Report of...

Compliance Emission Testing

Performed for the...

A4043

Dow Corning Corporation
Midland, Michigan

On the...

THROX's
Ionizing Wet Scrubber (IWS)

November 10-11, 2015

252.22

Network Environmental, Inc.
Grand Rapids, MI

Performed For:

Dow Corning Corporation
3901 S. Saginaw Road
Mail Box 065
Midland, MI 48686
Contact: Chris Caswell
Phone: (989) 496-5327
Fax: (989) 496-5457
e-mail: chris.caswell@dowcorning.com

Performed by:

Network Environmental, Inc.
2629 Remico, Suite B
Grand Rapids, MI 49519
Contact: David D. Engelhardt
Phone: (616) 530-6330
Fax: (616) 530-0001
e-mail: netenviro@aol.com

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I. INTRODUCTION

Network Environmental, Inc. was retained by the Dow Corning Corporation to perform compliance emission sampling on the thermal oxidizer's (THROX's) ionizing wet scrubber (IWS) at their Midland, Michigan facility. The purpose of the study was to meet the particulate (PM_{10}), carbon monoxide (CO) and total hydrocarbon (VOC) testing requirements of Michigan Department of Environmental Quality (MDEQ) – Air Quality Division Permit to Install No. 91-07E. MDEQ Air Permit No. 91-07E has established the following emission limits for this source:

Pollutant	Emission Limit
PM_{10}	3.5 Lbs/Hr & 13.4 Tons/Year
CO	90 Tons/Year
VOC	6.6 Lbs/Hr

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

- PM-10 – U.S. EPA Methods 17 & 202
- CO – U.S. EPA Method 10
- VOC – U.S. EPA Method 25A
- Exhaust Gas Parameters – U.S. EPA Methods 1 through 4

The sampling was performed over the period of November 10-11, 2015 by Stephan K. Byrd, R. Scott Cargill, Richard D. Eerdmans and David D. Engelhardt of Network Environmental, Inc.. Assisting with the study was Mr. Chris Caswell of the Dow Corning Corporation. Ms. Kathy Brewer and Mr. David Patterson 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
PM_{10} [1] EMISSION RESULTS SUMMARY
THROX IWS EXHAUST
DOW CORNING CORPORATION
MIDLAND, MICHIGAN

Sample	Date	Time	Air Flow Rate DSCFM [2]	Concentration	Emission Rate	
				Lbs/1000 Lbs, Dry [3]	Lbs/Hr [4]	Tons/Yr [5]
1	11/11/15	08:52-09:55	11,806	0.0146	0.770	3.37
2	11/11/15	10:42-11:45	11,687	0.0119	0.623	2.73
3	11/11/15	12:22-13:25	11,715	0.0103	0.539	2.36
Average			11,736	**0.0123**	**0.644**	**2.82**

(1) PM_{10} = Total Front Half Filterable and Back Half Condensable Particulate
(2) DSCFM = Dry Standard Cubic Feet Per Minute (STP = 68° F & 29.92 in. Hg)
(3) Lbs/1000 Lbs, Dry = Pounds of Particulate Per Thousand Pounds of Exhaust Gas on a Dry Basis
(4) Lbs/Hr = Pounds of Particulate Per Hour
(5) Tons/Yr = Tons Per Year (Calculated Using a Maximum of 8760 Hours Per Year of Operation)

II.2 TABLE 2
CARBON MONOXIDE (CO) EMISSION RESULTS SUMMARY
THROX IWS EXHAUST
DOW CORNING CORPORATION
MIDLAND, MICHIGAN

Sample	Date	Time	Air Flow Rate DSCFM (1)	Concentration	Emission Rate	
				PPM (2)	Lbs/Hr (3)	Tons/Yr (4)
1	11/10/15	10:51-12:43	11,134	N.D. (5)	N.D. (5)	N.D. (5)
2	11/11/15	08:39-10:45	11,806	N.D. (5)	N.D. (5)	N.D. (5)
3	11/11/15	11:04-13:04	11,701	N.D. (5)	N.D. (5)	N.D. (5)
Average			**11,547**	**----**	**----**	**----**

(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) Tons/Yr = Tons Per Year (Calculated Using A Maximum Of 8760 Hours Per Year Of Operation)
(5) N.D. = Non Detected At Detection Limits Of 0.1 PPM, 0.0050 Lbs/Hr & 0.022 Tons/Year

