OWENS-ILLINOIS
Consolidated Services
Division

Toledo, Ohio

June 17, 1985

Intra-Company

Mr. R. H. Russell - 2 NTC

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TRACY "B" FURNACE - METAL EMISSIONS

THIS REPORT FOR INTERNAL USE ONLY

INTRODUCTION

Particulate emission measurements, primarily for chrome, were conducted May 8, 1985 on Tracy "B" furnace. The tests were run similar to those performed by the California Air Resources Board (CARB) on May 7 and 8, 1985. The CARB tests of May 7, 1985, were observed by Messrs. Russell and Sagert and comments noted in Mr. Russell's trip report dated May 23, 1985.

SAMPLING AND ANALYSIS

Duplicate emission tests were performed using an EPA Method 5 sampling train. Twelve (12) sample points were located along two perpendicular diameters of the stack. The gas stream was sampled isokinetically at each point for 6 minutes for a total test time of 72 minutes.

At the completion of each test, the probe and filter were removed and set aside. A silica gel filled impinger and filter were attached to the umbilical line and the train was purged with dry, clean, ambient air for 15 minutes. The nozzle, probe liner, and front half of the filter holder were washed with acetone into a labelled polyethylene bottle. The two water filled impingers were volumetrically measured and contents transferred to a sample bottle labelled "impingers". The impingers, umbilical line, and back half of the filter holder were rinsed with methylene chloride into the "impinger" sample bottle. Silica gel was transferred to its original tared container.

The filter samples were oven dried at 105°C, cooled, and weighed. Probe washes and aliquots of the impinger solutions were taken to dryness at 105°C, cooled, and weighed. Impinger residues were reconstituted with distilled water, and titrated with 0.10 N NaOH for a sulfuric acid determination. The total particulate emissions reported in Table 1 were calculated from the filter catch plus the probe and impinger residues, less the H_2SO_4 measured in the impinger.

Analysis for the chrome and other metals were by the CARB acid extraction method. A copy of the CARB procedure and analytical notes written by the O-I analyst are attached for your information.

PROCESS DATA AND TEST RESULTS

The furnace process data for May 8, 1985 is presented in Table 2.

The particulate and metal emission rates are shown in Table 1. The metal emissions were determined from the front half catch (probe/filter) only and are extremely low. For analytical detections reported as less than μg (<), a value of 1/2 the limit was used in the emission calculation.

Copies of the field data sheets, analytical report, and computer calculations are attached to Messrs. Russell and Sagert's copies only.

Paul Sagert

Paul Sagert
Environmental Sampling Group

PDS/elb
Attach.

TABLE 1

TRACY "B" FURNACE EMISSION SUMMARY 5/8/85

A.	General		
	1. Test No.	1	2
	2. Avg. Gas Velocity (FPS)	53.5	54.8
	3. Avg. Gas Temp. (°F)	612	621
	4. Avg. Gas Volume (ACFM)	35,470	36,268
	(SDCFM)	15,321	15,501
	5. Isokinetic Variation (%)	98.6	99.3
B.	Emissions		
	1. Total Particulate		
	(grs./SDCF)	0.0446	0.0349
	(lbs./hr.)	5.85	4.64
	2. Metals		
	a. Arsenic (gr./SDCF)	9×10^{-6}	1.0×10^{-5}
	(lbs./hr.)	0.0011	0.0014
	b. Chrome (gr./SDCF)	1.42×10^{-4}	1.31×10^{-4}
	(lbs./hr.)	0.0187	0.0173
	c. $Chrome^{+6}$ (gr./SDCF)	1.5×10^{-7}	1.4×10^{-7}
	(lbs./hr.)	0.000019	0.000019
	d. Cadmium (gr./SDCF)	1.4×10^{-5}	1.5×10^{-5}
	(lbs./hr.)	0.0018	0.0020
	e. Lead (gr./SDCF)	8.6×10^{-5}	6.0×10^{-5}
	(lbs./hr.)	0.0113	0.0079
	f. Nickel (gr./SDCF)	4×10^{-6}	2×10^{-6}
	(lbs./hr.)	0.0006	0.0003
	g. Iron (gr./SDCF)	2.7×10^{-5}	1.3×10^{-5}
	(lbs/hr.)	0.0035	0.0017
	h. Magnesium (gr./SDCF)	1.4×10^{-5}	4.3×10^{-5}
	(lbs./hr.)	0.0018	0.0057
C.	Flue Gas Analysis		
	1. H_2O (% by volume)	10.8	11.0
	2. O_2 (% by volume)	10.3	11.3
	3. CO_2 (% by volume)	8.0	8.0

TABLE 2

TRACY "B" FURNACE PROCESS DATA - 5/8/85

1.	Color	Em. Green
2.	Load (TPD)	233
3.	Process Weight (TPD)	256.4

FIELD DATA SHEET

PLANT NO. _____

LOCATION Trach

DATE 5-8-85

TEST NO. 1

SOURCE "B"

FLUE DIA. 45 (IN.)

