Report of...

ROP Compliance Emission Sampling

Performed for...

Cadillac Casting, Inc.

Cadillac, Michigan

On the...

Cupola & SPO Pouring/Cooling Exhausts

October 25-27, 2016

029.45

Network Environmental, Inc.
Grand Rapids, MI

I. INTRODUCTION

Network Environmental, Inc. was retained by Cadillac Casting, Inc. of Cadillac, Michigan to conduct emission sampling at their facility. The purpose of the sampling was to meet the testing requirements of the State of Michigan Renewable Operating Permit (ROP) Number MI-ROP-B2178-2014.

The following is a list of the sources that were sampled and the emission limits for each source:

Source	Compound(s) To Be Sampled	Emission Limit(s)
EUMELTING (Cupola Scrubber Exhaust)	Particulate, Manganese (Mn), Lead (Pb), Total Metal HAPs, Total Hydrocarbons (VOC), Total VO HAPs, Carbon Monoxide (CO), Sulfur Dioxide (SO_2) & Fugitive VE's (MACT)	**ROP:** **Particulate:** 18.0 Lbs/Hr, 3.17 Tons/Month, 38.0 Tons/Year & 0.38 Lbs/Ton of Charge; **CO:** 375.0 Lbs/Hr, 66.7 Tons/Month, 800.0 Tons/Year & 8.0 Lbs/Ton of Charge; **SO_2:** 17.7 Lbs/Hr, 3.2 Tons/Month, 38.0 Tons/Year & 0.38 Lbs/Ton of Charge; **VOC:** 3.6 Lbs/Hr, 0.65 Tons/Month, 7.74 Tons/Year & 0.12 Lbs/Ton of Charge; **Mn:** 0.62 Lbs/Hr, & 1.35 Tons/Year; **Pb:** 0.3 Lbs/Hr, 0.054 Tons/Month, 0.65 Tons/Year & 0.0065 Lbs/Ton of Charge **MACT:** **Metal HAP's:** 0.0005 Grains/DSCF **or** 0.008 Lbs/Ton of Charge **or** **Particulate:** 0.006 Grains/DSCF **or** 0.10 Lbs/Ton of Charge; **VO HAP's:** 20 PPM @ 10% O_2; **Fugitive VE's:** 20% 6 Minute Average
EGSPOPOURANDCOOL (3 – Inline Exhaust Stacks)	Particulate, Lead (Pb), Total Hydrocarbons (VOC) & Carbon Monoxide (CO)	**Particulate:** 0.07 Lbs/Ton of Metal Processed & 6.50 Tons/Year; **Pb:** 4.4E-5 Lb/Ton of Iron Poured & 7.92 Lbs/Year; **CO:** 2.78 Lbs/Ton & 250 Tons/Year; **VOC:** 60.0 Lbs/Hr & 107.0 Tons/Year

The sampling in the study was conducted over the period of October 25-26, 2016 by R. Scott Cargill, Richard D. Eerdmans and David D. Engelhardt of Network Environmental, Inc.. Assisting with the study were Mr. Erik Olson of Cadillac Casting, Inc. and the operating staff of the facility. Mr. Rob Dickman and Mr. Shane Nixon of the MDEQ – Air Quality Division were present to observe the sampling and source operation.

II. PRESENTATION OF RESULTS

II.1 CUPOLA SCRUBBER EXHAUST (EUMELTING)

II.1.1 TABLE 1
PARTICULATE EMISSION RESULTS
CUPOLA SCRUBBER EXHAUST
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN
OCTOBER 25, 2016

Sample	Time	Air Flow Rate DSCFM (1)	Particulate Concentration Grains/DSCF (2)	Particulate Mass Rates	
				Lbs/Hr (3)	Lbs/Ton Charged (4)
1	09:48-11:30	30,154	0.0147	3.80	0.113
2	12:58-14:37	32,709	0.0125	3.51	0.107
3	15:44-17:22	32,494	0.0136	3.79	0.130
Average		**31,786**	**0.0136**	**3.70**	**0.117**

(1) DSCFM = Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) Grains/DSCF = Grains of Particulate Per Dry Standard Cubic Foot of Exhaust Gas
(3) Lbs/Hr = Pounds of Particulate Per Hour
(4) Lbs/Ton Charged = Pounds of Particulate Per Ton of Metal Charged. Calculated Using Charge Rates of 33.52 Tons/Hr For Sample 1, 32.69 Tons/Hr For Sample 2 & 29.21 Tons/Hr For Sample 3. Charge Rates Were Calculated Using Tons Of Metals Charged Data Supplied By Cadillac Casting, Inc..

II.1.2 TABLE 2
TOTAL METAL HAP'S EMISSION RESULTS
CUPOLA SCRUBBER EXHAUST
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN
OCTOBER 25, 2016

Sample	Time	Air Flow Rate DSCFM (1)	Total Metal HAP's Concentration Grains/DSCF (2)	Total Metal HAP's Mass Rates	
				Lbs/Hr (3)	Lbs/Ton Charged (4)
1	09:48-11:30	30,154	0.00057	0.147	0.0044
2	12:58-14:37	32,709	0.00027	0.075	0.0023
3	15:44-17:22	32,494	0.00059	0.165	0.0057
Average		**31,786**	**0.00047**	**0.129**	**0.0041**

(1) DSCFM = Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) Grains/DSCF = Grains Per Dry Standard Foot
(3) Lbs/Hr = Pounds Per Hour
(4) Lbs/Ton Charged = Pounds of Metal HAP's Per Ton of Metal Charged. Calculated Using Charge Rates of 33.52 Tons/Hr For Sample 1, 32.69 Tons/Hr For Sample 2 & 29.21 Tons/Hr For Sample 3. Charge Rates Were Calculated Using Tons Of Metals Charged Data Supplied By Cadillac Casting, Inc..

