Report of...

Compliance Emission Sampling

Performed for...

Morton Salt

Manistee, Michigan

On...

Various Sources

June 12-14, 2018

Project #: 203.12

By...

Network Environmental, Inc.
Grand Rapids, MI

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I. INTRODUCTION

Network Environmental, Inc. was retained by Morton Salt of Manistee, Michigan, to conduct an emission study at their facility. The purpose of the study was to meet the emission testing requirements of Michigan Department of Environmental Quality (MDEQ) – Air Quality Division Renewable Operating Permit No. MI-ROP-B1824-2015a. The following is a list of the sampling conducted and the established emission limits for each source:

Source	Compound(s) Sampled	Emission Limit
#6 Boiler Baghouse Exhaust **EU#6BOILER**	Particulate, Sulfur Dioxide (SO_2), Mercury (Hg), Carbon Monoxide (CO) & Hydrochloric Acid (HCl)	**Particulate:** 0.30 Lbs/1000 Lbs of exhaust gas @ 50% excess air **SO_2:** 2.5 Lbs/MMBTU **Hg:** 2.2E-05 Lbs/MMBTU **CO:** 420 PPM, Dry @3 %O_2 **HCl** (1)**:** See Below
MAC Baghouse Exhaust **FGPELLPRETZEL** (EUPELLPROD & EUPRETZELSALT)	Particulate (2) (See Below)	**Particulate (PM):** 0.014 Grains/DSCF **PM 10:** 3.96 Lbs/Hr **PM 2.5:** 3.96 Lbs/Hr
Pellet Cooling Scrubber Exhaust **EUPELLETCOOLING**	Particulate	**Particulate:** 0.032 Lbs/1000 Lbs of exhaust gas

(1) While there is no HCL emission limit under the area source NESHAP rule (40 CFR Part 63 Subpart JJJJJJ), the source must demonstrate that potential to emit (PTE) is less than Clean Air Act (CAA) major source thresholds (10 tons per year of a single HAP or 25 tons per year of total HAPs). As Hg levels from the boiler are negligible and no other non - de minimus sources of HAPs are at the facility, HCl is the HAP of concern. The HCl testing was designed to demonstrate that the HCl emissions are below 9.9 Tons/Year (an approximate emission level of 0.015 Lbs/MMBTU). The results were calculated at worst case conditions (8760 hours per year of operation and a maximum design rate of 216 MMBTU/Hr for the boiler)

(2) The total particulate (front half filterable and back half condensable) emissions was determined. By adding the condensable particulate to the filterable particulate the testing was designed to meet the PM 10 & PM 2.5 requirements of the permit. Both the pellet production and the pretzel salt operations were running during the sampling.

The following reference test methods were employed to conduct the emission sampling:

- Particulate – U.S. EPA Method 17
- PM 10 & PM 2.5 – U.S. EPA Methods 17 & 202
- Mercury (Hg) – U.S. EPA Method 29
- Hydrochloric Acid (HCl) – U.S. EPA Method 26A
- Carbon Monoxide (CO) – U.S. EPA Method 10
- Sulfur Dioxide (SO_2) – U.S. EPA Method 6C

- Exhaust Gas Parameters (air flow rate, temperature, moisture & density) – U.S. EPA Reference Methods 1 through 4.

The sampling was performed over the period of June 12-14, 2018 by Stephan K. Byrd, R. Scott Cargill, Richard D. Eerdmans, and David D. Engelhardt of Network Environmental, Inc.. Assisting with the sampling was Mr. Donald E. Kuk of Morton Salt and the operating staff of the facility. Mr. Robert Dickman and Mr. Jeremy Howe of the Michigan Department of Environmental Quality (MDEQ) – Air Quality Division were present to observe the sampling and source operation.

II. PRESENTATION OF RESULTS

II.1 TABLE 1
PARTICULATE
EMISSION RESULTS SUMMARY
#6 BOILER EXHAUST
MORTON SALT
MANISTEE, MICHIGAN
JUNE 13, 2018

Source	Sample	Time	Air Flow Rate DSCFM(1)	Concentration Lbs/1000 Lbs @50%EA(2)	Mass Emission Rate	
					Lbs/Hr (3)	Lbs/MMBTU (4)
#6 Boiler Exhaust	1	08:44-09:49	38,139	0.0017	0.32	0.0020
	2	10:10-11:14	40,340	0.0019	0.34	0.0023
	3	11:33-12:36	39,027	0.0015	0.29	0.0019
	Average		**39,169**	**0.0017**	**0.32**	**0.0021**

(1) DSCFM = Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) Lbs/1000 Lbs @50% EA = Pounds of Particulate Per Thousand Pounds of Exhaust Gas Corrected to 50% Excess Air
(3) Lbs/Hr = Pounds of Particulate Per Hour
(4) Lbs/MMBTU = Pounds Per Million BTU of Heat Input (Calculated Using U.S. EPA Method 19 With An F-Factor of 9,780 DSCF/MMBTU)
(5) **Permit No. MI-ROP-B1824-2015a has established a particulate emission limit of 0.30 Lbs/1000 Lbs @ 50% Excess Air for the #6 Boiler**

II.2 TABLE 2
SULFUR DIOXIDE (SO_2)
EMISSION RESULTS SUMMARY
#6 BOILER EXHAUST
MORTON SALT
MANISTEE, MICHIGAN
JUNE 12, 2018

Source	Sample	Time	Air Flow Rate DSCFM (1)	Concentration PPM (2)	Mass Emission Rate	
					Lbs/Hr (3)	Lbs/MMBTU (4)
#6 Boiler Exhaust	1	09:59-10:59	40,381	227.1	111.21	0.740
	2	11:26-12:26	40,381	279.4	112.13	0.735
	3	13:02-14:02	42,562	277.3	117.30	0.759
	Average		**41,108**	**277.9**	**113.55**	**0.745**