II.3 TABLE 3
TOTAL HYDROCARBON (VOC) EMISSION RESULTS SUMMARY
THROX IWS EXHAUST
DOW CORNING CORPORATION
MIDLAND, MICHIGAN

Sample	Date	Time	Air Flow Rate SCFM (1)	Concentration PPM (2)	Emission Rate Lbs/Hr (3)
1	11/10/15	10:51-12:43	13,955	0.2	0.0191
2	11/11/15	08:39-10:45	14,302	0.2	0.0195
3	11/11/15	11:04-13:04	14,332	0.1	0.0098
Average			**14,196**	**0.2**	**0.0161**

(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 As Propane
(3) Lbs/Hr = Pounds Of VOC Per Hour

III. DISCUSSION OF RESULTS

The results of the emission sampling are summarized in Tables 1 through 3 (Sections II.1 through II.3). The results are presented as follows:

III.1 PM_{10} Emission Results (Table 1)

Table 1 summarizes the PM_{10} emission results as follows:

- Sample
- Date
- Time
- Air Flow Rate (DSCFM) – Dry Standard Cubic Feet Per Minute (STP = 68° F & 29.92 in. Hg)
- Particulate Concentration (Lbs/1000 Lbs, Dry) – Pounds Of Particulate Per Thousand Pounds Of Exhaust Gas On A Dry Basis
- Particulate Mass Emission Rate (Lbs/Hr) – Pounds Of Particulate Per Hour
- Particulate Mass Emission Rate (Tons/Year) – Tons Of Particulate Per Year (Calculated Using 8760 Hours Per Year Of Operation)

The results are presented as total particulate (front half filterable and back half condensable). A more detailed breakdown for each sample can be found in Appendix A.

III.2 CO Emission Results (Table 2)

Table 2 summarizes the 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 (Tons/Year) – Tons of CO Per Year (Calculated Using 8760 Hours Per Year Of Operation)

The CO sampling was conducted in conjunction with the Relative Accuracy Test Audit (RATA). Each sample consisted of three (3) twenty-five (25) minute sampling periods. The sampling was conducted over a two (2) day period. On the first day (11/10/15) during the fifth RATA run, the THROX was shut down because of a power outage. The testing was suspended and finished the next day (11/11/15).

The air flows used for the CO sampling were taken from the air flow RATA results on 11/10/15 and the particulate sampling results on 11/11/15.

III.3 VOC Emission Results (Table 3)

Table 3 summarizes the 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 A Wet (Actual) Basis As Propane
- VOC Mass Emission Rate (Lbs/Hr) – Pounds of VOC Per Hour

The VOC sampling was conducted in conjunction with the Relative Accuracy Test Audit (RATA). Each sample consisted of three (3) twenty-five (25) minute sampling periods. The sampling was conducted over a two (2) day period. On the first day (11/10/15), during the fifth RATA run, the THROX was shut down because of a power outage. The testing was suspended and finished the next day (11/11/15).

The air flows used for the VOC sampling were taken from the air flow RATA results on 11/10/15 and the particulate sampling results on 11/11/15.

IV. SAMPLING AND ANALYTICAL PROTOCOL

IV.1 PM_{10} – The particulate (including back half condensable analysis) sampling was conducted in accordance with U.S. EPA Methods 17 and 202. Method 17 is an in-stack filtration method. The samples were collected isokinetically on filters and in impinger trains (dry impinger technique). Three (3) samples were collected from the THROX's IWS exhaust. The exhaust samples were each sixty (60) minutes in duration and had a minimum sample volume of thirty (30) dry standard cubic feet.

The nozzle rinses and filters were analyzed gravimetrically for particulate in accordance with Method 17. The condensate (back half) was extracted and analyzed for 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 and condensable sampling train is shown in Figure 1.

IV.2 Carbon Monoxide – 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 THROX exhaust. A heated probe was used to extract the sample gases from the exhaust stack. 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 92.97 PPM was used to establish the initial instrument calibration. A calibration gas of 49.66 PPM was 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 49.66 PPM gas to determine the system bias. After each sample, a system zero and system injection of 49.66 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. 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 THROX exhaust. Sample gas was extracted through a heated probe. A heated teflon sample line was used to transport the 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 was used to establish the initial instrument calibration. Calibration gases of 29.17 PPM and 50.19 PPM were used to determine the calibration error of the analyzer. After each sample, a system zero and system injection of 29.17 PPM were performed to establish system drift and system bias during the test period. All calibration gases used were EPA Protocol Propane Calibration Gases.

