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JK Lamb / K-25 1034A

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Date of issue: July 25, 1947

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No. 6 of 20 copies, Series A.

Report No: A-4734

CARBIDE AND CARBON CHEMICALS CORPORATION

URANIUM CONTROL AND INSPECTION DEPARTMENT

PROGRESS REPORT ON URANIUM CONTROL AT K-25

FOR JUNE, 1947

Carbide and Carbon Chemicals Corporation Operating Contractor for the U.S. Atomic Energy Commission.

G. T. E. Sheldon
R. W. Levin

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CARBIDE AND CARBON CHEMICALS CORPORATION

URANIUM CONTROL AND INSPECTION DEPARTMENT

TO: S. C. Barnett

DATE: July 25, 1947

PROGRESS REPORT ON URANIUM CONTROL AT K-25

FOR JUNE, 1947

ACCOUNTABILITY SECTION - A. de la Garsa

A report was issued on the comparison of waste X-assay determinations from 8-aliquot drain line samples and from shaken liquid waste drums. The report stated that 8-aliquot drain line samples were not satisfactory for accounting purposes. The test was continued; the drain line samples were increased to 12 aliquots per drum. Initial results indicate that 12-aliquot drain line samples will be satisfactory for waste X-assay determination and that shaking of liquid waste drums may be discontinued.

The report on the effect of a small building datum change on building inventory was issued. The report stated that datum pressure changes as small as 0.005 psi. are reflected in motor load changes, and therefore in inventory changes.

The datum problem led to the consideration of better instrument primary pressure standards, of better instrument field test wagons, and of a possible design change on the building datum system. These considerations are now under urgent study.

In conjunction with the Process Engineering Department, plans were made to conduct a plant-wide instrument drift test. It was decided to use power loads as criteria for pressure drift. The test is pending receipt of the new instrument field test wagons.

A report on the variation of top product chemical analysis was issued. The report stated the need of more representative top product sampling and suggested the installation of a sampling manifold similar to the sampling manifold now installed on the cascade feed lines. The problem is under study; the design has been undertaken.

In preparation for operation of the C-816 stripping unit in the K-101 Section, studies have been made of the material accounting problems presented by the operation of the unit.

General

Routine quality control on stream weights continues. Sampling for chemical analysis of cascade feed and waste continues on a routine basis. No trouble was encountered with either the feed or waste sampling manifolds.

The required A.E.C. material accounting reports were issued.

Work on accounting problems in contaminated material continues.

A preliminary design of a sampler to be used in conjunction with the carbon-alumina separating equipment at K-1410 was made by F. Mills. The problem was turned over to the Design Section of Engineering Development for final design and working drawings.

Diversion Control

K-1300 Area

It was necessary to provide escorts for visitors to the 1300 Section on the 1, 2, 3 and 24 days of June. On these days an average of 100 visitors a day entered the 1300 Section gates. On normal days about 150 visitors have occasion to enter this area. The plans for the emergency crash door from the conversion room to the corridor were returned to Engineering by Mr. Preuss for revision on June 30th.

Plant II

By July 1 all the fish bowl offices on the "soft flooring" in Plant II had been removed. The stairways leading to the pipe galleries in the RR and SS areas had been secured.

Reprints of the Reader's Digest article on the Canadian Spy Trials have not yet been obtained. No reprints are available, however an attempt is being made to secure copies.

CONSUMPTION SECTION - C. P. Coughlen

I. Furnace Stand Experiment B-238

Purpose: To test feasability of thermal ppt. of TO_2F_2 from air-PG mixture.

A. 20% mixture of PG - 80% air was charged into a can. The can was heated to 350° F and evacuated slowly thru a Cold Trap. PG was

then transferred back into the can. The process was repeated 5 times. The Cold Trap was then evacuated and weighed to determine any TO_2F_2 pickup. There was no weight gain beyond the scale precision.

B. Experiment was more carefully repeated and trap weight gain was four grams. The Cold Trap H_2O wash analysed 4.4 grams of T.

II. One #2 AC Blower dismantled and analysed

Results in grams:

	T_4	T_6
Impeller	.41	1.06
Back plate	1.52	1.21
Casing		4.65

III. The report on the surface consumption in the K-312 section has been completed and will be issued shortly.

IV. Can Test of PG - O_2 Reaction

Data on 2, 4, and 6 weeks have been received.