II.1.3 TABLE 3
METALS EMISSION RESULTS SUMMARY
CUPOLA SCRUBBER EXHAUST
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN
OCTOBER 25, 2016

Metal	Sample 1 (09:48-11:30)		Sample 2 (12:58-14:37)		Sample 3 (15:44-17:22)		**Average**	
	Lbs/Hr (1)	Lb/Ton (2)	Lbs/Hr (1)	Lb/Ton (2)	Lbs/Hr (1)	Lb/Ton (2)	**Lbs/Hr (1)**	**Lb/Ton (2)**
Arsenic (As)	1.45E-04	4.31E-06	1.32E-04	4.03E-06	1.28E-04	4.39E-06	**1.35E-04**	**4.24E-06**
Antimony (Sb)	4.71E-04	1.41E-05	3.95E-04	1.21E-05	3.36E-04	1.15E-05	**4.01E-04**	**1.25E-05**
Beryllium (Be)	9.95E-06	2.97E-07	8.07E-06	2.47E-07	1.89E-05	6.46E-07	**1.23E-05**	**3.97E-07**
Cadmium (Cd)	1.95E-04	5.81E-06	2.05E-04	6.28E-06	1.84E-04	6.31E-06	**1.95E-04**	**6.13E-06**
Chromium (Cr)	1.13E-03	3.36E-05	1.21E-03	3.71E-05	1.43E-03	4.90E-05	**1.26E-03**	**3.99E-05**
Cobalt (Co)	5.74E-05	1.71E-06	8.44E-05	2.58E-06	6.95E-05	2.38E-06	**7.04E-05**	**2.22E-06**
Lead (Pb)	2.22E-02	6.64E-04	1.72E-02	5.26E-04	3.24E-02	1.11E-03	**2.39E-02**	**7.66E-04**
Manganese (Mn)	1.21E-01	3.62E-03	5.38E-02	1.65E-03	1.29E-01	4.43E-03	**1.02E-01**	**3.23E-03**
Nickel (Ni)	1.40E-03	4.17E-05	1.50E-03	4.59E-05	1.02E-03	3.50E-05	**1.31E-03**	**4.08E-05**
Selenium (Se)	5.61E-05	1.67E-06	4.70E-05	1.44E-06	3.55E-05	1.22E-06	**4.62E-05**	**1.44E-06**
Mercury (Hg)	2.27E-04	6.76E-06	6.37E-05	1.95E-06	6.65E-05	2.28E-06	**1.19E-04**	**3.66E-06**

(1) Lbs/Hr = Pounds Per Hour (Calculated using 30,154 DSCFM for Sample 1, 32,709 DSCFM for Sample 2 & 32,494 DSCFM for Sample 3)
(2) Lb/Ton = Pound Per Ton of Metal Charged. Calculated Using Charge Rates of 33.52 Tons/Hr For Sample 1, 32.69 Tons/Hr For Sample 2 & 29.21 Tons/Hr For Sample 3. Charge Rates Were Calculated Using Tons Of Metals Charged Data Supplied By Cadillac Casting, Inc..

II.1.4 TABLE 4
TOTAL HYDROCARBON (VOC) EMISSION RESULTS
CUPOLA SCRUBBER EXHAUST
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN
OCTOBER 25, 2016

Sample	Time	Air Flow Rate SCFM (1)	VOC Concentration PPM (2)	VOC Mass Rates	
				Lbs/Hr (3)	Lbs/Ton of Charge (4)
1	10:58-11:58	44,299	1.6	0.48	0.012
2	12:36-13:36	46,337	1.6	0.51	0.015
3	15:41-16:48	46,559	1.4	0.45	0.015
Average		**45,732**	**1.5**	**0.48**	**0.014**

(1) SCFM = Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) PPM = Parts Per Million (v/v) On An Actual "Wet" Basis As Propane
(3) Lbs/Hr = Pounds of VOC Per Hour As Propane
(4) Lbs/Ton of Charge = Pounds of VOC Per Ton of Metal Charged. Calculated Using Charge Rates of 41.12 Tons/Hr For Sample 1, 33.92 Tons/Hr For Sample 2 & 30.51 Tons/Hr For Sample 3. Charge Rates Were Calculated Using Tons Of Metals Charged Data Supplied By Cadillac Casting, Inc..

II.1.5 TABLE 5
VO HAP'S EMISSION RESULTS
CUPOLA SCRUBBER EXHAUST
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN
OCTOBER 25, 2016

Sample	Time	Air Flow Rate SCFM (1)	VO HAP's PPM (2)	VO HAP's PPM @ 10% O_2 (3)
1	10:58-11:58	44,299	0.8	0.76
2	12:36-13:36	46,337	0.8	0.77
3	15:41-16:48	46,559	0.7	0.72
Average		**45,732**	**0.8**	**0.75**

(1) SCFM = Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) PPM = Parts Per Million (v/v) On An Actual Basis As Hexane
(3) PPM @ 10% O_2 = Parts Per Million (v/v) On An Actual Basis As Hexane Corrected To 10 Percent Oxygen

II.1.6 TABLE 6
CARBON MONOXIDE (CO) EMISSION RESULTS
CUPOLA SCRUBBER EXHAUST
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN
OCTOBER 25, 2016

Sample	Time	Air Flow Rate DSCFM (1)	CO Concentration PPM (2)	CO Mass Rates	
				Lbs/Hr (3)	Lbs/Ton of Charge (4)
1	10:58-11:58	30,154	399.2	52.34	1.27
2	12:36-13:36	32,709	113.4	16.13	0.48
3	15:41-16:48	32,494	42.1	5.95	0.20
Average		**31,786**	**184.9**	**24.81**	**0.65**

(1) DSCFM = Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) PPM = Parts Per Million (v/v) On A Dry Basis
(3) Lbs/Hr = Pounds of CO Per Hour
(4) Lbs/Ton of Charge = Pounds of CO Per Ton of Metal Charged. Calculated Using Charge Rates of 41.12 Tons/Hr For Sample 1, 33.92 Tons/Hr For Sample 2 & 30.51 Tons/Hr For Sample 3. Charge Rates Were Calculated Using Tons Of Metals Charged Data Supplied By Cadillac Casting, Inc..

