Mostardi-Platt Associates, Inc.
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Environmental Consulting
Company

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Mostardi Platt

VOC OVERALL REDUCTION EFFICIENCY STUDY

Performed For

FERRARA PAN CANDY COMPANY

At The

Forest Park Plant
Catalytic Oxidizer
Forest Park, Illinois
September 22, 2000

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MOSTARDI PLATT PROJECT M003818
DATE SUBMITTED: OCTOBER 18, 2000

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CERTIFICATION SHEET

Having supervised and worked on the test program described in this report, and having written this report, I hereby certify the data, information, and results in this report to be accurate and true according to the methods and procedures used.

Data collected under the supervision of others is included in this report and is presumed to have been gathered in accordance with recognized standards.

MOSTARDI-PLATT ASSOCIATES, INC.

Eric Ehlers

Eric L. Ehlers
Project Supervisor

Reviewed by:

Scott W. Banach

Scott W. Banach
Director, Project Engineering

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1.0 INTRODUCTION

MOSTARDI-PLATT ASSOCIATES, INC. (Mostardi Platt) performed a volatile organic compound (VOC) overall reduction efficiency test program on the catalytic oxidizer at the Forest Park Plant of Ferrara Pan Candy Company (Ferrara Pan) in Forest Park, Illinois, on September 22, 2000. The tests were authorized by and performed for Ferrara Pan.

The purpose of this test program was to determine the VOC destruction efficiency during normal operating conditions with tests performed at the oxidizer inlet and outlet. An evaluation of the permanent total enclosure was also made to verify 100% capture.

The tests were conducted by Messrs. J. Robertson, A. Kuennen, T. Barr and E. Ehlers of Mostardi Platt. Mr. Al Maronta of Ferrara Pan provided assistance and coordinated plant operating conditions during the test program.

2.0 SUMMARY OF RESULTS

During this test program, three (3), one-hour volatile organic compound (VOC) tests were performed simultaneously at the catalytic oxidizer inlet and outlet test locations. Destruction efficiency averaged 99.2%. Complete test results for the catalytic oxidizer test locations are given on page 9.

The enclosures surrounding the chocolate room coating system and polishing room coating system met all four criteria required by the United States Environmental

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Protection Agency (USEPA) to qualify as a 100% permanent total enclosure (PTE). USEPA Method 204 results are appended. The overall reduction efficiency was then 99.2%.

3.0 DISCUSSION OF RESULTS

Three (3), one-hour VOC tests were run simultaneously on the catalytic oxidizer inlet and outlet test location. Tedlar bags were filled during each run at the inlet and outlet of the oxidizer in order to subtract methane and ethane concentrations from the results of the total hydrocarbon testing.

No problems were encountered with the testing equipment during the test program. Source operation appeared normal during the entire test program.

4.0 TEST PROCEDURES

All testing, sampling, analytical, and calibration procedures used for this test program were performed as described in the Title 40, *Code of Federal Regulations*, Part 60 (40CFR60), Appendix A, Methods 1 through 4, 18, 25A, and Part 51 (40CFR51), Appendix M, Method 204, and the latest revisions thereof. Where applicable, the *Quality Assurance Handbook for Air Pollution Measurement Systems*, Volume III, Stationary Source Specific Methods, United States Environmental Protection Agency (USEPA) 600/4-77-027b was used to determine the precise procedures.

4.1 Volumetric Flowrate Determination

In order to determine the emission rate on a lbs/hr basis, the gas velocity and volumetric flowrate were determined using Method 2, 40CFR60.

Velocity pressures were determined by traversing the test locations with S-type pitot tubes. Temperatures were measured using a K-type thermocouple with a calibrated digital temperature indicator. The molecular weight and moisture content of the gases were determined to permit the calculation of the volumetric flowrate. Sampling points utilized were determined using Method 1, 40CFR60.

4.2 Oxygen (O_2)/Carbon Dioxide (CO_2) Determination

Oxygen (O_2) and carbon dioxide (CO_2) gas contents were determined in accordance with Method 3, 40CFR60. This method analyzed samples collected in a grab manner using a Hays Orsat gas analyzer. Several gas extractions were performed during each test run to

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ensure a stable reading. Mandatory leak checks were performed prior to and following each use. Chemicals are changed frequently and inspected for reactivity prior to each use.

4.3 Moisture (H_2O) Determination

Determining the moisture content in the gas stream is necessary to calculate the stack gas volumetric airflow on a dry basis and the emission rate in lbs/hr. For this purpose, Mostardi Platt used the following method:

> American National Standards Institute (ANSI)/American Standard Testing Method (ASTM) Method E337-62 reapproved 1979, wet bulb/dry bulb measurements were made at the inlet and outlet ducts during each sampling run and the water vapor content was calculated as follows:

$$Bws = \left[\frac{e' - AP(t - t')}{P}\right]$$

where :

e' = saturated vapor pressure of water, in. Hg, at the wet bulb temperatu re, t'

$A = 3.67 \times 10^{-4}\left[1 + 0.00064\,(t' - 32)\right]$

P = absolute pressure, in. Hg, in the duct

t = dry bulb temperatu re, °F

t' = wet bulb temperatu re, °F

4.4 Methane (CH_4) and Ethane (C_2H_6) Determination

The Method 18, 40CFR60, sampling and measurement system meets the requirements for stack sampling of gaseous organic compounds set forth by the USEPA. In particular, it meets the requirements of USEPA Reference Method 18, "Determination of Gaseous Organic Compound Emissions by Gas Chromatography," 40CFR60, Appendix A. This method applies to the analysis of approximately 90% of the total gaseous organics emitted from an industrial source. The major organic components of a gas mixture are separated by gas chromatography and methane and ethane are quantified by a flame ionization detector (FID).

The gas chromatograph used during this program was a Varian 3400 with a FID. This instrument was calibrated using ultra-zero air and methane (CH_4) and ethane (C_2H_6) in nitrogen certified standards. The calibrations were performed before and after sampling with calibration checks performed each day. Sample times and locations were logged on integrator printouts.

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4.5 Total Organic Concentration Determination

Method 25A, 40CFR60, sampling and measurement system meets the requirements for stack sampling of volatile organic compounds (VOCs) set forth by the USEPA. In particular, it meets the requirements of USEPA Reference Method 25A, "Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer," 40CFR60, Appendix A. This method applies to the measurement of total gaseous organic concentration of hydrocarbons. With this method, gas samples were extracted from the inlet and stack through heated Teflon® sample lines to the analyzers.

The flame ionization detectors (FIDs) used during this program were JUM Model VE-7 High-Temperature Total Hydrocarbon Analyzers. They are highly sensitive FIDs that provide a direct reading of total organic vapor concentrations with linear ranges of 0-10, 100, 1000 and 10,000 ppm by volume. The instruments were calibrated using ultra-zero air and propane in air certified standards. The calibrations were performed before and after sampling with calibration checks performed between each test run. Sampling was conducted continuously for three one-hour periods. Sample times and locations were logged simultaneously on data loggers. Final concentrations were determined by subtracting the methane and ethane analysis from the Method 18, 40CFR60.

4.6 ENCOLOSURE CRITERIA AND TECHNIQUES (PTE)

4.6.1 NDO Distance to Emitting Point (PTE)

Criteria: All NDOs such as open doorways, windows, etc. must be at least four equivalent NDO diameters from the nearest potential VOC emitting point.

Technique: The dimensions of all NDOs and distances to potential emitting points are measured. The calculated NDO equivalent diameters are compared to the emitting point distances measured.

4.6.2 Total NDO Area (PTE)

Criteria: The area of all NDOs divided by the total area of all walls, floors and ceilings in the enclosure (called the "NEAR" ratio in the procedure) must not exceed 0.05.

Technique: The measured surfaces were used to determine a composite surface area of the enclosure and the normally open NDOs and the NEAR ratio was determined.

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4.6.3 Velocity of Airflow through NDO (PTE)

Criteria: The calculated face velocity through the NDOs must be greater than 200 feet per minute (fpm). This is defined as the total exhaust volume (in scfm), less make up air, divided by the area of all NDOs (in square feet). Alternately, the static pressure of the PTE can be measured.

Technique: The static pressure of the PTE was measured to verify if it meets the -0.007 inches H_2O criteria.

4.6.4 Direction of Airflow through NDO (PTE)

Criteria: The direction of airflow through all NDOs must be into the enclosure.

Technique: Dry ice was used at each normally open NDO to measure the direction of the airflow. A record of this data was made on the Procedure T data sheet. appended.

4.7 EVALUATION RESULTS (PTE)

The two (2) enclosures must meet all of the following four (4) requirements to qualify as a PTE. As currently configured the chocolate room enclosure geometry and the polishing room enclosure geometry compares to Method 204 criteria as follows:

4.7.1 Chocolate Room

4.7.1.1 Equivalent Diameters: NDO to VOC Emitting Point (PTE)

A list of minimum and current NDO to VOC emitting point distances are listed below:

NDO	Dimensions	Equivalent Diameter	VOC Emission Point	Distances		Pass/Fail?
				Minimum	Actual	
Exit Door	48" x 6"	19.1"	Food Grade Alcohol Coater	76.6"	186"	Pass
Hole in Floor	36" Diameter	36"	Food Grade Alcohol Coater	144"	264"	Pass

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$$\text{Equivalent Diameter} = \left(\frac{4 \times \text{area}}{\pi}\right)^{0.5}$$

Minimum Allowed Distance = 4 × Equivalent Diameter (NDO)

4.7.1.2 NDO to Enclosure Area Ratio (PTE)

The calculated NEAR ratio of the room is 0.0008. The calculation is as follows:

	A_N/A_T	≤ 0.05		
where:	A_N	= Area of normally open NDOs	=	9.07
	A_T	= Total Area of enclosure	=	11,594.76
	$\therefore$	A_N 9.07 ÷ A_T 11,594.76	=	0.0008

Because the calculated NEAR is less than the maximum allowable ratio of 0.05, the enclosure meets the requirements of this section.

4.7.1.3 NDO Facial Velocity Determinations (PTE)

The static pressure of the PTE was measured using a micromanometer. The negative pressure in the enclosure was -0.018 inches H_2O. This meets the -0.007 inches H_2O criteria.

4.7.1.4 NDO Air Flow Direction (PTE)

The air flow, verified using dry ice, through all of the normally open NDOs was into the enclosure.

4.7.2 Polishing Room

4.7.2.1 Equivalent Diameters: NDO to VOC Emitting Point (PTE)

A list of minimum and current NDO to VOC emitting point distances are listed below:

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NDO	Dimensions	Equivalent Diameter	VOC Emission Point	Distances		Pass/Fail?
				Minimum	Actual	
Exit Door 1	60" x 3"	15.1"	Food Grade Alcohol Coater	60.6"	90"	Pass
Exit Door 2	60" x 3"	15.1"	Food Grade Alcohol Coater	60.6"	90"	Pass

$$\text{Equivalent Diameter} = \left(\frac{4 \times \text{area}}{\pi}\right)^{0.5}$$

Minimum Allowed Distance = 4 × Equivalent Diameter (NDO)

4.7.2.2 NDO to Enclosure Area Ratio (PTE)

The calculated NEAR ratio of the room is 0.0003. The calculation is as follows:

$A_N/A_T \leq 0.05$

where: A_N = Area of normally open NDOs = 2.50

A_T = Total Area of enclosure = 9,420

$\therefore$ A_N 2.50 ÷ A_T 9,420 = 0.0003

Because the calculated NEAR is less than the maximum allowable ratio of 0.05, the enclosure meets the requirements of this section.

4.7.2.3 NDO Facial Velocity Determinations (PTE)

The static pressure of the PTE was measured using a micromanometer. The negative pressure in the enclosure was –0.16 inches H_2O. This meets the -0.007 inches H_2O criteria.

4.7.2.4 NDO Air Flow Direction (PTE)

The air flow, verified using dry ice, through all of the normally open NDOs was into the enclosure.

Calculations were performed on computer and by hand. An explanation of the nomenclature and calculations along with the complete test results is included in the appendix. Also appended are calibration data and copies of the raw field data sheets.

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Sample recovery was performed at the test site by the test crew. Initial and final analyses were performed at the Mostardi Platt laboratory in Elmhurst, Illinois. Copies of all sample analysis sheets are appended to this report.

Raw data are kept on file at the Mostardi Platt office in Elmhurst, Illinois. All samples from this test program (not already used in analysis) will be retained for 60 days after the submittal of the report, after which they will be discarded unless Mostardi Platt is advised otherwise.

5.0 QUALITY ASSURANCE PROCEDURES

Mostardi Platt recognizes the previously described reference methods to be very technique oriented and attempts to minimize all factors which can increase error by implementing its Quality Assurance Program into every segment of its testing activities.

Dry and wet test meters were calibrated according to methods described in the Quality Assurance Handbook, Sections 3.3.2, 3.4.2 and 3.5.2. Percent error for the wet test meter according to the methods was less than the allowable error of 1.0 percent. The dry test meters measured the test sample volumes to within 2 percent at the flowrate and conditions encountered during sampling.

Calibration gases were Protocol One gases.

6.0 ACKNOWLEDGMENTS

Mostardi Platt would like to thank all personnel involved in this project for their assistance in completing this test program, especially Mr. Al Maronta of Ferrara Pan Candy Company.

Respectfully submitted,

MOSTARDI-PLATT ASSOCIATES, INC.

Eric Ehlers

Eric L. Ehlers
Project Supervisor

ELE/kmt

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7.0 TEST RESULTS SUMMARY

Ferrara Pan Candy
Catalytic Oxidizer
Forest Park, Illinois
September 22, 2000

Method 25A VOC Results Summary									
Position	Test No.	Time	Airflow (dscfm)	Temp (°F)	Moisture Corr (1-Bws)	VOC Conc (ppmvd as C_3H_8)	Methane Conc (ppmvd)	Non Methane VOC Conc (ppmvd as C_3H_8)	VOC Emission Rate (lbs C_3H_8/hr)
Prime Oxidizer Inlet	1	0555-0655	4555	62	0.988	379.8	3.0	378.8	11.82
	2	0710-0810	4417	61	0.985	349.1	3.0	348.1	10.53
	3	0820-0920	4285	63	0.988	328.0	4.0	326.7	9.59
	Average		4419	3.3	0.987	352.3	3.3	351.2	10.65
Prime Oxidizer Outlet	1	0555-0655	4641	151	0.987	5.0	4.0	3.7	0.12
	2	0710-0810	4405	152	0.962	4.6	5.0	2.9	0.09
	3	0820-0920	4368	151	0.970	3.5	4.0	2.2	0.06
	Average		4471	151	0.973	4.4	4.3	2.9	0.09

Destruction Efficiency Summary			
Test No.	Inlet (lbs C_3H_8 /hr)	Outlet (lbs C_3H_8 /hr)	Efficiency (%)
1	11.82	0.12	98.0
2	10.53	0.09	99.1
3	9.59	0.06	99.4
Average	10.65	0.09	99.2

$$\text{Emission Rate (lbs/hr)} = \frac{\text{Concentration (ppmvd as } C_3H_8)}{8.7573 \times 10^6} \times \text{dscfm} \times 60$$

$$\text{Destruction Efficiency(\%)} = \frac{\text{Inlet (lbs}C_3H_8\text{ / hr)} - \text{Outlet (lbs}C_3H_8\text{ / hr)}}{\text{Inlet (lbs}C_3H_8\text{ / hr)}} \times 100$$

