIFFUSION PLANT
- OAK RIDGE Y-12 PLANT
- OAK RIDGE NATIONAL LABORATORY
- PADUCAH GASEOUS DIFFUSION PLANT

for the Atomic Energy Commission

Under U. S. Government Contract W7405 eng 26

UNION CARBIDE

RESTRICTED DATA This document contains restricted data as defined in the Atomic Energy Act of 1954. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.

[redacted]

PURGE CASCADE OPERATIONS

Unit K-312-1 was operated as the cascade top purge facility, and unit K-311-1 was operated as the cascade side purge during the third quarter of fiscal year 1961. The purge facility in unit K-311-1 purged an average of 16,251 scf per day; the rate in unit K-312-1 averaged 6,275 scf per day. The total purge rate during the quarter averaged 22,525 scf per day, 7.3% below that of the previous quarter. The average daily purge rates are presented in table C-13 for the second and third quarters of fiscal year 1961.

TABLE C-13

Cascade Purge Rates

Second Quarter, FY 1961				Third Quarter, FY 1961			
	Average Rates, Scf/Day				Average Rates, Scf/Day		
	Purge Facilities				Purge Facilities		
Month	Top	Side	Combined	Month	Top	Side	Combined
October	6,175	15,234	21,409	January	6,289	13,176	19,465
November	6,927	15,791	22,718	February	6,302	13,127	19,429
December	6,701	14,988	21,689	March	6,310	13,439	19,749

ELECTRICAL POWER

The electrical power production at the ORGDP generating station totaled 426,472 mwh during the third quarter of fiscal year 1961. This total output represents an average generation rate of 197.4 mw. The generation schedule was 230 mw from January 1, 1961, until February 20, 1961; on this date the schedule was reduced to 160 mw for the remainder of the report period. The ORGDP power production cost averaged $3.6025 per mwh during the third fiscal quarter, as compared to $3.9023 per mwh during the preceding report period. The reduced production cost during this quarter is attributed to the extensive use of coal with a correspondingly lower fuel cost.

Electric power acquired from all sources for the Oak Ridge area totaled 4,153,326 mwh, including ORGDP generation. This total represents an average load of 1,922.8 mw. Energy purchased from the TVA system during the third fiscal quarter totaled 3,726,855 mwh at an average cost of $3.9003 per mwh.

The average costs of power distributed through the 1601 account and the 1612 account were $3.9639 and $4.0093 per mwh, respectively. These costs represent a decrease of 0.6% and 0.5%, respectively, below the corresponding costs during the preceding quarter. The increased cost of power purchased from TVA was offset by the lower generating cost and the lower 1601 operating cost.

The ORGDP average power consumption was 1.8% above that of the previous quarter. This greater usage is due largely to the reduction of the Y-12 usage and the transfer of the subsequently available power to the ORGDP cascade. The K-33 and K-31 buildings process average usages increased 3.25% and 0.65%, respectively; the K-25, K-27, and K-29 buildings process average usages decreased 0.91%, 0.10%, and 0.63%, respectively, below those of the preceding report period.

A summary of the ORGDP power station operations, electrical operations, and natural gas distribution is outlined in table C-16 for the second and third quarters of fiscal year 1961. Table C-17 presents the electrical power supply and distribution data for the Oak Ridge area, along with the associated costs; table C-18 presents a detailed usage and cost analysis for the ORGDP power operations.

HEALTH PHYSICS

Personnel Radiation Monitoring

No personnel exposures in excess of the Plant Acceptable Limit were recorded, and the average film badge exposure per person monitored decreased from 38 mrem last period to 25 mrem. The decrease is attributed to less frequent change-out of ash receivers and filters in the K-1131 Feed Plant.

Air-Borne Alpha Activity

A decrease in the average level of air-borne alpha activity was shown by routine shift-length monitoring; however, spot samples taken during surveys of feed-manufacturing and chemical recovery operations showed increased activity. The average activity level shown by shift-length monitoring was less than 50% of the Maximum Permissible Concentration in air and that shown by spot air samples was about 75% of the permissible value. In areas where the potential of relatively high activity is recognized, including feed and recovery operations, the use of respiratory protective equipment is mandatory.

Alpha Contamination

The plant alpha contamination level increased slightly over that of the previous period, but continues to remain low and to reflect no health problems. The alpha contamination level is determined through audit surveys by both operating and staff groups in the 32 plant locations where contamination of significance is encountered.

Penetrating Radiation Levels

The plant radiation index of 6.0 represents a decrease of about 25% from last period, thus continuing the downward trend. The continued decrease is attributed primarily to the current conversion efficiency in the processing of feed materials resulting in less frequent change-out of ash receivers and filters.

EMERGENCY PLANNING ACTIVITIES

Special considerations given to emergency planning included the training of 369 plant personnel in radiation emergency procedures, and the establishing of fully equipped personnel assembly points; in addition, a plant-wide radiation drill was held emphasizing area evacuation, monitoring procedures, and incident control. Fourteen local drills, simulating potential operational emergencies, were held, and 81 employees were trained in the use of protective devices and equipment related to fire-fighting and rescue work.

Threshold detectors were modified to provide for more efficient dose determination and to prevent the release of radioactive gases in the event of fire, and drawings showing the layout of radiation detection alarm devices were completed.

INDUSTRIAL HYGIENE

Bio-Assay Results

Industrial health examinations and subsequent recalls included 1,144 chemical urinalyses, none of which were considered clinically significant. An investigation and follow-up concerning an unusually high uranium result indicated that the specimen had been contaminated with uranium-containing materials in an undetermined manner. The number of positive alpha activity results increased about 9%; however, this probably reflects the use of an improved separation technique adopted by the Works Laboratory. Of the specimens analyzed, 39 were done as part of routine termination procedure.

Industrial Environment

Analyses of 2,428 air samples for uranium and 26 nonradioactive air-borne contaminants gave 126 significant results. In addition, 55 miscellaneous air analyses were made to

assist in evaluating potential operational problems, such as dust, vapor toxicity, and the like.

Measurements of the noise level in 2 areas in which IBM and other office machinery is used, showed that these areas are not noise-hazard areas; however, correction of the comfort phase of the measured noise spectrums is planned.

Lighting improvements were made in some Maintenance Division and Technical Division areas. After being painted a light color, Maintenance machine shop areas showed lighting improvement ranging from 60% to 100%.

Plant Environment

Analyses of 846 air pollution type samples for uranium and 4 nonradioactive contaminants indicate that concentrations of fluorides and sulfur dioxide were sufficient to mark the more sensitive vegetation. However, none of the levels were equal to or greater than the maximum allowable concentration for industrial exposure of personnel.

INDUSTRIAL RELATIONS

EMPLOYEE AND COMPANY-UNION RELATIONS

Certified union representatives spent 4.4% of their scheduled working time investigating and processing grievances. The grievance which was pending arbitration at the end of last quarter was withdrawn, and 3 additional grievances were appealed to arbitration by the AFL-CIO Union; an arbitrator for hearing these is in the process of being selected.

PERSONNEL STATISTICS

Statistics pertaining to the work force, absenteeism, and labor turnover are given in table E-1.

TABLE E-1

Work Force, Absentee Rate, and Labor Turnover

	This Quarter	Last Quarter	1960[a]	1956-1960[a]
Type of Personnel				
Production Operations	917	1,029	1,051	1,301
Maintenance	1,308	1,335	1,374	1,709
Laboratory Research	473	475	472	483
Staff Services and Others	1,149	1,174	1,173	1,201
Total	3,847	4,013	4,070	4,694
Type of Payroll				
Hourly	1,860	1,982	2,035	2,529
Weekly	945	979	981	1,050
Monthly	1,042	1,052	1,054	1,115
Sex				
Males	3,284	3,446	3,505	4,094
Females	563	567	565	600
Absentee Rate, Per Cent	2.83	2.42	3.19	3.40
Labor Turnover, Per Cent	4.22	0.67	1.73	2.66
Reason for Termination				
Resigned	22	13	38	57
Reductions in Force	128	4	21	53
Discharged	0	0	0	1
Deceased	6	2	2	4
Retired	5	8	6	5
Military Inductions	1	0	0	2
Transfers	19	12	13	14
Disabilities	4	0	3	3
Total	185	39	83	139
Rehires and Reinstatements	6	14	14	26
New Hires	10	11	29	40
Transfers	3	1	6	2
Total	19	26	49	68

[a]Quarterly averages.

NUCLEAR MATERIAL CONTROL

INTRODUCTION

The nuclear material control program at the Oak Ridge Gaseous Diffusion Plant is concerned with maintaining accurate measurements of uranium inventories and flows. Efforts toward improving material measurements are made on a continuing basis. The status of various activities concerned with the Civilian Application Program are summarized.

GENERAL STUDIES ON MATERIAL CONTROL

K-1420 FLUORINATION FACILITY TEST 1, MATERIAL BALANCE

In order to establish the material holdup and operating efficiency for material accountability of the fluorination facility in K-1420, a complete operating test simulating normal operating conditions using urano-uranic oxide (U_3O_8) was completed during the third quarter of fiscal year 1961. The test consisted of four operational runs, two of which had feed rates of approximately 10 and 20 pounds of oxide per hour and two with approximate feed rates of 34 pounds of oxide per hour. A run consisted of continuous operation of the facility until the pressure drop (ΔP) across the cold trap indicated that the trap was full of uranium hexafluoride. A material balance, presented in table G-1, was made around the four operating runs in an attempt to determine an average holdup of material. After the operational part of the test was completed, the conversion facility was cleaned up to determine the over-all operating efficiency for material accountability. The recovery of material in the clean-up of the system, broken down by component parts of the system, is shown in table G-2.

Based upon the data compiled from the test, the following conclusions have been ascertained:

1. The material balance around the entire test operation of the conversion facility resulted in a net gain of 4,507 grams of uranium and 738 grams of uranium-235. The gain of material was obviously due to a residual hold-up of material in the system with a higher assay than the material fed.
2. The results of a material balance around the test operations combined with the results from monitoring the vent stack and surveys made by Health Physics indicate that the facility can be operated without any appreciable loss of material.
3. Since the clean-up of the system resulted in a recovery of slightly over 10 kilograms of uranium, it is concluded that for inventory purposes this quantity of material is representative of the material holdup for oxides having characteristics similar to that processed.
4. Conversion efficiency of each run indicates that the optimum feed rate was established in run No. 1, and that the higher the feed rate (pounds of oxide fed per hour), the lower the conversion efficiency.

CONT

REVISED SCRAP RECOVERY CRITERIA

Discard and recovery curves, figures G-1 and G-2, for solids and solutions, respectively, have been re-evaluated on the basis of the criteria released by the Commission in their memo, "Criteria for Uranium Recovery Operations," dated February 28, 1961. From the March 1, 1961, inventory it has been determined that 594 containers of stored scrap may be discarded. Total contained uranium is 12.8 kilograms, mainly in the normal isotopic range.

SAMPLE COMPOSITING OF PRODUCT MATERIAL 1, URANIUM HEXAFLUORIDE -- SAMPLING

For the purpose of continued checking of the representativeness of sample compositing on chemical purity of product material, a batch of material is periodically checked by taking a

TABLE G-1

Material Balance for the Test Operation

	Uranium Grams	Uranium-235 Grams
Oxide Charged	460,666	5,746
Total Material To Account For	460,666	5,746
UF_6 Recovered	383,659	4,977
Ash	64,687	833
Alumina	4,950	99
Vacuum Cleanings	1,797	50
Vent Stack Loss	27	0
Recovery From Clean-up Activity	10,053	525
Total Material Accounted For	465,173	6,484
Total Deficiency	-4,507	-738

TABLE G-2

Material Recovered in Clean-up Activity by Basic Divisions of the System

	Uranium (Grams)	U-235 (Grams)	Assay (%) Average	Lowest	Highest
I. Feed System					
1. Sintered tube filters H Area	4,846	185	3.818	3.520	5.508
2. Vent Line to Cambridge filter	14	1	6.250	1.726	6.876
Total Feed System	4,860	186			
II. F_2 Tower System					
1. F_2 Tower and Associated Lines	625	20	3.200	1.499	5.390
2. Sintered Tube Filters E Area	84	2	2.381	2.318	2.766
Total Tower System	709	22			
III. UF_6 Trapping System					
1. 10" Cold Trap					
A - F-16A	1,114	14	1.407	1.363	1.484
B - F-16B	433	2	1.436	1.377	1.650
Total 10" Cold Traps	1,547	16			
2. 5" Cold Traps					
A - F-20A	390	52	13.333	11.600	18.960
B - F-20B	698	167	23.926	23.300	24.700
Total 5" Cold Traps	1,088	219			
Total UF_6 Trapping System	2,635	235			
IV. Vent System	223	9	4.036	3.603	7.921
V. Miscellaneous	1,626	73	4.490	1.333	14.780
Total for Clean-up Activity	10,053	525			

sample, in addition to the regular sample for compositing, from each cylinder in a batch. A batch is defined as all cylinders of material produced in a single production-day. The reported analyses of the individual cylinder samples and the batch composite sample are examined by statistical methods to determine if there is any statistically significant difference between the samples from the individual cylinders of a batch and the batch composite sample of product material. The eight batches of product material checked as described above during the period from May, 1960, through February, 1961, have been grouped together to evaluate the effect on measurement variation by compositing individual cylinder samples on a batch basis and obtaining an analysis of the batch sample.

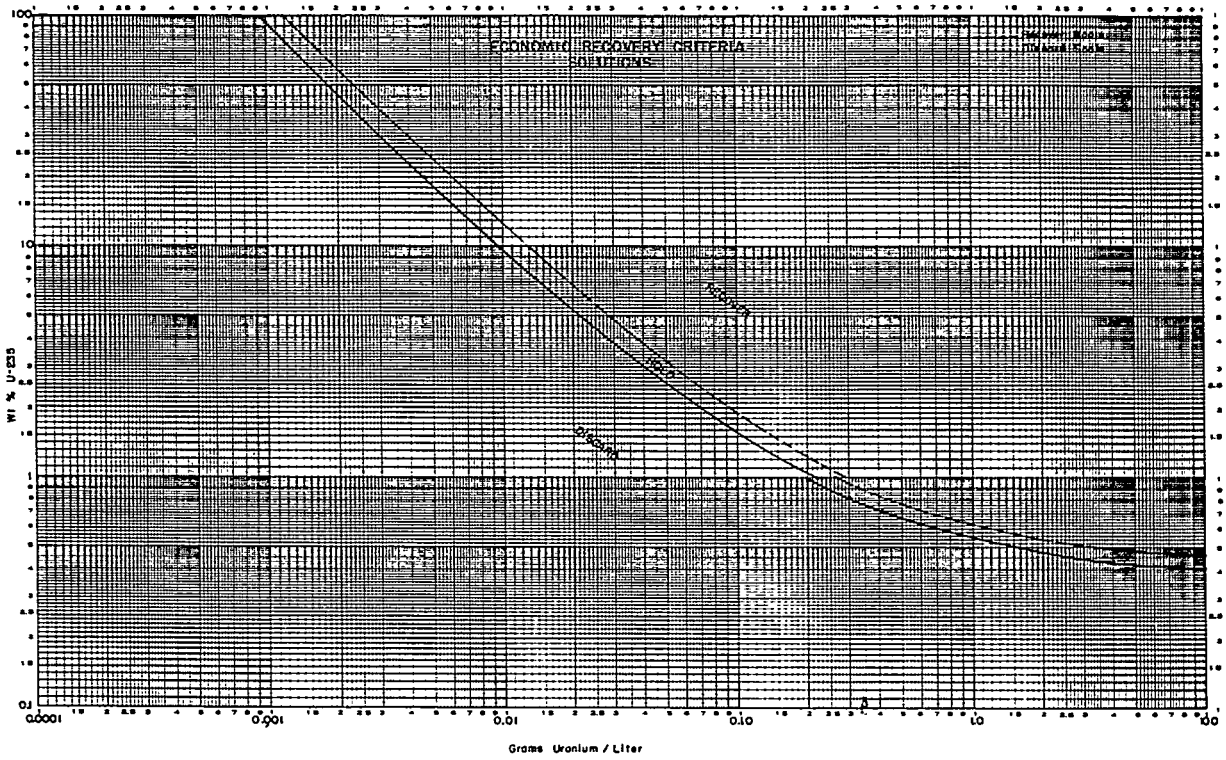


FIGURE G-1

Economic Recovery Criteria - Solutions

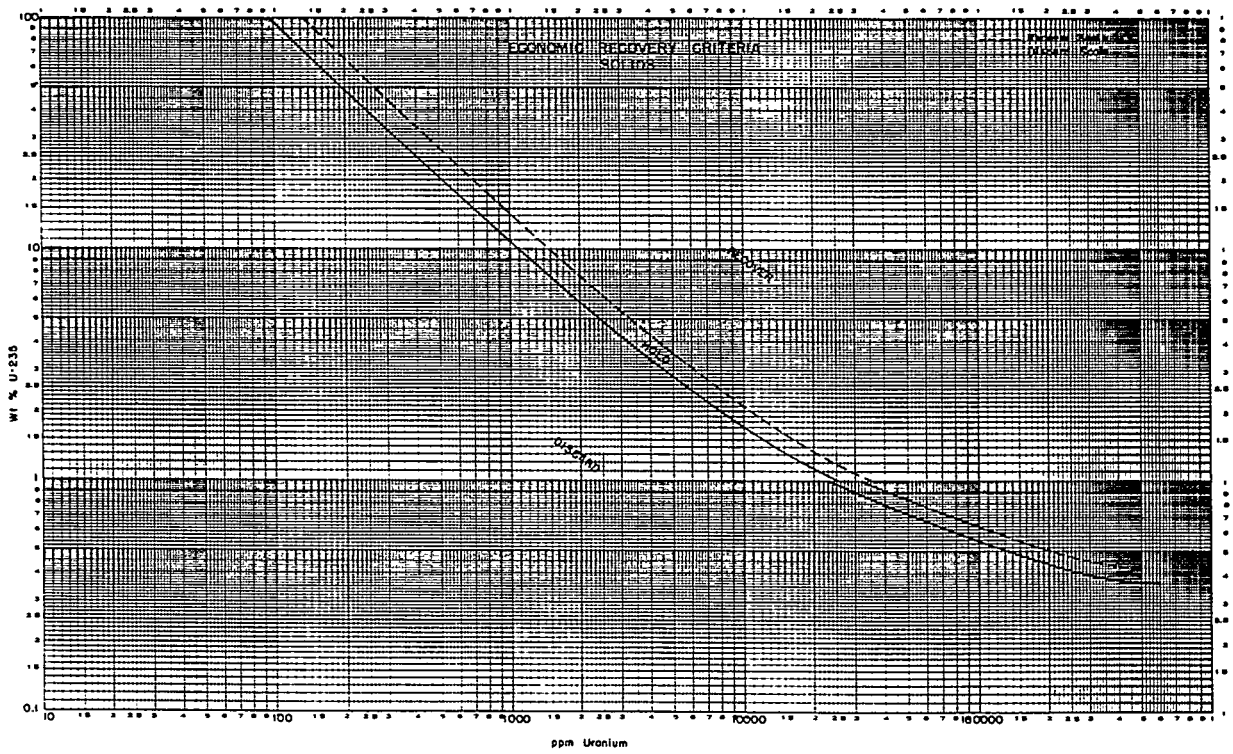


FIGURE G-2

Economic Recovery Criteria - Solids

The study consisted of computing weighted assays of 63 cylinders of tails material and comparing these computed assays with the Works Laboratory analysis of samples withdrawn to represent these cylinders. The weighted assay utilized the K-631 automatic mass spectrometer readings at 40-minute intervals together with the weight increment of uranium hexafluoride drained during the 40-minute period. The mean difference and limit of error was 0.00022 ± 0.00026 weight per cent uranium-235 between cylinders analyzed by the K-631 mass spectrometer and samples representing these cylinders analyzed in the Works Laboratory. Studies are currently in progress to ascertain the type and magnitude of a control program for maintaining assurance of K-631 spectrometer control if this machine were used for official assay measurement.

IBM 7090 APPLICATIONS

Programs have been prepared and checked for computing the K-31 and K-29 uranium inventories. These programs are designed to utilize PI readings from mark sense cards as input to the computer which converts the readings to pressure for the inventory calculation. The programs output are individual stage pressure and temperature data, cell average pressure and temperature data, pressure ratios, pressure ratio squared, the product of pressure ratio and temperature, and cell inventories. The programs can be so controlled that the output consists of data only if an inventory is not desired. Computer time used for these programs is less than two minutes.

Currently, programs are being prepared for the K-305 and K-304 sections of the plant as well as subroutines for calculating the onstream contaminants. Additional 7090 programs prepared and in use are those for computing the cascade value functions and one for evaluating fitted cascade inventory equations with six independent variables for goodness of fit.

OMIT

IBM MARK SENSE CARD DATA SYSTEM

Building K-31 is currently taking one set of data per day on mark sense cards. The error in marking has diminished to less than 0.8%. An average of 6 cards per set of data will stop the mark sense reading machine due to double marks or blank columns. Approximately one hour is required for an operator to record data for an entire unit. The official inventory forms for separating cascade data for the K-31 building as of March 1, 1961, were mark sense cards.

MATERIAL RELEASES 1. URANIUM--RELEASES 2. URANIUM HEXAFLUORIDE-RELEASES

During the third quarter of fiscal year 1961, material release reports 321 through 332 were issued. These reports covered the release of 124,501 grams of uranium and 996 grams of uranium-235 as uranium hexafluoride to the atmosphere. Table G-5 presents a detailed analysis of these releases by material type.

TABLE G-5

Material Releases

Third Quarter FY 1961	No. of Releases	Depleted, Grams		Normal, Grams		Enriched, Grams		Total, Grams	
		Uranium	U-235	Uranium	U-235	Uranium	U-235	Uranium	U-235
January	6	1,597	6	6,802	62	61,505	488	69,904	556
February	2	-	-	16,249	116	4,747	48	20,996	164
March	3	-	-	10,016	71	23,585	205	33,601	276
Total	11	1,597	6	33,067	249	89,837	741	124,501	996

OMIT

CASCADE CONDITIONING GAS TREATMENTS

During the third quarter of fiscal year 1961, a total of 1,078.9 pounds of conditioning gas was charged to the in-place equipment and evacuated to the cascade. Table G-6 presents an analysis of these treatments by month for this operating period.

TABLE G-6

Conditioning Gas

Third Quarter FY 1961	Pounds CCG Charged
January	414.4
February	293.0
March	371.5
Total	1,078.9

OMIT DECONTAMINATION, RECOVERY, AND CONVERSION

Decontamination

During the third quarter of fiscal year 1961, converter decontamination in the K-1420 building was as follows:

Converter Type	Number of Converters	Recovery, Grams	
		Uranium	Uranium-235
2	12	1,371	219.27
2 Heads	3	1,632	58.41
3	3	606	11.85
0	10	6,419	407.99
0 Spools	6 Batches	23,653	2,205.08
000	7	29,615	286.09
Totals	22	63,296	3,188.69

Recovery

A quantity amounting to 141,477 liters of solution was processed through the K-1420 recovery system during the third quarter of fiscal year 1961, with a removal of 1,814 pounds of uranium as impure oxide (U_3O_8) from the drum driers and calciners.

Conversion

The K-1420 fluorination facility operated for a total of 347.77 hours during the third quarter of fiscal year 1961. During this operating period, 8,662 pounds of uranium, as uranium hexafluoride, was produced with a product value of approximately $394,300.

ACCOUNTING EVALUATION STUDIES

1. MATERIAL BALANCE

CUMULATIVE PLANT ACCOUNTING EFFICIENCY

Estimated quantities of material representing the hidden inventory are shown in table G-7 by categories. The plant accounting efficiency is 99.87% for uranium and 99.76% for uranium-235. This has been determined by dividing the sum of the hidden inventory, the plant quarterly ending inventory, and the shipments by the total plant receipts, and multiplying by 100. Cumulative plant uranium and uranium-235 book-physical inventory differences are shown in figure G-3.

Book-Physical Inventory Difference Balance Area Limits of Error

The deficiency experience for four balance areas together with the calculated limits of measurement uncertainty are presented in control chart form in figure G-4. A discussion of

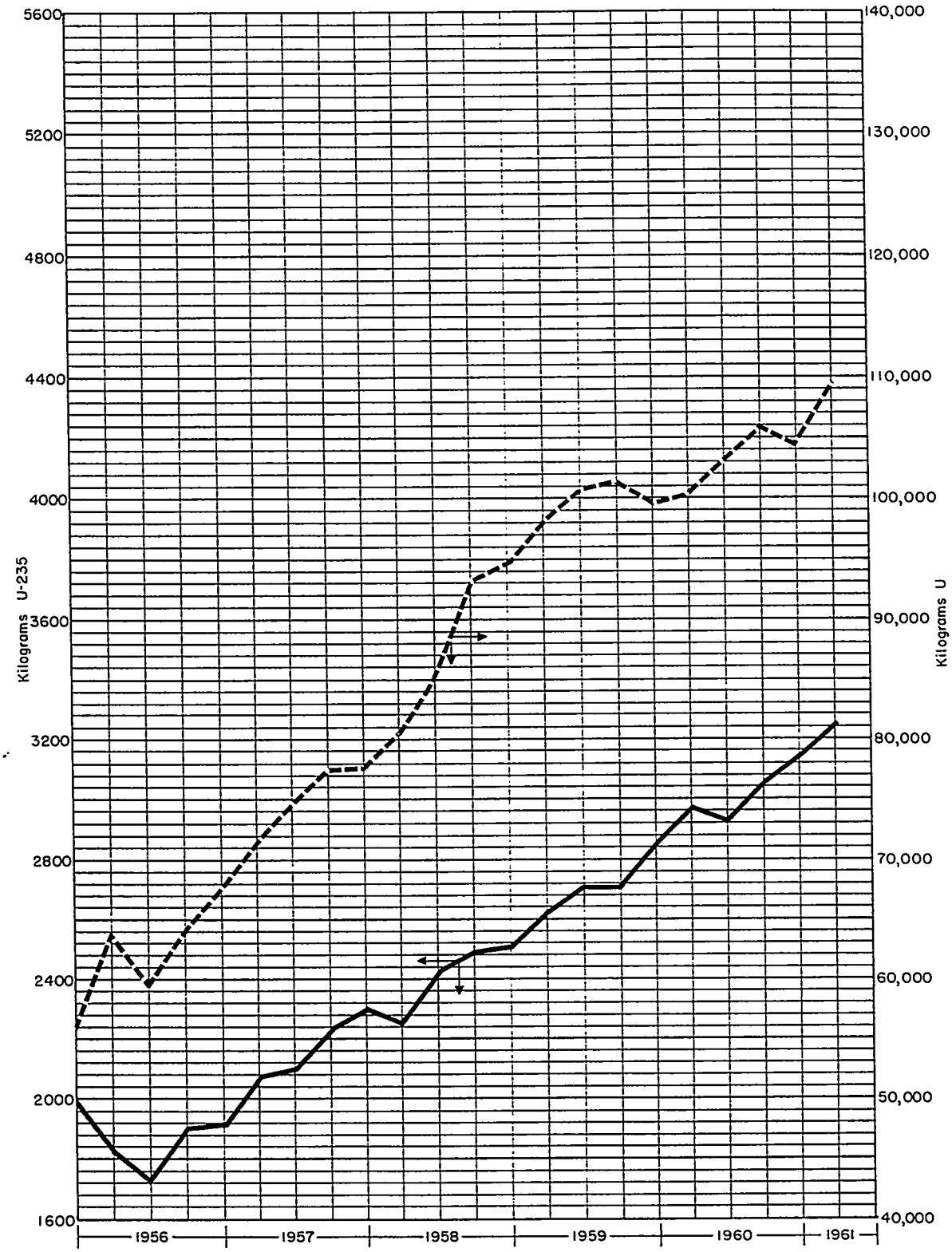


FIGURE G-3

Plant Uranium and U-235 Deficiencies - Cumulative from September 1944

TABLE G-7

Accounting Memorandum

Location of Deposit or Source of B.P.I.D.	Kilograms Uranium	Kilograms Uranium-235
Cascade:		
Inactive Consumption	4,822.6	920.2
Active Chemisorption	665.7	76.4
Physical Adsorption	1,462.8	122.1
Inventory Understatement	1,173.5	411.9
K-311 and K-312 Sections	15.5	5.4
Inactive Converters	31.9	2.3
K-1405 Holding Pond	273.5	5.7
Uncredited Materials Sent to Hot Salvage on Contaminated Drums	225.0	1.5
Poplar Creek Bed Contamination	6,594.0	53.1
Ground Near Feed Plant	191.0	1.3
Losses by Vent to Atmosphere	6,778.0	47.7
ORGDP-Paducah Interplant Cylinders "Heels" Dilution Before July 1955	-	179.2
Total	22,233.5	1,826.8

the book-physical inventory differences relative to these calculated limits of measurement uncertainty is included. It should be noted that the limits of error are reported for December, January, and February. This adjustment reflects a transition in reporting book-physical inventory difference limits of error one month out of phase with the current quarter in order to meet reporting schedules.

Cascade Balance Area

The reported book-physical inventory differences for this balance area for December, January, and February are, respectively, -504.3 kilograms, 633.4 kilograms, 1,276.8 kilograms uranium; and 70.7 kilograms, 53.6 kilograms, and 14.4 kilograms uranium-235.

Significant cascade operating conditions experienced during the quarter affecting the material balance of this area were special withdrawal activity amounting to 1,409 kilograms uranium-235 and a net uranium-235 inventory increase of 681 kilograms.

A review of recent expected and observed annual material balance experience in the cascade has indicated a tendency toward higher normal consumption rates. This is associated with a continuously increasing mean exposure assay in the separating equipment. At the present time, it is estimated that the normal consumption rate is 22.5 kilograms uranium-235 per month.

When assessed with respect to the noted operating conditions, the reported book-physical inventory differences are considered satisfactory.

Feed Manufacture Balance Area

The reported book-physical inventory differences for this area for January, February, and March are, respectively, 1,599.1 kilograms, 537.3 kilograms, and 3,075.0 kilograms uranium; and 10.5 kilograms, 2.2 kilograms, and 20.2 kilograms uranium-235. The January and March book-physical inventory differences exceeded the upper limits of measurement uncertainty and are at present under study for possible reasons. The February material balance experience was well within the limits of measurement uncertainty and is considered satisfactory. The uranium-235 experience is the combined effects of the uranium material balance uncertainty and the processing of materials with more than one assay level. No significance is attached to the uranium-235 book-physical inventory differences.

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (Is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number K-1452 Date of document 6/24/60

Title and author (if document is unnumbered)

copy tabbed pages

(This section to be completed by Document Center)

Date request received 10/12/95

Date submitted to ADC 11/30/95

Date submitted to HSA Coordinator 10/12/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 11/30/95 1/10/96

Date received from CICO 1/5/96 2-22-96

Date submitted to ChemRisk/Shonka and DOE 2-22-96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

UNCLASSIFIED

K/EM-274

SANITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT THIRD QUARTER FISCAL YEAR 1960

(EXTRACTED FROM SRD DOCUMENT # K-1452)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

November 30, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release to the public by:

Technical Information Officer 2/21/96
Date
Oak Ridge K-25 Site

[redacted]

UNCLASSIFIED

This [redacted]ment consi[redacted] of 147 [redacted]s
No. [redacted] 84 co[redacted] Series A.

DATE OF ISSUE: June 24, 1960 REPORT NO. K-1452

Z-64380

OAK RIDGE GASEOUS DIFFUSION PLANT
QUARTERLY REPORT

THIRD QUARTER FISCAL YEAR 1960

January 1, 1960 thru March 1, 1960

CENTRAL LIBRARY
REC. W40794
FILE
X-REF.
X-REF.

K 1452 19 A

K 1452 19 A

UNION CARBIDE NUCLEAR COMPANY
DIVISION OF UNION CARBIDE CORPORATION

Operating

- OAK RIDGE GASEOUS DIFFUSION PLANT
- OAK RIDGE Y-12 PLANT
- OAK RIDGE NATIONAL LABORATORY
- PADUCAH GASEOUS DIFFUSION PLANT

for the Atomic Energy Commission

Under U. S. Government Contract W7405 eng 26

UNION CARBIDE

RESTRICTED DATA This document contains restricted data as defined in the Atomic Energy Act of 1954. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.

[redacted]

N-600 F (10-59)

unless these barriers have been adversely affected by the barrier relocations and removals in size 2 equipment; each of these types has indicated increases in permeability during the preceding two-year period. Outlined in table C-13 is a summary of the changes in barrier permeabilities at ORGDP during the third quarter of fiscal year 1960.

PURGE CASCADE OPERATIONS

Unit K-312-1 was operated as the cascade top purge facility, and unit K-311-1 was operated as the cascade side purge during the third quarter of fiscal year 1960. The purge facility in unit K-311-1 purged an average of 16,941 scf. per day, while the rate in unit K-312-1 averaged 5,866 scf. per day. The total purge rate during the quarter averaged 22,807 scf. per day, an increase of 3.2 per cent above that of the preceding quarter. The average daily purge rates are presented in table C-14 for the second and third quarters of fiscal year 1960.

TABLE C-14

Cascade Purge Rates

Second Quarter, FY 1960				Third Quarter, FY 1960			
	Average Purge Rates, Scf/Day				Average Purge Rates, Scf/Day		
	Purge Facilities				Purge Facilities		
1959	Top	Side	Combined	1960	Top	Side	Combined
October	6,041	15,169	21,210	January	5,824	15,826	21,650
November	6,115	16,992	23,107	February	5,756	16,929	22,685
December	6,168	15,880	22,048	March	6,010	18,067	24,077

MATERIAL USAGES

The consumption rates of auxiliary materials which are essential to the plant operation are tabulated in table C-15. The material usages are listed for the second and third quarters of fiscal year 1960, exclusive of the code AK and code BR lube oils, and the liquid coolant. These latter items are presented for the periods of September 16 through December 15, 1959, and December 16, 1959, through March 15, 1960. Significant usage variations are discussed briefly below.

LIQUID COOLANT

Liquid coolant usage decreased during the quarter as a result of an indicated gain in several parts of the cascade.

found to be in good agreement both with a previously derived method and with the available experimental criticality data. The new method enables the determination of critical configurations of larger and more varied arrays of interacting units than was previously possible.

The plant criticality consultants meeting was held in January. Of particular interest in the items reviewed were the experimental and theoretical studies which resulted in an upward revision in the U-235 enrichment at which criticality is not considered to be possible, and the design of a safe entrainment separator based on experimental data on neutron poisons. No recommendations were made concerning criticality experiments other than to continue the additional work previously suggested for U-F-H systems.

FIRE PROTECTION

With the exception of the special dry pipe sprinkler systems in buildings K-305-9 through K-312-3, all portions of the Major Fire Protection Improvement Program sprinkler systems, underground piping, storage and pumping facilities are in service. New fixed fire protection facilities added, include 142 sprinkler systems with associated alarm equipment and 25,600 feet of underground fire main with related valves and hydrants.

EMERGENCY ACTIVITIES

Emergency activities during the period included 1 plant-wide and 14 local drills, simulating potential operational emergencies with emphasis being placed on acquainting plant personnel with emergency conditions which may be encountered in areas other than those which they are normally assigned. Four employees were trained in the use of hose streams in fire fighting and 62 in the use of protective devices and equipment.

HEALTH PHYSICS

Personnel Radiation Monitoring

The average film badge radiation exposure per person monitored decreased from 0.116 rem to 0.094 rem despite the fact that plant radiation levels had increased. In no case did personnel exposure exceed the Plant Acceptable Limit.

Air-Borne Alpha Activity

Shift-length monitoring for air-borne alpha activity showed that the number of samples exceeding the Plant Acceptable Limit was essentially unchanged, but the average air activity decreased about 30%. Similarly, spot air samples indicated a marked decrease in the average air-borne alpha activity this period, resulting from improved confinement of uranium-bearing materials.

Alpha Contamination

The alpha contamination level, as reflected by audit surveys of both operating and staff groups in the 30 locations where significant contamination is encountered, decreased 16% from that of last period. The decrease resulted primarily from improved equipment design and more effective decontamination procedures in the feed plant.

Penetrating Radiation Levels

The plant radiation index of 9.6 represents a 33% increase over last period. The increase is attributed primarily to the dismantling and cleaning of feed plant barrier filters in K-1410 without benefit of the normal decay period, this having been necessitated by a shortage of filters which the procurement of additional ones will eliminate.

Sanitary Water

An increase in radioactive contaminants in the plant sanitary water supply, which is taken from the Clinch River, reflects the discharge of mixed fission product waste materials, primarily Ru-106, from another installation upstream. None of the one-week sampling periods showed peak activity exceeding the long-term maximum permissible concentration. The quarterly average was less than 2% of the NCRP MPC_w for 40-hour week occupational exposure to the mixture of radionuclides involved, indicating no health consideration.

Uranium Concentrations in Streams

The average uranium concentrations in Poplar Creek and the Clinch River 1 mile below the plant, the latter reflecting the contribution of all Oak Ridge operations, decreased this quarter and remained well below recommended levels. There were no instances of water release at the plant boundaries above the long-term maximum permissible concentration; in fact, the average release level for the quarter is only 0.01% of the MPC_w for discharge of natural uranium materials.

INDUSTRIAL HYGIENE

Bio-Assay Results

The plant improvement program accounted for 39% of the uranium and 48% of the alpha activity findings which exceeded plant control values. Feed materials handling, preparation, and related maintenance accounted for 28% of the uranium and 14% of the alpha findings, and decontamination operations accounted for 16% and 28%, respectively. Chemical urinalyses are summarized in table E-1.

Industrial Environment

Air samples taken as part of the air-pollution survey program continued to indicate that atmospheric fluoride concentrations are occasionally high enough to produce vegetative marking on the more susceptible foliage; however, the fluorides and other materials for which samples were taken were well below the maximum allowable concentration for industrial human exposure.

TABLE E-1

Chemical Urinalyses

	This Quarter	Last Quarter	1959[a]	1955-1959[a]
Alpha Activity				
No. Analyses	1,185	1,465	1,465	1,614
No. Positive Results[b]	152	127	107	87
Fluorides				
No. Analyses	913	1,234	1,170	1,328
No. Positive Results[b]	21	14	7	44
Lead				
No. Analyses	27	17	12	11
No. Positive Results[b]	0	0	0	< 1
Mercury				
No. Analyses	144	182	167	147
No. Positive Results[b]	1	0	2	1
Plutonium				
No. Analyses	3	4	6	5
No. Positive Results[b]	0	0	0	< 1
Uranium				
No. Analyses	1,188	1,473	1,470	1,643
No. Positive Results[b]	302	340	292	270
Trichloroacetic Acid				
No. Analyses	8	21	12	3
No. Positive Results[b]	0	0	0	< 1
Copper				
No. Analyses[c]	0	0	< 1	< 1
Nickel				
No. Analyses[c]	48	52	44	66[d]

[a] Quarterly averages.

[b] Values equal to or greater than plant control values.

[c] No established M.A.C.

[d] 1957 - 1959 only.

INDUSTRIAL RELATIONS

EMPLOYEE AND COMPANY-UNION RELATIONS

Ten grievances were appealed to arbitration by the AFL-CIO Union and 1 grievance was appealed to arbitration by the UPGWA Union. Four of the 6 grievances pending from last quarter were withdrawn by the AFL-CIO Union, leaving 13 presently pending. Three cases have been heard in arbitration but the awards have not yet been received.

NUCLEAR MATERIAL CONTROL

INTRODUCTION

The nuclear material control program at the Oak Ridge Gaseous Diffusion Plant is concerned with maintaining accurate measurements of uranium inventories and flows. Efforts toward improving material measurements are made on a continuing basis. The status of various activities concerned with the Civilian Application Program are summarized.

GENERAL STUDIES ON MATERIAL CONTROL

MEASUREMENT METHODS FOR CONTAMINATED ALUMINA

A basic problem in accountability is concerned with the economics of recovery for many different types of scrap materials created in the course of normal plant operation. In the gaseous diffusion plant, contaminated alumina is a major scrap material. Experimental work has been initiated to determine whether this material can be evaluated for economic recovery through radiation scanning using the Scintillation counter. The successful application of this technique will result in greater economy of operation.

DISSOLVER SAMPLE

The "always-safe" dissolver places solid scrap materials into nitric acid solution as a preparatory step for uranium extraction. This equipment has been considered as a part of the Recovery system for accountability in the K-1420 building. It is believed that unaccounted for quantities in this operation during past material balance intervals have resulted from overcharging the account for uranium content in solid scrap materials. An obvious method of alleviating this problem is to shift the dissolver into the Decontamination account. However, the separation of this equipment requires a measurement be made of the output flow from the dissolver. After investigating available flow metering devices, a Foxboro flow meter was selected for installation because of its accuracy (~ 0.5 to 1.0%). In addition to the flow meter, a sampling point and calibration line will be installed.

MATERIAL RELEASES

A total of 380,189 grams of uranium and 2,917 grams uranium-235 were released during the quarter. Table G-1 presents these releases by material type.

TABLE G-1

Material Releases (Grams)

Date	Depleted Uranium	Reactor Tails U-235	Normal U	Normal U-235	Enriched Reactor Tails U	Enriched Reactor Tails U-235
January, 1960	30,171	196	-	-	17,289	147
February, 1960	14,406	94	251,437	1,789	-	-
March, 1960	22,261	145	7,504	53	37,121	493
Total	66,838	435	258,941	1,842	54,410	640

DECONTAMINATION, RECOVERY AND CONVERSION - K-1420 OPERATIONS

Decontamination

During the third quarter of fiscal year 1960, converter decontamination in the K-1420 building was as follows:

Converter Type	Number of Converters	Recovery Grams Uranium	Recovery Grams Uranium-235
2	24	3,002	1,345.04
2 (Heads)	18	1,220	83.13
2 (Shell)	2	578	15.84
0	40	25,373	1,250.78
0 (Spools)	12 (Batches)	21,568	917.35
00 (Spools)	4 (Batches)	9,673	312.29
Totals	64	61,414	3,924.43

Recovery

A quantity amounting to 179,335 liters of solution was processed through the K-1420 recovery system during the third quarter of fiscal year 1960, with a removal of 2,144 pounds of uranium as impure oxide (U_3O_8) from the drum driers and calciners.

Conversion

The K-1420 conversion facility was inactive until February 2, 1960. Upon resuming operation on this date, the facility operated intermittently for the remainder of the quarter. During this operating period, 4,434 pounds of uranium as uranium hexafluoride was produced, whose product value is approximately $151,417.

Cascade Conditioning Gas Treatments

During the report period, cascade conditioning gas usage and uranium recovery were as follows:

Date	Pounds CCG Charged	Pounds UF_6 Recovered
January 1960	431	0
February 1960	601	0
March 1960	590	0
Total	1,622	0

ACCOUNTING EVALUATION STUDIES

CUMULATIVE PLANT ACCOUNTING EFFICIENCY

Estimated quantities of material representing the hidden inventory are shown in table G-3 by categories. The plant accounting efficiency is 99.87 for uranium and 99.81 for uranium-235. This has been determined by dividing the sum of the hidden inventory, the plant quarterly ending inventory and the shipments by the total plant receipts, and multiplying by 100. Cumulative plant uranium and uranium-235 book-physical inventory differences are shown in figure G-1.

TABLE G-3

Accounting Memorandum

Location of Deposit or Source of B.P.I.D.	Uranium Kilograms	Uranium-235 Kilograms
Cascade:		
Inactive Consumption	4,684.8	879.9
Active Chemisorption	665.7	76.4
Physical Adsorption	1,425.8	117.6
Inventory Understatement	1,809.0	615.4
K-311 and K-312 Sections	18.5	6.0
Inactive Converters	45.9	1.3
K-1405 Holding Pond	120.0	2.5
Uncredited Materials Sent to Hot Salvage on Contaminated Drums	225.0	1.5
Poplar Creek Bed Contamination	4,784.0	37.3
Ground Near Feed Plant	191.0	1.3
Losses by Vent to Atmosphere	6,778.0	47.7
ORGDP - Paducah Interplant Cylinder "Heels" Dilution before July, 1955	-	179.2
Total	20,747.7	1,966.1

BOOK-PHYSICAL INVENTORY DIFFERENCE BALANCE AREA LIMITS OF ERROR

The deficiency experience for four balance areas together with the calculated limits of measurement uncertainty are presented in control chart form in figure G-2. A discussion of the book-physical inventory differences relative to these calculated limits of measurement uncertainty is included. It should be noted that the limits of error are reported for December, January, and February. This adjustment reflects a transition in reporting book-physical inventory difference limits of error one month out of phase with the current quarter in order to meet reporting schedules.

Cascade Balance Area

During the quarter, significant cascade operations affecting the material balance of this area were special withdrawal activity, and a change in inventory time for the December 1 inventory to avoid interfering with the operation of retiring from service cascade equipment in units K-305-10, 11, and 12.

Special withdrawals during the quarter amounted to 635 kilograms uranium-235; and the separating cascade inventory increased by 1,810 kilograms uranium-235. The December 1 cascade inventory was taken on November 26 and adjusted for feed and withdrawal streams to reflect conditions on December 1.

The reported BPID for December, January, and February of 642.6 kilograms, 83.3 kilograms, and 597.1 kilograms uranium, respectively, are well within the calculated limits of measurement uncertainty. The uranium-235 BPID's for these months are 96.8 kilograms, 45.3 kilograms, and 32.3 kilograms, respectively. The December BPID of 96.8 kilograms uranium-235 reflects the effect of a significant increase in uranium-235 inventory. Based upon the most recent assay dilution tests, the differential gas phase understatement was 62 kilograms uranium-235. Molecular exchange during December contributed 16 kilograms uranium-235 and normal consumption approximately 20 kilograms uranium-235 toward the observed December BPID. The total contribution from these affects is approximately 98 kilograms uranium-235, which is in good agreement with the reported difference.

When assessed with respect to the noted significant operating conditions and the calculated limits of measurement uncertainty, the reported uranium-235 and book-physical inventory differences are considered satisfactory.

Feed Manufacture Balance Area

The reported book-physical inventory differences for this balance area for December 1959, January and February 1960, are 2156.3 kilograms, -3690.5 kilograms and 2964.6 kilograms uranium. During the past fiscal year the material balance experience in this area has been an apparent recovery. Over this same period, substantial quantities of ash, produced earlier and carried at an estimated uranium content, have been reprocessed. It is believed that much of this material has been underestimated as to

UNCLASSIFIED

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2537

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 — Expected receipt of document 1 MONTH

Document number K-1451 — Date of document 4/29/60

Title and author (if document is unnumbered)

* Copy tabbed pages

(This section to be completed by Document Center)

Date request received 10/12/95

Date submitted to ADC 11/30/95

Date submitted to HSA Coordinator 10/12/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 11/30/95 1/10/96

Date received from CICO 1/5/96 2-22-96

Date submitted to ChemRisk/Shonka and DOE 2-22-96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

UNCLASSIFIED

K/EM-282

SANITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT SECOND QUARTER FISCAL YEAR 1960

(EXTRACTED FROM CRD DOCUMENT # K-1451)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

November 30, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

[illegible] has been approved for release
[illegible] by:
[illegible] Information Officer
[illegible] K-25 Site
2/21/96
Date

Down[redacted]DE TO [redacted]D
[redacted]8/93 Sa[redacted] W. Hall A[redacted]
[redacted] Downgrad[redacted] to CRD
Sam W[redacted]ohlfort [redacted]D, 1/5/94

[redacted]TIAL

This document consists of 152 pages
No. 24 of 84 copies, Series A.

DATE OF ISSUE: April 29, 1960 REPORT NO. K-1451

UNCLASSIFIED

K 1451 24 A

K 1451 24 A

Classification Changed To
CAD
(Insert Appropriate Classification Level and Category)
Sam W. Wohlfort 1/5/94
Authority for Change in Classification) (Date)
By: Sam W. Hall 2/1/94
(Signature of Person Making Change) (Date)
Verified by: Sam W. Wohlfort 2/1/94
(Signature of Person Verifying Change) (Date)

OAK RIDGE GASEOUS DIFFUSION PLANT
QUARTERLY REPORT

SECOND QUARTER FISCAL YEAR 1960

October 1, 1959 thru December 31, 1959

CENTRAL LIBRARY
REC.
L-35374
FILE
X-REF.
X-REF.

UNION CARBIDE NUCLEAR COMPANY
DIVISION OF UNION CARBIDE CORPORATION

Operating

- OAK RIDGE GASEOUS DIFFUSION PLANT
- OAK RIDGE Y-12 PLANT
- OAK RIDGE NATIONAL LABORATORY
- PADUCAH GASEOUS DIFFUSION PLANT

for the Atomic Energy Commission

Under U. S. Government Contract W7405 eng 26

UNCLASSIFIED

UNION CARBIDE

RESTRICTED DATA This document contains restricted data as defined in the Atomic Energy Act of 1954. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.

[redacted]

[redacted]

2

BARRIER PERMEABILITY SUMMARY

The barrier permeabilities in the ORGDP cascade displayed decreasing trends in all buildings during the second quarter of fiscal year 1960. These decreases in permeability were greater than the experience for the preceding two year period in all buildings except the K-31 building. The cause of such a general decrease in barrier permeabilities throughout the entire cascade is not readily obvious. However, the measured barrier permeabilities in the ORGDP cascade were probably influenced to some degree by a general power redistribution within the process buildings, which was associated with the shut down of units K-305-10, -11, and -12 at the top of the K-25 building. This power redistribution was effected early in December; however, the magnitude of the barrier permeability decreases are greater than would normally be anticipated as a result of the changes in operating levels in the individual buildings. Outlined in table C-13 are the permeability changes associated with the various barrier types within each building in the ORGDP cascade.

TABLE C-13

PURGE CASCADE OPERATIONS

Unit K-312-1 was operated as the cascade top purge facility, and unit K-311-1 was operated as the cascade side purge during the second quarter of fiscal year 1960. The purge facility in unit K-311-1 purged an average of 16,014 scf per day, while the rate in unit K-312-1 averaged 6,108 scf per day. The total purge rate during the quarter averaged 22,111 scf per day, a decrease of 5.3% below that of the preceding quarter. The average daily purge rates are presented in table C-14 for each month of fiscal year 1960 to date.

TABLE C-14
Cascade Purge Rates

Month	Average Purge Rates, Scf per Day		
	Top Purge Facility	Side Purge Facility	Combined Purge Facilities
July, 1959	6,046	17,589	23,635
August	6,034	17,661	23,695
September	6,239	16,429	22,668
October	6,041	15,169	21,210
November	6,115	16,992	23,107
December	6,168	15,880	22,048

HEALTH PHYSICS

PERSONNEL MONITORING

Radiation Monitoring

The average film-badge radiation exposure per person monitored increased from 108 to 116 mrem. This slight increase was apparently due to exposures to higher radiation fields by employees associated with feed manufacture. No personnel exposures exceeding the Plant Acceptable Limit were recorded.

The average exposure per person monitored is compared with corresponding figures for other periods in table E-6 and is shown graphically in figure E-5.

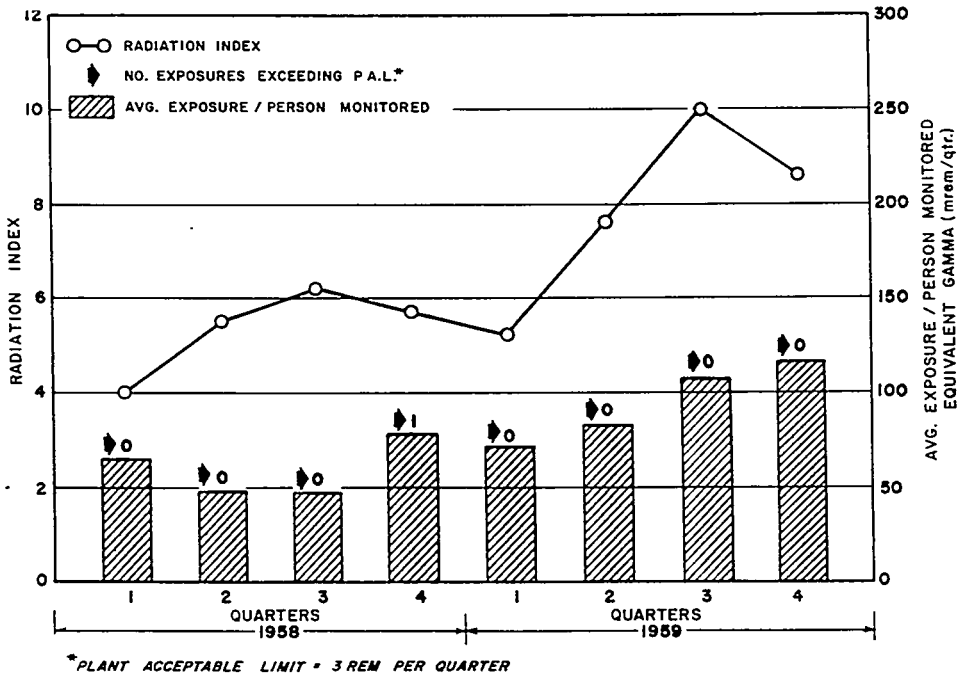


FIGURE E-5
Film Badge Exposure and Penetrating Radiation Index

Personnel Contamination

On-the-job spot checks of personnel who perform operations in contaminated locations showed improvement with only 9% of the 159 checks made this period exceeding the Plant Acceptable Limit. None of the 265 hand checks taken at the end of work periods was over the Plant Acceptable Limit. Results of these and other contamination checks are summarized in table E-6 and are shown graphically in figure E-6.

AIR-BORNE ALPHA ACTIVITY

Results of the routine shift-length air monitoring program for air-borne alpha activity showed an increase in both the number of samples exceeding the Plant Acceptable Limit and the average air activity. In the majority of instances, these conditions were noted in locations associated with feed manufacture and allied operations where the potential of high activity is recognized and the

routine use of adequate respiratory protective devices is mandatory. An accelerated air-contamination evaluation program is in progress in these locations.

TABLE E-6
Personnel Radiation Monitoring

	This Quarter	Last Quarter	1959[a]	1958[a]	1954-1958[a]
Radiation Exposure					
No. Persons Monitored	640	695	632	606	-
No. Exposures > P.A.L.[b]	0	0	0	0.25	0.13[c]
Av. Equivalent γ Exposure Per Quarter Per Person Monitored (rem)[d]	0.116	0.108	0.096	0.059	-
Maximum Quarterly Exposure (rem)	2.90	1.52	2.90	3.65	4.01[c]
Routine Hand Checks					
Av. No. Persons Checking Daily	265	263	293	353	474
Hand Checks > P.A.L.	0	0	0.5	0.25	4.7
Personnel On-The-Job Spot Checks[e]					
Total Checks Made	159	168	180	191	421
No. > P.A.L.	15	26	26	22	86
Per Cent > P.A.L.	9.4	15	14	12	20

a Quarterly averages.
b Plant Acceptable Limit = 3 rems per quarter.
c 1955 through 1958 only.
d 0.6 rem of beta exposure is considered equivalent to 0.3 rem of gamma exposure.
e Includes checks of employees' hands and clothing.

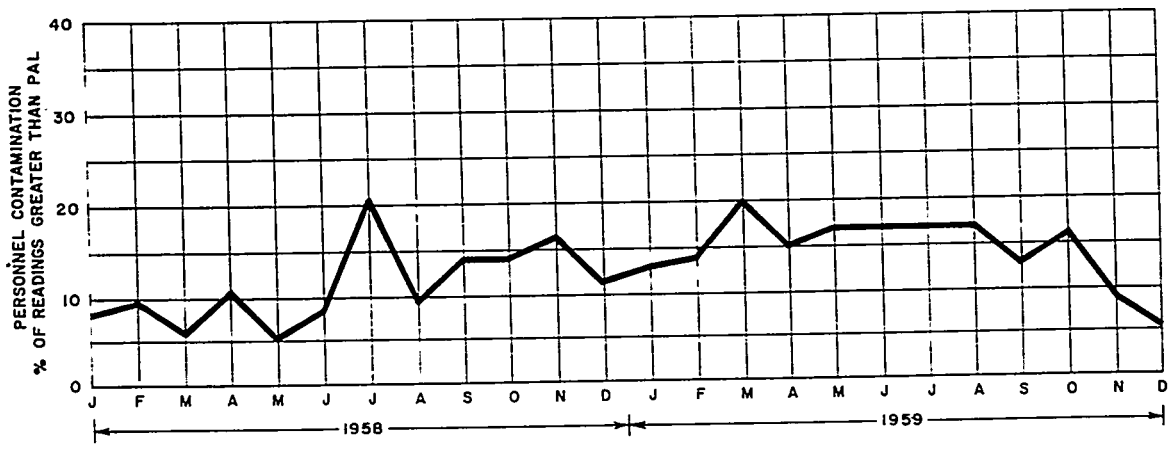


FIGURE E-6
Hand, Shoe, and Clothing On-The-Job Contamination

Spot air samples taken in conjunction with audit surveys also indicated an increase in air-borne activity as both the number of samples exceeding the Plant Acceptable Limit and the average air activity increased. The latter was primarily influenced by a single short-term peak which occurred during a sampling operation in K-601 involving the making and breaking of cylinder pigtail connections. In other plant locations, air activity levels remained unchanged and relatively low, with no new problems of significance.

Results of air-borne alpha activity samples are summarized in table E-7 and are shown graphically in figure E-7.

ALPHA CONTAMINATION

The plant alpha contamination level, as reflected by audit surveys of both operating and staff groups in the 28 plant locations where significant contamination is encountered, remained essentially

unchanged from that of last quarter; however, the level for the year increased about 15% over the similar values for last year. This increase is attributed primarily to the spread of materials during normal operation and maintenance activities in the feed plant.

The results of routine audits are summarized in table E-7 and are shown graphically in figure E-8.

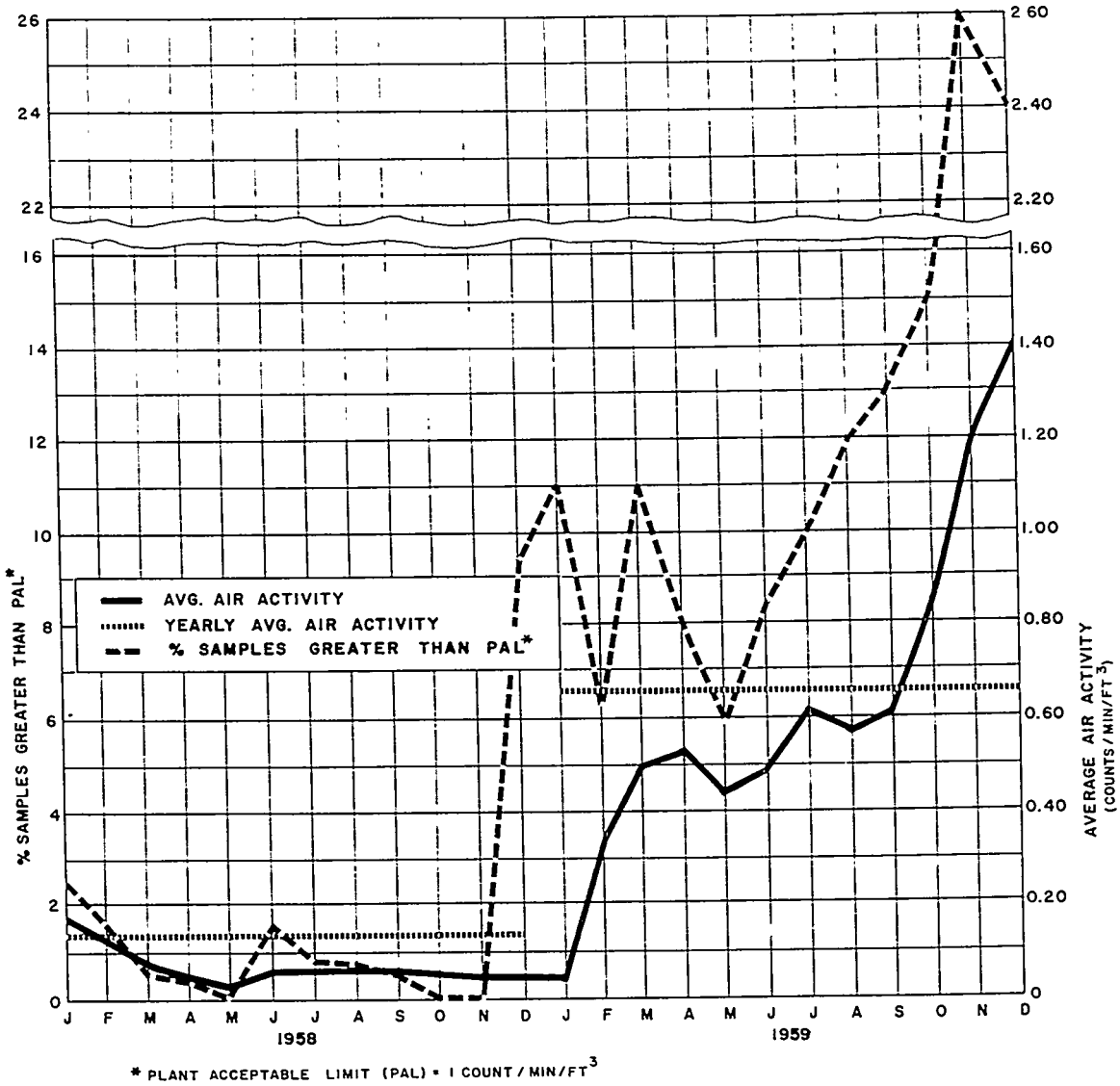


FIGURE E-7
Plant Air Activity and Shift-Length Air Samples

PENETRATING RADIATION LEVELS

The plant radiation index of 8.6 represents a slight decrease from last period, which was achieved primarily through more prompt clean-up of material spilled in the K-1131 pit area during equipment change-outs and through improved shielding of stored uranium ash containers. The radiation index of 7.8 for the year shows a continuation of the gradual upward trend in plant radiation levels as influenced by the feed plant and related activities where greater uranium conversion efficiency has resulted in increased concentrations of radiation-emitting ash materials.

