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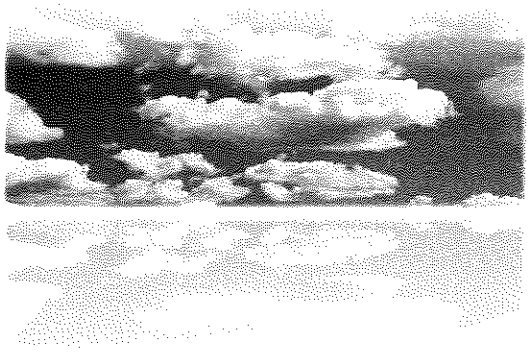

REPORT ON MEASUREMENT SERVICES

Detroit Hydrogen Plant

Hydrogen Plant Heater Stack

Air Products and Chemicals, Inc.
7201 Hamilton Boulevard
Allentown, PA 18195
Client Reference No. 4504002404

CleanAir Project No. 13179
STAC Certificate No. 2007.002.0113.1217
Revision 0, Final Report
April 26, 2017

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AIR QUALITY DIV.

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COMMITMENT TO QUALITY

To the best of our knowledge, the data presented in this report are accurate, complete, error free and representative of the actual emissions during the test program. Clean Air Engineering operates in conformance with the requirements of ASTM D7036-04 Standard Practice for Competence of Air Emission Testing Bodies.

April 26, 2017

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I hereby certify that the information contained within each appendix section of the final test report has been reviewed and, to the best of my ability, verified as accurate.

April 26, 2017

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REPORT REVISION HISTORY

Version	Revision	Date	Pages	Comments
Draft	D0a	04/21/17	All	Draft version of original document.
Final	0	04/26/17	All	Final version of original document.

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ACRONYMS & ABBREVIATIONS

AAS (atomic absorption spectrometry)
acfm (actual cubic feet per minute)
ACI (activated carbon injection)
ADL (above detection limit)
AIG (ammonia injection grid)
APC (air pollution control)
AQCS (air quality control system(s))
ASME (American Society of Mechanical Engineers)
ASTM (American Society for Testing and Materials)
BDL (below detection limit)
Btu (British thermal units)
CAM (compliance assurance monitoring)
CARB (California Air Resources Board)
CCM (Controlled Condensation Method)
CE (capture efficiency)
°C (degrees Celsius)
CEMS (continuous emissions monitoring system(s))
CFB (circulating fluidized bed)
CFR (Code of Federal Regulations)
cm (centimeter(s))
COMS (continuous opacity monitoring system(s))
CT (combustion turbine)
CTI (Cooling Technology Institute)
CTM (Conditional Test Method)
CVAAS (cold vapor atomic absorption spectroscopy)
CVAFS (cold vapor atomic fluorescence spectrometry)
DI H_2O (de-ionized water)
%dv (percent, dry volume)
DLL (detection level limited)
DE (destruction efficiency)
DCI (dry carbon injection)
DGM (dry gas meter)
dscf (dry standard cubic feet)
dscfm (dry standard cubic feet per minute)
dscm (dry standard cubic meter)
ESP (electrostatic precipitator)
FAMS (flue gas adsorbent mercury speciation)
°F (degrees Fahrenheit)
FB (field blank)
FCC (fluidized catalytic cracking)
FCCU (fluidized catalytic cracking unit)
FEGT (furnace exit gas temperatures)
FF (fabric filter)
FGD (flue gas desulfurization)
FIA (flame ionization analyzer)
FID (flame ionization detector)
FPD (flame photometric detection)
FRB (field reagent blank)
FSTM (flue gas sorbent total mercury)
ft (feet or foot)
ft^2 (square feet)
ft^3 (cubic feet)
ft/sec (feet per second)
FTIR (Fourier Transform Infrared Spectroscopy)
FTRB (field train reagent blank)
g (gram(s))
GC (gas chromatography)
GFAAS (graphite furnace atomic absorption spectroscopy)
GFC (gas filter correlation)
gr/dscf (grains per dry standard cubic feet)
> (greater than)/ ≥ (greater than or equal to)
g/s (grams per second)
H_2O (water)
HAP(s) (hazardous air pollutant(s))
HI (heat input)
hr (hour(s))
HR GC/MS (high-resolution gas chromatography and mass spectrometry)
HRVOC (highly reactive volatile organic compounds)
HSRG(s) (heat recovery steam generator(s))
HVT (high velocity thermocouple)
IC (ion chromatography)
IC/PCR (ion chromatography with post column reactor)
ICP/MS (inductively coupled argon plasma mass spectroscopy)
ID (induced draft)
in. (inch(es))
in. H_2O (inches water)
in. Hg (inches mercury)
IPA (isopropyl alcohol)
ISE (ion-specific electrode)
kg (kilogram(s))
kg/hr (kilogram(s) per hour)
< (less than)/ ≤ (less than or equal to)
L (liter(s))
lb (pound(s))
lb/hr (pound per hour)
lb/MMBtu (pound per million British thermal units)
lb/TBtu (pound per trillion British thermal units)
lb/lb-mole (pound per pound mole)
LR GC/MS (low-resolution gas chromatography and mass spectrometry)
m (meter)
m^3 (cubic meter)
MACT (maximum achievable control technology)
MASS® (Multi-Point Automated Sampling System)
MATS (Mercury and Air Toxics Standards)
MDL (method detection limit)
µg (microgram(s))
min. (minute(s))
mg (milligram(s))
ml (milliliter(s))
MMBtu (million British thermal units)
MW (megawatt(s))
NCASI (National Council for Air and Stream Improvement)
ND (non-detect)
NDIR (non-dispersive infrared)
NDO (natural draft opening)
NESHAP (National Emission Standards for Hazardous Air Pollutants)
ng (nanogram(s))
Nm^3 (Normal cubic meter)
% (percent)
PEMS (predictive emissions monitoring systems)
PFGC (pneumatic focusing gas chromatography)
pg (picogram(s))
PJFF (pulse jet fabric filter)
ppb (parts per billion)
PPE (personal protective equipment)
ppm (parts per million)
ppmdv (parts per million, dry volume)
ppmwv (parts per million, wet volume)
PSD (particle size distribution)
psi (pound(s) per square inch)
PTE (permanent total enclosure)
PTFE (polytetrafluoroethylene)
QA/QC (quality assurance/quality control)
QI (qualified individual)
QSTI (qualified source testing individual)
QSTO (qualified source testing observer)
RA (relative accuracy)
RATA (relative accuracy test audit)
RB (reagent blank)
RE (removal or reduction efficiency)
RM (reference method)
scf (standard cubic feet)
scfm (standard cubic feet per minute)
SCR (selective catalytic reduction)
SDA (spray dryer absorber)
SNCR (selective non-catalytic reduction)
STD (standard)
STMS (sorbent trap monitoring system)
TBtu (trillion British thermal units)
TEOM (Tapered Element Oscillating Microbalance)
TEQ (toxic equivalency quotient)
ton/hr (ton per hour)
ton/yr (ton per year)
TSS (third stage separator)
USEPA or EPA (United States Environmental Protection Agency)
UVA (ultraviolet absorption)
WFGD (wet flue gas desulfurization)
%wv (percent, wet volume)

1. PROJECT OVERVIEW

Test Program Summary

Air Products and Chemicals, Inc. (Air Products) contracted CleanAir Engineering (CleanAir) to successfully complete emissions compliance measurements at the Detroit Hydrogen Plant. The testing was performed at the Hydrogen (H_2) Plant Heater Stack. The test program included the following objectives:

- To perform a relative accuracy test audit (RATA) on the continuous emission monitoring system (CEMS);
- To determine compliance for PM and PM_{10};
- To determine compliance for H_2SO_4;
- To determine compliance for VOCs.

A summary of the test program results is presented below. Section 2 Results provides a more detailed account of the test conditions and data analysis. Test program information, including the test parameters, on-site schedule and a project discussion, begins on page 3.

Table 1-1:
Summary of Emissions Compliance Test Results

Source Constituent	(Units)	Sampling Method	Average Emission	Permit Limit[1]
H_2 Plant Heater Stack				
PM	(lb/MMBtu)	USEPA M-5	0.0017	0.0034
PM	(Ton/yr)	USEPA M-5	5.2	6.86
PM_{10}	(lb/MMBtu)	USEPA M-5 / 202	0.0035	0.010
H_2SO_4	(lb/MMBtu)	Draft ASTM CCM	0.000090	N/A
VOC	(lb/MMBtu)	USEPA M-25A/18	< 0.00071	0.0055
NO_X	(lb/MMBtu)	USEPA M-7E	0.0066	0.013
NO_X	(ppmdv @ 0% O_2)	USEPA M-7E	6.1	60
CO	(Ton/yr)	USEPA M-10	< 1.0	13

[1] Permit limits obtained from MDEQ Permit to Install No. 63-08D.

