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2907

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2907

K/EM-394

SANITIZED VERSION OF MATERIAL ACCOUNTABILITY JULY 1946 REPORT

(SANITIZED VERSION OF CRD DOCUMENT #KZ-1155)

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

April 23, 1996

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 Hasty 5/14/96
Technical Information Officer Date
Oak Ridge K-25 Site

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CARBIDE AND CARBON CHEMICALS CORPORATION

PROCESS DIVISION

KZ 1155 5 A

PROCESS MATERIALS DEPARTMENT

KZ 1155 5 A

RECORD COPY

September 9, 1946

PLANT RECORDS 1950

MATERIAL ACCOUNTABILITY JULY 1946

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CARBIDE AND CARBON CHEMICALS CORPORATION

PROCESS DIVISION

PROCESS MATERIALS DEPARTMENT

September 9, 1946

To: E. D. Flickinger

MATERIAL ACCOUNTABILITY JULY 1946

Attached are reports on the August 1, 1946 inventories and material balances for July 1946, on T and X for the cascade and plant. Two complete reports on accountability are presented; one based on an X concentration in crude feed of 0.705 wt. %, the Manhattan District value, and the other based on 0.721 wt. %. The value of 0.721 wt. % while it may be biased, should be used for determining unaccounted losses of X, since all inventory and stream assays, except product, are calculated on this basis. The cascade balances have been analysed for uncertainties due to random errors in measurements and assays and these results are stated on the July cascade balance sheet. The additional uncertainties in the unaccounted losses due to systematic errors are very large and a satisfactory material balance on the cascade cannot be obtained until these biases are considerably reduced.

The individual and summary effects of these systematic errors are enumerated below:

Uncertainty in the T balance due to systematic errors:

The uncertainty of cell size factors does not contribute appreciably to the variance of the July T balance since the cell conditions were nearly the same for the two inventories.

The impurities in depleted feed, waste, and product cause a greater variance in the T balance than do all measurements of cascade inventory and streams. Due to lack of accurate laboratory analyses, feed, waste, and product were considered as pure TF_6 in the material balances. If the impurities in depleted feed, waste and product were 0.2% and the confidence belt on this value were ± 0.1% the unaccounted loss of T and the corresponding confidence belt would be:

Unaccounted loss	95 % Confidence belt
115 Kg. T	± 75 Kg. T

It can be seen that it is very important to get precise analyses for T or impurities, in which the systematic error must be less than 0.025%.

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Uncertainty in the X balance due to systematic errors:

The estimated biases in the feed purity, ratio of waste to feed purties and product purity contribute a greater uncertainty to the daily rate of loss of X than do all other variables, excluding size factors, in the July X balance.

The additional uncertainty in loss of X for July 1946 due to these biases is ± 1.9 Kg.X. This is compared to ± 1.6 Kg.X from all other variables, excluding size factors. It is important to reduce the biases in assay, for they set a limit on losses of ± 0.061 Kg.X/day or ± 22.3 Kg. X per year which cannot be detected even with no uncertainty in inventory or measurements.

The following limits on the biases expressed as % of X content with 95% certainty should be obtained as soon as possible:

(1)	Feed purity	0.23 %
(2)	Product purity	0.23%
(3)	Ratio of waste to feed purities	0.1%

During the month of July the cascade X-Inventory was increased by 112 Kg. The uncertainty of the size factors contributes to the uncertainty of the X-Inventory change; this contribution is large when a large change of X-Inventory is effected. Assuming that the present size factors are known with an accuracy of ± 6%, the contribution to variance in change of X-Inventory for the month of July is 3 Kg^2 X. This is equivalent to an uncertainty of ± 3.5 Kg. X in the X-Inventory change.

It is to be noted that this contribution is large because of the large X-Inventory change during July. In normal months, with little change in X-Inventory, the size factor uncertainty contribution will be small. A report on the advisability of size factor determinations will be forthcoming.

