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INTER-COMPANY CORRESPONDENCE

(INSERT NAME) COMPANY CARBIDE AND CARBON CHEMICALS CORP. LOCATION Post Office Box P OAK RIDGE, TENN.

KZ-

TO Mr. J. L. Waters
LOCATION K-303-7

DATE January 29, 1947

ANSWERING LETTER DATE

ATTENTION

COPY TO Messrs. F. H. Anderson
A. de la Garza
R. W. Levin
G. T. E. Sheldon

File

SUBJECT Recovery And Disposal of Radioactive Material in Plant Waste

REPORT NO. KZ 3700

We have received the request for "Figures on the amounts of different types of waste already reworked, the amounts and disposition of the residue produced in the recovery operation". The same request asks for the program in progress and the status of the work as well as a tabulated list of known amounts of radioactive material now stored at this plant.

This report is confined strictly to "T" contaminated materials and their products and does not include other radioactive materials or equipment which might have or has had "T" bearing materials on it. In reference to the amounts and disposition of the reworked material Tables 1 and 2 are given. Tables 3 and 4 show sample material balances and estimations of recovery of the Recovery and Conversion Units. Table 5 gives a list of "T" bearing waste materials stored and the estimated amounts. A flow sheet is given to provide a general view of the flow of waste materials as they are now handled. Under the paragraph "Waste Products Projects", are listed the various projects now being done on waste materials and the group doing the work. Personal comments are given at the end.

Discussion of Tables

The figures obtained from various sources (8 different units) are none too accurate but are qualitative indications of the progress and efficiency of the recovery operations in progress.

Table 1 was prepared by taking the TF_6 fed to the cascade and in storage and obtaining all of the by-products produced to date. This, of course, introduced a slight error since no correction was made for the material "in process" on December 31. The December 31 "in process" material actually produced a smaller part of by-products than a strict weighted proportional part of the by-products. Therefore, the error introduced was small. At the bottom of the table the "T" in waste materials charged to Recovery and the Unaccounted Material are shown for convenience. These figures were not used in estimating the percent distribution since it was thought their omission would give a better approximation of the efficiency.

Table 2 gives a breakdown by classes of the material charged. Some of these figures were estimated since no analyses were available, and checks made on some of the sampling methods used to obtain the "T" content showed the "T" in the samples to be as much as 100% high.

Tables 3, 4 and 5 are self-explanatory and are taken from the best figures which could be obtained at the time.

% Recovery of "T" as TF_6

The overall estimate of the percent recovery of "T" as TF_6 is indicated by Table 1 to be 61.01% (Unaccounted for excluded). The combination of the sample material balances show this figure to be 51.6% (Unaccounted for included). These figures are low because

1. The record of the early filtrate analyses is doubtful and in the early stages of operation the final filtration of the recovery unit did not always remove most of the "T". There is no record of these high "T" content filtrate solutions having been reworked or refiltered. This causes Table 1 to show an abnormal high "T" content in filtrate and wash water.
2. The fluorination of the "T" recovered from 816-816 mixture was not carried to completion and the ash was shipped with large amounts of "T" still in it. Early fluorination operations showed the ash to contain 2% or less "T", but the October and more recent ashes have contained as much as 40% "T".
3. The impure filter cake obtained from the "water media" solutions has been shipped when containing as much as 4 to 8% "T" instead of less than 1% "T", as was the case in a great many of the earlier filter cakes.

It should be held in mind that these figures do not refer to the material accounted for but to estimations of the efficiency of the processes. The overall unaccounted for appears to average about 10 to 12%.

Waste Products Projects

1. Cascade Services is now operating a "water media" Recovery Unit, a Conversion Unit for converting oxides to TF_6, a portion of an Oil Recovery Unit and Decontamination Unit.

   About one half of the back log of "water media" and three fourths of the back log of contaminated oils have been reworked.