TABLE E-7
Environmental Radiation and Radioactive Materials

	This Quarter	Last Quarter	1959[a]	1958[a]	1954-1958[a]
Air Activity (Shift-Length)					
No. Samples Taken	2,845	3,362	2,959	1,136	1,988
No. Above P.A.L.[b]	612	391	368	24	28
Av. Activity per Sample (c/min./ft^3)	1.1	0.59	0.66	0.13	0.13
Air Activity (Spot)					
No. Samples Taken	214	219	223	224	261
No. Above P.A.L.[b]	25	15	21	28	19
Av. Activity per Sample (c/min./ft^3)	11	0.57	3.3	0.96	0.88
Alpha Contamination					
Plant Contamination Index[c]	488	468	445	386	209
No. Locations Included	28	28	26	24	52
% Plant Area Surveyed	1.2	1.2	1.2	1.1	1.8
Penetrating Radiation					
Radiation Index[d]	8.6	10	7.8	5.4	3.0
No. Locations Included	8	8	8.5	9	9.3
Plant Sanitary Water					
Av. Gross Beta Activity (dis/min./100 ml.)	129	25	58	39	32
Av. Uranium Concentration (ppb.) in Sanitary Water Influent	3.1	1.1	2.0	2.4	-

a Quarterly averages.

b P.A.L. - Plant Acceptable Limit.

c The contamination index is a figure which reflects the product of the extent and intensity of alpha contamination exceeding the P.A.L. Values include those plant locations which a 6-month average contamination index of 10 or greater.

d The radiation index, which reflects both the extent and intensity of radiation found, is essentially the product of the work area over which the dose rate is more than 7.5 mrep/hr. and a weighting factor which depends upon the actual radiation intensities over the area concerned.

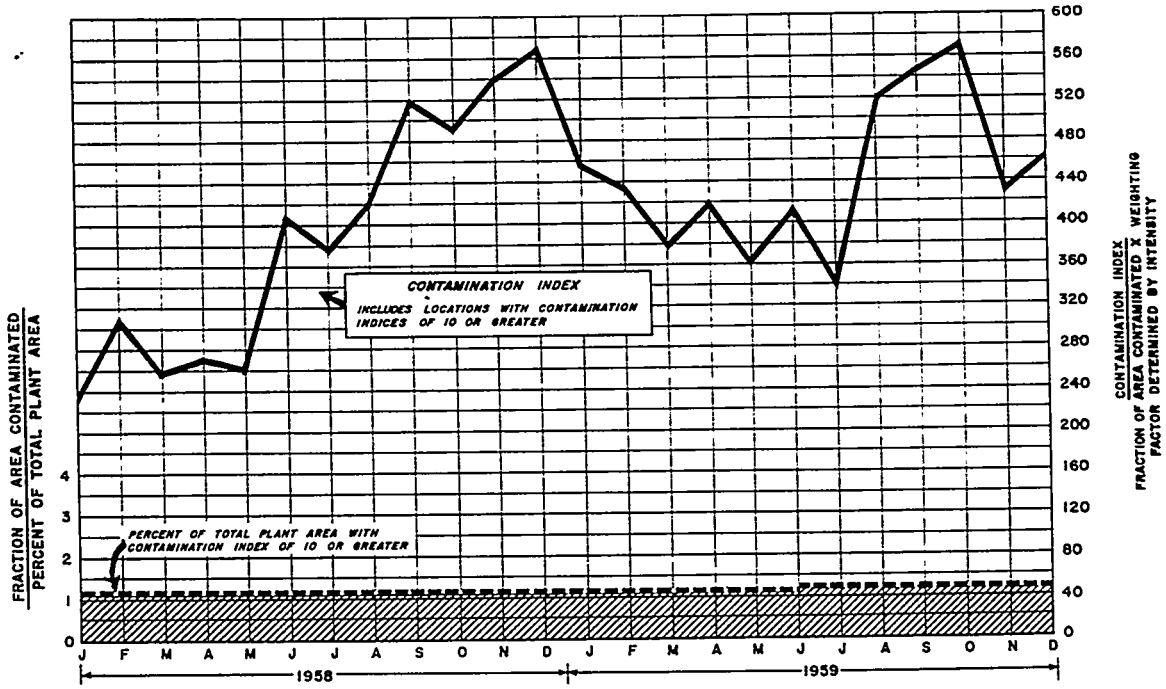


FIGURE E-8
Plant Contamination Levels

RADIATION SOURCE CHECKS

Routine monthly checks of the 18 radium sources revealed no radium leakage. In addition, the annual inspection of other plant radiation sources, consisting of the various isotopes used in research, nondestructive testing, and instrumentation, revealed no leakage or violation of radiation safety requirements.

SANITARY WATER

Increased radioactive contaminants in the plant sanitary water supply noted over short intervals resulted in a quarterly average beta activity of 129 dis/min./100 ml., and the resulting yearly average was somewhat higher than that of last year. The increase, attributed to the discharge of mixed fission product waste materials from another upstream installation, presents no significant health consideration, and the activity values remain well below the appropriate NCRP MPC_w for 40-hour week occupational exposure to the mixture of radionuclides involved. Provision of a continuous detecting and recording low level beta water monitor in the sanitary water plant will afford more prompt indication of possible emergency conditions in the event of abnormally high concentrations of radioactive contaminants.

The average uranium concentrations in the plant sanitary water influent, as well as the average beta activity, are listed in table E-7 and shown graphically in figure E-9.

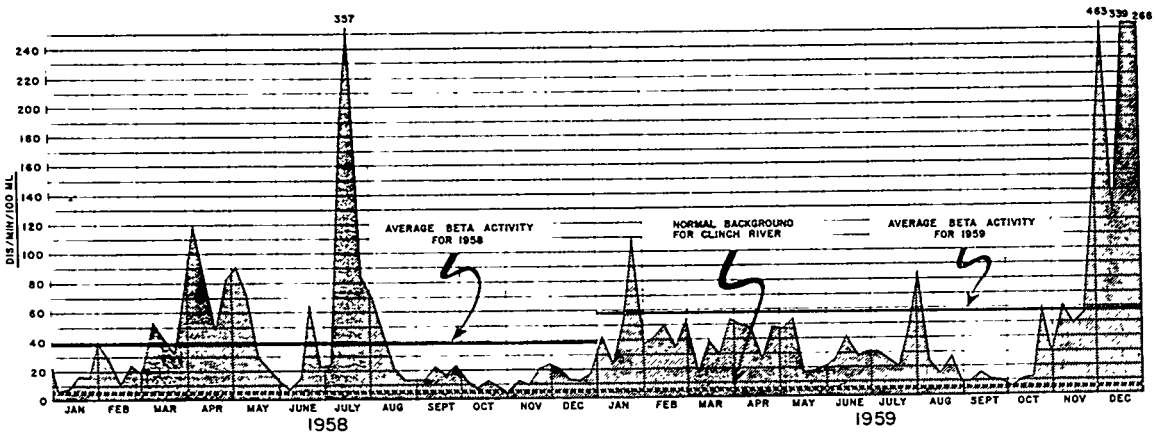


FIGURE E-9
Beta Activity in Plant Sanitary Water

PLANT ENVIRONS

The average uranium concentrations in the Poplar Creek and Clinch River increased this quarter, attributed to downstream movement of uranium-contaminated silt following a period of heavy rainfall. The quarterly and yearly average levels for these locations, as shown in table E-8, continue to remain well below concentrations which would indicate a health hazard or pollution problem.

SPECIAL STUDIES

A slight increase in contamination levels was noted in the K-1420 Recovery Area following recovery of uranium from Savannah River materials, but no unanticipated problems were involved.

Environmental sampling included studies of soil and vegetation which reflected normal distribution

of uranium and fluorides, the levels being commensurate with air-borne activities in the same areas. Checks in local stagnant waters for strontium-90 attributed to bombtest fall-out revealed that levels have remained relatively low and unchanged in recent years.

TABLE E-8
Uranium Concentrations in Streams

Stream Sampling Locations	This Quarter	Last Quarter	1959	1958	1954-1958
Average uranium concentrations (ppb.)[a] in water at:					
East Fork at Poplar Creek	124	99	89	54	50
Poplar Creek at Clinch River	14	7.1	9.1	12	13
Clinch River 1 mile below ORGDP	4.3	1.9	3.8	4.1	3.6

a 71,000 ppb. soluble natural uranium in water is equivalent to 5×10^{-5} μ c/ml., the Plant Acceptable Limit, based in NCRP MPC_w for effluents at points where they leave control of the plant.

SIGNIFICANT PLANT LOCATIONS OF HAZARDOUS MATERIAL

Figure E-10 shows the principal plant locations of some of the more hazardous materials and indicates the average extent and intensity of surface contamination by radioactive materials.

INSTRUMENTATION

Additions to plant radiation-detection equipment this year included 8 beta-gamma survey instruments, 1 fast-neutron instrument, 3 alpha survey instruments, six 200 mr dosimeters, and 1 dosimeter charger. New radiation alarms were installed in the K-1131 Feed Production Building, K-1231 Pulverizing Area, K-1410 Decontamination Building, and the K-601 Sampling Room.

Table E-9 lists radiation-detection instruments available in the plant. Audits of these instruments showed that about 87% were in satisfactory operating condition this year as compared with 83% in 1958.

TABLE E-9
Radiation-Detection Instruments

Items	No. Available
Constant Air Monitors	20
Air Samplers	34
Minometers	16
Dosimeters	60
Dosimeter Chargers	5
Beta-Gamma Survey Meters	214
Alpha Survey Meters	231
Hand Counters	45
Neutron Meters	1

NUCLEAR SAFETY

ACCIDENT PREVENTION ACTIVITIES

Engineering Design and Specifications

Nineteen approval letters concerning plant equipment and operations and 1 technical report were issued. Documents issued during the year included 49 approval letters, 1 uranium accumulation report, and 7 technical reports.

Criticality experiments with 2.0% enriched material in block and solution form were continued throughout the year at another UCNC installation and the data obtained, in conjunction with data from the Hanford PCTR experiments, with like material, enabled an increase in the plant criteria

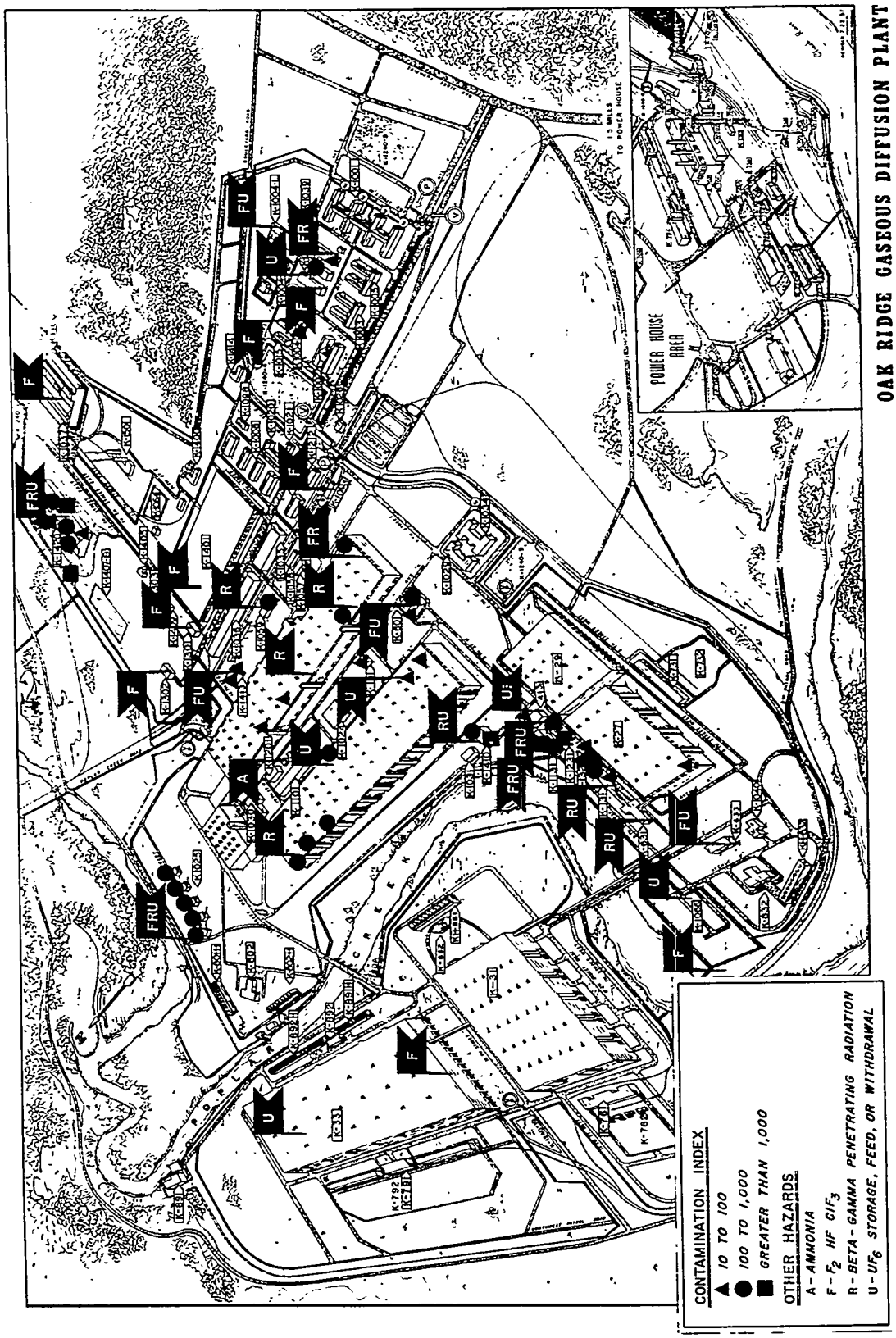


FIGURE E-10
Locations of Radioactive Contamination and Hazardous Materials

NUCLEAR MATERIAL CONTROL

INTRODUCTION

The nuclear material control program at the Oak Ridge Gaseous Diffusion Plant is concerned with maintaining accurate measurements of uranium inventories and flows. Efforts toward improving material measurements are made on a continuing basis.

GENERAL STUDIES ON MATERIAL CONTROL

PRODUCT CYLINDER SAMPLING TEST 1. URANIUM HEXAFLUORIDE--SAMPLING

A cylinder sampling test of a 5″ cylinder containing 23,339 grams of Paducah tails material has been completed. The test was designed to check the validity of the cylinder sampling technique for 5″ product type cylinders containing uranium hexafluoride.

The cylinder was heated until liquefied, then rocked to homogenize its contents. After homogenization, the cylinder was inverted, connected to a sampling manifold and three samples of approximately 105 grams each were withdrawn. The cylinder was then allowed to cool. After the cylinder had cooled, 301 grams of C-816 was charged to the cylinder. The cylinder was again heated to liquefy the cylinder contents and homogenization was accomplished by rocking. Five samples were withdrawn from the cylinder. The procedure was repeated until a total of 15 samples were obtained. Each sample was analyzed in duplicate (two P-10 tubes) by gravametric analysis for uranium in the Works Laboratory.

The mean of the analyses of samples withdrawn prior to charging the cylinder with C-816 was 67.593% uranium. The mean of the analyses of the 15 samples obtained subsequent to the charging of C-816 to the cylinder was 66.707% uranium. The calculated theoretical weight percent uranium for the contents of the cylinder after the charging of C-816 was 66.718%. No significant difference between means was observed; therefore, adequate sampling by this technique exists.

Analysis of Feed Manufacture Material Flows 1. NEPTUNIUM 2. TECHNETIUM

Presented in table G-1 is an analysis of ORGDP feed plant material throughputs for fiscal year 1959. This analysis was made to determine the accumulation points throughout the process system for the elements Technetium and Neptunium. The object of the study was to locate possible take off points for the recovery of these elements from the plant by-product streams. The chemical analyses for Neptunium and Technetium of the materials shown were made at the Oak Ridge National Laboratory from samples obtained by the Health Physics Department of the Oak Ridge Gaseous Diffusion Plant.

TABLE G-1
ORGDP Feed Plant Material Flow Analysis
July 1, 1958 thru June 30, 1959

Equipment Description	Pieces of Equipment	Material Processed	Analysis		Material Accumulated		Gen. Rate/Mo.	
			Tc-ppm	Np-ppb	Gms-Tc	Gms-Np	Gms-Tc	Gms-Np
F_2 Tower Ash	4	6,449,149 gms	0.940 ppm	< 1	6.06	0.006	0.51	0.0005
F_2 Clean-Up Reactor Ash	1	21,772,320 gms	0.630*ppm	3	13.72	0.065	1.14	0.0054
Barrier Filter	4	816,462 gms	3.800*ppm	3	3.10	0.002	0.26	0.0001
Cyclone Filter	2	5,896,670 gms	2.250*ppm	10.5	13.27	0.062	1.11	0.0052
K-1410 Soak Tank Solution	1	30,031 l.	1.900 mg/l.	3	57.06	0.000	4.76	0.0000
K-1410 Soak Tank Sludge	1	916,252 gms	1.400 ppm	< 1	1.28	0.001	0.11	0.0001

* Average analysis

Processing Savannah River Uranyl Nitrate Solution

1. URANYL NITRATES

During November 1959, the ORGDP received three tank trailers of uranyl nitrate (UNH) solution from Savannah River, which totaled 11,400 gallons of UNH solution (3800 gallons/trailer). An accountability procedure was written to outline the methods used for accountability in the processing of this material at the Oak Ridge Gaseous Diffusion Plant.*

The K-1215 truck weight scales were used as the official scales in weighing the tank trailers. These scales are graduated in ten pound (10 lb.) increments and have a capacity of 30 tons. The ORGDP receiving weight was established by weighing each tank trailer before and after processing. Therefore, it was necessary to inspect each trailer for foreign matter such as ice, snow, and mud adhering to the trailers, before they were weighed in. The inspection of each tank trailer revealed no deposits of foreign matter; therefore, no cleaning was necessary.

A sampling test was accomplished on the first tank trailer of material received in order to ascertain the degree of homogenization required for future tank trailer sampling. The test included sampling of the trailer as received, and at varying intervals of mixing. The mixing of the solution was accomplished by recycling the material from the dip-leg feed line of the trailer and returning to the open inspection port on the trailer through a nozzle equipped with an anti-splash cover. The solution was recycled by a pump capable of moving 1,800 gallons of solution per hour. All tank trailer samples were aspirator thief samples. Sampling of the feed line to the process equipment was made by the continuous sample method already established at the ORGDP. Each feed line was sampled by a continuous sample integrated with the material feed rate. The waste lines from the evaporators were sampled once each hour to control the condensate discard steam.

Sampling Test of SRO (UNH) Solution

1. URANYL NITRATES

The laboratory results of the sampling test were analyzed by the analysis of variance technique with the following results.

1. There was no significant difference in sampling due to agitation.

2. The sampling and analytical limits of error for uranium are ± 0.25%.

3. The uranium limit of error for each trailer is calculated to be 265 grams. For the difference between stations the LE is 375 grams uranium.

A summation of the Savannah River UNH receipts is shown in table G-2.

K-1302 Vent Stack Contamination 1. URANIUM RECOVERY

Following recent high uranium analyses on the K-1420 fluorination system vent line, the K-1302 vent stack was opened for inspection. This was done on October 14 after having been opened on September 28. Approximately two years ago, this stack was found contaminated and was cleaned. However, at that time some residual material was allowed to remain. During the current cleaning, all material was removed. The recovery amounted to 627 pounds of material containing 26,069 grams uranium and 853 grams uranium 235.

Referee Analysis of Belgian Oxide Samples

1. URANIUM OXIDE ANALYSIS

Four lots of Belgian oxide were observed to have uranium analyses as determined at the ORGDP and Ledoux laboratories outside the defined splitting limit of 0.1%. Referee samples from these

* Varlan, A., and Stief, S. S., "Test Run of Savannah River UNH," January 20, 1960, KP-1815 (Secret).

lots were forwarded, at the request of AEC, to the National Bureau of Standards for analysis. The results of these analyses are shown below:

Lot No.	% UO_3 ORGDP	Ledoux	NBS
29	99.44	99.33	99.41
30	99.43	99.30	99.42
33	99.52	99.41	99.52
34	99.46	99.34	99.45

TABLE G-2
Summary of SRO (UNH) Measurements

Shipment No.	Gross Weight (Lbs.) SRO	ORGDP	Difference*	Analysis gU/g SRO	ORGDP	Difference*	Uranium Kg SRO	ORGDP	Difference*
75	32,630	32,600	30	.004847	.004833	.000014	71.739	71.421	0.318
76	31,960	32,580	-620	.004872	.004857	.000015	70.625	71.821	-1.196
77	32,720	32,670	50	.004872	.004862	.000010	72.305	72.019	0.286
Totals	97,310	97,850	-540	.004864**	.004851**	.000013**	214.669	215.261	-0.592

* SRO - ORGDP
** Average

Economics of Discontinuing Scrap Sampling 1, SCRAP RECOVERY

Substantial monetary savings are to be realized by eliminating the sampling and storage of current scrap materials accumulation. It is estimated that the sampling and analytical effort alone amounts to $1,270 per month. An effort is being made to recover scrap materials on an as-generated basis. Segregation is made by point of origin to minimize isotopic dilution losses.

The principal solid scrap currently being processed through the continuous dissolver in K-1420 is alumina. At the present throughput rate, there are approximately 2 to 3 months supply of alumina available for maximum operation on this material before attaining a current status. Other materials can then be processed, possibly including off-area scrap.

Cascade Hidden Inventory Factors 1. CASCADE INVENTORIES

All necessary cascade hidden inventory factors have been adjusted to reflect the most recent cascade equipment changes and decontamination experience. The use of these factors will become effective January 1, 1960, and will be used in calculating the quarterly cascade hidden inventory for the Oak Ridge Gaseous Diffusion Plant. Table G-3 presents a breakdown of these factors by types of equipment and plant location.

Material Releases 1. URANIUM--RELEASES 2. URANIUM-235

There were no material releases involving uranium at the ORGDP during the quarter other than those vented to the atmosphere during the operation of the K-1131 building. A total of 118,136 grams uranium and 834 grams uranium-235 were released. Table G-4 presents these releases by type of material processed.

Nickel Residues Received From International Nickel Company

During the three-month report period, 54,106 pounds of nickel residue were received from the International Nickel Company, making a total of 401,181 pounds received to date. During the quarter, 145,604 pounds of nickel residue were shipped to Oak Ridge Processing Company for smelting into ingots. A total of 163,549 pounds of nickel residue has been shipped to Oak Ridge Processing Company, leaving 237,632 pounds on inventory at the ORGDP.

TABLE G-3
Cascade Hidden Inventory Factors

Section	Equipment Size	Converter Consumption Initial gu/conv	Converter Consumption Long Term gu/conv/d	Cell Piping Consumption Initial gu/stage	Cell Piping Consumption Long Term gu/stage/d	Unit Piping Consumption Initial gu/unit	Unit Piping Consumption Long Term gu/unit/d	Pumps Consumption Initial gu/pump	Pumps Consumption Long Term gu/pump/d	Seal Consumption gu/seal
K-305	3			2.98	0.00117	124.9	0.05589	0.9398	0.09401	12.9
K-304	3			2.98	0.00138	123.1	0.05260	0.9398	0.09401	12.9
K-303	2			4.83	0.00199	188.8	0.08219	1.1780	0.10460	12.9
K-302	2			4.83	0.00202	187.0	0.08219	1.1780	0.10460	12.9
K-310	2			4.83	0.00206	149.6	0.06575	1.1780	0.10460	12.9
K-311	3			2.98	0.00155	127.4	0.05589	0.9398	0.09401	12.9
K-301 *	1			5.80	0.00248	206.9	0.09205	1.1780	0.10460	12.9
K-309	1			5.80	0.00248	161.0	0.06904	1.1780	0.10460	12.9
K-402 *	2			4.83	0.00206	203.3	0.08877	1.1780	0.10460	12.9
K-502	0			6.65	0.00500	431.8	0.19068	26.21	0.81100	12.9
K-602 1-5	00			16.64	0.00428	703.6	0.30904	20.42	0.76200	12.9
K-602 6	00			16.64	0.00428	800.2	2.08110	20.42	0.76200	12.9
K-902 1-7	000			15.32	0.01131	1050.2	0.46027	29.46	1.62200	12.9
K-902 8	000			15.32	0.01131	1140.4	3.89589	29.46	1.62200	12.9
* Badger Cluster				2.30	0.00098					

K-306 Seals - 1,140 seals at 7.2 gu/seal

TABLE G-4
Material Releases, Grams

Month	Depleted Reactor Tails U	Depleted Reactor Tails U-235	Normal U	Normal U-235	Enriched Reactor Tails U	Enriched Reactor Tails U-235
October, 1959	-	-	33,180	236	-	-
November, 1959	22,825	148	5,788	41	9,594	82
December, 1959	25,705	167	13,922	99	7,122	61
Total	48,530	315	52,890	376	16,716	143

Radiation Alarm

The new portable radiation alarm for use by the Materials Handling Department was tested and operation was satisfactory on 115 volt commercial power and on power from a portable gasoline powered electric generator. Faulty operation was first obtained when the alarm was powered by a power converter operated by a truck electrical system. This fault was corrected, however, when a constant voltage transformer was installed and internal adjustments in the alarm were made.

K-633-2 Test Loop

The K-633-2 test loop is complete and in operation. The total calculated volume of the system from the compressor flanges but excluding the compressor is 3,049.67 ft.^{3}

Toxicological Information

A survey conducted at the request of the AEC revealed no new chemically or radiologically toxic material generated or introduced to the ORGDP during 1959.

CORROSION AND CONSUMPTION

QUANTITATIVE DETERMINATION OF FLUORIDE FORMED ON BARRIER 1. BARRIER--CORROSION

Excellent agreement was found between the amounts of fluoride formed on as determined by the weight gain and pyrohydrolysis methods although sample to sample differences indicate a considerable variation in corrosion rates. Samples used in this determination were five 6-inch barrier tubes chosen at random from a group of fifty such tubes that were exposed to a mixture of

DISTRIBUTION

1. K-25 Site Records (RC)
2. ~~ChemRisk/Shonka Research Associates~~
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number K-1410 Date of document 12/22/58

Title and author (if document is unnumbered)

QCGDP QUARTERLY REPORT 7/1/58 - 9/30/58 - COPY ONLY TAGGED PAGES

(This section to be completed by Document Center)

Date request received 10/12/95

Date submitted to ADC 11/30/95

Date submitted to HSA Coordinator 10/12/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 11/30/95 1/10/96

Date received from CICO 1/5/96 2-22-96

Date submitted to ChemRisk/Shonka and DOE 2-22-96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

UNCLASSIFIED

K/EM-278

SANITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT FIRST QUARTER FISCAL YEAR 1959

(EXTRACTED FROM CRD DOCUMENT # K-1410)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

November 30, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release to the public by:

Asst Technical Information Officer 2/21/96
Oak Ridge K-25 Site Date

~~DOWNGRADED TO CRD~~
~~4/28/93 Gary W. Hall, AA~~
~~Downgraded to CRD~~
~~Sam W. Wohlfort, ADD, 1/5/94~~

~~SECRET~~

~~CONFIDENTIAL~~

~~This document consists of ..... pages~~
~~No. ..... of ..... copies, Series A.~~

REPORT NO. K-1410

Technology - Gaseous Diffusion Process
(M-3679-22nd Ed.)

DATE OF ISSUE: December 22, 1958

~~IND. REL. DIV.~~
~~K. W. BAHLER~~

OAK RIDGE GASEOUS DIFFUSION PLANT
QUARTERLY REPORT

FIRST QUARTER FISCAL YEAR 1959

July 1, 1958 thru September 30, 1958

~~Classification Changed To~~
~~CRD~~
~~(Insert Appropriate Classification Level and Category)~~
~~By authority of: Sam W. Wohlfort 1/5/94~~
~~(Authority for Change in Classification) (Date)~~
~~By: Gary W. Hall 2/11/94~~
~~(Signature of Person Making Change) (Date)~~
~~Verified by: Sam W. Wohlfort 2/11/94~~
~~(Signature of Person Verifying Change) (Date)~~

CENTRAL LIBRARY
REC. W40778
FILE
X-REF.
X-REF.

K 1410 12 A

K 1410 12 A

OAK RIDGE GASEOUS DIFFUSION PLANT

Operated by

UNION CARBIDE NUCLEAR COMPANY
DIVISION OF UNION CARBIDE CORPORATION

for the Atomic Energy Commission

UNCLASSIFIED

Acting Under U. S. Government Contract W7405 eng 26

~~**RESTRICTED DATA** This document contains restricted data as defined in the Atomic Energy Act of 1954. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.~~

~~RESTRICTED DATA This document contains Restricted Data as defined in the Atomic Energy Act of 1954. Unauthorized disclosure subject to Administrative and Criminal Sanctions.~~

~~SECRET~~

~~CONFIDENTIAL~~

2

TABLE C-6
Overall Plant Production (Q)

Month	Total, Kgs. Xe	Daily Rate, Kgs. Xe	% Change
	Previous Quarter		
April, 1958	2,840.797	94.693	-6.4
May	2,983.226	96.233	+1.6
June	2,872.518	95.751	-0.5
Total	8,696.541	95.566	-1.5
	Current Quarter		
July, 1958	3,118.312	100.591	+5.1
August	3,167.146	102.166	+1.6
September	3,083.598	102.787	+0.6
Total	9,369.056	101.838	+6.6

TABLE C-7
Uranium-235 Input to the ORGDP

Month	Total, Kgs. U-235	Daily Rate, Kgs. U-235	% Change
	Previous Quarter		
April, 1958	2,933.463	97.782	-7.3
May	3,095.110	99.842	+2.1
June	3,077.448	102.582	+2.7
Total	9,106.021	100.066	+0.1
	Current Quarter		
July, 1958	3,218.606	103.826	+1.2
August	3,288.349	106.076	+2.2
September	3,206.317	106.877	+0.8
Total	9,713.272	105.579	+5.5

OAK RIDGE URANIUM-235 GRADIENT

The ORGDP uranium-235 gradient level at the end of the quarter showed an increase across all sections of the cascade as compared to the gradient level at the end of the previous quarter. The increased feed rate resulted in the small increase that was observed in the gradient level across the K-33, K-31, K-29, and K-27 buildings. The increased target withdrawal assay for top product uranium raised the gradient level across the upper portions of the K-25 building. The cascade optimum load redistribution during the first of July produced a higher gradient level in the lower part of the K-25 building. Presented in figure C-4 are the cascade uranium and uranium-235 inventory levels for each month of the current fiscal year. Figure C-5 presents the ORGDP beginning and ending uranium-235 inventory levels for the report period, and table C-8 presents the cascade uranium-235 and enriched uranium-235 inventory levels, as well as the individual monthly and quarterly changes.

OAK RIDGE CASCADE MATERIAL BALANCE

The Oak Ridge cascade material balance showed a gain of 1249.483 kilograms of uranium during the first quarter of fiscal year 1959. This increase is considered within the normal deviation of current cascade operating conditions. The monthly uranium-235 deficiencies were -19.086, 0.876, and 30.452 kilograms for July, August, and September, respectively. These deficiencies give a book-physical uranium-235 inventory difference of -12.242 kilograms, which is within normal loss experience.

Cascade Inventory

TABLE C-8
Oak Ridge Cascade Inventory

Month	Ending U-235 Inventory	ΔU-235	Ending Xe Inventory	Δ Xe
		Previous Quarter		
March, 1958		-		-
April		+277.598		+285.715
May		- 102.436		- 115.085
June		+254.588		+241.327
Total		+429.750		+111.957
		Current Quarter		
June, 1958		-		-
July		+263.455		+265.889
August		- 116.788		- 121.141
September		- 120.053		- 111.950
Total		+ 26.614		+ 32.798

CASCADE STREAMS

The feed rate of Paducah product material to the Oak Ridge cascade during the report period averaged 8876.6 kilograms uranium per day at an average assay of 1.395%. The uranium-235 contained in this feed stream averaged 123.865 kilograms per day, an increase of approximately 2.541 kilograms per day above that of the previous quarter. The auxiliary stream averaged 5751.4 kilograms of uranium per day at an average assay of 0.700%. The auxiliary feed stream to the Oak Ridge cascade was maintained at the optimum level throughout the report period; this stream consisted primarily of normal assay uranium. The uranium-235 contained in the average daily auxiliary feed stream was 7.355 kilograms greater than that of the preceding quarter. The feed rate of enriched

MATERIAL RELEASES

Five releases involving uranium material occurred at the ORGDP during the first quarter of fiscal year 1959. This number compares with 4 such releases during the preceding quarter. Three of the releases this quarter involved defective cylinder valves and occurred in the K-631 building, Lab A, and at the north side of the K-1413 building on September 3, 11, and 24, respectively. The other releases occurred at the K-1004 pilot plant on September 2 and on the road between K-1131 and K-1410 on September 5. The release at the pilot plant occurred when a seal failed during a power failure; the release on September 5, 1958, concerned uranium tetrafluoride which spilled from equipment en route for decontamination.

Table C-17 summarizes the known amount of material involved in the releases described above. Also included are the releases in the cylinder storage vaults and material vented during the operation of the K-1131 feed plant during the quarter.

TABLE C-17
Material Releases

Date	Location	Amount Released, Grams	
		Uranium	Uranium-235
September 2, 1958	K-1004-L	7,666	51
September 3, 1958	K-631	307	1
September 11, 1958	K-1004-A	705	3
July, 1958	Storage Vault	68	0
July, 1958	K-1131 Vent	40,527	288
August, 1958	K-1131 Vent	58,854	407
September, 1958	K-1131 Vent	54,326	387
Total		162,453	1,137
% Change from Previous Quarter		+133.2	+124.7

CASCADE STREAM EFFICIENCY

The ORGDP cascade operated at an onstream efficiency of 99.71% during the first quarter of fiscal year 1959. This represents a decrease of 0.01% below that of the preceding quarter. Excluding outages for equipment exchange programs, the ORGDP cascade operated at an onstream efficiency of 99.79% (99.82% last quarter). Omitting offstream time for equipment exchange programs and power outages, the ORGDP cascade onstream efficiency becomes 99.80% (99.85% last quarter). The total onstream efficiencies during the quarter for buildings K-33, K-31, K-29, K-27, and K-25 were 99.72%, 99.62%, 99.50%, 99.76%, and 99.73%, respectively.

The monthly cascade onstream efficiencies during fiscal years 1958 and 1959 to date are presented in figure C-11. The offstream time, the per cent of total offstream time, the number of times offstream, and a comparison with the same items for the preceding quarter are summarized in table C-18.

The cost of offstream time during the quarter for buildings K-33, K-31, K-29, K-27, and K-25 amounted to 45.15%, 27.17%, 14.59%, 7.15%, and 5.94%, respectively, of the total cost.

Figure C-12 presents a tabulation of the monthly cost of offstream time for fiscal years 1958 and 1959, to date.

PURGE CASCADE OPERATIONS

Unit K-312-1 was operated as the cascade top purge throughout the first quarter of fiscal year 1959. Unit K-311-1 was operated as the cascade side purge facility during the report period.

The purge facilities in units K-311-1 and K-312-1 purged an average of 18,108 scf per day and 5,787 scf per day, respectively. The total purge rate during the quarter averaged 23,896 scf per day, an increase of 0.1% above that of the fourth quarter of fiscal year 1958.

The average uranium hexafluoride concentration of the purge gases from the K-312-1 purge facility was 8.501×10^{-5} mole per cent during the report period. The purge gases from the K-311-1 side purge facility had an average uranium hexafluoride concentration of 2.933×10^{-5} mole per cent. The average daily purge rates are presented in table C-20 for each month of the fourth quarter of fiscal year 1958 and the first quarter of fiscal year 1959. Figure C-13 depicts the monthly purge rates for fiscal years 1958 and 1959, to date.

TABLE C-18
Separating Cascade Cell Offstream Time

	Offstream Time, Hours	% of Total Offstream Time	Increase in Offstream Time over Previous Quarter	Number of Times Offstream	% of Total Number of Times Offstream	Increase in Number of Times Offstream over Previous Quarter
Pump Seal Repairs	1,225.00	30.06	+151.92	356	26.20	+46
Stage Motor Repairs	157.09	3.85	+80.27	43	3.16	+15
Stage Pump Repairs	182.23	4.47	+45.41	29	2.13	+15
Converter Replacement	87.63	2.15	+6.50	10	0.74	+1
Electrical Equipment Repairs	7.22	0.18	+2.19	7	0.52	+3
Inleakage Checks	120.13	2.95	+41.59	373	27.45	+122
Control Valve Repairs	9.55	0.23	+3.29	4	0.29	+1
Coolant Inleakage Checks	10.55	0.26	+10.17	12	0.88	+11
Instrumentation Repairs	-	-	-	-	-	-
Lube System Repairs	20.48	0.50	+1.12	29	2.13	+4
Coolant System Repairs	122.79	3.01	-74.91	39	2.87	-6
Engineering Tests	296.36	7.27	+157.02	25	1.84	-6
ClF_3 Operations	201.85	4.95	+136.35	34	2.50	+16
Equipment Exchange Program	1,155.90	28.37	-285.39	119	8.76	-19
Miscellaneous	354.18	8.69	+156.57	166	12.22	+43
Coolant Leaks to the Cascade	12.80	0.31	+10.78	3	0.22	+2
Power Load Reduction	112.24	2.75	-243.88	110	8.09	-17
Totals	4,076.00	100.00	+199.00	1,359	100.00	+231

TABLE C-19
Cost of Offstream Time, 1958

	April	May	June	July	August	September
Pump Seal Repairs	8,114.73	3,712.87	5,431.55	9,512.56	8,693.96	5,019.50
Stage Motor Repairs	2,348.50	1,357.51	289.87	1,867.53	1,918.38	1,510.05
Stage Pump Repairs	699.62	642.29	661.13	464.82	568.09	134.40
Converter Replacement	688.73	870.56	919.30	3,710.16	2,814.23	426.31
Electrical Equipment Repairs	24.55	98.53	12.54	123.87	71.84	80.85
Inleakage Checks	625.80	257.05	442.97	1,208.17	1,023.97	788.23
Control Valve Repairs	208.57	108.70	82.05	-	673.95	6.17
Coolant Inleakage Checks	-	-	36.15	702.12	754.71	-
Instrumentation Repairs	-	-	-	-	-	-
Lube System Repairs	113.96	6.05	107.35	8.36	64.38	63.99
Coolant System Repairs	693.61	662.11	229.21	1,289.83	754.73	1,155.69
Engineering Tests	4,254.79	3,930.26	1,852.02	-	63.56	7,193.73
ClF_3 Operations	45.93	96.67	678.01	939.68	2,167.55	86.86
Equipment Exchange	18,344.00	16,625.37	10,008.86	24,599.84	34,178.91	25,244.62
Miscellaneous	2,611.68	842.64	1,029.22	3,448.96	2,985.76	2,994.65
Special Coolant Leaks	-	192.14	-	195.28	1,581.64	-
Power Outages	11,394.32	1,047.33	1,508.37	3,069.52	1,532.42	1,972.77
Totals	50,218.79	30,450.16	23,288.60	51,140.70	59,848.08	46,677.82

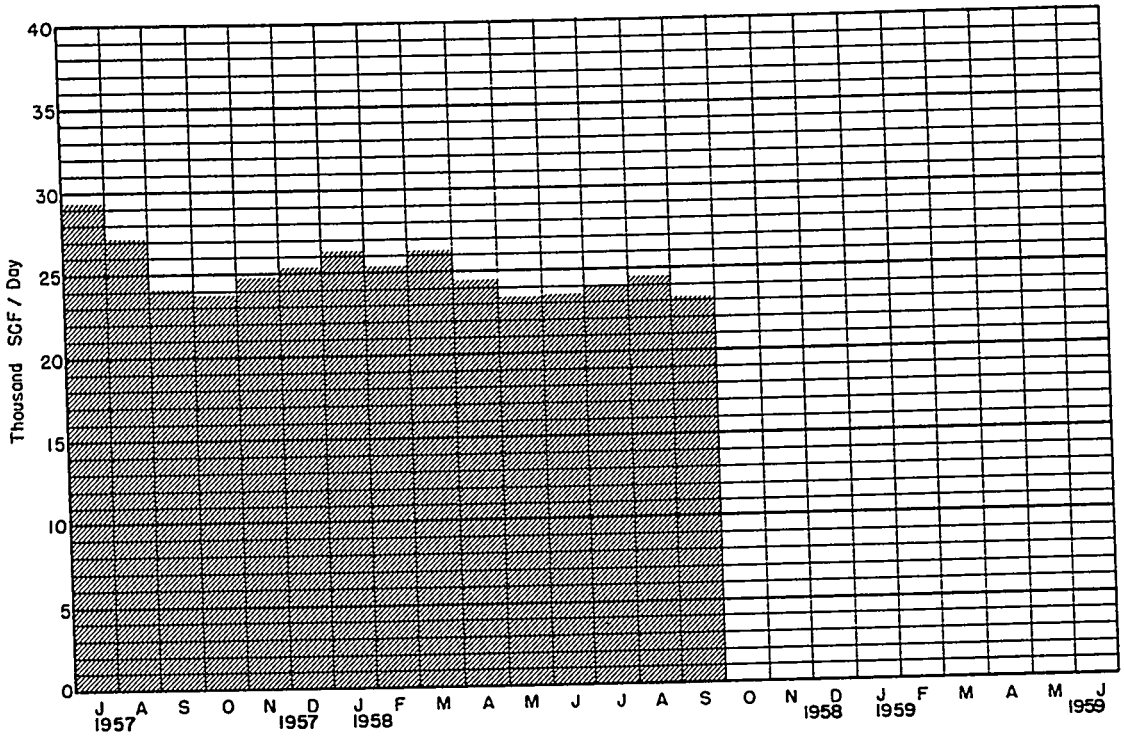


FIGURE C-13
Cascade Purge Rate

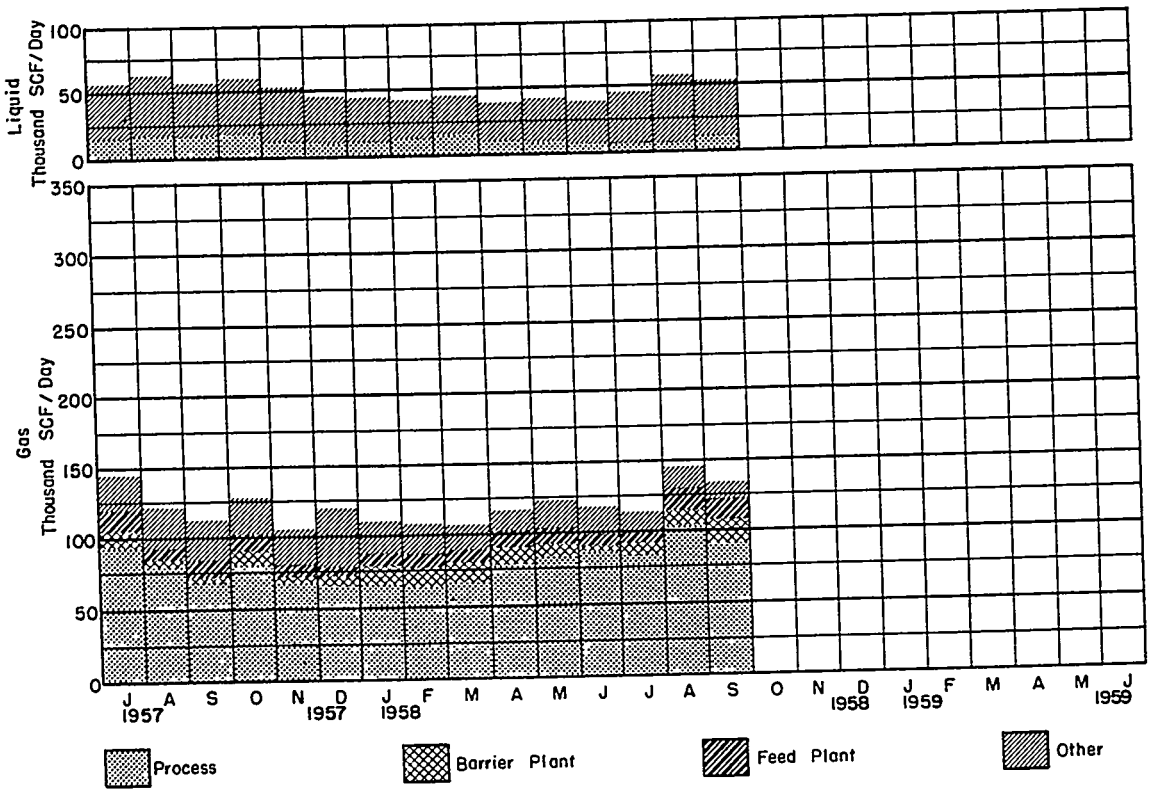


FIGURE C-14
Nitrogen Usage

TABLE C-20
Cascade Purge Rates

Month	Average Purge Rates, Scf per Day			
	Top Purge Facilities*	Side Purge Facilities		Combined Purge Facilities
		K-312-1*	K-311-1	
April, 1958	2,842	7,291	14,401	24,534
May	5,049	1,412	17,033	23,494
June	5,646	-	17,921	23,567
July	5,712	-	18,288	24,000
August	5,880	-	18,604	24,484
September	5,769	-	17,412	23,181

* Unit K-312-3 was the top purge facility until May 7, 1958. After this date, the unit was removed from operation, and the status of unit K-312-1 was changed from a side purge facility to that of the top purge facility.

BARRIER PERMEABILITY SUMMARY

The majority of the barrier types in the centrifugal stages of the K-25 and K-27 buildings displayed increased permeabilities during the quarter, resuming the trend initiated during the third quarter of fiscal year 1958, but interrupted, apparently as the result of side purge changes, during the fourth quarter of fiscal year 1958.

The barrier permeabilities in the axial stages of the K-29, K-31, and K-33 buildings continued the decreasing trend which has been apparent for several quarters. Average monthly permeability changes during the report period and the corresponding average changes during the past two years are tabulated in table C-21 for the various barrier types within each building of the cascade.

K-25 BUILDING

With one exception, the barrier types in the K-25 building exhibited increasing permeabilities during the report period, reversing the trend observed during the preceding quarter. However, the increased permeabilities of the current report period are apparently a continuation of the trend initiated during the third quarter of fiscal year 1958 which was interrupted during the fourth quarter by the changes in side purge operations. These side purge changes resulted in varied light gas concentrations in the K-25 cascade and affected the method of permeability determination. Thus, it is probable that the permeabilities measured during the previous quarter are misleading and that, had there been no side purge changes, the current quarter would be the third consecutive period of increased average K-25 building barrier permeability.

K-27 BUILDING

in the K-27 building reversed the trend apparent during 3 preceding quarters, decreasing in permeability by an average of 0.07% per month. The average change for these barriers during the past 2 years has been -0.02 ± 0.04% per month. The small diameter barrier in the K-27 building increased in permeability an average of 0.28% per month this quarter as opposed to a

satisfactory as compared with 94% during last period.

Current results of audits are compared with those of other periods in table E-20.

TABLE E-20
Safety, Fire Protection, and Electrical Audit Results

	This Quarter	Last Quarter	1958[a]	1957[a]	1955-1957[a]
General Safety					
Plant Conditions					
Number Audited	6,646	10,427	9,428	12,051	11,733
Number Satisfactory	6,319	9,947	8,987	11,417	11,026
% Satisfactory	95	95	95	95	94
Employee Safe Practices					
Number Audited	687	1,078	1,000	1,328	1,531
Number Satisfactory	592	1,012	924	1,217	1,383
% Satisfactory	86	94	92	92	90
Fire Protection					
Number Audited	948	1,677	1,491	2,005	1,925
Number Satisfactory	926	1,631	1,453	1,929	1,824
% Satisfactory	98	97	97	96	95
Electrical					
Number Audited	3,898	7,488	6,350	7,962	6,755
Number Satisfactory	3,582	7,070	5,939	7,527	6,275
% Satisfactory	92	94	94	95	93

[a] Where totals are concerned, figures refer to quarterly averages.

AIR-BORNE CONTAMINANTS

Chemicals

Decreases of 46% in the number of non-radioactive air samples taken and of 27% in significant findings from these samples were noted.

Alpha Activity

The number of shift-length air samples in excess of the plant acceptable limit and the average air activity indicated by the continuous sampling program increased only slightly and revealed no significant change from the relatively low levels established during the previous period. Only 0.6% of the samples taken exceeded the P.A.L., and these occurred primarily in the K-1131 Feed Production and K-1413 Engineering Development Facilities during equipment maintenance activities.

The number of spot air samples exceeding the P.A.L. which were taken in conjunction with audit surveys decreased significantly and the average air activity recorded was less than one-half the corresponding figure of the last report period; the decrease may be attributed in part to improved exhaust facilities and material-handling procedures in the K-1420 and K-1410 Equipment-Cleaning Buildings.

Air-borne alpha activity data are tabulated in table E-21, and are shown graphically in figure E-3.

ALPHA CONTAMINATION

Plant alpha contamination levels, as reflected by audit surveys of both operating and staff groups in the 22 plant locations where significant contamination is encountered, increased about 28% from that of last quarter. This increase is primarily the result of contamination spread during routine operations and maintenance activities in the K-1131 Feed Production facilities.

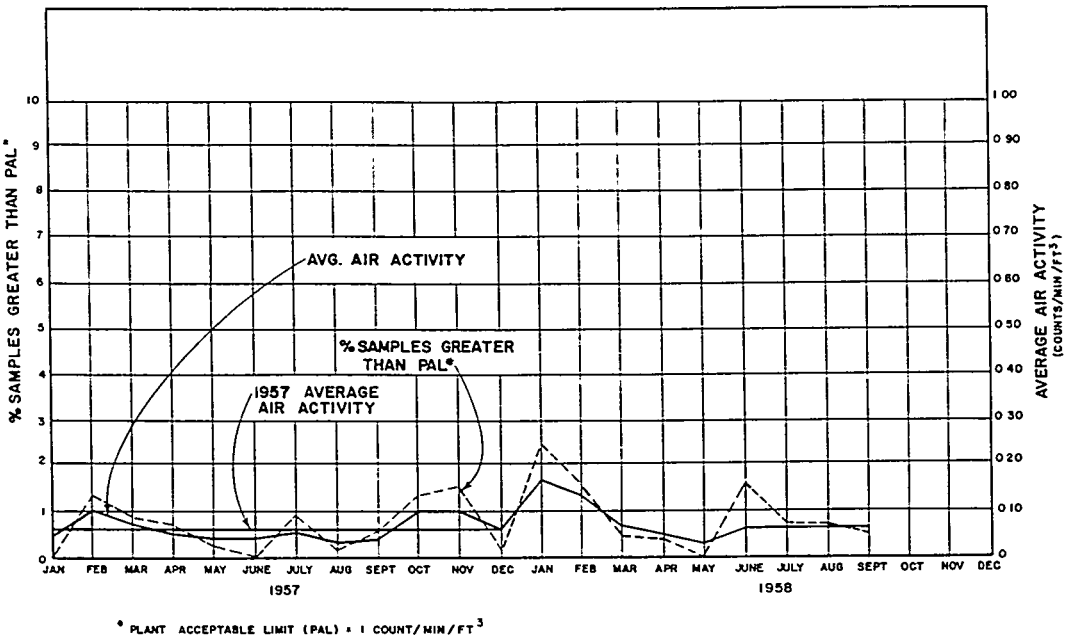


FIGURE E-3
Plant Air Activity and Shift-Length Air Samples

TABLE E-21
Environmental Radiation and Radioactive Materials

	This Quarter	Last Quarter	1958[a]	1957[a]	1953-1957[a]
Air Activity (Shift-Length)					
No. Samples Taken	788	1,034	1,148	2,512	2,164
No. Above P.A.L.[b]	5	4	11	17	26
Av. Activity per Sample (c/min/ft^3)	0.06	0.05	0.09	0.06	0.12
Air Activity (Spot)					
No. Samples Taken	222	215	224	219	278
No. Above P.A.L.[b]	11	23	24	15	27
Av. Activity per Sample (c/min/ft^3)	0.40	1.0	0.92	0.94	0.87[c]
Alpha Contamination					
Plant Contamination Index[d]	436	312 (340)	337	138	225
No. Locations Included	22	25	24	44	59
% Plant Area Surveyed	1.1	1.1	1.1	1.7	2.0
Penetrating Radiation					
Radiation Index[e]	6.2	5.4 (5.0)	5.3	3.4	2.2
No. Locations Included	10	8	8.7	10	8.7
Plant Sanitary Water					
Av. Beta Activity (dis/min/100 ml)	68	47	48	27	31
Av. Uranium Concentration (ppb) in Sanitary Water Influent	2.9	3.4	2.6	4.0	-

[a] Where totals are concerned, figures refer to quarterly averages.

[b] P.A.L. - Plant Acceptable Limit.

[c] 1954 through 1957 only.

[d] The contamination index is a figure which reflects the product of the extent and intensity of alpha contamination exceeding the P.A.L. Effective July 1, 1957, values included only those plant locations with a 6-month average contamination index of 10 or greater; values for periods prior to that date included those locations with a 6-month average contamination index of 2.0 or greater. The value in parentheses represents the contamination index last quarter for those areas currently included in the calculation of the index.

[e] The radiation index, which reflects both the extent and intensity of radiation found, is essentially the product of the work area over which the dose rate is more than 7.5 mrep/hr and a weighting factor which depends upon the actual radiation intensities over the area concerned. The value in parentheses represents the radiation index last quarter for those areas currently included in the calculation of the index.

UNCLASSIFIED

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

//

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number K-1361 Date of document 3/11/58

Title and author (if document is unnumbered)

Copy tab pages only

(This section to be completed by Document Center)

Date request received 10/12/95

Date submitted to ADC 11/30/95

Date submitted to HSA Coordinator 10/12/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 11/30/95 1/10/96

Date received from CICO 1/5/96 2-22-96

Date submitted to ChemRisk/Shonka and DOE 2-22-96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

UNCLASSIFIED

K/EM-284

SANITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT SECOND FISCAL QUARTER OCTOBER 1, 1957 THRU DECEMBER 31, 1957

(EXTRACTED FROM CRD DOCUMENT # K-1361)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

November 30, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release to the public by:

for John F Preston 2/21/96
Technical Information Officer Date
Oak Ridge K-25 Site

[redacted]
12/28/93 [redacted]
Downgraded to CRD
Sam W. Wohlfort, ADD, 1/5/94

[redacted]

This document consists of 192 pages
No. 40 of 108 copies, Series A.

[redacted]

DATE OF ISSUE: March 11, 1958 REPORT NO. K-1361

UNCLASSIFIED

PLANT RECORDS
2-19501

CENTRAL LIBRARY
REC. W40757
X-REF.
X-REF.

OAK RIDGE GASEOUS DIFFUSION PLANT
QUARTERLY REPORT
SECOND FISCAL QUARTER
October 1, 1957 thru December 31, 1957

Classification Changed To
CRD
(Insert Appropriate Classification Level and Category)

By authority of: Sam W. Wohlfort 1/5/94
(Authority for Change in Classification) (Date)

By: Sam W. Hall 2/11/94
(Signature of Person Making Change) (Date)

Verified by: Sam W. Wohlfort 2/11/94
(Signature of Person Verifying Change) (Date)

LOAN COPY
TO BE RETURNED TO
PLANT RECORDS K-1031

K 1361 40 A

UNCLASSIFIED

K 1361 40 A

OAK RIDGE GASEOUS DIFFUSION PLANT

Operated by

UNION CARBIDE NUCLEAR COMPANY
DIVISION OF UNION CARBIDE CORPORATION

for the Atomic Energy Commission

Acting Under U. S. Government Contract W7405 eng 26

RESTRICTED DATA
This document contains restricted data as defined in the Atomic Energy Act of 1954. Unauthorized disclosure subject to Administrative and Criminal Sanctions.

~~RESTRICTED DATA~~ ~~This document contains restricted data as defined in the Atomic Energy Act of 1954. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.~~

[redacted]

ABNORMAL OPERATIONS

POWER DISTURBANCES

Difficulties with the B cable interrupted the operation of 113 cells in the K-25 building for 2,350 cell-hours on October 21, 12 cells for 24.5 cell-hours on October 23, and 4 cells for 4.5 cell-hours on October 25.

The total area scheduled demand was reduced 60 mw on November 2 as a result of simultaneous outages of two generating units for overhaul at the Kingston generating station, and loading restrictions of 50% on two other units due to boiler tube leaks. Reductions were effected in the K-33 building by operational interruption to 5 cells in units 6 and 7 for 10.9 cell-hours and by lowering operating pressures in units 1, 2, 3, and 8. Electrical load increases at the ORGDP were initiated within 11 hours; normal area loading was resumed within 18 hours.

The ORGDP generating station output was interrupted temporarily on November 25 as a result of a superheater-tube leak in the No. 3 boiler. During the boiler outage, 14 cells in the K-302 section, 35 cells in the K-301 section, and 12 cells in the K-309 section were inoperative for total outage-times of 462, 1155, and 396 cell-hours, respectively. An additional 25 mw was scheduled from TVA while the boiler was repaired. On November 26, the boiler was returned to service, and the TVA demand was restored to the original 2035 mw level.

The ORGDP electrical generation varied up to 4 mw from November 11 through December 15 as dictated by the availability of natural gas fuel. Stage-pressure adjustments were effected in the K-301 and K-309 sections to maintain the desired electrical load in the K-25 building. The ORGDP generation was reduced 30 mw to the 55 mw level on December 3 for repairs to turbo-generator No. 6. A 5 mw load reduction was effected in the K-303 section to remain within cable capabilities. During the outage, 25 mw of additional power was purchased from TVA. Stage-pressures in the K-303 section were restored to normal within 28 hours.

COOLANT LEAKS

The only coolant inleakage at ORGDP during the quarter occurred in cell 10 of unit K-303-7. The 4.8 pounds per day liquid coolant leak occurred subsequent to the installation of converters on November 14. The leak was eliminated with the substitution of the stage 1 converter on November 18.

MATERIAL RELEASES

Four releases of uranium material other than from the vent stack in the K-1131 building were experienced at ORGDP during the second quarter of fiscal year 1958 as opposed to six such releases during the preceding quarter. Most of the material released at ORGDP is vented during the operation of the K-1131 feed manufacturing facility; however, the amounts thus lost decreased this quarter by 14,422 grams and 98 grams of uranium and uranium-235, respectively.

A process gas release occurred in the K-413 building on October 10 when a calrod heater damaged the oil line to the W-2 pump mist-filter. A second release occurred 10 hours later when the replacement mist-filter was being welded and a uranium deposit in the pump apparently became warmed.

A release occurred on October 28 during the removal of powder obstructions between a cleanup-reactor and the cold-trap in the K-1131 building. The amount of material involved in the 1 minute release was minor, and no estimates are available of the total uranium included.

During the transportation of a filter from the K-1131 to the K-1410 building on November 21, a blanked-flange became loosened from the bottom of the filter, permitting an insignificant quantity of ash to escape.

A bellows in a drain-line valve in the K-631 building ruptured on November 26, allowing approximately 1 pound of liquid uranium to escape.

Table C-14 summarizes the amount of material vented during operation of the K-1131 feed plant during the quarter. Also included are the amounts of material involved in the releases described above.

TABLE C-14
Material Releases

Date	Location	Amount Released, Grams	
		Uranium	Uranium-235
10-10-57	K-413	3,041	46
10-28-57	K-1131	-	-
10-57	K-1131 Vent	14,740	103
11-21-57	K-1131	-	-
11-26-57	K-631	307	1
11-57	K-1131 Vent	23,409	167
12-57	K-1131 Vent	18,588	126
Total		60,085	443
% Change from Previous Quarter		-18.5	-34.8

CASCADE STREAM EFFICIENCY

The ORGDP cascade operated at an onstream efficiency of 99.36% during the second quarter of fiscal year 1958. This represents a decrease of 0.22% below that of the preceding quarter. Excluding outages for equipment exchange programs, the ORGDP cascade operated at an onstream efficiency of 99.49% (99.68% last quarter). Omitting offstream time for equipment exchange programs and power outages, the ORGDP cascade onstream efficiency becomes 99.82% (99.80% last quarter). The total onstream efficiencies during the current quarter for buildings K-33, K-31, K-29, K-27, and K-25 were 99.83%, 99.42%, 99.83%, 99.56% and 99.16%, respectively.

The monthly cascade onstream efficiencies during fiscal years 1957 and 1958 to date are shown in figure C-11. The offstream time is summarized in table C-15, as well as the per cent of total offstream time, the number of times offstream, and a comparison with the same items for the preceding quarter.

The costs of offstream time, broken down by causes, for the current and preceding quarters are shown in table C-16. Figure C-12 presents a tabulation of the monthly cost of offstream time for fiscal years 1957 and 1958 to date.

The cost of offstream time during the quarter for buildings K-33, K-31, K-29, K-27, and K-25 amounted to 16.16%, 27.96%, 3.47%, 0.77%, and 51.64%, respectively, of the total cost.