Very truly yours,

R. W. Levin

R. W. Levin
Process Materials Department

RWL/nf

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CASCADE BALANCE

MONTH OF JULY 1946

Inventory July 1, 1946	Kg. T	Kg. X	V(T) Kg. T^2	V(X) Kg. X^2
Surge Drums (K-631)	902.40	4.80	80.82	0.0008
Carbon Traps	10.41	0.16	0.25	0.0001
Charged to Cascade				
C-616 *	39,250.86	283.00	2.92	0.0057
C-1040	27.43	3.28	0.00	0.0010
K-25 Waste	8,411.10	48.28	2.50	0.0332
C-617	692.25	4.89	0.06	0.0004
C-940	13,909.65	121.02	1.10	0.0113
C-1435	152.47	45.70	0.00	0.0017
Total Charged	62,443.76	506.17	6.58	0.0533
Total to Account For	80,191.47	816.32	251.03	0.2498
Inventory August 1, 1946				
Surge Drums (K-631)	860.80	4.29	82.50	0.0038
Carbon Traps	7.88	0.04	0.00	0.0150
Cold Traps (302-5 CT & P&P)	0.58	0.00	0.00	0.0000
Credited to Cascade				
Waste Produced	62,014.94	326.50	19.20	0.1920
C-1435 "	67.04	20.12	0.00	0.0000
C-1635 "	0.06	0.03	0.00	0.0000
C-1735 "	74.42	44.71	0.00	0.0011
Removed From Carbon Traps	77.87	0.51	0.24	0.0000
Total Credited	62,234.33	391.87	19.44	0.1931
Total Accounted For	80,171.89	813.70	236.07	0.3949
Total Unaccounted For	19.58	2.62	487.10	0.6447
95% Confidence Belt	± 44.14	± 1.61		
Percent Unaccounted For	0.024%	0.32%		

* 0.721 wt. %

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AREA MATERIAL BALANCE
MONTH July, 1946

	Kg. U	Kg. X
INVENTORY 7-1-46		
RECEIVED	728,203.55	4,297.46
*C-616	24,866.92	179.29
C-940	3,673.43	31.96
UO_3 (18.88 grams)	----	----
*Q"-1-2800 (.42 lbs.)	----	----
Total To Account For	756,743.90	4,508.71
INVENTORY 8-1-46		
SHIPPED		
C-1635 (2.40 grams)	----	----
C-1735 (1.1683 grams)	----	----
C-1435-B	134.43	40.43
C-1435	58.87	17.64
C-616	77.36	.56
C-439	.08	----
C-617	1.08	.01
Total Accounted For		
Total Unaccounted For	-325.50	-43.37
% Unaccounted For	----	----

* .721 % Concentration

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AREA MATERIAL BALANCE
TO August 1, 1946

		Kg. T	Kg. X
INVENTORY START		0.00	0.00
A	Received	783,186.50	5,755.25
	Total To Account	783,186.50	5,755.25
B	Inventory Aug. 1, 1946	756,797.58	4,498.68
C	Shipments	19,150.36	1,159.57
D	Used	146.77	.97
D	Lost	183.71	1.30
	Total Accounted For	776,278.42	5,660.52
	Total Unaccounted For	6,908.08	94.73
	% Unaccounted For	.88	1.65

This report based on .721% concentration For Raw Feed

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RECEIPTS TO Aug. 1, 1946

A

MATERIAL	Kg. T	Kg. X
*C-616	666,131.04	4,802.80
C-934	14,695.29	122.92
C-834	2,813.84	20.03
C-1125	134.80	10.78
C-1025	291.15	36.82
C-1325	41.71	10.01
Waste S-50 Material	78,115.22	524.94
C-439	1,990.35	14.03
C-617	1,659.97	11.73
C-1423	173.36	51.70
C-1935	35.68	.39
C-1000	6.99	.35
C-723 (5.0 lbs.)	----	----
C-285	.31	.002
C-T-238 (1.1794 grams)	----	----
C-11025 (.4183 grams)	----	----
C-940	17,096.79	148.75
U-238 (35.3733 grams)	----	----
UO_3 (18.88 grams)	----	----
"O" 1-2800 (.42 lbs.)	----	----
Total	783,186.50	5,755.25

* .721% Concentration

INVENTORIES August 1, 1946

B

MATERIAL AND LOCATION	Kg. T	Kg. X
WASTE K-25 MATERIAL		
Stg. K-27	604,479.36	3,085.38
8A Vault	31.07	.30
131	5,618.92	31.05
631	5,555.18	27.33
17A	428.66	2.23
1401	119.62	.69
Lab	33.97	.16
Total	616,266.78	3,147.14
WASTE S-50 MATERIAL		
Stg. K-27	76,661.87	515.21
Vault 17A	192.05	1.28
Total	76,853.92	516.49
C-834		
131	38.77	.28
17A Vault	1.30	.009
Lab	1.58	.01
Total	41.65	.30
MISC. DBM		
131	302.29	1.78
Lab	3.75	02
MISC. EBM		
131	197.40	1.82
17A	9.18	.07
8A	.14	.0009
Lab	2.88	.32