The analyzer was calibrated to the output of the data acquisition system (DAS) used to collect the data. 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 Moisture - Moisture samples were collected in accordance with U.S. EPA Method 4. Samples were withdrawn from the stack and passed through an impinger train before being passed through pre-weighed silica gel. The water collected was measured to the nearest 1 ml and the silica gel was re-weighed to the nearest 1 g. The moisture collected along with the sample volume was used to determine the percent moisture in the exhaust. Each sample was a minimum of twenty-five (25) minutes in duration and had a minimum sample volume of twenty-one (21) standard cubic feet. A diagram of the moisture sampling train is shown in Figure 4.

IV.5 Air Flows - The air flow rates were determined in conjunction with the other sampling by employing U.S. EPA Reference Methods 1 and 2. The sampling for the source was conducted on the 54 inch I.D. exhaust stack. A total of 12 traverse points were used for the air flow determinations. The sample point dimensions are shown in Appendix G. Velocity pressures were determined using an S-Type pitot tube. Temperatures were measured using a Type K thermocouple. Oxygen and carbon dioxide content was determined in conjunction with the RATA or by collecting a bag from the moisture sampling train and Orsat analysis. A diagram of the air flow sampling train is shown in Figure 5

IV.6 Sampling Location – The sampling location for the THROX exhaust was on the 54 inch I.D. exhaust stack at a location 16 duct diameters downstream and greater than 2 duct diameters upstream from the nearest disturbances.

This report was prepared by:

David D. Engelhardt
Vice President

This report was reviewed by:

Stephan K. Byrd
President

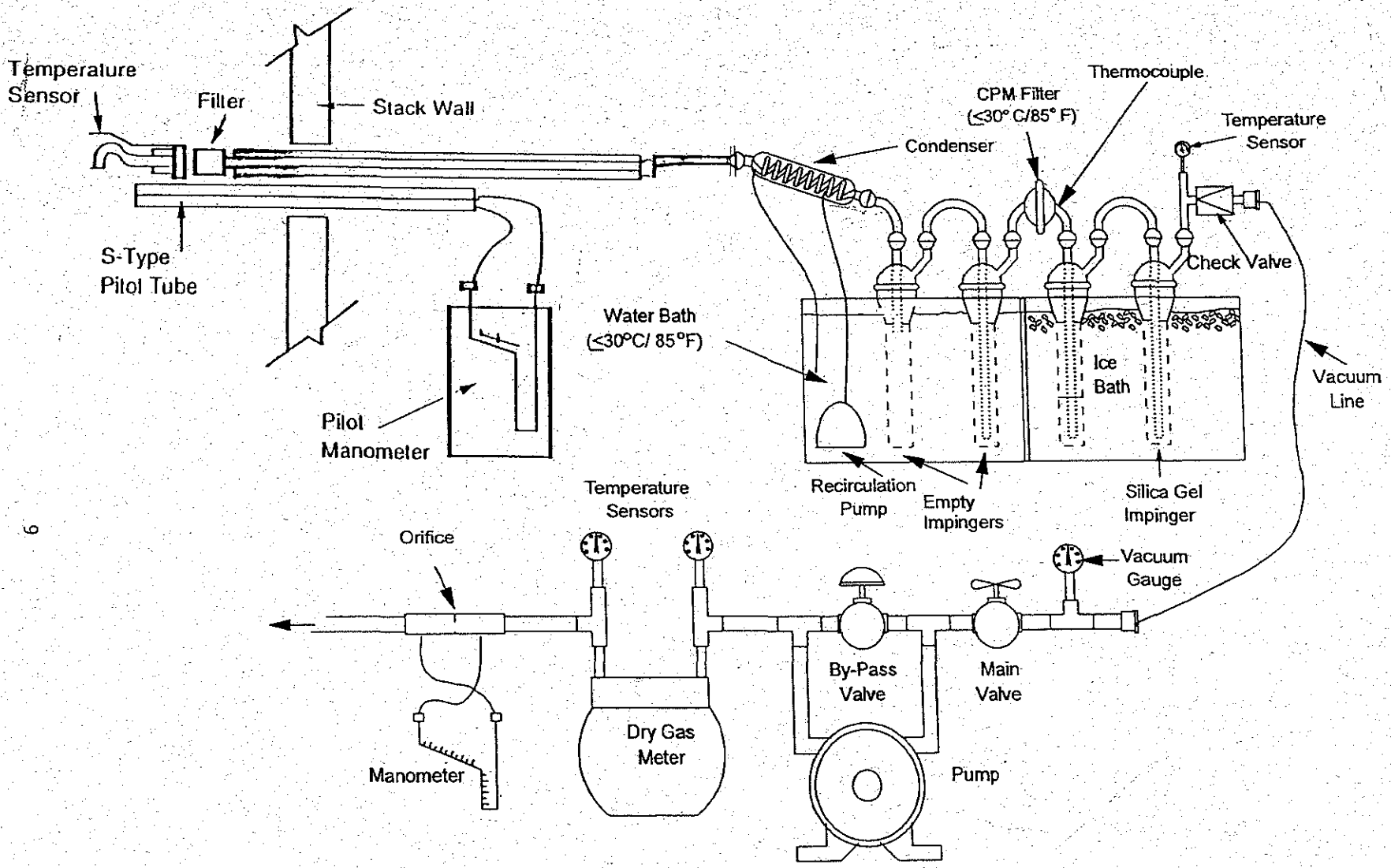

Figure 1

PM_{10} Sampling Train

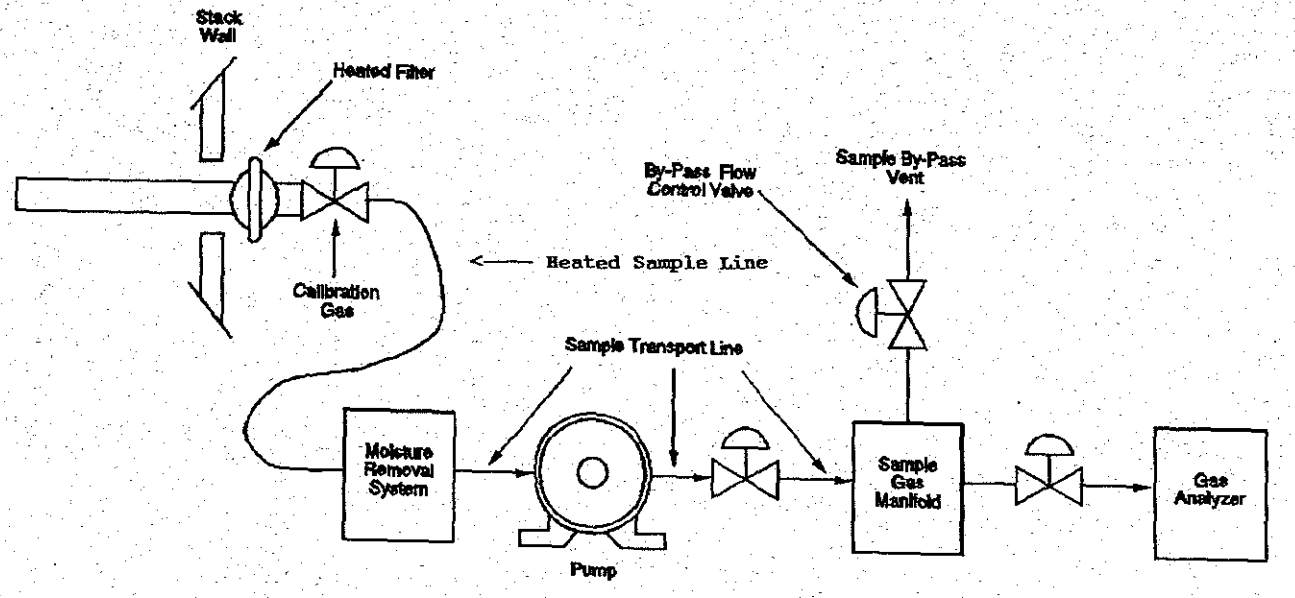