The data suggest a steady increase with time in TO_2F_2 formation within the cans.

CODED CHEMICALS - F. H. Anderson

Material Handling Unit

Routine transfers of feed, product, and waste were made during the month. The sampling of the contaminated materials was continued.

More desirable storage locations were sought for high assay material storage. A location at Y-12 was rejected because it offered no advantages over the K-25 locations. However to improve K-25 existing facilities, an engineering study was requested to devise a signal device to report unauthorized approach to these locations.

The large gasket used on product cylinders heretofore has been made from poly T F E. This gasket has not been holding up too well, probably due to the extreme temperature variations to which it is subjected after installation. As a result each gasket is used but one time, and the gasket expense is high.

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A study was initiated to secure other types of gasket material. P-10 appears to be promising and is being tested further. Other types of gasket materials are being secured.

Preparations were made to receive a large shipment of 2500000 per cent oxide material. Much of this material is to be shipped in metal containers supplied by K-25.

Most of the miscellaneous enriched materials which have accumulated for several months have been turned over for feeding to the cascade.

Accounting Unit

The section of the monthly accountability report put out by this section was issued two days earlier than the month previous, and in addition contained substantially more information.

A study was made of the Y-12 uranium accounting system to ascertain whether any part of it would improve the system at K-25. Recommendations are to be made after further investigation.

Laboratory Coordination Unit

A total of 475 assay results were received and applied. Calculations using them were made and checked.

G. T. E. Sheldon

R. W. Levin

RWL/ljh

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Date of issue: August 22, 1947

AEC RESEARCH AND DEVELOPMENT REPORT
This document consists of 8 Pages.
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Report No. A-4760

Carbide and Carbon Chemicals Corporation Operating Contractor for the U.S. Atomic Energy Commission.

CARBIDE AND CARBON CHEMICALS CORPORATION

URANIUM CONTROL AND INSPECTION DEPARTMENT

PROGRESS REPORT ON URANIUM CONTROL AT K-25

FOR JULY, 1947

G. T. E. Sheldon
R. W. Levin

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CARBIDE AND CARBON CHEMICALS CORPORATION

URANIUM CONTROL AND INSPECTION DEPARTMENT

TO: S. C. Barnett DATE: August 22, 1947

PROGRESS REPORT ON URANIUM CONTROL AT K-25

FOR JULY, 1947

ACCOUNTABILITY SECTION - A. de la Garza

Four new suppressed range instrument test wagons have been placed in operation. These test wagons are specifically for building datum calibrations.

Work on the primary pressure standard continued. The shop work was completed during July; it is expected to have the standard in use by the end of August. The standard has a precision of $\pm$ 0.001 psi.

The instrument drift test was not started due to the new test wagons not being in operation until the end of the month.

It was shown that 12 - aliquot drain line samples were satisfactory for waste X-assay determination. Shaking of liquid waste drums was discontinued.

Procedures and data sheets for taking inventory of the C-816 stripping unit in the K-101 Section were finished.

Extensive design calculations were made on the product sampling manifold for determining product T-analysis. These calculations indicated the use of orifices of about 13 thousandths of an inch diameter. Fearing excessive maintenance due to orifice plugging, it was decided to investigate the possibility of a "spot" sampler that takes a small instantaneous sample per two product cylinders. This "spot" sampler does not require orifices or capillaries, and therefore appears favorable from this viewpoint. However, due to sample bomb inleakage, it may be necessary to intermittently pump down the sample bomb; tests are planned to determine whether pumping on an L-28 immersed product cylinder will remove any of the frozen-out cylinder contents.

A check on the active gaseous inventory of the cascade was developed; the check makes use of power bus loads. Good agreement between the inventory difference calculated by operating instruments and that calculated from bus loads has been obtained.

Cascade feed charges and waste production are being checked by comparing Coded Chemicals' figures with those from on-line and off-line cylinder weights from K-131 and K-631 log sheets. Considering that these two sources are independent (different scales and operators), remarkable agreement has been shown.

It was shown that the present precision of a monthly T-balance, based on the official monthly inventories, is about ± 200 kg. T. This shows the need of more T-inventories to better determine the loss rate for the month and to gain insight into causes of balance variability. A program is planned.

General

Routine quality control of stream weights continues.

Routine sampling for chemical analysis of cascade waste and feed and X-assay of cascade waste continues.