   The Decontamination Unit has two sections, one of which cleans contaminated equipment and containers (except oily parts), and the other cleans spills in various parts of the plant. The flow sheet shows the disposition of these "T" bearing materials. The pump shop removes contaminated oil and in some cases cleans small amounts of "T" from pumps brought in for repair. The "T" bearing portion is shipped to Contaminated Storage. The flow sheet shows the various units handling waste products, which are not cascade tails, and the points to which they are shipped. The Contaminated Storage and Pure Storage are under the Coded Chemicals Unit and the others not mentioned are self explanatory.
2. The Chemical Section of the Design and Development Department are working on methods for recovering the "T" from carbon and alumina. It is understood that the method for recovering "T" from carbon is near completion, as well as the separation of the carbon from alumina; but considerable more work is needed on the recovery of "T" from alumina.
3. The Chemical Section of the Design and Development Department are still working on the recovery of contaminated oils. A part of the process has been completed and turned over to Cascade Services.
4. The Design Section of the Design and Development Department is working on a method to remove S16 from TF_6 in the mixture which has accumulated at points in the cascade. The Chemical Section of the same department did some work on this recovery, but what is thought to be a better process has been devised and is well under way.
5. The Accountability Section of the Uranium Control and Inspection Department together with the Coded Chemicals Unit has been working on methods of sampling "water media" and getting more accurate inventory. Considerable progress has been made and accurate inventories of "water media" should be completed by the end of February.
6. The Accountability Section of the Uranium Control and Inspection Department has also started procedures for obtaining accurate material balances on the Recovery and Conversion Units. Considerable progress has been made and this should soon reduce the unaccounted for losses at the Recovery and Conversion Units.

7. The Diversion Control Section of Uranium Control and Inspection Department has begun working on establishing diversion control measures for the units handling "T" bearing waste materials.

Comments

As can be seen, the recovery of waste materials is scattered between and within departments, among two or more sections.

530 lbs. of "T" has been recovered as TF_6 while there is an estimated 26,690 lbs. of contaminated "T" in Storage. (1.97% has been recovered). The cost of recovering this material so far to date has been exceedingly high according to a report put out by Cascade Services. The % "T" recovered as TF_6 of the reworked "T" bearing materials, although explainable, is estimated at 61%. The job of getting facts and accurate figures on the amounts of waste at various points is most difficult, and often conflicting figures are obtained; hence the accounting of the contaminated materials and estimates of the "T" in the materials are none too good.

PROCESS DIVISION
URANIUM CONTROL & INSPECTION DEPT.

Frank Mills
Frank Mills

FM/ga

Enclosure

TABLE 1

ESTIMATION OF RECOVERED TF_6 FORM REWORKED "WATER MEDIA" AND 816-616 MIXTURE AND THE BY-PRODUCTS FROM MAY 1946 TO JAN. 1947

Name of Material	Disposition	Lbs. or Gals.	Lbs. "T"	Percent Distribution of "T"	Weighted Average Assay Percent "X"
TF_6 Recovered	Fed to Cascade	640.63 lbs.	433.23	49.86	2264305
TF_6 Recovered	As Samples to Laboratory	10.62 lbs.	7.19	.83	2264305
TF_6 Recovered	To Pure Storage Coded Chem.	143.30 lbs.	96.89	11.15	2244082
TF_6 Recovered	Unaccounted and Piping	21.07 lbs.**	14.25**	1.64	2268506
Total TF_6	Fed and in Storage	783.93 lbs.	530.12	61.01	
Caustic Solutions	To Contaminated Storage	3089. gals.	2.88	.33	2256752
Ash from Conversion	To Contaminated Storage	460.55 lbs.	137.29	15.80	2249543
Impure Filter Cake	To Contaminated Storage	2684.7 lbs.	63.02*	7.25	8880287
Filtrate and Wash Water	To Contaminated Storage	13215. gals.	105.39*	12.13	2284667
Filtrate from Sodium Uranate	Dumped by Development Dept.	4000. gals.	nil		
Condensate	To Contaminated Waste	605. gals.	2.52	.29	2240002
Reworked except TF_6	To Laboratory as Samples		6.25***	.72	
Total "T" Completely Reworked			868.91	100.00	
Total "T" in Waste Charged to Recovery From Table 2			986.71		
Unaccounted			-117.80 lbs.		

* No analysis available on about one quarter of the containers and the accuracy of about one half of the filtrate analysis which are available are questionable.

** Claimed lost in transferring Batch 12 from small cylinders to one large cylinder for sampling and feeding.

*** Estimated.

All weighted "X" average assays except TF_6 fed are either estimated or contain estimated figure.