(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 SO_2 Per Hour
(4) Lbs/MMBTU = Pounds Per Million BTU of Heat Input (Calculated Using U.S. EPA Method 19 With An F-Factor of 9,780 DSCF/MMBTU)
(5) **Permit No. MI-ROP-B1824-2015a has established an SO_2 emission limit of 2.5 Lbs/MMBTU for the #6 Boiler**

II.3 TABLE 3
CARBON MONOXIDE (CO)
EMISSION RESULTS SUMMARY
#6 BOILER EXHAUST
MORTON SALT
MANISTEE, MICHIGAN
JUNE 12, 2018

Sample	Time	Air Flow Rate DSCFM (1)	% O_2 (2)	CO Concentration		Mass Emission Rate
				PPM (3)	PPM@3%O_2 (4)	Lbs/Hr (5)
1	09:59-10:59	40,381	8.2	80.3	113.18	14.10
2	11:26-12:26	40,381	8.0	42.6	59.11	7.48
3	13:02-14:02	42,562	8.5	147.3	212.63	27.26
Average		**41,108**	**8.2**	**90.1**	**128.31**	**16.28**

(1) DSCFM = Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) % O_2 = Percent Oxygen (v/v) On A Dry Basis
(3) PPM = Parts Per Million (v/v) On A Dry Basis
(4) PPM@3%O_2 = Parts Per Million (v/v) On A Dry Basis Corrected To 3 Percent Oxygen
(5) Lbs/Hr = Pounds of CO Per Hour
(6) **40 CFR Part 63 Subpart JJJJJJ Table 1 has established a CO emission limit of 420 PPM @ 3%O_2 for the #6 Boiler**

II.4 TABLE 4
MERCURY (Hg)
EMISSION RESULTS SUMMARY
#6 BOILER EXHAUST
MORTON SALT
MANISTEE, MICHIGAN
JUNE 12, 2018

Sample	Time	Air Flow Rate DSCFM (1)	Concentration Mg/M^3 (2)	Mass Emission Rate	
				Lbs/Hr (3)	Lbs/MMBTU (4)
1	09:57-12:02	40,381	N.D. (5)	N.D. (5)	N.D. (5)
2	12:42-14:47	42,562	2.42E-04	3.86E-05	2.49E-07
3	15:26-17:30	41,339	N.D. (5)	N.D. (5)	N.D. (5)
Average (6)		**41,427**	**2.30E-04**	**3.57E-05**	**2.30E-07**

(1) DSCFM = Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) Mg/M^3 = Milligrams Per Dry Standard Cubic Meter
(3) Lbs/Hr = Pounds of Hg Per Hour
(4) Lbs/MMBTU = Pounds Per Million BTU of Heat Input (Calculated Using U.S. EPA Method 19 With An F-Factor of 9,780 DSCF/MMBTU)
(5) N.D. = Not Detected At Detection Limits Of 2.24E-04 Mg/M^3, 3.42E-05 Lbs/Hr & 2.20E-07 Lbs/MMBTU
(6) Averages were calculated using the detection limit values for Samples 1 & 3
(7) **40 CFR Part 63 Subpart JJJJJJ Table 1 has established a Hg emission limit of 2.2E-05 Lbs/MMBTU for this source.**

II.5 TABLE 5
HYDROCHLORIC ACID (HCl)
EMISSION RESULTS SUMMARY
#6 BOILER EXHAUST
MORTON SALT
MANISTEE, MICHIGAN
JUNE 13, 2018

Sample	Time	Air Flow Rate DSCFM (1)	Concentration Mg/M^3 (2)	Mass Emission Rate	
				Lbs/Hr (3)	Lbs/MMBTU (4)
1	08:44-09:49	38,139	1.45	0.21	0.00132
2	10:10-11:14	40,340	1.97	0.30	0.00200
3	11:33-12:36	39,027	1.83	0.27	0.00175
Average		**39,169**	**1.75**	**0.26**	**0.00169**

The potential HCl emissions are 1.14 Tons/Year using the Lbs/Hr results and 1.60 Tons/Year using the Lbs/MMBTU results (5)

(1) DSCFM = Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) Mg/M^3 = Milligrams Per Dry Standard Cubic Meter
(3) Lbs/Hr = Pounds Of HCl Per Hour
(4) Lbs/MMBTU = Pounds Per Million BTU of Heat Input (Calculated Using U.S. EPA Method 19 With An F-Factor of 9,780 DSCF/MMBTU)
(5) The potential emissions were calculated based on 8,760 Hours/Year of operation, a maximum design rate of 216 MMBTU/Hr and using the emission results averages.

II.6 TABLE 6
PARTICULATE
EMISSION RESULTS SUMMARY
VARIOUS SOURCES
MORTON SALT
MANISTEE, MICHIGAN
JUNE 14, 2018

Source	Sample	Time	Air Flow Rate DSCFM (1)	Concentration Grains/DSCF (2)	Emission Rate Lbs/Hr (3)
Pellet Production/ Pretzel Salt Baghouse	1	09:45-11:24	21,166	0.00083	0.15
	2	12:06-14:02	20,736	0.00078	0.14
	3	14:32-16:11	20,971	0.00070	0.13
	Average		**20,958**	**0.00077**	**0.14**

Source	Sample	Time	Air Flow Rate DSCFM (1)	Concentration Lbs/1000 Lbs (4)	Emission Rate Lbs/Hr (3)
Pellet Cooling Scrubber	1	09:24-11:01	6,953	0.011	0.35
	2	11:18-12:50	6,935	0.012	0.38
	3	13:04-14:37	6,911	0.013	0.40
	Average		**6,933**	**0.012**	**0.38**

(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/1000 Lbs = Pounds Of Particulate Per Thousand Pounds Of Exhaust Gas On An Actual Basis
(5) **Permit No. MI-ROP-B1824-2015a has established particulate emission limits of 0.014 Grains/DSCF for the Pellet Production/Pretzel Salt Baghouse and 0.032 Lbs/1000 Lbs of Exhaust Gas for the Pellet Cooling Scrubber**