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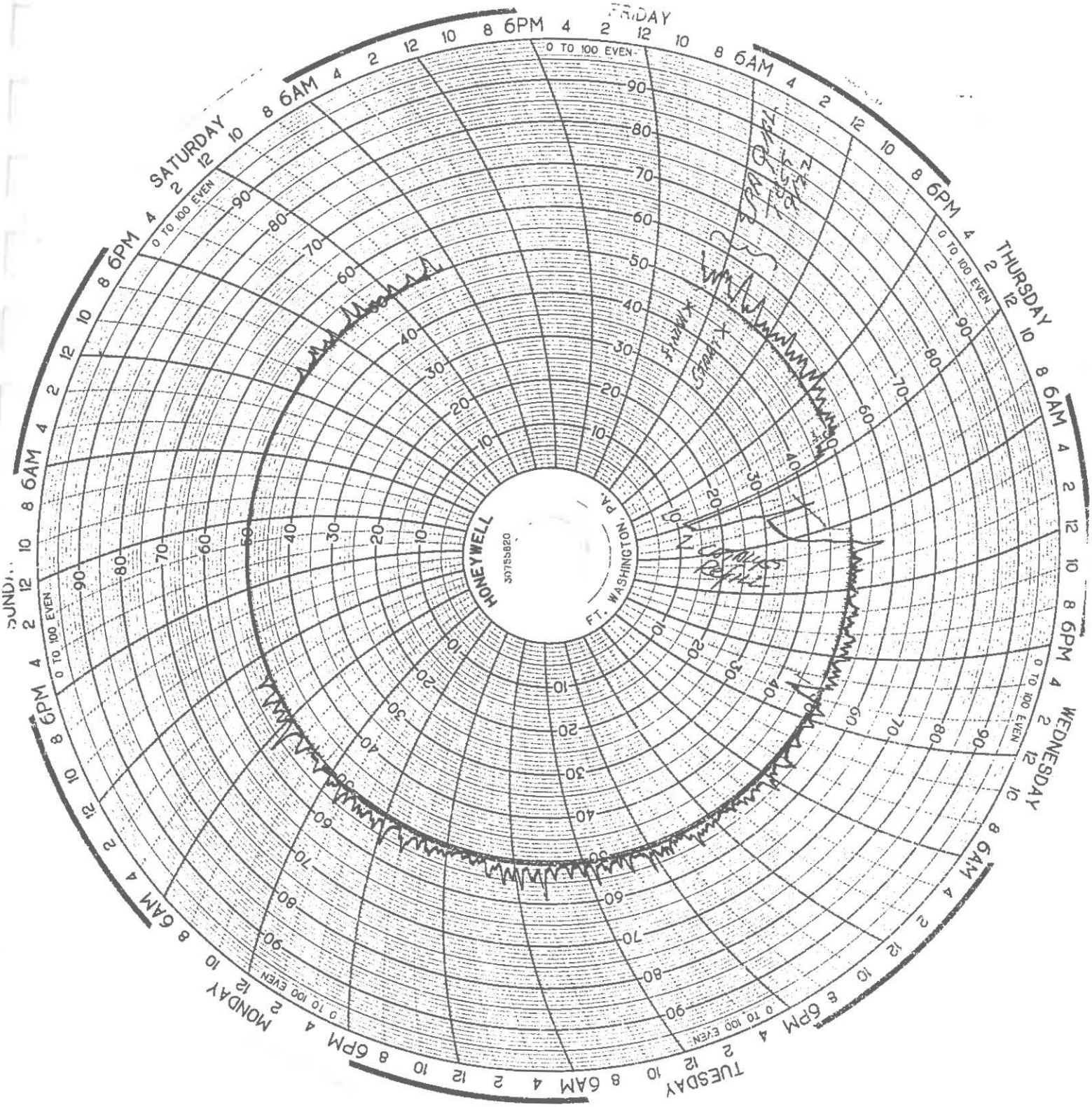
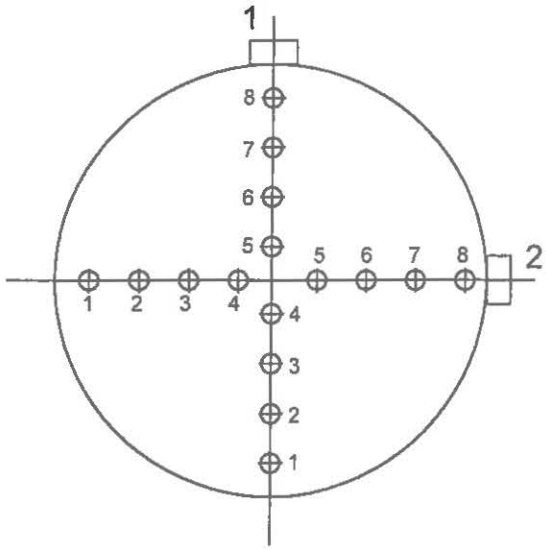
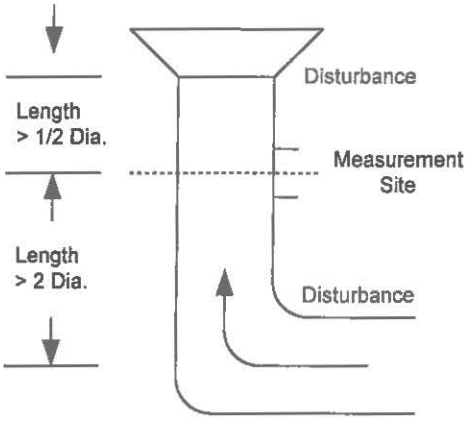
APPENDIX



ICPR Qualifying Test
9/22 - 6:00 AM - 9:30 AM
Mustard & Platt

EQUAL AREA TRAVERSE FOR ROUND DUCTS





Job:	Ferrara Pan Candy Company Forest Park, Illinois
Date:	September 22, 2000
Unit No:	Catalytic Oxidizer
Duct No:	Stack
Stack Diameter:	31 Inches
Stack Area:	5.241 Square Feet
No. Points Across Diameter:	8
No. of Ports:	2

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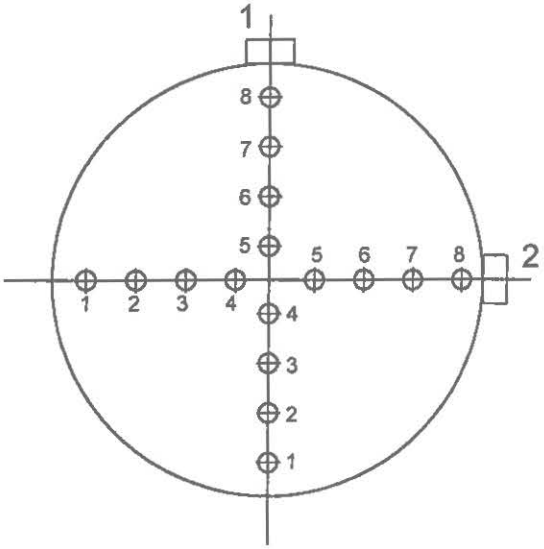
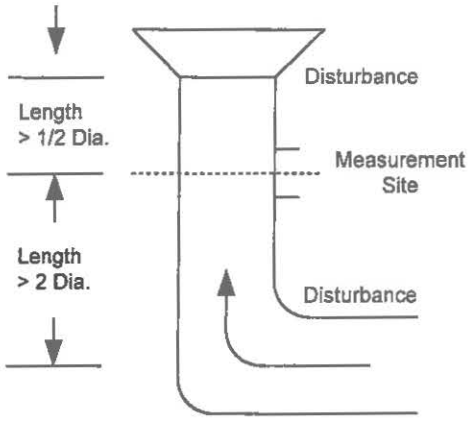
EQUAL AREA TRAVERSE FOR ROUND DUCTS





Job:	Ferrara Pan Candy Company Forest Park, Illinois
Date:	September 22, 2000
Unit No:	Catalytic Oxidizer
Duct No:	Inlet
Duct Diameter:	30 Inches
Duct Area:	4.909 Square Feet
No. Points Across Diameter:	8
No. of Ports:	2

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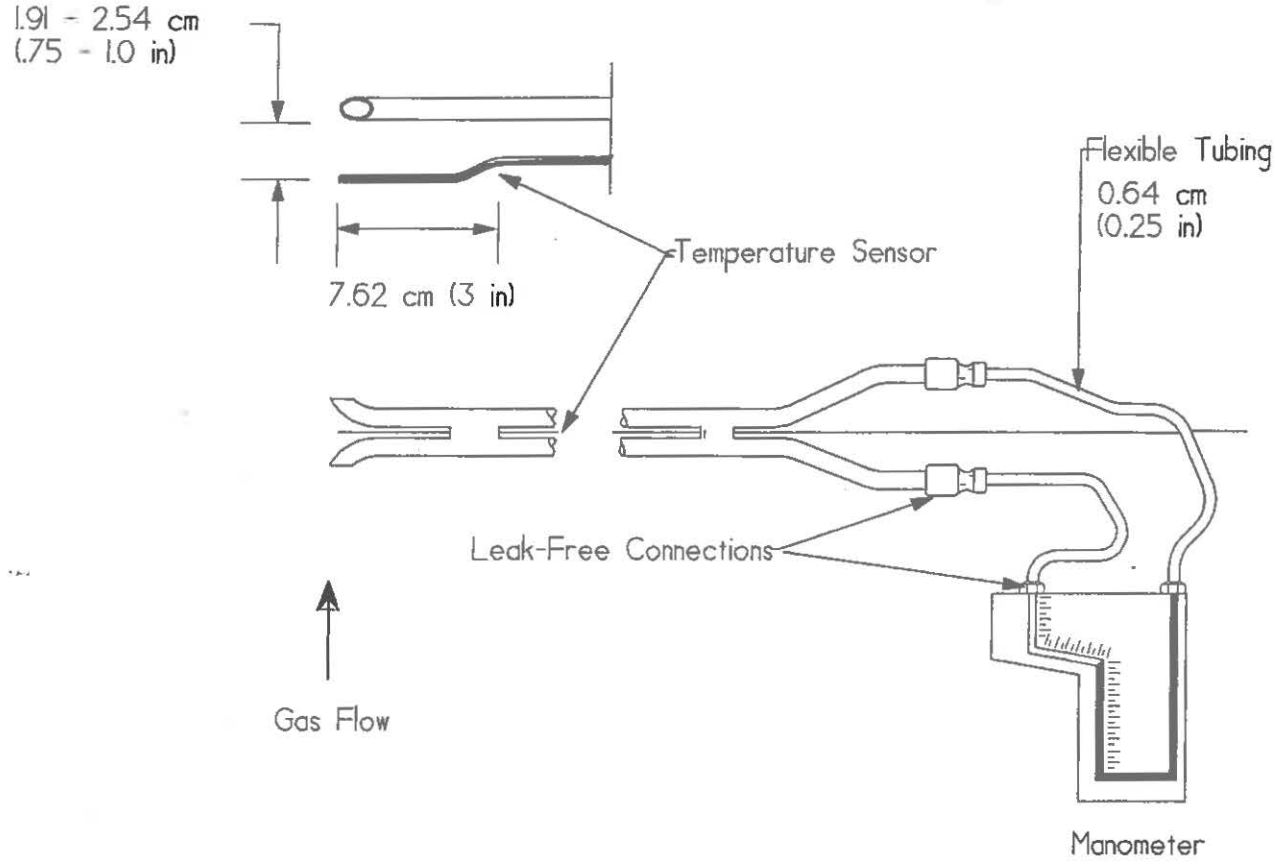
S-Type Pitot Tube Manometer Assembly



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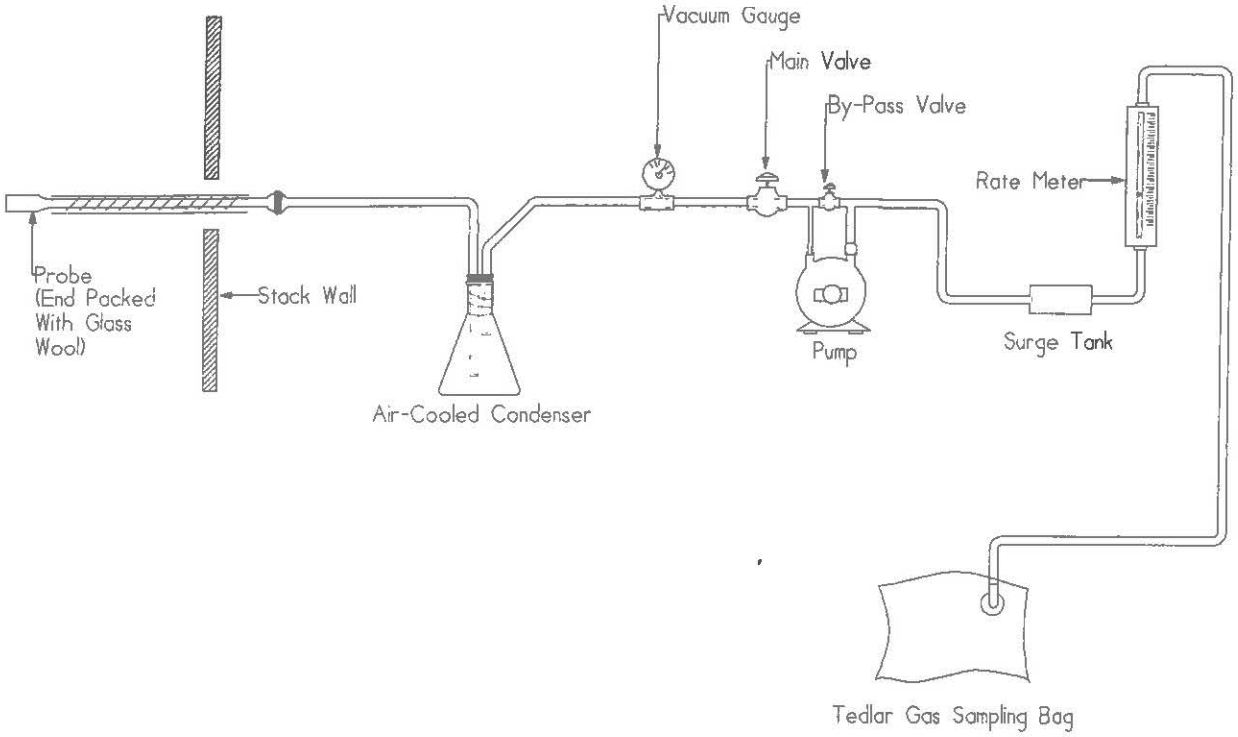
Sampling Train For Integrated Gas Sampling

EPA Reference Method 3



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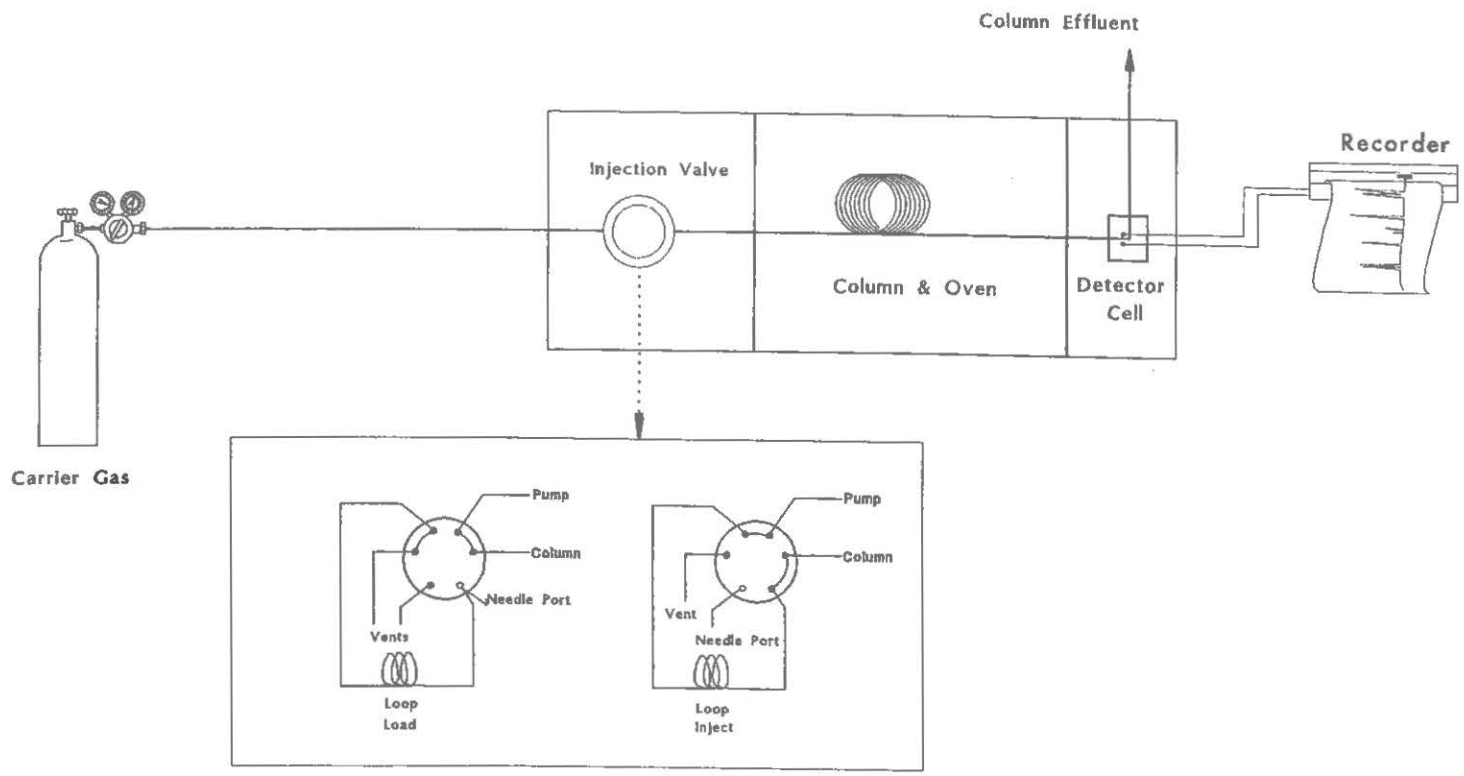
DWG-E

[Rev. 7/97]