Table 1-2:
Summary of RATA Results

Source Constituent (Units)	Reference Method (USEPA)	Relative Accuracy[1]	Units	Applicable Specification	Specification Limit[2]
H_2 Plant Heater Stack					
Flow rate (dscfh)	M-2	13.4	% of RM	PS6	20% of RM
O_2 (% dv)	M-3A	0.02	%dv	PS3	± 1.0% dv
H_2O (% wv)	M-4	13.5	% of RM	N/A	N/A
NOx (ppmdv)	M-7E	2.4	% of RM	PS2	20% of RM
NOx (lb/MMBtu)	M-7E	9.1	% of RM	PS2	20% of RM
NOx (ppmdv @ 0%O2)	M-7E	2.2	% of RM	PS2	20% of RM
CO (ppmdv)	M-10	0.4	ppmdv	PS4A[3]	± 5 ppmdv
CO (lb/hr)	M-10	0.4	% of Std.	PS4A[3]	5% of Standard[4]

[1] Relative Accuracy is expressed in terms of comparison to the reference method (% RM) or applicable emission standard (% Std.), equivalent to the permit limit in Table 1-2. The specific expression used depends on the specification limit.

[2] Specification limits obtained from 40 CFR 60, Appendix B, Performance Specifications, unless otherwise noted.

[3] For any sources emitting less than 200 ppmv of CO, PS4A applies. The PS4A RA limit is either < 10% of RM, <5% of Standard, or ± 5 ppmv (abs. average difference plus 2.5 x confidence coefficient).

[4] CO Standard = 13 Ton/yr = 56.9 lb/hr (assuming 8,760 operating hours/year)

Test Program Details

Parameters

The test program included the following emissions measurements:

- particulate matter (PM), assumed equivalent of filterable particulate matter (FPM)
- condensable particulate matter (CPM)
- particulate matter less than 10 microns in diameter (PM_{10}), assumed to be the sum of:
  - FPM
  - CPM
- sulfuric acid mist (H_2SO_4)
- volatile organic compounds (VOCs), assumed equivalent to total hydrocarbons (THCs) minus:
  - methane (CH_4)
  - ethane (C_2H_6)
- nitrogen oxide (NO_X)
- carbon monoxide (CO)
- flue gas composition (e.g., O_2, CO_2, H_2O)
- flue gas temperature
- flue gas flow rate

Schedule

Testing was performed on March 15 and 16, 2017. The on-site schedule followed during the test program is outlined in Table 1-3.

Table 1-3:
Test Schedule

Run Number	Location	Method	Analyte	Date	Start Time	End Time
1	H_2 Plant Heater Stack	USEPA Method 5/202	FPM/CPM	03/15/17	09:16	11:28
1	H_2 Plant Heater Stack	USEPA Method 25A/18	VOC	03/15/17	09:37	10:37
2	H_2 Plant Heater Stack	USEPA Method 25A/18	VOC	03/15/17	10:46	11:46
3	H_2 Plant Heater Stack	USEPA Method 25A/18	VOC	03/15/17	12:34	13:34
2	H_2 Plant Heater Stack	USEPA Method 5/202	FPM/CPM	03/15/17	12:35	14:47
3	H_2 Plant Heater Stack	USEPA Method 5/202	FPM/CPM	03/15/17	15:27	17:50
0	H_2 Plant Heater Stack	Draft ASTM CCM	Sulfuric Acid	03/16/17	09:25	10:44
1	H_2 Plant Heater Stack	USEPA Methods 3A/7E/10	O_2/NOx/CO	03/16/17	09:25	09:46
1	H_2 Plant Heater Stack	USEPA Method 2	Velocity & Flow Rate	03/16/17	09:30	09:55
2	H_2 Plant Heater Stack	USEPA Methods 3A/7E/10	O_2/NOx/CO	03/16/17	09:54	10:15
2	H_2 Plant Heater Stack	USEPA Method 2	Velocity & Flow Rate	03/16/17	09:59	10:07
3	H_2 Plant Heater Stack	USEPA Method 2	Velocity & Flow Rate	03/16/17	10:15	10:25
3	H_2 Plant Heater Stack	USEPA Methods 3A/7E/10	O_2/NOx/CO	03/16/17	10:26	10:47
1	H_2 Plant Heater Stack	Draft ASTM CCM	Sulfuric Acid	03/16/17	12:22	13:48
4	H_2 Plant Heater Stack	USEPA Methods 3A/7E/10	O_2/NOx/CO	03/16/17	12:22	12:43
4	H_2 Plant Heater Stack	USEPA Method 2	Velocity & Flow Rate	03/16/17	12:25	12:38
5	H_2 Plant Heater Stack	USEPA Methods 3A/7E/10	O_2/NOx/CO	03/16/17	12:54	13:15
5	H_2 Plant Heater Stack	USEPA Method 2	Velocity & Flow Rate	03/16/17	12:56	13:08
6	H_2 Plant Heater Stack	USEPA Methods 3A/7E/10	O_2/NOx/CO	03/16/17	13:25	13:46
6	H_2 Plant Heater Stack	USEPA Method 2	Velocity & Flow Rate	03/16/17	13:28	13:40
2	H_2 Plant Heater Stack	Draft ASTM CCM	Sulfuric Acid	03/16/17	14:39	16:03
7	H_2 Plant Heater Stack	USEPA Methods 3A/7E/10	O_2/NOx/CO	03/16/17	14:39	15:00
7	H_2 Plant Heater Stack	USEPA Method 2	Velocity & Flow Rate	03/16/17	14:46	14:52
8	H_2 Plant Heater Stack	USEPA Method 2	Velocity & Flow Rate	03/16/17	15:10	15:23
8	H_2 Plant Heater Stack	USEPA Methods 3A/7E/10	O_2/NOx/CO	03/16/17	15:10	15:31
9	H_2 Plant Heater Stack	USEPA Method 2	Velocity & Flow Rate	03/16/17	15:41	15:53
9	H_2 Plant Heater Stack	USEPA Methods 3A/7E/10	O_2/NOx/CO	03/16/17	15:41	16:02
3	H_2 Plant Heater Stack	Draft ASTM CCM	Sulfuric Acid	03/16/17	16:39	17:39
10	H_2 Plant Heater Stack	USEPA Methods 3A/7E/10	O_2/NOx/CO	03/16/17	16:42	17:03
10	H_2 Plant Heater Stack	USEPA Method 2	Velocity & Flow Rate	03/16/17	16:45	16:57

Discussion

Project Synopsis

CleanAir conducted the sample program over a two-day span. During the first test day, three (3) Method 5/202 test runs were conducted along with three (3) Method 25A/18 test runs.

The RATA was conducted during the second test day, along with EPA Method 2 traverses for flow measurements. As part of the draft ASTM CCM test method, a conditioning test run (Run 0) was conducted prior to the three reported H_2SO_4 test runs.

Results from USEPA Method 5/202, Run 1

Upon applying the laboratory results to the particulate test runs, it was noted that Run 1 was considerably higher than the subsequent two runs. Further, almost the entire difference can be traced to the front-half, probe and acetone rinse. The net weight of the particulate matter in the probe rinse collected from Run 1 is slightly more than five times higher than collected in either Run 2 or Run 3.

A review of operating conditions indicates no significant variation in the operation of the unit. It is suspected that the probe liner used may have been contaminated prior to its use for Run 1. CleanAir cleans, preps and seals all probe liners in a glassware laboratory prior to mobilizing to a project site. Once on-site, the liner to be used is moved from the field lab trailer to the stack test location. It should remain sealed during this process.

The possibility exists that some sort of contamination could have occurred in the process of transferring the liner from the shipping container to installing the liner in the probe at the stack test location. We cannot prove that happened but the circumstances seem to strongly indicate that possibility.

Because we cannot say for certain that contamination caused the higher results of Run 1, the averages presented in Table 1-2 and Table 2-3 are of all three runs. The parameter sheets in Appendix C present both the average of all three runs and the average of Runs 2 and 3 only. It is likely that the latter is the most accurate representation of actual emissions.

Modifications to Test Methodology

USEPA Method 5/202

For this test program, the PM emission rate is assumed equivalent to FPM emission rate. The PM_{10} emission rate is assumed equivalent to the sum of FPM and CPM emission rates (units of lb/hr, Ton/yr, or lb/MMBtu for all constituents).

The analytical procedures in Method 202 include an ammonium titration of the inorganic sample fractions with pH less than 7.0 to neutralize acids with hygroscopic properties, such as H_2SO_4, that may be present in the sample. This step speeds up the sample desiccation process and allows the samples to come to a constant weight prior to weighing. The weight of ammonium added to the sample as a result of the titration is subtracted from the analytical result.

The laboratory performing the gravimetric analysis (CleanAir Analytical Services) has determined that only samples with an initial pH less than 4.5 require a significant amount of ammonium neutralization, resulting in a correction in excess of 0.5 mg. Based on this observation, the laboratory has altered its procedures to read that a sample must have a pH lower than 4.5 in order to be titrated.

The final results for each parameter were expressed as the average of three runs and were below the permit limits for both PM and PM_{10}.