II.7 TABLE 7
TOTAL PARTICULATE[1] (PM 10 & PM 2.5)
EMISSION RESULTS SUMMARY
PELLET PRODUCTION/PRETZEL SALT BAGHOUSE
MORTON SALT
MANISTEE, MICHIGAN
JUNE 14, 2018

Source	Sample	Time	Air Flow Rate DSCFM [2]	Concentration Grains/DSCF [3]	Emission Rate Lbs/Hr [4]
Pellet Production/ Pretzel Salt Baghouse	1	09:45-11:24	21,166	0.0024	0.43
	2	12:06-14:02	20,736	0.0029	0.52
	3	14:32-16:11	20,971	0.0034	0.62
	Average		**20,958**	**0.0029**	**0.52**

(1) Total Particulate = Front Half Filterable Particulate Plus Back Half Condensable Particulate
(2) DSCFM = Dry Standard Cubic Feet Per Minute (STP = 68 ºF & 29.92 in. Hg)
(3) Grains/DSCF = Grains Of Particulate Per Dry Standard Cubic Foot Of Exhaust Gas
(4) Lbs/Hr = Pounds Of Particulate Per Hour
(5) **Permit No. MI-ROP-B1824-2015a has established an emission limit of 3.96 Lbs/Hr for both PM 10 & PM 2.5**

III. DISCUSSION OF RESULTS

The results of the emission sampling are summarized in Tables 1 through 7 (Sections II.1 through II.7). The results are presented as follows:

III.1 #6 Boiler Particulate Emission Results (Table 1)

Table 1 summarizes the particulate emission results for the #6 Boiler as follows:

- Sample
- Time
- Air Flow Rate (DSCFM) – Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- Particulate Concentration (Lbs/1000 Lbs @ 50% EA) – Pounds of Particulate per Thousand Pounds of Exhaust Gas Corrected to Fifty Percent Excess Air
- Particulate Mass Emission Rate (Lbs/Hr) – Pounds of Particulate Per Hour
- Particulate Mass Emission Rate (Lbs/MMBTU) – Pounds of Particulate Per Million BTU Of Heat Input (Calculated Using U.S. EPA Method 19 With An F-Factor of 9,780 DSCF/MMBTU)

A more detailed breakdown of each individual particulate sample can be found in Appendix A.

III.2 #6 Boiler Sulfur Dioxide (SO_2) Emission Results (Table 2)

Table 2 summarizes the SO_2 emission results for the #6 Boiler 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/MMBTU) – Pounds of SO_2 Per Million BTU Of Heat Input (Calculated Using U.S. EPA Method 19 With An F-Factor of 9,780 DSCF/MMBTU)

All the SO_2 sample data was calibration corrected using Equation 7E-5 from U.S. EPA Method 7E.

III.3 #6 Boiler Carbon Monoxide (CO) Emission Results (Table 3)

Table 3 summarizes the CO emission results for the #6 Boiler as follows:

- Sample
- Time
- Air Flow Rate (DSCFM) - Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- Oxygen (O_2) Concentration (%) - Percent on a Dry Basis

- CO Concentration (PPM) - Parts Per Million (v/v) on a Dry Basis
- CO Concentration (PPM @ 3 $\%O_2$) - Parts Per Million (v/v) on a Dry Basis Corrected To 3 Percent Oxygen
- CO Mass Emission Rate (Lbs/Hr) - Pounds of CO Per Hour

All the CO sample data was calibration corrected using Equation 7E-5 from U.S. EPA Method 7E.

III.4 #6 Boiler Mercury (Hg) Emission Results (Table 4)

Table 4 summarizes the Hg emission results for the #6 Boiler as follows:

- Sample
- Time
- Air Flow Rate (DSCFM) – Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- Hg Concentration (Mg/M^3) – Milligrams Per Dry Standard Cubic Meter
- Hg Mass Emission Rate (Lbs/Hr) – Pounds of Hg Per Hour
- Hg Mass Emission Rate (Lbs/MMBTU Heat Input) – Pounds of Hg Per Million BTU of Heat Input (Calculated using Equation 2.1 from U.S. EPA Method 19. The F Factor used for the Lbs/MMBTU calculations was 9,780 DSCF/MMBTU.)

A more detailed breakdown of each individual Hg sample can be found in Appendix A.

III.5 #6 Boiler Hydrochloric Acid (HCl) Emission Results (Table 5)

Table 5 summarizes the HCl emission results for the #6 Boiler as follows:

- Sample
- Time
- Air Flow Rate (DSCFM) - Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- HCl Concentration (Mg/M^3) - Milligrams Per Dry Standard Cubic Meter
- HCl Mass Emission Rate (Lbs/Hr) - Pounds of HCl Per Hour
- HCl Mass Emission Rate (Lbs/MMBTU Heat Input) - Pounds of HCl Per Million BTU of Heat Input (Calculated using Equation 2.1 from U.S. EPA Method 19. The F Factor used for the Lbs/MMBTU calculations was 9,780 DSCF/MMBTU.)

A more detailed breakdown of each individual HCl sample can be found in Appendix A.

III.6 Pellet Production/Pretzel Salt Baghouse Particulate Emissions (Table 6)

Table 6 summarizes the particulate emission results for the Pellet Production/Pretzel Salt Baghouse as follows:

- Source
- Sample
- Time
- Air Flow Rate (DSCFM) – 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 On A Dry Basis
- Particulate Mass Emission Rate (Lbs/Hr) – Pounds of Particulate Per Hour

III.7 Pellet Cooling Scrubber Particulate Emissions (Table 6)

Table 6 summarizes the particulate emission results for the Pellet Cooling Scrubber as follows:

- Source
- Sample
- Time
- Air Flow Rate (DSCFM) – Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- Particulate Concentration (Lbs/1000 Lbs) – Pounds of Particulate Per Thousand Pounds of Exhaust Gas On An Actual Basis
- Particulate Mass Emission Rate (Lbs/Hr) – Pounds of Particulate Per Hour

III.8 Pellet Production/Pretzel Salt Baghouse Total Particulate (PM 10 & PM 2.5) Emissions (Table 7)