Measurement Of Gaseous Organic Compound Emissions By Gas Chromatography

EPA Reference Method 18



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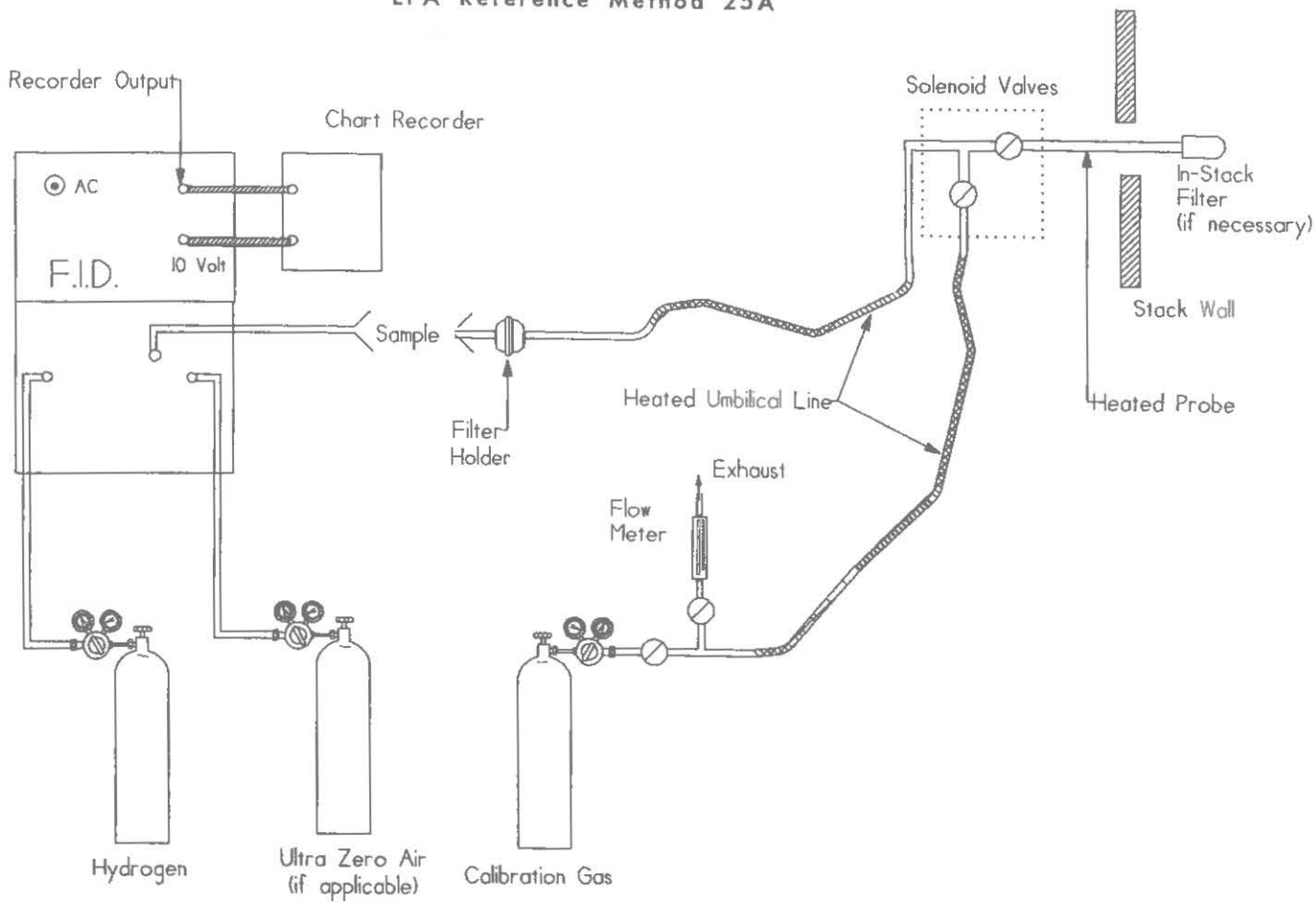
DWG-AU

[Rev. 7/97]

Total Gaseous Organic Concentration Using a Flame Ionization Analyzer

EPA Reference Method 25A



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DWG-A1

[Rev. 7/97]

GC Operating Conditions
Trace Hydrocarbon Analysis by GC/FID

Operator	FRANK H. JANKE
Date	Sept. 22, 2000
Instrument I.D.	Varian 3400-9647

Column

Type	6' x 1/8" 80/100 Porapak N
Material	Stainless Steel

Column Oven Temperatures

Initial Temperature	40° C
Initial Time	0.0 min
Program Rate	30° C / min
Final Temperature	170° C
Final Time	1.0 min

Detector

Type	flame ionization detector
Temperature	190°C
Attenuation	16
Range	11 / 12
Auto Zero?	Yes
Hydrogen Flow	30 mL/min
Air Flow	300 mL/min

Injector

Type	teflon gas sample valve
Sample Loop Size	1.0 ml
Sample Loop Temperature	170°C
Auxiliary Loop Temperature	170°C

Carrier Gas

Type	Helium, UHP
Flowrate	30 mL/min
Pressure	22.5 psi

Plotter Section

Plot Speed	0.5 cm/min
Zero Offset	15%
Plot Signal	A
Time Ticks?	Yes
Instrument Event Codes	Yes
User Number	Not used (0 - 0)
Print User Number	No
Print Report	Yes
Print Run Log	No

Integration

Run Mode	1 (analysis)
Peak Measurement Parameter	1 (area)
Long Report Format	No
Result Calculation Type	1 (area %)
Divisor	1.000
Amount Standard	1.000
Multiplier	1.000
Result Units	left blank
Report Unidentified Peaks	Yes
Unidentified Peak Factor	0.000
Sample ID	
Subtract Blank Baseline	No
Peak Reject Value	1000
Signal to Noise Ratio	5
Tangent Peak Width	10
Initial Peak Width	8

Timed Events Table

Program 1 Event Type	1 (Peak Width)
Start Time	10.0 min
Width	16

Cylinder Gases Used

Carrier: Helium	K-026913
Hydrogen	K-019288
Air	K-026956
Low Level Hydrocarbon Standard	ALM 023211
Mid Level Hydrocarbon Standard	AAL 13847
High Level Hydrocarbon Standard	ALM 032015

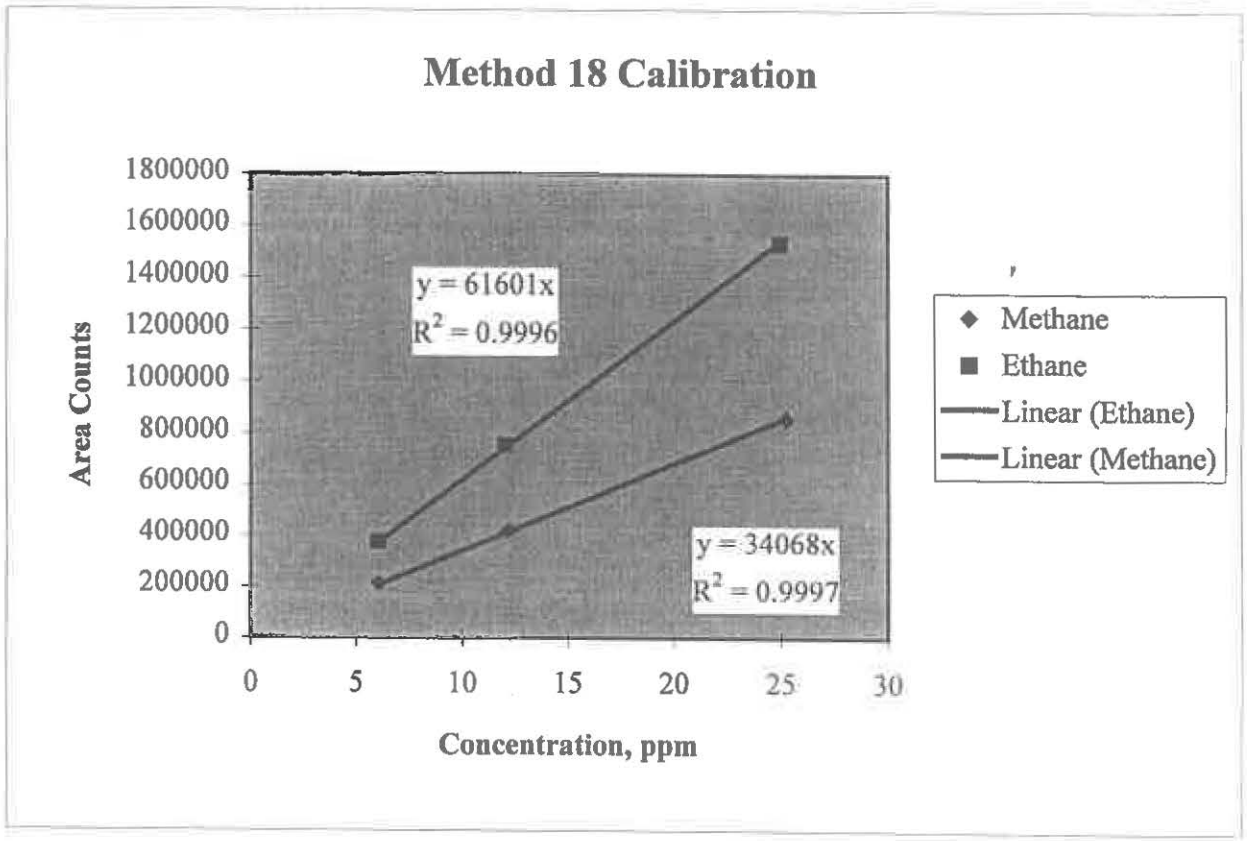
F:\DATA\LAB\FIDOPCON.FRM

Revision Date: 10/14/98

Method 18

Analysis for Methane and Ethane Calibration

Date:	7/31/00	
Analyst:	DJS	
Lo-Range	6.07	6.03
Run #	Methane	Ethane
1	210430	371962
2	210807	378662
3	212174	380748
Average	211137	377124
%RSD	0.43	1.22
RF	34784	62541
Mid-Range	12.17	12.02
Run #	Methane	Ethane
1	422168	757032
2	417849	749558
3	422156	753856
Average	420724	753482
%RSD	0.59	0.50
RF	34571	62686
Hi-Range	25.26	24.97
Run #	Methane	Ethane
1	860897	1532167
2	855317	1528839
3	853533	1530596
Average	856582	1530534
%RSD	0.45	0.11
RF	33911	61295
Ave. RF	34422	62174
%RSD	1.32	1.23



	6.07	6.03	12.17	12.02	25.26	24.97
Methane	211137		420724		856582	
Ethane		377124		753482		1530534

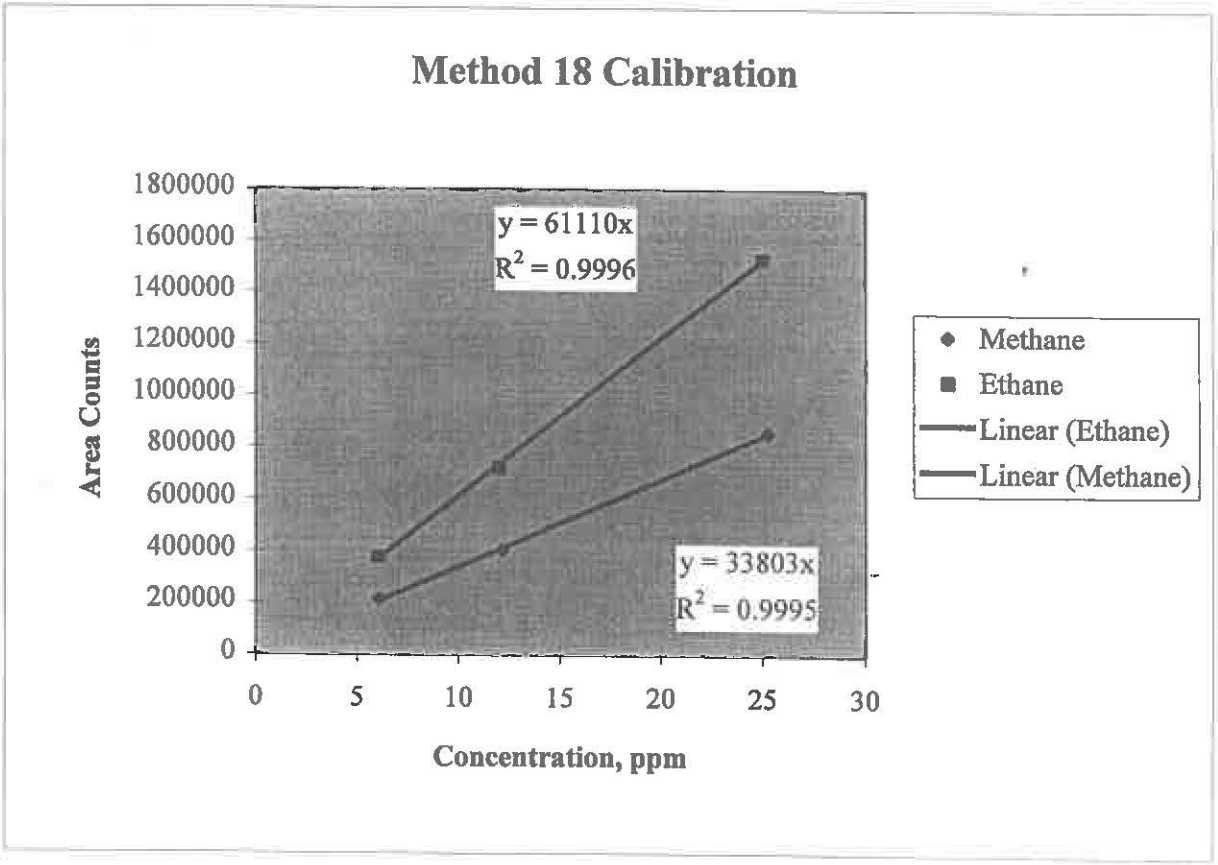
Begin of Day Cal

Method 18

Analysis for Methane and Ethane Calibration

Project No: M003818
Client/Loc: Ferrara Pan Candy

Date:	9/22/00	
Analyst:	FHJ	
Lo-Range	6.07	6.03
Run #	Methane	Ethane
1	210430	371962
2	210807	378662
3	212174	380748
Average	211137	377124
%RSD	0.43	1.22
RF	34784	62541
Mid-Range	12.17	12.02
Run #	Methane	Ethane
1	403410	723674
2	403780	720994
3	401151	717194
Average	402780	720621
%RSD	0.35	0.45
RF	33096	59952
% Drift	-3.85	-3.57
Hi-Range	25.26	24.97
Run #	Methane	Ethane
1	860897	1532167
2	855317	1528839
3	853533	1530596
Average	856582	1530534
%RSD	0.45	0.11
RF	33911	61295
Ave. RF	33930	61263
%RSD	2.49	2.11



	6.07	6.03	12.17	12.02	25.26	24.97
Methane	211137		402780		856582	
Ethane		377124		720621		1530534

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Method 18

Sample Results for Methane and Ethane

Date: 09/22/00
Analyst: FHJ

Project No: M003818
Client/Loc: Ferrara Pan Candy

Sample No: M003818-001
Test No: 1
Location: Oxidizer Inlet
Sample Date 9/22/2000

Run #	Methane	Ethane
1	113566	ND
2	117734	ND
3	118811	ND
Average	116704	ND
%RSD	2.37	ND
RESULT	**3**	**ND**

Sample No: M003818-002
Test No: 2
Location: Oxidizer Inlet
Sample Date 9/22/2000

Run #	Methane	Ethane
1	108374	ND
2	108670	ND
3	102794	ND
Average	106613	ND
%RSD	3.11	ND
RESULT	**3**	**ND**

Sample No M003818-003
Test No: 3
Location: Oxidizer Inlet
Sample Dat 9/22/2000

Run #	Methane	Ethane
1	116166	ND
2	122645	ND
3	121397	ND
Average	120069	ND
%RSD	2.86	ND
RESULT	**4**	**ND**

Sample No: M003818-004
Test No: 1
Location: Oxidizer Outlet
Sample Date 9/22/2000

Run #	Methane	Ethane
1	142396	ND
2	149726	ND
3	152299	ND
Average	148140	ND
%RSD	3.47	ND
RESULT	**4**	**ND**

Sample No: M003818-005
Test No: 2
Location: Oxidizer Outlet
Sample Date 9/22/2000

Run #	Methane	Ethane
1	175967	ND
2	171486	ND
3	171752	ND
Average	173068	ND
%RSD	1.45	ND
RESULT	**5**	**ND**

Sample No M003818-006
Test No: 3
Location: Oxidizer Outlet
Sample Dat 9/22/2000

Run #	Methane	Ethane
1	136130	ND
2	127297	ND
3	127276	ND
Average	130234	ND
%RSD	3.92	ND
RESULT	**4**	**ND**