Draft ASTM Controlled Condensation Method

Prior to the first official test run, a sample conditioning run was performed in order to minimize the absorption capacity of the front-half components of the sample train (upstream of the H_2SO_4 collection portion of the sample train). The conditioning run was recovered in the same manner as the official test runs, but is not included in the results.

Three test runs were performed on March 16. The final result was expressed as the average of three valid runs (Runs 1, 2 and 3).

USEPA Methods 18 and 25A

Three (3) Method 25A test runs for THCs were performed concurrently with three (3) 60-minute Method 18 bag collections for CH_4 and C_2H_6 on March 15. The final results for each parameter were expressed as the average of three valid runs (Runs 1, 2 and 3).

Method 25A states that the mid-range calibration gas should be used for the drift checks between runs. Because the flue gas contained very low levels of hydrocarbons, the operator used the low-level calibration gas for the drift checks.

VOC emission rate is normally equivalent to THC emission rate, minus CH_4 and C_2H_6 emission rate (units of lb/hr, Ton/yr, or lb/MMBtu for all constituents). For all runs, the THC concentration was below the reportable instrument response (considered to be 1% of instrument span, 0.5 ppm, vw). For CH_4 and C_2H_6, a non-detectable result was obtained for all runs; therefore, no correction was made to the THC results. VOC emissions are equivalent to THC emission rate.

USEPA Methods 2, 3A, 4, 7E, and 10 – Performance Specifications 2, 3, 4A, and 6

O_2 and CO_2 Mid-Range Calibration Gas

When using a high level calibration gas of 18.9%, the mid-level gas should fall between 7.56% and 11.34% (40% to 60% of the high level value). The mid-level gas used was 12.0%, which is 63.5% of the high level gas.

CO_2 Concentration

A review of the reference method carbon dioxide (CO_2) data, found in Appendix G of this report, will show one-minute averages that are flagged with a red background. This indicates that at least one second of data during that minute was above the high level calibration point of 18.9%.

This occurred in just under 20% of all the one-minute averages recorded during the test program. In no instance was any one-minute average above the high level calibration point.

Sample Approach

One-minute average data points for oxygen (O_2), CO_2, nitrogen oxide (NO_X) and carbon monoxide (CO) (dry basis) were collected over a period of 21 minutes for each relative accuracy test audit (RATA) reference method (RM) run.

The average result for each RM run was calculated and compared to the average result from the facility continuous emissions monitoring system (CEMS) over identical time intervals in order to calculate relative accuracy (RA):

- For O_2 (%dv), RA is expressed as the average absolute difference between the RM and facility CEMS runs. The final result was below the limit of ± 1.0% dv set by Performance Specification (PS) 3.

- For NO_X (ppmdv) concentration, RA is expressed as the percent difference between RM and facility CEMS runs. The final result was below the limit of 20% of the RM set by PS 2.
- For NO_X (lb/MMBtu) emission rate, RA is expressed as the percent difference between RM and facility CEMS runs. The final result was below the limit of 20% of the RM set by PS 2.
- For NO_X (ppmdv @ 0% O_2) concentration, RA is expressed as the percent difference between RM and facility CEMS runs. The final result was below the limit of 20% of the RM set by PS 2.
- For CO (ppmdv) concentration, the RA limit is expressed as the average absolute difference between the RM and facility CEMS runs, plus 2.5 times the confidence coefficient. The final result was below the limit of ± 5 ppmdv set by PS 4A, which is applicable to sources that emit less than 200 ppmv of CO.
- For CO (lb/hr) diluent, RA is expressed as the percent difference between RM and facility CEMs runs. The final result was below the limit of 5% of the standard (permit limit listed in Table 1-3 on page 4) set by PS 4A.
- CO_2 data was collected only as supplemental information.

All CO concentrations measured were below the instrument reportable response (considered to be 1% of instrument span, 0.45 ppm, dv).

Facility flow rate CEMS were evaluated using Method 2 as the RM. A complete flow and temperature traverse was performed during each 21-minute RATA run, converted to units of dry standard cubic feet per hour (dscfh) and then compared to facility CEMS results over the corresponding 21-minute intervals.

The flow rate, RA, is expressed as the percent difference between RM and facility CEMS data. The final results were below the limit of 20% of the RM set by PS 6.

Moisture data was used to convert flow rate from wet basis to dry basis and was obtained from concurrently operated Draft ASTM CCM test runs:

- For RATA Runs 1, 2 and 3, H_2O data was obtained from Draft ASTM CCM Run 0.
- For RATA Runs 4, 5 and 6, H_2O data was obtained from Draft ASTM CCM Run 1.
- For RATA Runs 7, 8 and 9, H_2O data was obtained from Draft ASTM CCM Run 2.
- For RATA Run 10, H_2O data was obtained from Draft ASTM CCM Run 3.

NO_X and CO results from the RATA were converted from units of dry volume-based concentration (ppmdv) to mass-based emission rate units (lb/hr, Ton/yr, and lb/MMBtu) to demonstrate compliance with permit limits. The final results for each parameter were expressed as the average of all 10 RATA runs. The final results were below the permit limits.

Calculation of Final Results

Emission results in units of dry volume-based concentration (lb/dscf, ppmdv) were converted to units of lb/MMBtu using the F_d factor method. Fuel F_d factors were provided by Air Products. Flow rates used in calculating lb/hr emissions were obtained in the following manner:

- For Method 5/202, flow rate measurements are incorporated into the sampling procedures.
- For Method 18/25A, flow rate measurements from the most nearly concurrent Method 5/202 test runs were used.
- For Method 7E/10, a flow rate measurement, per Method 2 specifications, was performed concurrently with each test run.

- For Draft ASTM CCM, the flow rate measurements made concurrently with the Method 7/10 run that most closely corresponded were used.

General Considerations

All run times listed throughout this report correspond to the plant time utilized by Air Products. Plant time is the time of the Air Products CEMS and data acquisition systems. The plant time is 60 minutes earlier than actual Eastern Daylight Savings Time.

End of Section

2. RESULTS

This section summarizes the test program results. Additional results are available in the report appendices, specifically Appendix C Parameters.

Table 2-1:
H_2SO_4 Emissions (Draft ASTM CCM)

Run No.		1	2	3	Average
Date (2017)		Mar 16	Mar 16	Mar 16	
Start Time (approx.)		12:22	14:39	16:39	
Stop Time (approx.)		13:48	16:03	17:39	
Process Conditions					
P_1	Hydrogen production (Mscf/day)	57.1	57.3	57.1	**57.2**
P_2	Aqueous NH3 feed to SCR (lb/hr)	36.1	35.7	35.7	**35.8**
P_3	SCR Inlet temperature (°F)	630	629	628	**629**
F_d	Oxygen-based F-factor (dscf/MMBtu)	8,989	8,989	8,989	**8,989**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions[1]					
O_2	Oxygen (dry volume %)	3.2	3.3	3.3	**3.3**
CO_2	Carbon dioxide (dry volume %)	18.4	18.4	18.4	**18.4**
T_s	Sample temperature (°F)	322	323	325	**323**
B_w	Actual water vapor in gas (% by volume)	15.01	14.78	15.28	**15.02**
Gas Flow Rate[2]					
Q_a	Volumetric flow rate, actual (acfm)	206,000	206,000	206,000	**206,000**
Q_s	Volumetric flow rate, standard (scfm)	138,000	137,000	137,000	**137,000**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	117,000	116,000	116,000	**117,000**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	29.24	29.14	27.76	**28.71**
Laboratory Data (Ion Chromatography)					
m_n	Total H_2SO_4 collected (mg)	0.0752	0.116	0.138	
Sulfuric Acid Mist (H_2SO_4) Results					
C_{sd}	H_2SO_4 Concentration (lb/dscf)	5.67E-09	8.81E-09	1.09E-08	**8.47E-09**
C_{sd}	H_2SO_4 Concentration (ppmdv)	0.0223	0.0346	0.0430	**0.0333**
$E_{lb/hr}$	H_2SO_4 Rate (lb/hr)	0.040	0.062	0.076	**0.059**
$E_{T/yr}$	H_2SO_4 Rate (Ton/hr)	0.17	0.27	0.33	**0.26**
E_{Fd}	H_2SO_4 Rate - Fd-based (lb/MMBtu)	0.000060	0.000094	0.00012	**0.000090**

[1] Oxygen and carbon dioxide concentrations from concurrent Method 3A test runs.
[2] Velocity and volumetric flow from concurrent Method 2 traverses.

Table 2-2:
Uncertainty Analysis – H_2SO_4 (Draft ASTM CCM)

		H_2SO_4 Results (ppmdv)		H_2SO_4 Results (lb/MMBtu)
Method		**CCM**		**CCM**
Run No.	**1**	0.022	**1**	0.000060
	2	0.035	**2**	0.000094
	3	0.043	**3**	0.00012
SD		0.0104		0.0000284
AVG		**0.033**		**0.000090**
RSD		31.3%		31.5%
N		3		3
SE		0.0060		0.000016
RSE		18.1%		18.2%
P		95.0%		95.0%
TINV		4.303		4.303
CI +		0.059		0.00016
AVG		**0.033**		**0.000090**
CI -		0.0074		0.000020
TB +		0.11		0.00031

AVG (average) is the mean value of the runs; N is the number of individual runs.