TABLE 2

Amount of Waste Fed to Recovery and Development up to December 31, 1946 (Excluding Carbon and Oils)

Material and Class	Gal. or Lbs.	Lbs. "T"	Estimated "X" Assay
"Water Media" Class A	5313 gal.	782.17	2268006
" " " B	3915 gal.	91.56	2250004
" " " C	4214 gal.	38.46	2280002
" " " D	550 gal.	10.45	2460006
" " " M	6391 gal.	47.30	2270001
Total to Recovery Development Department All Classes	20,384 gal.	969.94 lbs.	
	5,099 gal.	266.32 lbs.	
Total "Water Media" entering a Recovery Process	25,483 gal.	1236.36 lbs.	
Inventory 12-31-46	1,424	339.87 lbs.	
Net Reworked to Recovery Process 12-31-46	24,059 gal.	896.49 lbs.	
816 & 616 Mixture Class B	686 lbs.	268.81 lbs.	
Net lbs. "T" Charged to Re-working		1165.30 lbs.	
Conversion & T_3O_8 Pure Storage		178.59 lbs.	
Inventory 12-31-46			
Net "T" in material Charged to Re-working		986.71 lbs.	

TABLE 3

Material Balance of "Water Media" Recovery Batches 62 Thru 68

Name of Material	Lbs. or Gals.	Lbs"T"	% Distribution
"Water Media" Charged	1321.5 gal.	23.213	100.00
Row Filter Cake Shipped	35.94 lbs.	1.722	7.42
NH_4OH Filtrate Shipped	605. gal.	.1865	.80
Wash Water Shipped	395. gal.	.4765	2.05
T_3O_8 Shipped	14513 grams	19.512	84.06
Total Out		21.897	94.33
Unaccounted		-1.316	-5.67

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TABLE 4

"T" Material Balance on Conversion Unit October 1-31, Incl.

Name of Material	Gms. or Gals.	Gms. "T"	% Distribution
PTFE-TF_4 *	4,940. gms.	3,221. gms.	4.19
TF_4 *	2,356. "	1,871. "	2.43
T_3O_8 *	57,357. "	34,322. "	44.63
TF_6 from depressuring	2,634. "	1,781. "	2.32
Caustic Urinate	55,111. "	35,706. "	46.43
	122,398. "	76,901. "	100.0%
TF_6 produced **	69,783. "	47,173. "	61.34
Ash produced **	41,231. "	16,441. "	21.38
Caustic Solutions **	4,901. Gal.	470. "	.61
		64,084. "	83.33
Unaccounted		-12,817. "	-16.67

* Difference in Inventory October 1 and October 31 plus receipts

** Difference in Inventory October 1 and October 31 plus shipments

Unaccounted for adjusted

% Recovery of T as TF_6 processed through Recovery and Conversion
61.34 x 84.06 = 51.56%

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TABLE 5

"T" Bearing Waste Materials on hand December 31, 1946 Including By-products from Reworked Material (Estimated 12-31-46)

Name of Material	Location	Lbs. or Gal.	Lbs. "T"	Av. "X" Assay
Filter cake from MFL oil	Development Dept.	51.8 lbs.	17.24	2281325
Filter cake from C-2144 oil	" "	190. lbs.	6.954	2257734
Contaminated C-2144	Contaminated Storage	800 lbs.	2.000	-
Contaminated MFL	" "	2000 lbs.	6.000	
Contaminated oil (C-2144 & Mech)	Oil Recovery	1748.9 lbs.	6.277	
T_3O_8 from Carbon	Development Dept.	2163.75 lbs.	1630.	3358505
Raw Filter cake (Recovery)	Contaminated Storage	2684.7 lbs.	63.02	8880287
Ash (from conversion)	Contaminated Storage	460.55 lbs.	137.29	2249543
Water media, incl. filtrate, wash water, condensate and caustic solutions	Contaminated Storage	35.438 gal.	1033.96	2278475
Carbon and Alumina	Contaminated Storage	272,090 lbs.	21,997.47	-
Carbon and Alumina	Development Dept.	7,525.8	1,412.79	
TF_6 recovered from Converters	Development Dept.		1.05	2290001
Reworked Products in Process at "water media" and oil recovery conversion, decontamination, T_3O_8 pure storage			585.95	
Total Estimate of "T" in Waste Materials (12-31-46)			2,6890.00	

Note: All "X" assays estimated or contain estimated figures.