FLUE AREA 11.04 (FT^2)

BAROMETRIC PRESS. 29.92

STATIC PRESS. -0.40" H_2O

PITOT NO. 8 CF .851

PUMP BOX NO. 4 VCF 1.015

FILTER WEIGHT 107.3 (mg) Imp. RES. = 61.0 mg

PROBE WASH 12.7 (mg) Imp ACID = 39.0 mg

RESIDUE = 22 mg

ACETONE BLANK 2.6 mg

NOZZLE DIA. 5/16 (IN.)

FLUE GAS: CO _____ (PPM)

CO_2 8.2 (%)

O_2 10.3 (%)

OTHER _____

LEAK RATE: BEFORE 0 (SCFM) @ 14 (IN. Hg)

AFTER ___ (SCFM) @ 12 (IN. Hg)

WATER VAPOR: CONDENSATE 1160 ML

SILICA GEL 21.6 ML

TOTAL 137.6 ML

C = 3.10 PITOT LEAK CHECK OK

$$\Delta P_c = \frac{C \times (T_o + 460) \times \Delta H_p}{(T_s + 460)}$$

TIME 1319	PT.	DIST. (IN.)	PITOT, ΔH_p (IN. H_2O)	STACK, T_s (°F)	METER, V_m CF @	VAC. (IN. HG)	PROBE, T_p (°F)	FILTER, T_f (°F)	METER TEMP. (°F)	ORIFICE, ΔP_c (IN. H_2O)	ORIFICE, ΔP (IN. H_2O)
	0	---	---	---	1791.110	---	---	---	IN / OUT	---	---
6	1	1.9	0.44	590	1795.8	9.6	230	225	100 / 99	0.73	0.73
12	2	6.6	0.49	610	1800.5	9.9	220	220	100 / 99	0.78	0.78
18	3	13.2	0.56	630	1806.0	11.1	235	230	103 / 100	0.89	0.89
24	4	31.8	0.48	640	1811.2	10.7	230	230	110 / 105	0.76	0.76
30	5	38.4	0.37	570	1815.9	8.0	225	240	117 / 109	0.63	0.63
36	6	43.6	0.25	600	1819.400	6.0	240	245	120 / 111	0.42	0.42
42	7	1.9	0.43	620	1824.1	8.3	220	245	120 / 115	0.71	0.71
48	8	6.6	0.47	630	1829.2	8.9	225	245	120 / 116	0.77	0.77
54	9	13.2	0.52	590	1834.4	10.2	230	250	121 / 118	0.89	0.89
60	10	31.8	0.49	620	1839.8	9.7	240	255	122 / 120	0.82	0.82
66	11	38.4	0.42	640	1844.2	8.1	240	250	125 / 120	0.69	0.69
72	12	43.6	0.29	610	1848.200	5.8	240	245	129 / 123	0.49	0.49
AVERAGE					57.09				113.4	0.72	

COMMENTS Method 5 PERFORMED BY ACK

72 MINUTE TEST

15 MINUTE PURGE

FIELD DATA SHEET

PLANT NO. _____

LOCATION [illegible]

DATE 5 8 85

TEST NO. 2

SOURCE "B"

FLUE DIA. 45 (IN.)

FLUE AREA 11.04 (FT^2)

BAROMETRIC PRESS. 2992

STATIC PRESS. -.40"

PITOT NO. 8 CF .851

PUMP BOX NO. 4 VCF 1.015

FILTER WEIGHT 108.7 (mg) Imp. Res. = 32 mg

PROBE WASH 11.8 (mg) Imp. Acid = 31 mg

Acid Blank 2.6 mg

RESIDUE 1 mg

NOZZLE DIA. 5/16 (IN.)