SD (standard deviation) and RSD (relative standard deviation) are measures of the variability of individual run

SE (standard error) and RSE (relative standard error) are measures of the variability of the average of the

P (probability) is the confidence level associated with the two-tailed Student's t-distribution.

TINV (t-value) is the value of the Student's t-distrubution as a function of P (probability) and N-1 (degrees of freedom).

CI (confidence interval) indicates that if the test is conducted again under the same conditions, the average would be expected to fall within the interval (CI- to CI+) about 95% of the time.

TB+ (upper tolerance bound) is the value below which 95% of future runs are expected to fall (assuming testing at the same conditions).

Table 2-3:
FPM, CPM and Total PM_{10} Emissions (EPA Method 5/202)

Run No.		1*	2	3	Average
Date (2017)		Mar 15	Mar 15	Mar 15	
Start Time (approx.)		09:16	12:35	15:27	
Stop Time (approx.)		11:28	14:47	17:50	
Process Conditions					
P_1	Hydrogen production (Mscf/day)	58.6	57.0	57.0	**57.5**
P_2	Aqueous NH3 feed to SCR (lb/hr)	37.4	35.1	36.1	**36.2**
P_3	SCR Inlet temperature (°F)	636	628	629	**631**
F_d	Oxygen-based F-factor (dscf/MMBtu)	8,989	8,989	8,989	**8,989**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	3.5	3.6	3.8	**3.6**
CO_2	Carbon dioxide (dry volume %)	18.1	17.9	17.9	**18.0**
T_s	Sample temperature (°F)	311	312	312	**312**
B_w	Actual water vapor in gas (% by volume)	14.9	14.7	14.6	**14.7**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	225,000	217,000	226,000	**223,000**
Q_s	Volumetric flow rate, standard (scfm)	151,000	145,000	151,000	**149,000**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	129,000	124,000	129,000	**127,000**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	67.26	65.13	67.10	**66.50**
%I	Isokinetic sampling (%)	98.9	99.3	98.1	**98.8**
Laboratory Data					
m_n	Total FPM (g)	0.00923	0.00254	0.00240	
m_{CPM}	Total CPM (g)	0.00550	0.00515	0.00431	
m_{Part}	Total particulate matter (g)	0.01473	0.00769	0.00671	
FPM Results					
$E_{lb/hr}$	Particulate Rate (lb/hr)	2.3	0.64	0.61	**1.2**
$E_{T/yr}$	Particulate Rate (Ton/yr)	10	2.8	2.7	**5.2**
E_{Fd}	Particulate Rate - F_d-based (lb/MMBtu)	0.0033	0.00093	0.00087	**0.0017**
CPM Results					
$E_{lb/hr}$	Particulate Rate (lb/hr)	1.4	1.3	1.1	**1.3**
$E_{T/yr}$	Particulate Rate (Ton/yr)	6.1	5.7	4.8	**5.5**
E_{Fd}	Particulate Rate - F_d-based (lb/MMBtu)	0.0019	0.0019	0.0016	**0.0018**
TPM Results					
$E_{lb/hr}$	Particulate Rate (lb/hr)	3.7	1.9	1.7	**2.5**
$E_{T/yr}$	Particulate Rate (Ton/yr)	16	8.5	7.5	**11**
E_{Fd}	Particulate Rate - F_d-based (lb/MMBtu)	0.0052	0.0028	0.0024	**0.0035**

* Please see comments in Discussion, Results from USEPA Method 5/202 Run 1, on Page 5.

Table 2-4:
Uncertainty Analysis – FPM, CPM and Total PM_{10} (EPA Method 5/202)

		FPM Results (lb/MMBtu)		CPM Results (lb/MMBtu)		Total PM (as PM_{10}) Results (lb/MMBtu)
Method		**5**		**202**		**5/202**
Run No.	**1**	0.0033	**1**	0.0019	**1**	0.0052
	2	0.00093	**2**	0.0019	**2**	0.0028
	3	0.00087	**3**	0.0016	**3**	0.0024
SD		0.00137		0.000212		0.00151
AVG		**0.0017**		**0.0018**		**0.0035**
RSD		80.9%		11.8%		43.3%
N		3		3		3
SE		0.00079		0.00012		0.0009
RSE		46.7%		6.8%		25.0%
P		95.0%		95.0%		95.0%
TINV		4.303		4.303		4.303
CI +		0.0051		0.0023		0.0072
AVG		**0.0017**		**0.0018**		**0.0035**
CI -		-0.0017		0.0013		-0.00026
TB +		0.012		0.0034		0.015

AVG (average) is the mean value of the runs; N is the number of individual runs.

SD (standard deviation) and RSD (relative standard deviation) are measures of the variability of individual runs.

SE (standard error) and RSE (relative standard error) are measures of the variability of the average of the runs.

P (probability) is the confidence level associated with the two-tailed Student's t-distribution.

TINV (t-value) is the value of the Student's t-distrubution as a function of P (probability) and N-1 (degrees of freedom).

CI (confidence interval) indicates that if the test is conducted again under the same conditions, the average would be expected to fall within the interval (CI- to CI+) about 95% of the time.

TB+ (upper tolerance bound) is the value below which 95% of future runs are expected to fall (assuming testing at the same conditions).

Table 2-5:
THC, CH_4, C_2H_6 and VOC Emissions (EPA Method 25A/18)

Run No.		1	2	3	Average
Date (2017)		Mar 15	Mar 15	Mar 15	
Start Time (approx.)		09:37	10:46	12:34	
Stop Time (approx.)		10:37	11:46	13:34	
Process Conditions					
P_1	Hydrogen Production (Mscf/day)	58.9	57.7	57.7	**58.1**
P_2	Aqueous NH_3 feed to SCR (lb/hr)	35.9	36.6	36.6	**36.4**
P_3	SCR Inlet Temperature	637	633	633	**634**
F_d	Oxygen-based F-factor (dscf/MMBtu)	8,989	8,989	8,989	**8,989**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	3.2	3.3	3.2	**3.2**
CO_2	Carbon dioxide (dry volume %)	18.3	18.3	18.4	**18.3**
B_w	Actual water vapor in gas (% by volume)[1]	14.9	14.9	14.7	**14.8**
Gas Flow Rate[2]					
Q_{std}	Volumetric flow rate, dry standard (dscfm)	129,000	129,000	124,000	**127,000**
THC Results (as Propane)[3]					
C_{sd}	Concentration (ppmdv)	<0.59	<0.59	<0.59	**<0.59**
$E_{lb/hr}$	Emission Rate (lb/hr)	< 0.52	< 0.52	< 0.50	**< 0.51**
$E_{T/yr}$	Emission Rate (Ton/yr)	< 2.3	< 2.3	< 2.2	**< 2.2**
E_{Fd}	Emission Rate - F_d-based (lb/MMBtu)	<7.2E-04	<7.2E-04	<7.1E-04	**<7.1E-04**
Methane Results[4]					
C_{sd}	Concentration (ppmdv)	<0.24	<0.24	<0.24	**<0.24**
$E_{lb/hr}$	Emission Rate (lb/hr)	< 0.078	< 0.078	< 0.076	**< 0.077**
$E_{T/yr}$	Emission Rate (Ton/yr)	< 0.34	< 0.34	< 0.33	**< 0.34**
E_{Fd}	Emission Rate - F_d-based (lb/MMBtu)	<1.1E-04	<1.1E-04	<1.1E-04	**<1.1E-04**
Ethane Results[4]					
C_{sd}	Concentration (ppmdv)	<0.20	<0.20	<0.20	**<0.20**
$E_{lb/hr}$	Emission Rate (lb/hr)	< 0.12	< 0.12	< 0.12	**< 0.118**
$E_{T/yr}$	Emission Rate (Ton/yr)	< 0.52	< 0.52	< 0.51	**< 0.52**
E_{Fd}	Emission Rate - F_d-based (lb/MMBtu)	<1.7E-04	<1.7E-04	<1.6E-04	**<1.7E-04**
VOC Results					
$E_{lb/hr}$	Emission Rate (lb/hr)	< 0.52	< 0.52	< 0.50	**< 0.51**
$E_{T/yr}$	Emission Rate (Ton/yr)	< 2.3	< 2.3	< 2.2	**< 2.2**
E_{Fd}	Emission Rate - F_d-based (lb/MMBtu)	<7.2E-04	<7.2E-04	<7.1E-04	**<7.1E-04**

[1] Moisture data used for ppmwv to ppmdv correction obtained from nearly-concurrent M-5/202 runs 042017 184844
[2] Flow data used in lb/hr calculations was obtained from nearly-concurrent Method 5/202 runs .
[3] '<' indicates a measured response below the detedtion limit (assumed to be 1% of instrument span).
[4] '<' indicates a measured response below the analytical detection limit determined by the laboratory.