TABLE C-15
Separating Cascade Cell Off-Stream Time

	Off Stream Time Hours	% of Total Off-stream Time	Increase in Off-stream Time, over Previous Quarter	Number Times Off-stream	% of Total Number of Times Off-stream	Increase in Number of Times Offstream over previous Quarter
Pump Seal Repairs	1164.29	12.91	- 178.67	426	27.22	- 10
Stage Motor Repairs	80.71	0.89	+ 2.28	23	1.47	+ 3
Stage Pump Repairs	316.88	3.51	+ 124.23	37	2.36	+ 2
Converter Replacement	32.64	0.36	- 40.02	3	0.19	- 6
Electrical Equipment Repairs	8.32	0.09	- 11.48	4	0.26	- 2
Inleakage Checks	94.12	1.04	- 9.87	327	20.89	- 14
Control Valve Repairs	12.55	0.14	- 26.03	7	0.45	- 2
Coolant Inleakage Checks	0.48	0.01	- 8.03	1	0.06	- 7
Instrumentation Repairs	4.22	0.05	- 6.36	2	0.13	- 2
Lube System Repairs	37.58	0.42	+ 23.51	39	2.49	+ 11
Coolant System Repairs	243.72	2.70	+ 107.50	49	3.13	+ 19
Engineering Tests	281.95	3.13	+ 50.59	34	2.17	- 1
ClF_3 Operations	49.39	0.55	- 18.91	12	0.77	- 2
Equipment Exchange Program	1547.31	17.15	+ 74.71	97	6.20	- 27
Miscellaneous	551.56	6.11	+ 25.56	210	13.42	+ 54
Coolant Leaks to the Cascade	-	-	- 33.14	-	-	- 5
Power Load Reduction	4594.83	50.94	+ 2984.02	294	18.79	- 282
Totals	9020.55	100.00	+ 3059.89	1565	100.00	- 271

TABLE C-16
Cost of Off-Stream Time

	July 1957	August 1957	September 1957	October 1957	November 1957	December 1957
Pump Seal Repairs	3297.54	3832.56	2937.67	3617.01	3017.26	2810.13
Stage Motor Repairs	69.82	266.27	-	330.26	265.45	37.08
Stage Pump Repairs	1699.80	1600.57	227.47	1013.44	1413.54	864.60
Converter Replacement	256.00	459.20	142.38	-	84.02	150.98
Electrical Equipment Repairs	30.36	48.20	1.62	82.09	-	140.59
Inleakage Checks	266.27	374.78	308.75	374.67	254.46	249.96
Control Valve Repairs	328.23	1114.61	26.25	10.19	33.25	90.07
Coolant Inleakage Checks	34.17	2.14	315.98	2.88	-	-
Instrumentation Repairs	7.30	275.55	-	-	-	57.52
Lube System Repairs	33.27	14.78	15.89	50.57	58.38	260.91
Coolant System Repairs	128.07	357.26	271.54	328.85	618.76	760.86
Engineering Tests	430.88	369.76	491.24	901.86	195.82	1220.12
ClF_3 Operations	230.73	111.73	94.82	91.91	91.73	69.10
Equipment Exchange Program	4348.90	7771.21	3684.04	7453.17	5532.14	4792.37
Miscellaneous	1212.59	898.42	638.83	1567.99	2521.48	1412.78
Coolant Leaks	-	30.62	609.96	-	-	-
Power Outages	327.39	359.64	8852.60	9624.26	15,792.31	1166.50
Totals	12,701.32	17,887.30	18,619.04	25,449.15	29,878.60	14,083.57

PURGE CASCADE OPERATIONS

Unit K-312-3 was operated as the cascade top purge throughout the second quarter of FY 1958. Units K-312-1 and K-311-1 were operated as cascade side purge facilities during the report period.

The purge facilities in units K-312-1, K-311-1, and K-312-3 purged an average of 7,220 scf per day, 15,140 scf per day, and 2,280 scf per day, respectively. The total purge rate during the quarter averaged 24,640 scf per day, a decrease of 8.0% below that of the first quarter of FY 1958.

The purge gases from the K-312 purge facilities had an average uranium hexafluoride concentration of 17.6×10^{-5} mole per cent. The uranium hexafluoride concentration in the purge gases from the

K-311-1 side purge facility averaged 6.6 x 10^{-5} mole per cent. The average daily purge rates are presented in table C-17 for each month of the first and second quarters of FY 1958. Figure C-13 depicts the monthly purge rates for FY 1957 and FY 1958, to date.

TABLE C-17
Cascade Purge Rates

Month	Average Purge Rates, Scf per Day			
	Top Purge Facility	Side Purge Facilities		Combined Purge Facilities
		K-312-1	K-311-1	
July	2,658	9,888	16,788	29,334
August	2,220	9,265	15,538	27,023
September	2,239	7,983	13,781	24,003
October	2,191	6,574	15,048	23,813
November	2,272	7,695	14,855	24,822
December	2,378	7,407	15,499	25,284

BARRIER PERMEABILITY SUMMARY

Barrier permeabilities throughout the ORGDP cascade generally experienced decreases during the second quarter of FY 1958. The one notable exception to this trend was the K-29 building, where the barrier permeability increased significantly. The decreasing permeability tendency was especially evident in the K-33 building. The trend was lessened

K-25 BUILDING

Barrier permeabilities in the K-25 building displayed a decreasing trend during the quarter, with an average rate of change of -0.02% per month. The average rate for the past 2 years has been a decrease of 0.08 ± 0.02% per month.

The barriers exhibited permeability decrease rates of 0.61, 0.07, and 0.05% per month, respectively. The indicated rates are in accord with the decrease rates experienced in these barrier types for the past 2 years. The change was much greater than past experience, possibly due to pressure adjustments effected in the sections of the plant where this barrier type is installed. The pressure revisions were necessitated by power outages, and are of a temporary nature. The barrier installed in the K-25 building is composed largely of barrier transferred from the K-27 building. The apparent permeability increase indicated for this barrier probably resulted from pressure revisions.

K-27 BUILDING

The barrier in the K-27 building displayed a barrier permeability increase rate of 0.07% per month during the report period. The rate of change for these barriers during the past 2 years has been -0.06 ± 0.02% per month. The barrier type experienced a decrease rate of 1.42% per month. The operating temperature of the stages in which this barrier type is installed was increased during the report period; the large permeability change reported was largely a result of the effective change in permeability associated with this change in stage temperature. In addition, the majority of this barrier is of recent installation; large permeability decreases are common with newly installed barrier.

personnel of the first nuclear safety training school for representatives of the Commission and Commission contractors.

Following its discussion in a paper at an American Nuclear Society meeting, lively and renewed interest has been exhibited by many organizations throughout the nation in the simple device used at the ORGDP since 1950 for monitoring personnel in the event of possible nuclear accidents; its use had previously been adopted by several Commission contractors.

TABLE E-20
Safety Meetings and Attendance

	This Quarter	Last Quarter	1957[a]	1956[a]	1953 - 1956[a]
Meetings Reported	348	314	331	345	249
Attendance	5,820	5,107	5,577	5,998	4,195

[a] Values are quarterly averages.

PLANT EVALUATION

REVIEWS OF PLANT PROGRAMS

Following the sharp increase in the disabling-injury experience as reported for the second quarter of 1957, the normal plant review and evaluation program was extended to include a detailed analysis of the accident and injury experience over a 5-year period, with particular attention being given to factors affecting unsafe acts on the part of employees, which, as in previous years, were the primary causes of approximately 88% of the injuries. The extended injury-free period of approximately 2,660,000 employee-hours achieved during this report period was considered to reflect the efforts of the plant groups in implementing improved work practices on the part of employees as well as taking other specific safety measures.

NUCLEAR SAFETY

No deviations from the provisions of approval letters were noted on audits of plant equipment and operations, which included a special, detailed over-all audit, and the total of 4 for the year is the lowest in several years. An undetected uranium accumulation in a converter was formally investigated and the committee recommendations to prevent a similar occurrence have been placed in effect.

Changes in cascade operations and equipment effected during the year as a result of the shutdown of the K-306 Section of the K-25 Production Unit included the installation of necessary additional unit block valves for automatic sectionalization of the cascade for inventory control in the event of power difficulties.

MECHANICAL

Routine inspections and tests of pressure relieving devices, boilers, pressure vessels, cylinders, hoisting equipment, turbines, and diesel engines showed no significant change from the conditions noted during previous quarters in the degree of operational safety provided. Unacceptable conditions evidenced during routine inspections included an inoperative high temperature shutdown device on one of 16 diesel engines on emergency generating units, one tank in K-1231 found to be cracked and consequently condemned for pressure service, and several cracks requiring welding repair were detected in the casting of No. 5 power turbine by Magnaflux inspection.

A summary of routine inspections and tests are shown in table E-21.

TABLE E-21
Mechanical Inspections and Tests

	This Quarter	Last Quarter	1957[a]	1956[a]
PRESSURE RELIEF DEVICES				
No. Tested, Repaired or Replaced	689	634	755	975
No. Satisfactory	136	206	330	544
% Satisfactory	19.8	32.5	43.7	56.0
% with Obstructed Vents[b]	31.4	30.6	22.4	12.0
% with Stop Valves Closed[c]	3.1	3.0	4.3	1.8
COMPRESSED GAS AND UF_6 CYLINDERS				
No. Tested	104	196	235.5	382
No. Satisfactory[d]	102	195	249.75	376
% Satisfactory	99	99.5	98.5	98
BOILERS AND PRESSURE VESSELS				
No. Inspected or Tested	546	515	568.5	919
No. Satisfactory[d]	537	502	555	830
% Satisfactory	98.3	97.4	97.6	90.0
HOISTING EQUIPMENT[e]				
No. Inspected or Tested	506	482	524	445
No. Satisfactory[d]	451	358	436.75	401
% Satisfactory	89.1	90.1	83.3	90.0

[a] Where totals are concerned, figures refer to quarterly averages.

[b] Includes vents with 25% or more obstruction on inlet or outlet.

[c] Refers to installations on which shutoff valves are installed.

[d] Includes equipment with minor defects not affecting safe operation.

[e] Includes cranes, hoists, elevators, lifts, and winches.

SAFETY, FIRE PROTECTION, AND ELECTRICAL

A more or less steady improvement in plant conditions as related to personnel safety was noted throughout 1957, with audits of general plant safety conditions, employee practices, fire protection features, and electrical items indicating appreciable increases in the proportion of items found to be satisfactory in all categories. For each of these types of items, the audit results indicated reductions of approximately 30% in the number of unsatisfactory conditions, as the proportion of satisfactory items increased from the already relatively high value of 93% for 1956 to 95% for 1957.

Current results of audits are compared with those of other periods in table E-22.

AIR-BORNE CONTAMINANTS

Chemicals

With the increasing use of gas-shielded electric welding methods, the air monitoring program for the associated carbon monoxide and ozone was expanded to permit a continuing evaluation of the exposure potential arising from this type of operation, and the effects of these activities are reflected in the data of table E-23, where the results of analyses for air-borne chemicals are summarized. As previously noted under ENGINEERING DESIGN AND SPECIFICATIONS, the installation of devices to reduce air-borne concentrations of nickel in the K-1037 Barrier Plant was initiated.

TABLE E-22
Safety, Fire Protection, and Electrical Audit Results

	This Quarter	Last Quarter	1957[a]	1956[a]
General Safety				
Plant Conditions				
Number Audited	11,605	8,771	12,051	14,430
Number Satisfactory	11,004	8,258	11,417	13,383
% Satisfactory	95	94	95	93
Employee Safe Practices				
Number Audited	1,261	1,036	1,328	1,613
Number Satisfactory	1,181	951	1,217	1,424
% Satisfactory	94	92	92	88
Fire Protection				
Number Audited	1,969	1,703	2,005	2,345
Number Satisfactory	1,926	1,602	1,929	2,199
% Satisfactory	98	94	96	94
Electrical				
Number Audited	8,040	7,150	7,962	8,263
Number Satisfactory	7,568	6,785	7,527	7,687
% Satisfactory	94	95	95	93
Total Items Audited				
Number Audited	22,875	18,660	23,346	26,651
Number Satisfactory	21,679	17,596	22,090	24,693
% Satisfactory	95	94	95	93

[a] Where totals are concerned, figures are quarterly averages.

TABLE E-23
Sample Analyses for Air-Borne Chemicals[a]

	This Quarter	Last Quarter	1957[b]	1956[b]	1952 - 1956[b]
Carbon Monoxide					
No. Analyses	72	42	66	124	72
Significant Results	22	1	10	13	6
Fluoride					
No. Analyses	56	105	78	112	65
Significant Results	0	1	<1	49	27
Hydrogen Fluoride					
No. Analyses	736	819	579	430	305
Significant Results	4	16	8	9	10
Mercury					
No. Analyses	67	67	69	124	112
Significant Results	9	6	8	16	8
Nickel					
No. Analyses	138	188	114	161	123
Significant Results	86	67	50	38	29
Ozone					
No. Analyses	16	0	5	10	3
Significant Results	9	0	2	8	2
Uranium					
No. Analyses	749	910	635	521	365
Significant Results	143	111	94	54	29
Miscellaneous					
No. Analyses	32	25	28	121	104
Significant Results	10	3	5	31	16

[a] Individual listings are given for those chemicals for which 10 or more samples were taken. Additional miscellaneous samples included analyses for ammonia, chromates, freons, hydrogen chloride, isopropanol, nitrogen dioxides, phosgene, trichloroethylene, and atmospheric dust.

[b] Figures are quarterly averages.

Alpha Activity

Although increases were noted in the fraction of shift-length air samples in excess of the plant acceptable limit and in the average air activity for this period, the yearly average decreased to about one-half of the value recorded in 1956. This favorable experience primarily resulted from the lower activity levels experienced in the K-1131 Feed Plant as a result of improved powder-confinement techniques.

Similarly, while there was an increase in the number of over-P.A.L. samples noted on routine surveys in areas where air-borne activity may be encountered, the average spot-air activity decreased this period primarily as a result of the improved control of air-borne materials effected by the installation of an enclosed system for the sampling, pulverizing, and material transfer operations conducted in the Vault 16-A Storage Area. The resulting lower levels for the year compare favorably with those recorded for both 1956 and the 3-year base period.

Air-borne alpha activity data are tabulated in table E-24 and are shown graphically in figure E-7.

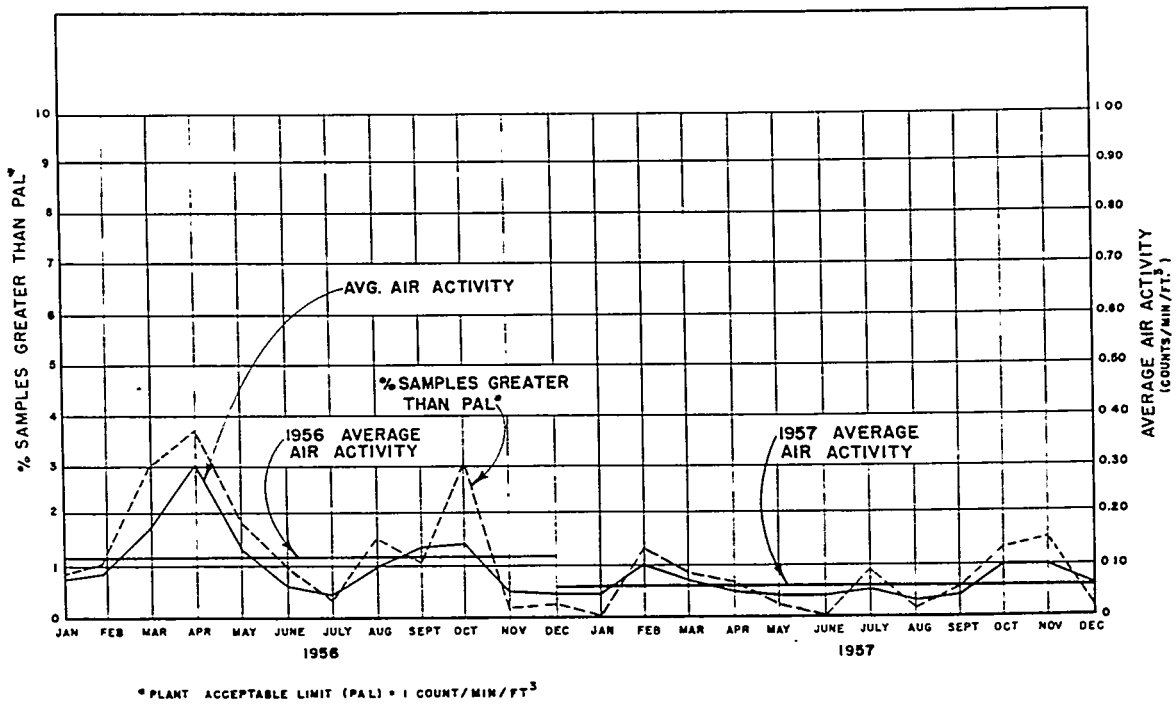


FIGURE E-7
Plant Air Activity and Shift-Length Air Samples

ALPHA CONTAMINATION

Plant alpha contamination levels, as reflected by audit surveys of both operating and staff groups in the 29 plant locations where significant contamination is encountered, increased about 27% from those of last quarter. This increase is primarily the result of periods of relatively high contamination associated with normal operations in the K-1131 Feed Plant. The contamination index for 1957 increased slightly over the previous year but remained well below the average for the past 4 years. The results of routine audits are summarized in table E-24, and are shown graphically in figure E-8.

TABLE E-24
Environmental Radiation and Radioactive Materials

	This Quarter	Last Quarter	1957[a]	1956[a]	1953 - 1956[a]
Air Activity (Shift-Length)					
No. Samples Taken	2,412	2,542	2,512	2,783	2,077
No. Above P.A.L.[b]	23	14	17	42	28
Av. Activity per Sample (c./min./ft.^{3})	0.09	0.04	0.06	0.11	0.14
Air Activity (Spot)					
No. Samples Taken	216	214	219	197	293
No. Above P.A.L.[b]	22	11	15	15	30
Av. Activity per Sample (c./min./ft.^{3})	0.69	0.93	0.94	2.0	0.85[c]
Alpha Contamination					
Plant Contamination Index[d]	224	177	138	116	246
No. Locations Included	29	29	44	58	62
% Plant Area Surveyed	1.4	1.4	1.7	2.1	2.0
Penetrating Radiation					
Radiation Index[e]	3.8	4.2	3.4	2.7	1.9
No. Locations Included	9	9	10	8	8.4
Plant Sanitary Water					
Av. Beta Activity (dis./min./100 ml.)	31	30	28	26	32
Av. Uranium Concentration (ppb.) in Sanitary Water Influent	5.1	3.6	4.0	-	-

[a] Where totals are concerned, figures are quarterly averages.

[b] P.A.L. - Plant Acceptable Limit.

[c] 1954 through 1956 only.

[d] The contamination index is a figure which reflects the product of the extent and intensity of alpha contamination exceeding the P.A.L. Effective July 1, 1957, values included only those plant locations with a 6-month average contamination index of 10 or greater; values for periods prior to that date included those locations with a 6-month average contamination index of 2.0 or greater.

[e] The radiation index, which reflects both the extent and intensity of radiation found is essentially the product of the work area over which the dose rate is more than 7.5 mrep/hr. and a weighting factor which depends upon the actual radiation intensities over the area concerned.

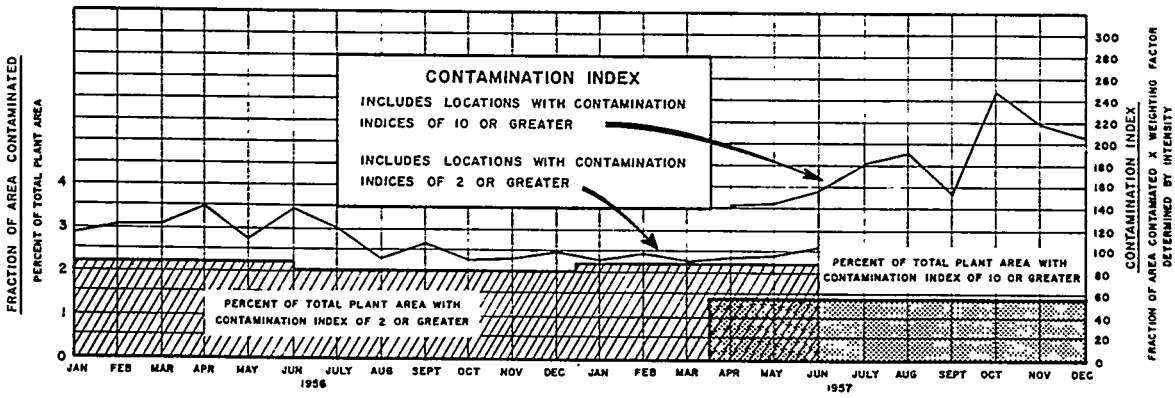


FIGURE E-8
Plant Contamination Levels

PENETRATING RADIATION LEVELS

The normal accumulation of beta-gamma emitting daughter products in equipment associated with the K-1131 Feed Plant continued to present the primary source of penetrating radiation, and increases in the conversion efficiency of the uranium to the hexafluoride and reductions in the frequency of changeout of some equipment items resulted in a general increase in the radiation during the year.

The 139 routine beta-gamma monitoring reports submitted by operating groups represent little change from last period, but the 532 reported during the year represent a significant increase over the 331 reported in 1956.

SANITARY WATER

The average beta activity in the plant sanitary water remained relatively unchanged from the previous period as the release of fission product waste materials from an installation upstream from the ORGDP continued at a normal rate.

The average beta activity recorded for the year was only slightly higher than the 1956 average and remained below that for the preceding 3 years. The average uranium concentration in the plant sanitary water influent and the average beta activity, as shown in table E-24, continue to indicate no health hazard. Changes in beta activity in the sanitary water throughout the year as compared with the previous year are shown in figure E-9.

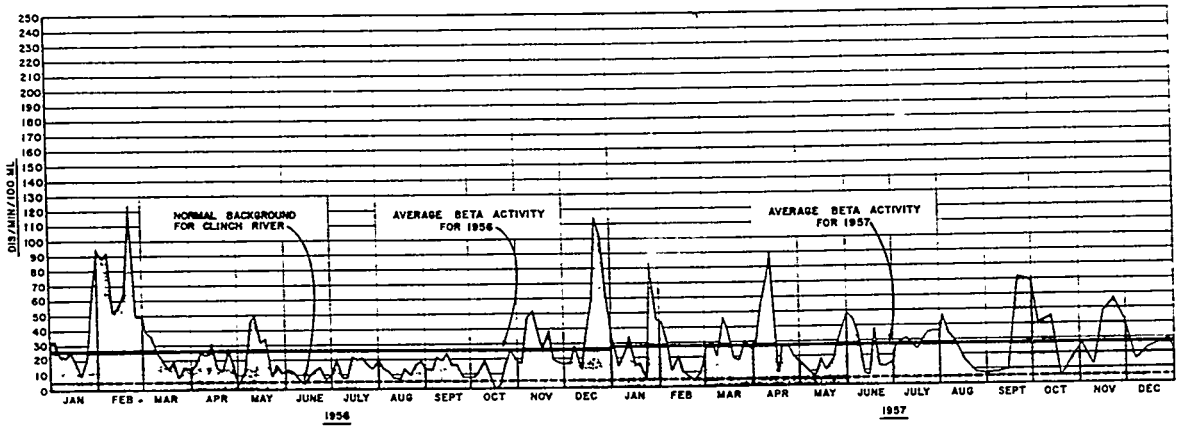


FIGURE E-9
Beta Activity in ORGDP Sanitary Water

RADIUM SOURCE CHECKS

Routine checks of the 21 plant radium sources revealed no evidence of source leakage.

PLANT ENVIRONS

The average uranium concentration in Poplar Creek and in the Clinch River 1 mile below the plant increased slightly during this period, apparently as a result of the downstream movement of uranium-contaminated silt following a period of heavy rainfall. The decrease noted in the average uranium concentration of East Fork Creek is considered to be within the range of normal variation as determined by the release of materials from another installation upstream from the ORGDP. The yearly average concentration for the East Fork Creek and the Clinch River was not significantly different from similar figures for 1956, although a significant decrease was noted in the average concentration in Poplar Creek.

Significant Plant Locations of Hazardous Material

Figure E-10 shows the principal locations of some of the more hazardous materials at ORGDP and also indicates the average extent and intensity of radioactive surface contamination in the plant.

TABLE E-25
Uranium Concentrations in Streams

Stream Sampling Locations	This Quarter	Last Quarter	1957[a]	1956[a]	1953 - 1956[a]
Average uranium concentrations (ppb) in water at:					
East Fork at Poplar Creek	65	100	61	59	39
Poplar Creek at Clinch River	17	13	13	31	12
Clinch River 1 mile below ORGDP	7.9	4.8	5.4	3.8	2.5

[a] Values are quarterly averages.

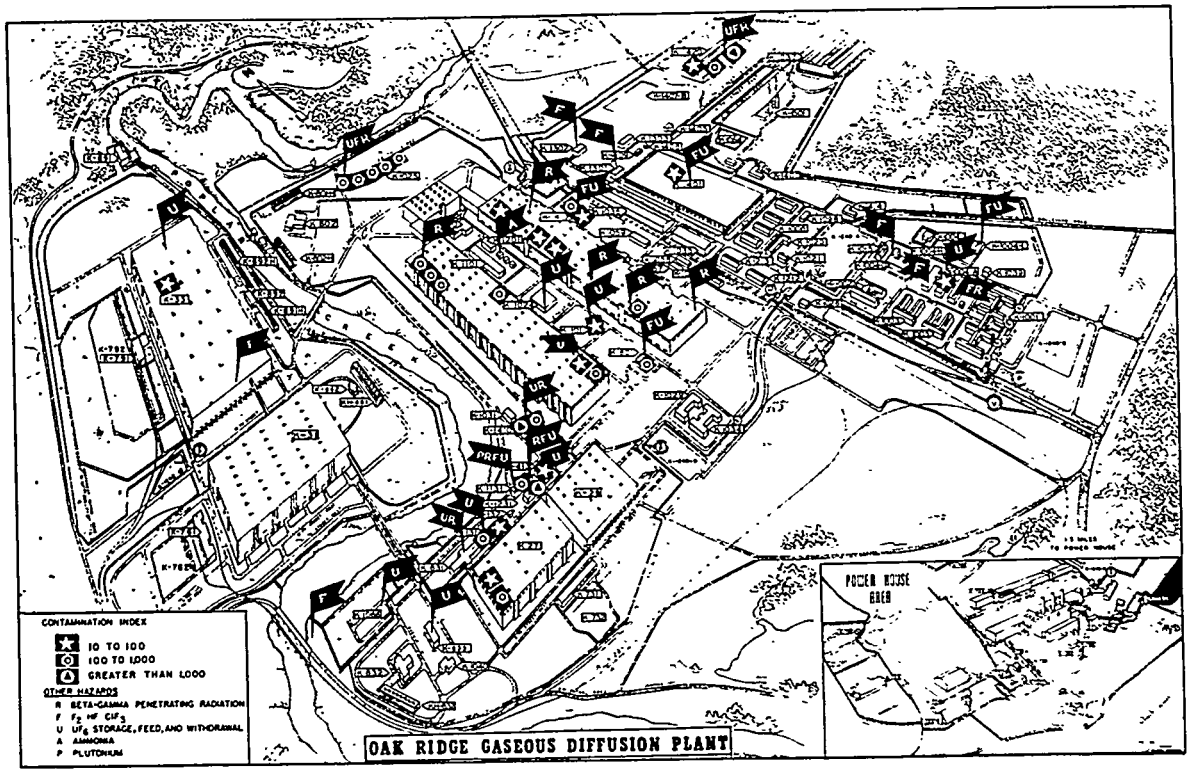


FIGURE E-10
Locations of Radioactive Contamination and Hazardous Materials

EMERGENCY ACTIVITIES

EVACUATION DRILLS AND EMERGENCY RESPONSES

Emergency training activities this period included 52 local and 4 plant-wide drills simulating potential operational emergencies. The training of local emergency groups to acquaint them with problems in other areas as well as in their immediate work locations was again emphasized during the quarter. During the year, 233 simulated emergency drills were staged, as shown in table E-26, and the ORGDP participated in the National readiness exercise designated as "Operations Alert." Thirty-three employees received training during the quarter making a total of 843 employees trained during the year in the use of fire fighting and respiratory protective equipment.

In order to facilitate the reporting of emergencies in the plant, "Tele-caps," or plastic caps which fit in the center of the telephone dials, were distributed for installation on plant telephones. These

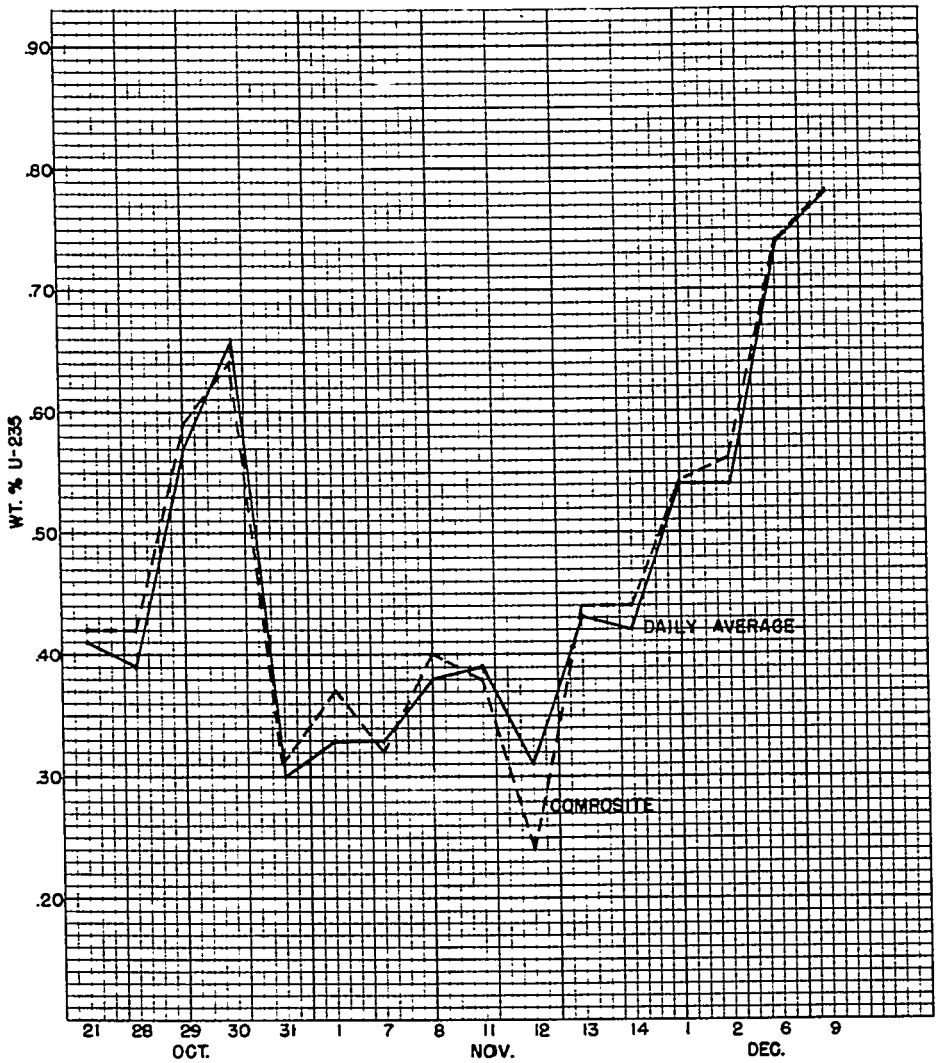


FIGURE G-2
Compositing of Daily Samples of Side Stream for Wt. % U-235

GENERAL STUDIES ON MATERIAL CONTROL

TEST OPERATION OF K-1420 CONVERSION FACILITY

An overall uranium balance was run on four one-per-day test runs in the K-1420 conversion facility in December in order to check the operating efficiency of this facility. For the test, a batch containing 103,245 grams of uranium oxide material, with an assay between one and two per cent, was blended. Fifteen samples were withdrawn for duplicate analyses on each sample. A total of 95,220 grams of uranium oxide material with 80.43 weight per cent uranium and 1.691 weight per cent uranium-235 was transferred to the fluorination facility for the test.

Except for the reactors, the facility was cleaned prior to the test run and operated only on the day shift. One run was made per day with each of the three lines being charged with 6,000 grams of uranium oxide material. All equipment was decontaminated after the test with the solutions being sampled and analyzed for uranium and uranium-235 content. The uranium and uranium-235 content in the UF_6 produced, plus that in the decontamination solutions obtained from decontaminating the equipment after the test run, indicated a gain of 5.25 per cent in uranium and a gain of 19.48 per cent in uranium-235.

The vent stack was closely monitored throughout the test. Results of the monitoring indicated that less than 0.3 grams uranium were vented through the stack during the test. The only explanation for the gain is that the material was contained in the undecontaminated reactors and was produced during the test run. Based upon these data, it is believed that a second test should be performed. Table G-2 presents the material balance obtained from the test operation of the fluorination equipment.

TABLE G-2
Material Balance of Conversion Test

Material Accounted For:	Analysis gU/g	Assay % U-235	Grams U	Grams U-235
Production				
UF_6 Cylinders	0.6743	1.939	37,416	725.35
Ash Receivers	0.6870	2.107	16,269	342.78
NaF Traps	0.0093	2.780	300	8.34
Vent Stack	-	-	-	-
Sub-total			53,985	1,076.47
Decontamination				
Condensers	0.0762	1.889	3,045	57.53
Vent Condensers	0.0531	2.148	301	6.47
Barrier Filters	0.0188	2.013	478	9.62
Pig Tails and Ash Receivers	0.0338	3.298	731	24.11
Sub-total			4,555	97.73
Unused Oxide	0.8043	1.691	22,062	373.07
Total Test Material Accounted For			80,602	1,547.27
Test Material Changed	0.8043	1.691	76,585	1,295.05
% Inventory Change			5.25	19.48

SEPARATION OF PURE UF_6 FROM IMPURE GASEOUS MIXTURES*

Pure UF_6 samples have been separated directly from impure gaseous mixtures by controlling the trapping temperature and pressure so that the partial pressure of an impurity did not exceed its vapor pressure. Such a separation is theoretically possible in any gas system where the partial pressure of UF_6 can be caused to exceed its vapor pressure before the partial pressure of any impurity exceeds its respective vapor pressure.

Laboratory tests have shown that the impurity in the separated UF_6 was only 0.02% nitrogen by mass spectrometer analysis after separation from gas mixtures containing as high as 20% impurities, including C-816, F-114, fluorine, hydrogen fluoride, nitrogen and oxygen. The efficiency for UF_6 condensation from mixtures of this kind is about 90% with a trap pressure of 2 psia and a temperature of 45° F.

For a definite set of trap conditions and with a knowledge of the impurities involved, the partial pressure of a condensible contaminant may be determined by the expression:

$$ppC = \frac{P - v.p.\ UF_6}{1 + \left(\frac{\%\ lights}{\%\ C}\right)_{influent}} \qquad (1)$$

Where: C = any impurity to be considered as a possible condensed contaminant.

*The theory and methods of calculation were taken from a report, *"The Direct Separation of Pure Uranium Hexafluoride from Impure Gaseous Mixtures"*, by J. A. Westbrook and W. S. Pappas.

UNCLASSIFIED

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (Is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number K-1360 Date of document 12/2/57

Title and author (if document is unnumbered)

ORGDP QUARTERLY REPORT 7/1/57 - 9/30/57 } COPY ONLY C-9, C17, C-19 C-20, C-21, E-14, E-15 } E-16 & E-17 (also flagged) TABBED PAGES ONLY

(This section to be completed by Document Center)

Date request received 10/12/95

Date submitted to ADC 11/30/95

Date submitted to HSA Coordinator 10/12/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 11/30/95 1/10/96

Date received from CICO 1/5/96 2-22-96

Date submitted to ChemRisk/Shonka and DOE 2-22-96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

UNCLASSIFIED

K/EM-279

SANITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT FIRST FISCAL QUARTER JULY 1, 1957 THRU SEPTEMBER 30, 1957

(EXTRACTED FROM CRD DOCUMENT # K-1360)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

November 30, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

...ment has been approved for release
... by:
Asst John F. Patton 2/21/96
...ation Officer Date
...ge K-25 Site

Down Grade To CRD
1/28/93 Sam W. Wohlfort HR

UNCLASSIFIED

~~SECRET~~

Downgraded to CRD
Sam W. Wohlfort, ADD, 1/5/94

This document consists of 194 pages
2 of 3 copies, Series A.

~~CONFIDENTIAL~~

DATE OF ISSUE: December 2, 1957 REPORT NO. K-1360

PLANT RECORDS DEPT.
CENTRAL FILES
REC. L-83701
X-REF.
X-REF.

OAK RIDGE GASEOUS DIFFUSION PLANT
QUARTERLY REPORT

FIRST FISCAL QUARTER

July 1, 1957 thru September 30, 1957

CENTRAL LIBRARY
REC. W40756
FILE
X-REF.
X-REF.

Classification Changed To
CRD
(Insert Appropriate Classification Level and Category)

By authority of: Sam W. Wohlfort 1/5/94
(Authority for Change in Classification) (Date)

By: Sam W. Hall 2/11/94
(Signature of Person Making Change) (Date)

Verified by: Sam W. Wohlfort 2/11/94
(Signature of Person Verifying Change) (Date)

K 1360 52 A

K 1360 52 A

OAK RIDGE GASEOUS DIFFUSION PLANT

Operated by

UNION CARBIDE NUCLEAR COMPANY
DIVISION OF UNION CARBIDE CORPORATION

for the Atomic Energy Commission

Acting Under U. S. Government Contract W7405 eng 26

~~RESTRICTED DATA This document contains restricted data as defined in the Atomic Energy Act of 1954. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.~~

RESTRICTED DATA
This document contains Restricted Data as defined in the Atomic Energy Act of 1954. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.

~~SECRET~~

~~CONFIDENTIAL~~

2

Oak Ridge Cascade Material Balance

The Oak Ridge cascade material balance for the first quarter of fiscal year 1958 indicates a total uranium deficiency of 408.025 kilograms of uranium, representing an average monthly uranium deficiency of 136.008 kilograms. The individual monthly uranium deficiencies as experienced during the report period were -414 kilograms, -20 kilograms, and 843 kilograms for July, August, and September, respectively. The large gain indicated for July is attributed to the reduction of the plant operating level from the extended to contract power conditions. The change to contract power level at the Oak Ridge plant site resulted in a substantial release of cascade inventory to the tails stream and thereby emphasized the normal uranium inventory discrepancies that are known to exist. The ORGDP uranium-235 deficiency during the report period totaled 127.818 kilograms, largely incurred during July. The individual monthly uranium-235 deficiencies during the report period were 103.686 kilograms, 7.656 kilograms, and 16.47 kilograms. The large July uranium-235 deficiency is considered to be the result of a shift in the cascade uranium-235 gradient level following the cascade operating level reduction to the contract power level despite the reduced inventory level which resulted in a cascade uranium material gain. The deficiencies for August and September are considered normal for current plant operation. All deficiencies mentioned above are discussed in greater detail in the SS accountability section of the report.

Cascade Streams

During the first quarter of fiscal year 1958 the average daily feed rate of Paducah product material to the ORGDP was 9,515.9 kilograms of uranium at an average assay of 1.110%. During August of the report period, the feeding of reactor tails uranium to the Oak Ridge cascade was initiated in an attempt to utilize more efficiently the uranium materials available for use as cascade feed. The target feed rate of reactor tails material to the Oak Ridge cascade was 30 kilograms uranium-235 per day during August and September, and should increase during future report periods as the availability of uranium oxide materials continues to improve. Table C-8 presents a listing of the Paducah product and reactor tails average daily feed rates for the months of the report period, as well as an average value for the quarter. From this table, it can be seen that no significant trend relating to cascade feed conditions can be established for the report period. Although the feed rate of Paducah product material to the ORGDP during August and September showed a decrease as a result of the feeding of reactor tails uranium to the Oak Ridge cascade, the July feed rate of Paducah product material was lower than normal as the result of the depletion of the uranium oxide stockpile prior to July 1, 1957, when operation of the diffusion plant site at the extended power level was in effect.

TABLE C-8

Major Feed Streams to the Oak Ridge Cascade

	Paducah Product			Reactor Tails		
Month	Kg. U/Day	Kg. U-235/Day	Assay, %	Kg. U/Day	Kg. U-235/Day	Assay, %
July	10,115.4	111.397	1.101	-	-	-
August	9,574.3	107.347	1.121	4,371.385	29.201	0.668
September	8,836.2	98.012	1.109	4,470.374	29.907	0.669
Average	9,515.9	105.668	1.110	4,420.068*	29.548*	0.669

* Based on average for two-month period.

The feeding of enriched assay uranium to the Oak Ridge cascade was continued during the report period and averaged 99.996 kilograms of uranium per day at an average assay of 1.350%. The major portion of this material was obtained from the K-1413 fluorination unit which processes material reclaimed from recovery operations. Table C-9 outlines the enriched uranium feed rates and cascade tails production rates which were experienced at the Oak Ridge plant site during the

when water entered the generator breaker cubicle due to an overflow of the building roof drain during a period of heavy rainfall. The outage required the shutdown of the K-303 and K-304 sections for 13 minutes and 3.5 hours, respectively.

A leak in a main steam valve drain line necessitated the shutdown of the only boiler in service at the ORGDP generating facility on September 16. The utilization of all tie-cables, including portions of the overhead lines, and the curtailment of certain electrical loads allowed sufficient power to be obtained from TVA to continue operation of all K-25 cells at normal capacity except the K-301 and K-309 sections and 12 cells in the K-302 section. The boiler No. 1 was returned to service within 10 hours.

Boiler No. 1 was again shut down on September 17 when the steam line to a turbo-generator ruptured. The resultant power loss necessitated the shutdown of the K-301 and K-309 sections.

result of the simultaneous outages of 2 generators at the TVA Kingston plant and a 50% load reduction on an additional generator due to boiler tube leaks. The 45 mw, which was dropped by pressure reductions in the K-33 building process load, was restored on September 25. During the reduction, 13 cells in K-33 were shut down for 30 minutes when the flame was unexpectedly extinguished in one boiler at the TVA Kingston plant.

Coolant Leaks

Five evaporative-type coolant leaks and three liquid coolant inleakages to the cascade occurred during the first quarter of fiscal year 1958 as compared to two evaporative-type and three liquid coolant inleakages during the previous quarter. Table C-14 summarizes the dates, locations, and methods of eliminating the inleakages. Also shown are the rates at which the coolant entered the cascade.

TABLE C-14
Coolant Inleakages to the Cascade

	Date	Location	Rate, # /Day	Method of Eliminating Inleakages
Liquid	8-14-57	K-303-8.1	7.0	Stage 3 converter replaced.
	8-16-57	K-303-8.1	1.4	Stage 4 converter replaced.
	8-25-57	K-402-9.2	40.0	A and B row of gas cooler tubes plugged in all converters.
Evaporative	8-31-57	K-602-3.6	12.0	Stage 1 converter replaced.
	9- 6-57	K-602-3.4	30.0	Stage 4 converter replaced.
	9-11-57	K-902-2.1	7.8	Stage 6 converter replaced.
	9-16-57	K-902-2.10	21.3	Stage 4 converter replaced.
	9-19-57	K-902-2.10	5.7	Stage 6 converter replaced.

Material Releases

Six material releases were experienced at ORGDP during the first quarter of fiscal year 1958. On July 23, a small release occurred in the K-1131 building when a uranium hexafluoride pump failed. During pressure testing of cell K-304-5.8 on August 1, process material was released within the cell enclosure. On August 15, a one-minute release occurred in K-1131 when a flange on a cleanup reactor burned. The W-2 pump failed in building K-413 causing a small release on August 21. On August 24, process gas was released during the dismantling of a compressor at the K-1420 building. A minor release was experienced in K-602-4 during the expulsion of wet air to the atmosphere; the

released material issued from an unpurged line. The amounts of material involved in the releases were minor, and no estimates are available of the total uranium included therein with the exception of the release in K-304-5.8.

Table C-15 summarizes the amount of the material vented during operation of the K-1131 feed plant during the quarter. Included also are the releases in the cylinder storage vaults and cell K-304-5.8.

TABLE C-15
Material Releases

Date	Location	Amount Released, Grams	
		Uranium	Uranium-235
July, 1957	K-1131	47,429	320
1953 - 1957	Vault 16-A	285	2
August, 1957	K-1131	20,651	140
September, 1957	K-1131	5,079	34
August 1, 1957	K-304-5.8	253	183
Total		73,697	679

Cascade Stream Efficiency

The ORGDP cascade operated at an onstream efficiency of 99.58% during the first quarter of fiscal year 1958. This represents a decrease of 0.20% below that of the preceding quarter. Excluding outages for equipment exchange programs, the ORGDP cascade operated at an onstream efficiency of 99.68% (99.83% last quarter). Omitting offstream time for equipment exchange programs and power outages, the ORGDP cascade onstream efficiency becomes 99.80% (99.84% last quarter). The total onstream efficiencies during the current quarter for buildings K-33, K-31, K-29, K-27, and K-25 were 99.90%, 99.24%, 99.91%, 99.45%, and 99.56%, respectively.

The monthly cascade onstream efficiencies during fiscal years 1957 and 1958 to date are shown in figure C-11. The offstream time is summarized in table C-16, as well as the per cent of total offstream time, the number of times offstream, and a comparison with the same items for the preceding quarter.

The costs of offstream time, broken down by causes, for the current and preceding quarters are shown in table C-17. Figure C-12 presents a tabulation of the monthly cost of offstream time for fiscal years 1957 and 1958 to date. The cost of offstream time during the quarter for buildings K-33, K-31, K-29, K-27, and K-25 amounted to 14.48%, 43.60%, 2.46%, 2.89%, and 36.57% respectively, of the total cost.

Purge Cascade Operations

Unit K-312-3 was operated as the cascade top purge throughout the first quarter of fiscal year 1958. Units K-312-1 and K-311-1 were operated as cascade side purge facilities during the report period.

The purge facilities in units K-312-1, K-311-1, and K-312-3 purged an average of 9,045 scf per day, 15,369 scf per day, and 2,372 scf per day, respectively. The total purge rate during the quarter averaged 23,787 scf per day, a decrease of 13.4% below that of the fourth quarter of fiscal year 1957.

The average uranium hexafluoride concentration of the purge gases from the K-312 purge facilities was 35.673×10^{-5} mole per cent. The uranium hexafluoride concentration in the purge gases from the K-311-1 side purge facility averaged 10.601×10^{-5} mole per cent. The average daily purge rates are presented in table C-18 for each month of the fourth quarter of fiscal year 1957 and the

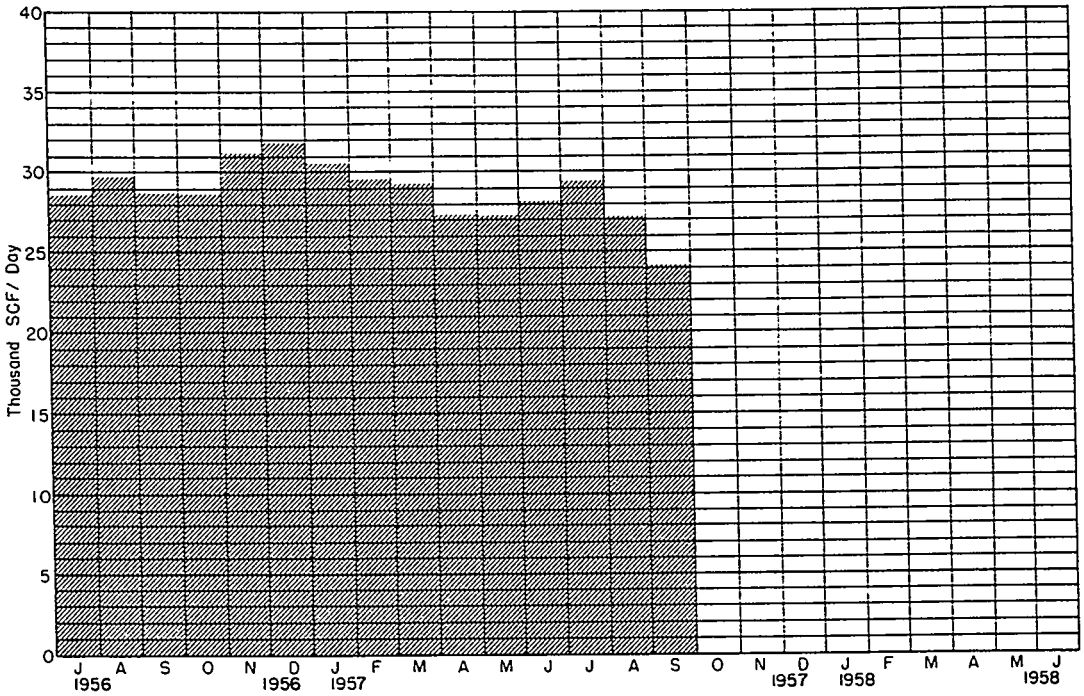


FIGURE C-13
Cascade Purge Rate

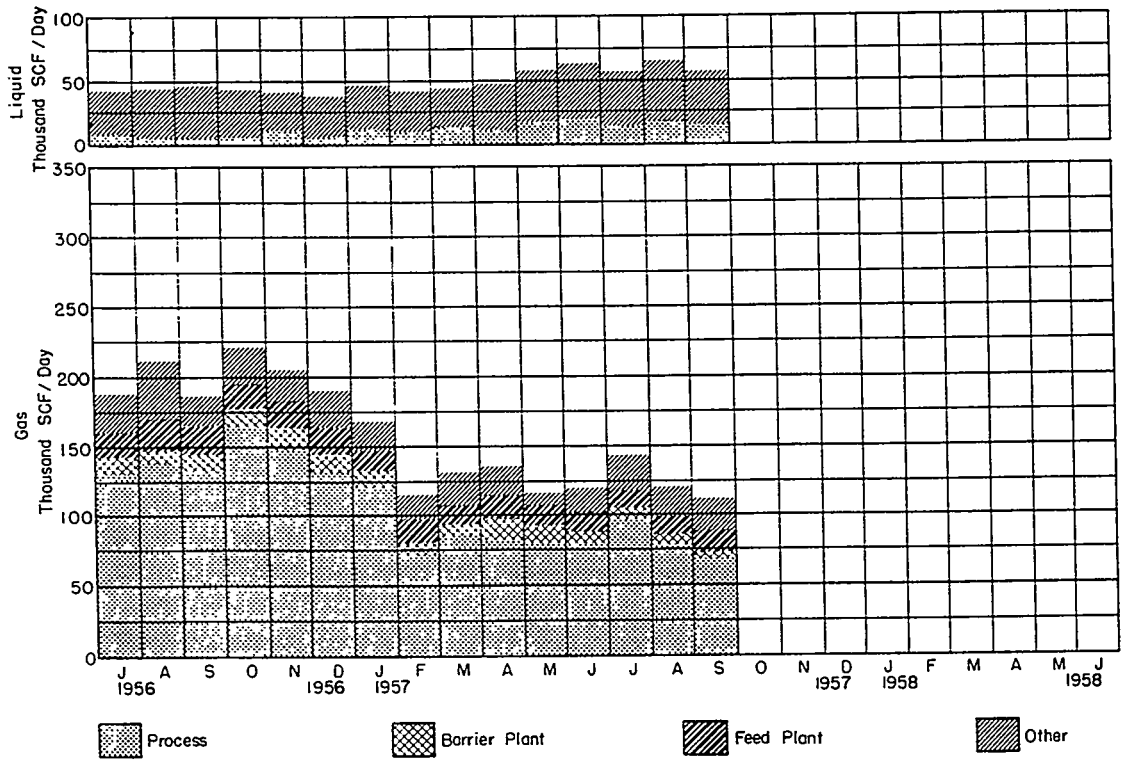


FIGURE C-14
Nitrogen Usage

first quarter of fiscal year 1958. Figure C-13 depicts the monthly purge rates for fiscal years 1957 and 1958 to date.

TABLE C-16
Separating Cascade Cell Offstream Time

	Offstream Time, Hours	% of Total Offstream Time	Increase in Offstream Time over Previous Quarter	Number Times Offstream	% of Total Number of Times Offstream	Increase in Number of Times Offstream over Previous Quarter
Pump Seal Repairs	1,342.96	22.53	+ 177.71	436	23.75	- 45
Stage Motor Repairs	78.43	1.32	+ 15.53	20	1.09	+ 4
Stage Pump Repairs	192.65	3.23	+ 26.91	35	1.91	+ 7
Converter Replacement	72.66	1.22	- 35.73	9	0.49	- 2
Electrical Equipment Repairs	19.80	0.33	+ 12.76	6	0.33	- 1
Inleakage Checks	103.99	1.74	+ 3.30	341	18.57	- 24
Control Valve Repairs	38.58	0.65	+ 24.64	9	0.49	0
Coolant Inleakage Checks	8.51	0.14	+ 3.03	8	0.44	+ 4
Instrumentation Repairs	10.58	0.18	+ 9.55	4	0.22	+ 2
Lube System Repairs	14.07	0.24	- 7.80	28	1.53	+ 7
Coolant System Repairs	136.22	2.29	- 3.24	30	1.63	- 2
Engineering Tests	231.36	3.88	+ 175.46	35	1.91	+ 8
ClF_3 Operations	68.30	1.15	+ 48.46	14	0.76	+ 4
Equipment Exchange Programs	1,472.60	24.71	+ 802.73	124	6.75	+ 21
Miscellaneous	526.00	8.82	+ 152.41	156	8.50	- 44
Coolant Leaks to the Cascade	33.14	0.56	- 45.51	5	0.27	0
Power Load Reduction	1,610.81	27.01	+ 1,500.19	576	31.36	+ 500
Totals	5,960.66	100.00	+ 2,860.40	1,836	100.00	+ 439

TABLE C-17
Cost of Offstream Time, Dollars

	April	May	June	July	August	September
Pump Seal Repairs	9,703.49	11,358.81	9,392.22	3,297.54	3,832.56	2,937.67
Stage Motor Repairs	29.55	62.59	380.32	69.82	266.27	-
Stage Pump Repairs	4,995.41	1,945.22	1,208.91	1,699.80	1,600.57	227.47
Converter Replacement	1,796.42	755.21	80.13	256.00	459.20	142.38
Electrical Equipment Repairs	29.39	72.45	117.22	30.36	48.20	1.62
Inleakage Checks	1,345.28	1,284.44	1,150.16	266.27	374.78	308.75
Control Valve Repairs	201.79	115.11	112.03	328.23	1,114.61	26.25
Coolant Inleakage Checks	557.02	-	23.35	34.17	2.14	315.98
Instrumentation Repairs	-	61.45	-	7.30	275.55	-
Lube System Repairs	139.86	20.98	68.08	33.27	14.78	15.89
Coolant System Repairs	1,125.55	998.18	40.72	128.07	357.26	271.54
Engineering Tests	2,879.59	425.09	1,207.88	430.88	369.76	491.24
ClF_3 Operations	75.98	359.20	297.26	230.73	111.73	94.82
Equipment Exchange Programs	7,383.94	11,022.40	10,581.20	4,348.90	7,771.21	3,684.04
Miscellaneous	2,602.65	2,279.29	1,876.21	1,212.59	898.42	638.83
Special Coolant Leaks	1,458.10	867.22	-	-	30.62	609.96
Power Outages	4,094.22	2,740.35	2,276.44	327.39	359.64	8,852.60
Total	38,418.24	34,367.99	28,812.13	12,701.32	17,887.30	18,619.04

TABLE C-18
Cascade Purge Rates

	Average Purge Rates, Scf/Day			
		Side Purge Facilities		
Month	Top Purge Facility	K-312-1	K-311-1	Combined Purge Facilities
April	2,639	8,400	16,150	27,189
May	2,668	9,429	15,075	27,172
June	2,605	9,611	15,797	28,013
July	2,658	9,888	16,788	29,334
August	2,220	9,265	15,538	27,023
September	2,239	7,983	13,781	24,003

TABLE E-21
Safety, Fire Protection, and Electrical Audit Results

	This Quarter	Last Quarter	1957[a] To Date	1956[a]
General Safety				
Plant Conditions				
Number audited	8,771	12,566	12,196	14,430
Number Satisfactory	8,257	11,933	11,554	13,383
% Satisfactory	94	95	95	93
Employee Safe Practices				
Number Audited	1,036	1,319	1,350	1,613
Number Satisfactory	951	1,187	1,229	1,424
% Satisfactory	92	90	91	88
Fire Protection				
Number Audited	1,703	2,077	2,017	2,345
Number Satisfactory	1,602	1,999	1,930	2,199
% Satisfactory	94	96	96	94
Electrical				
Number Audited	7,150	7,814	7,935	8,263
Number Satisfactory	6,785	7,447	7,513	7,687
% Satisfactory	95	95	95	93

a Where totals are concerned, figures are quarterly averages.

TABLE E-22
Sample Analyses for Air-Borne Chemicals[a]

	This Quarter	Last Quarter	1957[b] To Date	1956[b]	1952-1956[b]
Carbon Monoxide					
Number Analyses	42	39	63	124	72
Significant Results	1	3	6	13	6
Fluorine					
Number Analyses	105	103	85	112	65
Significant Results	1	0	1	49	27
Hydrogen Fluoride					
Number Analyses	819	456	527	430	305
Significant Results	16	6	9	9	10
Mercury					
Number Analyses	67	56	69	124	112
Significant Results	6	4	7	16	8
Nickel					
Number Analyses	188	73	103	161	123
Significant Results	67	23	38	38	29
Uranium					
Number Analyses	910	542	596	521	365
Significant Results	111	68	78	54	29
Miscellaneous					
Number Analyses	23	45	29	126	107
Significant Results	3	6	7	33	18

a Individual listings are given for those chemicals for which 10 or more samples were taken. Additional miscellaneous samples included analyses for ammonia, chromates, dust, hydrogen chloride, isopropanol, and trichloroethylene.

b Figures are quarterly averages.

Alpha Activity

Both the fraction of shift-length air samples in excess of the plant acceptable limit and the average air activity indicated by the continual sampling program remained low and essentially unchanged. Similarly, there was no change in the number of samples over-P.A.L. noted on audit surveys in areas where air-borne alpha activity is normally encountered; the average spot-air activity decreased this period as a result of the low levels recorded in the K-1131 Feed Plant during a period of reduced operations.

Air-borne alpha activity data are tabulated in table E-23, and are shown graphically in figure E-3.

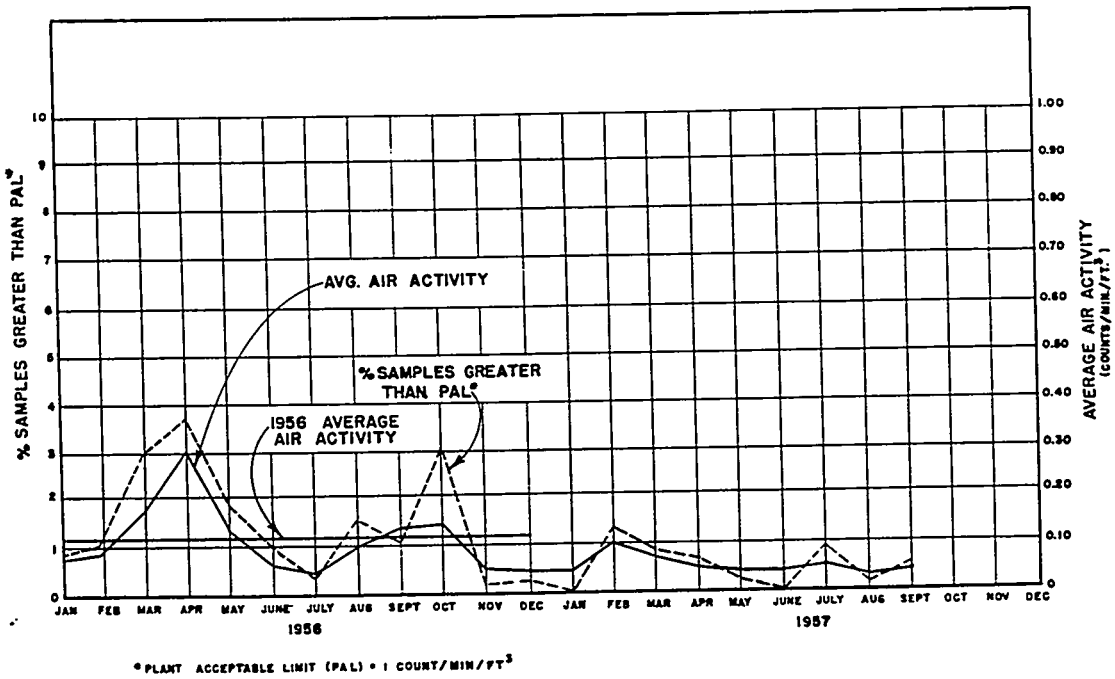


FIGURE E-3
Plant Air Activity and Shift-Length Air Samples

ALPHA CONTAMINATION

Plant alpha contamination levels, as reflected by audit surveys of both operating and staff groups in the 29 plant locations where significant contamination is encountered, increased about 20% from that of last quarter. This increase is primarily the result of contamination spread during normal operations in the K-1131 Feed Plant and the K-1420 Decontamination Building.