Table 7 summarizes the total particulate emission results for the Pellet Production/Pretzel Salt Baghouse as follows:

- Source
- Sample
- Time
- Air Flow Rate (DSCFM) – 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 On A Dry Basis
- Particulate Mass Emission Rate (Lbs/Hr) – Pounds of Particulate Per Hour

III.9 Emission Limits

Source	Emission Limit(s)
#6 Boiler Baghouse Exhaust **EU#6BOILER**	**Particulate:** 0.30 Lbs/1000 Lbs of exhaust gas @ 50% excess air **SO_2:** 2.5 Lbs/MMBTU **Hg:** 2.2E-05 Lbs/MMBTU **CO:** 420 PPM, Dry @3 $\%O_2$ **HCl (1):** See Below
MAC Baghouse Exhaust **FGPELLPRETZEL** (EUPELLPROD & EUPRETZELSALT)	**Particulate (PM):** 0.014 Grains/DSCF **PM 10:** 3.96 Lbs/Hr **PM 2.5:** 3.96 Lbs/Hr
Pellet Cooling Scrubber Exhaust **EUPELLETCOOLING**	**Particulate:** 0.032 Lbs/1000 Lbs of exhaust gas
(1) While there is no HCL emission limit under the area source NESHAP rule (40 CFR Part 63 Subpart JJJJJJ), the source must demonstrate that potential to emit (PTE) is less than Clean Air Act (CAA) major source thresholds (10 tons per year of a single HAP or 25 tons per year of total HAPs). As Hg levels from the boiler are negligible and no other non - de minimus sources of HAPs are at the facility, HCl is the HAP of concern. The HCl testing was designed to demonstrate that the HCl emissions are below 9.9 Tons/Year (an approximate emission level of 0.015 Lbs/MMBTU). The results were calculated at worst case conditions (8760 hours per year of operation and a maximum design rate of 216 MMBTU/Hr for the boiler)	

The results of all the testing conducted were below the established emission limits from MI-ROP-B1824-2015a

IV. SOURCE DESCRIPTION

IV.1 #6 Boiler (EU#6BOILER) – The #6 Boiler is a Wickes spreader stoker coal and natural gas co-fired boiler. It's maximum rating is 180,000 pounds of steam per hour (216 MMBTU/Hr). The particulate matter is controlled by a baghouse equipped with a Lime injection system. This boiler is used for generating process steam and electricity. Source operating data during the sampling can be found in Appendix B.

IV.2 Pellet Production/Pretzel Salt (FGPELLPRETZEL) – The pellet production area produces water softener pellets. The sources included in this process are; pellet briquetting machines, a vibratory screen, belt conveyors, bucket elevators and an enclosed crusher to recycle pellets. The particulate

matter from this area is controlled by the baghouse known as the MAC dust collector. All the sampling was conducted during normal operation of this process (See Appendix B).

The Pretzel Salt process is a totally enclosed pretzel salt production system which includes a main crusher, a pellet press, an enclosed screw conveyor, a recycle crusher, a bucket elevator and a sizing screener. The particulate matter from this area is controlled by the baghouse known as the MAC dust collector. All the sampling was conducted during normal operation of this process (See Appendix B).

IV.3 Pellet Cooling (EUPELLETCOOLING) – The pellet cooling is a cooling system used in the production of water softener pellets. The particulate matter is controlled by a venturi scrubber. All the sampling was conducted during normal operation of this process (See Appendix B).

V. SAMPLING AND ANALYTICAL PROTOCOL

Schematic diagrams of the sampling locations can be found in Appendix G. The sampling locations were as follows:

- #6 Boiler – A 78 inch I.D. stack with two (2) sample ports in a location that exceeds the eight (8) duct diameters downstream and two (2) duct diameters upstream from the nearest disturbances requirement of U.S. EPA Method 1. Twelve (12) sampling points were used for the isokinetic sampling.

- Pellet Production/Pretzel Salt Baghouse – A 36 inch I.D. exhaust stack with two (2) sample ports in a location approximately two (2) duct diameters downstream and six (6) duct diameters upstream from the nearest disturbances. Twenty-four (24) sampling points were used for the isokinetic sampling.

- Pellet Cooling Scrubber – A 21 inch I.D. exhaust stack with two (2) sample ports in a location approximately six (6) duct diameters downstream and four (4) duct diameters upstream from the nearest disturbances. Twenty (20) sampling points were used for the isokinetic sampling.

The sampling point dimensions for the isokinetic sampling trains were as follows:

Sample Point	FGPELLPRETZEL Dimension (Inches)	EUPELLETCOOLING Dimension (Inches)	EU#6BOILER Dimension (Inches)
1	1.00	0.55	3.43
2	2.41	1.72	11.39

3	4.25	3.07	23.90
4	6.37	4.75	54.91
5	9.00	7.18	66.61
6	12.82	13.82	74.57
7	23.18	16.25	----
8	27.00	17.93	----
9	29.63	19.28	----
10	31.75	20.45	----
11	33.59	----	----
12	35.00	----	----

Three (3) test runs (samples) were conducted for each of the compounds on each of the sources as listed below. Sample duration and minimum total sample volume were as follows:

Source	Compound(s) Sampled	Sample Duration / Minimum Sample Volume
#6 Boiler Baghouse Exhaust **EU#6BOILER**	Particulate	60 Minutes / 30 DSCF
	Sulfur Dioxide (SO_2)	60 Minutes / NA
	Mercury (Hg)	120 Minutes / 2 DSCM
	Carbon Monoxide (CO)	60 Minutes / NA
	Hydrochloric Acid (HCl)	60 Minutes / 1 DSCM
MAC Baghouse Exhaust **FGPELLPRETZEL** (EUPELLPROD & EUPRETZELSALT)	Particulate	96 Minutes / 60 DSCF
Pellet Cooling Scrubber Exhaust **EUPELLETCOOLING**	Particulate	90 Minutes / 60 DSCF