Figure 2

CO Sampling Train

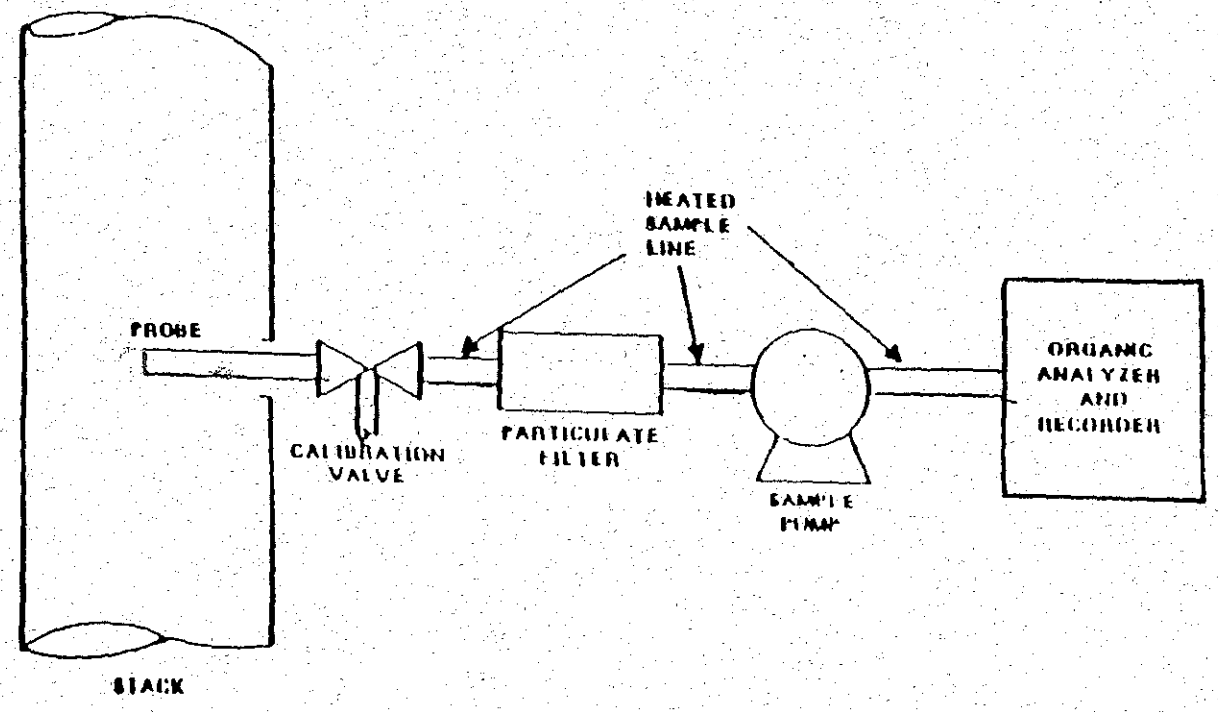

Figure 3

VOC Sampling Train