FLUE GAS: CO _____ (PPM)

CO_2 8.0 (%)

O_2 11.3 (%)

OTHER _____

LEAK RATE: BEFORE <0.01 (SCFM) @ 11 (IN. Hg)

AFTER 0.005 (SCFM) @ 11 (IN. Hg)

WATER VAPOR: CONDENSATE 127.0 ML

SILICA GEL 16.4 ML

TOTAL 143.4 ML

C = 3.10 PITOT LEAK CHECK OK

$$\Delta P_c = \frac{C \times (T_o + 460) \times \Delta H_p}{(T_s + 460)}$$

TIME	PT.	DIST. (IN.)	PITOT, ΔH_p (IN. H_2O)	STACK, T_s (°F)	METER, V_m CF @	VAC. (IN. HG)	PROBE, T_p (°F)	FILTER, T_f (°F)	METER TEMP. (°F)	ORIFICE, ΔP_c (IN. H_2O)	ORIFICE, ΔP (IN. H_2O)
20 Hrs	0	***	***	***	1859.65	***	***	***	IN / OUT	***	***
6	1	1.9	0.46	615	1864.8	8.5	260	270	116 / 118	0.77	0.77
12	2	6.6	0.50	640	1870.0	9.0	255	260	120 / 119	0.82	0.82
18	3	13.2	0.52	650	1875.3	9.0	260	245	122 / 119	0.84	0.84
24	4	31.8	0.46	590	1880.3	8.5	265	270	125 / 120	0.79	0.79
30	5	38.4	0.42	600	1885.2	8.0	250	255	128 / 121	0.71	0.71
36	6	43.0	0.33	590	1889.55	6.5	255	255	128 / 122	0.57	0.57
6	7	1.9	0.42	615	1894.3	7.0	230	275	125 / 123	0.71	0.71
12	8	6.6	0.51	605	1899.5	9.0	250	245	126 / 122	0.86	0.86
18	9	13.2	0.55	630	1904.9	9.8	270	265	130 / 124	0.91	0.91
24	10	31.8	0.50	640	1910.1	9.0	250	270	130 / 127	0.83	0.83
30	11	38.4	0.40	645	1914.8	7.5	255	255	132 / 128	0.66	0.66
36	12	43.0	0.31	635	1918.94	6.0	245	250	131 / 126	0.51	0.51
AVERAGE					59.29				124.3	0.75	

COMMENTS 72 MIN Test

Method 5

Dry gas 15 min

PERFORMED BY [illegible]

WENG ILLINOIS, INC.

PLANT: TRACY
DATE: 7-8-85
UNIT TESTED: 3 FURNACE - TEST #1

	VH(IN H2O)	TS(K)	TS(F)	VS(MPS)	VS(FPS)
1	0.440	583.	590.	16.4	53.6
2	0.490	594.	610.	17.4	57.1
3	0.560	605.	630.	18.8	61.7
4	0.480	611.	640.	17.5	57.3
5	0.370	572.	570.	14.9	48.7
6	0.250	589.	600.	12.4	40.6
7	0.430	600.	620.	16.4	53.8
8	0.470	605.	630.	17.2	56.5
9	0.520	583.	590.	17.8	58.3
10	0.490	600.	620.	17.5	57.4
11	0.420	611.	640.	16.4	53.6
12	0.290	594.	610.	13.4	44.0
	AVERAGE	596.	612.	16.3	53.5

PS =759. MMHG (29.89 INHG)
DS = 1.14 M (45.0 IN)
A = 1.03 SQM (11.04 SQFT)
%CO2= 8.0
%CO = 0.0
%O2 = 10.3
%N2 = 81.7

ST = 72. MIN
MD = 29.69

CP = 0.851
VCF = 1.015
DH = 1.
PB =760. MMHG (0.7 IN-H2O)
TM = 45. MMHG (29.92 INHG)
WC =138. C (113.4 F)
VMC = 1.617 ML (.)
VSTD= 1.421 CUM (57.090 CUFT)
DN = 7.95 CUM (52.64 CUFT)
MS = 28.43 MM (0.313 IN)

	MG COLLECTED
PARTICULATES	120.0000
IMPINGER RESIDUE (insoluble)	2232.0000
As	0.0290
Cr	0.4850
Cr +6	0.0005
Cd	0.0480
Pb	0.2940
Ni	0.0150
Fe	0.0910
Mg	0.0480

OWENS ILLINOIS, INC.