Table 2-6:
NO_X and CO Emissions (EPA Method 7E/10)

Run No.		1	2	3	4	5	6
Date (2017)		Mar 16	Mar 16	Mar 16	Mar 16	Mar 16	Mar 16
Start Time (approx.)		09:25	13:09	13:57	14:30	15:05	15:36
Stop Time (approx.)		09:46	13:30	14:18	14:51	15:26	15:57
Process Conditions							
P_1	Hydrogen Production (Mscf/day)	57.1	57.1	57.1	57.1	57.1	57.1
P_2	Aqueous NH_3 feed to SCR (lb/hr)	35.9	35.9	35.9	35.9	35.9	35.9
P_3	SCR Inlet Temperature	629	629	629	629	629	629
F_d	Oxygen-based F-factor (dscf/MMBtu)	8,991	8,990	8,988	8,990	8,988	8,989
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	8,760	8,760	8,760
Gas Conditions							
O_2	Oxygen (dry volume %)	3.28	3.31	3.27	3.22	3.21	3.21
CO_2	Carbon dioxide (dry volume %)	18.3	18.3	18.3	18.4	18.4	18.4
B_w	Actual water vapor in gas (% by volume)[1]	13.6	13.6	13.6	15.0	15.0	15.0
Gas Flow Rate[2]							
Q_a	Volumetric flow rate, actual (acfm)	207,000	205,000	208,000	206,000	206,000	206,000
Q_s	Volumetric flow rate, standard (scfm)	137,000	136,000	138,000	138,000	138,000	137,000
Q_{std}	Volumetric flow rate, dry standard (dscfm)	119,000	118,000	120,000	117,000	117,000	117,000
Nitrogen Oxides Results							
C_{sd}	Concentration (ppmdv)	5.3	5.0	5.1	5.0	5.2	5.2
$C_{sd\text{-}x}$	Concentration @ 0% O_2 (ppmdv)	6.2	6.0	6.0	5.9	6.2	6.1
C_{sd}	Concentration (lb/dscf)	6.3E-07	6.0E-07	6.1E-07	6.0E-07	6.2E-07	6.2E-07
$E_{lb/hr}$	Emission Rate (lb/hr)	4.5	4.3	4.4	4.2	4.4	4.3
$E_{T/yr}$	Emission Rate (Ton/yr)	20	19	19	18	19	19
E_{Fd}	Emission Rate - F_d-based (lb/MMBtu)	0.0067	0.0064	0.0065	0.0063	0.0066	0.0066
Carbon Monoxide Results[3]							
C_{sd}	Concentration (ppmdv)	<0.45	<0.45	<0.45	<0.45	<0.45	<0.45
$C_{sd\text{-}x}$	Concentration @ 0% O_2 (ppmdv)	<0.53	<0.53	<0.53	<0.53	<0.53	<0.53
C_{sd}	Concentration (lb/dscf)	<3.3E-08	<3.3E-08	<3.3E-08	<3.3E-08	<3.3E-08	<3.3E-08
$E_{lb/hr}$	Emission Rate (lb/hr)	< 0.23	< 0.23	< 0.23	< 0.23	< 0.23	< 0.23
$E_{T/yr}$	Emission Rate (Ton/yr)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
E_{Fd}	Emission Rate - F_d-based (lb/MMBtu)	<3.5E-04	<3.5E-04	<3.5E-04	<3.5E-04	<3.5E-04	<3.5E-04

[1] Moisture data obtained from nearly-concurrent Draft ASTM CCM runs.

[2] Flow data used in lb/hr calculations was obtained from nearly-concurrent Method 2 runs.

[3] For CO, '<' indicates a measured response below the detection limit (assumed to be 1% of the instrument calibration span).

Table 2-6 (Continued):
NO_X and CO Emissions (EPA Method 7E/10)

Run No.		7	8	9	10	Average
Date (2017)		Mar 16	Mar 16	Mar 16	Mar 16	
Start Time (approx.)		16:14	16:46	17:17	17:57	
Stop Time (approx.)		16:35	17:07	17:38	18:18	
Process Conditions						
P_1	Hydrogen Production (Mscf/day)	57.1	57.1	57.1	57.1	**57.1**
P_2	Aqueous NH_3 feed to SCR (lb/hr)	35.9	35.9	35.9	35.9	**35.9**
P_3	SCR Inlet Temperature	629	629	629	629	**629**
F_d	Oxygen-based F-factor (dscf/MMBtu)	8,989	8,988	8,989	8,991	**8,989**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	8,760	**8,760**
Gas Conditions						
O_2	Oxygen (dry volume %)	3.26	3.28	3.26	3.29	**3.26**
CO_2	Carbon dioxide (dry volume %)	18.4	18.3	18.4	18.4	**18.3**
B_w	Actual water vapor in gas (% by volume)[1]	14.8	14.8	14.8	15.3	**14.5**
Gas Flow Rate[2]						
Q_a	Volumetric flow rate, actual (acfm)	208,000	205,000	205,000	206,000	**206,000**
Q_s	Volumetric flow rate, standard (scfm)	138,000	136,000	136,000	137,000	**137,000**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	117,000	116,000	116,000	116,000	**117,000**
Nitrogen Oxides Results						
C_{sd}	Concentration (ppmdv)	5.2	5.1	5.3	5.1	**5.1**
$C_{sd\text{-}x}$	Concentration @ 0% O_2 (ppmdv)	6.2	6.1	6.2	6.0	**6.1**
C_{sd}	Concentration (lb/dscf)	6.2E-07	6.1E-07	6.3E-07	6.1E-07	**6.1E-07**
$E_{lb/hr}$	Emission Rate (lb/hr)	4.4	4.3	4.4	4.2	**4.3**
$E_{T/yr}$	Emission Rate (Ton/yr)	19	19	19	18	**19**
E_{Fd}	Emission Rate - F_d-based (lb/MMBtu)	0.0066	0.0065	0.0067	0.0065	**0.0065**
Carbon Monoxide Results[3]						
C_{sd}	Concentration (ppmdv)	<0.45	<0.45	<0.45	<0.45	**<0.45**
$C_{sd\text{-}x}$	Concentration @ 0% O_2 (ppmdv)	<0.53	<0.53	<0.53	<0.53	**<0.53**
C_{sd}	Concentration (lb/dscf)	<3.3E-08	<3.3E-08	<3.3E-08	<3.3E-08	**<3.3E-08**
$E_{lb/hr}$	Emission Rate (lb/hr)	< 0.23	< 0.23	< 0.23	< 0.23	**< 0.23**
$E_{T/yr}$	Emission Rate (Ton/yr)	< 1.0	< 1.0	< 1.0	< 1.0	**< 1.0**
E_{Fd}	Emission Rate - F_d-based (lb/MMBtu)	< 0.00035	< 0.00035	< 0.00035	< 0.00035	**< 0.00035**

[1] Moisture data obtained from nearly-concurrent Draft ASTM CCM runs.

[2] Flow data used in lb/hr calculations was obtained from nearly-concurrent Method 2 runs.

[3] For CO, '<' indicates a measured response below the detection limit (assumed to be 1% of the instrument calibration span).

Table 2-7:
Dry Standard Flow Rate RATA (EPA Method 2 / PS 6)

Run No.	Start Time	Date (2017)	RM Data (dscf/hr)	CEMS Data (dscf/hr)	Difference (dscf/hr)	Difference Percent
1	09:25	Mar 16	7,123,000	6,153,000	970,000	13.6%
2	09:54	Mar 16	7,055,000	6,153,000	902,000	12.8%
3 *	10:26	Mar 16	7,175,000	6,158,000	1,017,000	14.2%
4	12:22	Mar 16	7,033,000	6,139,000	894,000	12.7%
5	12:54	Mar 16	7,047,000	6,133,000	914,000	13.0%
6	13:25	Mar 16	7,008,000	6,123,000	885,000	12.6%
7	14:39	Mar 16	7,041,000	6,125,000	916,000	13.0%
8	15:10	Mar 16	6,958,000	6,114,000	844,000	12.1%
9	15:41	Mar 16	6,958,000	6,100,000	858,000	12.3%
10	16:42	Mar 16	6,972,000	6,004,000	968,000	13.9%
Average			**7,021,667**	**6,116,000**	**905,667**	**12.9%**

Relative Accuracy Test Audit Results

Standard Deviation of Differences	43,087	
Confidence Coefficient (CC)	33,120	
t-Value for 9 Data Sets	2.306	
		Limit
Relative Accuracy (as % of RM)	**13.4%**	**20.0%**

RM = Reference Method (CleanAir Data) 041417 171126
CEMS = Continuous Emissions Monitoring System (Air Products and Chemicals, Inc. Data)
RATA calculations are based on 9 of 10 runs. * indicates the excluded run.