Based on plant experience and experimental data, it has been determined that the contribution of uranium surface contamination to internal exposure as a result of ingestion or inhalation is negligible in locations with a contamination index of less than 10, and that such locations can therefore be treated in the same manner as uncontaminated ones. Previously, the arbitrary and purposely ultraconservative contamination index of 2 was chosen as the level at which contamination was considered to be significant, and as a result of the ORGDP evaluations of the actual problems involved, it has been possible to safely effect economies by reducing the number of plant locations where contamination is considered to be significant to one-half the former number, with a corresponding reduction in plant area from 345,000 square feet to 226,000 square feet. Accordingly, only those areas with an index of 10 or greater are now considered in computing plant contamination levels.

The results of audits for surface contamination are summarized in table E-23, and are shown graphically in figure E-4.

TABLE E-23
Environmental Radiation and Radioactive Materials

	This Quarter	Last Quarter	1957[a] To Date	1956[a]	1953-1956[a]
Air Activity (Shift-Length)					
No. Samples Taken	2542	2460	2545	2783	2077
No. Above P.A.L.[b]	14	8	14	42	28
Av. Activity per Sample (c./min./ft.^{3})	0.04	0.03	0.05	0.11	0.14
Air Activity (Spot)					
No. Samples Taken	214	238	219	197	293
No. Above P.A.L.[b]	11	11	12	15	30
Av. Activity per Sample (c./min./ft.^{3})	0.93	1.7	1.0	2.0	0.85[c]
Alpha Contamination					
Plant Contamination Index[d]	177	99(147)[d]	116	116	246
No. Locations Included	29	59	49	58	62
% Plant Area Surveyed	1.4	2.1	1.7	2.1	2.0
Penetrating Radiation					
Radiation Index[e]	4.2	2.7	3.2	2.7	1.9
No. Locations Included	9	11	10	8	8.4
Plant Sanitary Water					
Av. Beta Activity (dis./min./100 ml.)	30	27	27	26	32
Av. Uranium Concentration (ppb.) in Sanitary Water Influent	3.6	2.4	2.7	-	-

a Where totals are concerned, figures are quarterly averages.

b P.A.L. - Plant Acceptable Limit.

c 1954 through 1956 only.

d The contamination index is a figure which reflects the product of the extent and intensity of alpha contamination exceeding the P.A.L. Effective July 1, 1957, values include only those plant locations with a 6-month average contamination index of 10 or greater; values for periods prior to that date include those locations with a 6-month average contamination index of 2.0 or greater. The value in parentheses represents the contamination index last quarter for those areas currently included in the evaluation of this index.

e The radiation index, which reflects both the extent and intensity of radiation found is essentially the product of the work area over which the dose rate is more than 7.5 mrep/hr. and a weighting factor which depends upon the actual radiation intensities over the area concerned.

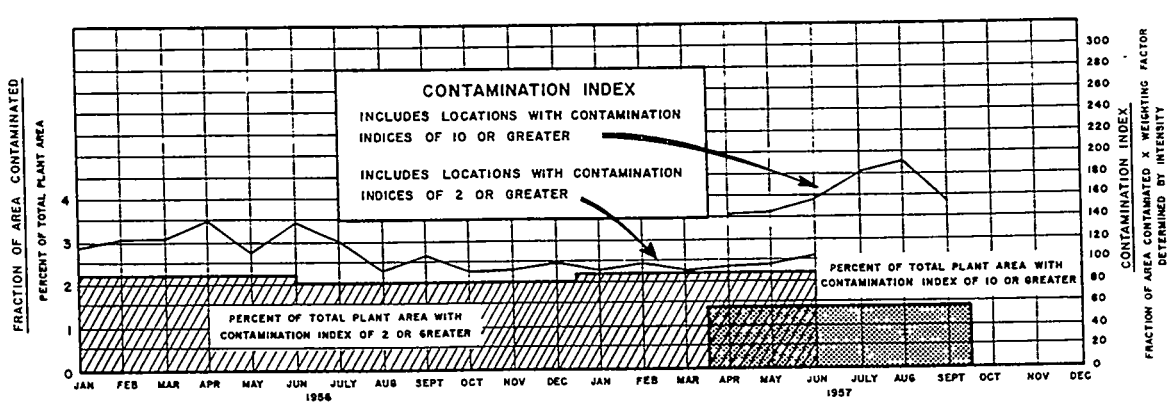


FIGURE E-4
Plant Contamination Levels

PENETRATING RADIATION LEVELS

The normal accumulation of beta-gamma emitting daughter products in equipment associated with the K-1131 Feed Plant continued to present the primary source of penetrating radiation. Normal build-up in this area was responsible for the increase in the radiation index from 2.7 to 4.2.

The 138 routine beta-gamma monitoring reports submitted by operating groups represent no change from the experience of last period.

SANITARY WATER

The average beta activity in the plant sanitary water increased only slightly as the routine releases of fission product waste material from an installation upstream from the ORGDP remained relatively unchanged. The average beta activity and the uranium concentration are shown in table E-23, and continue to be well below the maximum permissible levels.

RADIUM SOURCE CHECKS

One source on loan to another AEC installation was returned during the period; routine checks of the 21 plant radium sources revealed no evidence of source leakage.

PLANT ENVIRONS

While the average uranium concentration increased in the East Fork Creek during this period, it apparently remains within the range of normal fluctuation in the controlled releases of waste materials from an installation upstream from the ORGDP. The uranium concentrations in Poplar Creek and Clinch River continued low and relatively unchanged from the previous report period. The average concentrations, as shown in table E-24, remain far below the maximum permissible concentration.

TABLE E-24
Uranium Concentrations in Streams

Stream Sampling Locations	This Quarter	Last Quarter	1957[a] To Date	1956[a]	1953-1956[a]
Average uranium concentrations (ppb) in water at:					
East Fork at Poplar Creek	100	29	59	59	39
Poplar Creek at Clinch River	13	8.7	10	31	12
Clinch River 1 mile below ORGDP	4.8	5.2	4.2	3.8	2.5

a Values are quarterly averages.

EMERGENCY ACTIVITIES

EVACUATION DRILLS AND EMERGENCY RESPONSES

Emergency training activities this period consisted of 50 local and 5 plant-wide drills simulating potential operational emergencies, one "token" plant evacuation drill, and participation in the national readiness exercise designated as "Operation Alert 1957." In addition, 472 employees were specifically instructed in the use of fire fighting equipment for extinguishing lube oil fires. Four training films on extinguishing various types of fires were shown in the plant. Emergency equipment responses are tabulated in table E-25.

TABLE E-25
Emergency Equipment Responses

		This Quarter	Last Quarter	1957[a] To Date	1956[a]	1954-1956[a]
Fire Fighting Equipment	Alarms	36	56	39	38	42
	Drills	50	69	55	46	41
Emergency Truck	Alarms	29	40	29	25	32
	Drills	47	66	51	42	37
Ambulance	Alarms	14	20	17	12	15
	Drills	12	14	12	27	19

a Values are quarterly averages.

UNCLASSIFIED

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number ~~K-1253~~ K/EM-315 Date of document 8/23/56

Title and author (if document is unnumbered)

(This section to be completed by Document Center)

Date request received 10/20/95

Date submitted to ADC 12/19/95

Date submitted to HSA Coordinator 10/20/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 12/19/95 1/22/96

Date received from CICO 1/5/96 2/26/96

Date submitted to ChemRisk/Shonka and DOE 2/26/96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

K/EM-315

SANITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT FOURTH FISCAL QUARTER APRIL 1 THRU JUNE 30, 1956

(EXTRACTED FROM SRD DOCUMENT # K-1253)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

December 18, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release to the public by:

2/23/96
Technical Information Officer Date
Oak Ridge K-25 Site

K-1213

OAK RIDGE GASEOUS DIFFUSION PLANT

QUARTERLY REPORT

FOURTH FISCAL QUARTER

April 1, 1956 to June 30, 1956

OAK RIDGE GASEOUS DIFFUSION PLANT

UNION CARBIDE NUCLEAR COMPANY

DIVISION OF UNION CARBIDE AND CARBON CORPORATION

RESTRICTED DATA

[redacted]

G-83750

This document consists of 180 pages

No 50 [redacted] 73 [redacted]es, Series A.

[redacted]MAINS [redacted]RD: [redacted]/93

Sam [redacted] Wohl[redacted] (AR)

SECRET

[redacted]

DATE OF ISSUE: August 23, 1956 **REPORT NO.** K-1253

REM[redacted]S [redacted]RD 12/[redacted]3

Sa[redacted] W. N[redacted] ADD[redacted]

~~G79272~~

H-64011

OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT

FOURTH FISCAL QUARTER

April 1, 1956 thru June 30, 1956

CENTRAL LIBRAR

REC. W40687

FILE

X-REF.

X-REF.

TO [redacted] PLANT RECORDS K-1034

K 1253 50 A

K 1253 50 A

OAK RIDGE GASEOUS DIFFUSION PLANT

Operated by

UNION CARBIDE NUCLEAR COMPANY

A DIVISION OF UNION CARBIDE AND CARBON CORPORATION

for the Atomic Energy Commission

Acting Under U. S. Government Contract W7405 eng 26

RE[redacted] DATA

This [redacted] Data as [redacted] Atomic [redacted]ergy Act of 19[redacted] Unau[redacted]zed dis[redacted]ure subject to A[redacted]nistr[redacted] and Cri[redacted]nal Sanctions.

[redacted]

RESTRICTED DA[redacted] This d[redacted]ment contains restricted [redacted]a as [redacted]ed in the [redacted]mic Energy Act of 19[redacted] Its tran[redacted]al or the [redacted]osure of its contents in [redacted] manne[redacted] an unauth[redacted]ed person is prohibited.

[redacted]

[redacted]

3

MATERIAL RELEASES

Only one process gas release occurred during the fourth quarter of fiscal year 1956. On May 6, the gasket on a feed cylinder valve failed and 5 pounds of process gas were released to the atmosphere. The cylinder contained depleted material which was being fed to the K-633 test loop.

Several material releases occurred in vaults 15A and 16A and were attributed to corroded drums. The amounts are shown in table C-8, with the associated dates referring to the dates of discovery rather than to the dates of the actual releases.

Table C-8 shows the dates and locations of all material releases experienced during the fourth quarter, as well as the equivalent amounts of uranium and uranium-235. Also shown are the monthly amounts of material vented during normal operation of the feed plant (K-1131). In this manner, 69,984 kilograms of uranium as uranium hexafluoride, at an approximate assay of 0.67%, were vented during the quarter.

TABLE C-8
Material Releases

Date	Location	Amount Released, Grams	
		Uranium	Uranium-235
April 4, 1956	Vault 15A	1,734	14
April 9	Vault 15A	2,571	22
April 9	Vault 16A	18,066	475
April 12	Vault 16A	6	5
May 6	K-633 Test Loop	1,534	5
May 31	Vault 15A	1,286	11
April, May and June	K-1131 (Feed Plant)	69,984	472
Total		95,181	1,004

CASCADE STREAM EFFICIENCY

The Oak Ridge cascade operated at an on-stream efficiency of 99.71% during the fourth fiscal quarter, an increase of 0.01% above that of the preceding quarter. Excluding outages for improvements, the cascade operated at an on-stream efficiency of 99.75% (99.73% for last quarter). When omitting off-stream time for improvements and power outages, the cascade on-stream efficiency becomes 99.77% (99.77% for last quarter). The total on-stream efficiencies during the current quarter for buildings K-33, K-31, K-29, K-27, and K-25 were 99.57%, 99.64%, 99.46%, 99.68%, and 99.77%, respectively.

The monthly cascade on-stream efficiencies during fiscal years 1955 and 1956 are shown in figure C-4. The costs of off-stream time, broken down by causes, for the current and preceding quarters are shown in table C-9. Figure C-5 presents a tabulation of the monthly cost of off-stream time for fiscal years 1955 and 1956.

The cost of off-stream time during the quarter for buildings K-33, K-31, K-29, K-27, and K-25 amounted to 60.71%, 22.84%, 9.87%, 3.81%, and 2.77%, respectively, of the total cost. The maintenance required is summarized in table C-10, as well as the off-stream time, the per cent of total off-stream time, the number of times off stream, and a comparison with the same items for the preceding quarter.

PURGE CASCADE OPERATIONS

Units K-312-1 and K-311-1 were operated throughout the fourth quarter of fiscal year 1956 as cascade side purge facilities. Unit K-312-3 was operated during the report period as the cascade top purge.

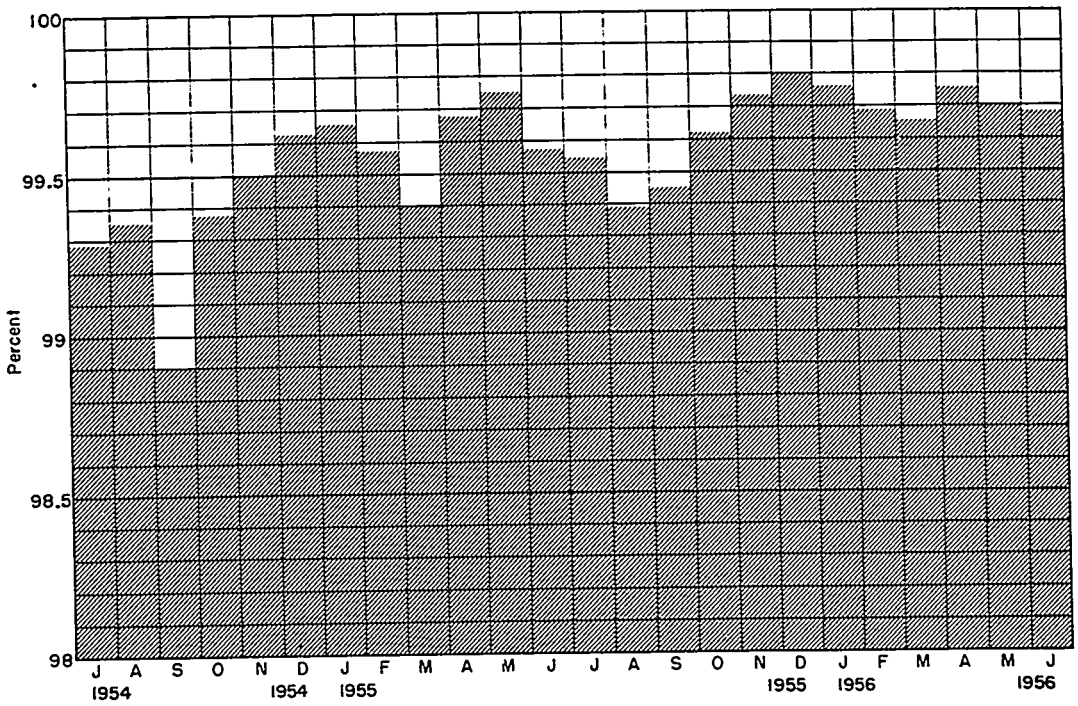


FIGURE C-4
Cascade Stream Efficiency

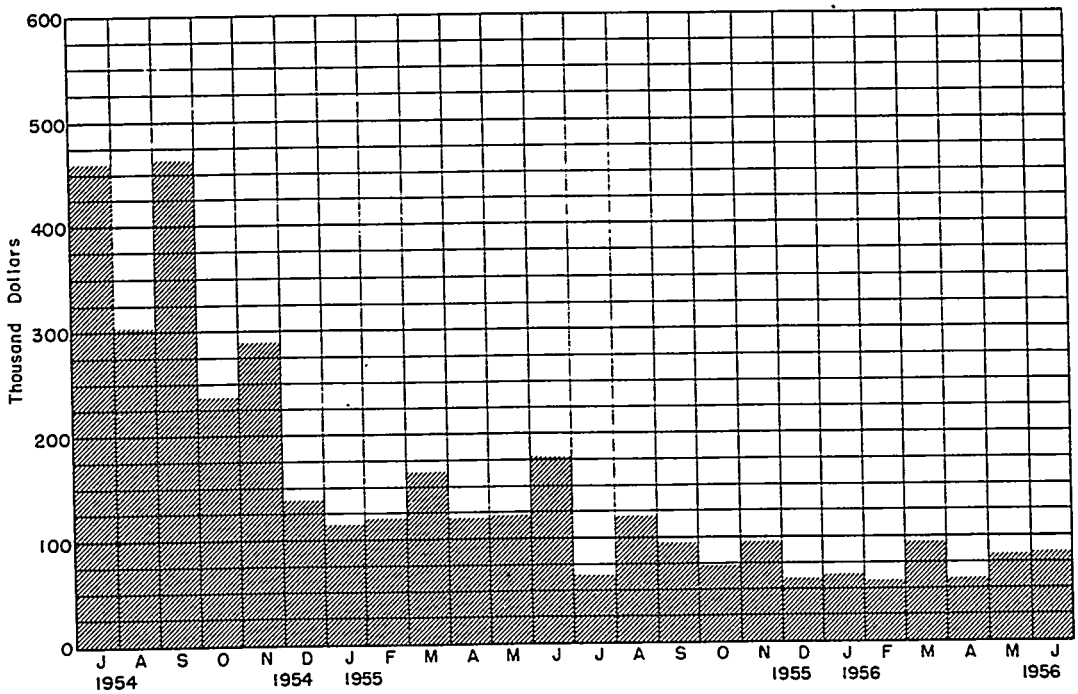


FIGURE C-5
Cost of Offstream Time

The purge facilities in units K-312-1, K-311-1, and K-312-3 purged an average of 8,160 scf per day, 14,685 scf per day, and 3,761 scf per day, respectively. During the quarter, the average total purge rate was 26,469 scf per day, an increase of 4.4% above that of the third fiscal quarter.

The average uranium hexafluoride concentration in the purge gases from the K-312 purge facilities was 5.233 x 10^{-5} mole per cent, an increase of 3.1% above that of the previous quarter. The average uranium hexafluoride concentration in the purge gases from the K-311-1 side purge facility was 12.834 x 10^{-5} mole per cent. The average daily purge rates are presented in table C-11 for each month of the third and fourth quarters of fiscal year 1956. Figure C-6 depicts the monthly purge rates for fiscal years 1955 and 1956.

TABLE C-9
Separating Cascade Cell Offstream Time

				April, May, June, 1956		
	Offstream Time Hours	Per Cent of Total Offstream Time	Increase in Offstream Time, Over Previous Quarter	Number Times Offstream	Per Cent of Total Number of Times Offstream	Increase in Number of Times Offstream Over Previous Quarter
Pump Seal Repairs	1,510.61	32.70	- 141.45	793	32.47	+43
Stage Motor Repairs	89.57	1.94	- 31.27	33	1.35	- 15
Stage Pump Repairs	244.07	5.28	+ 50.91	36	1.47	+ 1
Converter Replacement	107.92	2.34	+ 20.22	22	0.90	+ 4
Electrical Equipment Repairs	8.22	0.18	- 13.67	8	0.33	- 9
LC Inleakage Checks	167.23	3.62	- 21.34	673	27.56	- 79
Control Valve Repairs	2.72	0.06	- 7.01	7	0.29	- 3
Coolant Inleakage Checks	17.56	0.38	+ 2.54	11	0.45	- 27
Instrumentation Repairs	7.14	0.15	+ 0.34	6	0.25	- 6
Lube System Repairs	26.96	0.58	+ 6.20	44	1.80	+ 10
Coolant System Repairs	740.31	16.02	+546.96	105	4.30	+33
Engineering Tests	231.69	5.01	+ 43.50	72	2.95	+24
ClF_3 Operations	22.53	0.49	- 19.12	13	0.53	- 2
Improvement Program	375.43	8.13	- 66.98	40	1.64	- 10
Miscellaneous	549.83	11.90	+ 24.12	294	12.04	+ 1
Coolant Leaks, Special	221.31	4.79	- 204.61	13	0.53	- 23
Power Outages	297.06	6.43	- 325.15	272	11.14	- 239
Totals	4,620.16	100.00	- 135.81	2,442	100.00	- 297

TABLE C-10
Cost of Offstream Time

	January	February	March	April	May	June
Pump Seal Repairs	22,442.30	19,279.95	22,916.88	25,895.95	28,213.04	27,569.55
Stage Motor Repairs	21.95	335.75	42.54	778.13	236.37	86.23
Stage Pump Repairs	2,792.48	1,058.75	4,956.38	3,546.64	3,852.12	5,381.52
Converter Replacement	1,230.73	1,696.91	4,349.01	2,342.30	4,928.77	2,642.55
Electrical Equipment Repairs	277.63	463.84	1,203.75	155.24	150.25	563.82
Inleakage Checks	2,605.10	1,775.45	3,467.18	2,290.91	2,693.33	3,023.35
Control Valve Repairs	208.90	151.40	137.29	51.67	111.90	110.49
Coolant Inleakage Checks	18.16	16.55	29.95	1.30	6.01	55.60
Instrumentation Repairs	0.37	15.82	0.36	4.85	38.06	90.46
Lube System Repairs	158.15	11.30	108.21	26.33	15.56	49.63
Coolant System Repairs	3,689.88	1,700.00	2,415.05	2,405.98	9,220.82	8,047.63
Engineering Tests	8,438.16	7,912.45	7,119.77	4,859.21	9,495.64	8,472.42
ClF_3 Operations	275.57	53.10	806.87	240.72	968.82	82.54
Improvement Program	4,717.66	2,838.57	2,478.65	2,325.93	7,739.17	11,933.19
Miscellaneous	12,238.74	9,360.32	5,324.14	9,069.49	9,146.48	12,342.54
Special Coolant Leaks	769.02	287.99	582.63	335.77	537.42	144.12
Power Outages	3,565.46	9,505.23	39,144.80	3,676.21	3,797.11	1,586.31
Totals	63,450.26	56,463.40	95.093.46	58,006.63	81,150.87	82,181.95

TABLE C-11
Cascade Purge Rates

Month, 1956	Average Purge Rates, Scf/Day: Top Purge Facility K-212-3	Side Purge Facilities K-312-1	Side Purge Facilities K-311-1	Combined Purge Facilities
January	3,547	8,326	13,067	24,940
February	3,870	8,114	12,789	24,773
March	3,922	8,570	13,822	26,314
April	3,740	8,152	14,645	26,537
May	3,903	8,174	15,150	27,227
June	3,634	8,154	14,246	25,619

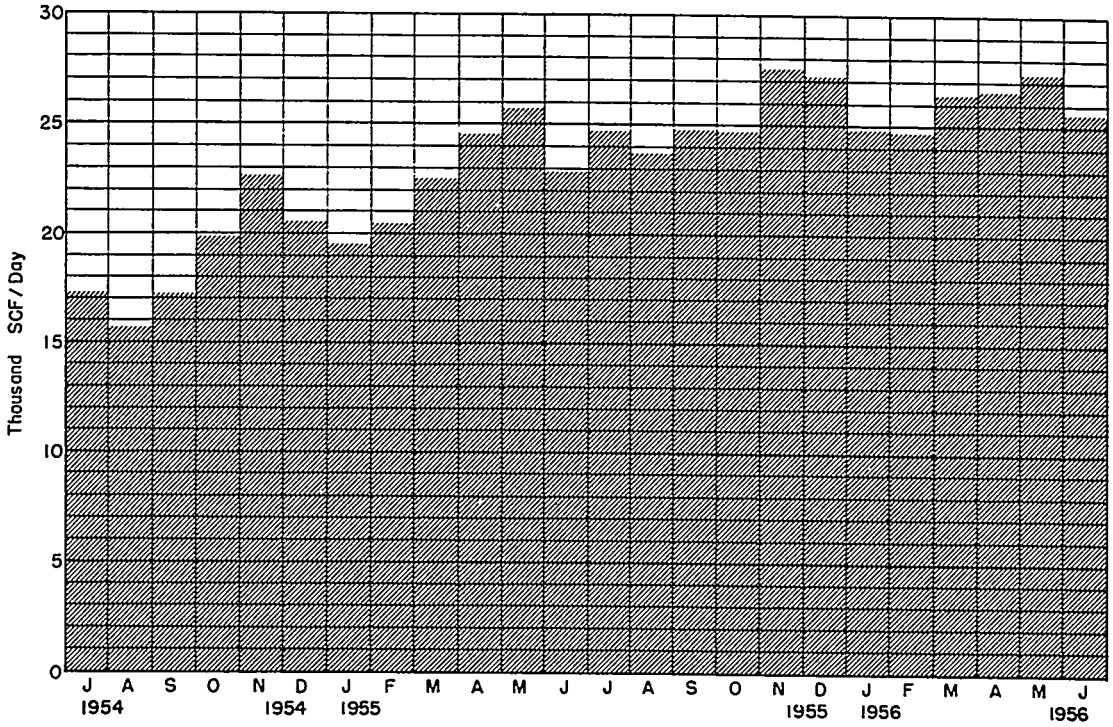


FIGURE C-6
Cascade Purge Rate

BARRIER PERMEABILITY SUMMARY

The permeabilities of the various types of barrier installed in the Oak Ridge Gaseous Diffusion Plant generally decreased during the fourth quarter of fiscal year 1956. These decreases are for the most part the result from two major causes. A plugging situation in the lower sections of the plant, apparently caused by the evacuation of chlorine trifluoride reaction products to the cascade from the K-633 test loop, resulted in measurable plugging in parts of the K-27, K-31, and K-33 buildings.

The second factor which had some effect on the barrier permeabilities in the plant was the number

PROPERTY DAMAGE

Property damage losses decreased about 80% this period, with a loss from all causes of $1,197. Over half of this was the result of a fire which occurred when a plastic caged floor fan overheated and ignited. Fortunately, damage was limited to about $650 due to prompt extinguishment by one head on the automatic sprinkler system. Although 17 fires were recorded as compared to 8 for last period, losses other than that for the fire already noted were minor.

There was a marked reduction in both the number and cost of equipment damage incidents with about $200 damage for 5 incidents being recorded as compared to about $5000 with 10 incidents for last period. A decrease was also noted in motor vehicle damage costs, and the loss was about one-half the corresponding average loss for 1955. Current property damage accidents are compared with those of other periods in table E-1.

OTHER INCIDENTS

Material Releases

Eighteen material releases occurred, none of which indicated significant problems or unexpected hazards. Of the 13 releases involving uranium contamination considerations, 6 involved seepage from defective drums, 4 from failure and repairs of feed-plant equipment, 2 were spills which occurred during handling and transporting operations, and 1 was due to an equipment failure in the K-633 Test Loop. Three corrosive material releases were due to leaks in the aqueous hydrofluoric acid pipe line between the feed plant and the tank farm, and one involved a defective hydrofluoric acid cylinder at the cylinder depot. The remaining incident was an ethyleneglycol release in the laboratory which resulted from a defective gasket on a heating unit.

Mechanical Equipment Failures

Leakage developed in defective welds in 4 vendor-owned hydrogen-fluoride cylinders, requiring disposal of the cylinder contents. One acetylene cylinder was found to have an excessive pressure, and acetone was released with the acetylene when the valve was opened. This was considered to be caused by possible overfilling of the cylinder with acetone or acetylene by the vendor, or to failure of the cylinder materials to a point where the cylinder could not be safely used for the normal acetylene contents. The cylinder contents were vented and the cylinder was destroyed by rifle fire.

A 1-1/2-inch diameter suspension bolt on a hoist in the K-33 Feed Room failed, dropping a 1-ton container, and a lifting ring failed on a special device for lifting tube bundle cores, dropping a core a few inches. Both failures were due to inadequate design of the parts; redesign of the suspension bolt was initiated, and the lifting rings for the tube bundles have been replaced by "U" clamps to prevent a recurrence of this type of failure.

The welds attaching the bridge motor and drive mechanism cracked loose on a 23-ton crane, and the parts were prevented from falling only by the suspension provided by the crane drive shafts. The welds on this crane were repaired and the welds were strengthened and additional bracing was added on both this crane and the only other similar crane in service at the plant.

A replacement schedule for crane pendant-control cables was instituted following an incident in which a short circuit in the pendant-control wiring of a 10-ton crane caused the crane to travel unattended to the rail stops at the end of the crane runway before the power could be shut off.

Two hoist cables were broken when load blocks were drawn against the hoists while the upper

groups this period as compared to 100 for last period.

The radiation levels are shown in figure E-2, where they are compared with the average film-badge exposure.

At the request of the AEC, an evaluation of personnel exposures to neutron and gamma radiation at the 3 production facilities of the Union Carbide Nuclear Company, and comments regarding the feasibility of reducing maximum permissible exposure limits to these radiations were completed and forwarded to the AEC Oak Ridge Operations Office.

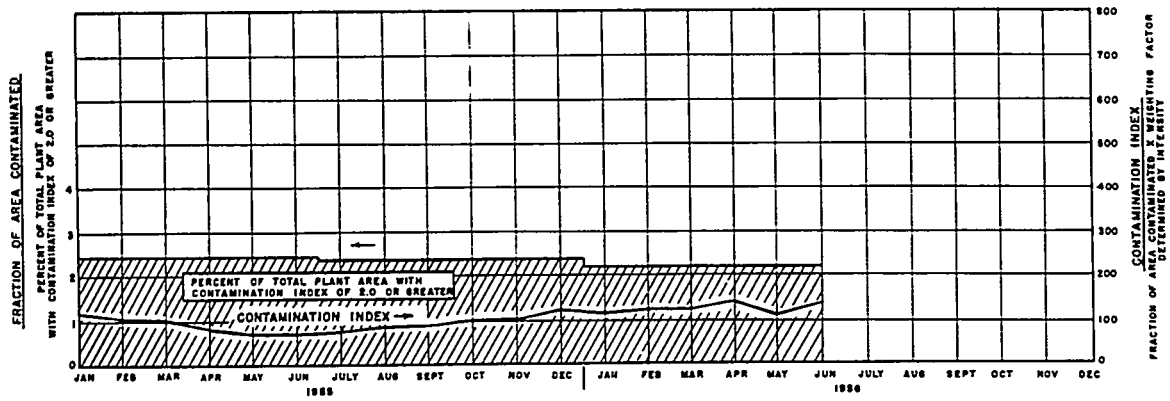


FIGURE E-4
Plant Contamination Levels

Air Activity Levels

Both the fraction of shift-length air samples in excess of the plant acceptable limit and the average air activity indicated by this continual sampling program increased slightly, primarily as a result of extensive maintenance activities on the powder conveyor systems in the K-1131 Feed Plant; adequate respiratory-protective devices are routinely worn in those areas affected.

The marked reduction in air-borne activity as indicated by spot air samples, also shown in table E-7, was associated with reduced operation of the powder-pulverizing unit in the K-1231 Feed Preparation Facility, this being a mandatory-respirator area in which operations are of an intermittent nature, and in which shift-length air samples are not routinely taken.

Air-activity data are tabulated in table E-7 and are shown graphically in figure E-5.

Radium Source Checks

Routine checks of the 22 plant radium sources revealed no evidence of source leakage.

Other Environmental Conditions

The average beta activity in plant sanitary water decreased to approximately one-half of the values reported for last period and for the previous 3-year period, the decrease being attributed to a decrease in the activity of mixed fission-product waste materials released into the Clinch River from an installation up-stream from the Oak Ridge Gaseous Diffusion Plant.

The average uranium concentration in the mud from Poplar Creek decreased approximately 75%,

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number ~~K-1251~~ K/EM-314 Date of document 2/15/56

Title and author (if document is unnumbered)

(This section to be completed by Document Center)

Date request received 10/20/95

Date submitted to ADC 12/19/95

Date submitted to HSA Coordinator 10/20/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 12/19/95 1/22/96

Date received from CICO 1/5/96 2/26/96

Date submitted to ChemRisk/Shonka and DOE 2/26/96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

K/EM-314

SANITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT SECOND FISCAL QUARTER OCTOBER 1 THRU DECEMBER 31, 1955

(EXTRACTED FROM SRD DOCUMENT # K-1251)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

December 18, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release to the public by:

2/23/96

Technical Information Officer Date
Oak Ridge K-25 Site

[redacted] ~~CONFIDENTIAL~~ K-1251

[redacted]

AEC RESEARCH AND DEVELOPMENT REPORT

OAK RIDGE GASEOUS DIFFUSION PLANT

QUARTERLY REPORT

SECOND FISCAL QUARTER

October 1, 1955 thru December 31, 1955

OAK RIDGE GASEOUS DIFFUSION PLANT

UNION CARBIDE NUCLEAR COMPANY

A DIVISION OF UNION CARBIDE AND CARBON CORPORATION

for the Atomic Energy Commission

Under U.S. Government Contract W7405 eng 26

RESTRICTED DATA

[redacted]

SECRET

RESTRICTED DATA This document contains restricted data as defined in the Atomic Energy Act of 1954. Its transmission or the disclosure of its contents in any manner to an unauthorized person is prohibited.

[redacted]

2

[redacted]

-REMAINS [redacted] RD: 12/8/93
Sa[redacted] W. [redacted]ohlfort ([redacted])

[redacted]

[redacted]

This document consists of 182 pages
No. [illegible] of 76 copies, Series A.

DATE OF ISSUE: February 15, 1956 REPORT NO. K-1251

REMAINS [redacted] RD 12/8/93
Ga[redacted] W. Hall [redacted]

G72250

OAK RIDGE GASEOUS DIFFUSION PLANT
QUARTERLY REPORT
SECOND FISCAL QUARTER
October 1, 1955 thru December 31, 1955

CENTRAL LIBR
REC. W4068
FILE
X-REF.
X-REF.

K 1251 43 A

K 1251 43 A

LOAN COPY
TO BE RETURNED TO
PLANT RECORDS K-1836

OAK RIDGE GASEOUS DIFFUSION PLANT

Operated by

UNION CARBIDE NUCLEAR COMPANY
A DIVISION OF UNION CARBIDE AND CARBON CORPORATION

for the Atomic Energy Commission

Acting Under U. S. Government Contract W7405 eng 26

RESTRICTED DATA
This [redacted] Data as defined [redacted] the Ato[redacted] Ene[redacted] Act of 1954. [redacted]thorized [redacted]losu[redacted] [redacted]bject to Adm[redacted]rative a[redacted]imina[redacted]nctions.

[redacted]

RESTRICT[redacted] DA[redacted] This document contains restricted [redacted] as [redacted]ed in the Ato[redacted]ergy Act of 19[redacted] Its tr[redacted]al or the dis[redacted] of its contents in any man[redacted] to an unauthor[redacted] person is prohibited.

[redacted]

[redacted]

3

TABLE C-6
C-816 Coolant Inleakages to the Cascade
(Continued)

Date	Location	Rate, Pounds per Day	Inleakage, Pounds	Method of Elimination of the Leaks
December 8, 1955	K-402-4.7	60	8	Replaced stage 2 converter.
December 14, 1955	K-309-3.4	56	15	Plugged No. 1 rows of gas cooler tubes in all stages.
December 17, 1955	K-301-2.1	7	2	Plugged No. 1 and B rows of gas cooler tubes in all stages.
December 18, 1955	K-301-1.1	29	5	Plugged 5 faulty gas cooler tubes in stage 6.
December 25, 1955	K-301-1.1	26	5	Plugged C-4 gas cooler tube in stage 6.
December 28, 1955	K-301-1.1	13	5	Plugged C-2 gas cooler tube in stage 2.
Total			201	

Freon-114 Coolant Leaks to the Cascade

There were no Freon-114 coolant leaks to the cascade during the first and second quarters of fiscal year 1956.

K-101 Building

The K-101 coolant removal facility was operated four times during this quarter as compared with three periods of operation during the preceding quarter. A total of 855 pounds of C-816 coolant was removed this quarter as compared with 1,051 pounds during the first quarter of fiscal year 1956. Table C-7 shows the beginning and ending dates of all four periods of operation and the corresponding amount of coolant withdrawn.

TABLE C-7
K-101 Coolant Removal Facility Withdrawal Operations

Date On	Date Off	Pounds C-816 Withdrawn
October 3, 1955	November 6, 1955	474
November 20, 1955	December 1, 1955	232
December 8, 1955	December 26, 1955	149
December 28, 1955	Still in Operation	0
Total		855

Material Releases

Eight process gas releases occurred during the second quarter of fiscal year 1956. On October 13, a sample tube ruptured releasing 35 grams of uranium hexafluoride in the barrier research laboratory. Six pounds of process gas was released on October 30 in the K-33 feed room due to a leaky cylinder valve. A corroded container permitted about two pounds of uranium hexafluoride to be released in K-1410 on October 31. On November 8, 10 pounds of reactor tails material was released in K-1131 due to a leak in the clean-up reactor. About 100 grams of top product material was released on December 4 in the K-306-7 product purification unit when a valve bellows ruptured. Two process gas releases of insignificant amounts occurred in K-413 on December 20 and 24 during Beach-Russ pump replacements. On December 26, 7 pounds of uranium hexafluoride was released to the atmosphere outside of building K-413. This release was caused by a leaky valve on a special withdrawal cylinder containing 1.44 assay material.

Table C-8 summarizes the dates, locations, and weights of uranium and uranium-235 lost in the above releases. Also included are the amounts of material vented during feed plant operation (building K-1131) and the amounts of material spilled due to corroded drums (vaults Nos. 15A and 16A).

TABLE C-8
Material Releases

Date	Location	Amount Released, Grams	
		Uranium	Uranium-235
October 13, 1955	K-1401	24	1
October 30, 1955	K-33 Feed Room	1,840	14
October 31, 1955	K-1410	663	12
November 8, 1955	K-1131	3,067	20
November 20, 1955	Vault 16A	1,555	54
November 30, 1955	Vault 15A	1	1
December 4, 1955	K-306-7 PPU	100	93
December 14, 1955	Vault 16A	9,117	63
December 20, 1955	K-413	*	*
December 24, 1955	K-413	*	*
December 26, 1955	K-413	2,147	31
October 1 through December 31, 1955	K-1131 (Feed Plant)	40,819	274
Total		59,333	563

* A small unmeasurable amount of process gas was released during pump changes.

Cascade Stream Efficiency

The K-25 cascade operated at an onstream efficiency of 99.71% during this quarter. This represents an increase of 0.25% above that of the preceding quarter. The onstream efficiencies during the current quarter for buildings K-33, K-31, K-29, K-27, and K-25 were 99.48%, 99.75%, 99.78%, 99.62%, and 99.73% respectively.

The monthly cascade onstream efficiencies during fiscal years 1955 and 1956 to date are shown in figure C-4. The costs of offstream time, broken down by causes, for the current and preceding quarters are shown in table C-9. Figure C-5 presents a tabulation of the monthly cost of offstream time for fiscal years 1955 and 1956, to date.

TABLE C-9
Cost of Offstream Time
(Fiscal Year 1956)

	July	August	September	October	November	December
Pump Seal Repairs	11,772.20	23,325.49	20,540.60	18,733.87	21,448.06	21,921.72
Stage Motor Repairs	203.27	238.42	394.09	473.69	157.25	153.75
Stage Pump Repairs	1,265.64	4,350.30	760.48	1,255.70	1,834.69	1,425.35
Converter Replacement	10,952.74	12,935.24	11,801.67	13,407.09	5,661.49	3,251.82
Electrical Equipment Repairs	586.20	351.81	1,873.53	752.34	1,408.22	507.76
Inleakage Checks	1,727.95	3,460.83	1,681.82	1,571.26	2,550.58	2,493.14
Control Valve Repairs	0	151.39	485.68	310.37	442.81	80.84
Coolant Inleakage Checks	14.57	32.33	73.91	68.23	14.85	47.78
Instrumentation Repairs	111.90	101.92	4.03	90.37	0	47.82
Lube System Repairs	211.36	71.06	24.74	21.07	12.45	5.43
Coolant System Repairs	7,544.00	927.63	2,233.60	4,645.03	2,076.39	2,189.27
Engineering Tests	1,505.72	7,620.23	5,869.88	8,420.53	7,086.67	3,001.79
ClF_3 Operations	136.37	226.63	2,257.63	37.04	482.13	230.63
Improvement Program	1,701.01	5,151.62	6,687.29	3,790.99	6,351.23	5,657.48
Miscellaneous	8,762.53	18,029.86	28,419.26	9,022.81	14,099.63	16,073.15
Special Coolant Leaks	2,018.73	1,155.78	165.49	1,180.95	388.98	404.67
Power Outages	19,988.86	42,894.42	13,289.53	10,797.86	31,855.58	1,857.03
Multiple Converter Changes	0	0	0	0	250.80	181.26
Totals	68,503.05	121,024.96	96,563.23	74,579.20	96,121.81	59,538.69

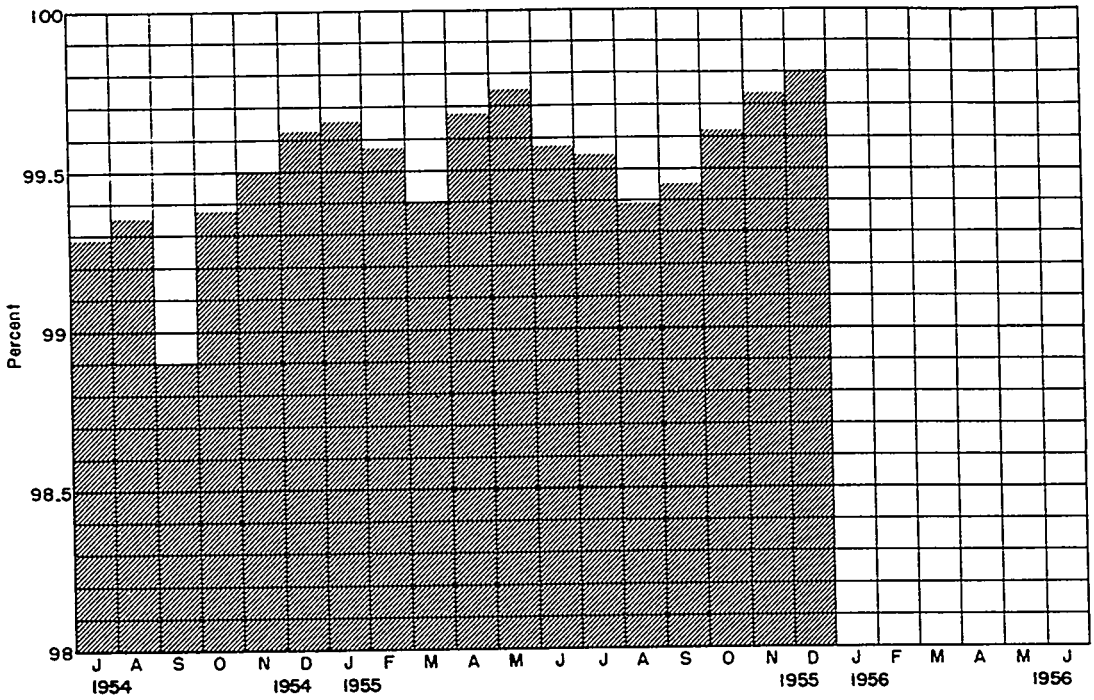


FIGURE C-4
Cascade Stream Efficiency

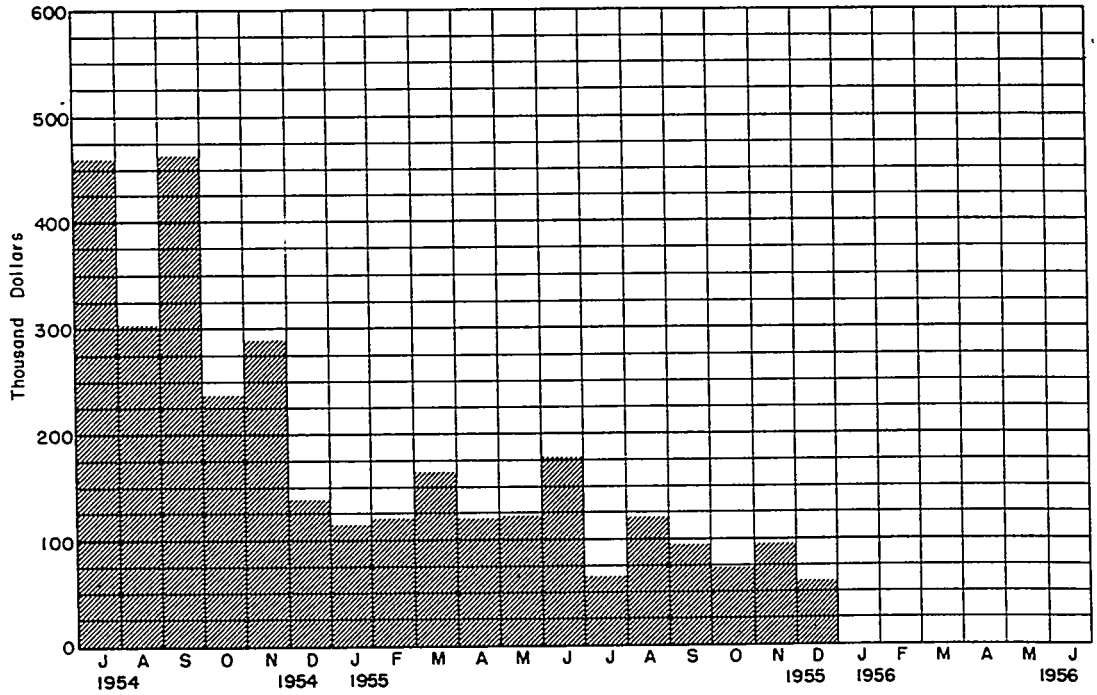


FIGURE C-5
Cost of Offstream Time

The cost of offstream time during the quarter for buildings K-33, K-31, K-29, K-27, and K-25 amounted to 73.26%, 15.58%, 3.81%, 4.67%, and 2.68%, respectively, of the total cost. The maintenance required is summarized in table C-10, as well as the offstream time, the per cent of total offstream time, the number of times offstream, and a comparison with the same items for the preceding quarter.

TABLE C-10
Separating Cascade Cell Offstream Time
(Second Quarter, Fiscal Year 1956)

	Offstream Time, Hours	Percent of Total Offstream Time	Increase in Offstream Time Over Previous Quarter	Number of Times Offstream	Percent of Total Number of Times Offstream	Increase in Number of Times Off-Stream Over Previous Quarter
Pump Seal Repairs	1,577.42	33.51	- 562.18	641	31.17	- 32
Stage Motor Repairs	257.06	5.46	+ 37.96	89	4.33	+ 37
Stage Pump Repairs	87.93	1.87	- 260.82	14	0.68	- 20
Converter Replacement	231.12	4.91	- 75.96	41	1.99	- 3
Electrical Equipment Repairs	22.28	0.47	- 51.96	18	0.88	+ 4
L. C. Inleakage Checks	159.34	3.39	- 83.58	555	26.99	-194
Control Valve Repairs	23.39	0.50	+ 18.11	10	0.49	+ 1
Coolant Inleakage Checks	14.91	0.32	- 1.23	32	1.56	+ 4
Instrumentation Repairs	11.36	0.24	- 29.62	4	0.19	- 11
Lube System Repairs	13.05	0.28	- 16.69	21	1.02	- 17
Coolant System Repairs	313.38	6.66	- 0.53	75	3.65	+ 27
Engineering Tests	112.58	2.39	- 165.73	31	1.51	- 18
ClF_3 Operations	45.10	0.96	- 1.85	14	0.68	+ 3
Improvement Program	456.47	9.70	-1,753.78	84	4.09	- 87
Miscellaneous	527.81	11.21	- 647.66	278	13.52	- 88
Coolant Leaks to the Cascade	378.49	8.04	- 140.10	25	1.22	+ 4
Power Load Reduction	384.09	8.16	- 295.40	120	5.84	-256
Multiple Converter Changes	90.96	1.93	+ 69.11	4	0.19	+ 2
Totals	4,706.74	100.00	-3,961.91	2,056	100.00	-644

Stream Efficiency this Quarter 99.71%
Stream Efficiency last Quarter 99.46%

PURGE CASCADE OPERATIONS

Purge Rates

Units K-312-1 and K-311-1 were operated throughout the quarter as cascade side purge facilities. Unit K-312-3 was operated as the cascade top purge during the entire quarter.

The purge facilities in units K-312-1, K-312-3, and K-311-1 purged an average of 8,042 scf per day, 3,849 scf per day, and 14,617 scf per day, respectively. The total purge rate during the quarter was 8.1% above that of the first quarter of fiscal year 1956.

The average uranium hexafluoride concentration in the purge gases from the K-312 purge facilities was 8.394×10^{-5} mole per cent, a decrease of 24.2% below that of the previous quarter. The average daily purge rates are tabulated in table C-11 for each month of the first and second quarters of fiscal year 1956. Figure C-6 depicts the monthly purge rates for fiscal years 1955 and 1956, to date.

Barrier Permeability Summary

No significant permeability decreases were experienced in the various types of barrier installed in the K-25 cascade during the second quarter of fiscal year 1956, whereas a general permeability decrease was experienced during the preceding quarter. During the current quarter, the barrier permeabilities in the K-27, K-31, and K-33 buildings increased while the barrier permeabilities

in the remainder of the cascade showed no significant change.

The largest permeability change during the quarter occurred in the K-33 building as a result of the unplugging effect obtained in units K-902-5, -6, -7, and -8. These units became severely plugged during the previous quarter

The calculation of barrier permeabilities in the K-25 cascade was generally unaffected by changes in operating conditions during the quarter. The only changes consisted of stage pressure increases in the K-303, K-309, K-301, K-602, and K-902 sections

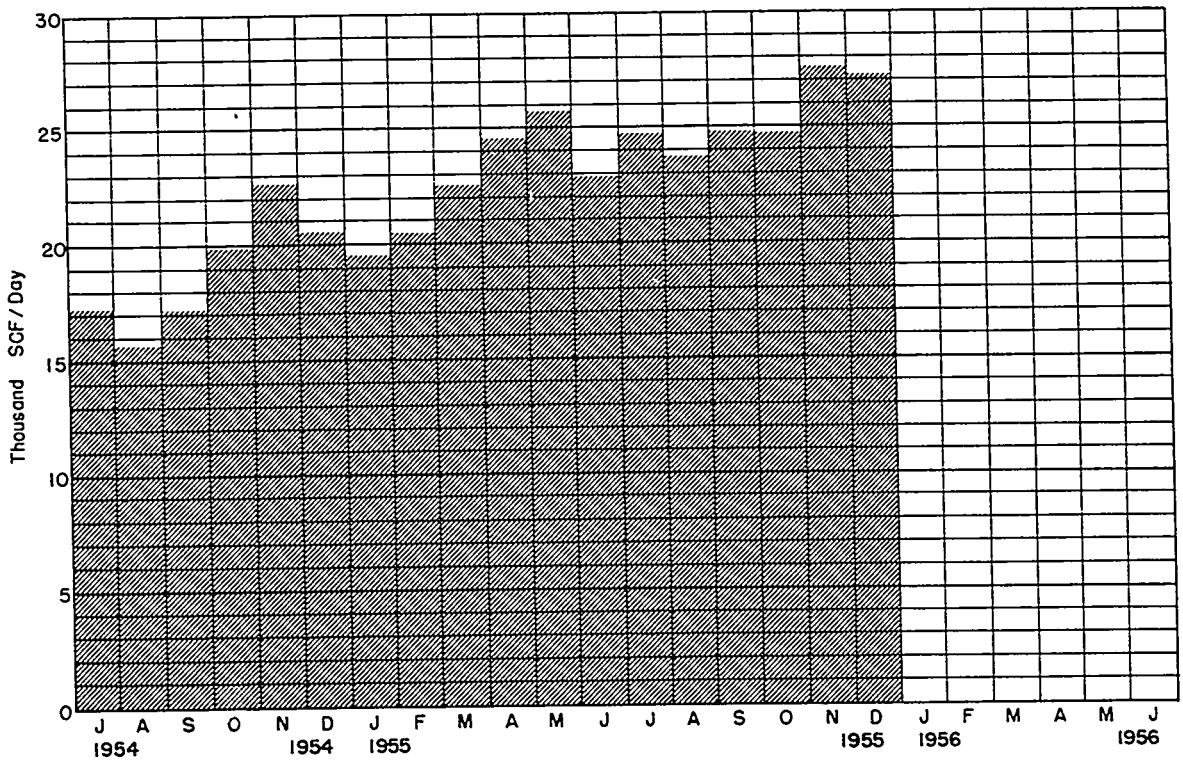


FIGURE C-6
Cascade Purge Rate

TABLE C-11
Cascade Purge Rates

Month	Average Purge Rates, scf/Day: Top Purge Facility K-312-3	Side Purge Facilities K-312-1	Side Purge Facilities K-311-1	Combined Purge Facilities
July, 1955	4,300	6,307	14,186	24,793
August, 1955	4,690	7,036	12,161	23,887
September, 1955	4,410	7,827	12,679	24,916
October, 1955	3,989	7,741	13,135	24,865
November, 1955	3,808	8,202	15,584	27,594
December, 1955	3,751	8,184	15,164	27,099

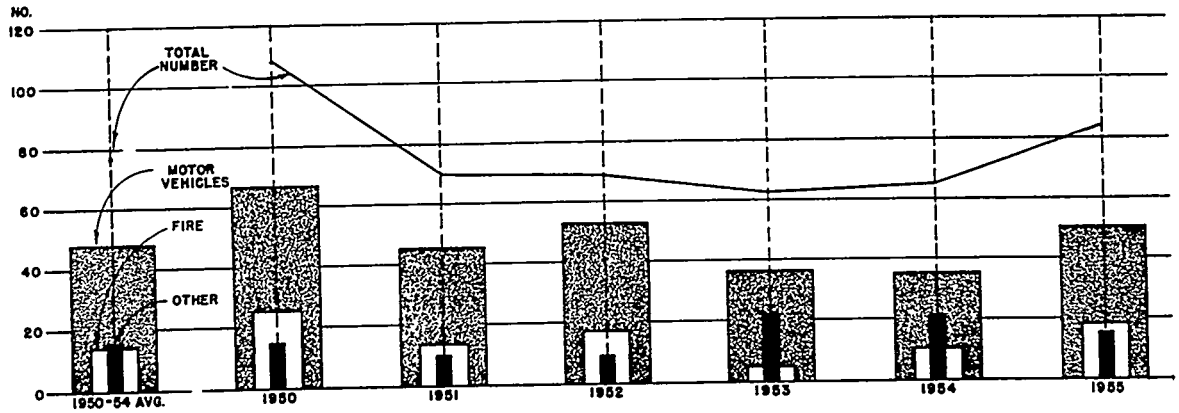


FIGURE E-6
Number of Property Damage Accidents

OTHER INCIDENTS

Material Releases

Of the 11 reported uranium material releases involving contamination considerations, 4 resulted from solution leakage from corroded containers in storage locations, 3 from leakage at uranium-hexafluoride cylinder valves, 2 from pump-seal leakage during uranium-hexafluoride withdrawal operations, 1 from a sample-tube rupture in a laboratory area, and 1 involved leakage from a process reactor. Of the 7 releases of toxic or corrosive materials, 2 involved small amounts of mercury in laboratory areas and 5 involved leaks of aqueous hydrofluoric acid from piping between the K-1131 Feed Plant and the storage tanks.

Long-term corrosion of the aqueous-hydrofluoric-acid transfer line noted above, which is currently being replaced, was the principal cause of 15 releases of toxic or corrosive materials for the year as compared to 3 for last year, and small releases of uranium hexafluoride during the more extensive axial-flow-compressor maintenance operations, carried out during the first part of the year in the K-1401 Maintenance Building, were the principal causes of the 26 releases of radioactive materials as compared to 18 for 1954; similar maintenance operations are now performed in a hooded area in the K-1420 Decontamination Building.

Mechanical Equipment Failures

The mechanical load brake of a K-33 crane failed and dropped a freon condenser approximately 18 inches on a building catwalk, and a drum of trichloroethylene was dropped when a defective weld of the stock ring in a bridle sling failed. Damage was negligible in each case and no injuries resulted.

One heat exchanger tube in a K-1131 Feed Plant cold trap failed, permitting the process material to leak into the cooling media; the defective tube was plugged and the trap was returned to service.

Weld leakage developed in 2 monel vessels and the welds and shell plates were found to be deteriorated and cracked as a result of normal stress corrosion and hydrogen embrittlement. Extensive repairs of the welds were made to permit operation of the vessels until replacements could be obtained.

to heavy industrial operations, and that the plant conditions remained essentially unchanged with regard to safety, fire, and electrical hazards; as shown in table E-6 about 92% of such items observed were considered satisfactory.

TABLE E-6
Safety, Fire Protection, and Electrical Audit Results

	This Quarter	Last Quarter	1955*
General Safety			
Plant Conditions			
Number Audited	13,458	16,673	8,696
Number Satisfactory	12,490	15,138	8,259
% Satisfactory	93	91	95
Employee Acts			
Number Audited	1,780	2,096	1,653
Number Satisfactory	1,602	1,917	1,505
% Satisfactory	90	91	91
Fire Protection			
Number Audited	2,234	1,737	1,427
Number Satisfactory	2,142	1,619	1,345
% Satisfactory	96	93	94
Electrical			
Number Audited	7,305	4,576	4,045
Number Satisfactory	6,614	4,030	3,615
% Satisfactory	90	88	89

* Where totals are concerned, these figures refer to quarterly averages.

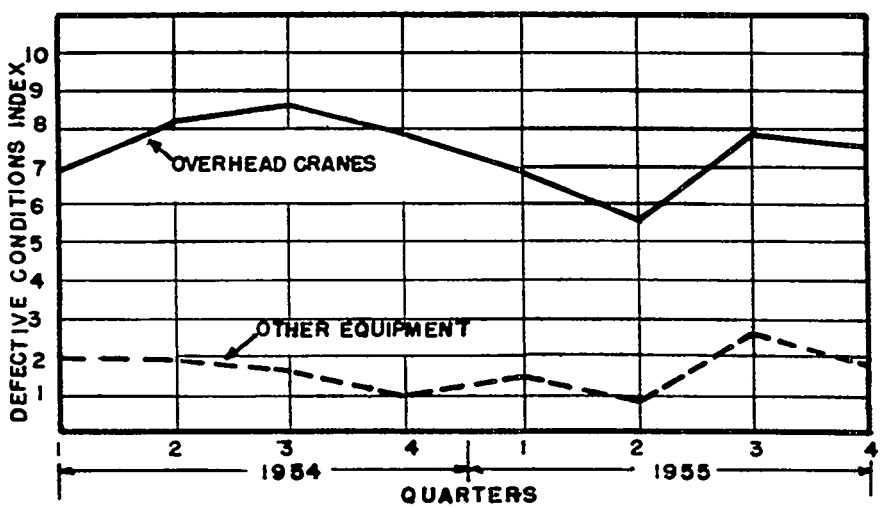


FIGURE E-7
Condition of Materials-Handling Equipment

HEALTH PHYSICS

Alpha Contamination

Plant alpha contamination levels in the 67 plant locations having contamination problems, as reflected in surveys by both operating and staff groups, increased 32% over last quarter. This increase was primarily attributed to the processing of an increased amount of ash material in the K-1231 Pulverizer Area, to contamination spread during minor dismantling operations in the K-1410

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (Is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number ~~K-1250~~ K/EM-313 Date of document 11/23/55

Title and author (if document is unnumbered)

(This section to be completed by Document Center)

Date request received 10/20/95

Date submitted to ADC 12/19/95

Date submitted to HSA Coordinator 10/20/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 12/19/95 1/22/96

Date received from CICO 1/5/96 2/26/96

Date submitted to ChemRisk/Shonka and DOE 2/26/96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

K/EM-313

SANITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT FIRST FISCAL QUARTER JULY 1 THRU SEPTEMBER 30, 1955

(EXTRACTED FROM SRD DOCUMENT # K-1250)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

December 18, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for [illegible]
[illegible] by:
[illegible] 2/23/96
[illegible] Information Officer
[illegible] Ridge K-25 Site

[redacted]

[redacted]

K-1250

[redacted]

OAK RIDGE GASEOUS DIFFUSION PLANT

QUARTERLY REPORT

FIRST FISCAL QUARTER

July 1, 19[illegible] thru September 30, 195[illegible]

OAK RIDGE GASEOUS DIFFUSION PLANT

UNION CARBIDE NUCLEAR COMPANY

[illegible]

[redacted]

[redacted]

2

~~CONFIDENTIAL~~

REMAINS SRD: 12/8/93
Sam W. Wohlfert (AR)

This document consists of 200 pages
No. 1 of 75 copies, Series A.

~~SECRET~~

~~SECRET~~

~~REMAINS SRD 12/8/93~~
Gary W. Hall ADD

16 694

DATE OF ISSUE: November 23, 1955 REPORT NO. K-1250

CENTRAL LIBRARY
REC. W40684
FILE
X-REF.
X-REF.

PLANT RECORDS DEPT.
CENTRAL FILES
REC. G-53291
FILE
X-REF.
X-REF.

OAK RIDGE GASEOUS DIFFUSION PLANT

QUARTERLY REPORT

FIRST FISCAL QUARTER

July 1, thru September 30, 1955

DEC 12 AM 10:49

MAINT. PLANNING & ... DEPT.

LOAN COPY
TO BE RETURNED TO
PLANT RECORDS K-1034

K 1250 9 A

K 1250 9 A

OAK RIDGE GASEOUS DIFFUSION PLANT

Operated by

UNION CARBIDE NUCLEAR COMPANY
A DIVISION OF UNION CARBIDE AND CARBON CORPORATION

for the Atomic Energy Commission

Acting Under U. S. Government Contract W7405 eng 26

~~RESTRICTED DATA~~
~~This document contains Restricted Data as defined in the Atomic Energy Act of 1954. Unauthorized disclosure subject to Administrative and Criminal Sanctions.~~

~~RESTRICTED DATA This document contains restricted data as defined in the Atomic Energy Act of 1954. Its transmittal or the disclosure of its contents in any matter to an unauthorized person is prohibited.~~

3

~~CONFIDENTIAL~~

~~SECRET~~

~~SECRET~~

K-101 Building

The K-101 coolant removal facility was in operation at the beginning of the first quarter of fiscal year 1956 and was operated during two other periods during this quarter. A total of 1,051 pounds of C-816 coolant was removed as compared with 317 pounds removed during the preceding quarter. Table C-8 shows the beginning and ending dates, all three periods of operation, and the corresponding amounts of coolant withdrawn.