	Kg. T	Kg. X
*C-616		
Warehouse	27,948.92	201.51
17A Vault	128.36	.93
Lab.	58.51	.42
402.4	1,936.60	13.96
131	2,559.93	18.46
HE-2	.36	.003
HF-19	50.88	.37
312-3	25.03	.18
Total	32,708.52	235.83
C-934		
17A Vault	6.55	.06
131	129.01	1.21
Lab	1.17	.01
Total	136.73	1.28
C-1025		
Lab	.16	.02
C-1040		
1301	.13	.02
C-1335		
Lab	.03	.01
C-1325		
Lab	.03	.007
C-936		
413	1,902.10	18.63
SA	11.73	.11
C-439		
17A	11.58	.08
C-617		
K-25 Stg.	.61	.004

* .721% Concnetration

B

	Kg. T	Kg. X
C-1423		
Vault 8A	63.73	19.01
Lab S-50	35.41	10.56
C-1427		
Vault 8A	66.31	19.75
Lab S-50	3.80	1.13
C-285		
Lab	.31	.002
C-T-236 (1.1794 Grams)	----	----
C-11025 (.4183 grams)	----	----
C-940		
X-1025 Stg.	27.37	.24
17A Vault	11.78	.10
U-238		
Lab (35.3733 grams)	----	----
"O" 1-2800	----	----
UO_3	----	----
Lab	----	----
C-1735		
Stg.	4.96	2.97
312-3	.41	.24
C-1435 B		
Stg.	4.99	1.50
Cold Traps	.58	----
Carbon & Alumina Stg.	9,277.34	60.90
Decontamination	6.55	.20
Surge Drums	860.80	4.29
Carbon Traps	7.88	.04
HE Devel. Dept.	215.87	1.73
1303 Recovery	43.66	.49
1301 Conversion	.09	.008
Contaminated Solutions	647.83	34.09
Total		

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SHIPMENTS TO August 1, 1946

C

MATERIAL		Kg. T	Kg. X
*C-616		997.21	7.19
C-935		13,460.58	150.76
C-1035		.19	.009
C-1135		262.86	18.43
C-1235		268.41	28.53
C-1335		2,346.50	611.56
C-1435		980.14	293.67
C-934		144.60	1.21
C-1000		7.56	.38
Waste		96.245	.54
Carbon		447.13	6.32
C-1423		1.64	.49
C-1327		.082	.026
C-616		2.54	.02
C-439		.23	.002
C-5327	(7.72 grams)	.005	----
EBM	(.9141 grams)	----	----
DBM	(.9112 grams)	----	----
C-1635	(2.40 grams)	----	----
C-1735	(1.1683 grams)	----	----
C-1435-B		134.43	40.43
Total		19,150.36	1,159.57

LOST TO August 1, 1946

D

Used Lab	102.62	.73
Lost Mfg.	183.71	1.30
Used Lab. (Waste)	44.15	.24
	330.48	2.27

* .721 % Concentration

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CARBIDE AND CARBON CHEMICAL CORPORATION

PROCESS DIVISION

PROCESS MATERIALS DEPARTMENT

To: R. W. Levin

September 6, 1946

CASCADE INVENTORY
August 1, 1946

At 11:00 a. m. on July 1, 1946 a cascade inventory was taken under the direction of the Process Materials Department. Data obtained at that time was used to calculate the cascade inventory.

The inventory figures listed in the table below is the gaseous inventory per building. The large variance of the 631 Bldg. is due to the uncertainty of the pressure determination. Plant III has initiated a DKZ order to install special low range PEM S which will serve to reduce the variance considerably.