(1) NA = Not Applicable
(2) DSCF = Dry Standard Cubic Feet (STP = 29.92 in Hg & 68 Deg. F)
(3) DSCM = Dry Standard Cubic Meters (STP = 29.92 in Hg & 68 Deg. F)

The following reference test methods to conduct the sampling:

- Particulate Matter (EU#6BOILER & EUPELLETCOOLING) – U.S. EPA Method 17
- PM, PM 10 & PM 2.5 (FGPELLPRETZEL) – U.S. EPA Methods 17 & 202
- Sulfur Dioxide (SO_2) – U.S. EPA Method 6C
- Hyrdochloric Acid (HCl) – U.S. EPA Method 26A

- Carbon Monoxide (CO) – U.S. EPA Method 10
- Mercury (Hg) – U.S. EPA Method 29
- Exhaust Gas Parameters (flow rate, temperature, moisture & density)– U.S. EPA Methods 1- 4

V.1 Particulate (EU#6BOILER & EUPELLETCOOLING) – The particulate emission sampling was conducted in accordance with U.S. EPA Reference Method 17. Method 17 is an in-stack filtration method. Three (3) samples were collected from each of the sources sampled. Sample duration and total sample volume were as listed in the above table. The samples were collected isokinetically and analyzed for total particulate by gravimetric analysis. All the quality assurance and quality control procedures listed in the method were incorporated in the sampling and analysis. The particulate sampling train is shown in Figure 1.

V.2 PM, PM 10 & PM 2.5 (FGPELLPRETZEL) – The particulate emission sampling was conducted in accordance with U.S. EPA Method 17. Method 17 is an in-stack filtration method. Three (3) samples were collected from the exhaust. Sample duration and total sample volume were as listed in the above table. The samples were collected isokinetically and analyzed for particulate by gravimetric analysis.

In addition to the standard front half analysis, the back half condensable particulate matter was determined in accordance with U.S. EPA Method 202 (Dry Impinger Technique). A sixty (60) minute nitrogen purge (as specified in Method 202) was conducted for the back half condensables immediately following each sample. The back half samples were extracted and analyzed for condensable particulate in accordance with Method 202. All the quality assurance and quality control procedures listed in the methods were incorporated in the sampling and analysis. The particulate sampling train is shown in Figure 2.

V.3 Sulfur Dioxide (SO_2) – The SO_2 sampling was conducted in accordance with U.S. EPA Reference Method 6C. A Bovar Model 721M gas analyzer was used to monitor the boiler 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 analyzer. The analyzer produces instantaneous readouts of the SO_2 concentrations (PPM).

The analyzer was calibrated by direct injection prior to the testing. A span gas of 848.9 PPM was used to establish the initial instrument calibration. Calibration gases of 450.1 PPM and 254.2 PPM 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 450.1 PPM gas to determine the system bias. After each sample, a

system zero and system injection of 450.1 PPM were performed to establish system drift and system bias during the test period. All calibration gases were EPA Protocol 1 Certified. Three (3) samples were collected from the boiler exhaust. 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 boiler. 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 3.

V.4 Carbon Monoxide (CO) – The CO sampling was conducted in accordance with U.S. EPA Reference Method 10. A Thermo Environmental Model 48C gas analyzer was used to monitor the boiler 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 analyzer. The analyzer produces instantaneous readouts of the CO concentrations (PPM).

The analyzer was calibrated by direct injection prior to the testing. A span gas of 985.3 PPM was used to establish the initial instrument calibration. Calibration gases of 254.0 PPM and 498.0 PPM 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 498.0 PPM gas to determine the system bias. After each sample, a system zero and system injection of 498.0 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 boiler. 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 3.

V.5 Mercury (Hg) – The Hg emission sampling was determined by employing U.S. EPA Method 29. Three (3) samples were collected from the boiler exhaust. Sample duration and total sample volume were as listed in the above table. The samples were collected isokinetically on quartz filters, in a nitric acid/hydrogen peroxide solution and in a acidic potassium permanganate solution.

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). All the quality assurance and quality control procedures listed in the methods were incorporated in the sampling and analysis. A diagram of the Hg sampling train is shown in Figure 4.

V.6 Hydrochloric Acid (HCl) – The HCl emission sampling was conducted in accordance with U.S. EPA Method 26A. The sampling was performed isokinetically in accordance with the method. The HCl was collected in the first two impingers of the sampling train, which contained 100 mls of 0.1 normal sulfuric acid. The probe rinse and the impinger catch from the impingers were combined and analyzed for HCl using Ion-chromatography as described in the method..

Three (3) samples were collected from the boiler exhaust. Sample duration and total sample volume were as listed in the above table. All the quality assurance and quality control requirements specified in the method were incorporated in the sampling and analysis. A diagram of the sampling train is shown in Figure 5.

V.7 Oxygen & Carbon Dioxide (EU#6BOILER) – 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 boiler 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 (%).

The analyzers were calibrated by direct injection prior to the testing. Span gases of 21.0% O_2 and 20.1% CO_2 were used to establish the initial instrument calibrations. Calibration gases of 12.1% O_2/6.05% CO_2 and 5.94% 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_2/6.05% CO_2 gas to determine the system bias. After each sample, a system zero and system injection of 12.1% O_2/6.05% 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 boiler. 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 3.

V.8 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 Reference Methods 1 through 4.

The air flow rate, temperature and moisture were determined using the isokinetic sampling trains.

The ambient default factor (20.9 $\%O_2$ & 0.0 $\%CO_2$) was used for the gas density on FGPELLPRETZEL and EUPELLETCOOLING. Gas density on EU#6BOILER was determined in conjunction with the the other sampling trains by monitoring for O_2 & CO_2 using EPA Method 3A.

All the quality assurance and quality control procedures listed in the methods were incorporated in the sampling and analysis.