Result is in ppm. The limit of detection is 1 ppm.
BDL = Below Detection Limit

End of Day Cal

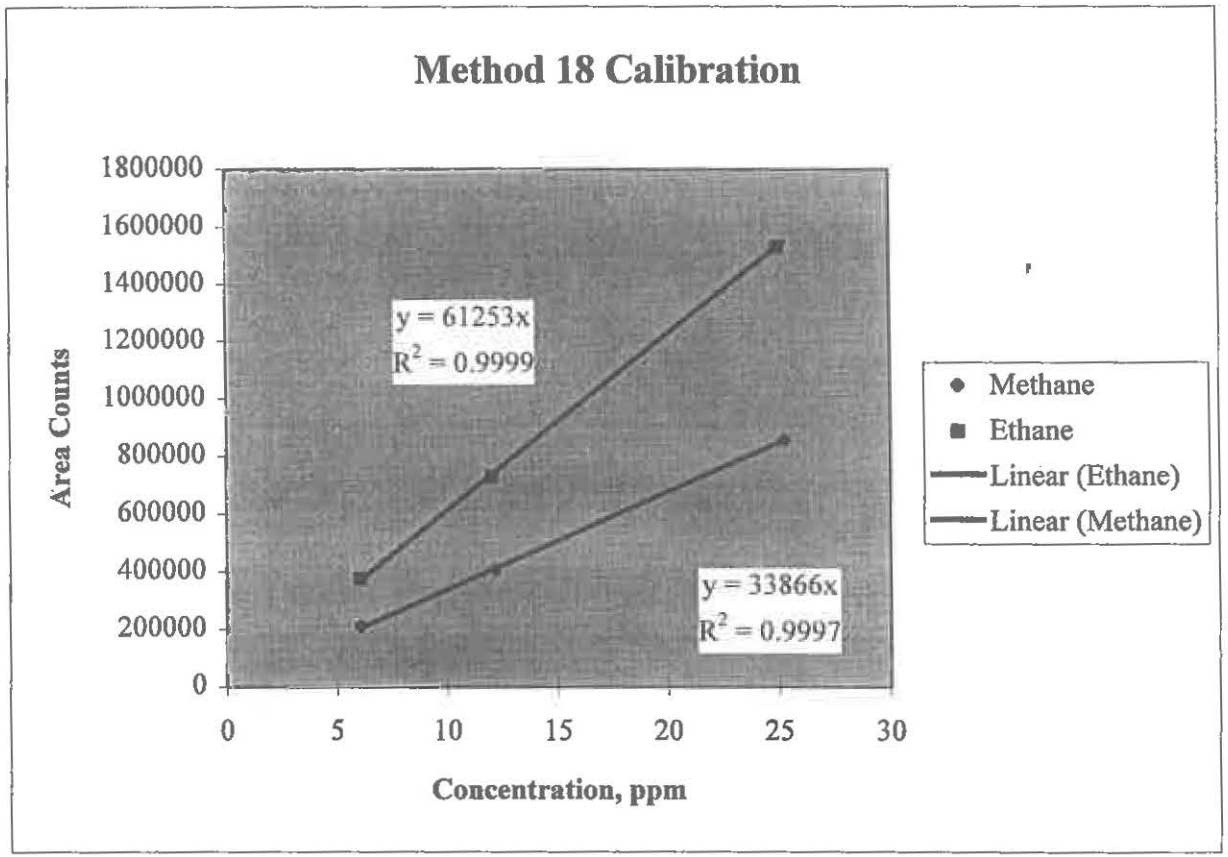
Method 18

Analysis for Methane and Ethane Calibration

Date: 9/22/00
Analyst: FHJ

Project No: M003818
Client/Loc: Ferrara Pan Candy

Lo-Range	6.07	6.03
Run #	Methane	Ethane
1	210430	371962
2	210807	378662
3	212174	380748
Average	211137	377124
%RSD	0.43	1.22
RF	34784	62541
Mid-Range	12.17	12.02
Run #	Methane	Ethane
1	410558	731627
2	405441	728957
3	405134	729944
Average	407044	730176
%RSD	0.75	0.18
RF	33447	60747
% Drift	-1.43	-0.84
Hi-Range	25.26	24.97
Run #	Methane	Ethane
1	860897	1532167
2	855317	1528839
3	853533	1530596
Average	856582	1530534
%RSD	0.45	0.11
RF	33911	61295
Ave. RF	34047	61528
%RSD	1.99	1.49



	6.07	6.03	12.17	12.02	25.26	24.97
Methane	211137		407044		856582	
Ethane		377124		730176		1530534

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PPMVD TO LB/HR
CONVERSION CALCULATIONS

1. NO_x $\dfrac{\text{ppm } NO_x}{8.3755 \times 10^6} = \dfrac{\text{lbs } NO_x}{\text{dscf}}$ **OR** $\text{ppm } NO_x \times 1.194 \times 10^{-7} = \dfrac{\text{lbs}/NO_x}{\text{dscf}}$

$$\frac{\text{lbs } NO_x}{\text{dscf}} \times \frac{\text{dscf}}{\text{min}} \times \frac{60 \text{ min}}{\text{hr}} = \frac{\text{lbs } NO_x}{\text{hr}}$$

2. SO_2 $\dfrac{\text{ppm } SO_2}{6.0151 \times 10^6} = \dfrac{\text{lbs } SO_2}{\text{dscf}}$ **OR** $\text{ppm } SO_2 \times 1.660 \times 10^{-7} = \dfrac{\text{lbs}/SO_2}{\text{dscf}}$

$$\frac{\text{lbs } SO_2}{\text{dscf}} \times \frac{\text{dscf}}{\text{min}} \times \frac{60 \text{ min}}{\text{hr}} = \frac{\text{lbs } SO_2}{\text{hr}}$$

3. CO $\dfrac{\text{ppm CO}}{1.3762 \times 10^7} = \dfrac{\text{lbs CO}}{\text{dscf}}$

$$\frac{\text{lbs CO}}{\text{dscf}} \times \frac{\text{dscf}}{\text{min}} \times \frac{60 \text{ min}}{\text{hr}} = \frac{\text{lbs CO}}{\text{hr}}$$

4. CH_4 $\dfrac{\text{ppm } CH_4}{(1 - \text{Bws})\, 2.4017 \times 10^7} = \dfrac{\text{lbs } CH_4}{\text{dscf}}$

$$\frac{\text{lbs } CH_4}{\text{dscf}} \times \frac{\text{dscf}}{\text{min}} \times \frac{60 \text{ min}}{\text{hr}} = \frac{\text{lbs } CH_4}{\text{hr}}$$

5. C_3H_8 $\dfrac{\text{ppm } C_3H_8}{(1 - \text{Bws})\, 8.7573 \times 10^6} = \dfrac{\text{lbs } C_3H_8}{\text{dscf}}$

$$\frac{\text{lbs } C_3H_8}{\text{dscf}} \times \frac{\text{dscf}}{\text{min}} \times \frac{60 \text{ min}}{\text{hr}} = \frac{\text{lbs } C_3H_8}{\text{hr}}$$

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SUMMARY OF RESULTS CALCULATIONS

$$Vm\,(std) = 17.647 \times Vm \times \left[\frac{P_{bar} + \frac{DH}{13.6}}{(460 + Tm)}\right] \times Y$$

$$Vw\,(std) = 0.0471 \times Vlc$$

Vlc = water + silica net

$$Bws = \left[\frac{Vw\,(std)}{Vw\,(std) + Vm\,(std)}\right]$$

$$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + [0.28 \times (100 - \%CO_2 - \%O_2)]$$

$$MS = Md \times (1 - Bws) + (18 \times Bws)$$

$$Vs = \sqrt{\frac{(Ts + 460)}{Ms \times Ps}} \times \sqrt{DP} \times Cp \times 85.49$$

Cp = pitot tube correction factor
Ps = absolute flue gas pressure
Ms = molecular weight of gas (lb/lb mole)
Md = dry molecular weight of gas (lb/lb mole)
Bws = water vapor in gas stream proportion by volume

$$Acfm = Vs \times Area\ (of\ stack\ or\ duct) \times 60$$

$$Dscfm = Acfm \times 17.647 \times \left[\frac{Ps}{(460 + Ts)}\right] \times (1 - Bws)$$

$$Scfm = Acfm \times 17.647 \times \left[\frac{Ps}{(460 + Ts)}\right]$$

$$Scfh = Scfm \times 60 \frac{min}{hr}$$

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MOISTURE CALCULATIONS

$$V_{wc(std)} = \frac{(V_f - V_i)\,\rho_w\,R\,T_{std}}{P_{std}\,M_w} = 0.04707(V_f - V_i)$$

$$V_{wsg(std)} = \frac{(W_f - W_i)\,R\,T_{std}}{P_{std}\,M_w} = 0.04715\,(W_f - W_i)$$

$$V_{m(std)} = 17.64\;V_m\;Y\,\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}$$

$$B_{ws} = \frac{V_{wc(std)} + V_{wsg(std)}}{V_{wc(std)} + V_{wsg(std)} + V_{m(std)}}$$

Where:

B_{ws} = Water vapor in gas stream, proportion by volume

M_w = Molecular weight of water, 18.015 lb/lb-mole

P_{bar} = Barometric pressure at the testing site, in. Hg

P_{std} = Standard absolute pressure, 29.92 in. Hg

R = Ideal gas constant, 0.048137 (in. Hg)(ft^3)/(g-mole)(°R) = [21.8348(in. Hg)(ft^3)/(lb-mole)(°R)]/453.592 g-mole/lb-mole

T_m = Absolute average dry gas meter temperature, °R

T_{std} = Standard absolute temperature, 528 °R

V_f = Final volume of condenser water, ml

V_i = Initial volume of condenser water, ml

V_m = Dry gas volume measured by dry gas meter, dcf

$V_{m(std)}$ = Dry gas volume measured by dry gas meter, corrected to standard conditions, scf

$V_{wc(std)}$ = Volume of condensed water vapor, corrected to standard conditions, scf

$V_{wsg(std)}$ = Volume of water vapor collected in silica gel, corrected to standard conditions, scf

W_f = Final weight of silica gel, g

W_i = Initial weight of silica gel, g

Y = Dry gas meter calibration factor

ΔH = Average pressure exerted on dry gas meter outlet by gas sample bag, in. H_2O

ρ_w = Density of water, 0.9982 g/ml

13.6 = Specific gravity of mercury (Hg)

17.64 = T_{std}/P_{std}

0.04707 = ft^3/ml 0.04715 = ft^3/g

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FID - Hydrocarbon Field Data Sheet

Project: Ferrara Pan
Location: Forrest Park Plant
Source: 1 Inlet
2 outlet
3
Operator: J Robertson
Date: 9/22/00

Calibration Gas ID	Concentration	Manufacturer/Serial No.
1		
2		
3		
4		
5		

Analyzer ID: Inlet S/N outlet S/N 9730691

Monitor Range:
Response Time: outlet

Chart Recorder
Span Value:
Chart Speed:

Inlet

	Time	1	2	3
Test 1	555-655	375.2	ppm	
		4555.5	DSCFM	
		0.012	Bws	
		11.853	lbs/hr	
Test 2	710-810	343.9	ppm	
		4417.2	DSCFM	
		0.015	Bws	
		10.566	lbs/hr	
T. 3	820-920	324.1	ppm	
		4281.8	DSCFM	
		0.012	Bws	
		9.603	lbs/hr	

Time	1	2	3
555-655	4.9	ppm	
	4640.7	DSCFM	
	0.013	Bws	
	0.158	lbs/hr	
710-810	4.4	ppm	
	4404.6	DSCFM	
	0.038	Bws	
	0.138	lbs/hr	
	3.4	ppm	
	4367.8	DSCFM	
	0.030	Bws	
	0.105	lbs/hr	

Time	1	2	3
Eff 98.7%			
98.7%			
98.9%			

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Site 1: Ferrara Pan Candy -- Time File 1

09/22/00 Time	Inlet VOC ppmv 1 min avg Bin#002	Outlet VOC ppmv 1 min avg Bin#003
05:55:00	171.9	3.1
05:56:00	168.1	2.9
05:57:00	165.2	2.8
05:58:00	169.9	2.8
05:59:00	160.3	2.8
06:00:00	169.9	2.8
06:01:00	154.3	2.6
06:02:00	154.6	2.6
06:03:00	159.5	2.6
06:04:00	160.5	2.6
06:05:00	151.0	2.6
06:06:00	138.5	2.6
06:07:00	129.0	2.5
06:08:00	136.1	2.5
06:09:00	121.5	2.5
06:10:00	245.9	2.6
06:11:00	453.7	3.5
06:12:00	495.5	4.7
06:13:00	359.4	4.4
06:14:00	282.3	3.8
06:15:00	287.3	3.4
06:16:00	354.9	3.7
06:17:00	364.4	4.0
06:18:00	351.1	4.0
06:19:00	349.3	4.0
06:20:00	345.3	4.1
06:21:00	358.7	4.3
06:22:00	366.0	4.3
06:23:00	323.6	4.2
06:24:00	291.6	3.9
06:25:00	319.4	3.9
06:26:00	334.0	4.0
06:27:00	435.0	4.3
06:28:00	539.3	5.9
06:29:00	615.5	6.4
06:30:00	678.1	8.4
06:31:00	698.4	8.5
06:32:00	612.4	7.4
06:33:00	514.2	5.7
06:34:00	462.8	5.1
06:35:00	452.2	4.6
06:36:00	416.6	4.4
06:37:00	422.9	4.1
06:38:00	467.4	4.1
06:39:00	411.3	4.4
06:40:00	422.8	4.2
06:41:00	432.0	4.5
06:42:00	473.0	4.6
06:43:00	453.0	5.0

Site 1: Ferrara Pan Candy -- Time File 1

09/22/00 Time	Inlet VOC ppmv 1 min avg Bin#002	Outlet VOC ppmv 1 min avg Bin#003
06:44:00	450.5	5.8
06:45:00	449.3	7.1
06:46:00	435.3	9.1
06:47:00	431.2	9.5
06:48:00	513.2	9.8
06:49:00	535.8	8.3
06:50:00	535.5	7.5
06:51:00	554.7	6.6
06:52:00	589.0	10.4
06:53:00	584.4	13.9
06:54:00	551.8	7.8
06:55:00	554.7	7.4
Average	375.2	4.9
Minimum	121.5	2.5
Maximum	698.4	13.9

ΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔ

Site 1: Ferrara Pan Candy -- Time File 1

09/22/00 Time	Inlet VOC ppmv 1 min avg Bin#002	Outlet VOC ppmv 1 min avg Bin#003
07:10:00	286.3	3.3
07:11:00	277.0	3.2
07:12:00	273.0	3.1
07:13:00	252.1	3.0
07:14:00	248.7	3.0
07:15:00	233.6	3.0
07:16:00	237.2	2.8
07:17:00	274.3	3.0
07:18:00	315.1	3.2
07:19:00	315.2	3.6
07:20:00	329.5	3.3
07:21:00	478.5	3.6
07:22:00	517.7	5.3
07:23:00	490.1	4.7
07:24:00	461.1	4.8
07:25:00	434.7	4.5
07:26:00	404.7	4.4
07:27:00	395.5	4.3
07:28:00	413.5	4.3
07:29:00	422.7	4.4
07:30:00	411.6	4.5
07:31:00	391.9	4.7
07:32:00	366.8	4.3
07:33:00	359.4	4.1
07:34:00	339.8	4.2
07:35:00	336.4	4.2
07:36:00	380.0	5.0
07:37:00	371.3	4.9
07:38:00	386.7	4.3
07:39:00	383.4	5.9
07:40:00	320.0	6.2
07:41:00	307.1	5.0
07:42:00	301.2	4.5
07:43:00	287.3	4.8
07:44:00	281.7	4.7
07:45:00	260.3	4.7
07:46:00	234.8	3.9
07:47:00	194.9	4.6
07:48:00	201.3	4.3
07:49:00	212.4	4.0
07:50:00	225.0	3.6
07:51:00	206.0	3.7
07:52:00	257.7	4.0
07:53:00	280.5	5.2
07:54:00	272.9	5.4
07:55:00	346.2	5.2
07:56:00	553.3	6.7
07:57:00	556.8	8.6
07:58:00	540.9	7.8

Site 1: Ferrara Pan Candy -- Time File 1

09/22/00 Time	Inlet VOC ppmv 1 min avg Bin#002	Outlet VOC ppmv 1 min avg Bin#003
07:59:00	502.3	7.6
08:00:00	491.3	6.9
08:01:00	400.3	4.9
08:02:00	359.0	4.4
08:03:00	373.2	4.4
08:04:00	364.0	4.2
08:05:00	350.3	4.0
08:06:00	336.7	3.9
08:07:00	308.2	3.4
08:08:00	306.8	3.4
08:09:00	281.4	3.2
08:10:00	273.5	3.0
Average	343.9	4.4
Minimum	194.9	2.8
Maximum	556.8	8.6

ΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔ

Site 1: Ferrara Pan Candy -- Time File 1

09/22/00 Time	Inlet VOC ppmv 1 min avg Bin#002	Outlet VOC ppmv 1 min avg Bin#003
08:20:00	190.9	3.2
08:21:00	211.4	3.4
08:22:00	187.2	2.8
08:23:00	193.8	2.8
08:24:00	195.2	2.8
08:25:00	185.1	2.6
08:26:00	169.1	2.6
08:27:00	162.5	2.5
08:28:00	167.4	2.3
08:29:00	173.9	2.3
08:30:00	157.3	2.4
08:31:00	148.1	2.3
08:32:00	137.1	2.2
08:33:00	153.3	2.2
08:34:00	136.0	2.3
08:35:00	114.6	2.2
08:36:00	126.4	2.1
08:37:00	128.0	2.0
08:38:00	147.4	1.9
08:39:00	163.5	2.2
08:40:00	183.8	2.2
08:41:00	215.8	2.3
08:42:00	237.4	2.4
08:43:00	273.8	2.6
08:44:00	288.1	2.9
08:45:00	276.5	2.9
08:46:00	291.6	2.7
08:47:00	322.2	2.9
08:48:00	321.2	3.3
08:49:00	336.9	3.3
08:50:00	387.0	3.4
08:51:00	398.6	3.7
08:52:00	394.6	3.6
08:53:00	378.5	3.7
08:54:00	416.0	3.9
08:55:00	399.8	4.3
08:56:00	384.5	3.8
08:57:00	365.0	3.6
08:58:00	343.7	3.5
08:59:00	335.4	3.3
09:00:00	329.4	3.4
09:01:00	312.3	3.2
09:02:00	299.1	3.2
09:03:00	277.0	3.0
09:04:00	260.4	2.9
09:05:00	244.4	2.8
09:06:00	228.3	2.7
09:07:00	250.5	2.8
09:08:00	332.0	4.1

Site 1: Ferrara Pan Candy -- Time File 1

09/22/00 Time	Inlet VOC ppmv 1 min avg Bin#002	Outlet VOC ppmv 1 min avg Bin#003
09:09:00	688.8	5.9
09:10:00	930.1	10.5
09:11:00	761.9	8.4
09:12:00	610.3	6.8
09:13:00	566.2	5.7
09:14:00	601.8	5.1
09:15:00	580.8	4.8
09:16:00	547.5	4.2
09:17:00	555.5	3.8
09:18:00	578.9	3.8
09:19:00	530.8	3.4
09:20:00	487.5	3.1
Average	324.1	3.4
Minimum	114.6	1.9
Maximum	930.1	10.5