II.1.7 TABLE 7
SULFUR DIOXIDE (SO_2) EMISSION RESULTS
CUPOLA SCRUBBER EXHAUST
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN
OCTOBER 25, 2016

Sample	Time	Air Flow Rate DSCFM (1)	SO_2 Concentration PPM (2)	SO_2 Mass Rates	
				Lbs/Hr (3)	Lbs/Ton of Charge (4)
1	10:58-11:58	30,154	3.1	0.93	0.023
2	12:36-13:36	32,709	9.3	3.02	0,089
3	15:41-16:48	32,494	1.5	0.48	0.016
Average		**31,786**	**4.6**	**1.48**	**0.043**

(1) DSCFM = Dry Standard Cubic Feet Per Minute (STP = 68 ºF & 29.92 in. Hg)
(2) PPM = Parts Per Million (v/v) On A Dry Basis
(3) Lbs/Hr = Pounds of SO_2 Per Hour
(4) Lbs/Ton of Charge = Pounds of SO_2 Per Ton of Metal Charged. Calculated Using Charge Rates of 41.12 Tons/Hr For Sample 1, 33.92 Tons/Hr For Sample 2 & 30.51 Tons/Hr For Sample 3. Charge Rates Were Calculated Using Tons Of Metals Charged Data Supplied By Cadillac Casting, Inc..

II.2 EGSPOPOURANDCOOL (3 - INLINE EXHAUST STACKS)

II.2.1 TABLE 8
PARTICULATE EMISSION RESULTS
EGSPOPOURANDCOOL
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN

Source	Sample	Date	Time	Air Flow Rate SCFM (1)	Particulate Mass Rate	
					Lbs/Hr (2)	Lbs/Ton of Metal (3)
SPO Pouring/Cooling #1	1	10/26/16	11:56-12:58	7,915	0.13	0.0038
	2	10/26/16	13:53-14:56	7,961	0.18	0.0067
	3	10/26/16	15:42-16:46	8,304	0.17	0.0059
	Average			**8,060**	**0.16**	**0.0055**
SPO Pouring/Cooling #2	1	10/26/16	17:44-18:48	7,360	0.11	0.0036
	2	10/27/16	08:45-10:31	7,335	0.08	0.0030
	3	10/27/16	11:11-12:18	7,517	0.06	0.0026
	Average			**7,404**	**0.08**	**0.0031**
SPO Pouring/Cooling #3	1	10/27/16	13:27-14:32	6,829	0.07	0.0028
	2	10/27/16	15:37-16:41	7,058	0.08	0.0027
	3	10/27/16	17:01-18:03	7,332	0.10	0.0032
	Average			**7,073**	**0.08**	**0.0029**

(1) SCFM = Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) Lbs/Hr = Pounds of Particulate Per Hour
(3) Lbs/Ton of Metal = Pounds of Particulate Per Ton of Metal Processed. Calculated Using The Following Metal Process Rates: Stack #1; 34.16 Tons/Hr For Sample 1, 26.76 Tons/Hr For Sample 2 & 28.97 Tons/Hr For Sample 3. Stack#2; 30.75 Tons/Hr For Sample 1, 26.94 Tons/Hr For Sample 2 & 22.93 Tons/Hr For Sample 3. Stack #3; 25.02 Tons/Hr For Sample 1, 29.72 Tons/Hr For Sample 2 & 31.26 Tons/Hr For Sample 3. Metal Process Rates Were Calculated Using Tons Of Metals Poured Data Supplied By Cadillac Casting, Inc..

II.2.2 TABLE 9
LEAD (Pb) EMISSION RESULTS
EGSPOPOURANDCOOL
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN

Source	Sample	Date	Time	Air Flow Rate DSCFM (1)	Lead (Pb) Mass Rate	
					Lbs/Hr (2)	Lbs/Ton of Iron (3)
SPO Pouring/Cooling #1	1	10/26/16	11:56-12:58	7,830	1.96E-04	5.73E-06
	2	10/26/16	13:53-14:56	7,876	1.99E-04	7.42E-06
	3	10/26/16	15:42-16:46	8,212	1.95E-04	6.72E-06
	Average			**7,972**	**1.96E-04**	**6.62E-06**
SPO Pouring/Cooling #2	1	10/26/16	17:44-18:48	7,296	1.71E-04	5.56E-06
	2	10/27/16	08:45-10:31	7,286	2.14E-04	7.93E-06
	3	10/27/16	11:11-12:18	7,446	1.20E-04	5.24E-06
	Average			**7,343**	**1.68E-04**	**6.24E-06**
SPO Pouring/Cooling #3	1	10/27/16	13:27-14:32	6,757	7.65E-05	3.06E-06
	2	10/27/16	15:37-16:41	6,993	1.30E-04	4.38E-06
	3	10/27/16	17:01-18:03	7,217	6.90E-05	2.21E-06
	Average			**6,989**	**9.19E-05**	**3.21E-06**

(1) DSCFM = Dry Standard Cubic Feet Per Minute (STP = 68 ºF & 29.92 in. Hg)
(2) Lbs/Hr = Pounds of Pb Per Hour
(3) Lbs/Ton of Iron = Pounds of Pb Per Ton of Iron Poured. Calculated Using The Following Metal Process Rates: Stack #1; 34.16 Tons/Hr For Sample 1, 26.76 Tons/Hr For Sample 2 & 28.97 Tons/Hr For Sample 3. Stack#2; 30.75 Tons/Hr For Sample 1, 26.94 Tons/Hr For Sample 2 & 22.93 Tons/Hr For Sample 3. Stack #3; 25.02 Tons/Hr For Sample 1, 29.72 Tons/Hr For Sample 2 & 31.26 Tons/Hr For Sample 3. Metal Process Rates Were Calculated Using Tons Of Metals Poured Data Supplied By Cadillac Casting, Inc..