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CASCADE BALANCE

MONTH OF JULY 1946

Inventory July 1, 1946	Kg. U	Kg.
Surge Drums	902.40	4.80
Carbon Traps	10.41	.16
Charged to Cascade		
C-616*	39,250.86	276.72
C-1040	27.43	3.28
K-25 Waste	8,411.10	48.28
C-617	692.23	4.89
C-940	13,909.65	121.02
C-1435	152.47	45.70
Total Charged	62,443.76	499.89
Inventory August 1, 1946		
Surge Drums	860.80	4.29
Carbon Traps	7.88	0.04
Cold Traps	0.58	0.00
Production		
Waste Produced	62,014.94	326.50
C-1435 "	67.04	20.12
C-1635 "	0.06	0.03
C-1735 "	74.42	44.71
Removed From Carbon Traps	77.87	0.51
Total unaccounted For	19.58	- 3.66
Percent Unaccounted For	.024	-

* .705 Concentration

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CASCADE BALANCE

TO AUGUST 1, 1946

	Kg. T	Kg. X
Inventory Start	0.00	0.00
Charged		
*C-616	632,511.79	4,459.22
C-1140	128.26	10.26
C-1040	283.15	36.10
C-1340	40.29	9.67
C-934	14,353.03	120.57
Waste (K-25)	80,914.06	460.15
Waste (S-50)	1,247.80	8.36
C-834	2,775.69	19.76
C-935	35.68	0.39
C-1000	6.99	0.355
C-639	281.26	1.36
C-617	1,556.83	11.71
C-439	1,930.19	13.34
C-539	332.74	1.93
C-5327	215.09	1.16
C-5331	582.85	3.37
C-940	17,057.28	148.40
Miscl. FBM	0.39	0.08
C-1435	152.47	45.70
Total To Account For	754,505.84	5,351.89
Inventory August 1, 1946	17,937.56	421.83
Lost	183.71	1.30
Production		
C-935	13,581.71	152.12
C-1135	263.18	18.68
C-1235	269.45	28.64
C-1335	2,346.97	610.39
C-1435	1,134.66	339.87
C-1000	7.56	0.58
C-936	1,910.55	18.51
C-1735	74.42	44.71
†Waste	700,490.71	3,632.60
†Removed From Carbon Traps	9,724.47	67.22
C-1635	0.06	0.03
Total Accounted For	747,925.01	5,336.18
Total Unaccounted For	6,580.83	15.71
Percent Unaccounted For	0.87	0.29

† Corrected
* Concentration .705

[redacted]

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ARFA MATERIAL BALANCE

MONTH JULY 1946

	Kg. T	Kg. X
Inventory July 1, 1946	728,203.55	4,297.46
Received		
*C-616	24,866.92	175.31
C-940	3,673.43	31.96
UO_2 (18.88 grams)	----------	----------
"Z" 1-2800 (.42 lbs.)	----------	----------
Total to Account For	756,743.90	4,504.73
Inventory August 1, 1946	756 797.58	4,493.44
Shipped		
C-1635 (2.40 grams)	----------	----------
C-1735 (1.1683 grams)	------	----------
C-1435-B	134.43	40.43
C-1435	58.87	17.64
C-616	77.36	0.55
C-439	0.08	-----
C-617	1.08	0.01
Total Accounted For	757,069.40	4,552.07
Total Unaccounted For	-325.50	-47.34
Percent Unaccounted For	------	-------

* .705% Concentration

[redacted]

[redacted]

AREA MATERIAL BALANCE

TO AUGUST 1, 1946

	Kg.	Kg. U
INVENTORY START	0.00	0.00
A. Received	783,186.50	5,648.67
Total To Account For	783,186.50	5,648.67
B. Inventory August 1, 1946	756,797.58	4,493.44
C. Shipments	19,150.36	1,159.41
D. Used	146.77	0.97
D. Lost	183.71	1.30
Total Accounted For	776,278.42	5,655.12
Total Unaccounted For	6,908.08	-6.45
Percent Unaccounted For	.88	—

This report based on .705% concentration for Raw Feed.

[redacted]

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RECEIPTS TO AUGUST 1, 1946

A

MATERIAL		Kg. T	Kg. X
* C-616		566,131.04	4,696.22
C-934		14,695.29	122.92
C-834		2,813.84	20.03
C-1125		134.80	10.78
C-1025		291.15	36.82
C-1325		41.71	10.01
Waste S-50 Material		78,115.22	524.94
C-439		1,990.35	14.03
C-617		1,659.97	11.73
C-1423		173.36	51.70
C-935		35.68	0.39
C-1000		6.99	0.35
C-723	(5.0 lbs.)	----	----
C-285		0.31	0.002
C-T-238	(1.1794 grams)	----	----
C-11025	(.4183 grams)	----	----
C-940		17,096.79	148.75
U-238	(35.3733 grams)	----	----
UO_3	(18.88 grams)	----	----
"Q" 1-2800	(.42 lbs.)	----	----
	Total	783,186.50	5,648.67