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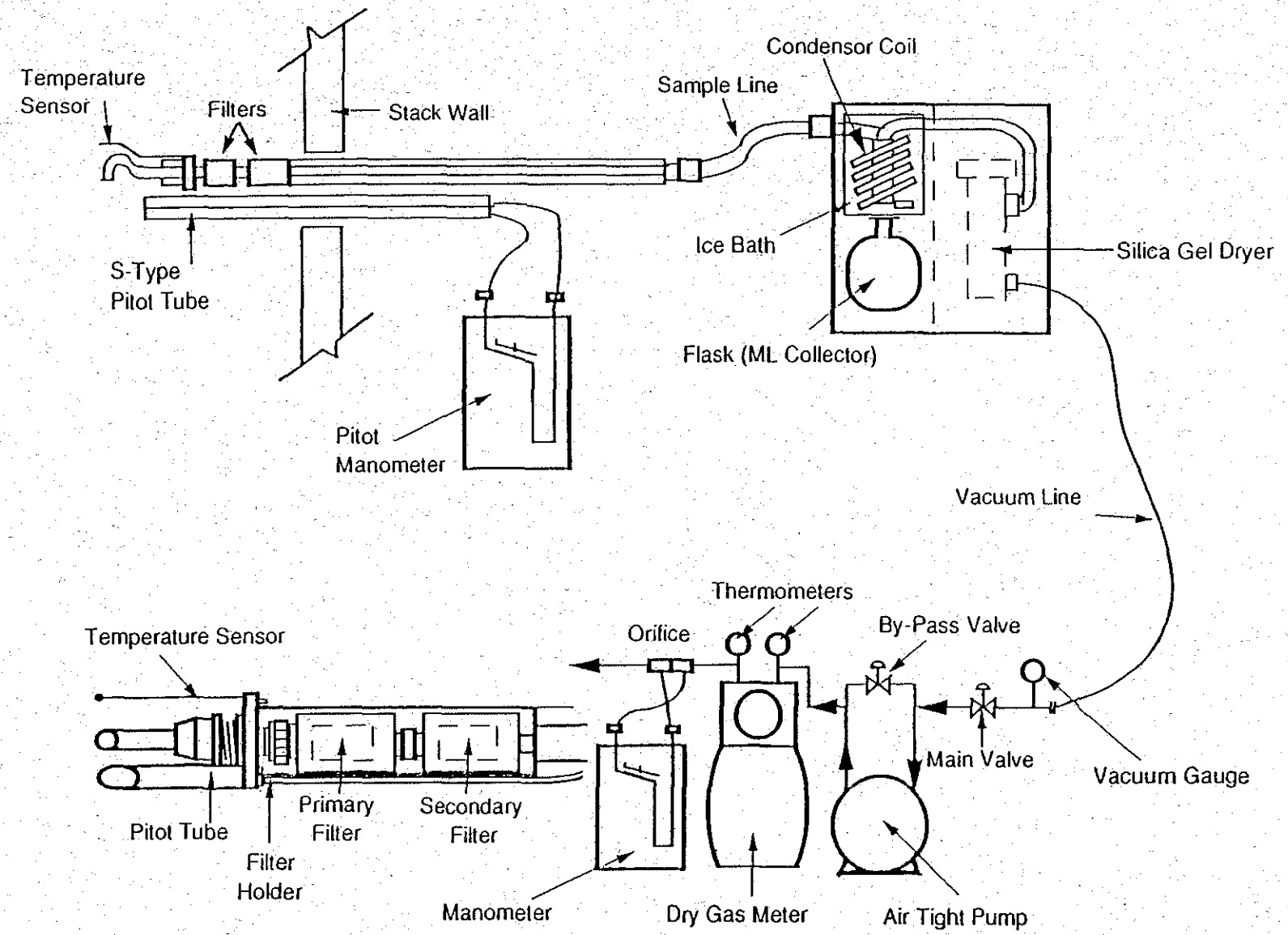