TABLE C-7
C-816 Coolant Inleakages To The Cascade

Date	Location	Rate, Lbs./Day	Inleakage, Pounds	Method of Elimination of the Leaks
7- 1	K-402-1.7	5	5	Plugged No. 1 and 2 rows of gas cooler tubes in stage 2.
7- 6	K-402-1.7	3	10	Replaced stage 2 converter.
7- 7	K-301-3.3	240	30	Plugged No. 1 row of gas cooler tubes in all stages.
7-20	K-301-4.2	2,000	250	Plugged No. 1 row of gas cooler tubes in all stages.
7-20	K-309-1.4	484	100	Plugged No. 1 row of gas cooler tubes in all stages.
8- 8	K-301-4.7	7	2	Plugged K-1 gas cooler tube in stage 3.
8- 9	K-309-2.1	10	10	Plugged D-3 gas cooler tube in stage 5.
8-20	K-402-4.7	146	20	Plugged W-4 gas cooler tube in stage 2.
8-20	K-301-1.3	23	5	Plugged E-1 gas cooler tube in stage 6.
8-23	K-301-3.7	6	5	Plugged No. 1 row of gas cooler tubes in all stages.
8-25	K-309-2.4	378	50	Plugged B-3 gas cooler tube in stage 3.
8-27	K-309-2.6	87	10	Plugged A-2 gas cooler tube in stage 5.
9-22	K-301-3.7	68	4	Plugged B-3 gas cooler tube in stage 2.
9-27	K-402-8.3	61	18	Plugged A and B rows of gas cooler tubes in all stages.
		Total	519 pounds	

TABLE C-8
K-101 Coolant Removal Facility Withdrawal Operations

Date On	Date Off	Pounds C-816 Withdrawn
In Operation	July 12	181
July 20	August 4	590
August 25	September 6	280
Total		1,051

Material Releases

Two process gas releases occurred during the first quarter of fiscal year 1956, the same as during the preceding quarter. On August 31, 0.5 pounds of uranium hexafluoride were released to the atmosphere. The release occurred during evacuation of cell K-301-1.4 while utilizing portable air jets. Approximately 2.8 kilograms of uranium were piped to the holding pond from the K-1420 No. 2 rinse subsequent to decontamination of converter No. 000-496 on September 12.

Table C-9 summarizes the dates, locations, and weights of uranium and uranium-235 lost in the above releases. Also included are the materials vented during feed plant operation (building K-1131), the materials vented during converter decontamination (building K-1401), and the materials spilled

due to corroded drums (vaults Nos. 15A and 16A).

TABLE C-9
Material Releases

Date	Location	Loss Grams U	Loss Grams U-235
August 31, 1955	K-301-1.4	153	23
September 12	K-1420	2,756	12
September 28	Vault 15A	2	0
	Vault 16A	124	29
July 10 through September 30	K-1131 Stack losses	20,982	141
July 1 through September 30	K-1401 Decontamination	120	2
	Total	24,137	207

Cascade Stream Efficiency

The K-25 cascade operated at an on-stream efficiency of 99.46% during this quarter. This represents a decrease of 0.20% below that of the preceding quarter. The on-stream efficiencies during the current quarter of buildings K-33, K-31, K-29, and K-27 - K-25 were 99.37%, 99.69%, 99.73%, and 99.44%, respectively.

The monthly cascade on-stream efficiencies during fiscal years 1955 and 1956 (to date) are shown in figure C-4. The costs of off-stream time, broken down by causes, for the current and preceding quarters are shown in table C-10. Figure C-5 presents a tabulation of the monthly cost of off-stream time for fiscal years 1955 and 1956, to date.

The cost of off-stream time during the quarter for buildings K-33, K-31, K-29, K-27, and K-25 amounted to 71.19%, 15.00%, 3.73%, 3.89%, and 6.19%, respectively, of the total cost. The maintenance required is summarized in table C-11, as well as the off-stream time, the per cent of total off-stream time, the number of times off-stream, and a comparison with the same items for the preceding quarter.

TABLE C-10
Cost of Off-Stream Time

	1955 April	May	June	July	August	September
Pump Seal Repairs	28,523.79	27,275.12	24,606.82	11,772.20	23,325.49	20,540.60
Stage Motor Repairs	3,047.45	2,360.41	1,081.94	203.27	238.42	394.09
Stage Pump Repairs	7,541.15	4,383.13	6,357.37	1,265.64	4,246.61	760.48
Converter Replacement	10,885.06	18,485.14	21,934.85	10,952.74	12,935.24	11,801.67
Electrical Equipment Repairs	362.95	262.03	1,100.59	586.20	351.81	1,873.53
L. C. Inleakage Checks	5,242.37	3,644.44	3,713.56	1,727.95	3,460.83	1,681.82
Control Valve Repairs	74.53	106.52	993.40	-	151.39	485.68
Coolant Inleakage Checks	55.98	32.15	117.61	14.57	32.33	73.91
Instrumentation Repairs	1.97	674.83	95.12	111.90	101.92	4.03
Lube System Repairs	0.30	1.75	226.96	211.36	71.06	24.74
Coolant System Repairs	2,469.01	3,338.80	11,414.51	7,544.00	927.63	2,233.60
Engineering Tests	10,248.15	6,155.25	5,266.41	1,505.72	7,620.23	5,869.88
ClF_3 Operations	316.97	1,476.26	623.35	136.37	226.63	2,257.63
Improvement Program	3,739.50	1,426.21	7,065.23	1,701.01	2,745.28	2,630.38
Miscellaneous	16,631.77	10,245.42	15,984.35	8,762.53	18,029.86	28,419.26
Special Coolant Leaks	1,154.79	942.04	413.50	2,018.73	1,155.78	165,49
Power Load Reduction	29,278.12	41,609.93	74,533.94	19,988.86	42,894.42	13,289.53
Converter and Compressor Change	-	-	-	-	2,334.70	2,261.06
Multi-converter Change	-	-	-	-	-	1,795.85
Totals	119,573.86	122,419.43	175,529.51	68,503.05	120,849.63	96,563.23

TABLE C-11
Separating Cascade Cell Off-Stream Time

	Off-Stream Time, Hours	% of Total Off-Stream Time	Increase in Off-Stream Time over Previous Quarter	Number Times Off-Stream	% of Total Number of Times Off-Stream	Increase in Number of Times Off-Stream Over Previous Quarter
Pump Seal Repairs	2,139.60	24.68	+ 664.11	673	24.92	+ 125
Stage Motor Repairs	219.10	2.53	+ 63.88	52	1.93	+ 2
Stage Pump Repairs	348.75	4.02	+ 24.85	34	1.26	+ 3
Converter Replacement	307.08	3.54	+ 31.21	44	1.63	+ 12
Electrical Equipment Repairs	74.24	0.86	+ 62.98	14	0.52	+ 0
L. C. Inleakage Checks	242.92	2.80	+ 51.63	749	27.74	+ 188
Control Valve Repairs	5.28	0.06	- 19.86	9	0.33	- 1
Coolant Inleakage Checks	16.14	0.19	+ 7.28	28	1.04	+ 7
Instrumentation Repairs	40.98	0.47	+ 18.51	15	0.56	- 2
Lube System Repairs	29.74	0.34	+ 6.83	38	1.41	+ 19
Coolant System Repairs	313.91	3.62	+ 63.83	48	1.78	- 5
Engineering Tests	278.31	3.21	+ 172.72	49	1.81	+ 14
ClF_3 Operations	46.95	0.54	+ 1.60	11	0.41	+ 1
Improvement Program	2,199.05	25.38	+ 1,193.75	170	6.30	+ 80
Miscellaneous	1,175.47	13.56	+ 429.50	366	13.55	+ 122
Coolant Leaks to the Cascade	518.59	5.98	+ 458.29	21	0.78	+ 16
Power Load Reduction	679.49	7.84	+ 34.40	376	13.92	+ 114
Converter and Compressor Change	11.20	0.13	+ 11.20	1	0,04	+ 1
Multi-Converter Change	21.85	0.25	+ 21.85	2	0.07	+ 2
Totals	8,668.65	100.00	+ 3,298.56	2,700	100.00	+ 698

Stream Efficiency this Quarter 99.46%
Stream Efficiency last Quarter 99.66%

PURGE CASCADE OPERATIONS

Purge Rates

Unit K-312-3 was operated as the cascade top purge during the entire quarter. Units K-312-1 and K-311-1 were operated throughout the quarter as side purge facilities.

During the quarter, purge facilities in units K-312-1, K-312-3, and K-311-1 purged an average of 7,057 scf per day, 4,467 scf per day, and 13,012 scf per day, respectively. The total purge rate during quarter increased 0.6% above that of the fourth quarter of fiscal year 1955.

The uranium hexafluoride concentration in the purge gases from the K-312 purge facilities averaged 11.070×10^{-5} mole per cent, an increase of 63.5% above that of the previous quarter. The average daily purge rates are tabulated in table C-12 for each month of the current and preceding quarters. Figure C-6 portrays the monthly purge rates for fiscal years 1955 and 1956 to date.

TABLE C-12
Cascade Purge Rates

	Average Purge Rates, scf/Day			
	Top Purge Facility	Side Purge Facilities		Combined Purge Facilities
Month	K-312-3	K-312-1	K-311-1	
April, 1955	3,164	5,181	16,113	24,458
May, 1955	3,498	5,498	16,687	25,683
June, 1955	3,336	5,919	13,683	22,938
July, 1955	4,300	6,307	14,186	24,793
August, 1955	4,690	7,036	12,161	23,887
September, 1955	4,410	7,827	12,679	24,916

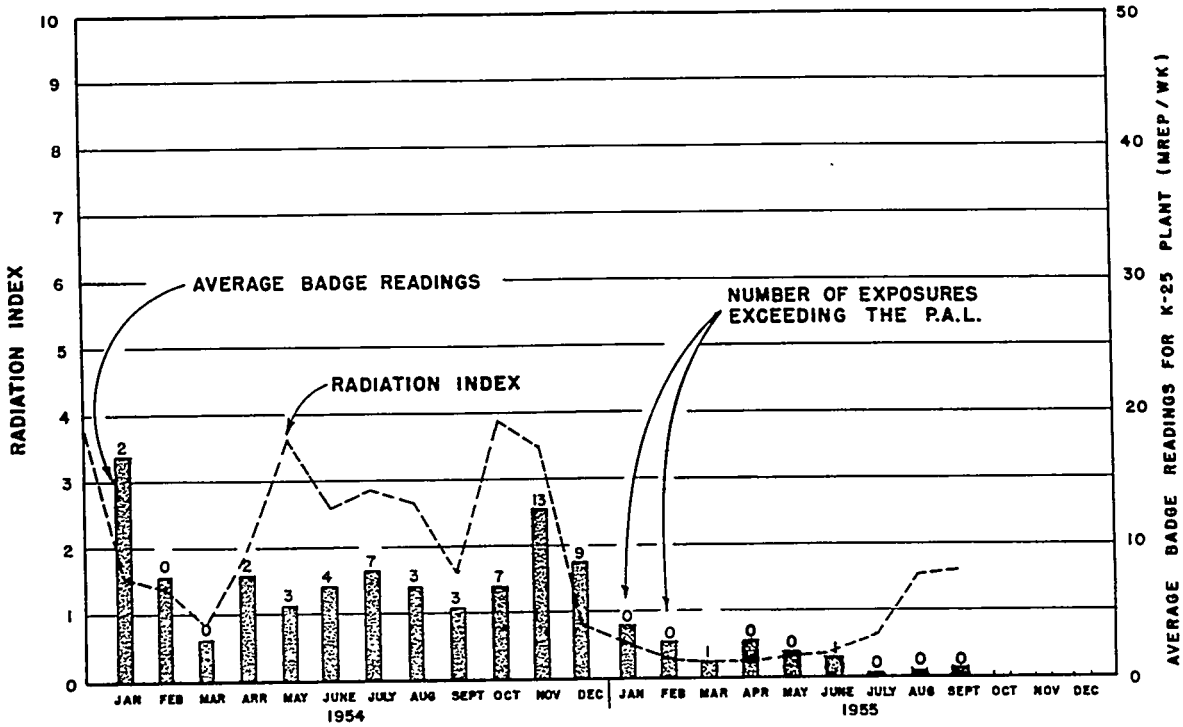


FIGURE E-2
Film Badge Exposure and Penetrating Radiation Index

OTHER INCIDENTS

Material Releases

Of the reported uranium material losses, only 3 involved possible contamination considerations, these being a small release of uranium hexafluoride in a process building and 2 small losses from corroded drums in storage vaults. In addition, 5 liquid acid spills were reported. The most significant of these occurred when a pressure build-up ruptured an over-filled cylinder as its liquid contents warmed to room temperature, releasing about 70 pounds of hydrogen fluoride; personnel injuries were restricted to 9 employees who experienced minor chemical burns. Two other releases of hydrogen fluoride and 1 of nitric acid resulted from leaking transfer lines and a defective valve on a tank truck, while the remaining incident involved spillage of discarded fluorine-generation electrolyte from a truck en route to the disposal facility. In none of these latter incidents were there any personnel injuries.

Mechanical Equipment Failure

The cable of an electric hoist broke with a resultant load drop when the hoist block was raised too far after the removal of a length of defective cable had rendered the geared upper limit device ineffective; damage was limited to the cable itself, and no injuries resulted.

PROTECTIVE EQUIPMENT AND FACILITIES

PERSONNEL

Five air-supplied impermeable-type suits were field-tested to determine their suitability for use in plant emergency work and were shown to give adequate protection and comfort to wearers under

HEALTH PHYSICS

Radioactive contamination continued at relatively low levels, only slight increases being noted in connection with the increased material handling associated with the resumption of production activities in the K-1131 Feed Plant. As noted under ENGINEERING DESIGN AND SPECIFICATIONS, a number of features associated with new facilities and alterations of old ones have greatly facilitated the handling of radioactive materials with a minimum of personnel and facility contamination.

A comparison of current environmental radiation conditions with those of other periods is shown in table E-7.

Alpha Contamination

Plant alpha-contamination levels in the 67 locations having contamination problems, as reflected by audit surveys by both operating and staff groups, increased only slightly and remained well below the values reported in 1954.

Figure E-4 compares present plant contamination levels with those of other periods.

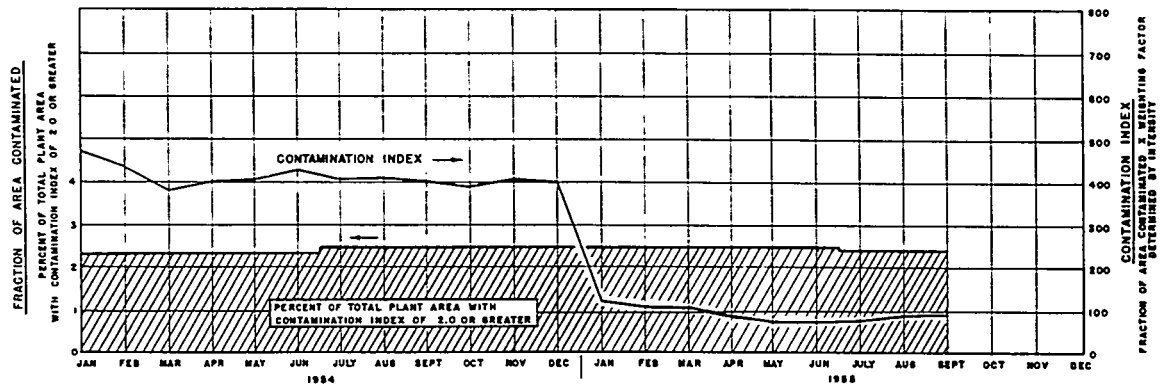


FIGURE E-4
Plant Contamination Levels

Penetrating-Radiation Levels

Although penetrating-radiation levels increased by almost a factor of 4 over the record low levels noted last quarter, the radiation index of 1.20 was only about one-half of the average value reported in 1954.

The increase is attributed principally to the normal accumulation of beta-gamma emitting uranium-daughter products associated with the resumption of production in the K-1131 Feed Plant, and to a corresponding increase in the decontamination and dismantling work performed on equipment containing such materials.

Thirteen routine beta-gamma monitoring reports were submitted by operating groups as compared with 5 for last period.

The relation between radiation levels and film badge readings is shown in figure E-2.

Air-Activity Levels

As noted in table E-7 further decreases in both the average air activity, as indicated by shift-length air samples, and the number of over-P.A.L. spot air samples were noted, these being attributable

largely to improved equipment for radioactive-materials control in connection with compressor dismantling operations as noted under ENGINEERING DESIGN AND SPECIFICATIONS.

Radium-Source Checks

Routine checks of the 22 plant radium sources revealed no evidence of source leakage.

Other Environmental Conditions

A decided decrease in the average beta activity in the K-25 sanitary water as shown in table E-7 may be attributed primarily to greater dilution of the fission-product waste material released from an installation upstream from K-25 as a result of a marked increase in the average flow volume of the Clinch River.

The average uranium concentration of the Poplar Creek and Clinch River stream bottoms, while remaining well below significant levels, increased slightly from the normal discharge of small amounts of uranium from the K-1131 Feed Plant.

TABLE E-7
Environmental Conditions

	This Quarter	Last Quarter	Year To Date[a]	1954[a]	1953 and 1954[a]
Alpha Contamination					
Plant Contamination Index[b]	86	80	93	413	431
No. Locations Included	67	64	65	62	60
% Plant Area Surveyed[b]	2.3	1.7	1.9	2.4	2.0
Penetrating Radiation					
Radiation Index[c]	1.20	0.31	0.70	2.18	1.85
No. Locations Included	8	8	8	8	8
Air Activity (Shift-Length)					
No. Samples Taken	1,569	1,885	1,642	1,744	1,876
No. Above P.A.L.[d]	7	19	19	29	22
Av. Activity Per Sample (c./min./ft.^{3})	0.03	0.34	0.19	0.20	0.15
Air Activity (Spot)					
No. Samples Taken	263	234	246	422	368
No. Above P.A.L.	6	10	9	24	47
Av. Activity Per Sample (c./min./ft.^{3})	0.13	0.25	0.39	0.57	0.57[e]
Water and Sewage Control					
Av. Beta Activity of K-25 Sanitary Water (dis./min./100 ml.)	14	39	27.9	38.8	36.7
U Concentration in Poplar Creek Mud (ppm.)	45	25	38.6	124	92
U Concentration in Clinch River Mud (ppm.)	1.5	1	2.6	3.4	2.1

a Where totals are concerned, figures refer to quarterly averages.

b Contamination index is a figure which reflects the product of the extent and intensity of alpha contamination exceeding the P.A.L.; the values shown include only those plant locations with a 6-month average contamination index of 2.0 or greater.

c The radiation index, which reflects both the extent and intensity of radiation found, is essentially the product of the work area over which the dose rate is more than 7.5 mrep/hr. and a weighting factor which depends upon the actual radiation intensities over the area concerned.

d P.A.L. - plant acceptable limit.

e 1954 only.

EMERGENCY ACTIVITIES

Emergency plans to be placed into effect in the event of an air-raid alert continued, with emphasis being placed on the determination of evacuation routes to off-plant emergency assembly areas and plans for plant shelters.

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 — Expected receipt of document 1 MONTH

Document number ~~K-1153~~ K/EM-312 — Date of document 8/10/55

Title and author (if document is unnumbered)

(This section to be completed by Document Center)

Date request received 10/20/95

Date submitted to ADC 12/19/95

Date submitted to HSA Coordinator 10/20/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 12/19/95 1/22/96

Date received from CICO 1/5/96 2/26/96

Date submitted to ChemRisk/Shonka and DOE 2/26/96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

K/EM-312

SANITIZED VERSION OF EXTRACT FROM K-25 PLANT QUARTERLY REPORT FOURTH FISCAL QUARTER APRIL 1 THRU JUNE 30, 1955

(EXTRACTED FROM SRD DOCUMENT # K-1153)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

December 18, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release to the public by:

2/23/96
Technical Information Officer Date
Oak Ridge K-25 Site

[redacted]

AEC RESEARCH AND DEVELOPMENT REPORT

K-1153

~~CONFIDENTIAL~~

[redacted]

...TORIED
FEB 1956 CF

PROPERTY OF
ORGDP LIBRARY

JAN 27 9 30 AM '75

K-25 PLANT QUARTERLY REPORT

FOURTH FISCAL QUARTER

April 1, 1955 thru June 30, 1955

1955 AUG 11 PM 3:27

D.M.L. 0

K-25 PLANT

CARBIDE AND CARBON CHEMICALS COMPANY

A DIVISION OF UNION CARBIDE AND CARBON CORPORATION

OAK RIDGE, TENNESSEE

Acting Under U S. Government Contract W7405 eng 26

[redacted]

~~RESTRICTED DATA~~

~~This document contains restricted data as defined in the Atomic Energy Act of 1954. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.~~

~~RESTRICTED DATA~~

~~This document contains restricted data as defined in the Atomic Energy Act of 1954. Its authorized disclosure is subject to Administrative and Criminal Sanctions.~~

~~CONFIDENTIAL~~

2

[redacted]

~~SECRET~~ ~~SECRET~~ ~~CONFIDENTIAL~~

~~Remains SRD: 12/8/93~~
~~Sam W. Wolfort (AR)~~
~~Remains SRD 12/8/93~~
~~Gary W. Hall ADD~~

This document consists of 186 pages
No. 43 of 75 copies, Series A.

DATE OF ISSUE: August 10, 1955

REPORT NO. K-1153

~~974207~~

K-25 PLANT QUARTERLY REPORT

FOURTH FISCAL QUARTER

April 1, thru June 30, 1955

CENTRAL LIBRARY
REC. W40623
FILE
X-REF.
X-REF.

~~TO BE RETURNED TO PLANT RECORDS K-1053~~

K 1153 41 A

K 1153 41 A

K-25 PLANT
CARBIDE AND CARBON CHEMICALS COMPANY
A DIVISION OF UNION CARBIDE AND CARBON CORPORATION
OAK RIDGE, TENNESSEE

~~RESTRICTED DATA~~
~~This document contains restricted data as defined in the Atomic Energy Act of 1954. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.~~

~~RESTRICTED DATA~~
~~This document contains Restricted Data as defined in the Atomic Energy Act of 1954. Unauthorized disclosure subject to Administrative and Criminal Sanctions.~~

~~CONFIDENTIAL~~
[redacted]

[redacted]

3

was lost when the inlet and outlet lube oil lines to the stage 2B pump in cell K-310-2.4 ruptured.

C-816 Coolant Leaks to the Cascade

Only four C-816 coolant leaks to the cascade were detected during this quarter as compared with 12 during the preceding quarter. The first leak was partially external with a loss of 250 pounds of C-816 coolant to the atmosphere. Table C-6 summarizes the dates, locations, and methods of eliminating these inleakages as well as the rates and total inleakages.

TABLE C-6

C-816 Coolant Inleakage to the Cascade

Date	Location	Rate, Lbs./Day	Inleakage, Lbs.	Method of Elimination of the Leaks
April 23	K-311-1.8	-	50*	Replaced the after cooler to the 4A pump.
May 10	K-402-3.1	120	20	Plugged A and B rows of gas cooler tubes in stage 2.
May 11	K-402-8.6	50	50	Plugged V-2 gas cooler tube in stage 4.
June 23	K-402-9.6	220	300	Plugged A and B rows of gas cooler tubes in all stages of this cell.
Total			420	

*In addition, 250 pounds of C-816 coolant was lost to the atmosphere.

Freon-114 Coolant Leaks to the Cascade

Only one Freon-114 coolant leak to the cascade was experienced during this quarter as compared with two such leaks during the preceding quarter. On April 12, a leak of 17 pounds per day (3 pounds total) was discovered in cell K-502-2.6. The stage 4 converter was replaced to eliminate the inleakage.

K-101 Building

The K-101 coolant removal facility was in operation at the beginning of the fourth quarter of fiscal year 1955 and operated for three other periods during this quarter. A total of 317 pounds of C-816 coolant was removed during this quarter as compared with 1,771 pounds removed during the preceding quarter. Table C-7 shows all four periods of operation and the corresponding amounts of coolant withdrawn.

TABLE C-7

K-101 Coolant Removal Facility Withdrawal Operations

Date On	Date Off	Pounds C-816 Withdrawn
In Operation	April 7	82
April 26	April 29	60
May 13	May 23	175
June 27	Still in Operation	0
Total		317

Material Releases

Two process gas releases occurred during this quarter as compared with four during the preceding quarter. On April 19, the flexible connection between a feed cylinder and permanent piping of the

K-633 test loop ruptured. Approximately 25 pounds of process gas was released. A gas cooler failure was experienced in the K-1401 test loop on June 8. This permitted water to enter the loop and hydrolize the uranium hexafluoride. An insignificant amount of material spilled while the equipment was being dismantled to be sent to K-1410 for decontamination.

Table C-8 summarizes the dates, locations, and weights of uranium and uranium-235 lost in the above releases. Also included is the material released while decontaminating 14 size 00 converters in K-1401.

TABLE C-8
Material Releases

Date	Location	Loss	
		Grams U	Grams U-235
April 19, 1955	K-633 Test Loop	7,668	28
June 8, 1955	K-1401 Test Loop	90	1
April 1, 1955 through June 30, 1955	K-1401 Decontamination	1,135	61
Total		8,893	90

Cascade Stream Efficiency

The K-25 cascade operated at an on-stream efficiency of 99.66% during this quarter. This represents an increase of 0.12% above that of the preceding quarter. The on-stream efficiencies during the current quarter for buildings K-33, K-31, K-29, K-27, and K-25 were 99.43%, 99.57%, 99.53%, 99.78%, and 99.70%, respectively.

The monthly cascade on-stream efficiencies during fiscal years 1954 and 1955 are shown in figure C-4. The costs of off-stream time, broken down by causes, for the current and preceding quarters are shown in table C-10. Figure C-5 presents a tabulation of the monthly cost of off-stream time for fiscal years 1954 and 1955.

The cost of off-stream time during the quarter for buildings K-33, K-31, K-29, K-27, and K-25 amounted to 60.97%, 21.68%, 7.50%, 2.98%, and 6.87%, respectively, of the total cost. The maintenance required is summarized in table C-9, as well as the off-stream time, the per cent of total off-stream time, the number of times off-stream, and a comparison with the same items for the preceding quarter.

TABLE C-9
Separating Cascade Cell Off-Stream Time

	Off-Stream Time, Hours	Per Cent of Total Off-Stream Time	Increase in Off-Stream Time Over Previous Qtr., Hrs.	Number of Times Off-Stream	Per Cent of Total Number of Times Off-Stream	Increase in No. of Times Off-Stream Over-Previous Quarter
Pump Seal Repairs	1,475.49	27.48	- 379.09	548	27.36	- 87
Stage Motor Repairs	155.22	2.89	- 32.48	50	2.50	- 6
Stage Pump Repairs	323.90	6.03	+ 1.62	31	1.55	- 1
Converter Replacement	275.87	5.14	+ 151.05	32	1.60	+ 19
Electrical Equipment Repairs	11.26	0.21	- 3.42	14	0.70	+ 3
Inleakage Checks	191.29	3.56	- 392.65	561	28.01	- 308
Control Valve Repairs	25.14	0.47	- 18.40	10	0.50	- 8
Coolant Inleakage Checks	8.86	0.16	- 35.23	21	1.05	+ 4
Instrumentation Repairs	22.47	0.42	+ 14.03	17	0.85	+ 10
Lube System Repairs	22.91	0.43	+ 9.30	19	0.95	- 2
Coolant System Repairs	250.08	4.66	- 141.44	53	2.65	- 58
Engineering Tests	105.59	1.97	- 100.00	35	1.75	- 2
ClF_3 Operations	45.35	0.84	+ 17.32	10	0.50	+ 4
Improvement Program	1,005.30	18.72	- 278.94	90	4.50	- 1
Miscellaneous	745.97	13.89	+ 86.41	244	12.19	+ 73
Coolant Leaks to the Cascade	60.30	1.12	- 119.28	5	0.25	- 7
Power Load Reduction	645.09	12.01	- 676.32	262	13.09	- 77
Totals	5,370.09	100.00	- 1,897.52	2,002	100.00	- 444

Stream Efficiency this Quarter 99.66%
Stream Efficiency last Quarter 99.54%

TABLE C-10
Cost of Offstream Time

	1955					
	January	February	March	April	May	June
Pump Seal Repairs	52,443.38	45,638.41	41,784.72	28,523.79	27,275.12	24,606.82
Stage Motor Repairs	526.95	3,147.68	2,454.90	3,047.45	2,360.41	1,081.94
Stage Pump Repairs	5,141.11	12,104.04	12,851.53	7,541.15	4,383.13	6,357.37
Converter Replacement	3,637.16	5,231.20	12,910.27	10,885.06	18,485.14	21,934.85
Electrical Equipment Repairs	17.14	15.56	1,555.29	362.95	262.03	1,100.59
Inleakage Checks	12,867.77	11,021.63	12,024.62	5,242.37	3,644.44	3,713.56
Control Valve Repairs	458.58	1,175.56	509.13	74.53	106.52	993.40
Coolant Inleakage Checks	175.90	167.52	847.38	55.98	32.15	117.61
Instrumentation Repairs	128.10	20.81	793.70	1.97	674.83	95.12
Lube System Repairs	73.13	28.51	122.97	0.30	1.75	226.96
Coolant System Repairs	3,241.89	6,571.60	1,474.41	2,469.01	3,338.80	11,414.51
Engineering Tests	8,287.09	961.51	7,935.15	10,248.15	6,155.25	5,266.41
ClF_3 Operations	285.15	8.36	547.30	316.97	1,476.26	623.35
Improvement Program	5,359.85	6,797.49	8,944.03	3,739.50	1,426.21	7,065.23
Miscellaneous	13,483.94	7,968.68	12,772.35	16,631.77	10,245.42	15,984.35
Special Coolant Leaks	1,375.38	1,028.02	1,631.06	1,154.79	942.04	413.50
Power Load Reduction	6,582.83	17,253.28	42,685.87	29,278.12	41,609.93	74,533.94
Totals	114,085.35	119,139.86	161,844.68	199,573.86	122,419.43	175,529.51

PURGE CASCADE OPERATIONS

Purge Rates

Unit K-312-3 was operated throughout the quarter as the cascade top purge. Units K-312-1 and K-311-1 were operated throughout the report period as side purge facilities.

Purge facilities in units K-312-3, K-312-1, and K-311-1 purged an average of 3,333 scf per day, 5,533 scf per day, and 15,507 scf per day, respectively, during the quarter. The total purge rate during the quarter was 17.0% above that of the third quarter of fiscal year 1955.

The average concentration of uranium hexafluoride in the purge gases from the K-312 purge facilities was 6.77 x 10^5 mole per cent, a decrease of 32.8% below that of the previous quarter. The average daily purge rates are tabulated in table C-11 for each month of the of the current and preceding quarters. Figure C-6 portrays the monthly purge rates for fiscal years 1954 and 1955.

TABLE C-11
Cascade Purge Rates

	Average Purge Rates, scf/Day			
	Top Purge Facility	Side Purge Facilities		Combined Purge Facilities
Month	K-312-3	K-312-1	K-311-1	
January, 1955	3,541	5,145	10,842	19,528
February, 1955	4,266	5,776	10,306*	20,348
March, 1955	3,687	5,431	13,477	22,595
April, 1955	3,164	5,181	16,113	24,457
May, 1955	3,498	5,498	16,687	25,683
June, 1955	3,336	5,919	13,683	22,938

*Includes K-311-1, K-302-1, and K-402-8 purge facilities.

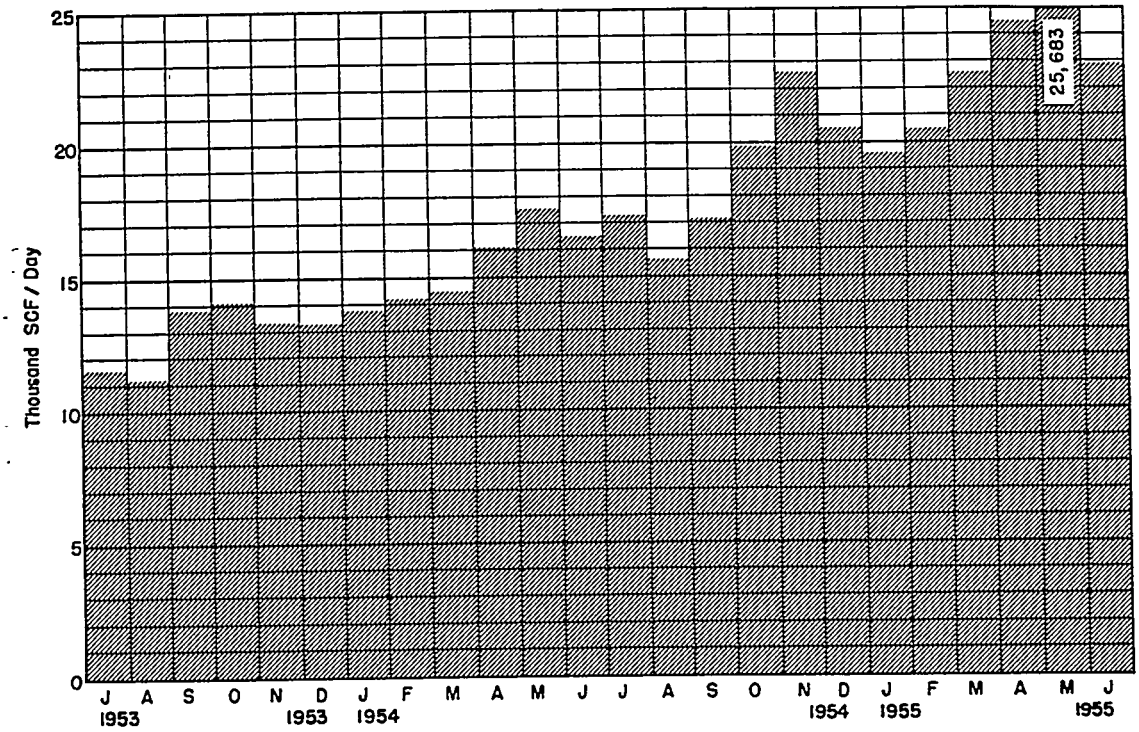


FIGURE C-6
Cascade Purge Rate

BARRIER PERMEABILITY SUMMARY

The reported permeabilities of the barrier installed in the K-25 plant decreased generally during the fourth quarter of fiscal year 1955. The largest decreases were noted in the K-29 and K-33 buildings and were probably caused by large changes in operating conditions. The same reason can be applied to the remaining buildings, but to a lesser degree. The determination of barrier permeabilities is precise where operating conditions vary only slightly, however, where operating conditions are changed, calculated barrier permeabilities are biased. Large pressure increases, as were made during this quarter, will bias permeabilities low and will result in reported permeability decreases. The permeability decreases during this quarter can be explained, to a great extent by pressure increases.

K-25 Building

The barrier permeabilities for the barrier installed in the K-25 building decreased at an average rate of 0.03% per month during the fourth quarter. This rate is the same as the rate of decrease experienced during the preceding quarter. The average rate of permeability decrease for the barrier installed in the K-25 plant during the past two years is slightly higher than was experienced during the past two quarters, the rate being 0.08 ± 0.02% per month. The barrier permeabilities in the K-25 building were not greatly affected during the quarter by chlorine trifluoride treatments since only seven such treatments were conducted during the period.

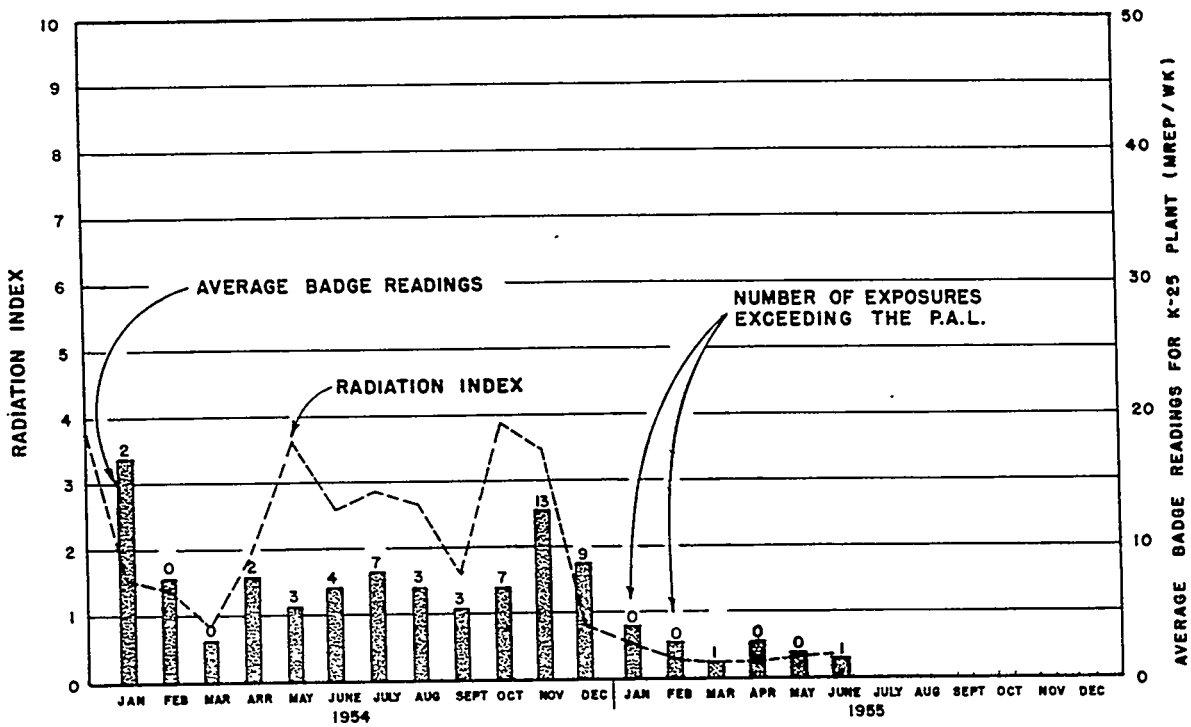


FIGURE E-2
Film Badge Exposure And Penetrating Radiation Index

15% of the quarterly average for 1954. Table E-1 compares current property-damage incidents and costs with those of other periods.

OTHER INCIDENTS

Material Releases

None of the 7 material releases reported indicated significant or unusual hazards. Of the 5 releases of radioactive materials, 3 occurred during the dismantling of compressors, 1 resulted from the rupture of a feed line from a feed cylinder, and 1 occurred when low-activity material was spilled from equipment during transit to a storage yard; 2 small releases of hydrogen fluoride resulted from process equipment failure and from transfer line repair in the storage area.

Mechanical Equipment Failure

Leakage in 3 superheater tubes necessitated a repair outage of a powerhouse boiler, and a second boiler outage was occasioned by a cracked drain line on a steam header valve, both failures resulting from normal stress corrosion phenomena.

A tube fracture in a recently installed feed-water heater at the powerhouse was attributed to vibrational fatigue.

Several tube failures and numerous tube-joint leaks have occurred in cell freon condensers in K-29, K-31, and K-33, the tube joint leakage being primarily attributed to inadequate expanding of the tubes at the time of installation; the exact cause of the tube failures is not known.

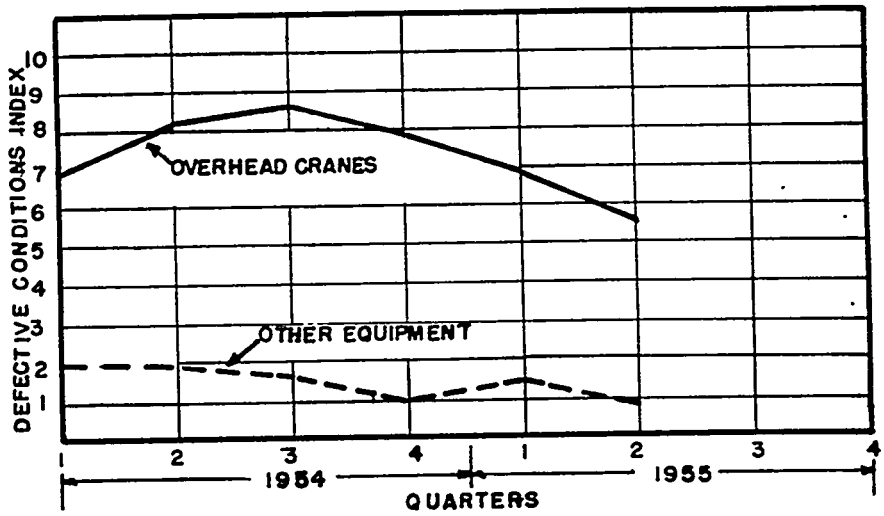


FIGURE E-3
Condition Of Materials-Handling Equipment

ELECTRICAL

Audit surveys of electrical equipment indicated 88% of the 3,113 items sampled to be in satisfactory condition. Corded equipment continued to be the primary factor in unsatisfactory conditions noted, with 81% of those items checked being in satisfactory condition as compared to 85% for last period.

FIRE PROTECTION

The program of razing frame buildings in the temporary construction areas adjacent to the plant was completed, this eliminating essentially all fire potential in these areas.

Audits of the fire-protection equipment revealed that 92% of the 1,249 items spot checked were found to be in satisfactory condition as compared to 96% for the preceding quarter. No significant changes in plant facilities were noted.

SAFETY

Safety audit results revealed that 92% of the 1,694 employee acts and 90% of the 11,836 plant conditions sampled were satisfactory as compared with corresponding values of 96% and 93%, respectively, noted during the previous report period.

HEALTH PHYSICS

Improvements in the control of contamination, primarily in decontamination and recovery locations, and the continued curtailment of operations in the K-1131 Feed Plant and associated facilities during the alteration program resulted in continuing decreases in the plant contamination and radiation indices, personnel radiation exposures, and air-borne alpha activity; similarly, it was a factor in the decrease of uranium concentrations in the mud of Poplar Creek.

Data reflecting environmental radiation conditions are tabulated in table E-6 with comparative data for other periods.

TABLE E-6
Environmental Conditions

	This Quarter	Last Quarter	Year To Date[a]	1954[a]	1953 and 1954[a]
Alpha Contamination					
Plant Contamination Index[b]	80	115	98	413	431
No. Locations Included	64	64	64	62	60
% Plant Area Surveyed[b]	1.7	1.7	1.7	2.4	2.0
Pentrating Radiation					
Radiation Index[c]	0.31	0.35	0.33	2.18	1.85
No. Locations Included	8	8	8	8	8
Air Activity (Shift-Length)					
No. Samples Taken	1,885	1,409	1,647	1,744	1,876
No. Above PAL[d]	19	31	25	29	22
Av. Activity Per Sample (c./min./ft.^{3})	0.34	0.17	0.27	0.20	0.15
Air Activity (Spot)					
No. Samples Taken	234	253	244	422	368
No. Above PAL	10	28	19	24	47
Av. Activity Per Sample (c./min./ft.^{3})	0.25	0.77	0.52	0.57	0.57[e]
Water and Sewage Control					
Av. Beta Activity of K-25 Sanitary Water (dis./min./100 ml.)	39	32	35.5	38.8	36.7
U Concentration (ppm.) in Poplar Creek Mud	25	44	35	124	92
U Concentration (ppm.) in Clinch River Mud	1	5	3.3	3.4	2.1

a Where totals are concerned, figures refer to quarterly averages.

b Contamination index is a figure which reflects the product of the extent and intensity of alpha contamination exceeding the PAL; the values shown include only those plant locations with a 6-month average contamination index of 2.0 or greater.

c The radiation index, which reflects both the extent and intensity of radiation found, is essentially the product of the work area over which the dose rate is more than 7.5 mrep/hr. and a weighting factor which depends upon the actual radiation intensities over the area concerned.

d PAL - plant acceptable limit.

e 1954 only.

Alpha Contamination

Plant alpha-contamination levels, as reflected by audit surveys of the 64 locations having significant contamination problems, decreased approximately 30% from the levels reported last period, with the contamination index of 80 being the lowest recorded since 1951.

Figure E-4 compares present plant contamination levels with those of other periods.

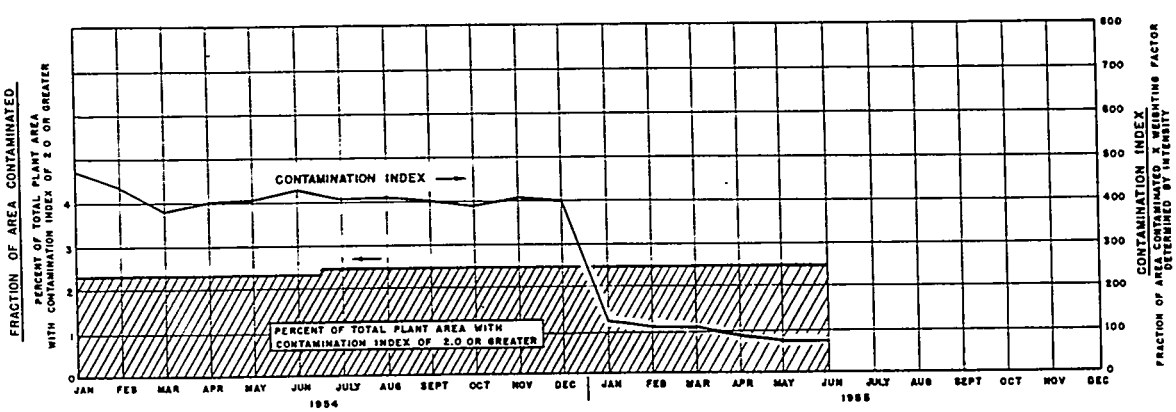


FIGURE E-4
Plant Contamination Levels

Penetrating-Radiation Levels

Penetrating-radiation levels within the plant, as indicated by audit surveys of those locations having significant radiation problems, decreased approximately 10%; the radiation index of 0.31 is about 14% of the 1954 average value and is the lowest such index reported since 1952 when compilation of this index was initiated.

The relation between radiation levels and film badge readings is shown in figure E-2.

Air-Activity Levels

Although the average air activity indicated by shift-length air samples increased markedly as a result of 3 material releases, no personnel hazard was indicated since all persons involved wore adequate respiratory protection during the period of high air activity. The fraction of shift-length air samples exceeding the plant acceptable limit decreased to about one-half of the corresponding value for last period while the average air activity on spot samples similarly dropped to about one-third of the preceding figure.

Radium-Source Checks

On routine checks of the 22 plant radium sources, a brass-contained radium source which had been encased in an additional capsule in 1953 because of apparent radon leakage again showed some signs of leakage; this was corrected by replacement of the outer capsule.

Other Environmental Conditions

The average beta activity in the K-25 sanitary water increased slightly, primarily as a result of a comparatively high amount of fission-product waste material accidentally released to the Clinch River during April from an installation upstream from K-25. The release was relatively short-termed and, during the latter part of the period, the activity in the water returned to well below the 1954 average. The uranium concentration in the Poplar Creek and Clinch River stream bottoms decreased significantly as the amount of material released from the K-1131 Feed Plant remained below normal and heavy rainfall resulted in better dispersion and downstream movement of contaminated silt.

EMERGENCY ACTIVITIES

Based on available information on hydrogen bomb effects, evacuation routes for plant personnel in event of an air raid were established in conjunction with AEC area-wide plans. Similary, 4 off-plant emergency assembly areas have been chosen for plant emergency personnel.

Preliminary bomb shelter designs have been prepared, but the lack of adequate information on thermo-nuclear weapons effects has delayed the development of a final design.

Seventy-six employees received training in the use of portable fire fighting appliances.

Of the 29 emergency drills staged during the period, 4 invloved plant-wide problems with emphasis being placed on evacuation of personnel. The K-25 Plant also participated in the June 15 Civil Defense air-raid test alert and in operation UNCAP with the AEC Operations Office.

Emergency equipment responses are tabulated in table E-7.

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (Is requested to provide the following document)

Date of request 10/12/95 — Expected receipt of document 1 MONTH

Document number ~~K-1152~~ KEM-311 — Date of document 5/11/55

Title and author (if document is unnumbered)

(This section to be completed by Document Center)

Date request received 10/20/95

Date submitted to ADC 12/19/95

Date submitted to HSA Coordinator 10/20/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 12/19/95 1/22/96

Date received from CICO 1/5/96 2/26/96

Date submitted to ChemRisk/Shonka and DOE 2/26/96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

K/EM-311

SANITIZED VERSION OF EXTRACT FROM K-25 PLANT QUARTERLY REPORT THIRD FISCAL QUARTER JANUARY 1 THRU MARCH 31, 1955

(EXTRACTED FROM SRD DOCUMENT # K-1152)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

December 18, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release
and sale by
[signature] 2/23/96
Technical Information Officer Date
Oak Ridge K-25 Site

SECRET AEC RESEARCH AND DEVELOPMENT REPORT

K-1152

Cy 17,

KC-191 PT.

~~CONFIDENTIAL~~

~~SECRET~~

~~TO BE RETURNED TO PLANT RECORDS K-1034~~

K-25 PLANT QUARTERLY REPORT

THIRD FISCAL QUARTER

January 1, 1955 - March 31, 1955

JAN 27 9 38 AM '55

K-25 PLANT

CARBIDE AND CARBON CHEMICALS COMPANY

A DIVISION OF UNION CARBIDE AND CARBON CORPORATION

OAK RIDGE, TENNESSEE

Acting Under U S Government Contract W7405 eng 26

~~RESTRICTED DATA~~

~~This document contains Restricted Data as defined in the Atomic Energy Act of 1954. Unauthorized disclosure subject to Administrative and Criminal Sanctions.~~

RESTRICTED DATA

This document contains restricted data as defined in the Atomic Energy Act of 1954. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.

~~SECRET~~

~~CONFIDENTIAL~~

2

SECRET

SECRET

SECRET

REMAINS SRD: 12/8/93
Sam W. Wolfe (AR)
REMAINS SRD 12/8/93
Gary W. Hall

This document consists of 188 pages
No. 1 of 75 copies, Series A.

CENTRAL LIBRARY
REC. W406 22
FILE
X-REF.
X-REF.

DATE OF ISSUE: May 11, 1955

REPORT NO. K-1152

C9317

K-25 PLANT QUARTERLY REPORT

THIRD FISCAL QUARTER

January 1, thru March 31, 1954

K 1152 17 A

K 1152 17 A

DOCUMENT INVENTORIED
Date 9-14-83 Initials CLS

K-25 PLANT
CARBIDE AND CARBON CHEMICALS COMPANY
A DIVISION OF UNION CARBIDE AND CARBON CORPORATION
OAK RIDGE, TENNESSEE

RESTRICTED DATA
This document contains Restricted Data as defined in the Atomic Energy Act of 1954. Unauthorized disclosure subject to Administrative and Criminal Sanctions.

RESTRICTED DATA
This document contains restricted data as defined in the Atomic Energy Act of 1954. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.

SECRET

SECRET

On March 19, the orchid network power frequency was reduced 5 cycles and 4 cells in K-33 were shut down for 10.5 hours. This occurred when the condenser cooling water to the K-25 power house was decreased due to excess debris at the intake screens. On March 20, excess water-borne debris at the rotating screens caused the drive shaft pins to shear. All K-25 turbo-generators except those supplying the high frequency network, were shut down. The total area load was reduced from 1805 to 1555 mw. Sections K-303, K-305, and K-310 were operated by utilizing TVA power via the B tie-cable. All units in K-301, K-302, K-304, and K-309 were isolated and shut down 5.3 hours. Six cells in K-33 were shut down 5.3 hours and the operating pressures in four units of K-33 were reduced 0.5 psi. Normal operation and generation were resumed 11 hours after the disturbance.

On March 31, 20 cells in K-33 were shut down for an average of 0.7 hours. This occurred when the Kingston radial feed was de-energized due to a disturbance at the Kingston steam plant.

K-33 Abnormalities

On January 6, 1955, the A and B booster stations were shut down in K-33 for one hour. This occurred when a relay was accidentally shorted during maintenance work on the motor test stand.

On January 9, a 1,500 scf per day air leak was detected in K-902-3.9. The leak was eliminated by repairing a cracked buffer line on the recycle valve.

Special Withdrawals

On March 12, 95 pounds of uranium hexafluoride at an assay of 3.611 per cent was withdrawn and shipped to the Y-12 plant. An additional 22.7 pounds at an assay of 3.648 per cent was withdrawn on March 18 and shipped to the Y-12 plant. A 12,000 pound withdrawal of 1.5 percent assay material was initiated on March 18. A total of 12,325 pounds of uranium hexafluoride was withdrawn by March 20 and shipped to another atomic energy installation.

Material Releases

There were four process gas releases during the third quarter of fiscal year 1955. The first release was incurred in the product purification unit on January 21. Uranium hexafluoride was released when a bellows ruptured on a drain valve. The next two releases occurred in the K-33 feed room on March 10. The line to an A-type cylinder ruptured releasing about 50 pounds of process material. During decontamination of the feed facilities, a second A-type cylinder ruptured and released an additional 471 pounds of uranium hexafluoride. The last release was caused by a faulty seal on the K-631 Elliott compressor. This took place on March 16 and a total of 10 pounds of material was released. Table C-6 summarizes the dates, locations, and weights of uranium and uranium-235 lost in the above releases. Also included are the following: (1) A material release in vault 16A, which was caused by drum deterioration; (2) The material released while decontaminating converters in K-1401.

K-101 Building

The K-101 coolant removal facility was in operation at the beginning of the third quarter of fiscal year 1955 and operated for four other periods during the report period. A total of 1,771 pounds of C-816 coolant was removed from the cascade during this quarter as compared with 1,064 pounds

TABLE C-10
Cost of Offstream Time

	1954			1955		
	October	November	December	January	February	March
Pump Seal Repairs	83,842.98	73,100.03	41,662.73	52,443.38	45,638.41	41,784.72
Stage Motor Repairs	2,557.31	3,344.29	1,058.89	526.95	3,147.68	2,454.90
Stage Pump Repairs	29,430.42	18,028.46	9,783.74	5,141.11	12,104.04	12,851.53
Converter Replacement	25,628.38	7,366.49	5,599.57	3,637.16	5,231.20	12,910.27
Electrical Equipment Repairs	6,342.45	635.22	352.60	17.14	15.56	1,555.29
Inleakage Checks	12,537.10	15,406.15	8,635.10	12,867.77	11,021.63	12,024.62
Control Valve Repairs	424.38	1,903.90	966.82	458.58	1,175.56	509.13
Coolant Inleakage Checks	463.53	94.04	267.19	175.90	167.52	847.38
Instrumentation Repairs	2,588.25	855.85	1,226.46	128.10	20.81	793.70
Lube System Repairs	-	674.51	3,495.19	73.13	28.51	122.97
Coolant System Repairs	3,178.43	970.18	4,569.27	3,241.89	6,571.60	1,474.41
Engineering Tests	4,621.72	2,731.53	7,144.17	8,287.09	961.51	7,935.15
ClF_3 Operations	587.68	465.66	1,918.30	285.15	8.36	547.30
Improvement Program	36,438.68	86,805.26	9,097.77	5,359.85	6,797.49	8,944.03
Miscellaneous	27,444.38	75,975.17	39,809.45	13,483.94	7,968.68	12,772.35
Special Coolant Leaks	1,169.51	-	-	1,375.38	1,028.02	1,631.06
Power Load Reduction	-	-	-	6,582.83	17,253.28	42,685.87
Totals	237,255.20	288,356.74	135,587.25	114,085.35	119,139.86	161,844.68

PURGE CASCADE OPERATIONS

Purge Rates

Unit K-312-3 was operated as the cascade top purge during the entire quarter. Units K-312-1 and K-311-1 were operated throughout the quarter as side purge facilities. Temporary purge facilities in units K-302-1 and K-402-8 were placed in operation from February 10 to February 14, 1955, after compressor failures necessitated the temporary shut down of the cells in unit K-311-1 which are equipped with high speed compressors.

During the quarter, purge facilities in units K-312-1, K-312-3, K-311-1, K-302-1 and K-402-8 purged an average of 5,451 scf per day, 3,831 scf per day, 11,246 scf per day, 114 scf per day, and 182 scf per day, respectively. The total purge rate during the quarter was 0.9% below that of the second quarter of fiscal year 1955.

The average concentration of uranium hexafluoride in the purge gases from the K-312 purge facilities decreased 81.9% this quarter below that of the previous quarter. This decrease is the consequence of abnormally high uranium hexafluoride concentrations which prevailed during the first four months of fiscal year 1955. The average daily purge rates and uranium hexafluoride concentrations are shown in table C-11 for each month of the current and preceding quarters. Figure 6 depicts the monthly purge rates for fiscal years 1954 and 1955.

TABLE C-11
Cascade Purge Rates

	K-312 Purge Rates		Total Purge Rates*
Month	Average Purge Rate, Scf/Day	Uranium Hexafluoride Concentrations Mole per cent x 10^5	Average Purge Rates Scf/Day
October, 1954	14,491	126.51	19,980
November, 1954	11,003	28.48	22,698
December, 1954	9,108	12.26	20,470
January, 1955	8,686	6.03	19,528
February, 1955	10,042	17.45	20,348
March, 1955	9,118	6.73	22,595

*Includes K-312-1, K-312-3, K-311-1, K-302-1, and K-402-8 purge facilities.

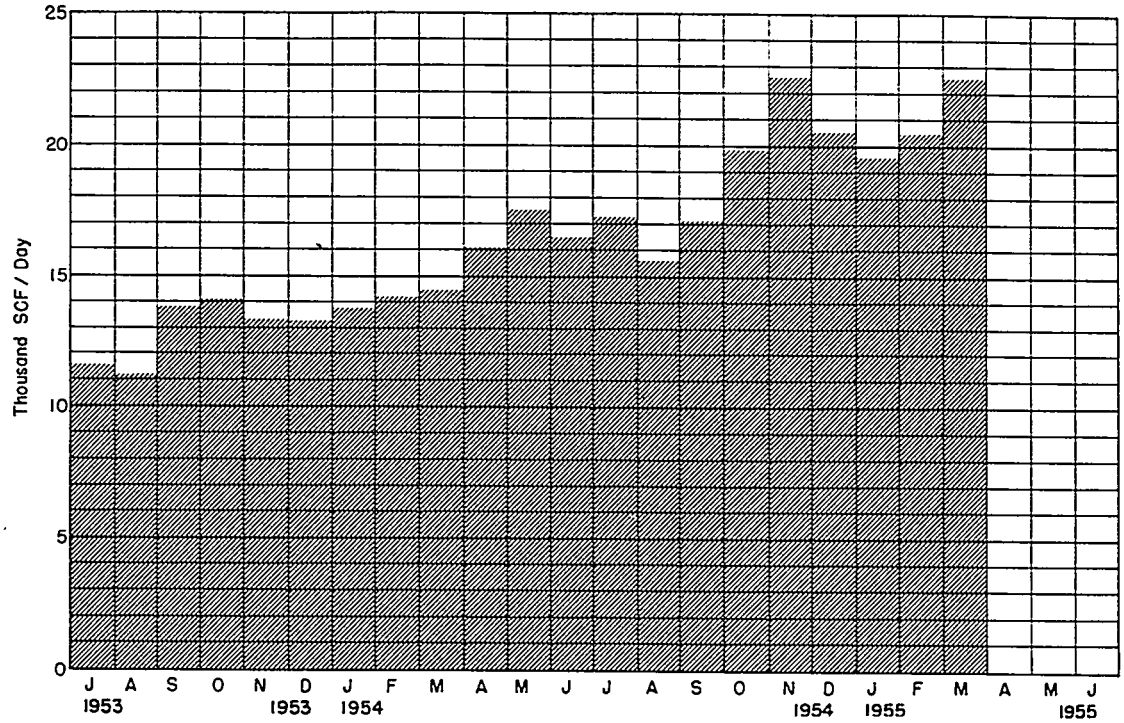


FIGURE C-6
Cascade Purge Rate

BARRIER PERMEABILITY SUMMARY

The barrier permeabilities for the K-25 plant decreased in all buildings of the plant with the exception of K-29 building. These decreases may in general be explained by stage operating pressures. Whenever stage pressures are increased, indicated barrier permeability reductions occur due to slight discrepancies in available barrier property information. The permeability decreases in the K-27, K-31, and K-33 buildings may be largely explained by pressure increases. The high permeability decrease rate in the K-33 building is also the result of the normally higher plugging rate of newly installed barrier since part of the K-33 barrier was placed on stream during the previous quarter. The permeability changes in the K-25 and K-29 buildings are within the normal variations of barrier permeabilities.

K-25 Building

Barrier permeabilities in the K-25 building decreased 0.03 per cent per month during the third quarter as compared with a 0.09 per cent decrease during the second quarter. This rate compares well with the average for the past two years of -0.07 ± 0.11 per cent per month. The overall building permeability trend is apparently normal, since only 4 chlorine trifluoride treatments were conducted in the building during the quarter.