PLANT: TRACY
DATE: 5-8-85
UNIT TESTED: B FURNACE - TEST #1

	CONCENTRATION G/DSCM	CONCENTRATION GR/DSCF	EMISSION RATE G/SEC	EMISSION RATE LB/HR
PARTICULATES	0.080651	0.035173	0.58196	4.6188
IMPINGER RESIDUE	0.021507	0.009379	0.15519	~~1.2317~~ 0.95
As	0.000019	0.000009	0.00014	0.0011
Cr	0.000326	0.000142	0.00235	0.0187
Cr +6	0.000000	0.000000~~0~~15	0.00000	0.000019
Cd	0.000032	0.000014	0.00023	0.0018
Pb	0.000198	0.000086	0.00143	0.0113
Ni	0.000010	0.000004	0.00007	0.0006
Fe	0.000061	0.000027	0.00044	0.0035
Mg	0.000032	0.000014	0.00023	0.0018

FLUE GAS VOLUME 16.74 ACMS (35470.ACFM)

7.23 DSCMS(15321.DSCFM)

MOISTURE 10.81%

ISOKINETIC SAMPLING RATE 98.6%

STANDARD CONDITIONS- 60.F, 29.92INHG

OWENS ILLINOIS, INC.

PLANT: TRACY
DATE: [illegible]-85
UNIT TESTED: 3 FURNACE - TEST #2

	VH(IN H2O)	TS(K)	TS(F)	VS(MPS)	VS(FPS)
1	0.460	597.	615.	16.9	55.5
2	0.500	611.	640.	17.8	58.5
3	0.520	616.	650.	18.3	60.0
4	0.460	583.	590.	16.7	54.8
5	0.420	589.	600.	16.0	52.7
6	0.380	583.	590.	14.2	46.4
7	0.420	597.	615.	16.2	53.0
8	0.510	591.	605.	17.7	58.0
9	0.550	605.	630.	18.6	61.1
10	0.500	611.	640.	17.8	58.5
11	0.400	614.	645.	16.0	52.5
12	0.310	608.	635.	14.0	46.0
	AVERAGE	600.	621.	16.7	54.8

PS =759. MMHG (29.89 INHG)
DS = 1.14 M (45.0 IN)
A = 1.03 SQM (11.04 SQFT)
%CO2= 8.0
%CO = 0.0
%O2 = 11.3
%N2 = 80.7

ST = 72. MIN
MD = 29.73

CP = 0.851
VCF = 1.015
DH = 1. MMHG (0.7 INH2O)
PB =760. MMHG (29.92 INHG)
TM = 51. C (124.3 F)
WC =143. ML
VMC = 1.679 CUM (59.290 CUFT)
VSTD= 1.520 CUM (53.66 CUFT)
DN = 7.95 MM (0.313 IN)
MS = 28.44

	MG COLLECTED
PARTICULATES	120.5000
IMPINGER RESIDUE (insoluble)	1.0000
As	0.0360
Cr	0.4540
Cr +6	0.0005
Cd	0.0520
Pb	0.2070
Ni	0.0070
Fe	0.0440
Mg	0.1480

OWENS ILLINOIS, INC.

PLANT: TRACY
DATE: 5-8-80
UNIT TESTED: B FURNACE - TEST #1

	CONCENTRATION G/DSCM	CONCENTRATION GR/DSCF	EMISSION RATE G/SEC	EMISSION RATE LB/HR
PARTICULATES	0.079459	0.034653	0.58010	4.6039
IMPINGER RESIDUE	0.000659	0.000288	0.00481	0.0382
As	0.000024	0.000010	0.00017	0.0014
Cr	0.000299	0.000131	0.00219	0.0173
Cr +6	0.000000	0.00000014	0.00000	0.000019
Cd	0.000034	0.000015	0.00025	0.0020
Pb	0.000136	0.000060	0.00100	0.0079
Ni	0.000005	0.000002	0.00003	0.0003
Fe	0.000029	0.000013	0.00021	0.0017
Mg	0.000098	0.000043	0.00071	0.0057

FLUE GAS VOLUME 17.12 ACMS (36268.ACFM)

7.32 DSCMS(15501.DSCFM)

MOISTURE 11.02%

ISOKINETIC SAMPLING RATE 99.3%

STANDARD CONDITIONS- 60.F, 29.92INHG

6-12-85 85C-126 + 85P71 Continued - Furnace Emission Tests

Procedure

Cut up entire fiberglass filter into 1/4" square and put into 50 mL beaker. Extract for 2 hrs. with 25 mL 0.25 M H_2SO_4 (H.P.) using teflon coated stirring bar agitation. Filtered extract thru #41 Whatman paper collecting the insoluble glass filter on the paper. Washed the glass filter material + paper 2x with 0.25 M H_2SO_4 and collected filtrate in 100 mL vol. flask. A teflon spatula was used to compress the spongy glass filter material + expel residual solution. The filtrate was diluted to 100 mL with 0.25 M H_2SO_4. Cr^{+6} (colorimetric) + soluble metals by ICP were run on the filtrate.