PITOT TRAVERSE DATA

Date:	09/22/2000	**Traverse Number:**	1
Project:	Ferrara Pan Candy	**Condition:**	Normal Load
Location:	Outlet	**Time:**	Start- 6:00 End- 6:06
Source:	Catalytic Oxidizer	**Data Taken By:**	AR/TB

Pressure, Barometric(Hg"):	29.33	**Carbon Dioxide Content(%):**	0.500
Pressure, Static(H2O"):	-0.50	**Oxygen Content(%):**	20.000
Pressure, Stack(Hg"):	29.293	**Nitrogen Content(%):**	79.500
Pitot Tube Coefficient(Cp):	0.836	**Water Vapor in Flue Gas (Bws):**	0.013
Flue Area:	5.240	**Molecular Wt. of Gas, Wet:**	28.742

Moisture Determination

Initial Volume.....	44.452	**Meter Calibration...**	1.005
Final Volume.....	46.3	**Initial Wt. .....**	521.3
Meter Temperature.....	65.5	**Final Wt. .....**	521.8
Meter Volume dscf.....	1.829		

Traverse Point:	Delta (ΔP)	SQRT (ΔP)	Temp. (°F)	Traverse Point:	Delta (ΔP)	SQRT (ΔP)	Temp. (°F)
1:	0.08	0.2828	145	1:	0.08	0.283	149
2:	0.08	0.2828	144	2:	0.10	0.316	149
3:	0.08	0.2828	155	3:	0.09	0.300	149
4:	0.09	0.3000	158	4:	0.09	0.300	149
5:	0.09	0.3000	159	5:	0.09	0.300	149
6:	0.08	0.2828	153	6:	0.09	0.300	150
7:	0.07	0.2646	153	7:	0.09	0.300	150
8:	0.07	0.2646	152	8:	0.08	0.283	150
9:				9:			
10:				10:			
11:				11:			
12:				12:			

Average Delta (ΔP):.....	0.0844	**Average Flue Temperature (Ts):.....**	150.875
Average SQRT Delta (ΔP):.....	0.2902	**Actual Vol. Flow Rate (acfm):.....**	5552.01
Flue Gas Velocity,ft/sec:.....	17.659	**Dry Standard Flow Rate (dscfm):.....**	4640.97
Standard Flow Rate (scfh).....	282000	**Standard Flow Rate (scfm):.....**	4700.78
Comments:	282047		

PITOT TRAVERSE DATA

Date:	09/22/2000	**Traverse Number:**	2
Project:	Ferrara Pan Candy	**Condition:**	Normal Load
Location:	Outlet	**Time:**	Start- 7:19 End- 7:23
Source:	Catalytic Oxidizer	**Data Taken By:**	AR/TB

Pressure, Barometric(Hg"):	29.33	**Carbon Dioxide Content(%):**	0.500
Pressure, Static(H2O"):	-0.50	**Oxygen Content(%):**	20.000
Pressure, Stack(Hg"):	29.293	**Nitrogen Content(%):**	79.500
Pitot Tube Coefficient(Cp):	0.836	**Water Vapor in Flue Gas (Bws):**	0.038
Flue Area:	5.240	**Molecular Wt. of Gas, Wet:**	28.467

Moisture Determination

Initial Volume.....

Final Volume.....

Meter Temperature.....

Meter Volume dscf.....

Meter Calibration.....

Initial Wt. .....

Final Wt. .....

Traverse Point:	Delta (ΔP)	SQRT (ΔP)	Temp. (°F)
1:	0.08	0.2828	149
2:	0.08	0.2828	149
3:	0.08	0.2828	150
4:	0.08	0.2828	151
5:	0.08	0.2828	152
6:	0.08	0.2828	151
7:	0.07	0.2646	151
8:	0.07	0.2646	151
9:			
10:			
11:			
12:			

Traverse Point:	Delta (ΔP)	SQRT (ΔP)	Temp. (°F)
1:	0.08	0.283	149
2:	0.08	0.283	150
3:	0.08	0.283	153
4:	0.08	0.283	155
5:	0.08	0.283	156
6:	0.08	0.283	157
7:	0.08	0.283	158
8:	0.09	0.300	156
9:			
10:			
11:			
12:			

Average Delta (ΔP):.....	0.0794	**Average Flue Temperature (Ts):**.....	152.375
Average SQRT Delta (ΔP):.....	0.2816	**Actual Vol. Flow Rate (acfm):**.....	5421.58
Flue Gas Velocity,ft/sec:.....	17.244	**Dry Standard Flow Rate (dscfm):**.....	4405.1
Standard Flow Rate (scfh).....	275000	**Standard Flow Rate (scfm):**.....	4579.11

Comments: 274746

PITOT TRAVERSE DATA

Date:	09/22/2000	**Traverse Number:**	3
Project:	Ferrara Pan Candy	**Condition:**	Normal Load
Location:	Outlet	**Time:**	Start- 8:26 End- 8:30
Source:	Catalytic Oxidizer	**Data Taken By:**	AR/TB

Pressure, Barometric(Hg"):	29.33	**Carbon Dioxide Content(%):**	0.500
Pressure, Static(H2O"):	-0.50	**Oxygen Content(%):**	20.000
Pressure, Stack(Hg"):	29.293	**Nitrogen Content(%):**	79.500
Pitot Tube Coefficient(Cp):	0.836	**Water Vapor in Flue Gas (Bws):**	0.030
Flue Area:	5.240	**Molecular Wt. of Gas, Wet:**	28.554

Moisture Determination

Initial Volume.....
Final Volume.....
Meter Temperature.....
Meter Volume dscf.....

Meter Calibration.....
Initial Wt. .....
Final Wt. .....

Traverse Point:	Delta (ΔP)	SQRT (ΔP)	Temp. (°F)	Traverse Point:	Delta (ΔP)	SQRT (ΔP)	Temp. (°F)
1:	0.07	0.2646	149	1:	0.08	0.283	148
2:	0.07	0.2646	150	2:	0.08	0.283	150
3:	0.08	0.2828	152	3:	0.09	0.300	151
4:	0.07	0.2646	154	4:	0.08	0.283	152
5:	0.07	0.2646	153	5:	0.08	0.283	151
6:	0.08	0.2828	150	6:	0.07	0.265	151
7:	0.07	0.2646	149	7:	0.08	0.283	151
8:	0.07	0.2646	149	8:	0.09	0.300	152
9:				9:			
10:				10:			
11:				11:			
12:				12:			

Average Delta (ΔP):.....	0.0769	**Average Flue Temperature (Ts):.....**	150.75
Average SQRT Delta (ΔP):.....	0.2770	**Actual Vol. Flow Rate (acfm):.....**	5317.13
Flue Gas Velocity,ft/sec:.....	16.912	**Dry Standard Flow Rate (dscfm):.....**	4367.75
Standard Flow Rate (scfh).....	270000	**Standard Flow Rate (scfm):.....**	4502.84

Comments: 270170

PITOT TRAVERSE DATA

Date:	09/22/2000	Traverse Number:	1		
Project:	Ferrara Pan Candy	Condition:	Normal Load		
Location:	Inlet	Time:	Start- 6:09	End- 6:14	
Source:	Catalytic Oxidizer	Data Taken By:	AR/TB		

Pressure, Barometric(Hg"):	29.33	Carbon Dioxide Content(%):	0.000
Pressure, Static(H2O"):	-0.50	Oxygen Content(%):	20.900
Pressure, Stack(Hg"):	29.293	Nitrogen Content(%):	79.100
Pitot Tube Coefficient(Cp):	0.836	Water Vapor in Flue Gas (Bws):	0.012
Flue Area:	4.909	Molecular Wt. of Gas, Wet:	28.706

Moisture Determination

Initial Volume.....
Final Volume.....
Meter Temperature.....
Meter Volume dscf.....

Meter Calibration.....
Initial Wt. .....
Final Wt. .....

Traverse Point:	Delta (ΔP)	SQRT (ΔP)	Temp. (°F)	Traverse Point:	Delta (ΔP)	SQRT (ΔP)	Temp. (°F)
1:	0.08	0.2828	65	1:	0.05	0.224	60
2:	0.07	0.2646	65	2:	0.06	0.245	61
3:	0.08	0.2828	65	3:	0.07	0.265	59
4:	0.07	0.2646	64	4:	0.06	0.245	59
5:	0.08	0.2828	63	5:	0.10	0.316	59
6:	0.09	0.3000	63	6:	0.08	0.283	59
7:	0.10	0.3162	62	7:	0.09	0.300	59
8:	0.09	0.3000	62	8:	0.10	0.316	59
9:				9:			
10:				10:			
11:				11:			
12:				12:			

Average Delta (ΔP):.....	0.0794	Average Flue Temperature (Ts):.....	61.5
Average SQRT Delta (ΔP):.....	0.2805	Actual Vol. Flow Rate (acfm):.....	4647.82
Flue Gas Velocity,ft/sec:.....	15.780	Dry Standard Flow Rate (dscfm):.....	4554.75
Standard Flow Rate (scfh).....	277000	Standard Flow Rate (scfm):.....	4610.08

Comments: 276605

PITOT TRAVERSE DATA

Date:	09/22/2000	Traverse Number:	2		
Project:	Ferrara Pan Candy	Condition:	Normal Load		
Location:	Inlet	Time:	Start- 7:11	End- 7:15	
Source:	Catalytic Oxidizer	Data Taken By:	AR/TB		

Pressure, Barometric(Hg"):	29.33	Carbon Dioxide Content(%):	0.000
Pressure, Static(H2O"):	-0.50	Oxygen Content(%):	20.900
Pressure, Stack(Hg"):	29.293	Nitrogen Content(%):	79.100
Pitot Tube Coefficient(Cp):	0.836	Water Vapor in Flue Gas (Bws):	0.015
Flue Area:	4.909	Molecular Wt. of Gas, Wet:	28.673

Moisture Determination

Initial Volume.....
Final Volume.....
Meter Temperature.....
Meter Volume dscf.....

Meter Calibration.....
Initial Wt. .....
Final Wt. .....

Traverse Point:	Delta (ΔP)	SQRT (ΔP)	Temp. (°F)	Traverse Point:	Delta (ΔP)	SQRT (ΔP)	Temp. (°F)
1:	0.07	0.2646	62	1:	0.08	0.283	59
2:	0.07	0.2646	62	2:	0.07	0.265	59
3:	0.07	0.2646	62	3:	0.08	0.283	59
4:	0.07	0.2646	61	4:	0.08	0.283	60
5:	0.07	0.2646	61	5:	0.07	0.265	60
6:	0.06	0.2449	61	6:	0.07	0.265	60
7:	0.08	0.2828	61	7:	0.08	0.283	60
8:	0.09	0.3000	61	8:	0.08	0.283	60
9:				9:			
10:				10:			
11:				11:			
12:				12:			

Average Delta (ΔP):.....	0.0744	Average Flue Temperature (Ts):.....	60.5
Average SQRT Delta (ΔP):.....	0.2724	Actual Vol. Flow Rate (acfm):.....	4512.76
Flue Gas Velocity,ft/sec:.....	15.321	Dry Standard Flow Rate (dscfm):.....	4417.45
Standard Flow Rate (scfh).....	269000	Standard Flow Rate (scfm):.....	4484.72
Comments:	269083		

PITOT TRAVERSE DATA

Date:	09/22/2000	Traverse Number:	3
Project:	Ferrara Pan Candy	Condition:	Normal Load
Location:	Inlet	Time:	Start- 8:20 End- 8:24
Source:	Catalytic Oxidizer	Data Taken By:	AR/TB

Pressure, Barometric(Hg"):	29.33	Carbon Dioxide Content(%):	0.000
Pressure, Static(H2O"):	-0.50	Oxygen Content(%):	20.900
Pressure, Stack(Hg"):	29.293	Nitrogen Content(%):	79.100
Pitot Tube Coefficient(Cp):	0.836	Water Vapor in Flue Gas (Bws):	0.012
Flue Area:	4.909	Molecular Wt. of Gas, Wet:	28.706

Moisture Determination

Initial Volume.....
Final Volume.....
Meter Temperature.....
Meter Volume dscf.....

Meter Calibration.....
Initial Wt. .....
Final Wt. .....

Traverse Point:	Delta (ΔP)	SQRT (ΔP)	Temp. (°F)	Traverse Point:	Delta (ΔP)	SQRT (ΔP)	Temp. (°F)
1:	0.08	0.2828	64	1:	0.06	0.245	62
2:	0.07	0.2646	64	2:	0.07	0.265	62
3:	0.09	0.3000	64	3:	0.07	0.265	62
4:	0.07	0.2646	64	4:	0.06	0.245	62
5:	0.07	0.2646	64	5:	0.06	0.245	62
6:	0.06	0.2449	64	6:	0.07	0.265	62
7:	0.07	0.2646	63	7:	0.07	0.265	62
8:	0.08	0.2828	63	8:	0.07	0.265	62
9:				9:			
10:				10:			
11:				11:			
12:				12:			

Average Delta (ΔP):.....	0.0700	Average Flue Temperature (Ts):.....	62.875
Average SQRT Delta (ΔP):.....	0.2642	Actual Vol. Flow Rate (acfm):.....	4383.64
Flue Gas Velocity,ft/sec:.....	14.883	Dry Standard Flow Rate (dscfm):.....	4284.56
Standard Flow Rate (scfh).....	260000	Standard Flow Rate (scfm):.....	4336.6

Comments: 260196

CALIBRATION PROCEDURES

PITOT TUBES

The pitot tubes used during this test program are fabricated according to the specification described and illustrated in the *Code of Federal Regulations*, Title 40, Part 60, Appendix A, Methods 1 through 5 as published in the *Federal Register*, Volume 42, No. 160; hereafter referred to by the appropriate method number. The pitot tubes comply with the alignment specifications in Method 2, Section 4; and the pitot tube assemblies are in compliance with specifications in the same section.

Pitot tube assemblies are calibrated in accordance with Method 2, Section 4, against a standard hemispherical pitot utilizing a wind tunnel meeting the specification in Method 2, Section 4.1.2.

TEMPERATURE SENSING DEVICES

The potentiometer and thermocouples are calibrated against a mercury thermometer in a calibration well. Alternatively, readings are checked utilizing a NBS traceable millivolt source.

DRY GAS METERS

The test meters are calibrated according to Method 5, Section 5.3 and "Procedures for Calibrating and Using Dry Gas Volume Meters as Calibration Standards" by P.R. Westlin and R.T. Shigehara, March 10, 1978.

ANALYTICAL BALANCE

The accuracy of the analytical balance is checked with Class S, Stainless Steel Type 303 weights manufactured by F. Hopken and Son, Jersey City, New Jersey.

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Pitot Tube Calibration Data

Calibration Pitot Tube: Type: Std. Hemi Size (OD): .250 " Pitot ID #: S-1

Type "S" Pitot Tube ID Number: 279 A & B Cp(std) = 0.99

Calibration Date: 1/12/95 Performed By: MPS

P_{std}, (in.) H_2O		A-Side Calibration		
Set Value	Read Value	P_s, (in.) H_2O	$C_{p(S)}$ [a]	DEV. [b]
0.25	0.28	0.40	0.828	0.006
0.55	0.52	0.73	0.832	0.002
0.85	0.85	1.20	0.833	0.001
1.00	1.60	2.25	0.835	0.001
2.00	2.50	3.50	0.837	0.003
3.00	3.30	4.60	0.839	0.005
		Average	0.834	0.003

P_{std}, (in.) H_2O		B-Side Calibration		
Set Value	Read Value	P_s, (in.) H_2O	$C_{p(S)}$ [a]	DEV. [b]
0.25	0.28	0.40	0.828	0.008
0.55	0.51	0.72	0.833	0.003
0.85	0.85	1.20	0.833	0.003
1.00	1.55	2.15	0.841	0.004
2.00	2.60	3.60	0.841	0.005
3.00	3.25	4.50	0.841	0.005
		Average	0.836	0.005

$\overline{C_p}(A) - \overline{C_p}(B) =$ 0.002 ***(must be ≤ 0.01)***

[a] $C_{p(S)} = C_{p(std)}\sqrt{\frac{\Delta P_{std}}{\Delta P_s}}$

[b] $DEV = C_{p(S)} - \overline{C_p}$, (must be ≤ 0.01)

TYPE S PITOT TUBE INSPECTION DATA FORM

Pitot tube assembly level? X yes ____ no

Pitot tube openings damaged? ____ yes (explain below) X no

α_1 = 6 ° (<10°), α_2 = 2 ° (<10°) z = A sin γ = 0.054 (in.); (<0.125 in.)