II.2.3 TABLE 10
TOTAL HYDROCARBON (VOC) EMISSION RESULTS
EGSPOPOURANDCOOL
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN

Source	Sample	Date	Time	Air Flow Rate SCFM (1)	VOC Concentration PPM (2)	VOC Mass Rates	
						Lbs/Hr (3)	Lbs/Ton (4)
SPO Pouring /Cooling #1 Exhaust	1	10/26/16	11:48-12:51	7,915	35.1	1.90	0.057
	2	10/26/16	13:41-15:00	7,961	33.7	1.83	0.068
	3	10/26/16	15:44-16:50	8,304	31.7	1.80	0.065
	Average			**8,060**	**33.5**	**1.84**	**0.063**
SPO Pouring /Cooling #2 Exhaust	1	10/26/16	17:39-18:50	7,360	37.9	1.91	0.062
	2	10/27/16	08:31-10:46	7,335	37.9	1.90	0.054
	3	10/27/16	11:13-12:17	7,517	29.7	1.53	0.069
	Average			**7,404**	**35.2**	**1.78**	**0.062**
SPO Pouring /Cooling #3 Exhaust	1	10/27/16	13:23-14:33	6,829	28.7	1.34	0.055
	2	10/27/16	15:35-16:40	7,058	31.1	1.50	0.050
	3	10/27/16	17:00-18:05	7,332	32.9	1.65	0.059
	Average			**7,073**	**30.9**	**1.50**	**0.055**

(1) SCFM = Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) PPM = Parts Per Million (v/v) On A Wet (Actual) Basis
(3) Lbs/Hr = Pounds of VOC Per Hour As Propane
(4) Lbs/Ton = Pounds of VOC Per Ton of Iron Poured. Calculated Using The Following Metal Process Rates: Stack #1; 33.52 Tons/Hr For Sample 1, 27.04 Tons/Hr For Sample 2 & 27.55 Tons/Hr For Sample 3. Stack#2; 30.85 Tons/Hr For Sample 1, 35.50 Tons/Hr For Sample 2 & 22.31 Tons/Hr For Sample 3. Stack #3; 24.43 Tons/Hr For Sample 1, 29.91 Tons/Hr For Sample 2 & 27.78 Tons/Hr For Sample 3. Metal Process Rates Were Calculated Using Tons Of Metals Poured Data Supplied By Cadillac Casting, Inc..

II.2.4 TABLE 11
CARBON MONOXIDE (CO) EMISSION RESULTS
EGSPOPOURANDCOOL
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN

Source	Sample	Date	Time	Air Flow Rate DSCFM (1)	CO Concentration PPM (2)	CO Mass Rates	
						Lbs/Hr (3)	Lbs/Ton (4)
SPO Pouring /Cooling #1 Exhaust	1	10/26/16	11:48-12:51	7,830	405.1	13.79	0.411
	2	10/26/16	13:41-15:00	7,876	377.2	12.92	0.478
	3	10/26/16	15:44-16:50	8,212	388.9	13.89	0.504
	Average			**7,972**	**390.4**	**13.53**	**0.464**
SPO Pouring /Cooling #2 Exhaust	1	10/26/16	17:39-18:50	7,296	517.6	16.42	0.532
	2	10/27/16	08:31-10:46	7,286	503.4	15.95	0.449
	3	10/27/16	11:13-12:17	7,446	371.6	12.03	0.539
	Average			**7,343**	**464.2**	**14.80**	**0.507**
SPO Pouring /Cooling #3 Exhaust	1	10/27/16	13:23-14:33	6,757	367.8	10.81	0.442
	2	10/27/16	15:35-16:40	6,993	397.5	12.09	0.404
	3	10/27/16	17:00-18:05	7,217	340.6	10.69	0.385
	Average			**6,989**	**368.6**	**11.20**	**0.410**

(1) DSCFM = Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) PPM = Parts Per Million (v/v) On A Dry Basis
(3) Lbs/Hr = Pounds of CO Per Hour
(4) Lbs/Ton = Pounds of CO Per Ton of Iron Poured. Calculated Using The Following Metal Process Rates: Stack #1; 33.52 Tons/Hr For Sample 1, 27.04 Tons/Hr For Sample 2 & 27.55 Tons/Hr For Sample 3. Stack#2; 30.85 Tons/Hr For Sample 1, 35.50 Tons/Hr For Sample 2 & 22.31 Tons/Hr For Sample 3. Stack #3; 24.43 Tons/Hr For Sample 1, 29.91 Tons/Hr For Sample 2 & 27.78 Tons/Hr For Sample 3. Metal Process Rates Were Calculated Using Tons Of Metals Poured Data Supplied By Cadillac Casting, Inc..

III. DISCUSSION OF RESULTS

The results of the emission sampling are summarized in Tables 1 through 11 (Sections II.1 through II.2). The results are presented as follows:

III.1 Cupola (EUMELTING) Scrubber Exhaust

III.1.1 Cupola Particulate Emission Results (Table 1)

Table 1 summarizes the Cupola particulate emission results as follows:

- Sample
- Time
- Air Flow Rate (DSCFM) – Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- Particulate Concentration (Grains/DSCF) – Grains of Particulate Per Dry Standard Cubic Foot of Exhaust Gas
- Particulate Mass Emission Rate (Lbs/Hr) – Pounds of Particulate Per Hour
- Particulate Mass Emission Rate (Lbs/Ton Charged) – Pounds of Particulate Per Ton of Metal Charged

A more detailed breakdown for each sample can be found in Appendix A.

III.1.2 Cupola Total Metal HAP's Emission Results (Table 2)

Table 2 summarizes the cupola total metal HAP's emission results as follows:

- Sample
- Time
- Air Flow Rate (DSCFM) – Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- Total Metal HAP's Concentration (Grains/DSCF) – Grains Per Dry Standard Cubic Foot
- Total Metal HAP's Mass Emission Rate (Lbs/Hr) – Pounds Per Hour
- Total Metal HAP's Mass Emission Rate (Lbs/Ton Charged) – Pounds Per Ton of Metal Charged

A more detailed breakdown for each sample can be found in Appendix A.