For Tracy filter samples, the glass filter + paper were put in 75 ml round bottom Pt dishes, used HNO_3 + HF + H_2SO_4 to wet oxidize and destroy the filter material. Took to dryness with ~2 mL H_2SO_4. Fused the residue with 2 g (1:1 molar ratio NaOH + Li_2CO_3) fusion mix. Dissolved the sample in HNO_3 and diluted to 200 mL after adding Ga. Total Cr was run on these samples.

Probe wash samples were put in tared 150 mL beaker and evaporated at room temp. Then they were dried at 110°C and residue wts. obtained. The dried residues were treated to extraction by stirring with 0.25 M H_2SO_4 just like the filter samples. Many of these samples had semi-charred or oily residues which remained

10-12-85

in the beaker after filtration through 41 paper. The 41 paper was washed with 0.25M H_2SO_4 and the filtrate diluted to 100 mL. The washed paper was returned to the corresponding beaker and the contents were treated with $HNO_3 + H_2SO_4 + H_2$ until the organic matter was gone. These samples were also taken to 100 mL volume and analyzed by ICP for total Cr in the case of hay samples. Sallo grove wash insolubles were not analyzed.

The following analysis programs residing on data disk 19 were used for ICP analysis

85P71.PRG 7 metals in 0.25M H_2SO_4

85P71A.PRG Cr only in H_2SO_4

85P71B.PRG Cr only (fusion stds) 206.149 nm
(gave bad results for background corrected data)

85P71C.PRG Cr only (fusion stds) 267.71 ±.045
(good data)

TO
Joe Grau

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03 - 8069	6822.012	5-17-85	6-12-85	S

Analytical Service Report

CONSOLIDATED SERVICES
Division of Owens-Illinois

CHEMICAL AND PHYSICAL TESTING DEPARTMENT

Analysis of Tracy B Emission Samples

mg	B-1 filter paper + residue	B-1 filter filtrate	B-1 probe wash paper + residue	B-1 probe wash filtrate	B-1 residue wt @ 110°C (probe wash) 0.0153g
As		37	45	<16	
TOTAL Cr	65	486	487	21	<2
Cd		49	49	<0.7	
Pb		301	307	<13	
Ni		14	15	<3	
Fe	13.2%	121	125	4	
Mg	(blanks subtracted)	93	96	3	

The circled values are the ones used to calculate the emission rates (in cases of < val 1/2 the value was used)

	B-2 filter paper + residue	B-2 filter filtrate	B-2 probe wash paper + residue	B-2 probe wash filtrate	B-2 probe wash residue wt at 110°C 0.0144g
As		44	52	<16	
TOTAL Cr	46	450	456	14	6
Cd		52	53		1
Pb		213	220		<13
Ni	9.5%	6	7		<3
Fe	(blanks subtracted)	73	78		5
Mg		192	196		4

	Blank Filter paper + residue	Blank Filter filtrate		110 mL acetone blank paper + residue	110 mL acetone blank filtrate	acetone blank 110 mL residue wt. @ 110°C 0.0026g
As		<16	16		<16	
TOTAL Cr	12	<2	2	<2	<2	
Cd		<0.7	1		<0.7	
Pb		<13	13		<13	
Ni		47	—		<3	
Fe		32	34		2	
Mg		47	48		0.9	

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GCD	03-8069-6822-012	5/13/85	6/3/85	

Analytical Service Report

CONSOLIDATED SERVICES
Division of Owens-Illinois

CHEMICAL AND PHYSICAL TESTING DEPARTMENT

Subject: Analysis of Glass Samples & Raw Material

Flint glass:
Total S as SO_3 : 0.18% , 0.18%

Emerald Green glass:
Total S as SO_3 : 0.13% , 0.13%

Total Cr as Cr_2O_3 : 0.12% , 0.12%

Iron Chromite:
Total Cr as Cr_2O_3 : 37.7% , 37.7%

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Analytical Service Report

CHEMICAL AND PHYSICAL TESTING DEPARTMENT

CONSOLIDATED SERVICES
Division of Owens-Illinois

Tracy B Emission Samples

Sample	µg Cr^{6+}
Tracy B-1	
Filter (85E-436)	<1 µg
Acetone Wash (85E-437)	<1 µg
Tracy B-2	
Filter (85E-438)	<1 µg
Acetone Wash (85E-439)	<1 µg

BY John E Freeman APPROVED BOOK 361 PAGE 48