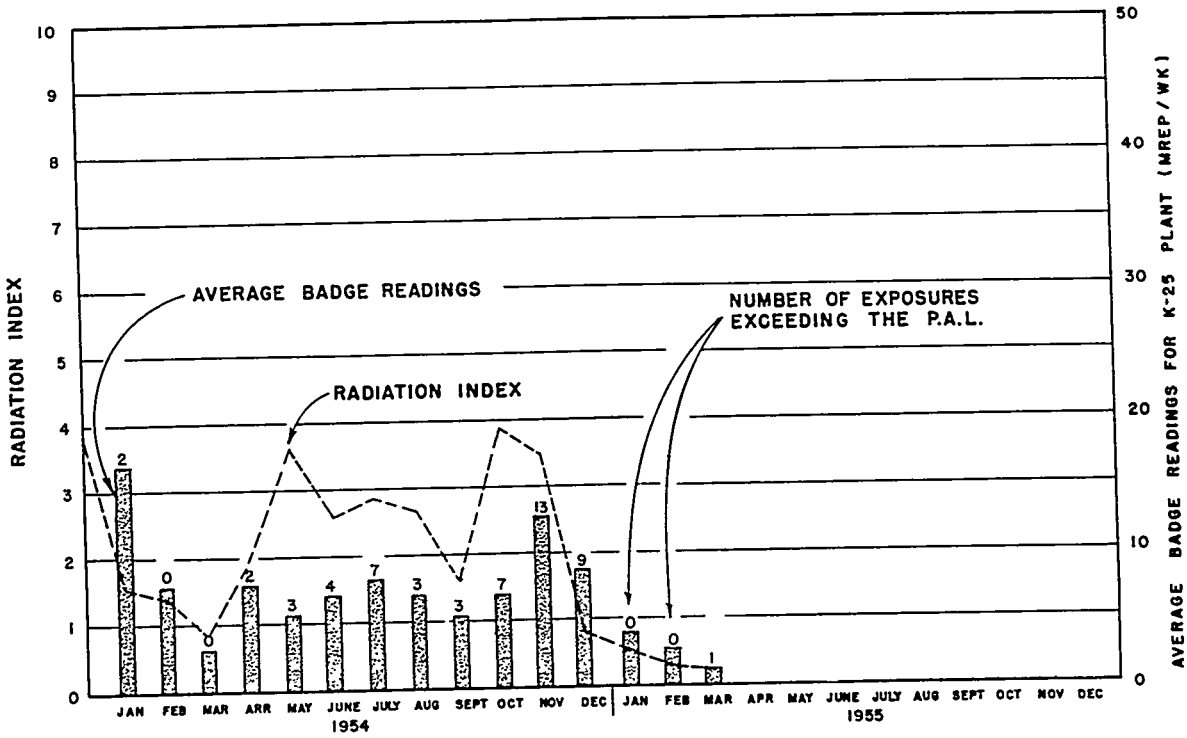


FIGURE E-2
Film Badge Exposure And Penetrating Radiation Index

PROPERTY DAMAGE

The $5,800 loss resulting from 4 property-damage incidents was due primarily to a feed-cylinder explosion, which was probably caused by a reaction of UF_6 and entrained hydrocarbon oil during the heating cycle; this incident resulted in the destruction of the cylinder, other damage to plant equipment, and the loss of a significant quantity of material. The 21 motor-vehicle accidents recorded reflect increases by factors of about 2 in both the number of accidents and the monetary loss as compared with similar data reported during the previous period. Table E-1 compares current property-damage incidents and costs with those of other periods.

OTHER INCIDENTS

Material Releases

No significant or unanticipated hazards were indicated by the 8 material releases reported; these do not include the explosion noted above. Of 7 releases of radioactive materials reported, 5 occurred during the dismantling of compressors and 2 resulted from process-equipment failures; the other incident involved the release of a small amount of fluorine when a purged fluorine line was cut.

Mechanical-Equipment Failures

A 36-hour outage of a powerhouse boiler occurred due to leakage in a waterwall tube.

Leaves brought in by extremely high river flows accumulated on the water-intake screens of the powerhouse water supply faster than they could be sluiced off and necessitated the shutdown of

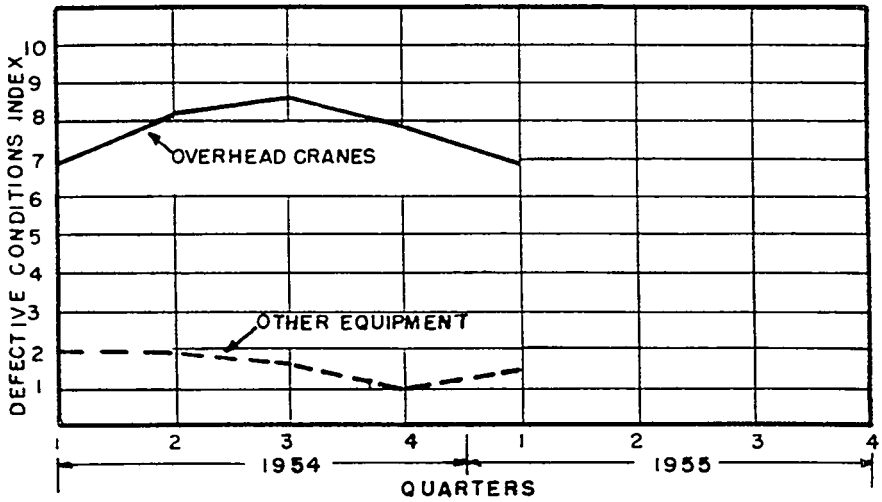


FIGURE E-3
Condition Of Materials-Handling Equipment

FIRE PROTECTION

The razing of temporary frame buildings adjacent to the plant area continued, considerably lessening the area fire potential. Safety audits of fire protection equipment in the plant revealed that 96% of the 2,858 items sampled were satisfactory. No significant changes in the plant facilities were noted.

SAFETY

Safety audit results continued to show that the factors affecting safety were those common to heavy industrial operations; 96% of the 983 employee acts and 93% of 3,402 plant conditions specifically checked on safety audits were found to be satisfactory, these figures comparing favorably with corresponding ones of 95% and 80% for the previous report period.

HEALTH PHYSICS

Most of the plant health physics factors described below were influenced markedly by the cessation of operations in the K-1131 Feed Plant and associated facilities to carry out the equipment - alterations program; these changes included the removal and decontamination of operating equipment as well as the decontamination of the K-1131 Building and other associated facilities. In particular, the plant contamination and radiation indices were at the lowest values reported for several years, and these conditions were reflected by reductions in both personnel on-the-job contamination and radiation exposure as reported under ACCIDENT AND INJURY EXPERIENCE. The average air-borne alpha activity and the concentration of uranium in the mud of Poplar Creek were also influenced noticeably. Data reflecting enviromental radiation conditions are tabulated in table E-6 with comparative data for other periods.

Alpha Contamination

Plant alpha-contamination levels, as reflected by surveys of the 64 locations having significant

contamination problems, decreased more than 70% from the levels reported for last quarter and were at the lowest level reported since 1951.

Figure E-4 compares present plant contamination levels with those of other periods.

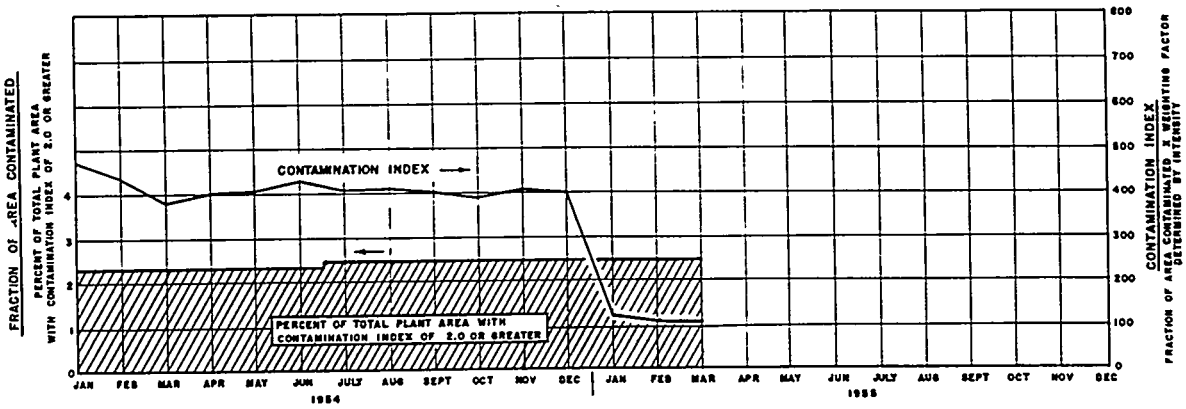


FIGURE E-4
Plant Contamination Levels

TABLE E-6
Environmental Conditions

	This Quarter	Last Quarter	Year To Date [a]	1954 [a]	1953 and 1954 [a]
Alpha Contamination					
Plant Contamination Index [b]	115	402	115	413	431
No. Locations Included	64	62	64	62	60
% Plant Area Surveyed [b]	1.7	2.5	1.7	2.4	2.0
Penetrating Radiation					
Radiation Index [c]	0.35	2.72	0.35	2.18	1.85
No. Locations Included	8	9	8	8	8
Air Activity (Shift Length)					
No. Samples Taken	1,409	1,278	1,409	1,744	1,876
No. Above PAL	31	29	31	29	22
Average Activity Per Sample (c./min./ft.^{3})	0.17	0.29	0.17	0.20	0.15
Air Activity (Spot)					
No. Samples Taken	253	359	253	422	368
No. Above PAL	28	36	28	24	47
Average Activity Per Sample (c./min./ft.^{3})	0.77	1.85	0.77	0.57	0.57 [d]
Water and Sewage Control					
Av. Beta Activity of K-25 Sanitary Water (dis./min./100ml.)	32	39	32	38.8	36.7
U Concentration (ppm.) in Poplar Creek Mud	44	203	44	124	92
U Concentration (ppm.) in Clinch River Mud	5.0	5.0	5.0	3.4	2.1

a Where totals are concerned, figures refer to quarterly averages.

b Contamination index is a figure which reflects the product of the extent and intensity of alpha contamination exceeding the PAL and the values shown include only those plant locations with a 6-month average contamination index of 2.0 or greater.

c The radiation index, which reflects both the extent and intensity of radiation found, is essentially the product of the work area over which the dose rate is more than 7.5 mrep/hr. and a weighting factor which depends upon the actual radiation intensities over the area concerned.

d 1954 only.

Penetrating-Radiation Levels

Penetrating-radiation levels within the plant, as indicated by surveys of those locations having significant radiation problems, decreased to 0.35, this being about 15% of the 1954 average value, and the lowest level reported since 1952 when the compilation of this index was initiated.

The relation between radiation levels and film-badge readings is shown in figure E-2.

Air-Activity Levels

Although the fraction of samples exceeding the plant acceptable limit remained essentially unchanged, the average air activity indicated by both shift-length air samples and spot air samples taken in connection with the plant audit surveys decreased appreciably.

Radium-Source Checks

Routine checks of the 22 plant radium sources revealed nc evidence of source leakage.

Other Environmental Conditions

The average beta activity in the plant sanitary-water supply decreased only slightly, an increase in the water flow of the Clinch River being partially offset by an increase in the volume of mixed fission-product wastes released from the storage lake of an installation upstream from K-25. The average uranium concentration in mud from Poplar Creek decreased markedly as a result of both curtailed operations in the K-1131 Feed Plant and the downstream movement and dilution of contaminated silt resulting from the increased water flow during a period of heavy rainfall. The average uranium concentration of the Clinch River mud remained low and unchanged.

EMERGENCY ACTIVITIES

In connection with the 26 drills held during the period, 5 of which involved plant-wide problems. emphasis continued to be directed toward further improvement in the proficiency of local emergency squads which have been organized in each of the major plant areas on all shifts.

About 140 employees received training in the use of portable fire fighting appliances. Emergency equipment responses are tabulated in table E-7.

TABLE E-7
Emergency Equipment Responses

	This Quarter	Last Quarter	Year To Date *	1954*	1953 and 1954*
Fire Fighting Equipment					
Alarms	38	40	38	52	55
Drills	22	37	22	42	39
Emergency Truck					
Alarms	34	29	34	39	28
Drills	23	38	23	35	31
Ambulance					
Illness or Injury	15	12	15	14	21
Drills	8	14	8	12	12 **

* Values given are quarterly averages.
** 1954 only.

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number ~~K-1151~~ K/EM-310 Date of document 2/15/55

Title and author (if document is unnumbered)

Copy tab pgs only

(This section to be completed by Document Center)

Date request received 10/20/95.

Date submitted to ADC 12/19/95

Date submitted to HSA Coordinator 10/20/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 12/19/95 1/22/96

Date received from CICO 1/5/96 2/26/96

Date submitted to ChemRisk/Shonka and DOE 2/26/96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

K/EM-310

SANITIZED VERSION OF EXTRACT FROM K-25 PLANT QUARTERLY REPORT SECOND FISCAL QUARTER OCTOBER 1 THRU DECEMBER 31, 1954

(EXTRACTED FROM SRD DOCUMENT # K-1151)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

December 18, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release to the public by:

2/23/96

Technical Information Officer Date
Oak Ridge K-25 Site

SECRET

K-1151

~~CONFIDENTIAL~~

PMENT REPORT

Cy 1A

~~SECRET~~

PROPERTY OF
ORGDP LIBRARY

K-25 PLANT QUARTERLY REPORT

SECOND FISCAL QUARTER

October 1, thru December 31, 1954

RECEIVED
17 ... 5
VICE PRESIDENT
CARBIDE

DOCUMENT INVENTORIED
Date Initials
9/14/84 [illegible]

K-25 PLANT

CARBIDE AND CARBON CHEMICALS COMPANY

A DIVISION OF UNION CARBIDE AND CARBON CORPORATION

OAK RIDGE, TENNESSEE

Acting Under U S Government Contract W7405 eng 26

~~RESTRICTED DATA~~
~~This document contains Restricted Data as defined in the Atomic Energy Act of 1954. Unauthorized disclosure subject to Administrative and Criminal Sanctions.~~

RESTRICTED DATA
This document contains restricted data as defined in the Atomic Energy Act of 1954. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.

~~SECRET~~

~~CONFIDENTIAL~~

2

SECRET

SECRET

CONFIDENTIAL

SECRET

REMAINS SRD: 12/8/93
Sam W. Wohlfort (AR)
REMAINS SRD 12/8/93
Gary W. Hall AED

This document consists of 190 pages
No. 1 of 78 copies, Series A.

DATE OF ISSUE: February 15, 1955

REPORT NO. K-1151

K 1151 1 A

K 1151 1 A

K-25 PLANT QUARTERLY REPORT

SECOND FISCAL QUARTER

October 1, thru December 31, 1954

F15381

CENTRAL LIBRARY
REC. W40621
FILE
X-REF.
X-REF.

TO PLANT RECORDS K-1034

K-25 PLANT
CARBIDE AND CARBON CHEMICALS COMPANY
A DIVISION OF UNION CARBIDE AND CARBON CORPORATION
OAK RIDGE, TENNESSEE

RESTRICTED DATA
This document contains Restricted Data as defined in the Atomic Energy Act of 1954. Unauthorized disclosure subject to Administrative and Criminal Sanctions.

RESTRICTED DATA
This document contains restricted data as defined in the Atomic Energy Act of 1954. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.

SECRET

CONFIDENTIAL

SECRET

3

Assay Modification

On December 6, the top product assay was increased 0.20%. This increase was in accord with ARCO schedules.

Material Releases

There were four process gas releases during the second quarter of fiscal year 1955. The first release was incurred in the pilot plant laboratory on October 10. About 5 to 10 pounds of uranium hexafluoride was released to the atmosphere when a seal failed on a high pressure purge cell. The next release occurred in the product withdrawal cell on October 14, when 150 grams of uranium hexafluoride was lost as an inlet valve failed and ruptured the line. About 50 grams of uranium hexafluoride was released on December 12 when the bellows ruptured on the B bank feed valve of the product purification unit. On December 22, 10 pounds of uranium hexafluoride was lost while a Beach-Russ pump rotor was being inspected in K-413. Table C-6 outlines the date, location, and weights of uranium and uranium-235 of the above releases. Also included are the following: (A) Two material releases in vault 16A, which are due to deteriorated drums. (B) Material vented at K-1131 during November. (C) Material released while decontaminating equipment during this quarter.

TABLE C-6
Material Releases

Date	Location	Loss	
		Grams U	Grams U-235
October 10	K-1004-L	3,067	20
October 14	K-306-7.10	101	94
October 14	Vault 16A	164	8
November 8	Vault 16A	274	6
November 1 - 29	K-1131	22,415	150
December 12	Product Purification Unit	34	32
December 22	K-413	3,067	40
October 1 through December 1, '54	K-1401 Decontamination	815	40
Total		29,937	390

C-816 Coolant Leaks to the Cascade

Four C-816 coolant leaks to the cascade were detected during this quarter as compared with nine during the preceding quarter. Table C-7 summarizes the date, location, and method of eliminating these leaks as well as the rates and total inleakages.

TABLE C-7
C-816 Coolant Inleakage to the Cascade

Date	Location	Rate, #/Day	Inleakage, Pounds	Method of Elimination of the Leaks
October 15	K-301-5.5	44	150	Plugged E-4 tube in stage 6
October 24	K-402-2.1	112	20	Plugged B rows of gas cooler tubes
October 25	K-301-4.1	28	85	Plugged D-1 and J-1 in stage 4
December 5	K-301-1.2	66	6	Plugged one tube in stage 4
Total			261	

Freon-114 Coolant Leaks to the Cascade

Two Freon-114 coolant inleakages were experienced during the second quarter of fiscal year 1955. A leak of 400 pounds per day (100 pounds total) occurred in cell K-502-2.2 on October 10. The

TABLE C-10
Cost of Off-Stream Time

	July 1954	August 1954	September 1954	October 1954	November 1954	December 1954
Pump Seal Repairs	135,915.31	96,050.93	127,392.34	83,842.98	73,100.03	41,662.73
Stage Motor Repairs	6,621.82	564.46	5,185.15	2,557.31	3,344.29	1,058.89
Stage Pump Repairs	26,048.70	19,557.28	30,609.15	29,430.42	18,028.46	9,783.74
Converter Replacement	36,393.56	13,309.17	23,793.72	25,628.38	7,366.49	5,599.57
Electrical Equipment Repairs	-	42.47	3,775.16	6,342.45	635.22	352.60
Inleakage Checks	37,446.45	19,372.68	11,785.62	12,537.10	15,406.15	8,635.10
Control Valve Repairs	2,184.99	2,477.09	3,821.14	424.38	1,903.90	966.82
Coolant Inleakage Checks	76.90	169.82	75.12	463.53	94.04	267.19
Instrumentation Repairs	369.21	304.67	642.65	2,588.25	855.85	1,226.46
Lube System Repairs	244.82	285.32	16.79	-	674.51	3,495.19
Coolant System Repairs	3,275.03	3,854.83	9,180.71	3,178.43	970.18	4,569.27
Engineering Tests	2,093.14	24,530.59	4,339.69	4,621.72	2,731.53	7,144.17
ClF_3 Operations	2,238.81	3,018.36	3,274.04	587.68	465.66	1,918.30
Improvement Program	46,009.33	75,368.21	22,848.45	36,438.68	86,805.26	9,097.77
Miscellaneous	157,406.07	41,748.60	214,822.63	27,444.38	75,975.17	39,809.45
Special Coolant Leaks	3,985.88	1,227.80	3,523.20	1,169.51	-	-
Totals	460,310.02	301,882.28	465,085.56	237,255.20	288,356.74	135,587.25

PURGE CASCADE OPERATIONS

Purge Rates

Unit K-312-3 operated as the cascade top purge throughout the quarter. Unit K-312-1 operated during the entire quarter as a side purge facility; in addition, unit K-311-1 was placed in operation on October 15, 1954, and continued in operation during the remainder of the quarter as a side purge facility. The temporary purge facility in unit K-302-1 operated from October 1 to October 15 and for two brief periods in November and December.

Purge facilities in units K-312-1, K-312-3, K-311-1, and K-302-1 purged an average of 8,298 scf per day, 3,236 scf per day, 8,901 scf per day, and 591 scf per day, respectively, during the quarter. The total purge rate during the quarter was 4.6% above that of the first quarter of fiscal year 1955.

The average uranium hexafluoride concentration in the purge gases from the K-312 purge facilities decreased 59.5% this quarter below that of the first fiscal quarter. This decrease is the result of an abnormally high concentration indicated for the previous quarter. The average daily purge rates and uranium hexafluoride concentrations are tabulated in table C-11 for each month of the current and preceding quarters. Figure C-6 portrays the monthly purge rates for fiscal years 1954 and 1955.

TABLE C-11
Cascade Purge Rates

	K-312 Purge Rates		Total Purge Rates*
Month	Average Purge Rate, Scf/Day	Uranium Hexafluoride Concentrations Mole Per Cent x 10^5	Average Purge Rate, Scf/Day
July, 1954	17,299	76.58	21,249
August, 1954	15,685	109.18	19,071
September, 1954	17,037	227.37	20,064
October, 1954	14,491	126.51	19,980
November, 1954	11,003	28.48	22,698
December, 1954	9,108	12.26	20,470

*Includes K-312-1, K-312-3, K-311-1, and K-302-1 purge facilities.

Purge System Changes

The interim side purge facility in unit K-302-1 was removed from on-stream operation on October

15, 1954, at which time unit K-311-1 was placed in initial on-stream operation. This latter unit is designed to control the high cascade light contaminant upflow rates which have been in effect since the K-33 building has been in operation.

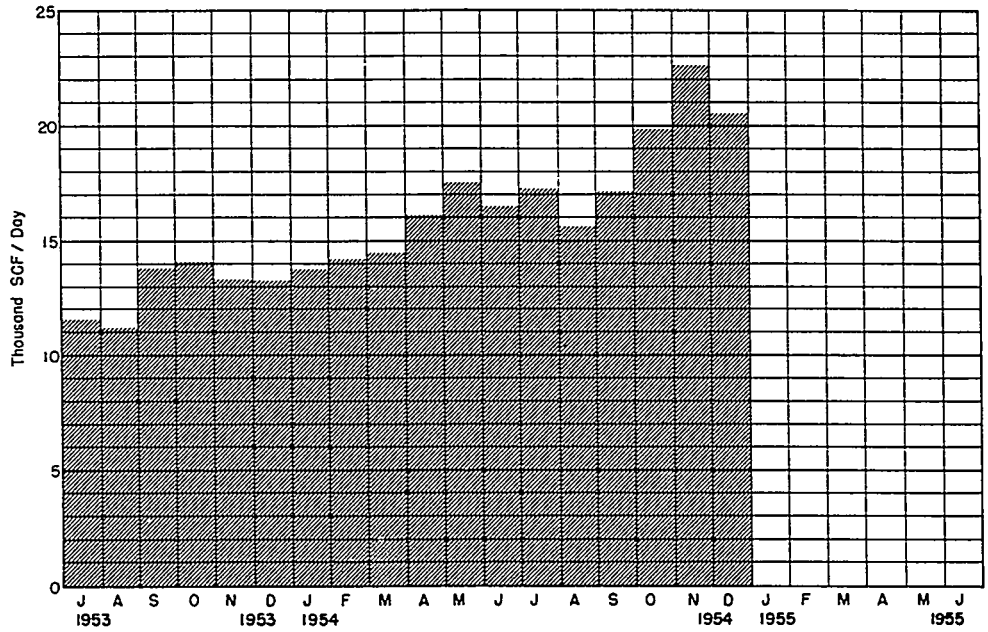


FIGURE C-6
Cascade Purge Rate

BARRIER PERMEABILITY SUMMARY

The reported barrier permeabilities in the K-25 plant showed a general decrease during the second quarter of fiscal year 1955. The only reported permeability increases during the quarter were in the K-27 building and in a small portion of the K-25 building. Most of the permeability decreases and the increase in the K-27 building resulted from stage pressure changes and are therefore fictitious. Due to insufficient information as to the behavior of barrier permeabilities with changes in stage pressure, calculation errors are introduced which result in apparent barrier permeability changes with stage pressure changes. The permeability decreases as the pressure is raised and increases as the pressure is lowered. Most of the permeability changes occurring this quarter can be explained by pressure changes.

K-25 Building

Barrier permeabilities in the K-25 building decreased 0.09% per month during the quarter as compared with a 0.02% decrease during the first fiscal quarter. This over-all rate is consistent with the average for the past two years of -0.06 ± 0.03% per month and apparently represents a normal trend, since only three chlorine trifluoride treatments were conducted in the building during the quarter.

ELECTRICAL

On audit surveys of electrical equipment, 95% of the 238 items checked were considered satisfactory, this being considerably above the corresponding figure of 80% for last quarter.

FIRE PROTECTION

The position of the plant was somewhat improved with regard to fire-protection considerations by the razing of temporary frame buildings near the plant area. No significant changes in the Plant itself were noted.

SAFETY

Factors affecting safety continued to be those common to heavy industrial operations. Approximately 80% of 2500 specific items checked on safety audits were found to be in satisfactory condition.

HEALTH PHYSICS

Alpha Contamination

Plant alpha contamination levels, as reflected by surveys of the 62 locations having significant contamination problems, remained approximately constant, and the yearly experience reflects a 9% decrease from that of 1953. This decrease is primarily attributable to extensive decontamination programs in the Maintenance and Chemical Divisions, and to the cessation of uranium handling in the K-1413 Design and Development Building. Figure E-8 and Table E-6 compare present plant contamination levels with those of other periods.

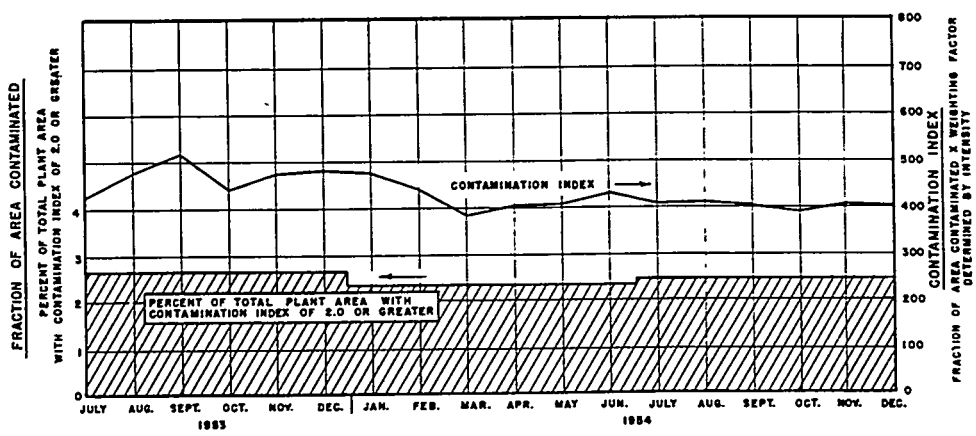


FIGURE E-8
Plant Contamination Levels

Penetrating Radiation Levels

Penetrating radiation levels within the plant, as indicated by surveys of those locations having significant radiation problems, showed no significant change over last period even though the yearly experience shows an increase of approximately 40% over that of 1953. The increase is basically attributable to the re-processing of ash resulting from the manufacture of cascade feed material and a consequent concentration of beta-gamma emitting components of this ash. This, of course, ultimately resulted in higher radiation levels in the re-processing operations and in the

decontamination and maintenance operations performed on associated processing equipment, levels as high as 51 rep. per hour being noted on surveys. Figure E-3 shows the relation between radiation levels and film badge readings and Table E-6 compares present levels with the averages for other periods.

TABLE E-6
Environmental Conditions

	This Quarter	Last Quarter*	Year To Date	1953*	1952 and 1953*
Alpha Contamination					
Plant Contamination Index**	402	406	413	456	349
No. Locations Included	62	62	62	58	44
Percent Plant Area Surveyed**	2.5	2.5	2.4	1.52	1.90
Penetrating Radiation					
Radiation Index α	2.72	2.43	2.18	1.53	1.25
No. Locations Included	9	9	8	8	8
Air Activity (Shift-Length)					
No. Samples Taken	1,278	1,534	1,744	2,007	1,884
No. Above P.A.L.	29	28	29	14	14
Average Activity per sample (c./min./ft.^{3})	0.29	0.38	0.20	0.098	0.094
Air Activity (Spot)					
No. Samples Taken	359	431	422	313	204
No. Above P.A.L.	36	11	24	70	49
Average Activity per Sample (c./min./ft.^{3})	0.85	0.21	0.57	Not Available	
Water and Sewage Control					
Av. Beta Activity of K-25 Sanitary Water (dis./min./100 ml.)	39	23	38.8	34.5	28.2
U Concentration (ppm.) in Poplar Creek Mud	203	119	124	58.9	65.5
U Concentration (ppm.) in Clinch River Mud	5.0	2.5	3.4	0.75	1.4

*Where totals are concerned, figures refer to quarterly averages.

**Contamination Index is a figure which reflects the product of the extent and intensity of alpha contamination exceeding the P.A.L. and the Plant Contamination Index includes plant locations with a 6-months average contamination index of 2.0 or greater.

α The Radiation Index, which reflects both the extent and intensity of radiation found, is essentially the product of the work area over which the dose rate is more than 7.5 mrep./hr. and a weighting factor which depends upon the actual radiation intensities over the areas concerned.

Air Activity Levels

Plant air activity due to air-borne alpha emitters, as indicated by samples from those plant locations where shift-length sampling is performed, decreased; however, the number of samples exceeding the plant acceptable limit increased slightly, with the principal cause of the change being the result of material released in the K-1410 Decontamination building during the cleaning and dismantling of equipment from the K-1131 feed production facility. The average air activity recorded for this year increased over 1953 primarily as a result of 2 high activity samples taken during material releases in the K-306-7 product withdrawal facility, but remains well below the established plant limits. The average air activity indicated by spot air samples taken during plant audit surveys increased as the result of material releases occurring during new material recovery operations, material pulverizing operations, and process equipment dismantling. Table E-6 compares present air activity levels with the average for a two-year base period, and air activities are shown graphically in Figure E-9.

Radium Source Checks

Routine checks of the 22 plant radium sources revealed no evidence of source leakage.

Other Environmental Conditions

The average beta activity in the plant sanitary water supply increased this period and the yearly

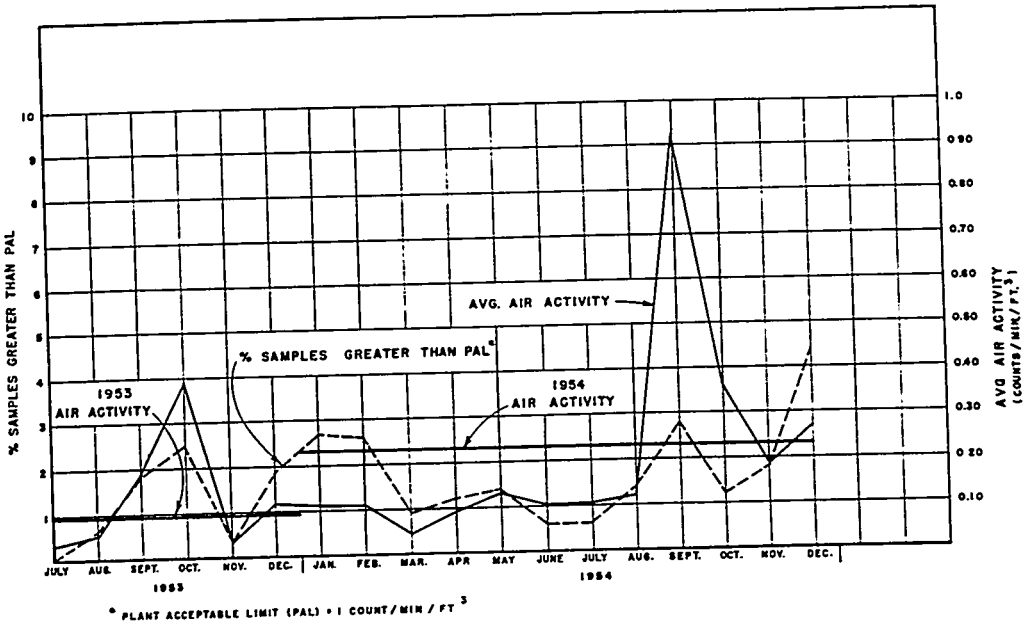


FIGURE E-9
Plant Air Activity on Shift-Length Air Samples

average remained slightly above that recorded in 1953. The increase is attributed to several short-term releases of mixed fission product wastes into the Clinch River by an installation upstream from K-25, and to the concurrent sub-normal dilution of these wastes as the result of reduced water flow volume in the river. Uranium concentration in mud from Poplar Creek and Clinch River showed increases during the period, and yearly average values were considerably higher than those recorded for 1953. These increases are attributed to the build-up of silt as the result of reduced stream movement during periods of light rainfall. Table E-6 compares present water and mud activity with those of other periods, and water activity over an extended period is shown in Figure E-10.

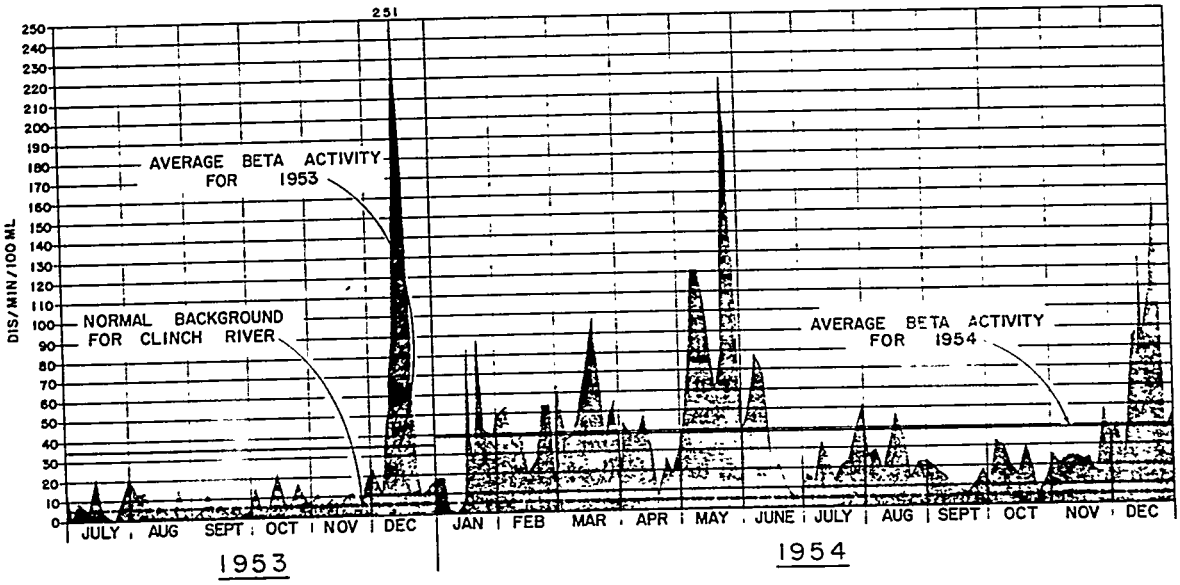


FIGURE E-10
Beta Activity in K-25 Sanitary Water

SIGNIFICANT PLANT LOCATIONS OF HAZARDOUS MATERIALS

Figure E-11 shows the principal locations of some of the more hazardous materials at K-25 and also indicates the average extent and intensity of radioactive surface contamination in the plant.

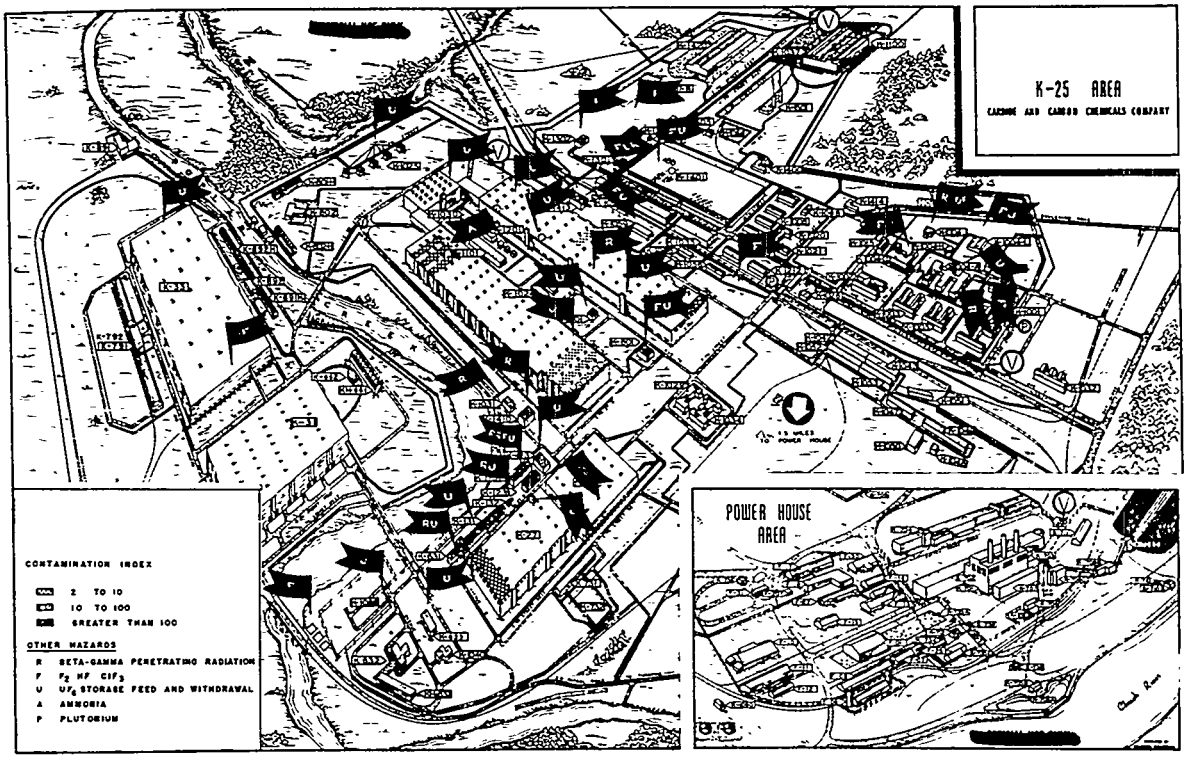


FIGURE E-11
Locations of Radioactive Contamination and Hazardous Materials

EMERGENCY ACTIVITIES

EVACUATION DRILLS AND EMERGENCY RESPONSES

The handling of emergency situations by local emergency squads continued to receive emphasis, the 38 drills conducted this quarter bringing the total number of simulated emergencies to 167 for the year, these including 7 plant-wide drills.

Emergency equipment responses are tabulated in Table E-7.

TABLE E-7
Emergency Equipment Responses

	This Quarter	Last Quarter	This* Year	Last* Year
Fire Fighting Equipment				
Alarms	40	53	52	57
Drills	37	49	42	35
Emergency Truck				
Alarms	29	40	39	17
Drills	38	33	35	26
Ambulance				
Illness or Injury	12	17	14	28
Drills	14	13	12	-

*Values given are quarterly averages.

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number ~~K-1150~~ K/EM-309 Date of document 11/15/54

Title and author (if document is unnumbered)

(This section to be completed by Document Center)

Date request received 10/20/95

Date submitted to ADC 12/19/95

Date submitted to HSA Coordinator 10/20/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 12/19/95 1/22/96

Date received from CICO 1/5/96 2/26/96

Date submitted to ChemRisk/Shonka and DOE 2/26/96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

K/EM-309

SANITIZED VERSION OF EXTRACT FROM K-25 PLANT QUARTERLY REPORT FIRST FISCAL QUARTER JULY 1 THRU SEPTEMBER 30, 1954

(EXTRACTED FROM SRD DOCUMENT # K-1150)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

December 18, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release to the public by:

2/23/96

Technical Information Officer Date
Oak Ridge K-25 Site

SECRET

AEC RESEARCH AND DEVELOPMENT REPORT K-1150

[redacted]

SECRET

TO BE [illegible] TO PLANT RECORDS K-1034

K-25 PLANT QUARTERLY REPORT

FIRST FISCAL QUARTER

July 1, thru September 30, 1954

PROPERTY OF
ORGDP LIBRARY
JAN 27 9 58 AM '75

K-25 PLANT
CARBIDE AND CARBON CHEMICALS COMPANY
A DIVISION OF UNION CARBIDE AND CARBON CORPORATION
OAK RIDGE, TENNESSEE

Acting Under U.S. Government Contract W7405 eng 26

RESTRICTED DATA
This document contains restricted data as defined in the Atomic Energy Act of 1946. Unauthorized disclosure subject to Administrative and Criminal Sanctions.

RESTRICTED DATA
This document contains restricted data as defined in the Atomic Energy Act of 1946. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.

SECRET

[redacted]

SECRET

2

SECRET

~~SECRET~~

REMAINS SRD: 12/8/93
Sam W. Wohlfort (AR)
REMAINS SRD 12/8/93
Gary W. Hall ADD

This document consists of 190 pages
No. 14 of 77 copies, Series A.

DATE OF ISSUE: November 15, 1954

REPORT NO. K-1150

K-25 PLANT QUARTERLY REPORT

FIRST FISCAL QUARTER

July 1, thru September 30, 1954

F90314

K 1150 14 A

K 1150 14 A

CENTRAL LIBRARY
REC 2040620
FILE
X-REF.
X-REF.

K-25 PLANT
CARBIDE AND CARBON CHEMICALS COMPANY
A DIVISION OF UNION CARBIDE AND CARBON CORPORATION
OAK RIDGE, TENNESSEE

~~RESTRICTED DATA~~
~~This document contains Restricted Data as defined in the Atomic Energy Act of 1954. Unauthorized disclosure subject to Administrative and Criminal Sanctions.~~

RESTRICTED DATA
This document contains restricted data as defined in the Atomic Energy Act of 1946. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.

~~SECRET~~

SECRET

3

TABLE C-7
C-816 Coolant Inleakages to the Cascade

Date	Location	Rate, Pounds/day	Inleakage, Pounds	Method of Elimination of Leak
July 14	K-402-6.1	43	5	*
July 24	K-301-4.3	143	20	12 tubes plugged
August 2	K-309-2.2	73	20	Stage 6**
August 4	K-311-1 booster pump	15	15	Cooler removed from Service
August 15	K-309-3.6	138	23	Stage 5**
September 2	K-301-5.5	21	15	*
September 7	K-301-4.7	35	20	Stage 1**
September 24	K-309-2.6	4	35	Replaced stage 5
September 26	K-303-4.2	15	20	Replaced stage 3
Total			173	

*A and B rows of gas cooler tubes plugged in all stages of cell.
**A and B rows of gas cooler tubes plugged in specified stage.

Freon-114 Coolant Leaks to the Cascade

One Freon-114 coolant inleakage was reported during this quarter. A leak of 400 pounds per day (45 pounds total) occurred on July 15 in cell K-502-2.8. Stages 1 and 2 of that cell were replaced to eliminate the inleakage.

Material Releases

Three material releases occurred during the first quarter of fiscal year 1955. The first occurred in the 20-stage pilot plant on August 2. A storage drum leak was detected in vault 16A. A process gas release of 10 pounds of uranium hexafluoride took place in K-631 while the oil in a Beach-Russ pump was being replaced. The oil was contaminated, and when a flexible connection ruptured, the process gas was released. Table C-8 outlines the date, location, and weights of uranium and uranium-235 of the above releases.

TABLE C-8
Material Releases

Date	Location	Loss	
		Grams U	Grams U-235
August 2	K-1401	500	4
August 16	Vault 16A	52	2
August 30	K-631	3,067	22
April 1 through September 30*	K-1401 Decontamination	10,855	315
Total		14,474	343

*This includes the values for the fourth quarter of fiscal year 1954.

Cascade Stream Efficiency

The K-25 cascade operated at an on-stream efficiency of 99.20% during the report period. This efficiency represents an increase of 0.12% above that of the preceding quarter. The on-stream efficiencies during the current quarter for buildings K-33, K-31, K-29, and K-27 - K-25 were 98.16%, 98.34%, 97.22%, and 99.39%, respectively.

The monthly cascade on-stream efficiencies during fiscal years 1954 and 1955 are shown in figure C-4. The costs of off-stream time, broken down by causes, for the current and preceding quarters are shown in table C-10. Figure C-5 presents a tabulation of the monthly cost of off-stream time for fiscal years 1954 and 1955.

The cost of off-stream time during the quarter for buildings K-33, K-31, K-29, K-27, and K-25 amounted to 38.57%, 33.38%, 16.16%, 8.34%, and 3.55%, respectively, of the total cost. The maintenance required is summarized in table C-9 as well as the off-stream time, the per cent of total off-stream time, the number of times off stream, and a comparison with the same items for the preceding quarter.

TABLE C-9
Separating Cascade Cell Off-Stream Time

	Off-Stream Time, Hours	Per Cent of Total Off-Stream Time	Increase in Off-Stream Time Over Previous Quarter, Hrs.	Number of Times Off-Stream	Per Cent of Total Number of Times Off-Stream	Increase in No. of Times Off-Stream Over Previous Quarter
Pump Seal Repairs	4,427.97	32.69	- 420.55	593	21.05	123
Stage Motor Repairs	302.92	2.24	- 316.91	39	1.38	- 15
Stage Pump Repairs	833.28	6.15	+ 65.95	30	1.06	1
Converter Replacement	544.44	4.02	+ 22.33	29	1.03	6
Electrical Equipment Repairs	24.76	0.18	- 48.72	7	0.25	- 38
Light Contaminant Inleakage Checks	528.17	3.90	- 152.73	626	22.22	100
Control Valve Repairs	63.38	0.47	- 30.68	26	0.92	- 25
Coolant Inleakage Checks	17.47	0.13	- 25.53	26	0.92	13
Instrumentation	23.40	0.17	- 106.61	10	0.35	- 22
Lube System Repairs	23.99	0.18	+ 8.70	14	0.50	3
Coolant System Repairs	498.40	3.68	+157.19	55	1.95	- 22
Engineering Tests	283.67	2.09	- 2,287.42	32	1.14	- 41
ClF_3 Operations	289.98	2.14	+151.02	73	2.59	52
K-27 Improvement Program	1,494.15	11.03	+338.42	88	3.13	26
Miscellaneous	3,706.55	27.37	+555.94	1,148	40.76	- 279
Special Coolant Leaks	481.77	3.56	+251.45	21	0.75	14
Total	13,544.30	100.00	- 1,838.15	2,817	100.00	- 104

Stream Efficinecy this Quarter: 99.20%
Stream Efficiency Last Quarter: 99.08%

TABLE C-10
Cost of Off-Stream Time

	April 1954	May 1954	June 1954	July 1954	August 1954	September 1954
Pump Seal Repairs	138,238.26	114,961.98	122,830.56	135,915.31	96,050.93	127,392.34
Stage Motor Repairs	3,762.69	17,582.82	6,954.01	6,621.82	564.46	5,185.15
Stage Pump Repairs	14,869.32	38,168.82	30,910.99	26,048.70	19,557.28	30,609.15
Converter Replacement	33,651.15	31,603.99	16,590.76	36,393.56	13,309.17	23,793.72
Electrical Equipment Repairs	179.36	-	2,880.71	-	42.47	3,775.16
L. C. Inleakage Checks	13,842.32	17,610.77	11,273.46	37,446.45	19,372.68	11,785.62
Control Valve Repairs	4,603.24	4,543.86	2,716.79	2,184.99	2,477.09	3,821.14
Coolant Inleakage Checks	338.46	717.80	3.45	76.90	169.82	75.12
Instrumentation Repairs	1,311.50	231.14	-	369.21	304.67	642.65
Lube System Repairs	111.18	870.74	10.24	244.82	285.32	16.79
Coolant System Repairs	9,572.07	1,255.51	2,850.65	3,275.03	3,854.83	9,180.71
Engineering Tests	11,996.70	6,574.65	16,508.57	2,093.14	24,530.59	4,339.69
ClF_3 Operations	72.03	1,577.71	10,817.50	2,238.81	3,018.36	3,274.04
Improvement Program	11,143.53	31,550.97	28,820.63	46,009.33	75,368.21	22,848.45
Miscellaneous	99,451.74	79,496.15	81,496.15	157,406.07	41,748.60	214,822.63
Special Coolant Leaks	4,020.73	2,311.83	-	3,985.88	1,227.80	3,523.20
Totals	347,164.28	348,974.59	324,664.47	460,310.02	301,882.28	465,085.56

PURGE CASCADE OPERATIONS

Purge Rates

Unit K-312-3 operated throughout the quarter as the cascade top purge. Unit K-312-1 and the temporary purge facility in K-302-1 operated for the entire quarter as side purge facilities. In addition, the K-312-2 purge unit was operated for three days in September to provide supplementary purge capacity

Purge facilities in K-312-1, K-312-3, and K-302-1 purged an average of 13,473, 3,201, and 3,454 scf per day, respectively, during the report period. Unit K-312-2 purged a total of 6,839 scf during the three-day period of operation. The total purge rate for the first quarter of fiscal year 1955 was 20.0% above that of the preceding three-month period. The increased amounts of light gas contaminants in the cascade this quarter are the direct result of the cascade additions in the K-33 building.

The average indicated uranium hexafluoride concentration in the purge gases this quarter increased 419.2% above that of the previous quarter. This indicated increase is attributed to relatively large amounts of fluorocarbons in the purge gases. Large amounts of contaminants often cause the monitoring instrumentation to indicate abnormally high uranium hexafluoride concentrations. The average daily purge rates and uranium hexafluoride concentrations are tabulated in table C-11 for each month of the current and preceding quarters. Figure C-6 depicts the monthly purge rates for fiscal years 1954 and 1955.

TABLE C-11
Cascade Purge Rates

Month	Average Daily Purge Rate, Scf/Day	Uranium Hexafluoride Concentration, Mole Per Cent x 10^5
April, 1954	16,037	23.69
May, 1954	17,570	37.31
June, 1954	16,480	18.57
July, 1954	27,299	76.58
August, 1954	15,685	109.18
September, 1954	17,037	227.37

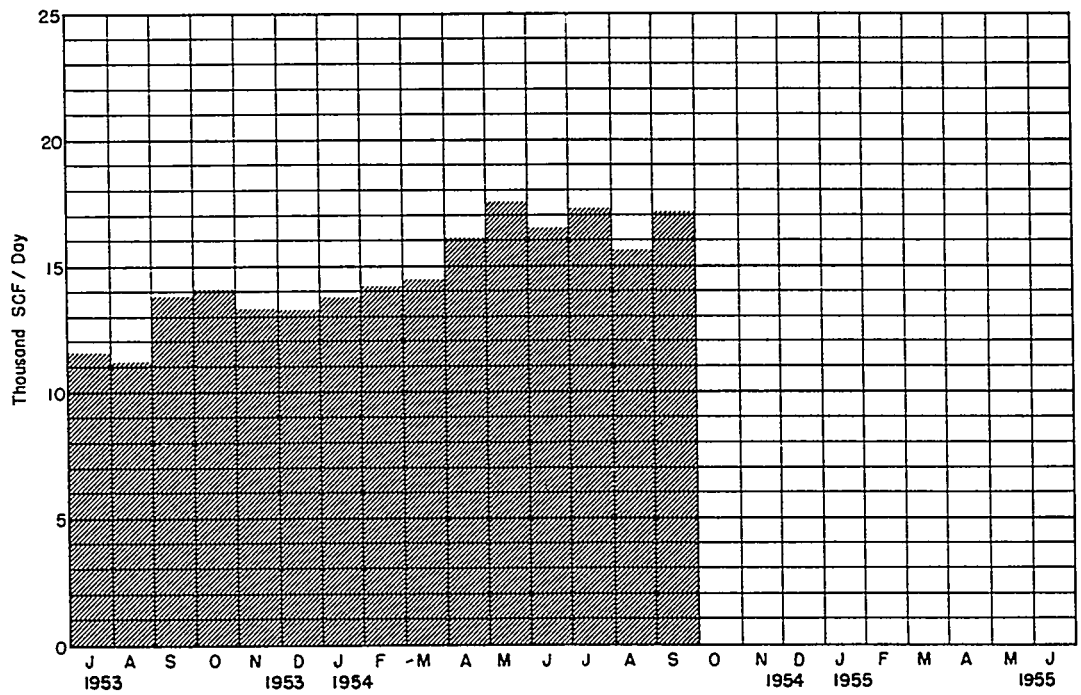


FIGURE C-6
Cascade Purge Rate

Purge System Changes

The work involved in the conversion of unit K-311-1 for use as a side purge facility is nearing

completion. This unit is designed to control the light contaminant upflow resulting from the on-stream operation of building K-33. The unit was removed from on-stream operation on August 23, 1954, and should be placed in operation as a purge facility early in the second quarter of fiscal year 1955.

The interim side purge facility was established in the K-302-1 unit in order to control the light contaminant upflow from the K-33 building until the K-311-1 unit is completed.

BARRIER PERMEABILITY SUMMARY

Barrier permeabilities in the K-25 plant in general showed little variation during the first fiscal quarter of 1955. Slight permeability decreases were experienced in all of the plant with the exception of the K-31 building.

Barrier permeabilities in the K-25 building decreased 0.02% per month during the first fiscal quarter, as compared to a decrease of 0.25% per month during the fourth quarter of fiscal year 1954. This rate compares favorably with the average for the past two years of -0.04 ± 0.03% per month. The quarterly trend of permeability changes was apparently normal since only two chlorine trifluoride treatments were conducted in the building during the period.

storage were unsuitable, and defects requiring repairs in the weld areas of 2 monel HF tanks were also found by the same methods.

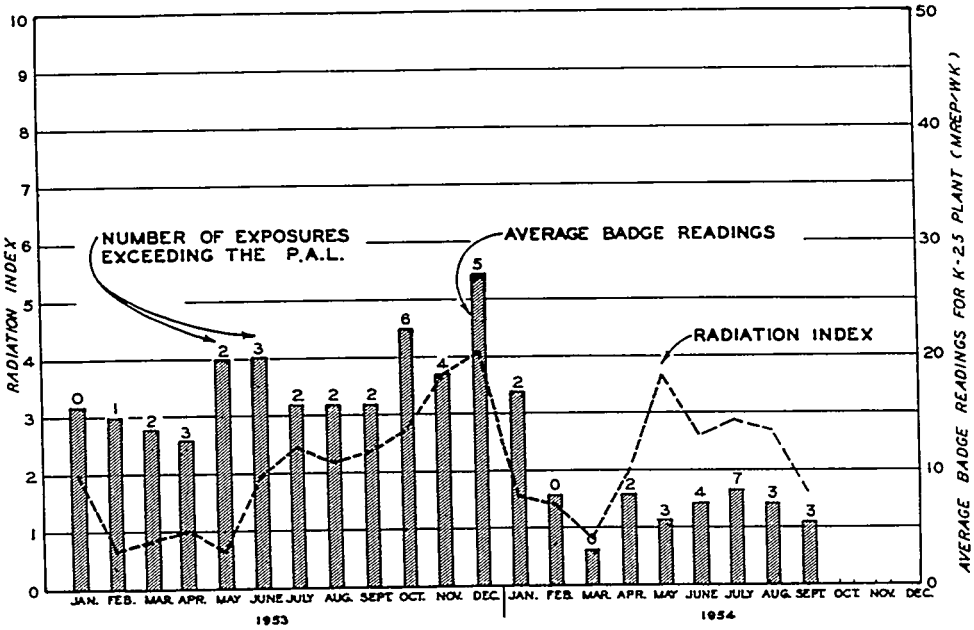


FIGURE E-2
Film Badge Exposures and Plant Penetrating Radiation Index

Routine inspections of plant materials-handling equipment indicated an increase in the defective-conditions index* of the overhead cranes, with excessively worn or damaged cables and defective brakes being the major contributing factors. These defects were attributed primarily to continued heavy usage of the cranes. As is indicated in figure E-3, the corresponding index for other materials-handling equipment decreased by approximately 15%.

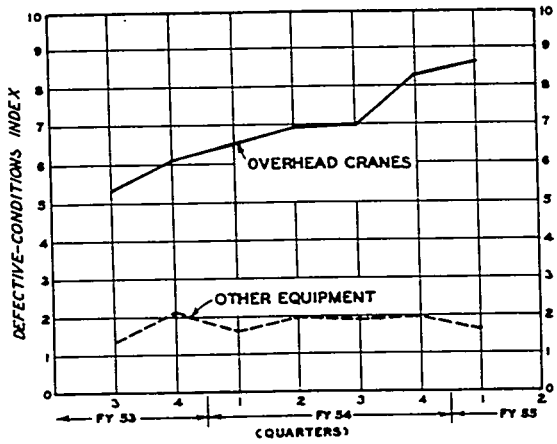


FIGURE E-3
Materials-Handling Equipment Conditions

* The defective-conditions index represents the number of equipment defects noted during inspections multiplied by weighting factors which reflect the potential seriousness of these defects.

Fire Protection

Routine inspections and tests of fixed fire-protection equipment revealed no abnormal faults, and all of those noted were corrected.

PLANT CONDITION AND AUDIT

Special Hazards

One incident which involved misoperation of equipment was formally investigated; otherwise, audits of plant facilities indicated that equipment usage and operating procedures were satisfactory.

Electrical

Audit surveys of electrical equipment in both new and existing installations indicate that, in general, the installations are in accordance with plant standards, although about 20% of the 228 items checked were found to have installation defects. The majority of these were relatively minor and were readily corrected.

Safety

Audits of plant facilities show that unsafe conditions caused only 14% of the plant injuries as compared to 20% for last quarter, the remainder of the injuries being due primarily to employee acts. These conditions continue to be basically those common to industry in general and are not considered indicative of hazards peculiar to the plant or to the chemicals industry.

Health Physics

Alpha Contamination. Although the average contamination index* increased about 10%, as shown in table E-2, the year-to-date experience reflects a noticeable improvement over that of 1953. This increase is primarily attributed to contamination conditions in the K-1131 Feed Plant. Recent comparative surface contamination data are shown in figure E-4.

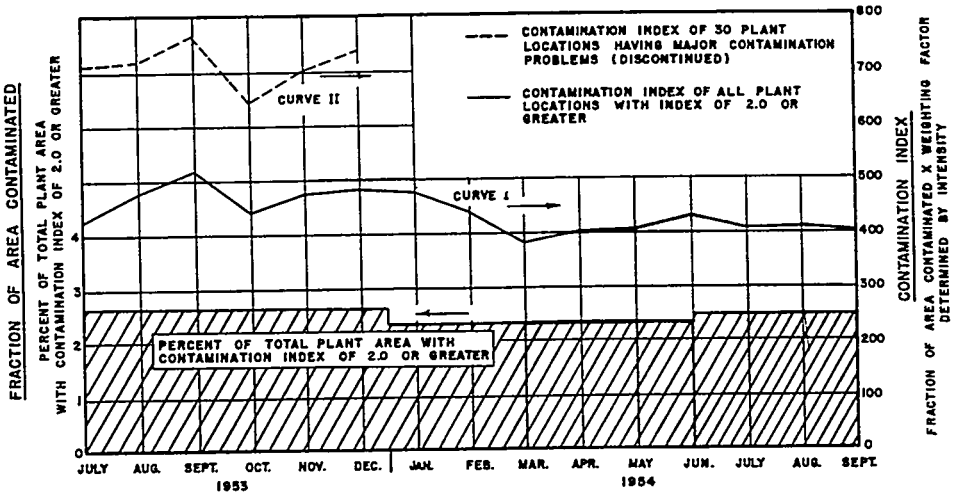


FIGURE E-4
K-25 Plant Contamination Levels

* Contamination Index is a figure which reflects the product of the extent and intensity of surface alpha contamination exceeding the P.A.L.

Penetrating Radiation Levels. The noticeable decrease in the penetrating radiation index* , as shown in figure E-2 and given in table E-2, is attributed to lower radiation levels from UF_6 production equipment in both the feed-production and decontamination facilities and to the absence of the comparatively high temporary radiation fields associated with instrument calibration operations in the K-301-3 Calibration Room which were reported last quarter.

Routine checks of the 22 plant radium sources revealed no evidence of leakage.

Air Activity Levels. The average air activity due to air-borne alpha contamination in the 9 plant locations where shift-length samples are taken increased sharply as shown in table E-2. However, this increase was due primarily to the high activity of 2 samples taken during short-term releases of product-level material following equipment failure in the K-306-7 Product Withdrawal Station and is not indicative of general plant conditions. The number of samples exceeding the P.A.L. remained unchanged; these were primarily due to the accidental release of material following equipment failure in the K-1301 Oxide Conversion Building and to pulverizing operations in the K-1231 Building.

As shown in table E-2, the average air activity indicated by spot air samples taken in connection with plant audit inspections remained relatively unchanged and well below the P.A.L., while the number of samples exceeding the P.A.L. decreased significantly.

Water and Stream Bottom Survey Program. The decrease in the average beta activity of the treated water supply, as shown in table E-2, may be attributed to a decrease in the amount of mixed fission product waste material released into the Clinch River from an upstream installation, and to the greater dilution provided by an increase in Clinch-River flow rates. On the other hand, the increase in the average uranium concentration of the Poplar Creek stream bottom is attributed to a normal continued build-up of silt in the stream bottom as a result of slow stream movement during a period of unusually light rainfall, and is not considered to represent a health hazard. The concentration reported for the Clinch River remains very low and relatively unchanged.