III.1.3 Cupola Metals Emission Results (Table 3)

Table 3 summarizes the cupola metals emission results as follows:

- Sample

- Time
- Metals Mass Emission Rate (Lbs/Hr) – Pounds Per Hour
- Metals Mass Emission Rate (Lb/Ton) – Pound Per Ton of Metal Charged

III.1.4 Cupola Total Hydrocarbon (VOC) Emission Results (Table 4)

Table 4 summarizes the cupola VOC emission results as follows:

- Sample
- Time
- Air Flow Rate (SCFM) – Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- VOC Concentration (PPM) – Parts Per Million (v/v) On An Actual (Wet) Basis As Propane
- VOC Mass Emission Rate (Lbs/Hr) – Pounds of VOC Per Hour As Propane
- VOC Mass Emission Rate (Lbs/Ton of Charge) – Pounds of VOC Per Ton of Metal Charged

III.1.5 Cupola VO HAP's Emission Results (Table 5)

Table 5 summarizes the cupola VO HAP's emission results as follows:

- Sample
- Time
- Air Flow Rate (SCFM) – Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- VO HAP's Concentration (PPM) – Parts Per Million (v/v) On An Actual (Wet) Basis As Hexane
- VO HAP's Concentration (PPM @ 10% O_2) – Parts Per Million (v/v) On An Actual (Wet) Basis As Hexane Corrected to 10 Percent Oxygen

III.1.6 Cupola Carbon Monoxide (CO) Emission Results (Table 6)

Table 6 summarizes the CO emission results as follows:

- Sample
- Time
- Air Flow Rate (DSCFM) – Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- CO Concentration (PPM) – Parts Per Million (v/v) On A Dry Basis
- CO Mass Emission Rate (Lbs/Hr) – Pounds of CO Per Hour
- CO Mass Emission Rate (Lbs/Ton of Charge) – Pounds of CO Per Ton of Metal Charged

III.1.7 Cupola Sulfur Dioxide (SO_2) Emission Results (Table 7)

Table 7 summarizes the SO_2 emission results as follows:

- Sample
- Time
- Air Flow Rate (DSCFM) – Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- SO_2 Concentration (PPM) – Parts Per Million (v/v) On A Dry Basis
- SO_2 Mass Emission Rate (Lbs/Hr) – Pounds of SO_2 Per Hour
- SO_2 Mass Emission Rate (Lbs/Ton of Charge) – Pounds of SO_2 Per Ton of Metal Charged

III.1.8 Visible Emissions

The visible emissions (VE's) observations can be found in Appendix D. Fugitive VE's from the foundry buildings were recorded on 10/27/16. The highest six minute average opacity reading recorded was 2.3%.

III.2 EUSPOPOURANDCOOL (3 - INLINE EXHAUST STACKS)

III.2.1 EGSPOPOURANDCOOL Particulate Emission Results (Table 8)

Table 8 summarizes the EGSPOPOURANDCOOL (SPO Pouring/Cooling #1, #2 & #3 Exhausts) particulate emission results as follows:

- Source
- Sample
- Date
- Time
- Air Flow Rate (SCFM) – Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- Particulate Mass Emission Rate (Lbs/Hr) – Pounds of Particulate Per Hour
- Particulate Mass Emission Rate (Lbs/Ton of Metal) – Pounds of Particulate Per Ton of Metal Processed

A more detailed breakdown for each sample can be found in Appendix A.

III.2.2 EGSPOPOURANDCOOL Lead (Pb) Emission Results (Table 9)

Table 9 summarizes the EGSPOPOURANDCOOL (SPO Pouring/Cooling #1, #2 & #3 Exhausts) Pb emission results as follows:

- Source
- Sample
- Date
- Time
- Air Flow Rate (DSCFM) – Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- Pb Mass Emission Rate (Lbs/Hr) – Pounds of Pb Per Hour
- Pb Mass Emission Rate (Lbs/Ton of Iron) – Pounds of Pb Per Ton of Iron Poured

A more detailed breakdown for each sample can be found in Appendix A.

III.2.3 EGSPOPOURANDCOOL Total Hydrocarbon (VOC) Emission Results (Table 10)

Table 10 summarizes the EGSPOPOURANDCOOL (SPO Pouring/Cooling #1, #2 & #3 Exhausts) VOC emission results as follows:

- Source
- Sample
- Date
- Time
- Air Flow Rate (SCFM) – Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- VOC Concentration (PPM) – Parts Per Million (v/v) On A Wet (Actual) Basis
- VOC Mass Emission Rate (Lbs/Hr) – Pounds of VOC Per Hour As Propane
- VOC Mass Emission Rate (Lbs/Ton) – Pounds of VOC Per Ton of Iron Poured

III.2.4 EGSPOPOURANDCOOL Carbon Monoxide (CO) Emission Results (Table 11)

Table 11 summarizes the EGSPOPOURANDCOOL CO emission results as follows:

- Sample
- Date
- Time
- Air Flow Rate (DSCFM) – Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- CO Concentration (PPM) – Parts Per Million (v/v) On A Dry Basis
- CO Mass Emission Rate (Lbs/Hr) – Pounds of CO Per Hour
- CO Mass Emission Rate (Lbs/Ton Poured) – Pounds of CO Per Ton of Iron Poured

IV. SAMPLING AND ANALYTICAL PROTOCOL

The sampling location for each source was as follows:

- Cupola Scrubber Exhaust – A 48 inch I.D. diameter exhaust stack with 2 sample ports in a location 8 duct diameters downstream and 3 duct diameters upstream from the nearest disturbances. Twelve (12) sampling points were used for the isokinetic sampling on this source.