* .705% Concentration

[redacted]

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INVENTORIES
AUGUST 1, 1946

[redacted]

B

Material and Location		Kg.T	Kg.X
Waste K-25 Material			
Stg. K-27		604,479.36	3,085.36
Vault 8-A		31.07	0.30
K-131		5,618.92	31.05
K-631		5,555.18	27.33
Vault 17-A		428.66	2.23
K-1401		119.62	0.69
Lab.		33.97	0.16
	Total	616,266.78	3,147.14
Waste S-50 Material			
Stg. K-27		76,661.87	515.21
Vault 17-A		192.05	1.28
	Total	76,853.92	516.49
C-834			
K-131		38.77	0.28
Vault 17-A		1.30	0.009
Lab.		1.58	0.01
	Total	41.65	0.30
Miscl. DBM			
K-131		302.29	1.78
Lab.		3.75	0.02
Miscl. EBM			
K-131		197.40	1.82
Vault 17-A		9.18	0.07
Vault 8-A		0.14	0.0009
Lab.		2.88	0.32
C-616			
Warehouse		27,948.92	197.04
Vault 17-A		128.36	0.90
Lab.		58.51	0.41
K-402-4		1,936.60	13.65
K-131		2,559.93	18.05
HE-2		0.36	0.003
HE-19		50.81	0.36
K-312-3		25.03	0.18
	Total	32,709.52	230.59

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		B	No. 1	No. 2
C-934			8.55	1.06
Vault 17-A			129.01	1.22
X-131			1.17	0.03
Lab.		Total	138.73	1.28
C-1025			1.16	0.02
Lab.				
C-1040			1.13	0.02
X-1301				
C-1335			0.03	0.01
Lab.				
C-1325			0.03	0.007
Lab.				
C-936			1,902.10	18.83
X-413			11.73	.11
Vault 8-A				
C-439			11.58	0.08
Vault 17-A				
C-617			1.81	0.004
X-25 Stg.				
C-1423			38.73	19.02
Vault			35.42	10.33
Lab. S-50				
C-1427			48.31	19.73
Vault 8-A			1.80	1.13
Lab. S-50				
C-285			0.31	0.002
Lab.				
C-T-238	(1.1794 grams)		----	----
C-11025	(.4183 grams)		----	----

[redacted]

[redacted]

B

	Mg. U	Mg. U
C-940		
K-1025 Stg.	27.37	0.24
Vault 17-A	11.78	0.10
U-238		
Lab. (35.3733 grams)	----	----
"Q" K-2800	No analysis	
UO_2		
Lab. (18.88 grams)	----	----
C-1735		
Stg. K-312-3	4.96	2.97
	0.41	0.24
C-1435-B		
Stg. K-306-7	4.99	1.50
Cascade	—	
Cold Traps	0.58	
Carbon and Alumina Stg.	9,277.34	60.90
Decontamination	8.55	0.20
Surge Drums	860.80	4.22
Carbon Traps	7.38	0.04
HE Devel. Dept.	215.37	1.73
1303 Recovery	43.66	0.42
1301 Conversion	0.09	0.008
Contaminated Solutions	647.33	34.09
Total		

[redacted]

[redacted]

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SHIPMENTS TO AUGUST 1, 1946

C

MATERIAL		Kg. T	Kg. X
C-616		997.21	7.03
C-935		13,460.58	150.76
C-1035		0.19	0.009
C-1135		262.86	18.43
C-1235		268.41	28.53
C-1335		2,346.50	811.56
C-1435		980.14	293.67
C-934		144.60	1.21
C-1000		7.56	0.38
Waste		96.245	0.54
Carbon		447.13	6.32
C-1423		1.64	0.49
C-1327		0.082	0.026
C-617		2.54	0.02
C-439		0.23	0.002
C-5327	(7.72 grams)	0.005	----
EBM	(.9141 grams)	----	----
DBM	(.9112 grams)	----	----
C-1635	(2.40 grams)	----	----
C-1735	(1.1683 grams)	----	----
C-1435-B		134.43	40.43
	Total	19,150.36	1,159.41

LOST TO AUGUST 1, 1946

D

		Kg. U	Kg. U
Used Lab.		102.62	0.73
Lost Mfg.		183.71	1.30
Used Lab. (Waste)		44.15	0.24
	Total	330.48	2.27

DISTRIBUTION

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