Work on accounting problems in contaminated material continues.

The work of assembling the required AEC material accounting reports has been discontinued. Coded Chemicals will in the future be responsible for this work. J. Foster of this section will continue to give the assembled reports a final check.

Sources of Uncertainty in X-Balance

Table I gives the known sources of uncertainty in the X-balance and the current limit of error and contributing yearly variance for each source. The following discussion is in order:

1. Consumption:

   No current limit of error is given for this source of uncertainty. At present it is not known whether original estimates of consumption are applicable to current operating conditions. Needless to say, effective use of material balances for control is not possible without better knowledge of consumption. At present, lack of a consumption figure probably sets a lower limit of ± 50 kg. X to the yearly balance; therefore, consumption remains by far the most important quantity to be evaluated.

2. Cascade Streams:

A. T-Analysis:

Laboratory and sampling contributions (precision and bias) to uncertainty in the T-analysis of the cascade streams have either met the set target or are tolerable. No large uncertainty results from these measurements. With the exception of product sampling and analysis, good control of these measurements is in effect.

B. X-Assay:

With the exception of the value of normal material assay, laboratory and sampling contributions (precision and bias) to uncertainty in the X-assay of the cascade streams have either met the target or are tolerable. Good control of these measurements is in effect.

At present it is thought that the normal material assay may be in error by 1% of its value. This error sets a lower limit of $\pm$ 12 kg. X to the yearly balance.

C. Weights:

Weighing contributions (precisions and bias) to uncertainty in the weights of the cascade streams have met the set target. No large uncertainty results from these measurements. Good control of these measurements is in effect.

3. Change of Cascade Inventory:

A. Control Valves:

The precision of control valves is satisfactory for the balance.

B. Heavy Contaminant (C-816):

The removal of the C-816 from the cascade will in the future lessen the importance of this variable. Underestimating C-816 inventory by 200 lbs. over a year will result in a balance uncertainty of less than $\pm$ 2 kg. X, since the bulk of the C-816 inventory was in the lower plant section.

C. Light Contaminant (Nitrogen and Oxygen):

The precision of the light contaminant is presently thought to be tolerable.

D. Pressures:

Investigations on the effect of pressures on the yearly balance are still in progress. This much may be said now: the variability of the building datum is still excessive; it sets a precision of

about $\leq$ 6 kg. X to the monthly balance, and more to the yearly balance.

An important factor under investigation is the possibility of a stage pressure drift over the entire cascade. A stage pressure drift may introduce a very large error, probably of the order of the consumption error.

E. Temperature:

The effect of temperature measurements is of no importance to the yearly balance.

F. Assay:

Employing the present method of comparision to standards, the effect of the X-gradient on the yearly balance is tolerable.

Remarks:

The above notes on "change of cascade inventory" variables are limited to little or no change of cascade X-inventory over the year's period. If there is a large change of X-inventory, comparable to the 41010001 to 21130003 change, biases in the variables become of importance - in particular those in the size factors, contaminants, pressures, and gradient assays.

DIVERSION CONTROL:

Most of the activities concerning diversion control for July were of a routine nature.

1. A check test was conducted to determine how efficiently the system of passes in Plant II was functioning. Three men were sent into Plant II to record the number of times they were asked for their badges or passes. All three men succeeded in walking about the plant freely without being stopped. One man even removed his badge and carried it in his pocket. This work was done on one shift only. Additional tests will be made on all shifts, and will be reviewed with all concerned.

2. Progress was made in standardizing the size of sample containers to be used in sending samples to the laboratory. It was decided to standardize on the following types:

   A. Small Mouth Glass Bottles
      2 quart
      1 quart
      $\frac{1}{2}$ pint

B. Glass Ointment Jars (Screw Cap)
16 ounce
8 ounce
1 ounce

C. Metal Containers
Ni. product cylinders
Ni. Harshaw Bomb (5 lbs.)
Hoke tubes
PSI. tubes
Quick opening sample cylinder

D. Plastic Bottles
400 ml.

3. In the K-1300 Section, it was necessary to provide escorts for visitors to the area from 8:00 a.m., July 1, until 8:00 a.m., July 30. An average of 100 visitors per day entered the area during this period.

The crash door was installed in the K-1301 Building during the month of July.