- EUSPOPOURANDCOOL (3 – Inline Exhaust Stacks) – Each exhaust is a 24 inch I.D. diameter stack and have 2 sample ports in a location 20 duct diameters downstream and 5 duct diameters upstream from the nearest disturbances. Twelve (12) sampling points were used for the isokinetic sampling.

The emission sampling was conducted by employing the following reference methods:

- Particulate – U.S. EPA Method 5 (Combined with Method 29)
- Lead (Pb), Manganese (Mn) & Total Metal HAPs – U.S. EPA Method 29 (Multiple Metals Train)
- Total Hydrocarbons (VOC's) & VO HAP's – U.S. EPA Method 25A
- Carbon Monoxide (CO) – U.S. EPA Method 10
- Visible Emissions (Fugitive MACT) – U.S. EPA Method 9
- Exhaust Gas Parameters (air flow, temperature, moisture & density) - U.S. EPA Methods 1-4

IV.1 Particulate & Metals

The total particulate & metals emission sampling was determined by employing U.S. EPA Method 29 (multiple metals train). Three (3) samples were collected from each of the sources. The samples were a minimum of sixty (60) minutes in duration. Each sample had a minimum sample volume of sixty (60) dry standard cubic feet for all the MACT compliance samples and thirty (30) dry standard cubic feet for the rest of the particulate/metals samples. The samples were collected isokinetically on quartz filters, in a nitric acid/hydrogen peroxide solution and in a acidic potassium permanganate solution (where applicable).

The filters, nozzle/probe rinses (front half) were analyzed gravimetrically for particulates in accordance with U.S. EPA Reference Method 5. The front half and the nitric acid/hydrogen peroxide solutions were analyzed for the specific metals by inductively coupled argon plasma mass spec (ICAP/MS) analysis. The front half, the nitric acid/hydrogen peroxide solutions and the acidic potassium permanganate solutions were analyzed for mercury by cold vapor atomic absorption spectrophotometry (CVAAS) (where applicable). All the quality assurance and quality control procedures listed in the methods will be incorporated in the sampling and analysis.

The metals analyzed were as follows:

SPO Pouring/Cooling – Lead (Pb)

Cupola ROP & Metal HAP's –

- Arsenic (As)
- Antimony (Sb)
- Beryllium (Be)
- Cadmium (Cd)
- Chromium (Cr)
- Cobalt (Co)
- Mercury (Hg)
- Lead (Pb)
- Manganese (Mn)
- Nickel (Ni)
- Selenium (Se)

A diagram of the particulate and metals sampling train is shown in Figure 1.

IV.2 Carbon Monoxide (CO) - The Carbon Monoxide (CO) emission sampling was conducted in accordance with U.S. EPA Reference Method 10. The sample gas was extracted from the exhausts through a heated teflon sample line which led to a VIA MAK 2 sample gas conditioner and then to a Thermo Environmental Model 48C portable stack gas monitor. This analyzer is capable of giving instantaneous readouts of the CO concentrations (PPM). Three (3) samples were collected from each of the exhausts sampled. Each sample was sixty (60) minutes in duration.

The analyzer was calibrated with EPA protocol CO calibration gases. Span gases of 4,509 PPM (for the Cupola), 2,215 PPM (for the SPO Pouring/Cooling on 10/26/16) and 985.3 PPM (for the SPO Pouring/Cooling on 10/27/16) were used to establish the initial instrument calibration. Calibration gases of 2,215 PPM, 985.3 PPM, 492.5PPM & 249.4 PPM (for the Cupola), 985.3 PPM, 492.5PPM & 249.4 PPM (for the SPO Pouring/Cooling on 10/26/16) and 492.5PPM & 249.4 PPM (for the SPO Pouring/Cooling on 10/27/16) were used to determine the calibration error of the analyzer. The sampling system (from the back of the stack probe to the analyzer) was injected using the 492.5 PPM gas to determine the system bias. After each sample, a system zero and system injection of 492.5 PPM were performed to establish system drift and system bias during the test period. All calibration gases were EPA Protocol 1 Certified.

The analyzer was calibrated to the output of the data acquisition system (DAS) used to collect the data from the exhausts. The analyzer averages were corrected for calibration error and drift using formula EQ.7E-5 from 40 CFR Part 60, Appendix A, Method 7E. A diagram of the sampling train is shown in Figure 2.

IV.3 Total Hydrocarbons (VOC) – The VOC sampling was conducted in accordance with U.S. EPA Reference Method 25A. A J.U.M. Model 3-500 flame ionization detector (FID) analyzer was used to monitor the sources sampled. Sample gas was extracted through a heated probe. A heated teflon sample line was used to transport the exhaust gases to the analyzer. The analyzer produces instantaneous readouts of the VOC concentrations (PPM).

The analyzer was calibrated by system injection (from the back of the stack probe to the analyzer) prior to the testing. A span gas of 96.49 PPM Propane was used to establish the initial instrument calibration. Calibration gases of 29.17 PPM and 50.19 PPM Propane were used to determine the calibration error of the analyzer. For the Cupola VO HAP's determinations, Hexane calibration gases of 86.00 PPM, 51.20 PPM and 27.00 PPM were also used in order to develop a response factor. After each sample, a system zero and system injection of 29.17 PPM Propane and 27.00 PPM Hexane (Cupola Only) were performed to establish system drift and system bias during the test period. All calibration gases used were EPA Protocol Calibration Gases. Three (3) samples were collected from each of the sources. Each sample was sixty (60) minutes in duration.

The analyzer was calibrated to the output of the data acquisition system (DAS) used to collect the data from the exhaust. The analyzer averages were corrected for calibration error and drift using formula EQ.7E-5 from 40 CFR Part 60, Appendix A, Method 7E. Figure 3 is a diagram of the VOC sampling train.