TABLE E-2
Environmental Conditions

	This Quarter	Last Quarter †	Year To Date*	1953*	1952 and 1953*
Alpha Contamination					
Alpha Contamination Index**	406	413 (374)	417	456	349
No. Locations Included	62	60	61	58	44
Percent Plant Area Surveyed**	2.5	2.3	2.4	1.52	1.90
Penetrating Radiation					
Radiation Index	2.43	2.60 (2.83)	2.01	1.53	1.25
No. Locations Included	9	8	8	8	8
Air Activity (Shift-Length)					
No. Samples Taken	1,534	2,541	1,900	2,007	1,884
No. Above P.A.L.	28	28	30	14	14
Average Activity per Sample (c./min./ft.^{3})	0.38	0.11	0.19	0.098	0.094
Air Activity (Spot)					
No. Samples Taken	431	358	443	313	204
No. Above P.A.L.	11	21	20	70	49
Average Activity per Sample (c/min./ft.^{3})	0.21	0.19	0.22	Not Available	
Water and Sewage Control					
Av. Beta Activity of K-25 Sanitary Water (dis./min./100 ml.)	23	55	38.6	34.5	56.3
U Concentration (ppm) in Poplar Creek Mud	119	47	90	58.9	65.5
U Concentration (ppm) in Clinch River Mud	2.5	2.7	2.8	0.75	1.4

† Values in parenthesis are based on areas comparable to those surveyed this quarter.
* Where totals are concerned, figures refer to Quarterly Averages.
** Includes all plant locations with a 6-month's average contamination index of 2.0 or greater.

*The Radiation Index, which reflects both the extent and intensity of radiation found, is essentially the product of the work area over which the dose rate is more than 7.5 mrep./hr. and a weighting factor which depends upon the actual radiation intensities over the areas concerned.

DISTRIBUTION

1. K-25 Site Records (RC)
2. ~~ChemRisk/Shonka Research Associates~~
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number ~~K-1053~~ K/EM-308 Date of document 8/24/54

Title and author (if document is unnumbered)

Copy 1st pgs only

(This section to be completed by Document Center)

Date request received 10/20/95

Date submitted to ADC 12/19/95

Date submitted to HSA Coordinator 10/20/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 12/19/95 1/22/96

Date received from CICO 1/5/96 2/26/96

Date submitted to ChemRisk/Shonka and DOE 2/26/96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

K/EM-308

SANITIZED VERSION OF EXTRACT FROM K-25 PLANT QUARTERLY REPORT FOURTH FISCAL QUARTER APRIL 1 THRU JUNE 30, 1954

(EXTRACTED FROM SRD DOCUMENT # K-1053)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

December 18, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release to the public by:

2/23/96

Technical Information Officer Date
Oak Ridge K-25 Site

SECRET [redacted] Indexed 8/16/72

DEVELOPMENT REPORT
K-1053

G 18A

[redacted]

K-25 PLANT QUARTERLY REPORT

FOURTH FISCAL QUARTER

April 1, thru June 30, 1954

K-25 PLANT
CARBIDE AND CARBON CHEMICALS COMPANY
A DIVISION OF UNION CARBIDE AND CARBON CORPORATION
OAK RIDGE, TENNESSEE

Acting Under U.S. Government Contract W7405 eng 26

RESTRICTED DATA
This document contains Restricted Data as defined in the Atomic Energy Act of 1946. Unauthorized disclosure subject to Administrative and Criminal Sanctions.

RESTRICTED DATA
This document contains restricted data as defined in the Atomic Energy Act of 1946. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.

[redacted]

CENTRAL LIBRARY
K-1004-A

[redacted]

SECRET

2

SECRET

~~REMAINS SRD: 12/8/93~~
~~Sam W. Wohlfort (AR)~~
~~REMAINS: SRD 12/8/93~~
~~Hand W. Hall ADD~~

~~CONFIDENTIAL~~

~~SECRET~~

This document consists of 202 pages
No. 18 of 78 copies, Series A.

DATE OF ISSUE: August 24, 1954 **REPORT NO.** K-1053

K 1053 18 A

K 1053 18 A

K-25 PLANT QUARTERLY REPORT

FOURTH FISCAL QUARTER

April 1, thru June 30, 1954

PLANT RECORDS DEPT.
CENTRAL LIBRARY
REC. 7-56218
FILE
X-REF.
X-REF.

K-25 PLANT
CARBIDE AND CARBON CHEMICALS COMPANY
A DIVISION OF UNION CARBIDE AND CARBON CORPORATION
OAK RIDGE, TENNESSEE

~~RESTRICTED DATA~~
~~This document contains Restricted Data as defined in the Atomic Energy Act of 1954. Unauthorized disclosure subject to Administrative and Criminal Sanctions.~~

RESTRICTED DATA
This document contains restricted data as defined in the Atomic Energy Act of 1946. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.

~~SECRET~~

~~CONFIDENTIAL~~

3

SECRET

loss of $2,000 was attributed to the 287 off-stream cell-hours. The disturbance caused the failure of 20 seals, 22 control valve diaphragms, 44 breakers, 2 motors, and 1 compressor.

Tails Condensation Abnormalities

Due to some undetermined incident on April 4, two waste cylinders were removed with assays above 2.0%. All related valving was thoroughly checked and no apparent cause of the abnormality was found. The assay of subsequent cylinders returned to normal values.

The condensation of tails material was discontinued for 3 hours on May 21 when a line between building K-413 and section K-312 became plugged. The tails material was re-routed for 6.5 hours until the line was unplugged.

Material Releases

Five process gas releases occurred during the fourth quarter of fiscal year 1954. Two of these releases occurred at K-306-7, one in the product purification unit and one at the product sample line. The former occurred on June 11 and about 0.5 ounces of process gas was lost. The latter took place on June 30 and approximately 4.5 ounces was lost. About 50 pounds of process gas was lost at K-633 during the month of June. This was caused by a partial plug in a faulty valve and the release occurred when the valve was removed. On June 15, 2.2 pounds of process gas was released to the atmosphere from the 20-stage pilot plant. Approximately 1.7 ounces of process gas was lost in D Laboratory on June 29 due to a faulty thermowell on a product sample cylinder.

Table C-6 shows the dates, locations, and amounts of both uranium and uranium-235 of the above releases. Also shown are material releases from eight storage drum leaks.

TABLE C-6
Material Releases

		Loss	
Date	Location	Grams U	Grams U-235
4-5	K-131	55,987	418
4-6	Vault 16A	207	5
4-10	K-1410	129	5
4-13	Vault 16A	406	8
4-18	K-1303	1,198	11
5-11	Vault 16A	966	13
5-26	Vault 16A	8	0
6-11	K-306-7	10	9
6-15	K-1401	1,000	7
6-29	D Laboratory	53	49
6-30	K-306-7	128	119
6-1 to 6-30	K-633	15,336	101
Total		75,428	745

C-816 Coolant Leaks to the Cascade

Only three C-816 coolant leaks occurred during the fourth quarter of fiscal year 1954 as compared with ten such leaks during the preceding quarter. The first leak detected was on April 7 in cell K-309-2.5. About 50 pounds of C-816 coolant entered the cascade at the rate of 153 pounds per day. The inleakage was eliminated by plugging the A and B rows of gas cooler tubes in all converters of cell K-309-2.5. Two minor leaks took place during May and no leaks were incurred during June. A C-816 coolant leak to the cascade of 1 pound per day occurred on May 10 in cell K-402-5.5. The inleakage was eliminated by plugging the A and B rows of gas cooler tubes in the stage 6 converter. On May 14, a C-816 coolant leak to the cascade of 72 pounds per day occurred in cell K-402-1.7. The inleakage was eliminated after 5 pounds of coolant entered the cascade by

TABLE C-8

Separating Cascade Cell Off-Stream Time

	Off-Stream Time, hours	Per Cent of Total Off-Stream Time	Increase in Off-Stream Time Over Previous Quarter, hrs.	Number of Times Off Stream	Per Cent of Total Number of Times offStream	Increase in No. of Times Off Stream over Previous Quarter
Pump Seal Repairs	4,848.52	31.52	941.16	470	16.09	50
Stage Motor Repairs	619.83	4.03	35.79	54	1.85	2
Stage Pump Repairs	767.33	4.99	-626.85	29	0.99	4
Converter Replacement	522.11	3.39	-526.49	23	0.79	-16
Electrical Equipment Repairs	73.48	0.48	36.78	45	1.54	30
Light Contaminant Inleakage Checks	680.90	4.43	91.83	526	18.01	-74
Control Valve Repairs	94.06	0.61	-93.23	51	1.75	-20
Coolant Inleakage Checks	43.00	0.28	-113.66	13	0.45	-10
Instrumentation	130.01	0.85	112.93	32	1.10	25
Lube System Repairs	15.29	0.10	-20.95	11	0.37	-1
Coolant System Repairs	341.21	2.22	-186.69	77	2.64	40
Engineering Tests	2,571.09	16.71	1,871.04	73	2.50	40
ClF_3 Operations	138.96	0.90	-2,870.31	21	0.72	-30
K-27 Improvement Program	1,155.73	7.51	310.88	62	2.12	28
Miscellaneous	3,150.61	20.48	1,696.19	1,427	48.85	1,234
Special Coolant Leaks	230.32	1.50	-127.15	7	0.23	-7
Totals	15,382.45	100.00	531.27	2,921	100.00	1,295

Stream Efficiency This Quarter, 99.08%
Stream Efficiency Last Quarter, 98.96%

TABLE C-9

Cost of Off-Stream Time

	January 1954	February 1954	March 1954	April 1954	May 1954	June 1954
Pump Seal Repairs	74,787.12	127,922.85	110,053.41	138,238.26	114,961.98	122,830.56
Stage Motor Repairs	5,746.25	9,299.94	6,821.95	3,762.69	17,582.82	6,954.01
Stage Pump Repairs	25,806.39	82,942.04	12,780.33	14,869.32	38,168.82	30,910.99
Converter Replacement	42,727.24	60,806.05	54,156.90	33,651.15	31,603.99	16,590.76
Electrical Equipment Repairs	7.57	8,712.52	80.35	179.36	-	2,880.71
Light Contaminant Inleakage Checks	20,943.92	17,328.99	15,348.37	13,842.32	17,610.77	11,273.46
Control Valve Repairs	5,886.64	6,420.24	8,503.96	4,603.24	4,543.86	2,716.79
Coolant Inleakage Checks	1,223.99	1,078.15	1,455.38	338.46	717.80	3.45
Instrumentation Repairs	257.01	111.86	943.03	1,311.50	231.14	-
Lube System Repairs	2,065.57	31.80	9.69	111.18	870.74	10.24
Coolant System Repairs	3,950.37	2,002.42	13,367.58	9,572.07	1,255.51	2,850.65
Engineering Tests	19.28	1,296.50	4,759.79	11,996.70	6,574.65	6,508.57
ClF_3 Operations	22,103.91	14,191.18	1,607.76	72.03	1,577.71	10,817.50
K-27 Improvement Program	3,625.38	6,832.75	15,346.93	11,143.53	31,550.97	28,820.63
Miscellaneous	60,589.75	55,276.19	17,425.61	99,451.74	79,412.00	81,496.15
Special Coolant Leaks	660.18	4,494.94	460.56	4,020.73	2,311.83	-
Totals	270,400.57	398,748.42	263,121.60	347,164.28	348,974.59	324,664.47

PURGE CASCADE OPERATIONS

Purge Rates

During the quarter, units 1 and 3 of section K-312 were in operation as the side and top purge units, respectively. Unit K-312-2 was not used for purge operations during the report period.

The auxiliary side purge facility at unit K-302-1 was placed into operation on April 20, 1954, and was in service during most of the remainder of the quarter.

The average daily purge rates for the K-302-1 unit were 911 scf, 1,305 scf, and 4,102 scf for April, May, and June, respectively. The total purge rate for the quarter was 2,097 scf per day. Average uranium hexafluoride concentrations are not available for these operations.

Units K-312-1 and K-312-3 purged an average of 13,874 and 2,821 scf per day, respectively. The total purge rate was 16,695 scf per day at an average concentration of 26.53 x 10^{-5} mole per cent uranium hexafluoride. The purge rate for the past quarter represented an increase of 18.1% above that of the third quarter of fiscal year 1954. The average indicated hexafluoride concentration in the purge gases during the past quarter decreased 41.3% below that of the previous quarter. This is probably due to the relatively large amounts of contaminants encountered in the purge gases during the third quarter of fiscal year 1954. Large amounts of the contaminants may effect the space recorder so as to indicate an abnormally high uranium hexafluoride concentration. The average daily purge rates and uranium hexafluoride concentrations are tabulated in table C-10 for each month of the current and preceding quarters. Figure C-6 depicts the monthly purge rates for fiscal years 1953 and 1954.

TABLE C-10
Cascade Purge Rates

Month	Average Daily Purge Rate Scf/Day	Uranium Hexafluoride Concentration Mole Per Cent x 10^5	Month	Average Daily Purge Rate Scf/Day	Uranium Hexafluoride Concentration Mole Per Cent x 10^5
January, 1954	13,802	26.50	April, 1954	16,037	23.69
February, 1954	14,174	75.10	May, 1954	17,570	37.31
March, 1954	14,441	33.95	June, 1954	16,480	18.57

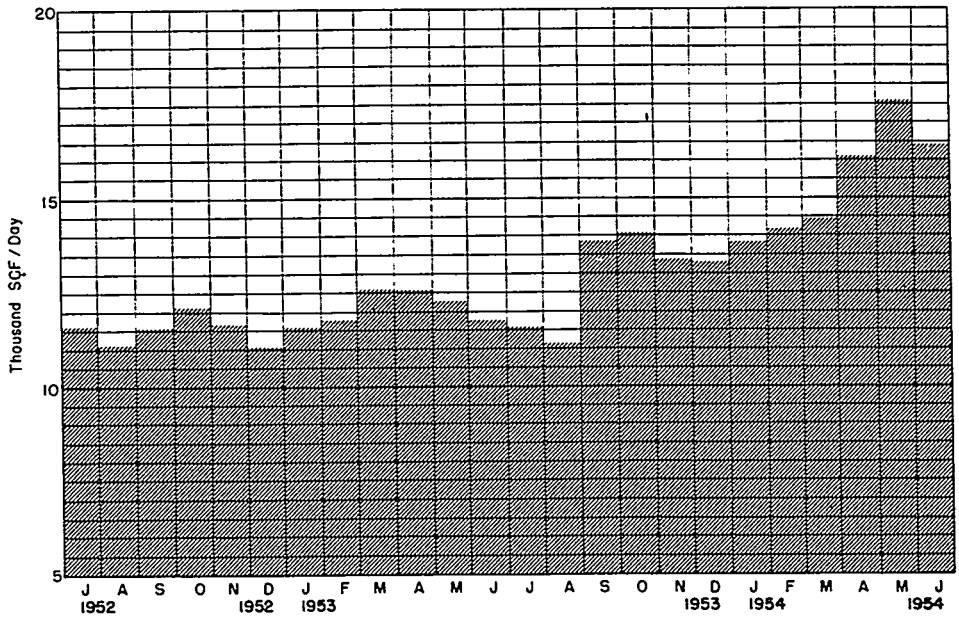


FIGURE C-6
Cascade Purge Rate

BARRIER PERMEABILITY SUMMARY

Barrier permeabilities decreased throughout the K-25 plant during the fourth quarter, except in the K-25 building. Much of this change is not readily explained; however, some factors which might have influenced such a trend are considered below.

Barrier permeabilities in the K-25 building decreased 0.25% per month during the fourth quarter as compared to a decrease of 0.05% per month during the preceding report period. The rate for the past

The annual inspections and tests completed on 4 of the Steam Plant Boilers revealed the need for routine preventive maintenance only.

The operational hazards and difficulties which may be encountered in the operation, construction, or repair of monel vessels were highlighted by noting that a vendor-manufactured monel drum for use in a low temperature HF recovery system contained several radial cracks in both heads; similarly, radiographic inspection of 2 shop-fabricated monel tanks for dilute HF storage revealed weld cracking and extreme porosity which necessitated repair and replacement.

A majority of the domestic water heating tanks originally installed in the plant appear to be nearing their usable service life since 6 of the 10 tanks inspected were found to be unfit for further normal service due to excessive internal corrosion.

Fire Protection

Routine inspections and tests of fixed fire protection equipment revealed no abnormal faults and all of those noted were corrected.

PLANT CONDITION AND AUDIT

Special Hazards

The two significant incidents which occurred during the quarter and were formally investigated involved misoperation of equipment. With the exception of these incidents, audit inspections of facilities and operations indicated that equipment usage and operating procedures were satisfactory.

Electrical

The general audits of the plant electrical equipment in both new and existing installations indicate that this work is generally carried on in accordance with standard safety requirements. Only about 12% of the 164 items checked for conformance with code installations were found to have minor installation defects or to be inadequately identified; all such items were readily corrected.

Safety

Audit surveys reveal the plant unsafe conditions, which caused about 20% of the plant injuries, to be primarily those common to industry in general and thus not indicative of significant unsafe conditions related to hazards peculiar to the plant or to the chemicals industry.

Health Physics

Alpha Contamination. As shown in table E-2, the average contamination index* decreased about 5%, and the year-to-date experience reflects a significant improvement over the corresponding figures recorded during 1953. This over-all decrease, as compared to last quarter, is attributed to improved clean-up operations in several plant locations while the slight rise noted at the close of the period, as indicated in figure E-3, is considered due mainly to increased operations and repairs in the K-1131 Feed Plant and Cascade Services Areas.

Penetrating Radiation Levels. The marked increase in the penetrating radiation index** as shown graphically in figure E-4 is attributed primarily to localized radiation sources found in the K-1410

* Contamination Index is a figure which reflects the product of the extent and intensity of surface alpha contamination exceeding the P.A.L.

**The Radiation Index, which reflects both the extent and intensity of radiation found, is essentially the product of the work area over which the dose rate is more than 7.5 mrep./hr. and a weighting factor which depends upon the actual radiation intensities over the areas concerned.

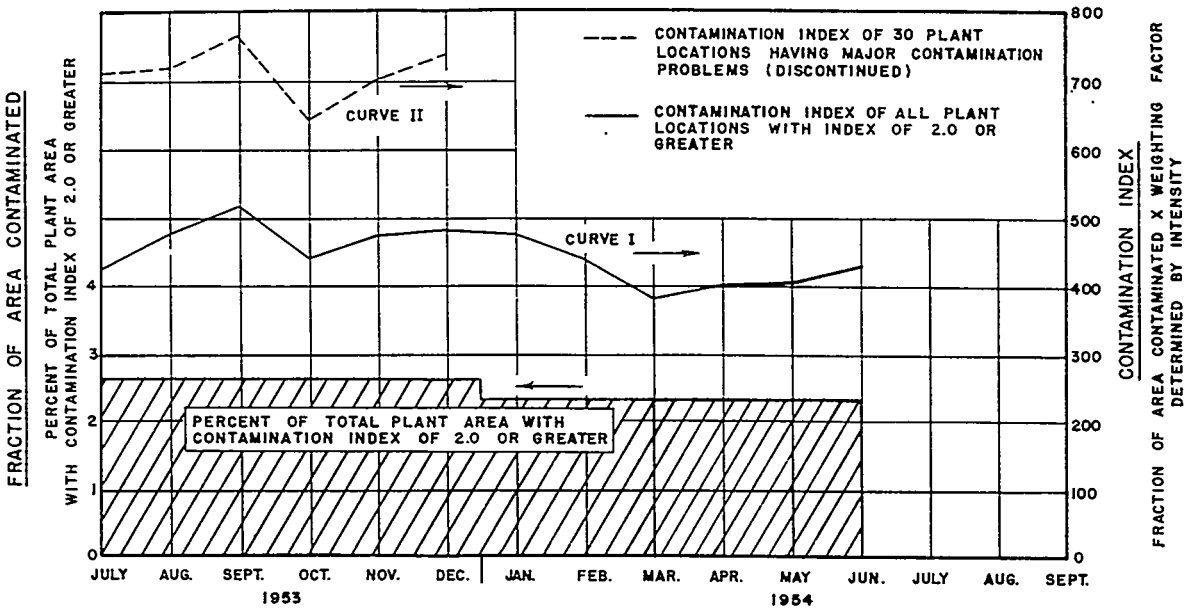


FIGURE E-3
K-25 Plant Contamination Levels

Decontamination Facility during dismantling of K-1131 Feed Plant equipment, and to radiation calibration operations in the K-301-3 Calibration Room. It may be noted that, as discussed under Personnel Monitoring, the film badge results also indicated increased radiation exposures of plant personnel.

Routine checks of the 22 plant radium sources revealed no evidence of leakage.

Air Activity Levels. The average activity of air-borne alpha contamination in the 10 plant locations where shift-length samples are taken remained low and relatively unchanged from last quarter, and although the number of samples exceeding the P.A.L., as shown in table E-2, recently decreased, the number recorded for the year to date represents a considerable increase over those of the comparable period in 1953. These over-P.A.L. conditions may be primarily attributed to short-term releases of radioactive material resulting from maintenance and powder-pulverizing operations during which adequate respiratory protective equipment is normally worn by the personnel involved.

The average air activity indicated by spot air samples taken in connection with plant audit inspections remained relatively unchanged and well below the P.A.L., as noted in table E-2.

Water and Stream Bottom Survey Program. An increase in the average beta activity in the treated water supply, as noted in table E-2, may be attributed to the relatively high beta activity accidentally released to the storage lake of an installation upstream from K-25 and subsequently released to the Clinch River. A peak activity of 222 dis./min./100 ml. was reached during May, and while this is considerably above normal, it was of short duration and was not considered to represent a significant health hazard.

The average uranium concentration of the Poplar Creek stream bottom, shown in table E-2, decreased significantly as increased stream movement during the earlier part of the quarter apparently continued to dilute and move the contaminated silt farther downstream. The decrease may further be attributed to termination of certain equipment cleaning operations which had resulted in the release of uranium materials to the stream. The concentration in the Clinch River remained very low and relatively unchanged.

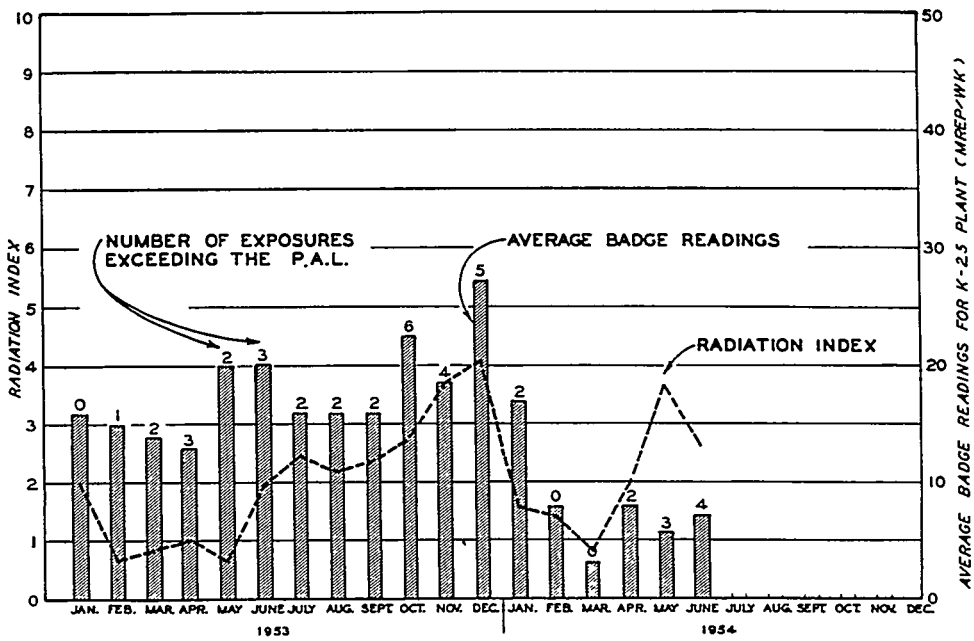


FIGURE E-4
K-25 Plant Penetrating-Radiation Index and Film Badge Exposures

TABLE E-2
Environmental Conditions

	This Quarter	Last Quarter	Year To Date*	1953*	1952 and 1953*
Alpha Contamination					
Alpha Contamination Index**	413	433	423	456	349
No. Locations Included	60	60	60	58	44
Percent Plant Area Surveyed**	2.3	2.3	2.3	1.52	1.90
Penetrating Radiation					
Radiation Index	2.60	1.03	1.82	1.53	1.25
No. Locations Included	8	8	8	8	8
Air Activity (Shift-Length)					
No. Samples Taken	2,541	1,631	2,086	2,007	1,884
No. Above P.A.L.	28	34	31	14	14
Average Activity per Sample	0.11	0.13	0.12	0.098	0.094
Air Activity (Spot)					
Total No. Taken	358	452	405	313	204
Total Greater than P.A.L.	19	28	23	70	49
Average Activity per Sample (c./min./ft.^{3})	0.21	0.25	0.23	Not Available	
Water and Sewage Control					
Average Beta Activity of K-25 Sanitary Water (dis./min./100 ml.)	55	42	48.8	34.5	56.3
U Concentration (ppm) in Poplar Creek Mud	47	100	74	58.9	65.5
U Concentration (ppm) in Clinch River Mud	2.7	3.2	3.0	0.75	1.43

*Where totals are concerned, figures refer to quarterly averages.
**Includes all plant locations with a contamination index of 2.0 or greater.

Industrial Hygiene

Urinary Information. The per cent of the positive urinary uranium findings contributed by the feed plant personnel was approximately the same as the previous quarter. The decontamination operations, the pilot plant, the process maintenance group, and the laboratories all contributed increased numbers of positive urinary uranium findings.

An increased number of positive urinary fluorides that were traceable to the feed plant was a direct result of the increased production of fluoride for the renewed operation of the feed manufacturing units and the increased demand for conditioning of new equipment.

Inhalation Data. Additional ventilation for the vapor degreaser in the central cleaning area has been installed and adjustments are almost completed.

Experimental in-place degreasing of electric motors with carbon tetrachloride was continued. Motors in use in a process building were cleaned, incorporating some hood and nozzle changes as indicated by previous test runs, with encouraging results from an industrial hygiene standpoint.

A basic design for the electrical maintenance shops carbon tetrachloride degreasing pit, for installation in the K-1401 Building, has been agreed upon.

The new system for grinding, transporting, storing, and melting scrap and contaminated barrier material, and ventilation of these operations in the barrier recovery plant is, essentially, completely installed.

Plant Facilities. Noise surveys of the main utility buildings have been completed.

The welding school has been moved to new quarters nearer the main plant. The walls, ceiling, and partitions were painted with a special mixture designed to absorb ultraviolet light and reduce reflection or flicker from the visible light generated by electric arc welding. A point of source ventilation system will be installed at a later date.

Miscellaneous. Random sampling of the fluorescent light tubes currently in stock and spectographic analyses of their phosphors revealed that some tubes of older vintage which contain beryllium are in stores and at least one shipment received during 1953 contained it.

TABLE E-3
Urinary Contaminants

Contaminant	Number of Analyses Performed	Number of Significant Findings
Alpha Activity	1381	27
Fluorides	679	40
Lead	2	0
Mercury	113	3
Plutonium	12	0
Uranium	1395	184

TABLE E-4
Air-Borne Contaminants

Contaminant	Number of Analyses Performed	Number of Significant Findings
Carbon Monoxide	46	5
Carbon Tetrachloride	3	2
Dust	14	0
Fluorine	130	9
Hydrogen Fluoride	205	6
Hydrogen Chloride	3	0
Mercury	38	1
Methyl Alcohol	1	0
Nickel	143	18
Nitrogen Oxides	8	2
Ozone	3	0
Phosgene	5	0
Trichloroethylene	16	1
Uranium	308	15

2 adsorber which will be installed in these cells. The volume of the unmodified size 2 adsorber was calculated to be 28.42 cubic feet; of the modified size 2 adsorber, 26.15 cubic feet; and of the size 3 adsorber, 10.98 cubic feet.

The calculated volumes of the purge cascade feed and return headers, feed booster station, and tops booster station are given in table H-7.

Volume measurements by nitrogen calibration will be made on the size 2X cooler, the modified size 2 adsorber, the unmodified size 2 adsorber, and the size 3 adsorber to verify volume calculations on these items of equipment.

TABLE H-6
Volumes of Cells 5, 7, 9, 10, 8, 6, and 4 in the K-311-1 Purge Cascade (Cubic Feet)

Pressure Region	Stage Number 1	2	3	4	5	6	Total
Cell 5							
$\bar{P}$	12.17	12.17	12.17	12.17	12.17	12.17	73.02
P_2	2.12	4.12	2.75	4.12	2.75	4.12	19.98
P_5	15.00	15.00	15.00	15.00	15.00	15.00	90.00
P_9	42.98	42.98	42.98	42.98	42.98	42.98	257.88
P_1	3.19	3.19	3.19	3.19	3.19	3.19	19.14
P_4	34.88	8.68	6.70	9.03	6.70	44.41	110.40
Total	110.34	86.14	82.79	86.49	82.79	121.87	570.42
Cells 7 and 9							
$\bar{P}$	12.17	12.17	12.17	12.17	12.17	12.17	73.02
P_2	2.12	4.12	2.75	4.12	2.75	4.12	19.98
P_5	15.00	15.00	15.00	15.00	15.00	15.00	90.00
P_9	42.98	42.98	42.98	42.98	42.98	42.98	257.88
P_1	4.37	3.19	3.19	4.08	3.19	3.19	21.21
P_4	34.88	8.68	6.70	9.03	6.70	44.41	110.40
Total	111.52	86.14	82.79	87.38	82.79	121.87	572.49
Cell 10							
$\bar{P}$	12.17	12.17	12.17	12.17	12.17	12.17	73.02
P_2	2.12	4.12	2.75	4.12	2.75	4.12	19.98
P_5	15.00	15.00	15.00	15.00	15.00	15.00	90.00
P_9	42.98	42.98	42.98	42.98	42.98	42.98	257.88
P_1	5.61	3.19	3.19	4.19	3.19	3.19	22.56
P_4	34.88	8.68	6.70	9.03	6.70	44.41	110.40
Total	112.76	86.14	82.79	87.49	82.79	121.87	573.84
Cells 8, 6, and 4							
$\bar{P}$	12.17	12.17	12.17	12.17	12.17	12.17	73.02
P_2	3.99	4.12	2.75	4.12	2.75	4.12	21.85
P_5	15.00	15.00	15.00	15.00	15.00	15.00	90.00
P_9	42.98	42.98	42.98	42.98	42.98	42.98	257.88
P_1	3.19	3.19	3.19	3.19	3.19	3.19	19.14
P_4	16.74	18.78	18.16	23.81	18.16	46.43	142.08
P_3	-	19.71	19.71	19.71	20.49	37.93	117.55
Total	94.07	115.95	113.96	120.98	114.74	161.82	721.52

TABLE H-7
K-311-1 Purge Cascade Auxiliary System Volumes*

3-Inch Return Line	Volume, Ft.3
From control valve at tops booster station to block valves at cells 7, 9, and 10	43.04

TABLE H-7
K-311-1 Purge Cascade Auxiliary System Volumes*
(Continued)

		Volume, Ft.3
Return Line		
From 3-inch return line to and including 6-inch header in unit by-pass housing		32.47
8-Inch Cell Feed Header		
From feed booster station (cell 1) to control valve at cell 3		65.88
From control valve at cell 3 to cell by-pass lines serving cells 5, 7, and 9		21.28
Feed Booster Station		
East pump:	Suction volume	27.62
	Discharge volume	32.68
West pump:	Suction volume	22.87
	Discharge volume	32.68
10-Inch Feed Line		
From block valve in 10-inch "B" spare header to feed booster station		52.81
8-Inch Return Line		
"B" by-pass line at cell 3 to control valve at feed booster station		12.47
10-Inch Return Line		
"A" by-pass line at cell 3 to 8-inch block valve in 8-inch "A" normal header		75.71
New 12-Inch Feed Line		
From block valve at K-310-1 to and including 10-inch "B" spare header at K-311-1		350.38
New 8-Inch Return Line		
From block valve at K-310-1 to and including 8-inch "A" normal line at K-311-1		191.32
14-Inch Line		
From new block valve at K-311-1 to existing block valve between K-310-3 and K-310-2		145.83
14-Inch Line		
From block valves at the suction side of the tops booster station to and including 8-inch "A" spare header at K-311-1		103.88
New 6-Inch Header		
From suction side of tops booster station to control valve at purge gas metering station		15.00
Tops Booster Station		
North pump:	Suction volume	8.72
	Discharge volume	10.87**
South pump:	Suction volume	8.37
	Discharge volume	40.92

*Volumes shown are bounded by block valves and control valves; block valve volumes are not included.

**Does not include size 2X cooler.

OMIT

K-33 INVENTORY DATA SHEETS

Inventory data sheets were prepared for the K-33 process system. Carbide and Carbon Chemicals Company instrument application drawings and instrument tabulations were utilized in preparing these data sheets.

DISTRIBUTION

1. K-25 Site Records (RC)
2. ~~ChemRisk/Shonka Research Associates~~
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number K-1052 K/EM-307 Date of document 5/3/54

Title and author (if document is unnumbered)

Copy tab pgs only

(This section to be completed by Document Center)

Date request received 10/20/95

Date submitted to ADC 12/19/95

Date submitted to HSA Coordinator 10/20/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 12/19/95 1/22/96

Date received from CICO 1/5/96 2/26/96

Date submitted to ChemRisk/Shonka and DOE 2/26/96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

K/EM-307

SANITIZED VERSION OF EXTRACT FROM K-25 PLANT QUARTERLY REPORT THIRD FISCAL QUARTER JANUARY 1 THRU MARCH 31, 1954

(EXTRACTED FROM SRD DOCUMENT # K-1052)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

December 18, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release
to the public by:
[signature] 2/23/96
[illegible] Information Officer Date
Oak Ridge K-25 Site

SECRET

AEC RESEARCH AND DEVELOPMENT REPORT

K-1052

Cy 10A

[redacted]

[redacted]

ORGDP LIBRARY

JAN 22 3 24 PM '75

K-25 PLANT QUARTERLY REPORT

THIRD FISCAL QUARTER

January 1, thru March 31, 1954

LOAN COPY
TO BE RETURNED TO
PLANT RECORDS K-1034

K-25 PLANT
CARBIDE AND CARBON CHEMICALS COMPANY
A DIVISION OF UNION CARBIDE AND CARBON CORPORATION
OAK RIDGE, TENNESSEE

Acting Under U.S. Government Contract W7405 eng 26

RESTRICTED DATA
This document contains Restricted Data as defined in the Atomic Energy Act of 1954. Unauthorized disclosure subject to Administrative and Criminal Sanctions.

RESTRICTED DATA
This document contains restricted data as defined in the Atomic Energy Act of 1946. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.

[redacted]

SECRET

SECRET

SECRET

~~CONFIDENTIAL~~

REMAINS SRD 12/8/
Sam W. Wohlfort (AR)
REMAINS SRD 2/8/55
Sam W. Hall ADD

This document consists of 232 pages
No. 10 of 81 copies, Series A.

DATE OF ISSUE: May 3, 1954

REPORT NO. K-1052

K-25 PLANT QUARTERLY REPORT
THIRD FISCAL QUARTER
January 1, thru March 31, 1954

E6544

CENTRAL LIBRARY
REC. W40545
F-L
X-REF.
X-REF.

K-25 PLANT
CARBIDE AND CARBON CHEMICALS COMPANY
A DIVISION OF UNION CARBIDE AND CARBON CORPORATION
OAK RIDGE, TENNESSEE

~~RESTRICTED DATA~~
~~This document contains Restricted Data as defined in the Atomic Energy Act of 1954. Unauthorized disclosure subject to Administrative and Criminal Sanctions.~~

RESTRICTED DATA
This document contains restricted data as defined in the Atomic Energy Act of 1946. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.

K 1052 10 A
K 1052 10 A

~~CONFIDENTIAL~~

SECRET

SECRET

3

K-101 Coolant Removal Facility

The K-101 coolant removal facility was in operation for 33 days during this quarter. A total of 1,412 pounds of C-816 coolant was removed from the cascade as compared with 965 pounds removed during the preceding quarter. Table C-7 shows the five periods of operation and the corresponding amounts of coolant removed from the cascade.

TABLE C-7
Coolant Removal Facility Withdrawal Operations

Date On	Date Off	Pounds C-816 Withdrawn
1-10-54	1-13-54	65
1-29-54	2-1-54	27
2-11-54	2-20-54	890
2-27-54	3-2-54	70
3-21-54	3-31-54	360
	Total	1,412

Freon-114 Coolant Leaks to the Cascade

Five Freon-114 coolant leaks to the cascade occurred during the third quarter of fiscal year 1954. Four such inleakages took place during the preceding quarter. Table C-8 presents the rates, total inleakage, dates, and locations of the Freon-114 coolant inleakages.

TABLE C-8
Freon-114 Coolant Inleakages

Date	Rate of Inleakage, pounds/day	Total Inleakage, pounds	Converter Replaced, Location
1-20-54	2	Small	K-502-2.3.1
1-29-54	300	25	K-502-1.9.2
2-17-54	Unknown	5,550	K-502-2.5.1
2-23-54	225	90	K-502-2.9.1
2-27-54	195	500	K-502-1.9.7

Special Withdrawal

On January 7, 100 pounds of process material at an assay of 1.957% was withdrawn from the cascade at cell K-602-4.10. This material was used to supply standard samples to be used at the Paducah plant.

Material Releases

Only one process gas release occurred during this quarter as compared with five such releases during the preceding quarter. Fourteen material releases occurred in vaults 15A, 16A, and 17A when several storage drums corroded.

The process gas release, which was incurred on February 12, incurred the loss of an estimated five pounds of uranium hexafluoride. This was released when the pressure control valve on C bath ruptured. The valve was replaced and no personnel exposures occurred.

Table C-9 summarizes the releases, the locations, and the amounts of both uranium and uranium-235 lost. Also shown is the amount of uranium from the decontamination of cascade equipment.

TABLE C-9
Material Releases

Date	Location	Loss Grams U	Loss Grams U-235
1-5-54	Vault 15A	784	5
2-12-54	K-131	1,534	23
3-8-54	Vault 15A	3,149	21
	Vault 17A	58	3
3-30-54	Vault 17A	400	3
1-1-54 to 3-31-54	Vault 16A*	22,047	184
1-1-54 to 3-31-54	K-1401 Equipment Decontamination	8,325	320
Total		36,297	559

*This consisted of 10 separate releases.

K-305-8 Assay Dilution Test

On March 8, an assay dilution test was conducted in unit K-305-8 in order to determine the actual gas phase inventory. This test was made A comparison of the actual and theoretical inventories is presented in section H of this report.

Cascade Stream Efficiency

The K-25 cascade operated at an on-stream efficiency of 98.96% during this quarter. This was a decrease of 0.41% below that of the preceding quarter. This decrease was almost entirely due to an increase in the stage pump seal failure rate and to an increase in the number of chlorine trifluoride recovery treatments. The on-stream efficiencies during this quarter for buildings K-33, K-31, K-29, and K-25 - 27 were 92.46%, 98.64%, 96.30%, and 99.13%, respectively.

The monthly cascade on-stream efficiencies experienced during fiscal years 1953 and 1954, to date, are shown in figure C-4. The cost of off-stream time, broken down by causes, for the current and preceding quarters is shown in table C-10. Figure C-5 presents a tabulation of the monthly cost of off-stream time for fiscal years 1953 and 1954. During this quarter, the cost of off-stream time for building K-31 was 45.82% of the total off-stream cost while the costs attributed to buildings K-33, K-29, K-27, and K-25 amounted to 1.77%, 33.56%, 8.76%, and 10.09%, respectively, of the total cost. For maintenance required during this quarter, table C-11 summarizes the off-stream time, the per cent of total off-stream time, the number of times off stream, and a comparison with the same items which were incurred during the preceding quarter.

TABLE C-10
Cost of Off-Stream Time

	October 1953	November 1953	December 1953	January 1954	February 1954	March 1954
Pump Seal Repairs	91,787.83	86,073.52	72,885.82	74,787.12	127,922.85	110,053.41
Stage Motor Repairs	9,963.85	11,798.00	3,798.22	5,746.25	9,299.94	6,821.95
Stage Pump Repairs	43,868.80	32,731.31	21,859.18	25,806.39	82,942.04	12,780.33
Converter Replacement	37,184.39	10,480.81	48,614.28	42,727.24	60,806.05	54,156.90
Electrical Equipment Repairs	10,983.92	23,842.04	70.26	7.57	8,712.52	80.35
Light Contaminant Inleakage Checks	13,179.80	14,423.07	10,017.65	20,943.92	17,328.99	15,348.37
Control Valve Repairs	8,590.65	5,216.86	3,700.04	5,886.64	6,420.24	8,503.96
Coolant Inleakage Checks	3,672.83	3,874.01	507.10	1,223.99	1,078.15	1,455.38
Instrumentation Repairs	817.30	1,419.91	60.04	257.01	111.86	943.03
Lube System Repairs	962.48	827.27	69.84	2,065.57	31.80	9.69
Coolant System Repairs	1,098.73	3,222.27	6,203.73	3,950.37	2,002.42	13,367.58
Engineering Tests	6.22	104.12	41,658.54	19.28	1,296.50	4,759.79
ClF_3 Operations	1,937.79	3,889.94	2,010.65	22,103.91	14,191.18	1,607.76
K-27 Improvement Program	7,663.31	12,137.76	28,245.16	3,625.38	6,832.75	15,346.93
Miscellaneous	54,786.27	16,424.52	69,753.73	60,589.75	55,276.19	17,425.61
Coolant Leaks to Cascade	-	293.89	1,450.62	660.18	4,494.94	460.56
Totals	286,504.17	226,736.00	310,904.86	270,400.57	398,748.42	263,121.60

TABLE C-11
Separating Cascade Cell Off-Stream Time

	Off-Stream Time, hours	Per Cent of Total Off-Stream Time	Increase in Off-Stream Time Over Previous Quarter, hours	Number of Times Off Stream	Per Cent of Total Number of Times Off Stream	Increase in No. of Times Off Stream over Previous Quarter
Pump Seal Repairs	3,907.36	26.32	+1,108.03	420	25.83	+75
Stage Motor Repairs	584.04	3.93	+298.06	52	3.20	+7
Stage Pump Repairs	1,394.18	9.39	+603.73	25	1.54	-14
Converter Replacements	1,048.60	7.06	+242.09	39	2.40	+15
Electrical Equipment Repairs	36.70	0.25	-323.22	15	0.92	-192
Light Contaminant Inleakage Checks	589.07	3.97	+292.68	600	36.90	+171
Control Valve Repairs	187.29	1.26	+8.50	71	4.37	+14
Coolant Inleakage Checks	156.66	1.05	-247.64	23	1.41	-3
Instrumentation	17.08	0.12	-51.99	7	0.42	-8
Lube System Repairs	36.24	0.24	+18.60	12	0.74	-1
Coolant System Repairs	527.90	3.55	+94.41	37	2.28	+15
Engineering Tests	700.05	4.71	-571.39	33	2.03	-3
ClF_3 Operations	3,009.27	20.26	+2,897.19	51	3.14	+47
K-27 Improvement Program	844.85	5.69	+386.15	34	2.09	-5
Miscellaneous	1,454.42	9.79	+585.05	193	11.87	+49
Coolant Leak to Cascade	357.47	2.41	+285.21	14	0.86	+11
Totals	14,851.18	100.00	+5,625.46	1,626	100.00	+178

Stream Efficiency This Quarter- - - - - 98.96%
Stream Efficiency Last Quarter- - - - - 99.37%

PURGE CASCADE OPERATIONS

Purge Rates

Units 1 and 3 of section K-312 were in operation as the side and top purge units, respectively, throughout the third quarter of fiscal year 1954. Unit K-312-2 was placed into parallel operation with unit K-312-1 for a few hours during this quarter following large inleakages to the cascade. The amount purged by K-312-2 was insignificant and therefore was not included in the total purge calculations. The auxiliary side purge facility at unit K-302-1 was placed into trial operation on March 21 for about eight hours. The unit was used when an air leak was discovered in the K-33 booster station.

Unit K-312-1 purged an average of 11,496 scf. per day and unit K-312-3 purged an additional 2,643 scf. per day. The total purge rate was 14,139 scf. per day at an average uranium hexafluoride concentration of 45.18×10^{-5} mole per cent. This was an increase of 4.1% above the purge rate experienced during the second quarter of fiscal year 1954. The indicated high uranium hexafluoride concentration in the purge gases is probably in error by a large factor. Relatively large amounts of contaminants in the purge gases, such as were encountered during the quarter, affect the metering instrumentation to the extent that excessive uranium hexafluoride concentrations are falsely indicated. The monthly purge rates for fiscal years 1953 and 1954 are shown in figure C-6. Table C-12 summarizes the average daily purge rates and uranium hexafluoride concentrations for the current and preceding quarters.

TABLE C-12
Cascade Purge Rates

Month	Average Daily Purge Rate, Scf./Day	Uranium Hexafluoride Concentration Mole Per Cent x 10^5	Month	Average Daily Purge Rate, Scf./Day	Uranium Hexafluoride Concentration Mole Per Cent x 10^5
October, 1953	14,008	17.08	January, 1954	13,802	25.50
November, 1953	13,390	9.33	February, 1954	14,174	75.10
December, 1953	13,364	5.32	March, 1954	14,441	33.95

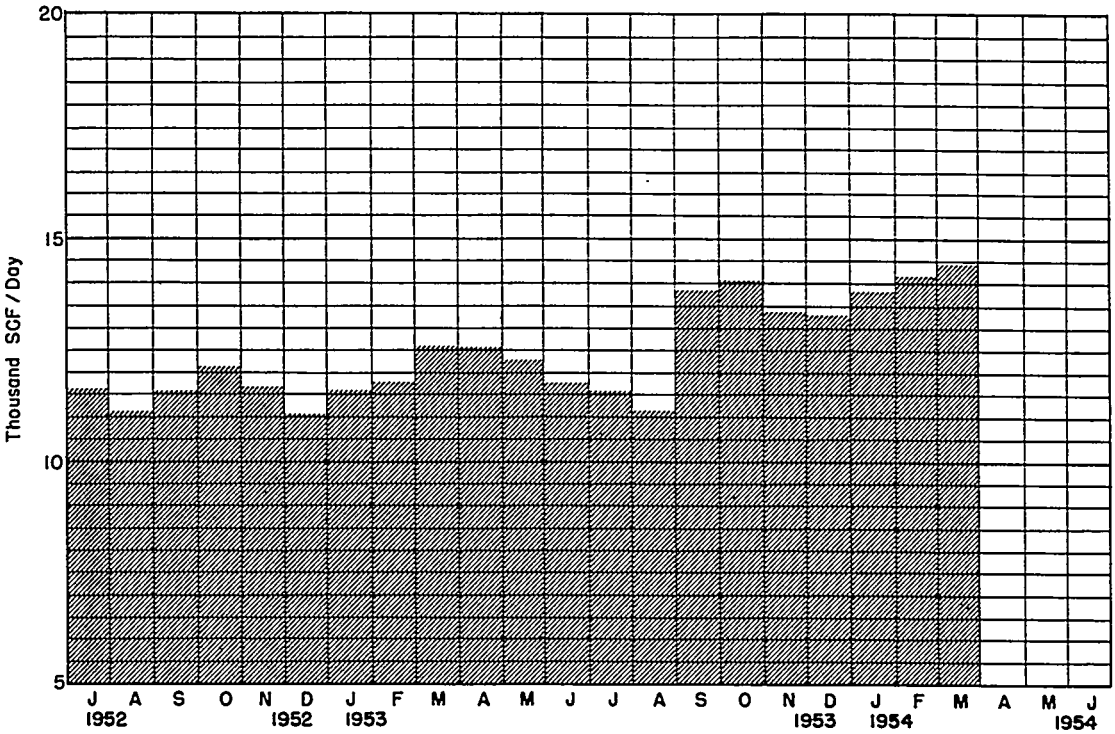


FIGURE C-6
Cascade Purge Rate

BARRIER PERMEABILITY SUMMARY

The rate of barrier permeability change in the K-25 plant remained essentially the same during the third fiscal quarter of 1954 as the rates experienced during the preceding quarter. Increases in permeability were noted in the K-31 building and, to a lesser degree, in the K-29 building, while small decreases were recorded in both the K-25 and K-27 buildings.

Barrier permeabilities in the K-25 building decreased 0.05% per month during the third fiscal quarter as compared to a 0.04% decrease in the preceding quarter. This rate of decrease is slightly higher than the 0.01 ± 0.01% change per month during the preceding two-year period, but is not considered to be significantly different from the long-term rate. The present rate can be considered a normal trend, since chlorine trifluoride treatments and uranium recovery tests conducted in the building during the period had relatively little effect on the barrier permeability. The chlorine trifluoride treatments were effected in only three cells (the average permeability increase was 2.3%). The uranium recovery tests, however, included 41 cells or about 9% of the total installed in the building. The average permeability increase in these cells was about 0.8%.

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number ~~K-1505~~ K/EM-318 Date of document 4/27/62

Title and author (if document is unnumbered)

(This section to be completed by Document Center)

Date request received 10/20/95

Date submitted to ADC 12/19/95

Date submitted to HSA Coordinator 10/20/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 12/19/95 1/22/96

Date received from CICO 1/5/96 2/26/96

Date submitted to ChemRisk/Shonka and DOE 2/26/96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

K/EM-318

SANITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT SECOND FISCAL QUARTER OCTOBER 1 THRU DECEMBER 31, 1961

(EXTRACTED FROM SRD DOCUMENT # K-1505)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

December 18, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release to the public by:

2/23/96

Technical Information Officer Date
Oak Ridge K-25 Site

K-1505

OAK RIDGE GASEOUS DIFFUSION PLANT

QUARTERLY REPORT

[illegible] QUARTER FISCAL YEAR [illegible]

[illegible] thru December [illegible]

UNION CARBIDE NUCLEAR COMPANY

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

UNION CARBIDE

RESTRICTED [illegible] This document [illegible] in the Atomic Energy Act [illegible] its contents [illegible] an unauthorized [illegible] is prohibited.

[illegible]

[redacted]

This document consists of 120 pages

No. 23 of 82 copies, Series A.

DATE OF ISSUE: April 27, 1962

REPORT NO. K-1505

K 1505 23 A

K 1505 23 A

OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT

SECOND QUARTER FISCAL YEAR 1962

October 1, 1961 thru December 31, 1961

UNION CARBIDE NUCLEAR COMPANY

DIVISION OF UNION CARBIDE CORPORATION

Operating

- OAK RIDGE GASEOUS DIFFUSION PLANT
- OAK RIDGE Y-12 PLANT
- OAK RIDGE NATIONAL LABORATORY
- PADUCAH GASEOUS DIFFUSION PLANT

for the Atomic Energy Commission

Under U. S. Government Contract W7405 eng 26

UNION CARBIDE

RESTR[redacted]ED DA[redacted] This do[redacted]ent contains restrict[redacted]ata as de[redacted] in the [redacted]c Energy Act of 1[redacted] Its trans[redacted] or the di[redacted]ure of its contents in[redacted]y manne[redacted]an unautho[redacted] person is prohibited.

3

[redacted]

PURGE CASCADE OPERATIONS

Unit K-312-1 was operated as the cascade top purge facility, and unit K-311-1 was operated as the cascade side purge during the second quarter of fiscal year 1962. The average daily purge rates are presented in table C-13 for the first and second quarters of fiscal year 1962. As shown in this comparison, the top purge rates decreased. The decrease during October was the result of inleakage reductions in the purge cascade; the sharp decrease in November occurred during a three-week period when the determination of calibration curves for the modifications incorporated in the system were being formulated. During December, five cells were removed from service in the top purge cascade for investigative purposes and are reflected in the average rate for that month.

Average purge rates for the current quarter were 16,807 scf per day for the K-311-1 purge facility and 6,249 scf per day for the K-312 unit. The combined purge rate during the quarter averaged 23,056 scf per day, 8.9% below that of the previous quarter.

TABLE C-13

Cascade Purge Rates

First Quarter, FY 1962				Second Quarter, FY 1962			
	Average Rates, Scf/Day				Average Rates, Scf/Day		
	Purge Facilities				Purge Facilities		
Month	Top	Side	Combined	Month	Top	Side	Combined
July	7,191	16,681	23,872	October	7,390	16,319	23,709
August	8,589	17,197	25,786	November	4,861	16,986	21,847
September	8,119	17,599	25,718	December	6,496	17,118	23,614

ELECTRICAL POWER

The ORGDP power station generated at the one-boiler level of operation during the entire second quarter of fiscal year 1962. The total production was 178,460 Mwh or an average generation of 80.8 Mw. The ORGDP power production cost averaged $4.5325 per Mwh as compared to $5.6235 per Mwh in the first quarter of fiscal year 1962. The fuel costs in the second quarter were predominantly coal costs as compared to gas costs in the first quarter. The unit costs, in general, reflect the use of coal as the cheaper fuel.

Electrical energy purchased from TVA totaled 3,501,236 Mwh, for a gross area usage of 3,679,696 Mwh. Of this amount, the Y-12 plant used 177,440 Mwh and ORNL used 24,681 Mwh. A total of 32,706 Mwh was credited to losses, and the net usage of the ORGDP was 3,444,869 Mwh.

The cost of electrical energy purchased from TVA averaged $3.9215 per Mwh which, when combined with the cost of ORGDP-generated power, gave a combined unit cost of $3.9511 per Mwh. The average costs of power distributed through the 1601 account and the 1612 account were $4.0434 per Mwh and $4.0799 per Mwh, respectively. These costs are slightly lower than the corresponding unit costs of $4.0491 per Mwh and $4.0819 per Mwh in the first quarter of fiscal year 1962.

The average power consumption at the ORGDP was 7.43% below that of the first quarter of fiscal year 1962. This decrease was distributed as follows: K-25, 13.12%; K-27, 12.91%; K-29, 6.89%; K-31, 6.06%; and K-33, 6.69%. This reduction in power consumption was occasioned by TVA cancelling 300 Mw of 1951 contract power effective at the end of the day, October 8, 1961, CST. The effect of this cancellation was to lower the TVA contract delivery at Oak Ridge from 1730 Mw to 1580 Mw, and to cancel the 150 Mw of contract power transferred from Oak Ridge to Paducah.

Penetrating Radiation

The plant radiation index of 9.3 represents a decrease of about 38% from the previous period; this is primarily due to reduced activities in the K-1131 feed plant and the K-1410 decontamination facility. The 1961 index of 9.2 represents a slight increase over that of 1960 but it constitutes no particular problem.

Radiation Sources

Routine monthly checks of the plant's 18 radium sources revealed no radon leakage. In addition, the annual inspection of all plant radiation sources used in research, nondestructive testing, and instrumentation revealed no leakage or other radiation safety problems.

Sanitary Water

The beta activity of radioactive contaminants in plant sanitary water, which is taken from the Clinch River, is influenced by the discharge of mixed fission product waste material from another installation upstream. The average for the year continued at the low value of 8.7×10^{-7} μc/cc recorded last year. None of the one-week sampling periods showed peak activity exceeding the long-term maximum permissible concentration; in fact, the 13-week average was only about 2% of the MPC_W specified by the National Committee on Radiation Protection for 40-hour week occupational exposure to the mixture of radio-nuclides involved. Monitoring results are summarized in table E-4 and the beta activity levels in the potable water system are shown graphically in figure E-5.

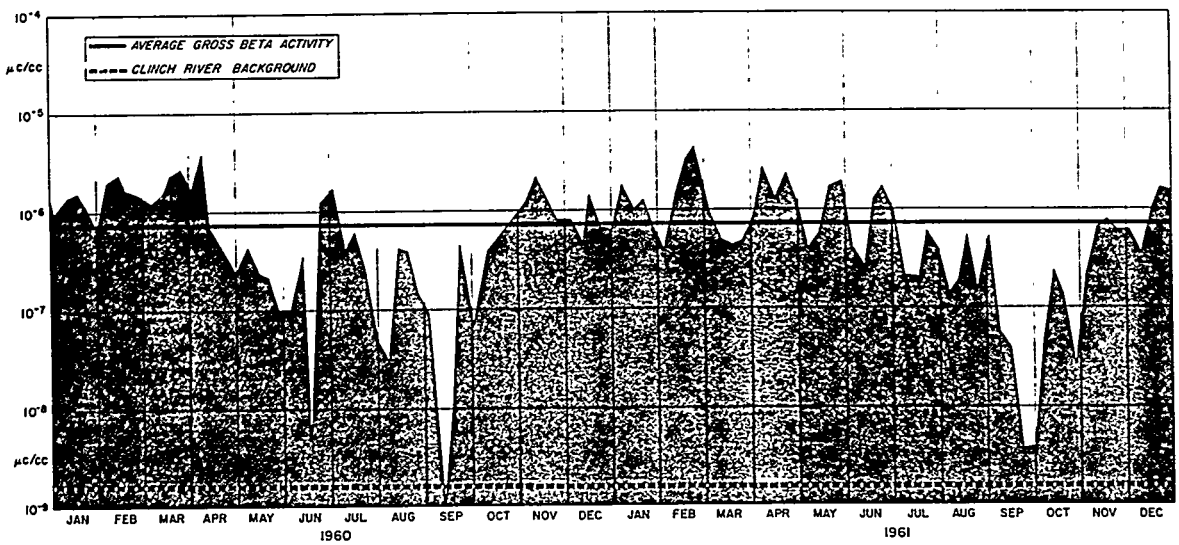


FIGURE E-5

Beta Activity in Plant Sanitary Water

Plant Environment

A total of 387 shift-length air samples were taken at 13 outdoor locations within the plant. The average alpha activity downwind and adjacent to major vent stacks was only 6% of the maximum permissible concentration for a 40-hour week occupational exposure. Averages for locations around the plant perimeter and at 5 locations 5 miles from the center of the plant were about 1% and 12%, respectively, of the appropriate maximum permissible limits.

The results of soil and vegetation samples collected within plant boundaries and at a 5-mile radius from the center of the plant showed average uranium concentrations of 290

ppb. which are not significantly different from background values for this area. At the same time, the gross beta activity of 1.9×10^{-4} μc/gram in vegetation and foliage (pine needles) increased by a factor of about 20, probably attributable to radioactive fallout from nuclear tests.

The average uranium concentration in Poplar Creek above the plant increased slightly this quarter as result of increased contaminants in East Fork which carries effluent from another installation upstream. However, the average quarterly and yearly levels in the Clinch River 1 mile below the plant were slightly less than those previously experienced and only about 0.01% of the maximum permissible concentration for the discharge of natural uranium materials to uncontrolled surface waterways. Stream monitoring results are shown in table E-5.

TABLE E-5

Uranium Concentration in Streams

Sampling Locations	Average Uranium Concentration, μc/cc x 10^{-7}				
	This Quarter	Last Quarter	1961	1960	1956-1960
East Fork at Poplar Creek	1.4	0.55	0.63	0.48	0.46
Poplar Creek at Clinch River	0.11	0.08	0.07	0.05	0.11
Clinch River 1 mile below Plant	0.02	0.03	0.02	0.03	0.03

NUCLEAR SAFETY

Nuclear safety audits of plant equipment and operations this period disclosed 4 deviations from approved equipment usage, and a uranium accumulation in cascade auxiliary equipment was formally reported as a significant noncritical incident. The total of 6 deviations and 3 noncritical incidents for the year remains in line with the low levels of past experience.

ELECTRICAL SAFETY

Electrical Safety Improvements

Electrical safety improvements for the year included replacement of deteriorated power poles and wooden crossarms throughout the plant area; the use of brightly colored single-unit test jumpers by electrical test workers; installation of permanent lighting in a portion of the K-25 cascade cell enclosures; installation of lightning protection on the brick vent stack at K-1403; replacement of the open-type 480-volt switches, fuses, and buses with approved-type enclosed equipment in K-1301; and the installation of emergency stop-button controls for the K-1030 pendant-operated overhead crane. Work on providing a positive ground collector for the pendant-operated overhead cranes in K-1401 and the provision of emergency stop-button controls on power-operated telescoping scaffolds is in progress.

Electrical Safety Audits

Audits of electrical installations associated with new facilities and major alterations of existing facilities indicated general compliance with specifications and code requirements. Audit results are summarized in table E-6.

NUCLEAR MATERIAL CONTROL

INTRODUCTION

The nuclear material control program at the Oak Ridge Gaseous Diffusion Plant is concerned with maintaining accurate measurements of uranium inventories and flows. Efforts toward improving material measurements are made on a continuing basis. The status of various activities concerned with the Civilian Application Program are summarized.

GENERAL STUDIES ON MATERIAL CONTROL

ORGDP CASCADE AUXILIARY EQUIPMENT INVENTORY FORMS

Redesigned cascade auxiliary systems data sheets are being prepared. The primary purpose in the new format is to facilitate the recording of field data and its application to mechanical processing by eliminating intermediate work sheets.

DECONTAMINATION OF PRODUCT CYLINDERS

Approximately once per year, 5 to 10 ORGDP product cylinders (5" I.D.) having larger than average heels are decontaminated at K-1420, utilizing special accountability techniques. The purpose of this decontamination is to ascertain whether the indicated empty weight (as received from Y-12) actually contains the estimated amount of uranium. Ten cylinders were decontaminated during this quarter that contained an estimated 1,331 grams uranium. The net recovery of uranium was 1,552 grams. This is an increase of actual over estimated uranium content of 221 grams and is considered to be in good agreement.

IBM 7090 APPLICATIONS

As of November 1, 1961, the gas phase inventory of all cascade separating equipment as well as the inventory of all cascade auxiliary equipment has been programmed to the IBM 7090 computer. As reported previously, these programs include features such as extending the uranium inventories to uranium-235 inventories through application of the computer interpolated cascade gradient, the calculation of cascade kilogram value units, the preparation of inventory change sheets, and the calculation of the inventory dollar evaluation on a cell basis. Central Data Processing costs for this system of inventory processing are less than $100 per month.