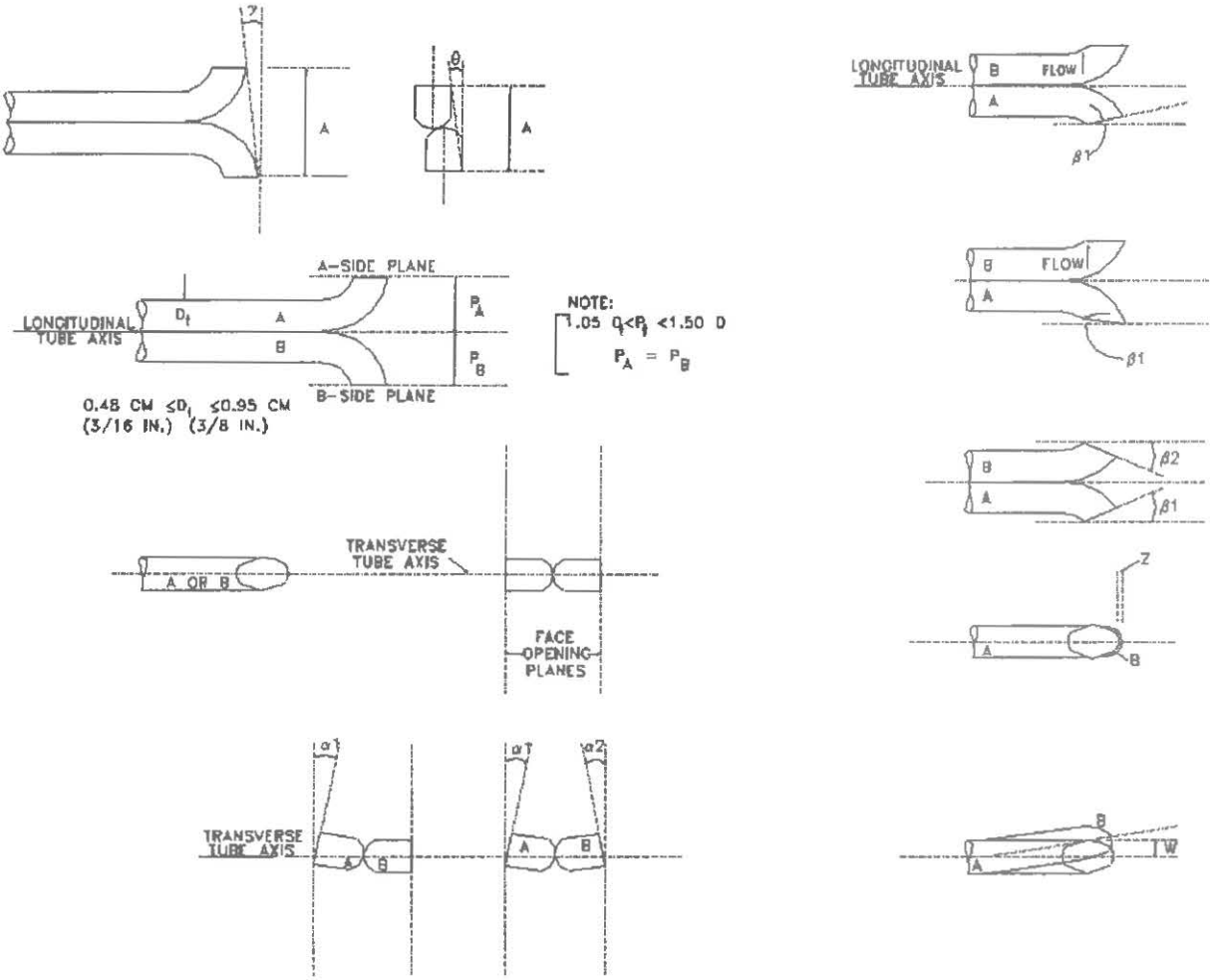
β_1 0.5 ° (<5°), β_2 = 2 ° (<5°) w = A sin θ = 0.027 (in.); (<0.03125 in.)

γ = 4 °, θ = 2 °, A = 0.772 (in.) P_A 0.39 (in.), P_B = 0.39 (in.), D_t = 0.250 (in.)

Comments: _____

Calibration required? ____ yes X no

Pitot Tube No.: 279 Date: 01/18/2000 Name: Rich Russ



STACK TEMPERATURE SENSOR CALIBRATION DATA FORM (FOR K-TYPE THERMOCOUPLES)

EPA Control Module Number: F7 Name: Rich Russ

Ambient Temperature: 83 °F Date: 09-19-00

Omega Engineering Calibrator Model No. CL23A Serial No. T-216363

Date Of Calibration Verification: 04-12-00

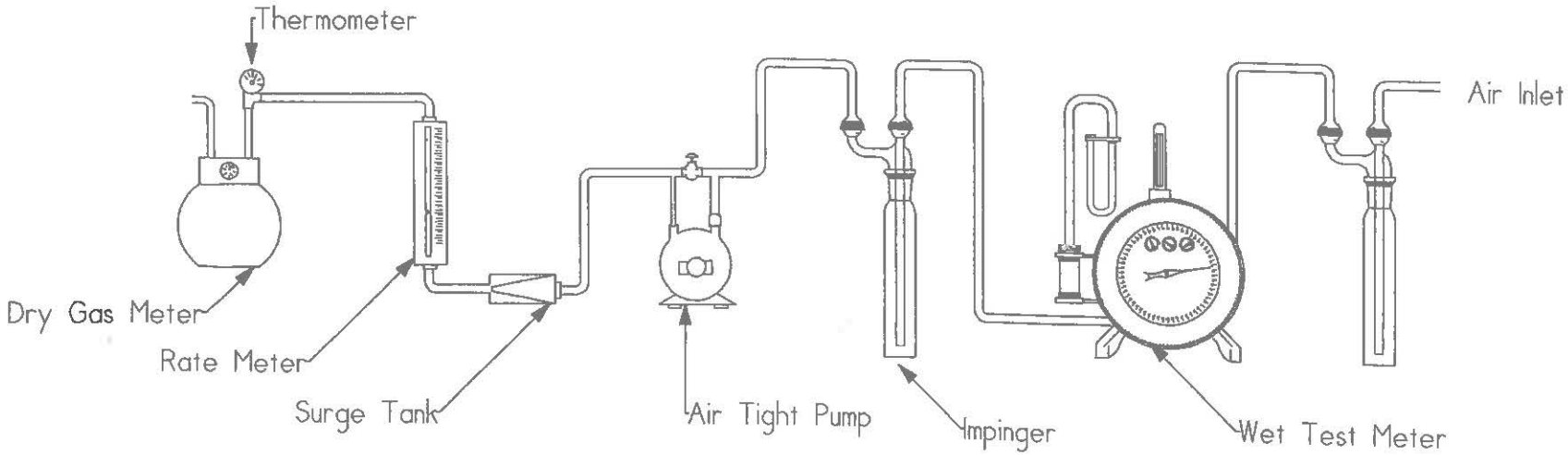
Primary Standards Directly Traceable to
National Institute of Standards and Technology (NIST)

Reference[a] Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference,[b] %
50	50	0.000
100	100	0.000
150	150	0.000
200	200	0.000
250	250	0.000
300	300	0.000
350	350	0.000
400	400	0.000
450	450	0.000
500	500	0.000
550	550	0.000
600	600	0.000
650	650	0.000
700	700	0.000
800	800	0.000
900	900	0.000
1000	1000	0.000
1100	1100	0.000
1200	1200	0.000

[a]Every (50°F) for each reference point.

$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

Gas Meter Calibration Train



Mostardi Platt

A Full Service Environmental Consulting Company

DWG-AF

[Rev. 7/97]

METER BOX CALIBRATION

Dry Gas Meter No.	F7	Date:	09-19-00
Standard Meter No.	2962156	Calibrated By:	Rich Russ
Standard Meter (Yr)	0.9953	Barometric Pressure :	29.12

Run Number		Orifice Setting in H20 Chg (H)	Standard Meter Gas Volume Vr	Dry Meter Gas Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Y
Final			39.714	37.469	80	92	89				
Inital			36.327	34.034	79	87	84				
Difference	1	0.10	3.387	3.435	79.5	89.5	86.5	88	20	0	1.001
Final			43.111	40.916	80	93	91				
Inital			39.714	37.469	80	92	89				
Difference	2	0.10	3.397	3.447	80	92.5	90	91.25	20	0	1.006
Final			46.514	44.370	80	94	92				
Inital			43.111	40.916	80	93	91				
Difference	3	0.10	3.403	3.454	80	93.5	91.5	92.5	20	0	1.008

Average 1.005

MOSTARDI-PLATT ASSOCIATES, INC.

SOURCE IDENTIFICATION: Ferrara Pan DATE: 9/22/00

RUN: outlet OPERATOR: [illegible]

SPAN: 0 - 60

CALIBRATION SUMMARY
(METHOD 25A)

	Identification	Cylinder No.	Name of Gas	Time	Cylinder Value (Units)	Analyzer Response Unit	Calibration Error (% of cal value)	Drift (% of span)
Pre cal Test 1	Zero Gas	ALMO 22508			0.0	0.0	0.0	—
	Low	ALMO 16132			15.2	15.3	0.66	—
	Mid	AAL 4937			25.1	25.0	-0.40	—
	High	AAL 15228			51.1	51.6	0.98	—
post 1 pre 2	Zero Gas					0.1	0.1	-0.17
	Low					15.4	1.32	-0.17
	Mid							
	High							
post 2 pre 3	Zero Gas					-0.2	-0.33	0.50
	Low					15.2	0.0	0.33
	Mid							
	High							
post 2	Zero Gas					-0.2	-0.33	0.0
	Low					15.1	-0.66	0.17
	Mid							
	High							
	Zero Gas							
	Low							
	Mid							
	High							
	Zero Gas							
	Low							
	Mid							
	High							

Mostardi Platt performs all calibrations through the complete sampling system and, therefore, no sample system bias exists and none is applied to the results.

$$\text{Calibration Error} = \left[\frac{\text{Analyzer Response} - \text{Cylinder Value}}{\text{Cylinder Value}}\right] \times 100 \text{ (must be} < 5\%)$$

$$\text{Drift} = \left[\frac{\text{Pretest Analyzer Response - Post Test Analyzer Response}}{\text{Span Value}}\right] \times 100 \text{ (must be} < \pm 3\%)$$

SOURCE IDENTIFICATION: Ferrera Fan DATE: 9/22/00

RUN: Inlet OPERATOR: J. Robertson

SPAN: 0-600

CALIBRATION SUMMARY
(METHOD 25A)

	Identification	Cylinder No.	Name of Gas	Time	Cylinder Value (Units)	Analyzer Response Unit	Calibration Error (% of cal value)	Drift (% of span)
pre cal Test 1	Zero Gas	ALMO 22508			0.0	0.0	0.0	
	Low	ALMO 37863			149.3	149.5	0.13	
	Mid	AAL 17549			304.5	305.2	0.23	
	High	AAL 9059			498.0	498.1	0.02	
post 1 pre 2	Zero Gas					1.7	0.28	-0.28
	Low							
	Mid					306.4	0.62	-0.20
	High							
post 2 pre 3	Zero Gas					1.4	0.23	0.05
	Low							
	Mid					305.6	0.36	0.13
	High							
post 3	Zero Gas					2.1	0.35	-0.12
	Low							
	Mid					305.0	0.16	0.10
	High							
	Zero Gas							
	Low							
	Mid							
	High							
	Zero Gas							
	Low							
	Mid							
	High							

Mostardi Platt performs all calibrations through the complete sampling system and, therefore, no sample system bias exists and none is applied to the results.

$$\text{Calibration Error} = \frac{\text{Analyzer Response} - \text{Cylinder Value}}{\text{Cylinder Value}} \times 100 \text{ (must be} < 5\%)$$

$$\text{Drift} = \frac{\text{Pretest Analyzer Response} - \text{Post Test Analyzer Response}}{\text{Span Value}} \times 100 \text{ (must be} < \pm 3\%)$$

ΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔ

Site 1: Ferrara Pan Candy -- Time File 1

09/22/00 Time	Inlet VOC ppmv 1 min avg Bin#002	Outlet VOC ppmv 1 min avg Bin#003
05:20:00	0.4	4.8
05:21:00	0.2	2.1
05:22:00	0.0	0.3
05:23:00	0.0	0.3
05:24:00	247.4	4.6
05:25:00	302.0	-0.1
05:26:00	305.2	0.0
05:27:00	305.2	-0.0
05:28:00	256.3	0.3
05:29:00	55.3	34.7
05:30:00	149.6	50.4
05:31:00	149.5	51.6
05:32:00	25.7	50.0
05:33:00	87.0	35.5
05:34:00	85.3	24.0
05:35:00	85.4	25.0
05:36:00	84.9	24.9
05:37:00	266.7	11.2
05:38:00	498.1	13.8
05:39:00	498.6	15.3
05:40:00	197.8	15.5

ΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔ

Site 1: Ferrara Pan Candy -- Time File 1

09/22/00 Time	Inlet VOC ppmv 1 min avg Bin#002	Outlet VOC ppmv 1 min avg Bin#003
06:56:00	369.3	9.8
06:57:00	5.6	15.6
06:58:00	3.0	15.5
06:59:00	2.2	15.4
07:00:00	1.7	7.4
07:01:00	150.1	5.0
07:02:00	306.6	0.2
07:03:00	306.4	0.1

ΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔ

Site 1: Ferrara Pan Candy -- Time File 1

09/22/00 Time	Inlet VOC ppmv 1 min avg Bin#002	Outlet VOC ppmv 1 min avg Bin#003
08:11:00	305.8	3.1
08:12:00	306.4	0.2
08:13:00	305.6	-0.2
08:14:00	301.2	1.4
08:15:00	3.3	9.0
08:16:00	1.8	15.2
08:17:00	1.4	15.2

ΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔ

Site 1: Ferrara Pan Candy -- Time File 1

09/22/00 Time	Inlet VOC ppmv 1 min avg Bin#002	Outlet VOC ppmv 1 min avg Bin#003
09:22:00	493.4	15.1
09:23:00	241.9	15.1
09:24:00	4.7	14.8
09:25:00	2.8	3.5
09:26:00	2.1	3.5
09:27:00	93.5	3.3
09:28:00	305.3	-0.2
09:29:00	305.0	-0.0

RATA CLASS

Scott Specialty Gases

Dual-Analyzed Calibration Standard

1290 COMBERMERE STREET,TROY,MI 48083 Phone 248 589-2950 Fax 248-589-2134

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

SCOTT SPECIALTY GASES
1290 COMBERMERE STREET
TROY,MI 48083

P O No 372000 1
Project No 05-58956-005

Customer

MOSTARDI PLATT

945 N OAKLAWN AVE
ELMHURST IL 60126-1012

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards, Procedure #G1, September, 1997

Cylinder Number ALM016132 Certification Date 3/23/00 Exp Date 3/23/2003
Cylinder Pressure*** 2000 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ANALYTICAL ACCURACY**	TRACEABILITY
PROPANE	15.2	PPM	+/- 1%	Direct NIST and NMI
AIR		BALANCE		

*** Do not use when cylinder pressure is below 150 psig

** Analytical accuracy is based on the requirements of EPA Protocol procedure G1 September 199

Product certified as +/- 1% analytical accuracy is directly traceable to NIST or NMI standards

REFERENCE STANDARD

TYPE/SRM NO	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 1667	8/01/01	ALM[illegible]		[illegible]PANE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
VARIAN/1400/06962426	03 23 00	FLAME IONIZATION

ANALYZER READINGS

(Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

First Triad Analysis **Second Triad Analysis** **Calibration Curve**

PROPANE

Date u3/23/00	Response Unit PPM	
Z1=0 0000	R1=12938	T1=3988 9
R2=12938	Z2=0 0000	T2=3983 3
Z3=0 0000	T3=3997 9	R3=12938
Avg Concentration	15 20	PPM

Concentration = A + Bx + Cx2 + Dx3 + Ex4	
r=1 00000	1568
Constants	A= 8 593885E 2
B=3 848376E 03	C=0
D=0	E=0

APPROVED BY [signature]

Scott Specialty Gases

RATA CLASS

Dual-Analyzed Calibration Standard

1290 COMBERMERE STREET,TROY,MI 48083 Phone: 248-589-2950 Fax: 248-589-2134

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

SCOTT SPECIALTY GASES
1290 COMBERMERE STREET
TROY,MI 48083

P.O. No.: 372000.1
Project No.: 05-58956-006

Customer

MOSTARDI PLATT

945 N OAKLAWN AVE
ELMHURST IL 60126-1012

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure #G1; September, 1997.