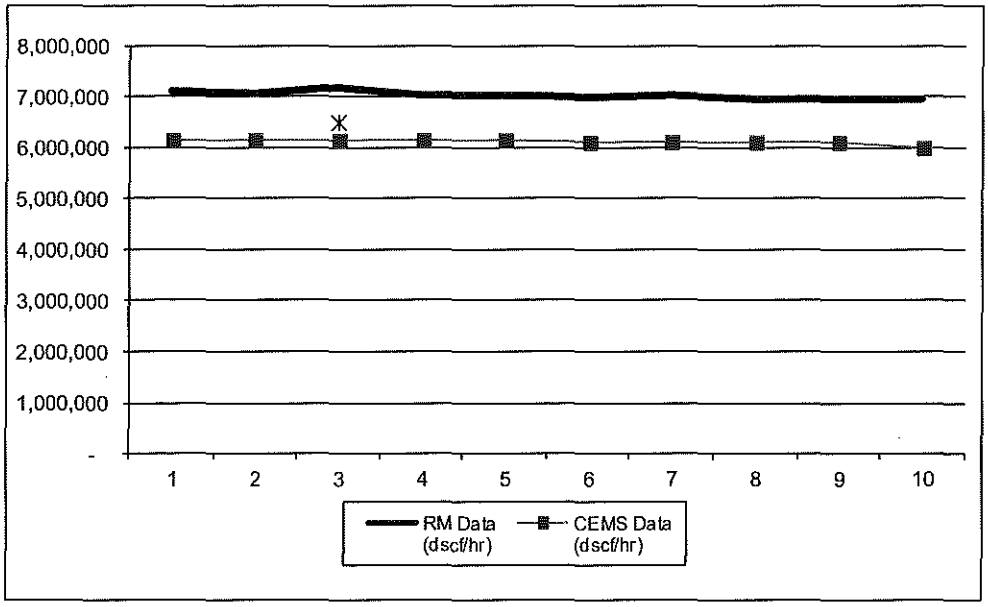

Table 2-8:
H_2O Concentration RATA (EPA Method 4)

Run No.	Start Time	Date (2017)	RM Data (%v)	CEMS Data (%v)	Difference (%v)	Difference Percent
1	09:25	Mar 16	13.6	16.0	-2.4	-17.9%
2	09:54	Mar 16	13.6	16.0	-2.4	-17.9%
3	10:26	Mar 16	13.6	16.0	-2.4	-17.9%
4	12:22	Mar 16	15.0	16.0	-1.0	-6.6%
5	12:54	Mar 16	15.0	16.0	-1.0	-6.6%
6	13:25	Mar 16	15.0	16.0	-1.0	-6.6%
7	14:39	Mar 16	14.8	16.0	-1.2	-8.2%
8	15:10	Mar 16	14.8	16.0	-1.2	-8.2%
9	15:41	Mar 16	14.8	16.0	-1.2	-8.2%
10	16:42	Mar 16	15.3	16.0	-0.7	-4.7%
	Average		**14.5**	**16.0**	**-1.5**	**-10.1%**

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Relative Accuracy Test Audit Results

Standard Deviation of Differences	0.6851	
Confidence Coefficient (CC)	0.4900	
t-Value for 10 Data Sets	2.262	
		Limit
Relative Accuracy (as % of RM)	**13.5%**	**NA**

RM = Reference Method (CleanAir Data) 042017 185607
CEMS = Continuous Emissions Monitoring System (Air Products and Chemicals, Inc. Data)
RATA calculations are based on all 10 runs.

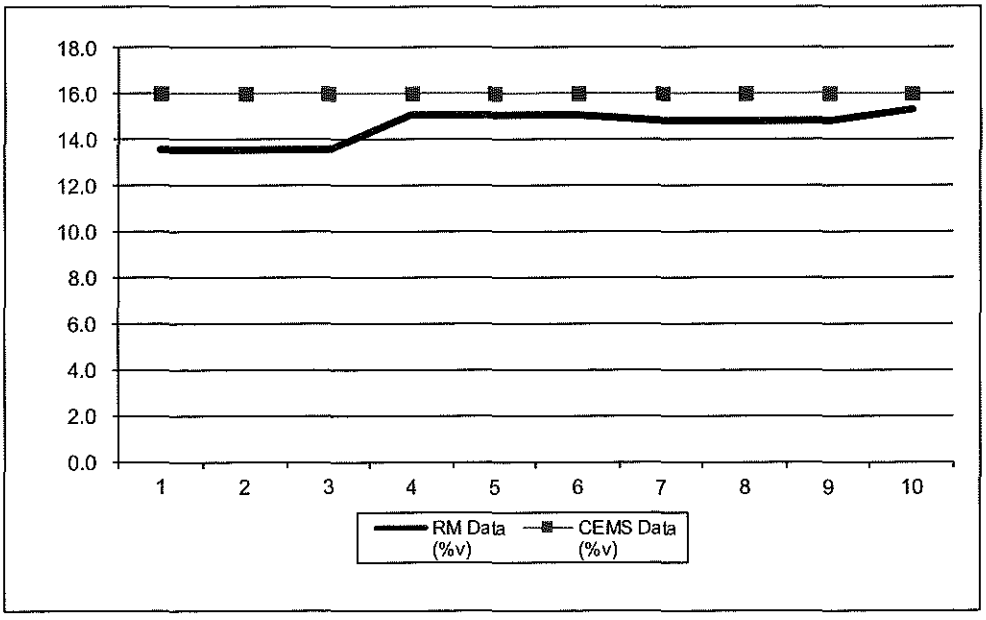


Table 2-9:
O_2 (%dv) RATA (EPA Method 3A / PS 3)

Run No.	Start Time	Date (2017)	RM Data (%dv)	CEMS Data (%dv)	Difference (%dv)	Difference Percent
1	09:25	Mar 16	3.28	3.30	-0.02	-0.7%
2	09:54	Mar 16	3.31	3.30	0.01	0.3%
3	10:26	Mar 16	3.27	3.30	-0.03	-1.0%
4	12:22	Mar 16	3.22	3.20	0.02	0.6%
5	12:54	Mar 16	3.21	3.20	0.01	0.4%
6	13:25	Mar 16	3.21	3.20	0.01	0.5%
7	14:39	Mar 16	3.26	3.30	-0.04	-1.1%
8	15:10	Mar 16	3.28	3.30	-0.02	-0.7%
9 *	15:41	Mar 16	3.26	3.20	0.06	1.8%
10	16:42	Mar 16	3.29	3.30	-0.01	-0.3%
	Average		**3.26**	**3.27**	**-0.01**	**-0.2%**

Relative Accuracy Test Audit Results

Standard Deviation of Differences	0.02212	
Confidence Coefficient (CC)	0.01700	
t-Value for 9 Data Sets	2.306	
		Limit
Avg. Abs. Diff. (%dv)	**0.020**	**1.0**

RM = Reference Method (CleanAir Data) 042017 185607
CEMS = Continuous Emissions Monitoring System (Air Products and Chemicals, Inc. Data)
RATA calculations are based on 9 of 10 runs. * indicates the excluded run.

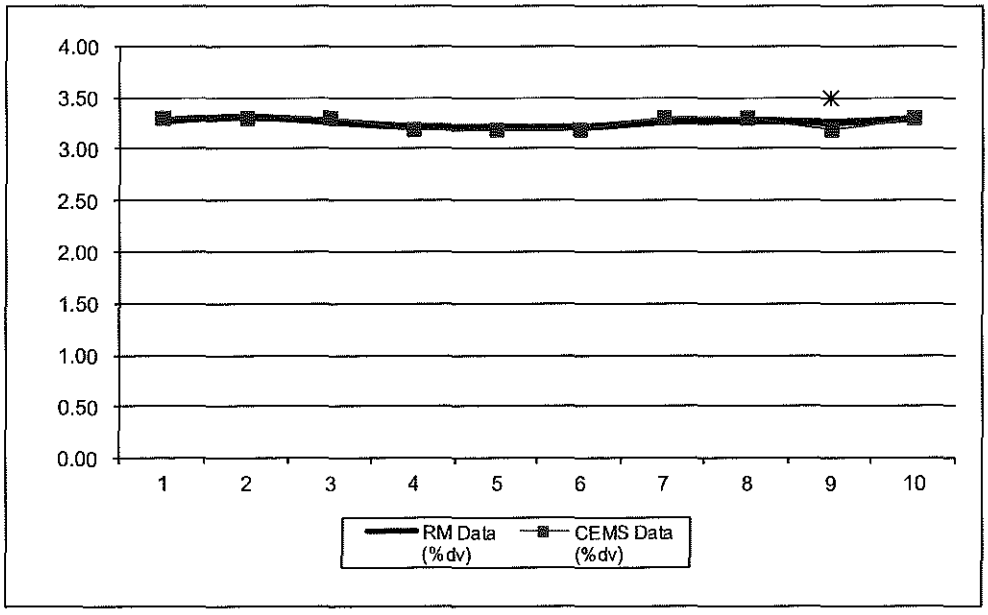


Table 2-10:
NO_x (ppmdv) Concentration RATA (EPA Method 7E / PS 2)