IV.4 Oxygen & Carbon Dioxide (Cupola Only) – The O_2 & CO_2 sampling was conducted in accordance with U.S. EPA Reference Method 3A. Servomex Model 1400M portable stack gas analyzers were used to monitor the exhaust. A heated teflon sample line was used to transport the exhaust gases to a gas conditioner to remove moisture and reduce the temperature. From the gas conditioner stack gases were passed to the analyzers. The analyzers produce instantaneous readouts of the O_2 & CO_2 concentrations (%). Three (3) samples were collected from the Cupola exhaust. Each sample was sixty (60) minutes in duration.

The analyzers were calibrated by direct injection prior to the testing. Span gases of 20.96% and 20.1% CO_2 were used to establish the initial instrument calibrations. Calibration gases of 12.1% O_2/5.97% CO_2 and 5.96% O_2/12.1% CO_2 were used to determine the calibration error of the analyzers. The sampling system (from the back of the stack probe to the analyzers) was injected using the 12.1% O_2/5.97% CO_2 gas to determine the system bias. After each sample, a system zero and system injection of 12.1% O_2/5.97% CO_2 were performed to establish system drift and system bias during the test period. All calibration gases were EPA Protocol 1 Certified.

The analyzers were calibrated to the output of the data acquisition system (DAS) used to collect the data from the exhaust. The analyzer averages were corrected for calibration error and drift using formula EQ.7E-5 from 40 CFR Part 60, Appendix A, Method 7E. A diagram of the sampling train is shown in Figure 2.

IV.5 Exhaust Gas Parameters – The exhaust gas parameters (air flow rate, temperature, moisture and density) were determined in conjunction with the other sampling by employing U.S. EPA Methods 1 through 4.

The SPO Pouring/Cooling exhausts have demonstrated ambient air (20.9% O_2 & 0.0 % CO_2) gas composition in the past. The ambient air default values were used to calculate gas density for the SPO Pouring/Cooling exhausts.

Air flow rates, temperatures and moistures were determined using the isokinetic sampling trains. All the quality assurance and quality control procedures listed in the methods were incorporated in the sampling and analysis.

IV.6 Visible Emissions – The VE's were determined in accordance with U.S. EPA Reference Method 9. The observations were conducted by a certified VE observer (Richard D. Eerdmans) in accordance with the method. VE's were monitored on 10/27/16. A copy of the observer's VE certification and data sheets can be found in Appendix D.

This report was prepared by:

David D. Engelhardt
Vice President

This report was reviewed by:

Stephan K. Byrd
President

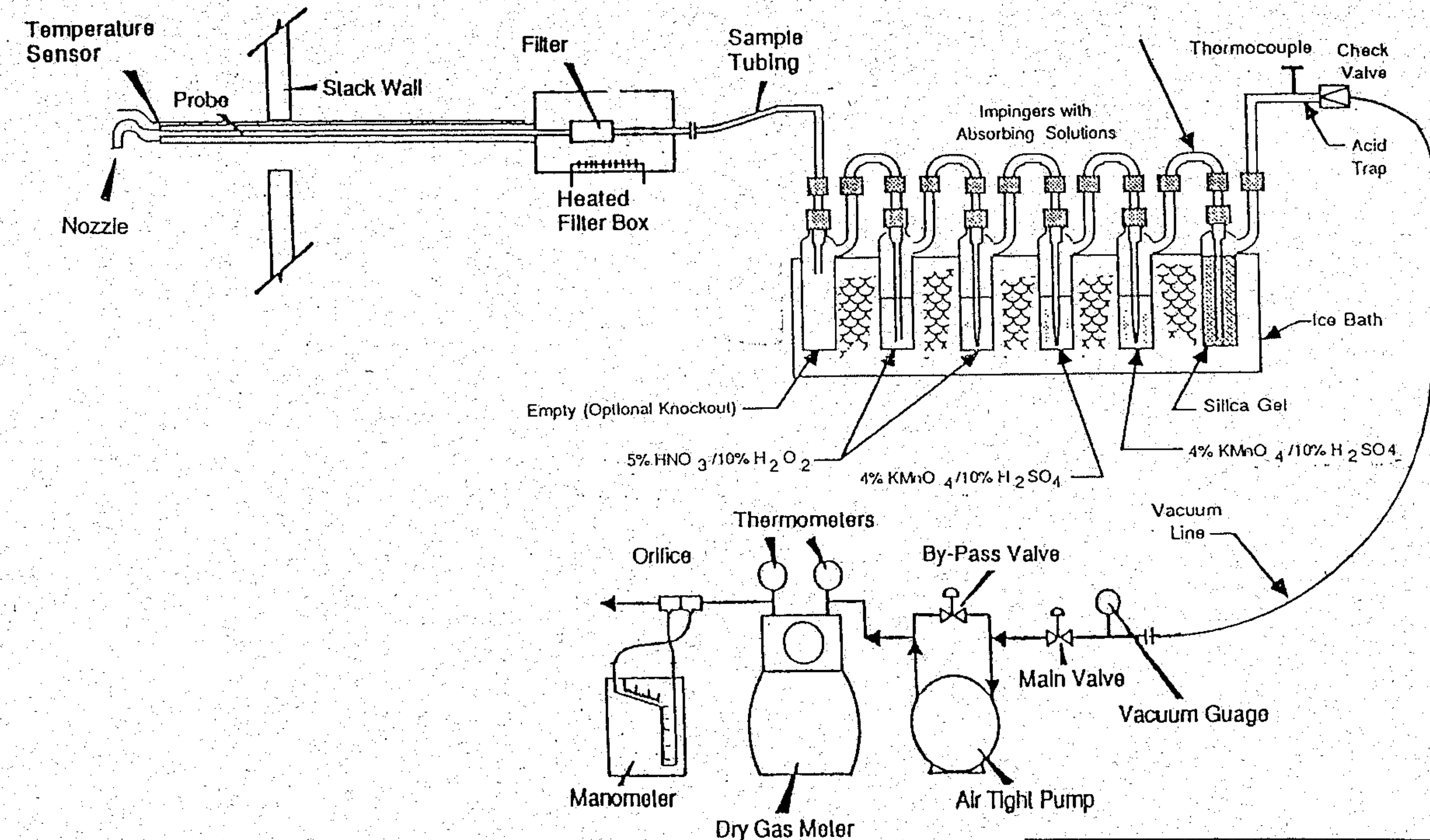

Figure 1

Particulate & Metals Sampling Train

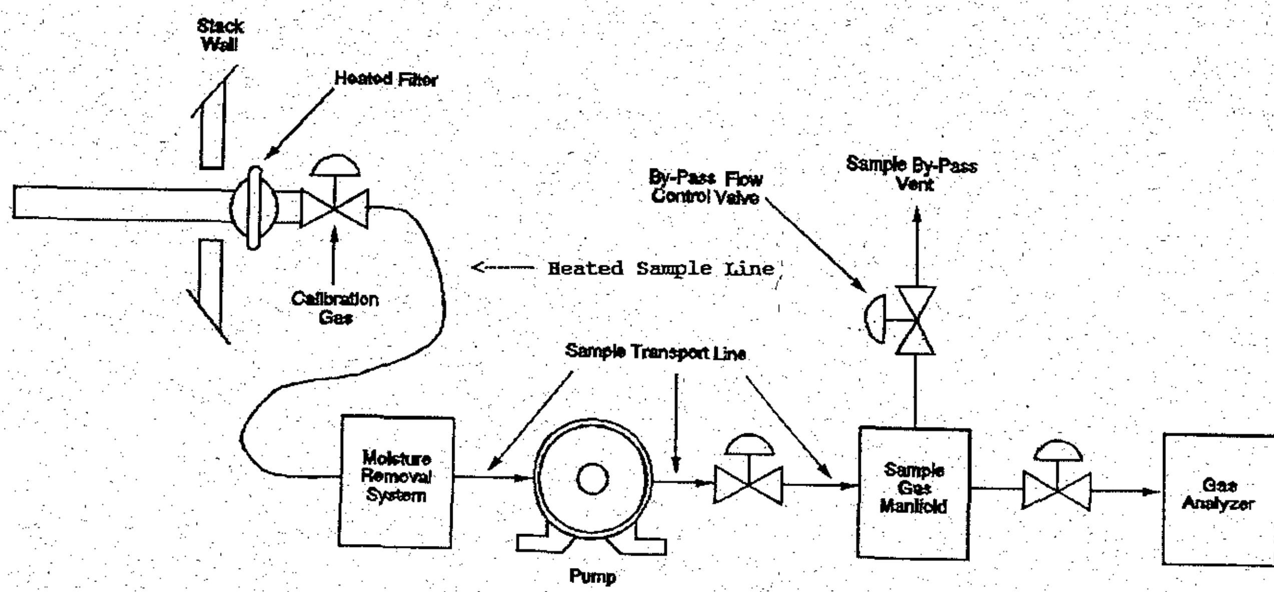

Figure 2

CO, SO_2, O_2 & CO_2 Sampling Train

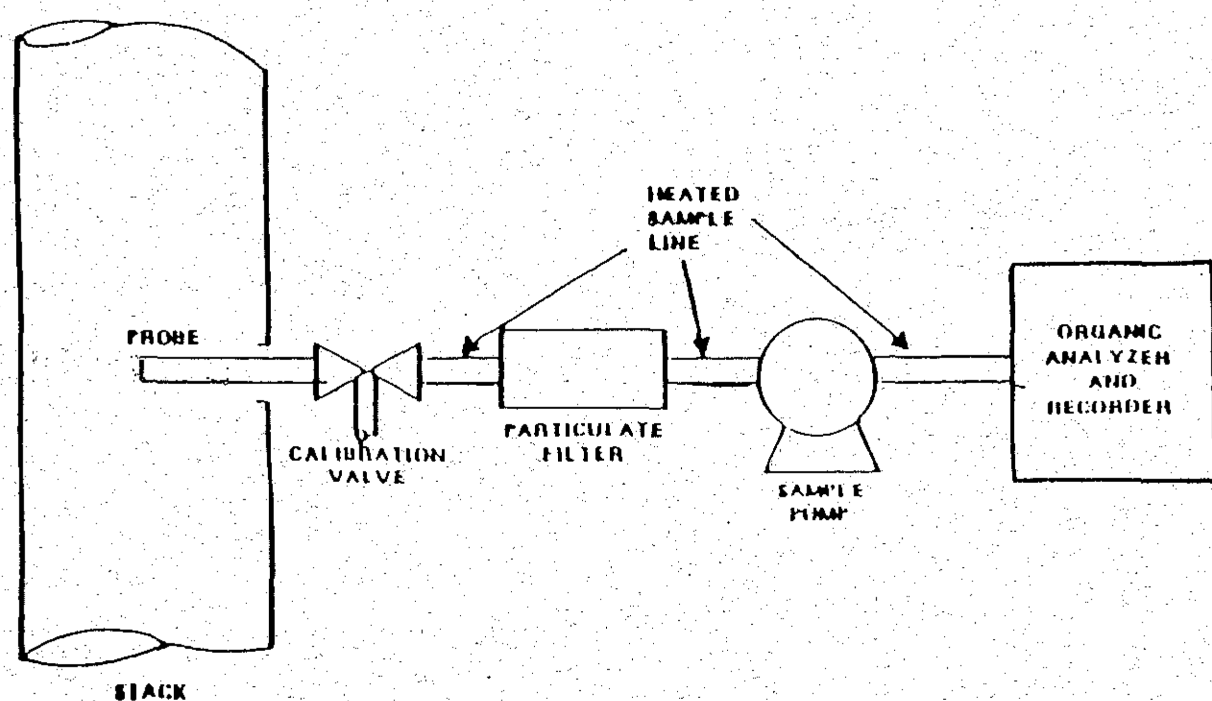

Figure 3

VOC & VO HAP's Sampling Train