Figure 1

Particulate Sampling Train

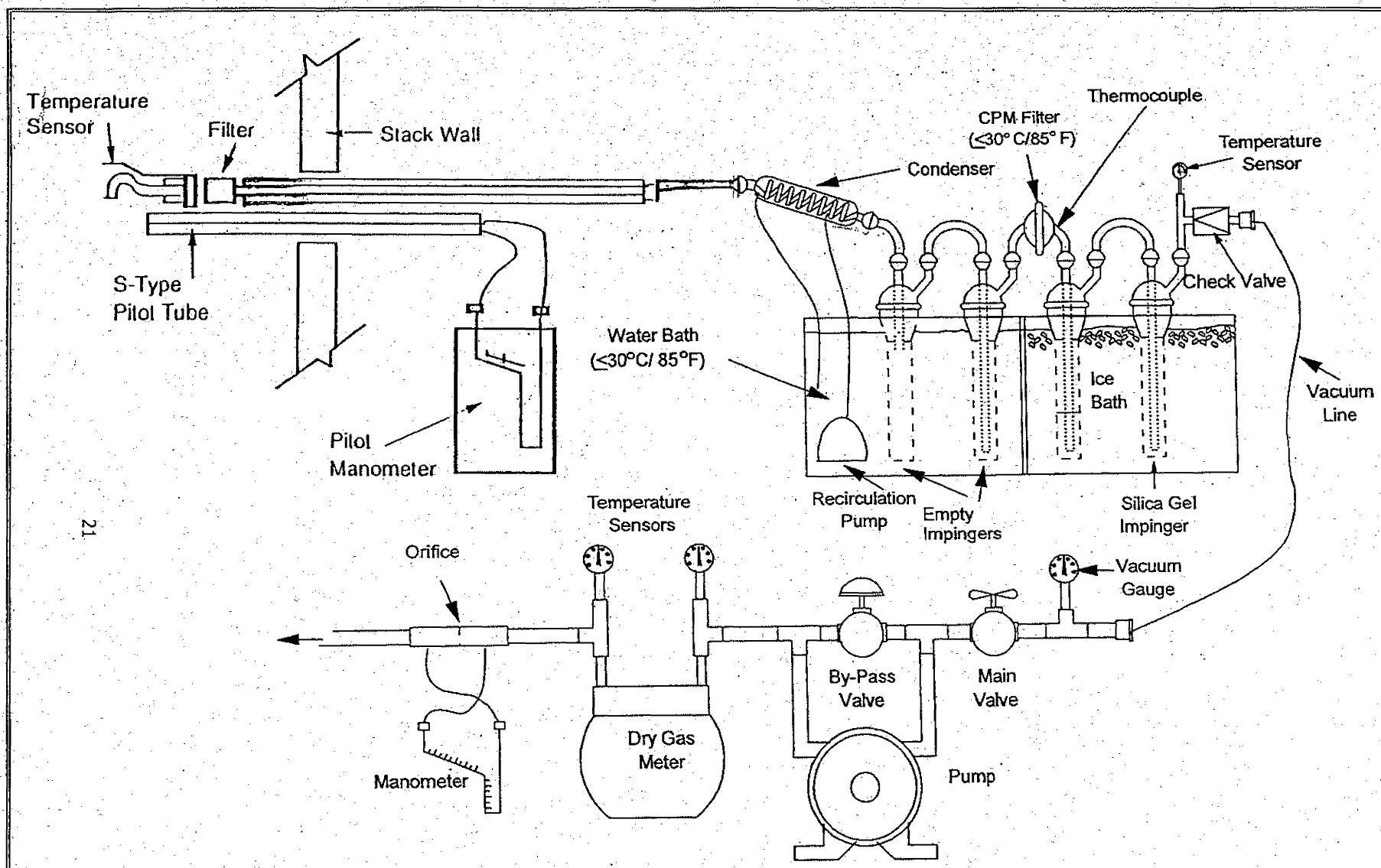

Figure 2

PM, PM 10 & PM 2.5 Sampling Train

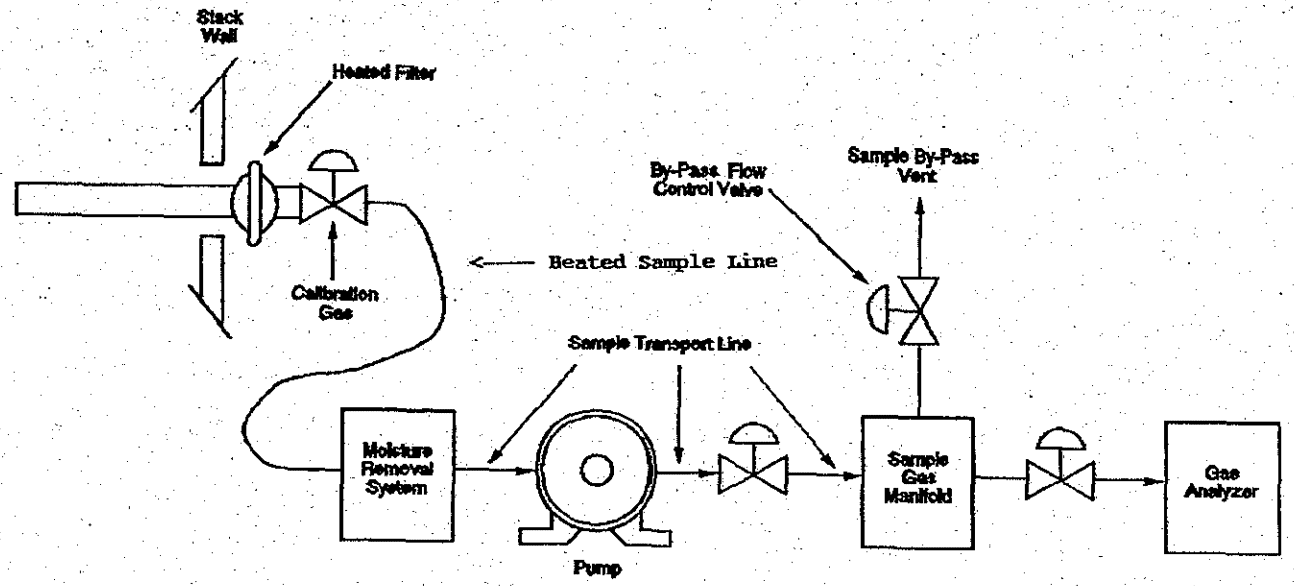

Figure 3