Run No.	Start Time	Date (2017)	RM Data (ppmdv)	CEMS Data (ppmdv)	Difference (ppmdv)	Difference Percent
1	09:25	Mar 16	5.25	5.20	0.05	1.0%
2	09:54	Mar 16	5.05	5.00	0.05	0.9%
3	10:26	Mar 16	5.08	5.00	0.08	1.6%
4	12:22	Mar 16	4.99	5.00	-0.01	-0.1%
5	12:54	Mar 16	5.23	5.20	0.03	0.5%
6	13:25	Mar 16	5.17	5.10	0.07	1.4%
7	14:39	Mar 16	5.23	5.10	0.13	2.4%
8	15:10	Mar 16	5.15	5.00	0.15	2.8%
9	15:41	Mar 16	5.26	5.10	0.16	3.1%
10 *	16:42	Mar 16	5.07	4.90	0.17	3.3%
Average			**5.16**	**5.08**	**0.08**	**1.5%**

Relative Accuracy Test Audit Results

Standard Deviation of Differences	0.05638	
Confidence Coefficient (CC)	0.04333	
t-Value for 9 Data Sets	2.306	
		Limit
Relative Accuracy (as % of RM)	**2.4%**	**20.0%**

RM = Reference Method (CleanAir Data) 042017 185607
CEMS = Continuous Emissions Monitoring System (Air Products and Chemicals, Inc. Data)
RATA calculations are based on 9 of 10 runs. * indicates the excluded run.

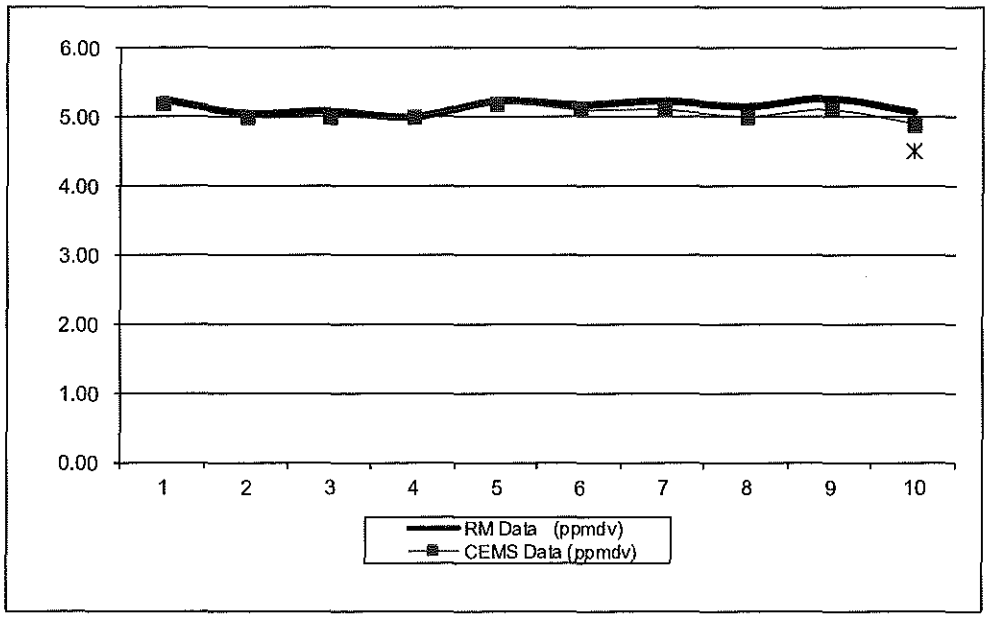


Table 2-11:
NO_X (ppmdv @ 0% O_2) Concentration RATA (EPA Method 7E / PS 2)

Run No.	Start Time	Date (2017)	RM Data (ppm@0%O2)	CEMS Data (ppm@0%O2)	Difference (ppm@0%O2)	Difference Percent
1	09:25	Mar 16	6.23	6.20	0.03	0.4%
2	09:54	Mar 16	6.00	5.90	0.10	1.6%
3	10:26	Mar 16	6.02	6.00	0.02	0.4%
4	12:22	Mar 16	5.90	5.90	0.00	0.1%
5	12:54	Mar 16	6.17	6.10	0.07	1.2%
6	13:25	Mar 16	6.11	6.00	0.11	1.8%
7	14:39	Mar 16	6.19	6.10	0.09	1.5%
8	15:10	Mar 16	6.10	5.90	0.20	3.3%
9	15:41	Mar 16	6.23	6.10	0.13	2.2%
10 *	16:42	Mar 16	6.02	5.80	0.22	3.6%
Average			**6.11**	**6.02**	**0.09**	**1.4%**

Relative Accuracy Test Audit Results

Standard Deviation of Differences	0.06282	
Confidence Coefficient (CC)	0.04829	
t-Value for 9 Data Sets	2.306	
		Limit
Relative Accuracy (as % of RM)	**2.2%**	**20.0%**

RM = Reference Method (CleanAir Data) 042017 185607
CEMS = Continuous Emissions Monitoring System (Air Products and Chemicals, Inc. Data)
RATA calculations are based on 9 of 10 runs. * indicates the excluded run.

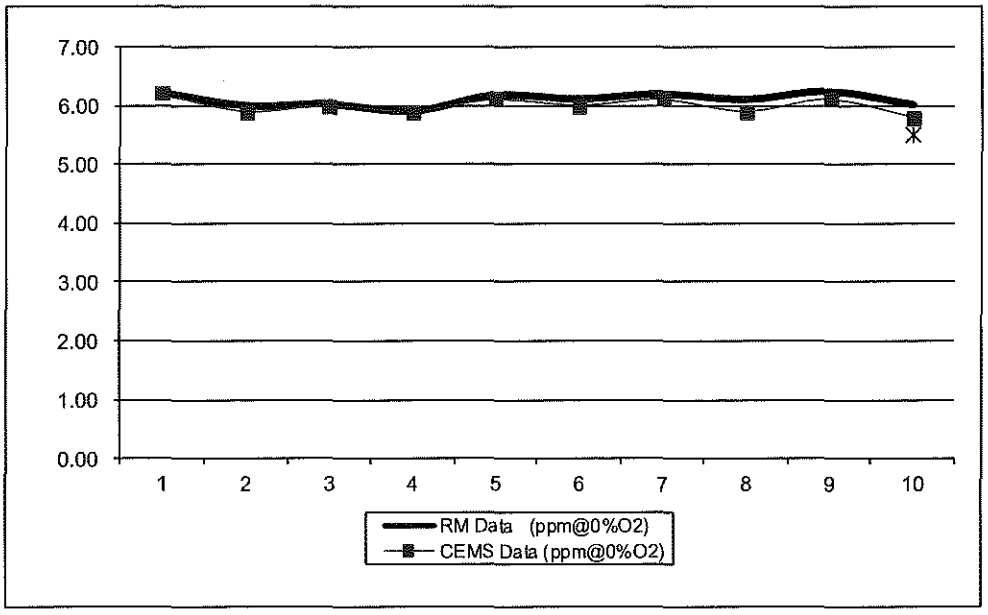


Table 2-12:
NO_X (lb/MMBtu) Emission Rate RATA (EPA Method 7E / PS 2)

Run No.	Start Time	Date (2017)	RM Data (lb/MMBtu)	CEMS Data (lb/MMBtu)	Difference (lb/MMBtu)	Difference Percent
1	09:25	Mar 16	0.0067	0.0070	-0.0003	-4.7%
2	09:54	Mar 16	0.0064	0.0060	0.0004	6.8%
3	10:26	Mar 16	0.0065	0.0060	0.0005	7.2%
4	12:22	Mar 16	0.0063	0.0060	0.0003	5.3%
5	12:54	Mar 16	0.0066	0.0060	0.0006	9.5%
6	13:25	Mar 16	0.0066	0.0060	0.0006	8.5%
7 *	14:39	Mar 16	0.0066	0.0060	0.0006	9.7%
8	15:10	Mar 16	0.0065	0.0060	0.0005	8.4%
9	15:41	Mar 16	0.0067	0.0070	-0.0003	-4.6%
10	16:42	Mar 16	0.0065	0.0060	0.0005	7.1%
Average			**0.0065**	**0.0062**	**0.0003**	**4.8%**

Relative Accuracy Test Audit Results

Standard Deviation of Differences	0.0003637	
Confidence Coefficient (CC)	0.0002796	
t-Value for 9 Data Sets	2.306	
		Limit
Relative Accuracy (as % of RM)	**9.1%**	**20.0%**

RM = Reference Method (CleanAir Data) 042417 172226
CEMS = Continuous Emissions Monitoring System (Air Products and Chemicals, Inc. Data)
RATA calculations are based on 9 of 10 runs. * indicates the excluded run.