A program has been written and placed in operational use for the preparation of all quality control data except the laboratory control data, presented in this report. This program prepares and plots control charts and associated control limits and computes the student "t" test for differences for all weight, analytical, and sampling control data on a monthly basis. Computer time utilized for processing data in this manner is approximately 2 minutes.

K-1420 VENT LINE SURVEY

A routine inspection survey of the K-1420 vent header (6" I.D.) covering the length of the header from the K-1420 cold trap room to and including the base of the K-1303 vent stack was concluded. The inspection was accomplished by removing the plates from nine inspection ports along the length of the line and removing all material accumulated at these points. The recovered accumulation amounted to 2,098 grams of powder. Sample results (0.5965 g.U/g. and 2.58% uranium-235) indicate the material recovered to be ash from the conversion facility, which indicates that no appreciable amount of material has been vented to the atmosphere by the K-1420 conversion facility since the last inspection was made approximately one year earlier.

TABLE G-1

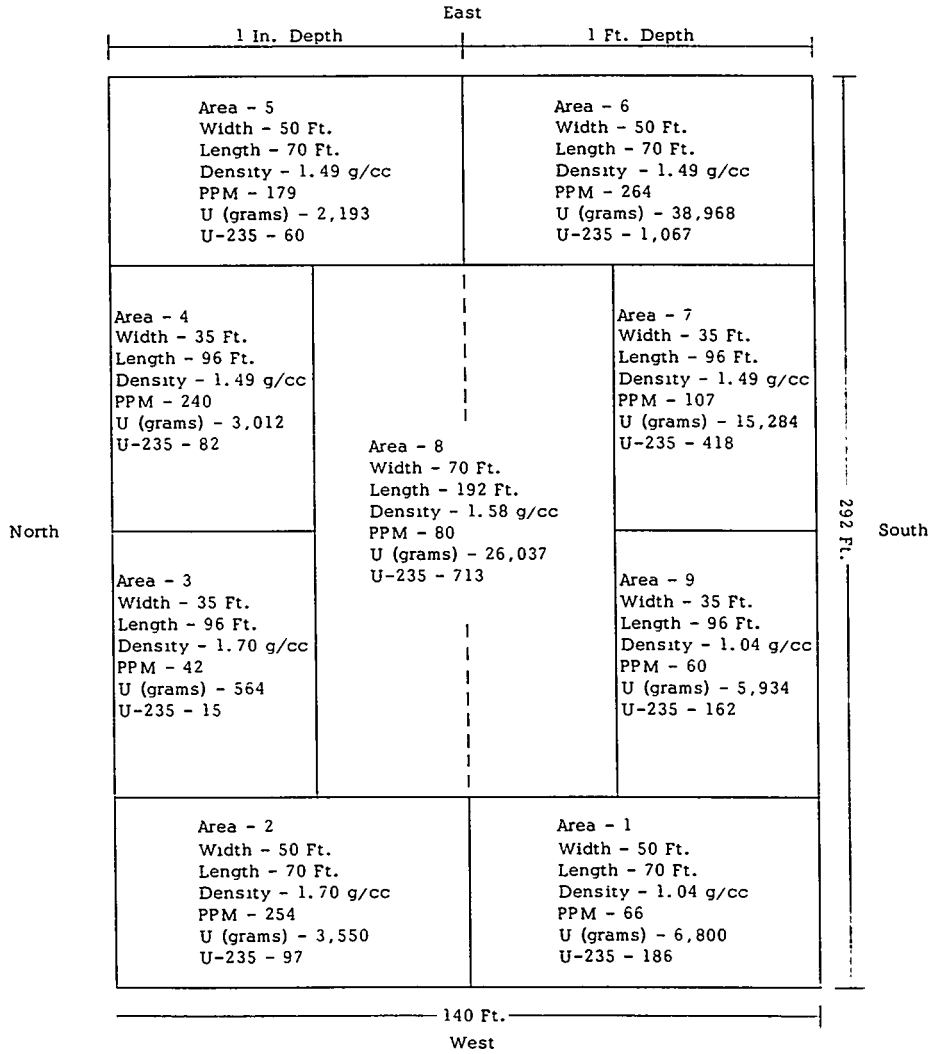
Calculations Summary

Area	Mud Depth (Feet)	Density (g/cc)	Uranium (ppm)	Assay (% U-235)	Uranium (Grams)	Uranium-235 (Grams)
1	1.000	1.04	66	2.737	6,800	186
2	0.083	1.70	254	2.737	3,550	97
3	0.083	1.70	42	2.737	564	15
4	0.083	1.49	240	2.737	3,012	82
5	0.083	1.49	179	2.737	2,193	60
6	1.000	1.49	264	2.737	38,968	1,067
7	1.000	1.49	149	2.737	15,284	418
8	*	1.58	80	2.737	26,037	713
9	1.000	1.04	60	2.737	5,934	162
				Totals	102,342	2,800

*Includes two mud depths of 1.000 and 0.083 feet.

TABLE G-2

K-1405 Holding Pond Survey
October 26, 1961



K-1405 HOLDING POND SURVEY

On October 26, 1961, the Process Control Laboratory resampled the K-1405 holding pond bed for quantitative estimates of uranium contamination. This waste disposal facility had been dredged and most of the contaminated residue removed a few days before these samples were taken. The sampling technique used was to divide the pond into nine areas and take one sample per area. These samples were analyzed in the Process Control Laboratory for uranium content. The samples were then composited and transferred to Uranium Analysis Laboratory for analysis of uranium-235 content.

In the calculations summary presented in table G-1, it may be noted that area 6, which is located in the K-1420 waste residue receiving end, has the highest estimated quantity of contamination and that area 3, which is located on the outlet end, has the lowest estimated quantity of contamination. The current hold-up of uranium in this facility is estimated to be 102,342 grams uranium and 2,800 grams uranium-235. Before dredging, the inventory was estimated to be 254,772 grams of uranium and 5,295 grams of uranium-235. A regional distribution of bed contamination in the holding pond is shown in table G-2.

MATERIAL RELEASES

During the second quarter of fiscal year 1962, material release reports 351 through 355 were issued. These reports covered the release of 212,769 grams uranium and 622 grams uranium-235 as uranium hexafluoride to the atmosphere. Table G-3 presents a breakdown of the releases.

TABLE G-3

Material Releases

Report No.	Date of Release	Location	Balance Area	Equipment Involved	Material Class	Grams Uranium	Grams Uranium-235
351	October, 1961	K-1420	410	Vent Stack	F	20	1
352	October, 1961	K-1131	550	Vent Stack	E	19,363	178
353	November, 1961	K-1420	410	Vent Stack	F	120	8
354	November 13, 1961	K-1413	510	2.5-Ton Cylinder	A	193,203	431
355	December, 1961	K-1420	410	Vent Stack	F	63	4
				Total Released		212,769	622

DECONTAMINATION, RECOVERY, AND CONVERSION - K-1420 OPERATIONS

Decontamination

Converter decontamination in the K-1420 building during the second quarter of fiscal year 1962 amounted to nine, size 000 converters, whose recovery was calculated to be 26,288 grams uranium and 221.16 grams uranium-235.

Recovery

A quantity amounting to 21,949 liters of solution was processed through the K-1420 recovery system during the second quarter of fiscal year 1962, with a removal of 2,080 pounds of uranium as oxide (U_3O_8) from the calciners.

Conversion

The K-1420 conversion facility operated for a total of 216.24 hours. A total of 4,525 pounds of uranium as uranium hexafluoride was produced with a product value of approximately $1,193,100.

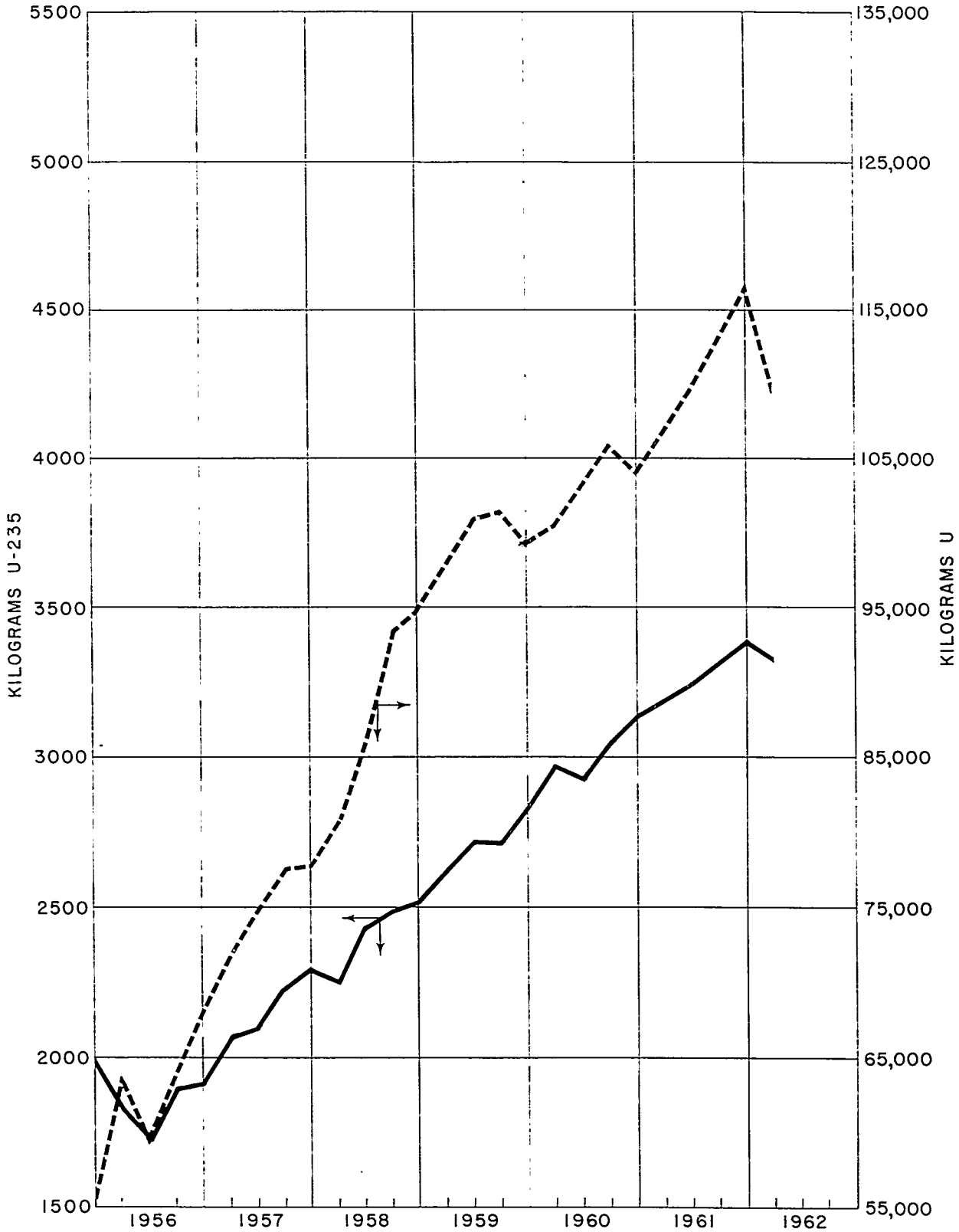


FIGURE G-1

Plant Uranium and U-235 Deficiencies

Cumulative from September 1944

ACCOUNTING EVALUATIONS

CUMULATIVE PLANT ACCOUNTING EFFICIENCY

Estimated quantities of material representing the hidden inventory are shown in table G-4 by categories. The plant accounting efficiency is 99.88% for uranium and 99.78% for uranium-235. This has been determined by dividing the sum of the hidden inventory, the plant quarterly ending inventory, and the shipments by the total plant receipts, and multiplying by 100. Cumulative plant uranium and uranium-235 book-physical inventory differences are shown in figure G-1.

TABLE G-4

Accounting Memorandum

Location of Deposit or Source of B.P.I.D.	Kilograms Uranium	Kilograms Uranium-235
Cascade:		
Inactive Consumption	5,468.3	995.3
Active Chemisorption	665.7	75.2
Physical Adsorption	1,420.9	117.6
Inventory Understatement	958.2	329.3
K-311 and K-312 Sections	17.5	6.2
Inactive Converters	33.2	2.4
K-1405 Holding Pond	102.3	2.8
Uncredited Materials Sent to Hot Salvage on Contaminated Drums	225.0	1.5
Poplar Creek Bed Contamination	6,594.0	53.1
Ground Near Feed Plant	191.0	1.3
Losses by Vent to Atmosphere	6,778.0	47.7
ORGDP-Paducah Interplant Cylinders "Heels" Dilution Before July, 1955	-	179.2
Total	22,454.1	1,811.6

BALANCE AREA ACCOUNTING EVALUATION

Cascade Balance Area

The reported book-physical inventory differences for this balance area for September, October, November, and December are, respectively, 1,144.6 kilograms, -2,314.4 kilograms, -263.7 kilograms, and 92.2 kilograms uranium; and 0.6 kilogram, -67.9 kilograms, 2.9 kilograms, and -19.4 kilograms uranium-235.

During October, power input to the separating cascade was reduced by 150 megawatts. This reduction in power was reflected in reductions in gas phase inventory of 22,300 kilograms uranium and 570 kilograms uranium-235 for this month. Additional significant cascade operating conditions experienced during this report period affecting the material balance of this area were special withdrawal activity amounting to 1,596 kilograms uranium-235 and a net uranium-235 inventory decrease of 1,307 kilograms for the report period. The reported book-physical inventory differences for this area are considered reasonable when assessed with respect to the noted operating conditions.

Feed Manufacture Balance Area

Production of uranium hexafluoride from oxide was initiated in the feed manufacture balance area during October, 1950. From that time through October, 1961, when the

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number ~~K-1903~~ K/EM-361 Date of document 7/7/72

Title and author (if document is unnumbered)

(This section to be completed by Document Center)

Date request received 9-21-95

Date submitted to ADC 12-21-95

Date submitted to HSA Coordinator 9-21-95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 12-21-95, 1-11-96

Date received from CICO 1-8-96 3/5/96

Date submitted to ChemRisk/Shonka and DOE 3/5/96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

K/EM-361

SANITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT THIRD QUARTER FISCAL YEAR 1972

(EXTRACTED FROM CRD DOCUMENT # K-1903)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

December 21, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release to the public by:
RJ Kortman /sgt 3/1/96
Classification Officer Date
Oak Ridge K-25 Site

[redacted]

[redacted]AL

K-1903

28-A

C-52

OAK RIDGE GASEOUS DIFFUSION PLANT
QUARTERLY REPORT
THIRD QUARTER FISCAL YEAR 1972
January 1, 1972 thru March 31, 1972

[redacted]

PROPERTY OF
GRGDP LIBRARY
UNION CARBIDE CORP. NUCLEAR DIV.

UNION CARBIDE CORPORATION
NUCLEAR DIVISION
OAK RIDGE GASEOUS DIFFUSION PLANT

operated for the ATOMIC ENERGY COMMISSION *under* U. S. GOVERNMENT Contract W-7405 eng 26

UNION CARBIDE
OAK RIDGE GASEOUS DIFFUSION PLANT
P. O. Box P
Oak Ridge, Tennessee 37830

[redacted]

-2-

[redacted]

[redacted]

[redacted]L [redacted]

This document consists of 176 pages,
No. 28 of 65 copies, Series A.

K-1903

DATE OF ISSUE: July 7, 1972

K 1903 28 A

K 1903 28 A

CENTRAL LIBRARY
REC. T-17040
FILE
X-REF.
X-REF.

OAK RIDGE GASEOUS DIFFUSION PLANT
QUARTERLY REPORT
THIRD QUARTER FISCAL YEAR 1972
January 1, 1972 thru March 31, 1972

OAK RIDGE GASEOUS DIFFUSION PLANT
Oak Ridge, Tennessee

-3-

RESTR[redacted] DAT[redacted] documen[redacted]ains restricte[redacted] dat[redacted] Atom[redacted] Act of [redacted] Its [redacted] disc[redacted] its [redacted] any [redacted] unautho[redacted]erson [redacted]ed.
GR[redacted] Excluded [redacted] automa[redacted] downgrading and declassification.

[redacted]

for each of the cascade buildings averaged 99.85% for K-33, 99.64% for K-31, and 97.33% for K-29. Hours offstream are summarized in Table C-9.

TABLE C-9

HOURS OFF STREAM

	January	February	March	FY 1972 3rd Qtr.	FY 1972 2nd Qtr.
Compressor Seal	749.97	183.00	42.42	975.39	1015.12
Stage Motor	0	55.58	0	55.58	78.26
Stage Compressor	17.17	38.50	193.46	249.13	269.88
Converter	0	0	0	0	0
Instrumentation	0	21.00	0	21.00	0
Coolant System	0	11.83	4.17	16.00	23.17
Inleakage Checks	0	0.55	0.50	1.05	11.21
Treatment Operation	0	18.67	4.42	23.09	97.02
Power Control	0	0	0.10	0.10	0
Power Interruptions	0	0	0	0	8.00
Plant Test	0	0	0	0	0
Miscellaneous	32.95	24.16	20.66	77.77	453.98
Economic Scheduling	0	0	0	0	95.66
Spares Unavailable	0	0	0	0	0
Total	800.09	353.29	265.73	1419.11	2052.30

PURGE CASCADE

[Keywords: Purge Systems--Control]

The average normal purge rate at K-311-1 during the third quarter was 7,788 scf per day. The highest monthly average during the quarter was in January when 8,452 scf per day was purged. The February and March rates were 7,397 and 7,516, respectively.

Purge Cascade Instrumentation and Control Improvements

[Keywords: Purge Systems]

A $136,000 General Plant Project for instrumentation and control improvements in the purge cascade has been approved by the AEC and final design is progressing. This project will uprate the central graphic panel area to permit more efficient monitoring of the purge process. Eight instrument panels will be installed adjacent to the existing graphic panel on the K-311-1 operating floor. The panel boards for the cells in the K-310-3 unit will contain a total cell motor load ammeter and pressure indication from the stage 3 high-side pressure transmitter. An annunciator panel will be provided to alert the operator to cell motor undercurrent or overcurrent, low coolant pressure,

low seal exhaust pressure, and cell motor power failure. The panel boards for the K-311-1 low-speed cells will contain the above instrumentation plus push-button shutdown switch. In addition to all of the above, the three high-speed cells in K-311-1 will be equipped with individual stage motor ammeters and an alarm on the annunciator to indicate excessive compressor vibration. Vibration detection instrumentation will also be installed on the two high-speed tops boosters. Instrumentation to permit surveillance and control of the B-booster station will be mounted on a separate panel. The total cell motor load for each cell in K-311-1 and lights to indicate the position of all the K-311-1 motor-operated block valves will be slaved into the K-25 Central Control Room. This project, which began during March, should be completed by December 1972.

New Cascade Purge Facility

A committee has been formed to study and make recommendations for a new ORGDP cascade purge facility which is included in the FY 1974 budget. The committee members are:

J. E. Shoemaker, Operations Division, Chairman
W. S. Lenihan, Engineering Division
F. J. Moran, Engineering Division
G. R. Jamieson, Gaseous Diffusion Development Division
Dr. R. L. Ritter, Gaseous Diffusion Development Division
Dr. R. A. Ebel, Operations Analysis and LRP Division

The committee is obtaining cost estimates for several new purge facility options to permit selection of the optimum site for such a facility. Options being cost estimated include the following:

1) A gaseous diffusion purge cascade located in a stand-alone building east of K-29 and patterned after the Paducah C-310 purge cascade.

2) A gaseous diffusion purge cascade located on the site of the standby K-502-3 unit.

3) Conversion of K-402-9 to a purge cascade.

4) Complete renovation of the present K-311-1 purge cascade.

Gaseous diffusion is the only separation method currently being considered for the purge process because it is a proven method. The length of time allotted until construction must begin on the new purge facility does not permit development of an entirely new process.

Dust Control, K-1413

Funds in the amount of $142,000 have been approved for the installation of a new electrostatic precipitator, bag filter house, equipment housing, and dehumidifier for dust collection in K-1413. Completion is scheduled for the end of December, 1972.

Stairwell and Corridors Smoke Detectors, K-1007

Funds in the amount of $10,700 have been approved for the installation of smoke detectors wired to release magnetically held swinging doors at 15 locations in the K-1007 Building.

Purge Cascade Improvements, K-311-1 and K-310-3

Funds in the amount of $136,000 have been approved for upgrading and centralizing the instrumentation for the monitoring and control of the Purge Cascade in K-311-1 and K-310-3. The new instrumentation will provide information at one operating station that will closely define the volume of light gases at the top of the cascade at any given time so that purging operations can be performed smoothly.

Permanent Tails Storage Area

Funds in the amount of $40,000 have been approved for the construction of a permanent tails storage area in the vicinity of K-1066. The area will be paved with asphaltic concrete and two oak saddles will be provided for each cylinder to be stored.

The following jobs have been completed:

Modify K-1421 incinerator; power supply to portals 4 and 7; replace oil circuit breakers, K-633; K-1004-J rest rooms and offices; power supply, auxiliary buildings, ORGDP east; high intensity lighting, K-1401 weld shop; addition to the Cascade Pilot Plant, K-1004-L.

A summary of the major alterations for the ORGDP at the end of the third quarter is presented in Table D-1.

[redacted]

Radiation Sources

No new radiation sources were registered during the period, routine checks of the eight radium sources at the ORGDP revealed no radon leakage, and the annual inspection of all plant radiation sources used in research, non-destructive testing, and instrument calibration revealed no leakages or other radiation safety problems.

Airborne Uranium Alpha Activity

The average total alpha activity levels reflected by the 1,476 routine shift-length samples recorded by the continuous monitoring units in locations where air contamination is suspected remained essentially unchanged and low, representing approximately seven percent of the radiation concentration guide of 10^{-10} μCi/cc uranium in air. The 257 shift-length air samples taken at four outdoor locations around the plant perimeter reflected an average total alpha activity downwind from major stack discharges of approximately three percent of the radiation concentration guide for a forty-hour occupational exposure period. Only about one-tenth of this total alpha activity is contributed by uranium; the major portion is attributed to natural radiation and fallout from previous nuclear weapons testing.

Potable Water Supply

The beta activity of radioactive contaminants in the plant potable water supply, which is taken from the Clinch River, reflects the effect of the discharge of mixed fission product waste material from another installation upstream. Analyses of the Clinch River samples at CRM-14.5 (ORGDP Sanitary Water Treatment Plant raw water intake), performed by ORNL for their control purposes, are also being used by the ORGDP. There was no indication that peak activity during the weekly sampling periods exceeded the long-term radiation protection guide values, and the thirteen-week average in plant potable water supply continues to be less than ten percent of the maximum permissible concentration in water for the mixture of radionuclides involved.

Water Pollutants

The average uranium concentration for the current period in the Clinch River, sampled approximately one mile below the plant and reflecting the contribution of all of the Oak Ridge Operations, remained less than 0.1 percent of the appropriate guide values for discharge of natural uranium materials to uncontrolled surface water bodies.

EMPLOYEE AND LABOR RELATIONS

ARBITRATION

Of the two grievances pending at the end of the second quarter, one, LRG 134-K, was heard on March 17, 1972, by Arbitrator Gerald A. Barrett. No decision has yet been rendered by the arbitrator. LRG 168-K is still pending.

[redacted]

[redacted]

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 Expected receipt of document 1 MONTH

Document number ~~K-1051~~ K/EM-306 Date of document 2/12/54

Title and author (if document is unnumbered)

Copy this pgs only.

(This section to be completed by Document Center)

Date request received 10/20/95

Date submitted to ADC 12/19/95

Date submitted to HSA Coordinator 10/20/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 12/19/95 1/22/96

Date received from CICO 1/5/96 2/26/96

Date submitted to ChemRisk/Shonka and DOE 2/26/96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

K/EM-306

SANITIZED VERSION OF EXTRACT FROM K-25 PLANT QUARTERLY REPORT SECOND FISCAL QUARTER OCTOBER 1 THRU DECEMBER 31, 1953

(EXTRACTED FROM SRD DOCUMENT # K-1051)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

December 18, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release to the public by:

[illegible] 2/23/96
[illegible] Information Officer Date
Oak Ridge K-25 Site

SECRET

K-1051

Cy 22A

~~CONFIDENTIAL~~

AEC RESEARCH AND DEVELOPMENT REPORT

PROPERTY OF
ORGDP LIBRARY

JAN 22 3 2 PM '75

~~SECRET~~

K-25 PLANT QUARTERLY REPORT

SECOND FISCAL QUARTER

October 1, thru December 31, 1953

K-25 PLANT
CARBIDE AND CARBON CHEMICALS COMPANY
A DIVISION OF UNION CARBIDE AND CARBON CORPORATION
OAK RIDGE, TENNESSEE

Acting Under U.S. Government Contract W7405 eng-26

~~RESTRICTED DATA~~
~~This document contains Restricted Data as defined in the Atomic Energy Act of 1946. Unauthorized disclosure subject to Administrative and Criminal Sanctions.~~

~~RESTRICTED DATA~~
~~This document contains restricted data as defined in the Atomic Energy Act of 1946. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.~~

~~SECRET~~

SECRET

SECRET

~~CONFIDENTIAL~~

~~SECRET~~

~~REMAINS SRD: 12/8/53~~
~~Sam W. Wohlfort (AR)~~
~~REMAINS SRD 12/8/53~~
~~Gary W. Hall AD~~

This document consists of 220 pages
No. [illegible] of 77 copies, Series A.

DATE OF ISSUE: February 12, 1954

REPORT NO. K-1051

~~E-83722~~

PLANT RECORDS DEPT.
CENTRAL FILES
REC. F-12382
FILE
X-REF.
X-REF.

K-25 PLANT QUARTERLY REPORT

SECOND FISCAL QUARTER

October 1, thru December 31, 1953

CENTRAL LIBRARY
REC. W40544
FILE
X-REF.
X-REF.

K-25 PLANT
CARBIDE AND CARBON CHEMICALS COMPANY
A DIVISION OF UNION CARBIDE AND CARBON CORPORATION
OAK RIDGE, TENNESSEE

~~RESTRICTED DATA~~
~~This document contains Restricted Data as defined in the Atomic Energy Act of 1946. Unauthorized disclosure subject to Administrative and Criminal Sanctions.~~

RESTRICTED DATA
This document contains restricted data as defined in the Atomic Energy Act of 1946. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.

K 1051 22 A
K 1051 22 A

~~SECRET~~

~~SECRET~~

3

On October 30, fifty pounds of uranium hexafluoride was released to the atmosphere at the K-1131 feed manufacturing plant. This was caused by a deficiency of refrigerant in the secondary cold traps. The traps became warm, allowing uranium hexafluoride to vaporize and escape to the atmosphere through the vent system.

A release took place in Building K-1131 on December 19 when a gasket failed in a uranium hexafluoride drain line. Ten pounds of uranium hexafluoride was released to the atmosphere. Another uranium hexafluoride release took place in Building K-1131 on December 22. Seven pounds of uranium hexafluoride was lost when the pressure in the fluorine scrubber increased due to a restriction in the outlet lines. The material was released to the atmosphere at the feed hopper.

The last release which occurred during this quarter took place on December 29 in Building K-101. A sight glass broke and about ten pounds of uranium hexafluoride escaped to the tower housing. The sight glass was immediately valved off and replaced. Subsequently, the uranium hexafluoride in the tower housing was evaluated via alumina traps. Table C-8 shows the dates, location, and amounts of uranium and uranium-235 lost in conjunction with each process gas release. Also shown are the amounts of material lost in Vaults 15A and 16A and in Building K-1401 during converter decontamination.

TABLE C-8
Material Releases

Date	Location	Loss	
		Grams U	Grams U-235
10-23	K-312-3	51	0.3
10-30	K-1131	15,335	102.7
12-19	K-1131	3,067	21.9
12-22	K-1131	2,147	15.0
12-29	K-101	3,067	662.5
10-1 to 12-31	Vault 15A	3,288	22.0
10-1 to 12-31	Vault 16A	7,339	61.4
10-1 to 12-31	K-1401 Equipment Decontamination	1,330	27.8
Total		35,624	913.6

Cascade Stream Efficiency

The K-25 cascade operated at an onstream efficiency of 99.37% during this quarter. This was an increase of 0.17% above that of the preceding quarter. The onstream efficiencies during this quarter were 98.56%, 97.62%, and 99.54% for Buildings K-31, K-29, and K-25-27, respectively.

The monthly cascade onstream efficiencies experienced during fiscal years 1953 and 1954, to date, are shown in figure C-3. The cost of offstream time, broken down by causes, for the current and preceding quarters is shown in table C-10. Figure C-4 presents a tabulation of the monthly cost of offstream time for fiscal years 1953 and 1954. During this quarter, the cost of offstream time for Building K-31 was 56.03% of the total offstream cost while the costs attributed to Buildings K-29 and K-27 amounted to 26.19% and 14.53%, respectively, of the total cost. For maintenance required this quarter, table C-9 summarizes the offstream time, the per cent of the total offstream time, the number of times offstream, and a comparison with the same items which were incurred during the preceding quarter.

corresponding change was noted in the average film badge reading which increased from 30 mrep./wk. to 45 mrep./wk. Although the greatly increased maintenance activities in contaminated areas offered increased potential exposure hazards, the effectiveness of radiation exposure control in the current year is indicated in that only 32 over-P.A.L. exposures were reported as compared to the 96 for 1952. The personnel-exposure potential and the actual personnel exposure as indicated by film badge readings are shown in figure E-6.

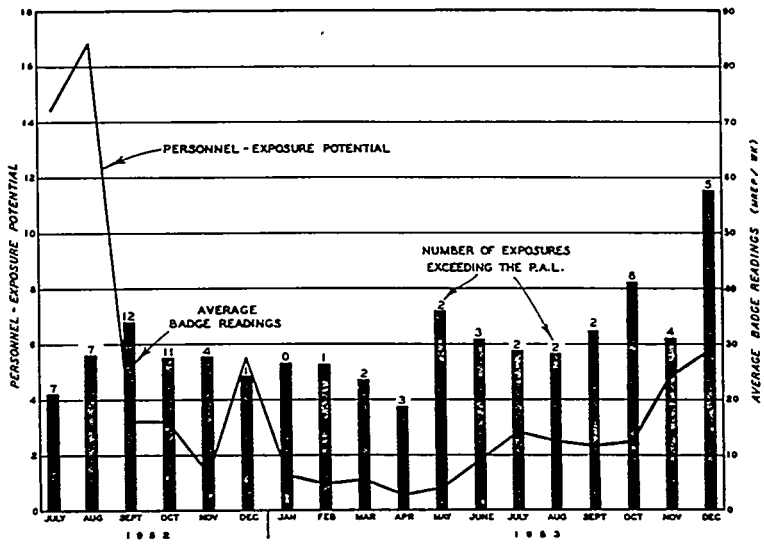


FIGURE E-6
The Average of the Maximum Penetrating Radiation Intensities and the Average Film Badge Reading in 6 Selected Locations

Air Activity Levels. The average air-borne alpha contamination of 10 locations where shift-length air samples are routinely taken increased from 0.09 counts/min./ft.^{3} to 0.17 counts/min./ft.^{3}. Thirty-three, or 1.6% of the 2,023 samples taken exceeded the P.A.L. of 1 count/min./ft.^{3}, the corresponding value for the previous quarter being 0.79%. The increase is due primarily to the handling operations involving the powdered ash in the K-1131 Feed Manufacture Building and to associated operations in the K-1231 Equipment Dismantling Building.

Although the average 1953 alpha air activity of 0.098 counts/min./ft.^{3} was relatively unchanged from the 1952 average of 0.089 counts/min./ft.^{3}, the percentage of samples in excess of 1 count/min./ft.^{3} decreased from 1.47% of those taken in 1952 to 0.99% during 1953, primarily as a result of changes in equipment design and the removal of certain plant equipment from operation. The average air activity and the percentage of long-term air samples in excess of the P.A.L. are shown in figure E-7.

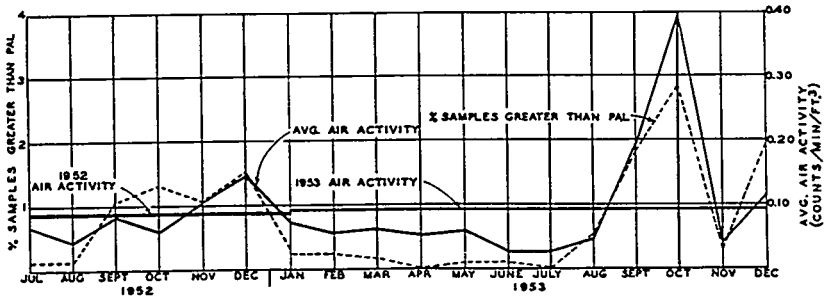


FIGURE E-7
Plant Air Activity - Long Term Air Samples
(Plant Acceptable Limit (P.A.L.) -1 Count/Min/Ft.^{3})

Water and Stream Bottom Survey Program. The average beta activity in the treated sanitary water supply rose to 32 dis./min./100 ml. Although this is considerably higher than the 7 dis./min./100 ml. of the previous quarter, it is not considered to represent a health hazard. This increase is attributed to the uncontrolled releases of excessive quantities of fissionable material to the Clinch River from an installation upstream from K-25 as a result of the overflow of the storage lake, and the lack of normal dilution caused by the low Clinch River flow resulting from limited rainfall. The beta activity for the K-25 sanitary water supply is shown in figure E-8. The annual average of 35 dis./min./100 ml. indicates a continuing upward trend when compared to the 1952 average of 22 dis./min./100 ml. and the 1951 average of 6.0 dis./min./100 ml. The 1953 peak activity of 251 dis./min./100 ml. is also above the corresponding 1952 and 1951 peaks of 138 dis./min./100 ml. and 56 dis./min./100 ml.

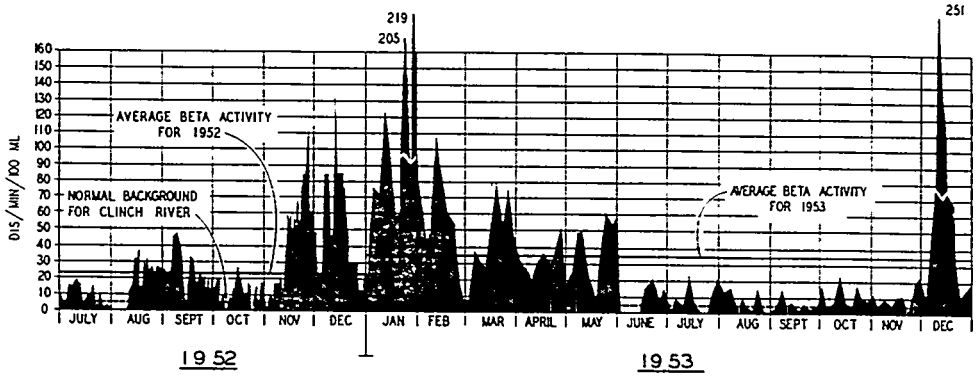


FIGURE E-8
β Activity in K-25 Sanitary Water

The average uranium concentration in the Clinch River bottom mud remained low and relatively unchanged, being 0.75 during this year as compared to 0.53 ppm. during 1952; however, the average concentration of uranium in the Poplar Creek mud increased from a level of 7 ppm. to an average concentration in 1953 of 59 ppm. A primary contribution to this increase was the gain in concentration this quarter to 121 ppm. from the previous 43 ppm.; this build-up is attributed to poor silt movement as a result of light rainfall and low stream level. This situation is considered temporary and not of significant hazard.

SIGNIFICANT PLANT LOCATIONS OF HAZARDOUS MATERIALS

Figure E-9 shows the principal locations of some of the more hazardous materials at K-25 and also indicates the average extent and intensity of radioactive surface contamination in the plant.

INDUSTRIAL HYGIENE

There was no basic change in the industrial hygiene program during the quarter.

The operation and maintenance of the Feed Plant continued to contribute the greatest number of positive urine and air findings. This area was responsible for 72% of the positive urinary uranium, 85% of the urinary fluoride, and 65% of the urinary alpha activity findings during the quarter. Eighty-five per cent of the positive air analyses for uranium and 57% of those for fluorine came from there also.

Equipment for additional ventilation to prevent high trichloroethylene concentrations in the central cleaning area has been ordered.

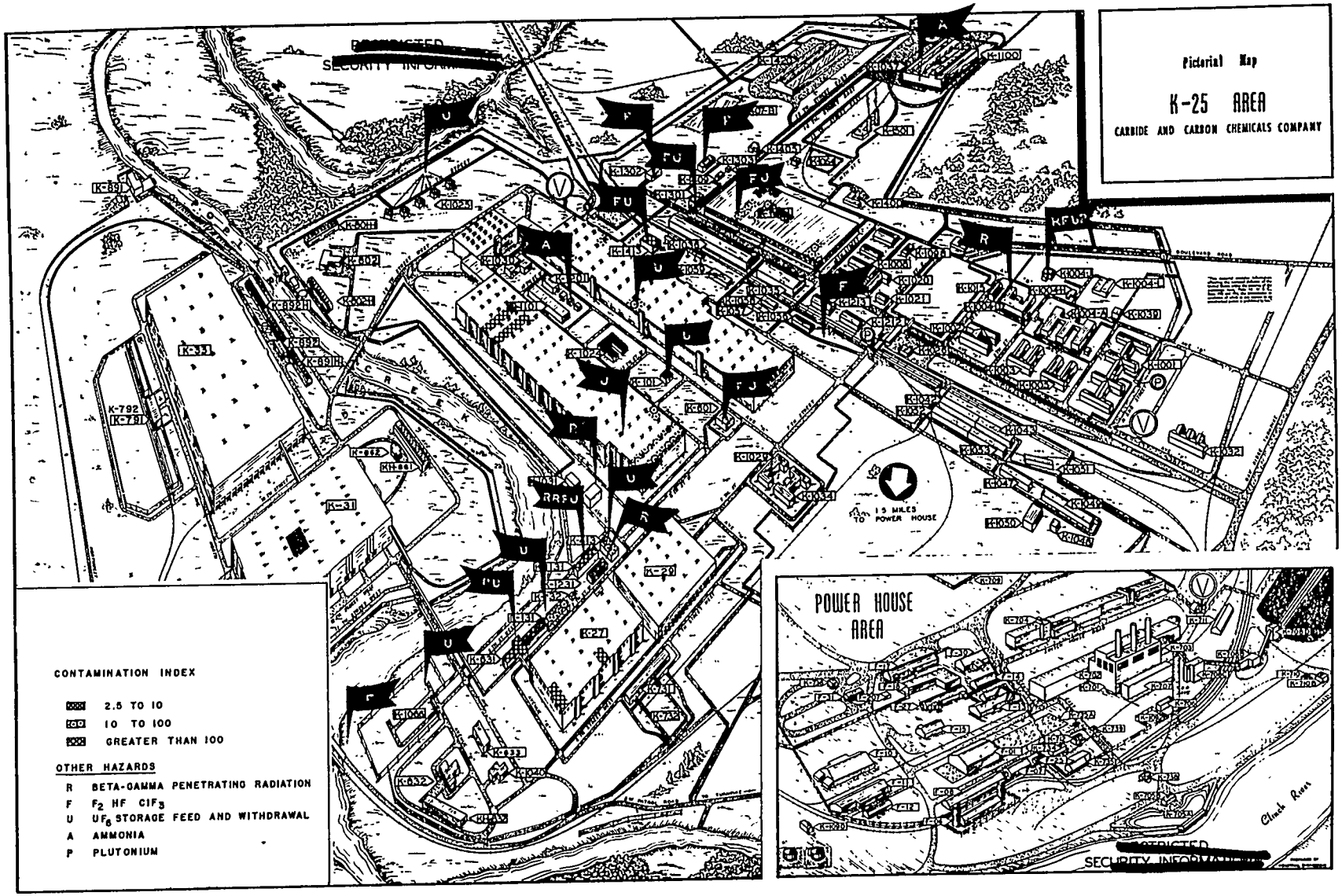


FIGURE E-9
Significant Location of Radioactive and Toxic Hazards

The one above-background radon determination made on the breath of an employee last quarter has been followed by 2 subsequent determinations which gave progressively lower results. A final determination is planned for the near future.

As a means of determining whether employees were showing beta activity, which could be present in the sanitary water supply, composite specimens, contributed on-the-job by a control group, were analyzed and the results were not significantly different from background.

Ventilation controls have been rearranged in the garage to prevent high concentrations of carbon monoxide.

Final reports on the special air analyses made in conjunction with the melting of contaminated barrier materials support the initial conviction that extensive ventilation will be required.

TABLE E-2
Urinary Contaminants

Contaminant	Maximum Allowable Concentrations	Total Number of Analyses	Positive Findings IND.	Positive Findings VMR
Alpha Activity	10 c./min./100 ml. Recalled if above 3 c./min./100 ml.	1280	24	2
Fluoride	4 mg./liter. Recalled if 2.0 mg./liter	631	21	0
Lead	0.10 mg./liter.	2	0	0
Mercury	0.10 mg./liter.	107	2	0
Plutonium	3.5 c./min./24 hr. specimen	133	0	0
Uranium	Not determined. Recalled if 0.005 mg./liter	1287	181	9

IND. Urine specimens submitted in scheduled Industrial Health Examinations.
VMR. Urine specimens submitted following suspected material releases or absorption.

TABLE E-3
Air-Borne Contaminants

Contaminant	Maximum Allowable Concentrations	Total No. of Analyses	Positive Findings
Dust	15 mg./m.^{3}	6	0
Fluorine	1 ppm.	62	14
Hydrogen Fluoride	3 ppm.	78	4
Hydrogen Chloride	5 ppm.	2	2
Mercury	0.10 mg./m.^{3}	36	1
Nickel	0.5 mg./m.^{3}	39	7
Phosgene	1 ppm.	1	0
Trichlorethylene	200 ppm.	4	1
Uranium	0.15 mg./m.^{3}	199	56

EMERGENCY PLANNING ACTIVITIES

PLANNING

Due to plant expansion, the Emergency Snow Equipment Plan was revised in order to facilitate the movement of both emergency equipment and normal traffic.

Preliminary studies were made of mass evacuation of personnel from the plant in case such evacuation is required, and possible locations were investigated for emergency equipment collection as well as for personnel assembly and dispersal points.

EVACUATION DRILLS AND EMERGENCY RESPONSES

During the quarter, 35 local and 6 plant-wide emergency drills were conducted, the latter including

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

2539

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

TIMOTHY BENNETT / 1034A

Requestor — Document Center (is requested to provide the following document)

Date of request 10/12/95 — Expected receipt of document 1 MONTH

Document number ~~K-961~~ K/EM-360 — Date of document 8/6/53

Title and author (if document is unnumbered) Pp. C11, C14, E5, E6, E7, and E8)

(This section to be completed by Document Center)

Date request received 9-21-95

Date submitted to ADC 12-21-95

Date submitted to HSA Coordinator 9-21-95

(This section to be completed by HSA Coordinator)

Date submitted to CICO 12-21-95, 1-11-96

Date received from CICO 1-8-96, 3/5/96

Date submitted to ChemRisk/Shonka and DOE 3/5/96

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

K/EM-360

SANITIZED VERSION OF EXTRACT FROM K-25 PLANT QUARTERLY REPORT FOURTH FISCAL QUARTER APRIL 1 THRU JUNE 30, 1953

(EXTRACTED FROM CRD DOCUMENT # K-961)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

December 21, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

This document has been approved for release to the public by:
[illegible] 3/1/96
Technical Information Officer
Oak Ridge K-25 Site

[redacted]

[redacted]

[redacted]

53-6567

This document consists of 222 pages
No. 17 of 74 copies, Series A.

DATE OF ISSUE: August 6, 1953 **REPORT NO.** K-961

K-25 PLANT QUARTERLY REPORT

FOURTH FISCAL QUARTER

April 1, thru June 30, 1953

[redacted]

CENTRAL LIBRARY
REC. 40481
FILE
X-REF.
X-REF.

K-25 PLANT
CARBIDE AND CARBON CHEMICALS COMPANY
A DIVISION OF UNION CARBIDE AND CARBON CORPORATION
OAK RIDGE, TENNESSEE

K 961 47 A

K 961 47 A

[redacted]

[redacted]

[redacted]

Freon-114 Coolant Leaks to the Cascade

During this quarter, six Freon-114 coolant leaks to the cascade were discovered and eliminated. This was three leaks less than were incurred during the preceding quarter, and the total Freon-114 on the cascade decreased approximately 70%. Table C-7 outlines the Freon-114 leakages to the cascade which were encountered this quarter.

TABLE C-7
Freon-114 Coolant Inleakages

Date	Rate of Inleakage, pounds per day	Total Inleakage, pounds	Converter Replaced, Location
April 10	1,500	150	K-502-1.1.6
May 6	41	8	K-502-1.9.4
May 18	13	3	K-502-3.9.4
May 28	10	2	K-502-3.8.1
June 11	80	13	K-502-1.3.7
June 12	58	5	K-502-1.8.7
Total		181	

Material Releases

On April 15, approximately 5 pounds of uranium hexafluoride was released to the atmosphere at Building K-631. The release resulted from a load bearing failure on the high-speed centrifugal compressor, requiring replacement of the compressor.

A second material release was incurred in Building K-631 on May 1 in the lower carbon trap room. A blank-off plate was blown from a line which tied the vent surge system to the condenser vent line. The feed and condensation operations were temporarily discontinued to stop the release. About 50 pounds of uranium hexafluoride were released.

On May 25, two cylinders containing uranium hexafluoride were being heated in the K-413 water bath prior to transfer of the contents to a larger cylinder. One of the cylinders began rising in the bath and the operators immediately left the room. The cylinder exploded and the entire contents (123 pounds of uranium hexafluoride) were released to the atmosphere. The entire building was contaminated and two operators were sent to the dispensary as a precautionary measure.

The last major process gas release during this quarter occurred in Building K-1131 on June 1. A cylinder containing Hanford tails material was being sampled when the packing gland nut on the valve broke and 952 pounds of uranium hexafluoride were released, 75 pounds of which were recovered by decontamination. A process gas "fog" blanketed Buildings K-1029 and K-1034 and evacuation of all personnel in these buildings was effected. Several personnel were sent to the dispensary to determine whether excess exposure resulted.

A summary of the material releases which occurred during this quarter is shown in table C-8. The table includes material lost during converter and compressor decontamination at Building K-1401.

TABLE C-8
Material Releases

Date	Location	Loss: Grams U	Loss: Grams U235
April 15	K-631	1,534	10
May 1	K-631	15,336	100
May 25	K-413	37,849	269
June 1	K-1131	269,143	1,790
April 1 to June 30	Equipment Decontamination	12,630	262
Total		336,492	2,431

PURGE CASCADE OPERATIONS

Purge Rates

Units 1 and 3 of Section K-312 operated as the side and top purge units, respectively, during the fourth quarter of fiscal year 1953. Unit 2 of Section K-312 was not placed into operation during this quarter.

Unit 1 purged an average of 10,051 scf per day and Unit 3 purged an additional 2,129 scf per day. The total daily purge rate was 12,180 scf per day at an average uranium hexafluoride concentration of 58.72 x 10^{-5} mol per cent. This was an increase in the purge rate of 1.63% above that of the preceding quarter. The monthly purge rates and uranium hexafluoride concentrations for this quarter and the preceding quarter are presented in table C-11.

TABLE C-11
Total Purge Rate

Month	Average Purge Rate, scf/day	Uranium Hexafluoride Concentration, Mol Per Cent x 105
January, 1953	11,584	20.02
February	11,782	30.61
March	12,589	149.33
April	12,542	70.75
May	12,293	68.31
June	11,706	37.11

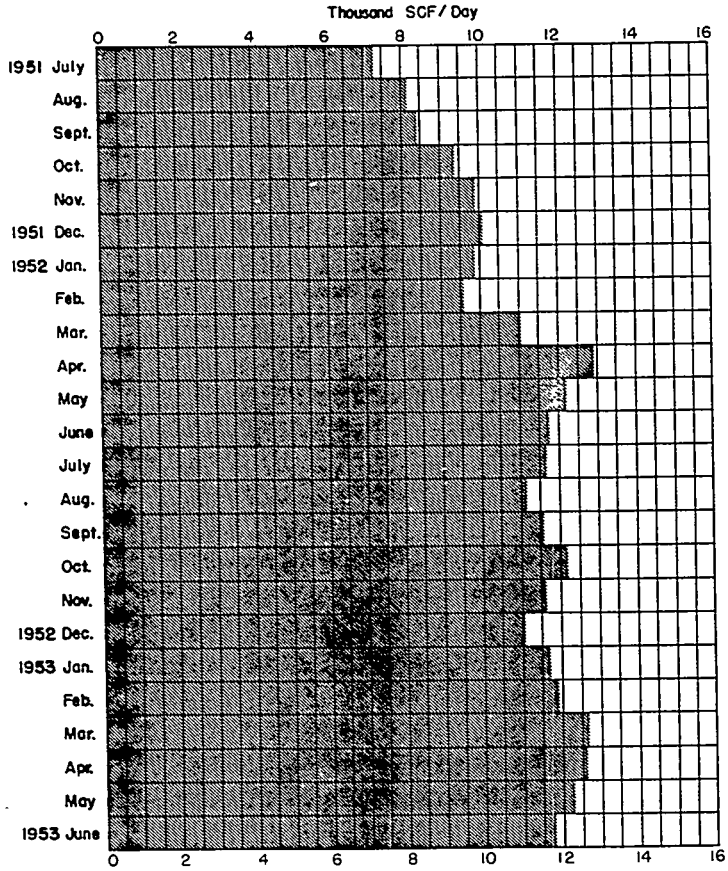


FIGURE C-5
Cascade Purge Rate

Special Hazards

Two significant incidents were formally reviewed, one involving the use of water for extinguishing cold trap fires and the second concerning a UF_6 condensation in cascade piping during a transfer operation.

Health Physics

Alpha Contamination. The alpha contamination problem in the plant as reflected by surveys of the 30 locations having major contamination problems continued to increase, the average area and hazard indices* being 47 and 560, respectively, as compared with the corresponding previous values of 46 and 388. This increase is attributed primarily to a build-up of radioactive materials from normal operations in the K-1131 Feed Manufacture Building and in the K-631 Disposal Building, to the use of the UO_3 drying unit in the K-1413 Design and Development Building, and to a release of material following an explosion in the K-413 Building. The upward trend in contamination for plant locations having major contamination problems is shown in figure E-2, where both the area index* and the hazard index* are indicated.

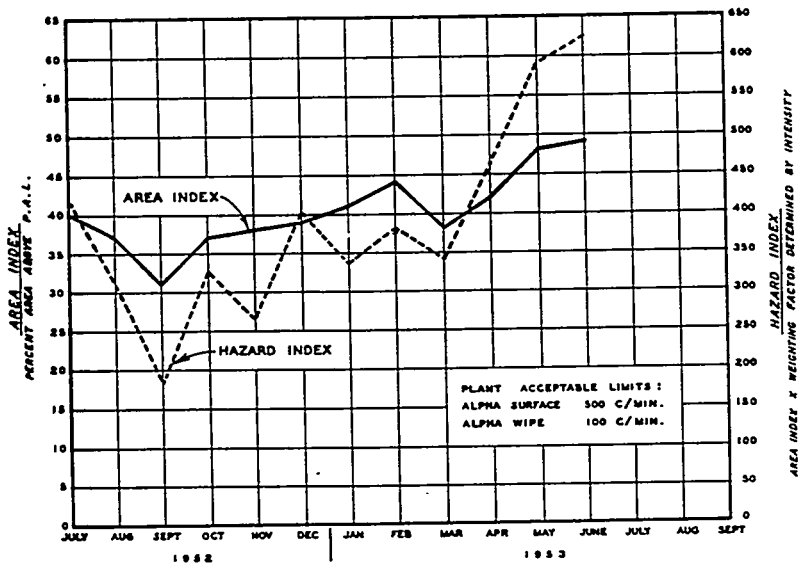


FIGURE E-2

Penetrating Radiation Levels. Only slight changes were noted in the penetrating radiation levels this quarter; the personnel-exposure potential** decreased slightly from 1.13 to 1.04, whereas the average film badge reading increased slightly from 25 mrep/wk. to 28 mrep/wk. The increased exposure as well as the larger number of over-P.A.L. badges reported under Accident and Injury Experience were attributed partly to a larger number of maintenance jobs on K-1131 Feed Plant equipment containing beta-gamma emitting materials.

The personnel-exposure potential and the actual personnel exposure as indicated by film badge readings are shown in figure E-3.

---

*The alpha contamination hazard index is a figure which reflects the product of the extent and the intensity of contamination exceeding the P.A.L.; the alpha contamination area index is essentially the fraction of the area which is contaminated in excess of the P.A.L. and thus reflects the extent of contamination only.

**The personnel-exposure potential is a figure reflecting the average radiation dose rate in the highest level locations and the number of personnel assigned to those locations.

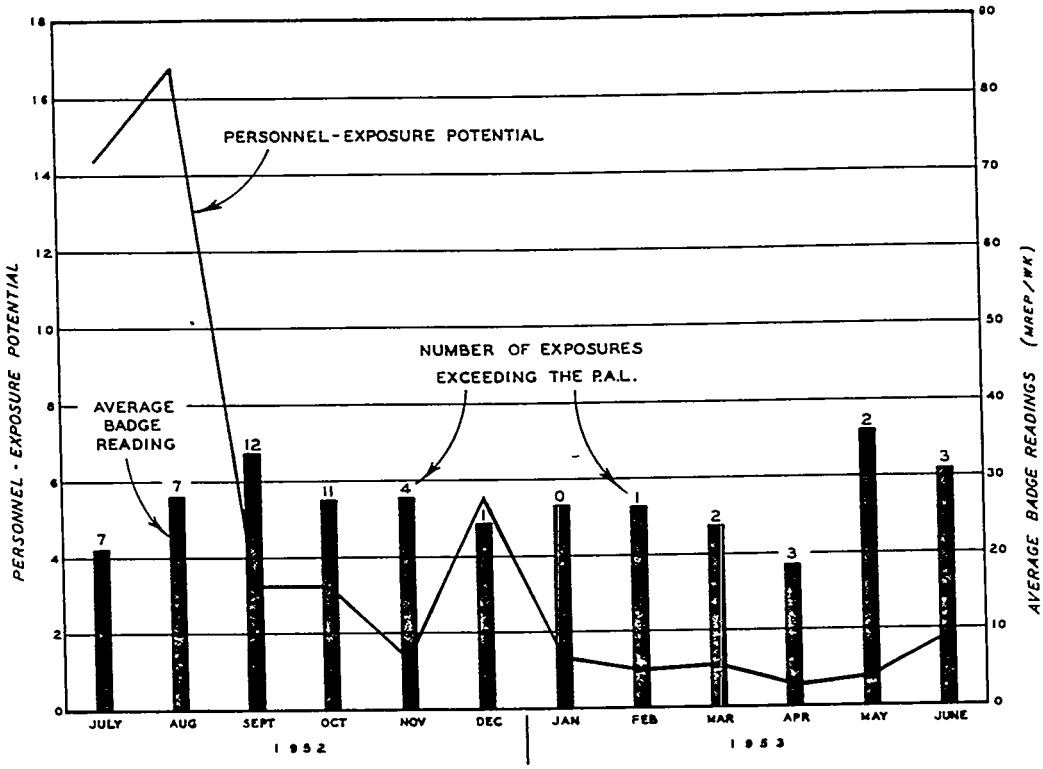


FIGURE E-3
The Average of the Maximum Penetrating Radiation Intensities and the Average Film Badge Reading in 5 Selected Locations

Air Activity Levels. The average air activity in the 9 locations where shift-length air samples are routinely taken decreased from 0.07 counts/min./ft.^{3} to 0.05 counts/min./ft.^{3}. Only 2, or 0.11%, of the 1,772 samples taken exceeded the P.A.L., the corresponding fraction last quarter being 0.29%. This decrease is attributed to the drop in levels of the K-1410 Decontamination Building resulting from improved operational methods for handling the K-1131 ash receivers.

Water and Stream Bottom Survey Program. The average beta activity in the treated sanitary water supply was 26 dis./min./100 ml. during this period as compared to 73 dis./min./100 ml. reported last quarter. The peak activity reached during May, 62 dis./min./100 ml., is considerably lower than the peak of 219 dis./min./100 ml. reported last period. The decrease is due to the reduced quantity of fission products released to the Clinch River from the storage lake of another installation upstream and to the lower beta activity found in that lake.

The average uranium concentration in Poplar Creek mud increased from 27 ppm. to 48 ppm. during this period. This concentration is attributed to the washing of floor areas in the plant and, although the increase gives a result significantly above recent plant experience, it is not considered to present an immediate health problem. The concentration in the Clinch River water remained unchanged at about 0.70 ppm.

INDUSTRIAL HYGIENE

The number of employees included in the industrial hygiene urinalysis program continued to increase although the total number of analyses reported decreased 7%, with a 16% decrease in the urinary uranium determinations alone. This latter figure was largely influenced by the increased effort on

the part of line supervision to reduce the number of employees with repetitious positive uranium findings and the beginning of the vacation season.

There was a further increase in the positive urinary uranium findings traceable to the Feed Plant. Seventy-one per cent of all positive findings was the result of employment in the Feed Plant or its supplemental operations. All the employees selected from a large group involved in a major gaseous release, which drifted from the Feed Plant into other work areas, showed temporary urinary uranium.

Three gaseous material releases in different areas of the plant involved personnel employed within the plant area by another contractor. These employees are not included in the routine industrial hygiene program but when examined following these exposures showed low level urinary uranium.

The urinary plutonium program for the maintenance and operating personnel in the Feed Plant has been enlarged, in keeping with evidence of the presence of plutonium in ash accumulations in the equipment.

Failure to note the change in the physical dimensions of a work area resulted in the serious overexposure of 2 employees to carbon monoxide.

New pieces of equipment acquired for use in work area evaluation are a smoke sampler and an oscillating thermal precipitator.

Special projects and investigations worked on during the quarter were: (1) Isolation of the source of the irritating fumes from the lapmasters in the seal shop. (2) Ventilation of the axial flow compressor maintenance pits. (3) Improvement of the ventilation of the central cleaning area degreasers. (4) Ventilation and collection of dusts and fumes from the scrap barrier grinding and melting operations. (5) Further development of the solvent cleaning of electric motors without service interruption as well as those removed from their mounts.

The composite findings of the industrial hygiene program are presented in tables E-2 and E-3.

TABLE E-2
Urinary Contaminants

Contaminant	Maximum Allowable Concentrations	Total No. of Analyses	Positive Findings IND.	Positive Findings VMR.
Alpha Activity	10 c./min./100 ml. Recalled if above 3 c./min./100 ml.	1,453	18	20
Fluorides	4 mg./liter. Recalled if 2.0 mg./liter.	912	17	6
Lead	0.10 mg./liter	15	0	0
Mercury	0.10 mg./liter	158	2	0
Plutonium	3.5 c./min./24-hr. specimen.	163	3*	0
Uranium	Not determined. Recalled if above 0.005 mg./liter.	1,491	232	60

*These specimens exceeded 0.7 c./min./24-hr. specimen.

IND. Urine specimens submitted in scheduled Industrial Health Examination.
VMR. Urine specimens submitted following suspected material releases or absorption.

TABLE E-3
Air-Borne Contaminants
(Continued)

Contaminant	Maximum Allowable Concentrations	Total No. of Analyses	Positive Findings
Dusts (non-silica)	15 mg./m.^{3}	2	0
Fluorine	1 ppm.	31	12
Hydrogen Chloride	5 ppm.	2	0
Hydrogen Fluoride	3 ppm.	19	6
Mercury	0.10 mg./m.^{3}	50	6
Lead	0.15 mg./m.^{3}	3	0
Nickel	0.5 mg./m.^{3}	23	13
Nickel Carbonyl	1.0 ppm.	1	0
Trichloroethylene	200 ppm.	7	4
Uranium	0.15 mg./m.^{3}	58	4

*Decafluorobis Cyclohexane.

EMERGENCY PLANNING ACTIVITIES

The 7 surprise plant-wide emergency drills conducted during the quarter included problems involving an explosion, 2 critical reactions, 2 power failures, and 2 chlorine releases. In addition, 29 local emergency drills, as conducted by shift personnel, consisted of 6 toxic gas releases, 3 rescue and first aid problems, 12 fire drills, and 8 simulated operational failures.

These emergency drills were designed to include problems that could occur at any time in the plant and which require area evacuation, communications and security control, personnel rescue and treatment, and operational difficulties. The plant continues to show improvement in the planning, staging, and handling of these emergencies.

In connection with the emergency assistance policy, K-25 fire equipment made 9 practice runs to Y-12 to determine the running time between plants and to familiarize personnel with the routes and portals. Aid in combatting a warehouse fire was given Y-12 on one occasion.

Fire fighting equipment responded to 50 alarms and 36 drills, and the emergency truck responded to 2 alarms and 21 drills.

Air blast horns have been installed and placed in service in the K-29 and K-31 buildings for evacuation purposes.

Two hose houses equipped with sufficient hose and spray nozzles were installed in the vicinity of K-1131 for controlling possible releases of certain toxic gases.

PLANT SECURITY

SECURITY PRACTICES

Clearances

Security clearances were obtained for 275 prospective K-25 employees while 545 such clearances were pending at the end of this period. Similarly, 544 clearances were obtained for subcontractor and vendor personnel with 1,056 pending.

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room