Cylinder Number: AAL4937 **Certification Date:** 3/23/00 **Exp. Date:** 3/23/2003
Cylinder Pressure*:** 2000 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ANALYTICAL ACCURACY**	TRACEABILITY
PROPANE	25.1	PPM	+/- 1%	Direct NIST and NMI
AIR		BALANCE		

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocol procedure G1, September 1997.
Product certified as +/- 1% analytical accuracy is directly traceable to NIST or NMI standards

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 1667	8/01/01	ALM014201	49.70 PPM	PROPANE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
VARIAN/1400/08982426	03/23/00	FLAME IONIZATION

ANALYZER READINGS

(Z = Zero Gas R = Reference Gas T = Test Gas r = Correlation Coefficient)

First Triad Analysis **Second Triad Analysis** **Calibration Curve**

PROPANE

Date:03/23/00	Response Unit:PPM	
Z1 = 0.0000	R1 = 12938.	T1 = 8581.2
R2 = 12938.	Z2 = 0.0000	T2 = 8577.7
Z3 = 0.0000	T3 = 8557.5	R3 = 12938.
Avg. Concentration:	25.10	PPM

Concentration = A + Bx + Cx2 + Dx3 + Ex4	
r = 1.00000	1668
Constants:	A = -0.5938885E-2
B = 3.9448376-03	C =
D = 0	E = 0

APPROVED BY: [signature]

Scott Specialty Gases

RATA CLASS

Dual-Analyzed Calibration Standard

1290 COMBERMERE STREET,TROY,MI 48083 Phone 248-589-2950 Fax 248-589-2134

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

SCOTT SPECIALTY GASES
1290 COMBERMERE STREET
TROY,MI 48083

P O No 31000
Project No 05-59131-010

Customer

Mostardi Platt Associates
joe
945 N OAKLAWN AVE
ELMHURST IL 60126-1012

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards, Procedure #G1, September, 1997

Cylinder Number. AAL15228 Certification Date 4/10/00 Exp Date 4/10/2003
Cylinder Pressure*** 2000 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ANALYTICAL ACCURACY**	TRACEABILITY
PROPANE	51.1	PPM	+/- 1%	Direct NIST and NMi
AIR		BALANCE		

*** Do not use when cylinder pressure is below 150 psig

** Analytical accuracy is based on the requirements of EPA Protocol procedure G1 September 1997
Product certified as +/- 1% analytical accuracy is directly traceable to NIST or NMI standards

REFERENCE STANDARD

TYPE/SRM NO	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 1666	8/01/01	ALM012035	99.50 PPM	PROPANE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
VARIAN/1400/06982426	04/10/00	FLAME IONIZATION

ANALYZER READINGS

(Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

First Triad Analysis

PROPANE

Date 04/10/00	Response Unit PPM	
Z1=0.0000	R1=2620.4	T1=1348.7
R2=2620.4	Z2=0.0000	T2=1342.1
Z3=0.0000	T3=1344.3	R3=2620.4
Avg Concentration	51.10	PPM

Second Triad Analysis

Calibration Curve

Concentration = A + Bx + Cx2 + Dx3 + Ex4	
r=1.00000	1568
Constants	A=-4.991674E02
B=3.606635E-02	C=
D=0	E=0

APPROVED BY [signature]

Scott Specialty Gases, Inc.

1290 COMBERMERE STREET, TROY, MI 48083 Phone (248) 589-2950 Fax (248) 589-2134

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer
MOSTARDI PLATT
ATTN CO SCOTT SPEC GASES
868 SIVERT DRIVE
WOODDALE, IL 60191

Assay Laboratory
Scott Specialty Gases, Inc
1290 Combermere
Troy, MI 48083

Purchase Order : MOPLATT PO#
Scott Project # : 525936

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay and Certification of Gaseous Calibration Standards, Procedure G1, September, 1993

Cylinder Number : ALM037863 **Certificate Date :** 3/25/98 **Expiration Date :** 3/25/2001
Cylinder Pressure + : 1900 psig **Previous Certificate Date :** None

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
Propane	149.3 ppm	±1% NIST Directly Traceable

Balance Gas: Air

+Do not use when cylinder pressure is below 150 psig
*Analytical accuracy is inclusive of usual known error sources which at least include precision of the measurement processes

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
NTRM1668	8/1/2001	ALM010210	99 5 ppm Propane in Air

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
C3H8 Varian/1400/08982426	3/25/98	Gas Chromatography

ANALYZER READINGS (Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components	First Triad Analysis	Second Triad Analysis	Calibration Curve
Propane	Date 3/25/98 Response Units mv Z1=0 03 R1=2 543 00 T1=3 814 00 R2=2 542 00 Z2=0 00 T2=3,809 00 Z3=0 00 T3=3 810 00 R3=2 542 00 Avg conc of Cust Cyl 149 3 ppm		Concentration=A+Bx+Cx^2+Dx^3+Ex^4 r=1 00000 NTRM1668 Constants A=0 259442000 B=0 039244470 C=0 000000000 D=0 000000000 E=0 000000000

Special Notes

Cylinder

Analyst

M68FVP-1

RATA CLASS

Scott Specialty Gases

Dual-Analyzed Calibration Standard

1290 COMBERMERE STREET,TROY,MI 48083 Phone: 248-589-2950 Fax: 248-589-2134

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

SCOTT SPECIALTY GASES
1290 COMBERMERE STREET
TROY,MI 48083

P.O. No.: MOPLATT PO#
Project No.: 05-40935-004

Customer

MOSTARDI PLATT
C/O SCOTT SPECIALTY GASES
868 SIVERT DRIVE
WOODDALE IL 60191

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards, Procedure #G1, September, 1997.

Cylinder Number: AAL17549 **Certification Date:** 2/22/99 **Exp. Date:** 2/22/2002
Cylinder Pressure*:** 1900 PSIG

COMPONENT	CERTIFIED CONCENTRATION		ANALYTICAL ACCURACY**	TRACEABILITY
PROPANE	304.5	PPM	+/- 1%	NIST
AIR		BALANCE		

*** Do not use when cylinder pressure is below 150 psig

** Analytical accuracy is inclusive of usual known error sources which at least include precision of the measurement processes
Product certified as +/- 1% analytical accuracy is directly traceable to NIST standards

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 1200	8/01/01	AAL9557	1193 PPM	PROPANE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
VARIAN/1400/08982426	02/22/99	FLAME IONIZATION

ANALYZER READINGS

(Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

First Triad Analysis **Second Triad Analysis** **Calibration Curve**

PROPANE

Date 02/22/99	Response Unit MV	
Z1=0.0000	R1=3023.0	T1=772.80
R2=30.28.0	Z2=0.0000	T2=769.10
Z3=0.0000	T3=770.70	R3=3023.0
Avg Concentration	304.5	PPM

Concentration = A + Bx + Cx2 + Dx3 + Ex4	
r=1.00000	1200
Constants	A=0.3942333
B=0.394509	C=
D=	E=

[illegible]

[illegible]

Special Notes:

APPROVED BY: [signature]

RATA CLASS

Dual-Analyzed Calibration Standard

Scott Specialty Gases

1290 COMBERMERE STREET, TROY, MI 48083 Phone 248-589-2950 Fax 248-589-2134

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

SCOTT SPECIALTY GASES
1290 COMBERMERE STREET
TROY, MI 48083

P O No MOPLATT PO#
Project No 05-44002-006

Customer

MOSTARDI PLATT
C/O SCOTT SPECIALTY GASES
868 SIVERT DRIVE
WOODDALE IL 60191

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards, Procedure #G1, September, 1997

Cylinder Number AAL9059 Certification Date 4/28/99 Exp Date 4/28/2002
Cylinder Pressure*** 1900 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ANALYTICAL ACCURACY**	TRACEABILITY
PROPANE	498.0	PPM	+/- 1%	Direct NIST and NMI
AIR		BALANCE		

*** Do not use when cylinder pressure is below 150 psig

** Analytical accuracy is based on the requirements of EPA Protocol procedure G1 September 1997

Product certified as +/- 1% analytical accuracy is directly traceable to NIST or NMI standards

REFERENCE STANDARD

TYPE/SRM NO	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 1200	8/01/01	AAL9567	1193 PPM	PROPANE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
VARIAN/1400/0898242B	04/28/99	FLAME IONIZATION

ANALYZER READINGS

(Z = Zero Gas R = Reference Gas T = Test Gas r = Correlation Coefficient)

First Triad Analysis

PROPANE

Date 04/28/99	Response Unit MV	
Z1 = 0.0000	R1 = 2,107.0	T1 = 1298.8
R2 = 2107.0	Z2 = 0.0000	T2 = 1298.8
Z3 = 0.0000	T3 = 1294.8	R3 = 2107.0
Avg Concentration	498.0	PPM

Second Triad Analysis

Calibration Curve

Concentration = A + Bx + Cx2 + Dx3 + Ex4	
r = 1.0000000000	1200
Constants	A = 0.2074165
B = 0.2828727	C =
D =	E =

APPROVED BY Mary Adcock

Project: Ferrara Pan Candy

Location: Catalytic Oxidizer

Date: 9-22-00 Test No: 1 Outlet Time: 600 - 606

Point No.	ΔP	$\sqrt{\Delta P}$	t_s	α	Point No.	ΔP	$\sqrt{\Delta P}$	t_s	α
1 1	0.08		145		2 1	0.08		149	
2	0.08		144		2	0.10		149	
3	0.08		155		3	0.09		149	
4	0.09		158		4	0.09		149	
5	0.09		159		5	0.09		149	
6	0.08		153		6	0.09		150	
7	0.07		153		7	0.09		150	
8	0.07		152		8	0.08		150	
		0.283					0.298		
			152.38					149.38	
						.2907		150.875	

P_{bar} 29.33 "Hg Static -0.5 "H_2O P_g 0.037 "Hg P_s 29.29 "Hg Pitot ID 279B C_p 0.836 Temp. ID F7

0.44 × 0.5 %CO_2 = 0.22 $\sqrt{\Delta P}$ 0.291 t_s 150.88 °F T 610.88 °R Flue Area 5.24 ft²

0.32 × 20 %O_2 = + 6.4 Duct Dimensions

0.28 × 79.5 %N_2 = + 22.26 B_{ws} 0.013 1 - B_{ws} 0.99 Disturbance: Upstream

(28.88 Md × 0.99 1-B_{ws}) + (18 × 0.013 B_{ws}) = 28.825 (Ms) Downstream

$v_s = 85.49 \times 0.836\ Cp \times \sqrt{\frac{(\quad)\ Ts\ °R}{Ms \times 29.29\ Ps}} \times 0.291\ \sqrt{\Delta P} = 17.691$ ft/sec (Vs)

Q_{acfm} = _____ Vs × _____ Flue Area × 60 = 5561.947 acfm Port Length _____ Inches

$Q_{dscfm} = 17.647 \times ACFM \times \frac{Ps}{Ts\ °R}$ = 4706.143 SCFM

$Q_{dscfm} = 17.647 \times ACFM \times \frac{Ps}{Ts\ °R} \times (1\text{-}Bws)$ = 4659.081 DSCFM

Pre-test leak check ✓ "H_2O

Post-test leak check ✓ "H_2O

4640.683

Data Taken By AR TB

Field Engineer Test Technician

Form 1-012 [Rev. 5-97]

Mostardi-Platt

Project: Ferrara Pan Lady Date 9-21-00
Sampling Location: Catalytic Oxidizer
Source Condition: _____ Monitor: Model F7
Dry Gas Meter No. F7 Y 1.005 Serial No. F7

Test (Run) No. 1 Barometric Pressure (P_{bar}) 29.33 in. Hg Orsat Analysis
Gas Temperature 150 °F Static Pressure -0.5 in. Hg 0.5 %CO_2 20 %O_2

Clock Time 24 hour	Meter Volume (V_m) ft^3	Meter Gage Pressure (ΔH) in. H_2O	Meter Temp. (t_m) °F	Impgr. Outlet Temp °F
556	44.452	0.05	65	[illegible]
601	44.91	0.05	65	
606	45.36	0.05	66	
611	45.79	0.05	66	
616	46.300			
Avg. 1.848			65.5	(T_m) 525.5 °R

Condensate
_____ mls (V_f)
- _____ mls (V_i)
_____ mls
× 0.04707 = _____
_____ ft^3 [$V_{wc(std)}$] + _____ ft^3 [$V_{wsg(std)}$]
= _____ ft^3 [$V_{w(std)}$]

Silica Gel or Train
521.8 grams (W_f)
- 521.3 grams (W_i)
0.5 grams
× 0.04715 = 0.024

$V_{m(std)}$ = 1.829 ft^3

Water Vapor, proportion by volume
B_{ws} = 0.013

Leak Check: 0" @ 8"

Moisture correction factor:
$1 - B_{ws}$ = 0.99

Comments:

Test (Run) No. _____ Barometric Pressure (P_{bar}) _____ in. Hg Orsat Analysis
Gas Temperature _____ °F Static Pressure _____ in. Hg _____ %CO_2 _____ %O_2

Clock Time 24 hour	Meter Volume (V_m) ft^3	Meter Gage Pressure (ΔH) in. H_2O	Meter Temp. (t_m) °F	Impgr. Outlet Temp °F
Avg.			(T_m)	°R

Condensate
_____ mls (V_f)
- _____ mls (V_i)
_____ mls
× 0.04707 = _____
_____ ft^3 [$V_{wc(std)}$] + _____ ft^3 [$V_{wsg(std)}$]
= _____ ft^3 [$V_{w(std)}$]

Silica Gel or Train
_____ grams (W_f)
- _____ grams (W_i)
_____ grams
× 0.04715 = _____

$V_{m(std)}$ = _____ ft^3

Water Vapor, proportion by volume
B_{ws} = _____

Leak Check:

Moisture correction factor:
$1 - B_{ws}$ = _____

Comments:

$$V_{m(std)} = 17.64\, V_m Y \frac{P_{bar} + \frac{DH}{13.6}}{T_m}$$

$$B_{ws} = \frac{V_{w(std)}}{V_{w(std)} + V_{m(std)}}$$

Operator AR

Project: Ferrara Pan Candy

Location: Catalytic Oxidizer

Date: 9-22-00 Test No: 2 outlet Time: 719-723

Point No.	ΔP	$\sqrt{\Delta P}$	t_s	α	Point No.	ΔP	$\sqrt{\Delta P}$	t_s	α
1 1	0.08		149		2 1	0.08		149	
2	0.08		149		2	0.08		150	
3	0.08		150		3	0.08		153	
4	0.08		151		4	0.08		155	
5	0.08		152		5	0.08		156	
6	0.08		151		6	0.08		157	
7	0.07		151		7	0.08		158	
8	0.07		151		8	0.09		156	
		0.278					0.285		
			150.5					154.25	
						.2816		152.375	

P_{bar} 29.33 "Hg Static -0.5 "H_2O P_g 0.037 "Hg P_s 29.29 "Hg Pitot ID 279A C_p 0.836 Temp. ID F7

0.44 × 0.5 %CO_2 = 0.22 $\sqrt{\Delta P}$ 0.282 t_s 152.38 °F T 612.38 °R Flue Area 5.24 ft²

0.32 × 20 %O_2 = + 6.4 Duct Dimensions

0.28 × 79.5 %N_2 = + 22.26 B_{ws} 0.038 1 - B_{ws} 0.96 Disturbance: Upstream

(28.88 Md × 0.96 1-B_{ws}) + (18 × 0.038 B_{ws}) = 28.409 (Ms) Downstream

$$v_s = 85.49 \times 0.836\ Cp \times \frac{(612.38)\ Ts\ °R}{(28.409\ Ms \times 29.29\ Ps)} \times 0.282\ \sqrt{\Delta P} = 17.290 \text{ ft/sec (Vs)}$$

Q_{acfm} = ____ Vs × ____ Flue Area × 60 = 5435.958 acfm Port Length ____ Inches

$$Q_{dscfm} = 17.647 \times ACFM \times \frac{Ps}{Ts\ °R} = 4588.232 \text{ SCFM}$$

$$Q_{dscfm} = 17.647 \times ACFM \times \frac{Ps}{Ts\ °R} \times (1\text{-}Bws) = 4404.702 \text{ DSCFM}$$

Pre-test leak check ✓ "H_2O

Post-test leak check ✓ "H_2O

4404.608

Data Taken By: AR TB

Field Engineer Test Technician

W- 98

D- 160

Bws = .038

Form 1012 [Rev. 5/97] Mostardi-Platt Ass

Project: Ferrara Pan Candy

Location: Catalytic Oxidizer

Date: 9-22-00 Test No: 3 outlet Time: 826-830

Point No.	ΔP	√ΔP	t_s	α	Point No.	ΔP	√ΔP	t_s	α
1 1	0.07		149		2 1	0.08		148	
2	0.07		150		2	0.08		150	
3	0.08		152		3	0.09		151	
4	0.07		154		4	0.08		152	
5	0.07		153		5	0.08		151	
6	0.08		150		6	0.07		151	
7	0.07		149		7	0.08		151	
8	0.07		149		8	0.09		152	
		0.269					0.285		
			150.75					150.75	

P_{bar} 29.33 "Hg Static 0.5 "H_2O P_g 0.037 "Hg P_s 29.29 "Hg Pitot ID 279B C_p 0.836 Temp. ID F7

0.44 × 0.5 %CO_2 = 0.22 √ΔP 0.277 t_s 150.75 °F T 610.75 °R Flue Area 5.24 ft²

0.32 × 20 %O_2 = + 6.4 Duct Dimensions

0.28 × 79.5 %N_2 = + 22.26 B_{ws} 0.030 1 - B_{ws} Disturbance: Upstream

(28.88 Md × 1-B_{ws}) + (18 × B_{ws}) = (Ms) Downstream

$$v_s = 85.49 \times 0.836\ C_p \times \sqrt{\frac{(610.75)\ Ts\ °R}{Ms \times 29.29\ Ps}} \times 0.277\ \sqrt{\Delta P} = 16.912\ \text{ft/sec (Vs)}$$

Q_{acfm} = 16.912 Vs × Flue Area × 60 = 5317.214 acfm Port Length Inches

$$Q_{dscfm} = 17.647 \times ACFM \times \frac{Ps}{Ts\ °R} = 4502.914\ \text{SCFM}$$

$$Q_{dscfm} = 17.647 \times ACFM \times \frac{Ps}{Ts\ °R} \times (1\text{-}Bws) = 4367.826\ \text{DSCFM}$$