SO_2, CO, O_2 & CO_2 Sampling Train

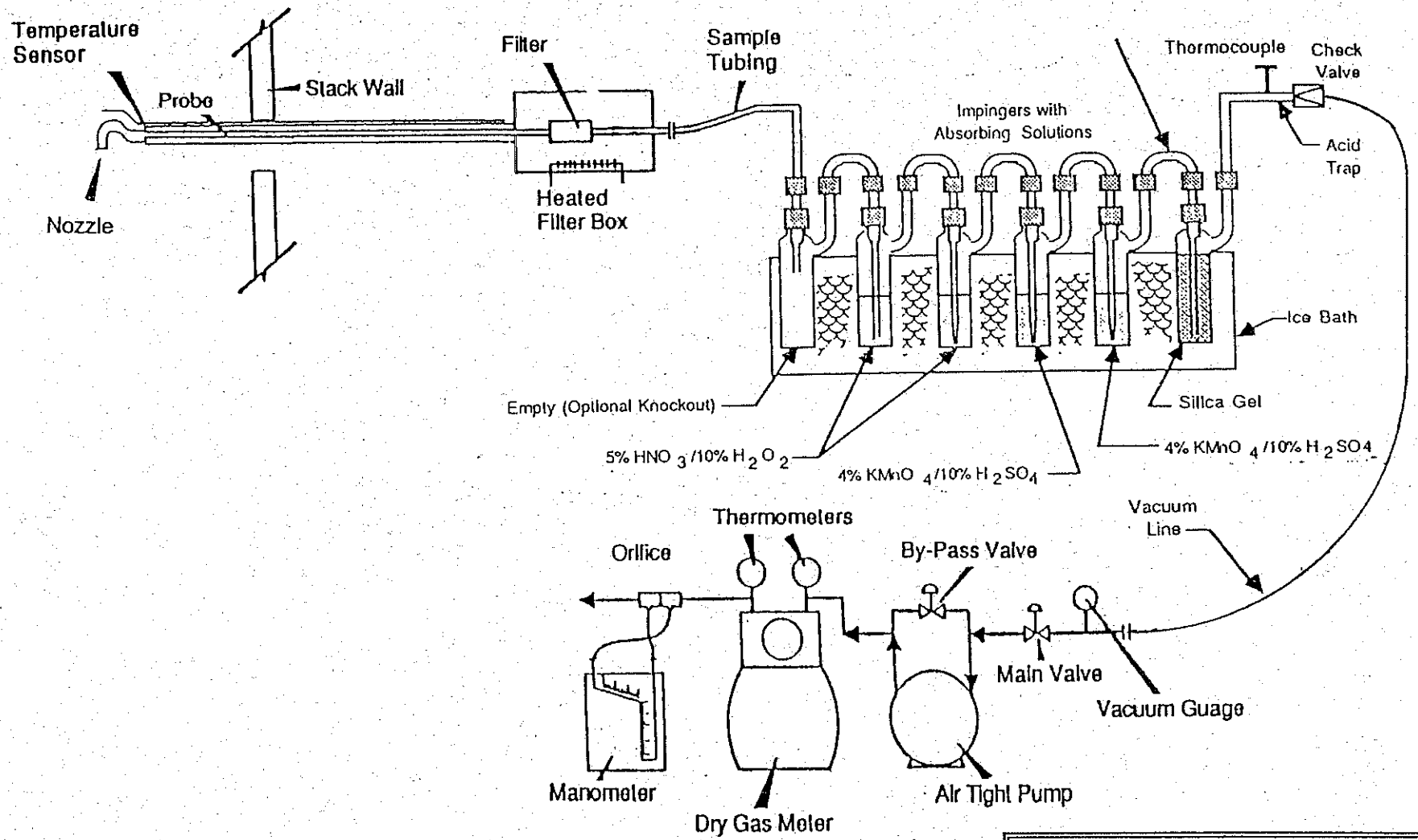

Figure 4

Hg
Sampling Train

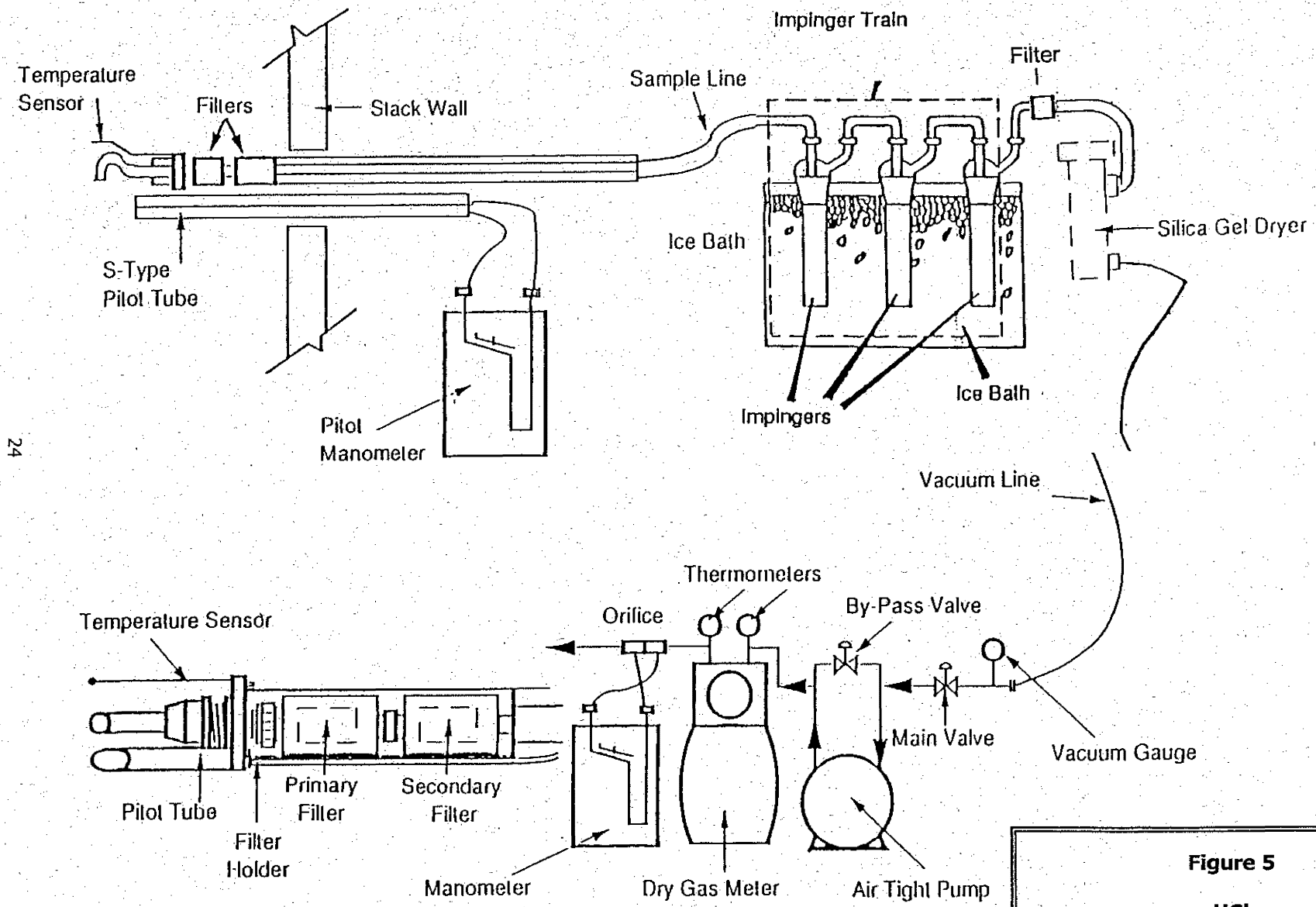

Figure 5

HCl Sampling Train