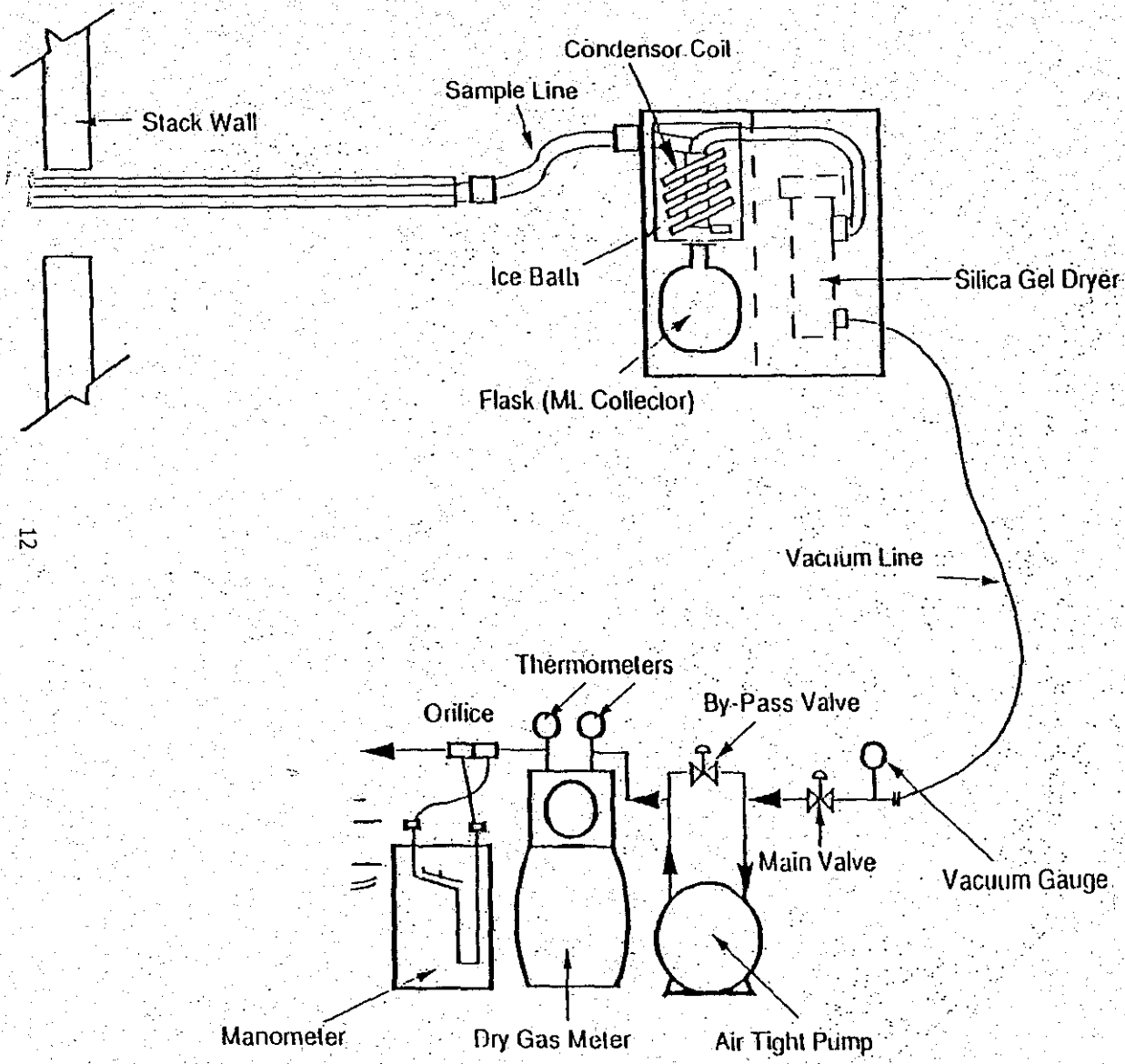

Figure 4

Moisture Sampling Train

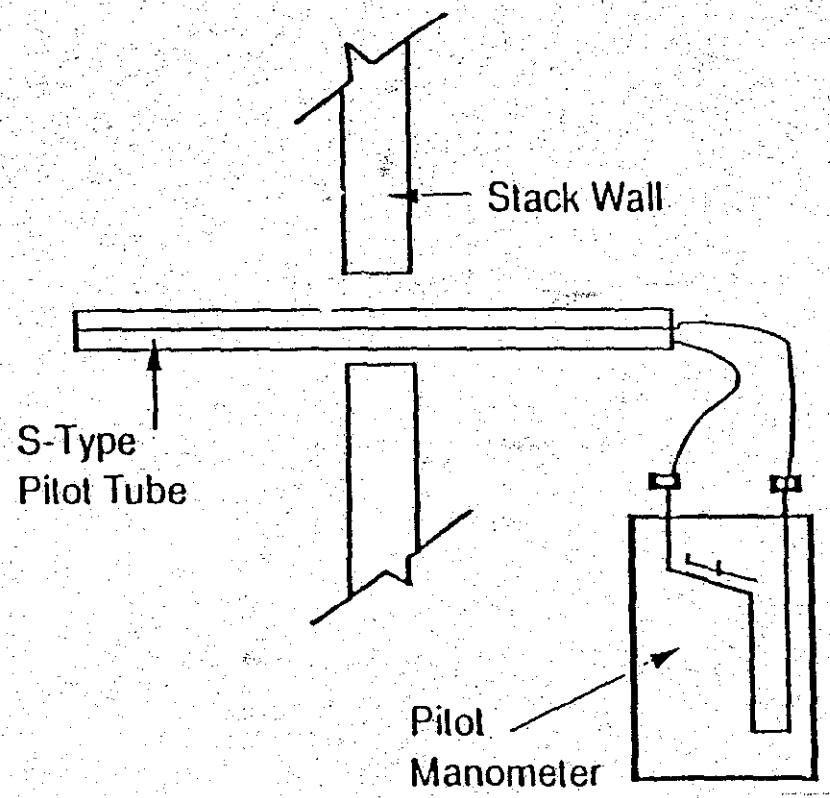

Figure 5

Air Flow Sampling Train