Pre-test leak check ✓ "H_2O Data Taken By: AR TC

Post-test leak check ✓ "H_2O Field Engineer Test Technician

W-94

D-160 62 .030

Form 1012 [Rev. 5-97] Mostardi-Platt

Project: Ferrara Pan Candy

Location: Catalytic Oxidizer

Date: 9-22-00 Test No: 1 Inlet Time: 609 - 614

Point No.	ΔP	$\sqrt{\Delta P}$	t_s	α	Point No.	ΔP	$\sqrt{\Delta P}$	t_s	α
1 1	0.08		65		2 1	0.05		60	
2	0.07		65		2	0.06		61	
3	0.08		65		3	0.07		59	
4	0.07		64		4	0.06		59	
5	0.08		63		5	0.10		59	
6	0.09		63		6	0.08		59	
7	0.10		62		7	0.09		59	
8	0.09		62		8	0.10		59	
		0.287					0.274		
			63.63					59.38	
						12805		61.50	

P_{bar} 29.33 "Hg Static -0.5 "H_2O P_g 0.057 "Hg P_s 29.39 "Hg Pitot ID 279B C_p 0.836 Temp. ID F7

00 0.44 × 0 %CO_2 = 0 $\sqrt{\Delta P}$ 0.281 t_s 61.51 °F T 521.51 °R Flue Area 4.909 ft²

54 0.32 × 20.9 %O_2 = + 6.4 Duct Dimensions

0.28 × 79.1 %N_2 = + 22.145 B_{ws} 0.012 1 - B_{ws} 0.99 Disturbance: Upstream

(28.545 Md × 0.99 1-B_{ws}) + (18 × 0.012 B_{ws}) = 28.479 (Ms) Downstream

$v_s = 85.49 \times 0.836\ Cp \times \sqrt{\frac{(521.51\ Ts\ °R)}{(28.479\ Ms \times 29.39\ Ps)}} \cdot 0.281\ \sqrt{\Delta P} = 15.880$ ft/sec (Vs)

Q_{acfm} = ____ Vs × ____ Flue Area × 60 = 4677.152 acfm Port Length ____ Inches

$Q_{dscfm} = 17.647 \times ACFM \times \frac{Ps}{Ts\ °R} =$ 4635.633 SCFM

$Q_{dscfm} = 17.647 \times ACFM \times \frac{Ps}{Ts\ °R} \times (1\text{-}Bws) =$ 4589.277 DSCFM

Pre-test leak check ✓ "H_2O Data Taken By AR TB

Post-test leak check ✓ "H_2O 4555.483 Field Engineer Test Technician

Form 1-12 (Rev. 5-97) Mostardi-Platt Associates

Project: Ferrara Pan Candy

Location: Catalytic Oxidizer

Date: 9-22-00 Test No: 2 Inlet Time: 7:11 - 7:15

Point No.	ΔP	√ΔP	t_s	α	Point No.	ΔP	√ΔP	t_s	α
1 1	0.07		62		2 1	0.08		59	
2	0.07		62		2	0.07		59	
3	0.07		62		3	0.08		59	
4	0.07		61		4	0.08		60	
5	0.07		61		5	0.07		60	
6	0.06		61		6	0.07		60	
7	0.08		61		7	0.08		60	
8	0.09		61		8	0.08		60	
		0.269					0.276		
			61.38					59.63	
						.3724		60.5	

P_{bar} 29.33 "Hg Static -0.5 "H_2O P_g 0.037 "Hg P_s 29.29 "Hg Pitot ID 2746 C_p 0.836 Temp. ID F7

0.44 × 0 %CO_2 = 0 √ΔP 0.273 t_s 60.51 °F T 520.51 °R Flue Area 4.909 ft²

0.32 × 20.9 %O_2 = - 6.4 Duct Dimensions

0.28 × 79.1 %N_2 = - 22.148 B_{ws} 0.015 1 - B_{ws} 0.99 Disturbance: Upstream

(28.548 Md × 0.99 1-B_{ws}) - (18 × 0.015 B_{ws}) = 28.533 (Ms) Downstream

$$v_s = 85.49 \times 0.836\ C_p \times \frac{(520.51)\ Ts\ °R}{(28.533\ Ms \times 29.29\ Ps)} \times 0.273\ \sqrt{\Delta P} = 15.398\ ft/sec\ (Vs)$$

Q_{acfm} = _____ Vs × _____ Flue Area × 60 = 4535.338 acfm Port Length _____ Inches

$$Q_{dscfm} = 17.647 \times ACFM \times \frac{Ps}{Ts\ °R} = 4503.714\ SCFM$$

$$Q_{dscfm} = 17.647 \times ACFM \times \frac{Ps}{Ts\ °R} \times (1\text{-}Bws) = 4458.677\ DSCFM$$

Pre-test leak check ✓ "H_2O 4417.2 Data Taken By: AR TB

Post-test leak check ✓ "H_2O Field Engineer Test Technician

W - 58

O - 62

Form 1012 (Rev. 5-97) Mostardi-Platt Associates

Bws = 0.015

Project: Ferrara Pan Candy

Location: Catalytic Oxidizer

Date: 9-21-00 Test No: 3 Inlet Time: 820- 824

Point No.	ΔP	√ΔP	t	α	Point No.	ΔP	√ΔP	t	α
1 1	0.08		64		2 1	0.06		62	
2	0.07		64		2	0.07		62	
3	0.09		64		3	0.07		62	
4	0.07		64		4	0.06		62	
5	0.07		64		5	0.06		62	
6	0.06		64		6	0.07		62	
7	0.07		63		7	0.07		62	
8	0.08		63		8	0.07		62	
		0.271					0.257		
			63.75					62	

P_{bar} 29.33 "Hg Static 0.5 "H_2O P_g 0.037 "Hg P_s 29.29 "Hg Pitot ID 279A C_p 0.836 Temp. ID F7

0.44 × 0 %CO_2 = 0 √ΔP 0.264 t 62.88 °F T 522.88 °R Flue Area 4.909 ft²

0.32 × 20.9 %O_2 = + 6.4 Duct Dimensions

0.28 × 79.1 %N_2 = + 22.148 B_{ws} 0.012 1 - B_{ws} Disturbance: Upstream

(28.548 Md × (1-B_{ws}) + (18 × B_{ws}) = (Ms) Downstream

v_s = 85.49 × 0.836 Cp × (522.88)Ts °R / (Ms × 29.29 Ps) × 0.264 √ΔP = 14.874 ft/sec (Vs)

Q_{acfm} = 14.874 Vs × Flue Area × 60 = 4380.906 acfm Port Length Inches

Q_{dscfm} = 17.647 × ACFM × Ps / Ts °R = 4333.854 SCFM

Q_{dscfm} = 17.647 × ACFM × Ps / Ts °R × (1-Bws) = 4281.848 DSCFM

Pre-test leak check ✓ "H_2O Data Taken By: AQ TB

Post-test leak check ✓ "H_2O Field Engineer Test Technician

W - 54
D - 60

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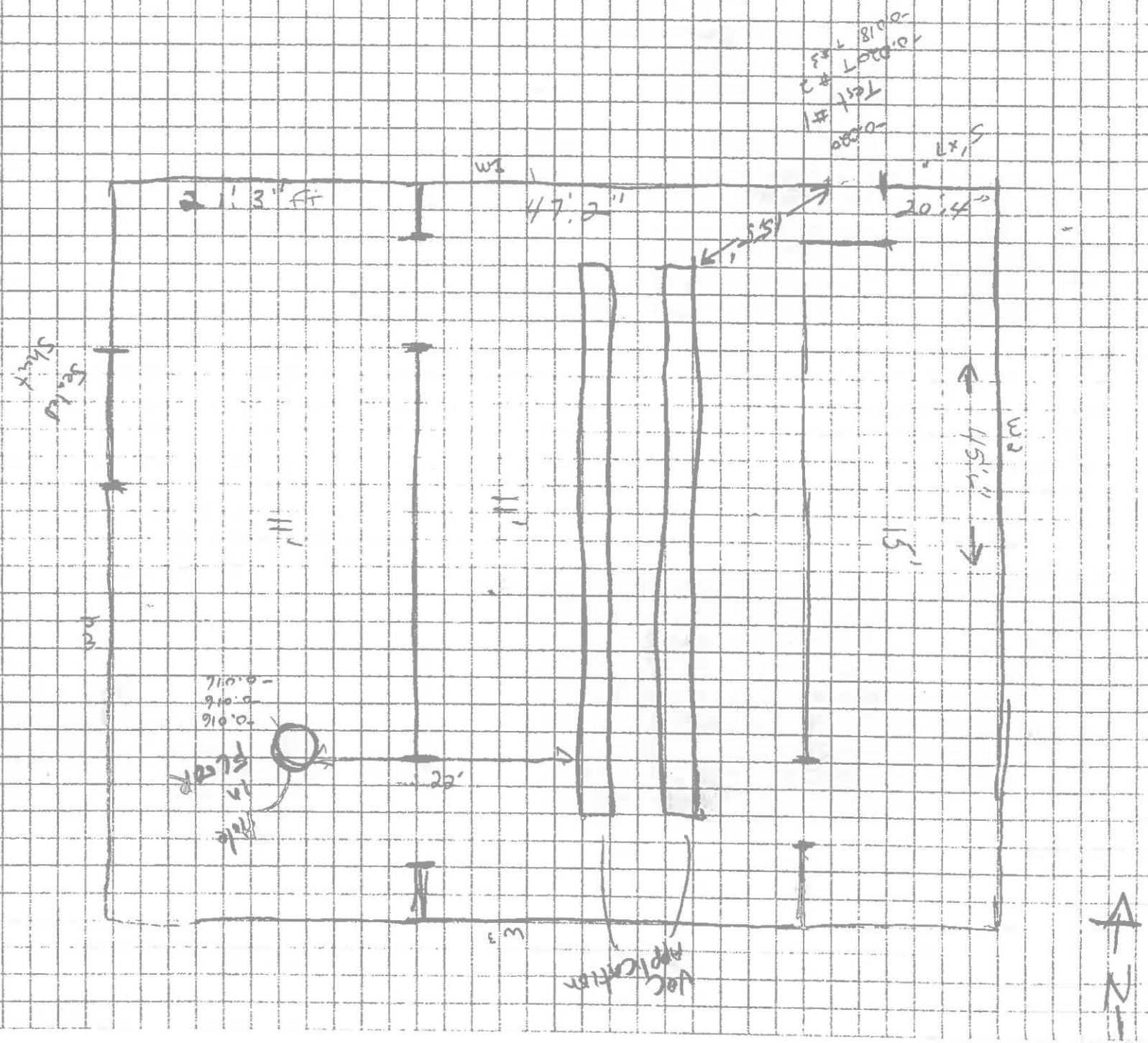
Bws = 0.012

CHOCOLATE ROOM



PROCEDURE T DATA SHEET

Project: Ferrara Pan Candy
Location: Chocolate Room
Date: 9/22/00

Sketch enclosure, all ducts, NDOs and potential VOC emission points on accompanying page. Label all dimensions.

Enclosure Designation:
Control Devices (s): Catalytic Oxidizer

Process(es) Enclosed:

NDO to VOC Emission Point

NDO	Dimensions	Equivalent Diameter	VOC Emission Point	Distances		Pass/ Fail?
				Minimum	Actual	
Exit Door	4' x 6"	1.6'	Food Grade Alcohol Coater	6.4'	15.5'	Pass
Hole in Floor	3' Diameter	3'		12.0'	22'	Pass

NDOs equivalent diameter $= \left(\frac{4 \times \text{area}}{\pi}\right)^{0.5}$

Minimum Allowed Distance = 4 × Equivalent Diameter (NDO)

NDO to Exhaust (TTE only)

Exhaust Point	Dimensions	Equivalent Diameter	NDO	Dimensions	Equivalent Diameter	Distances		Pass/ Fail?
						Minimum	Actual	

Equivalent diameter $= \left(\frac{4 \times \text{area}}{\pi}\right)^{0.5}$

Minimum Allowed Distance = 4 × Equivalent Diameter (NDO or Exhaust Point)

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Near Ratio [NDO Area/Total Enclosure Area]

NDO	Surface Area (FT^2)	Wall, Ceiling, or Floor Section	Surface Area (FT^2)
Ext Door	2.0	W1 93.75'x 11'	1031.25
Floor Hole	7.07	W3 93.75'x11'	1031.25
		W2 45.5' x 11'	500.5
		W4 45.5' x 11'	500.5
		F 93.75'x 45.5'	4265.63
		C 93.75'x45.5'	4265.63
TOTAL NDO AREA= 9.07		TOTAL ENCLOSURE AREA= 11,594.76	

NEAR ratio:

$\frac{\text{NDOArea}}{\text{EnclosureArea}}$ = 0.0008

Allowable NEAR ratio ≤ 0.05,

Pass/Fail? Pass

Velocity of Air through NDO

Exhausted Air			Make Up Air	
Exhaust Point	SCFM	Controlled? (Y/N?)	Make up point	SCFM
TOTAL			TOTAL	

total NDO area - _____ ft^2
(from section 5.2)

$\frac{\text{Exhaust scfm - 1 make up scfm}}{\text{NDO area (ft}^2\text{)}}$ = _____ fpm

fpm should be ≥ 200

pass/fail? _____

Static Pressure ≤ 0.018" H_2O - Ext Door
Hole in Floor ≤ 0.016" H_2O - Hole in floor

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PROCEDURE T DATA SHEET (cont.)

Direction of Air through NDO

Method used to check direction of airflow:

☐ **Smoke Tubes** ☐ **Velometer** ☐ **Plastic Strips** ☒ **Other:** Dry Ice

NDO	No.	Normally		Direction of Air Flow			NDO Required to be Normally Closed?	All Points?*
		Open	Closed	Into Enclosure	Out of Enclosure	Swirled		
Exit Door	1	X		X			No	Yes
Floor Hole	2	X		X			No	Yes

***Check to verify that airflow was checked at top, bottom, middle, and both sides of enclosure.**

Status of doors and windows

Are all access doors and windows whose areas are not included as NDOs closed during normal operation.
☒ Yes ☐ No

Capture of VOC Emissions

Does all exhaust ductwork go to control (for PTE) or to a point where it can be measured (for TTE).
☒ Yes ☐ No

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Polishing Room

PROCEDURE T DATA SHEET

Project: Ferrara Pan Candy
Location: Polishing Room
Date: 9/20/00

Sketch enclosure, all ducts, NDOs and potential VOC emission points on accompanying page. Label all dimensions.

Enclosure Designation:
Control Devices (s): Catalytic Oxidizer

Process(es) Enclosed:

NDO to VOC Emission Point

NDO	Dimensions	Equivalent Diameter	VOC Emission Point	Distances		Pass/ Fail?
				Minimum	Actual	
Exit Door 1	5'x 3"	1.26'	Food Grade Alcohol Cooker	5.05'	7.5'	Pass
Exit Door 2	5'x 3"	1.26'		5.05'	7.5'	Pass

$$\text{NDOs equivalent diameter} = \left(\frac{4 \times \text{area}}{\pi}\right)^{0.5}$$

Minimum Allowed Distance = 4 × Equivalent Diameter (NDO)

NDO to Exhaust (TTE only)

Exhaust Point	Dimensions	Equivalent Diameter	NDO	Dimensions	Equivalent Diameter	Distances		Pass/ Fail?
						Minimum	Actual	

$$\text{Equivalent diameter} = \left(\frac{4 \times \text{area}}{\pi}\right)^{0.5}$$

Minimum Allowed Distance = 4 × Equivalent Diameter (NDO or Exhaust Point)

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PROCEDURE T DATA SHEET (cont.)

Near Ratio [NDO Area/Total Enclosure Area]

NDO	Surface Area (FT^2)	Wall, Ceiling, or Floor Section	Surface Area (FT^2)
Ext Door 1	1.25	W2 90'x 15'	1350.0
Ext Door 2	1.25	W3 90'x 15'	1350.0
		W2 32'x15'	480.0
		W4 32'x15'	480.0
		F 90'x 32'	2880.0
		C 90'x32'	2880.0
TOTAL NDO AREA= 2.50		TOTAL ENCLOSURE AREA= 9420	

NEAR ratio:

$$\frac{\text{NDOArea}}{\text{EnclosureArea}} = 0.0003$$

Allowable NEAR ratio ≤ 0.05,

Pass/Fail? Pass

Velocity of Air through NDO

Exhausted Air			Make Up Air	
Exhaust Point	SCFM	Controlled? (Y/N?)	Make up point	SCFM
TOTAL			TOTAL	

total NDO area = _____ ft^2
(from section 5.2)

$$\frac{\text{Exhaust scfm - 1 make up scfm}}{\text{NDO area } (ft^2)} = \_\_\_\_\_ \text{fpm}$$

fpm should be ≥ 200

pass/fail? _____

Static ≤ -0.010" H_2O

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PROCEDURE T DATA SHEET (cont.)

Direction of Air through NDO

Method used to check direction of airflow:

☐ **Smoke Tubes** ☐ **Velometer** ☐ **Plastic Strips** ☒ **Other:** Dry Ice

NDO	No.	Normally		Direction of Air Flow			NDO Required to be Normally Closed?	All Points?*
		Open	Closed	Into Enclosure	Out of Enclosure	Swirled		
Exit 1	1	X		X			No	Yes
Exit 2	2	X		X			No	Yes

***Check to verify that airflow was checked at top, bottom, middle, and both sides of enclosure.**

Status of doors and windows

Are all access doors and windows whose areas are not included as NDOs closed during normal operation.

☒ Yes ☐ No

Capture of VOC Emissions

Does all exhaust ductwork go to control (for PTE) or to a point where it can be measured (for TTE).

☒ Yes ☐ No

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