CONSUMPTION SECTION - C. P. Coughlen

I. Work is still in progress on the thermal precipitation of TO_2F_2 from air-PG mixture. No further results are ready to be reported. Peculiar pressure results continue to be evidenced with L-28 traps.

II. The remaining four AC blowers were washed for consumption measurements and the samples are in the laboratory for analysis.

III. Two #1 size converters, A-104 and 78, were torn down and the samples are in the laboratory for analysis.

IV. Can test of O_2 - PG reaction

Additional analytical data on eight and ten week exposures are available. The data indicate the formation of UO_2F_2.

V. Cell test program:

Completion dates for the various phases of the cell test program have been set. By September 1, the final design of a satisfactory cold trap and manifold system is to be made, and data necessary to prove the efficiency of the traps and the adequacy of trapping techniques is to be secured. By October 1, plans for the entire program should be completed and preliminary runs in size 4 finished. By December 1, all data on cells are to be secured.

CODED CHEMICALS - F. H. Anderson

Material Handling Unit

The study to improve the gaskets used on product cylinders indicated that a soft metal type would be substantially cheaper if satisfactory for use. Aluminum ring type gaskets prepared by another group, are now under test.

Product cylinder length had previously been reduced by removing a false bottom. Spacers used to hold these cylinders in place in the shipping containers have now been shortened correspondingly, with the result that the dry ice requirement has been reduced about 50%.

Laboratory Coordination Unit

Analyses and assay results were obtained and applied in the usual manner.

Accounting Section

A study was made to improve the system for presenting transfer information to the accounting section. The Y-12 system was examined and considerable data obtained.

The portion of the monthly accountability report issued by this section was done earlier this month than last.

G. T. E. Sheldon

R. W. Levin

RWL/hp

SOURCES OF UNCERTAINTY IN X-BALANCE

August 1, 1947

Consumption	Source	Measurement		Error	Current ± Limit of Error	Current Sampling Schedule	Annual Variance $Kg.^2$ X Current: 2500	Annual Variance $Kg.^2$ X Target: 22.4
Cascade Streams	T-Analysis	Laboratory Contribution	Feed	Precision	0.12%	1 S./6000 lbs. TF_6	0.02	0.02
				Bias	0.03		0.50	0.50
			Waste	Precision	0.12	1 S./4500 lbs. TF_6	0.01	0.01
				Bias	0.03		0.25	0.25
			Product	Precision	0.42	1 S./weekly ship.	0.12	0.01
				Bias	0.20		1.40	0.15
		Sampling Contribution	Feed	Precision	< 0.25	1 S./6000 lbs. TF_6	< 0.08	0.08
			Waste	Precision	< 0.25	1 S./4500 lbs. TF_6	< 0.03	0.03
			Product	Precision	< 0.70	1 S./weekly ship.	< 0.35	0.01
				Bias	0.50		2.00	0.15
	X-Assay	Laboratory Contribution	Feed	Bias	1.00		35.00	1.10
			Waste/Feed	Precision	0.05	1 S./4500 lbs. TF_6 for mo. comp.	0.06	0.06
				Bias	0.05		0.80	0.80
			Product	Precision	0.10	1 S./2 cyl.	0.00	0.01
				Bias	0.20		1.40	1.40
		Sampling Contribution	Waste	Precision	0.30	1 S./4500 lbs. TF_6 for mo. comp.	0.06	0.06
				Bias	0.05		0.80	0.80
			Product	Precision	0.20	1 S./2 cyl.	0.00	0.00
	Weights		Feed	Precision	2 lb/day		0.01	0.01
			Feed-Waste	Bias	1 lb/day		0.15	0.15
			Waste	Precision	2 lb/day		0.00	0.00
				Bias	2 lb/day		0.06	0.07
			Product	Precision	1 g/cyl.		0.00	0.00
				Bias	½ g/cyl.		0.30	0.30
Change of Cascade Inventory	Operational Factors		Control Valves	Precision	2.5 units		0.06	0.06
			Heavy Contaminant	Precision	15%		0.06	0.06
			Light Contaminant	Precision	20%		0.35	0.35
			Datum Pressure	Precision	0.03 psi.		9.00	0.20
			Stage Pressure	Precision	0.02 psi.		0.04	0.04
			Temperature	Precision	2%		0.00	0.00
			Assay	Precision	0.75%		0.20	0.20

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