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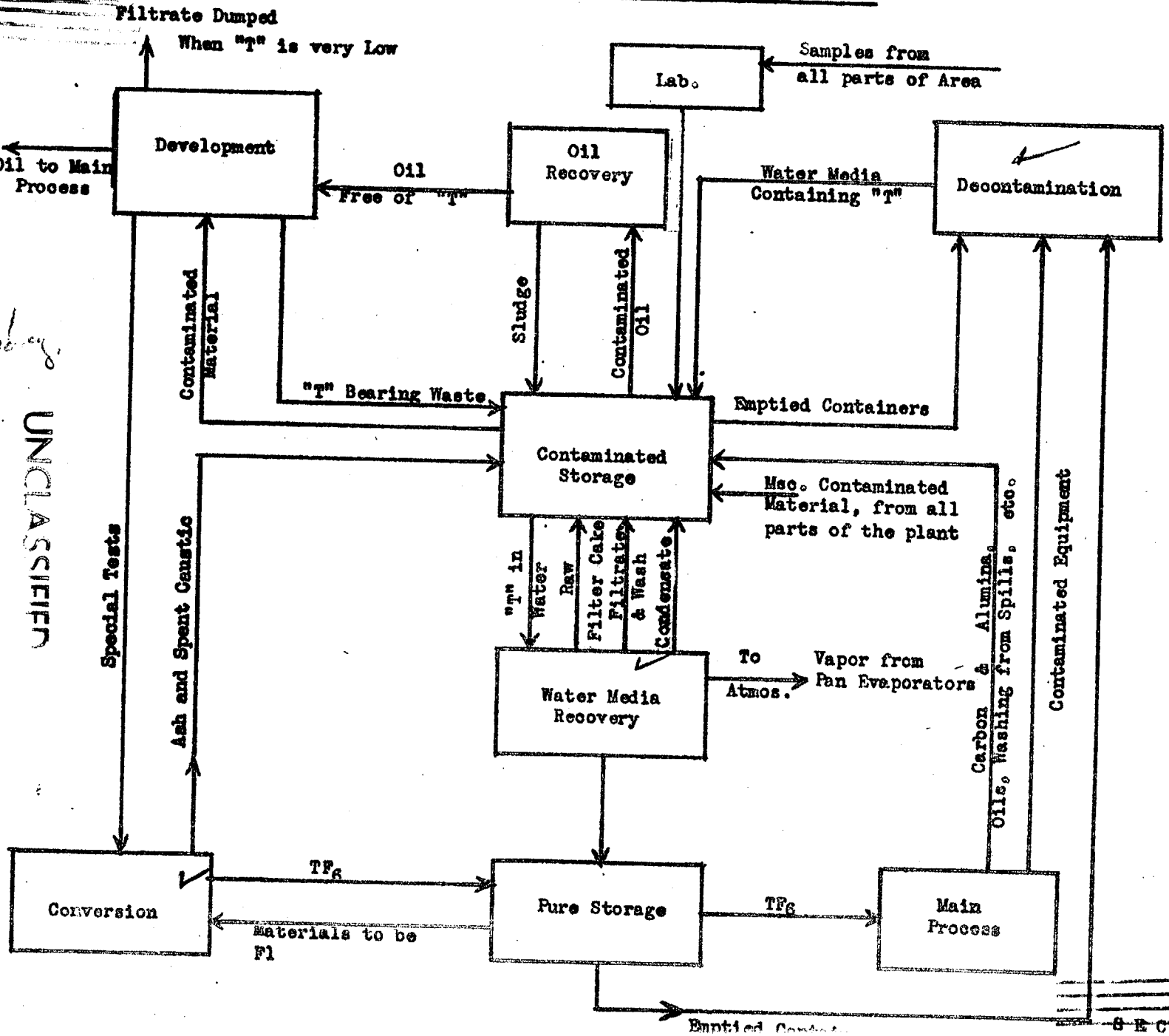
FLOW SHEET OF MATERIALS CONTAMINATED WITH "T



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