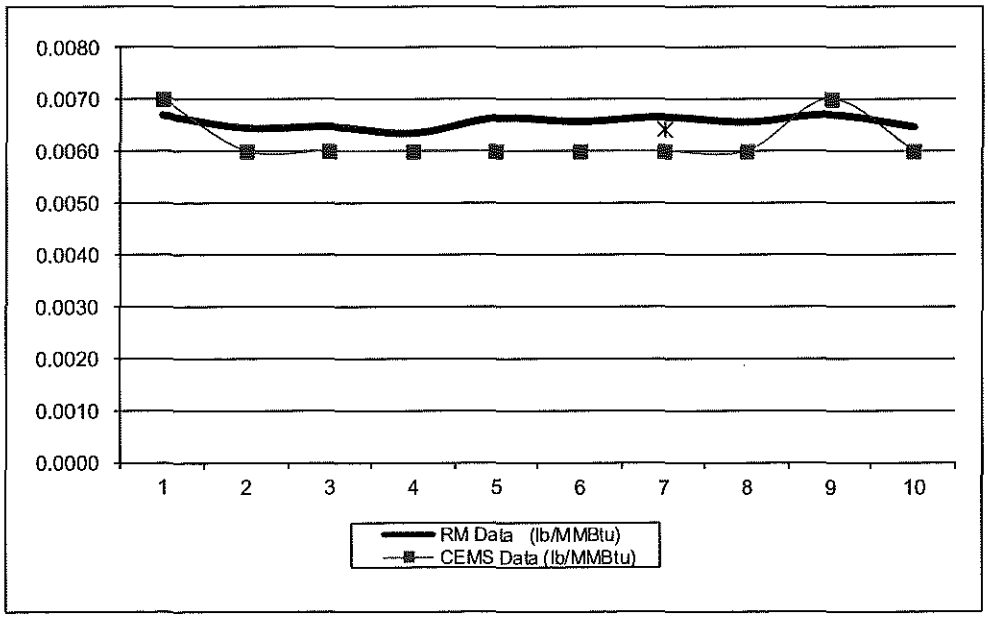


Table 2-13:
CO (ppmdv) Concentration RATA (EPA Method 10 / PS 4A)

Run No.	Start Time	Date (2017)	RM Data (ppmdv)	CEMS Data (ppmdv)	Difference (ppmdv)	Difference Percent
1	09:25	Mar 16	0.00	0.40	-0.40	N/A
2	09:54	Mar 16	0.00	0.40	-0.40	N/A
3	10:26	Mar 16	0.00	0.40	-0.40	N/A
4	12:22	Mar 16	0.00	0.40	-0.40	N/A
5	12:54	Mar 16	0.00	0.40	-0.40	N/A
6	13:25	Mar 16	0.00	0.40	-0.40	N/A
7	14:39	Mar 16	0.00	0.40	-0.40	N/A
8	15:10	Mar 16	0.00	0.40	-0.40	N/A
9	15:41	Mar 16	0.00	0.40	-0.40	N/A
10	16:42	Mar 16	0.00	0.40	-0.40	N/A
	Average		**0.00**	**0.40**	**-0.40**	

Relative Accuracy Test Audit Results

Standard Deviation of Differences	0.00000	
Confidence Coefficient (CC)	0.00000	
t-Value for 10 Data Sets	2.262	
		Limit
Avg. Abs. Diff. + CC (ppmdv)	**0.4**	**5.0**

RM = Reference Method (CleanAir Data) 041417 171126
CEMS = Continuous Emissions Monitoring System (Air Products and Chemicals, Inc. Data)
RATA calculations are based on all 10 runs.

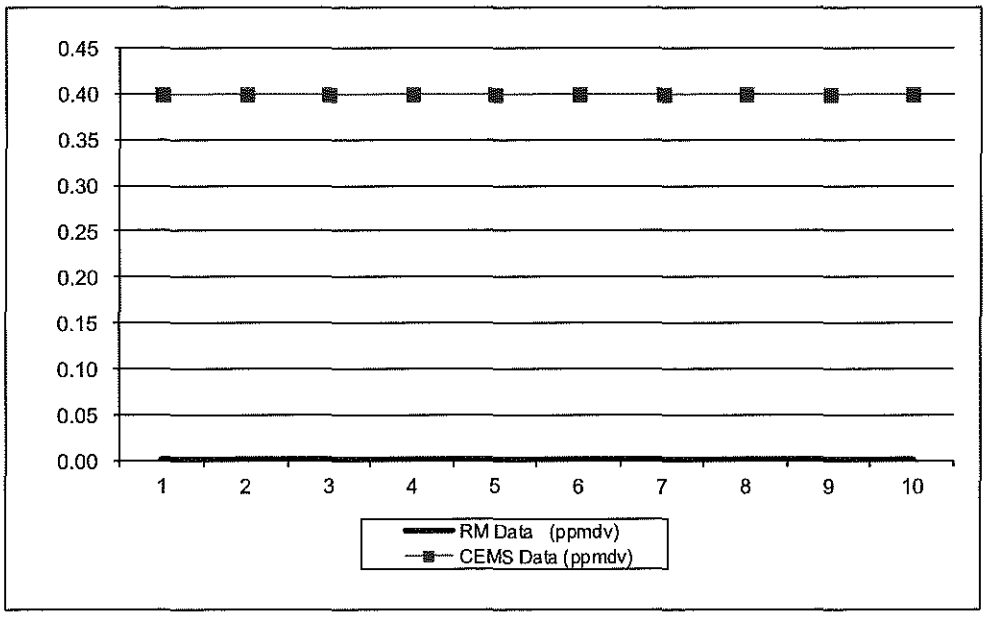


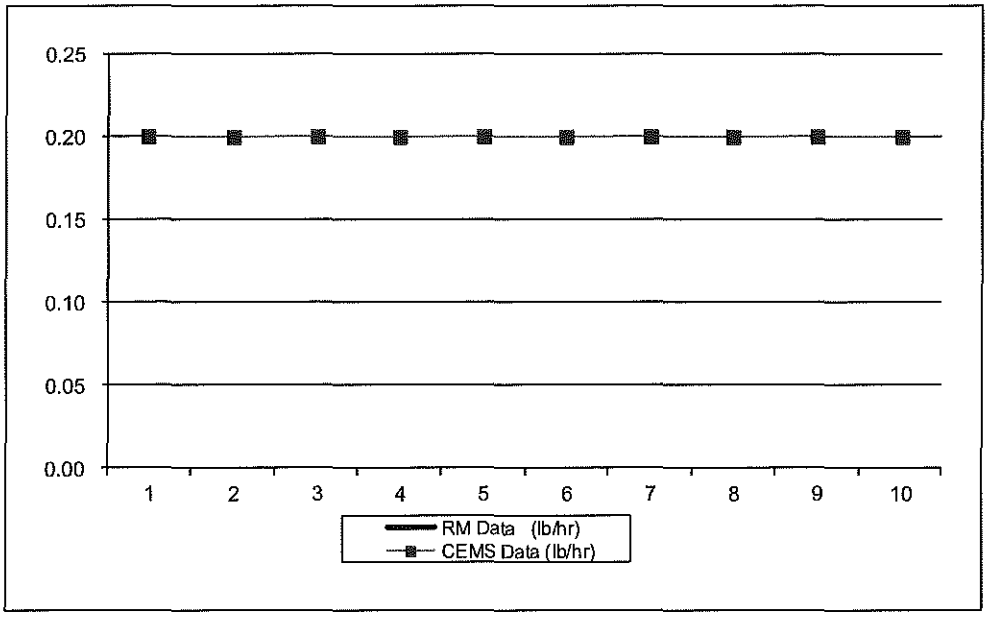
Table 2-14:
CO (lb/hr) Emission Rate RATA (EPA Method 10 / PS 4A)

Run No.	Start Time	Date (2017)	RM Data (lb/hr)	CEMS Data (lb/hr)	Difference (lb/hr)	Difference Percent
1	09:25	Mar 16	0.00	0.20	-0.20	N/A
2	09:54	Mar 16	0.00	0.20	-0.20	N/A
3	10:26	Mar 16	0.00	0.20	-0.20	N/A
4	12:22	Mar 16	0.00	0.20	-0.20	N/A
5	12:54	Mar 16	0.00	0.20	-0.20	N/A
6	13:25	Mar 16	0.00	0.20	-0.20	N/A
7	14:39	Mar 16	0.00	0.20	-0.20	N/A
8	15:10	Mar 16	0.00	0.20	-0.20	N/A
9	15:41	Mar 16	0.00	0.20	-0.20	N/A
10	16:42	Mar 16	0.00	0.20	-0.20	N/A
	Average		**0.00**	**0.20**	**-0.20**	

Relative Accuracy Test Audit Results

Standard Deviation of Differences	0.00000	
Confidence Coefficient (CC)	0.00000	
t-Value for 10 Data Sets	2.262	
		Limit
Relative Accuracy (as % of Appl. Std.)	**0.4%**	**5.0%**
Appl. Std. = 56.9 lb/hr		

RM = Reference Method (CleanAir Data) 041417 171126
CEMS = Continuous Emissions Monitoring System (Air Products and Chemicals, Inc. Data)
RATA calculations are based on all 10 runs.



End of Section