Post/MACES
Pfizer Monica

Pfizer Inc
7000 Portage Road
Kalamazoo, MI 49001

March 8, 2019

Via **FedEx TRK#** 774654440653

Michigan Department of Environmental Quality
Air Quality Division – Technical Programs Unit
Constitution Hall, 2nd Floor, South
525 West Allegan Street
Lansing, MI 48933

RE: NOx RATA Test Report

To Whom It May Concern:

Please find two copies of the NOx CEMS RATA Test Report for Pharmacia & Upjohn LLC, a subsidiary of Pfizer Inc. The NOx CEMS is installed on one 144.5 MMBTU/hr natural gas fired boiler as required by Permit to Install #57-15.

The RATA was performed on February 5, 2019. The NOx Relative Accuracy was 4.94% versus an allowable limit of 20%.

The boiler is located at our facility at 7000 Portage Road, Kalamazoo, Michigan. If you need any additional information or have any questions, please feel free to contact me at (269) 833-3842 or e-mail jeffrey.robey@pfizer.com.

Sincerely,

Jeff Robey

Jeff Robey
Manager EHS
PGS Kalamazoo Site

c: Ms. Monica Brothers, MDEQ-AQD

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION

RENEWABLE OPERATING PERMIT REPORT CERTIFICATION

Authorized by 1994 P.A. 451, as amended. Failure to provide this information may result in civil and/or criminal penalties.

Reports submitted pursuant to R 336.1213 (Rule 213), subrules (3)(c) and/or (4)(c), of Michigan's Renewable Operating Permit (ROP) program must be certified by a responsible official. Additional information regarding the reports and documentation listed below must be kept on file for at least 5 years, as specified in Rule 213(3)(b)(ii), and be made available to the Department of Environmental Quality, Air Quality Division upon request.

Source Name: Pharmacia & Upjohn Company, LLC | County: Kalamazoo

Source Address: 7000 Portage Road | City: Kalamazoo

AQD Source ID (SRN): B3610 | ROP No.: MI-ROP-B3610-2014 | ROP Section No.: 1

Please check the appropriate box(es):

☐ **Annual Compliance Certification (Pursuant to Rule 213(4)(c))**

Reporting period (provide inclusive dates): From _____ To _____

☐ 1. During the entire reporting period, this source was in compliance with **ALL** terms and conditions contained in the ROP, each term and condition of which is identified and included by this reference. The method(s) used to determine compliance is/are the method(s) specified in the ROP.

☐ 2. During the entire reporting period this source was in compliance with all terms and conditions contained in the ROP, each term and condition of which is identified and included by this reference, **EXCEPT** for the deviations identified on the enclosed deviation report(s). The method used to determine compliance for each term and condition is the method specified in the ROP, unless otherwise indicated and described on the enclosed deviation report(s).

☐ **Semi-Annual (or More Frequent) Report Certification (Pursuant to Rule 213(3)(c))**

Reporting period (provide inclusive dates): From _____ To _____

☐ 1. During the entire reporting period, **ALL** monitoring and associated recordkeeping requirements in the ROP were met and no deviations from these requirements or any other terms or conditions occurred.

☐ 2. During the entire reporting period, all monitoring and associated recordkeeping requirements in the ROP were met and no deviations from these requirements or any other terms or conditions occurred, **EXCEPT** for the deviations identified on the enclosed deviation report(s).

☒ **Other Report Certification**

Reporting period (provide inclusive dates): From 3/7/2019 To 3/7/2019

Additional monitoring reports or other applicable documents required by the ROP are attached as described:

Boiler 9 RATA Test Report

I certify that, based on information and belief formed after reasonable inquiry, the statements and information in this report and the supporting enclosures are true, accurate and complete

Ron Perry	Site Leader	269-833-0196
Name of Responsible Official (print or type)	Title	Phone Number

Signature of Responsible Official: R M Perry | Date: 7 MARCH 2019

* Photocopy this form as needed.

EQP 5736 (Rev 11-04)

Stack Test Group, Inc.
Air Compliance & Emissions Solutions

Chicago Office:
1500 Boyce Memorial Dr.
Ottawa, IL 61350
Phone 815-433-0545
888 STACK TEST
Fax 815-433-0592

REPORT OF A RELATIVE ACCURACY TEST AUDIT ON THE CEMS ASSOCIATED WITH THE BOILER #9 EXHAUST STACK AT THE PFIZER FACILITY LOCATED IN KALAMAZOO, MICHIGAN

Prepared for:

PFIZER, INC.
7000 PORTAGE ROAD
KALAMAZOO, MI 49001

Prepared by:

STACK TEST GROUP, INC.
1500 BOYCE MEMORIAL DRIVE
OTTAWA, IL 61350

FEBRUARY 5, 2019
STACK TEST GROUP, INC. PROJECT NO. 18-3114

Report Prepared By:

Gary A. Kohnke
Project Manager

Reviewed By:

Nicholas M. Sergenti, QSTI
Project Manager

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4.1
RELATIVE ACCURACY TEST AUDIT
For
Nitrogen Oxides

PLANT: Pfizer, Inc.
PROJECT #: 18-3114
SOURCE: Boiler #9
R.M. ANALYZER: TECO 42C
LOCATION: Exhaust Stack

	Date	Time	Run	Reference Method	CEM Monitor	Diff. (Xi)	
				$NOx_{(lbs/MMBTU)}$	$NOx_{(lbs/MMBTU)}$	$NOx_{(lbs/MMBTU)}$	Di^2
	02/05/19	08:15 - 08:36	1	0.041	0.044	-0.003	0.000009
	02/05/19	08:40 - 09:01	2	0.043	0.045	-0.002	0.000004
	02/05/19	09:05 - 09:26	3	0.043	0.044	-0.001	0.000001
	02/05/19	09:26 - 09:47	4	0.042	0.044	-0.002	0.000004
	02/05/19	09:52 - 10:13	5	0.042	0.044	-0.002	0.000004
	02/05/19	10:13 - 10:34	6	0.043	0.044	-0.001	0.000001
	02/05/19	10:39 - 11:00	7	0.043	0.044	-0.001	0.000001
	02/05/19	11:00 - 11:21	8	0.043	0.044	-0.001	0.000001
	02/05/19	11:25 - 11:46	9	0.043	0.044	-0.001	0.000001
*	02/05/19	11:46 - 12:07	10	0.043	0.044	-0.001	0.000001

SUM			-0.0140	0.0000260
MEAN	0.0426	0.0441	-0.0016	
STANDARD DEVIATION			0.0007265	
CONFIDENCE COEFFICIENT			0.0005478	
RELATIVE ACCURACY			4.94	

CALCULATION USED: RA= [|d| + |cc|] / RM MEAN *100

* Note: This test run was not used in calculating the relative accuracy.

APPENDIX A

SAMPLE CALCULATIONS

1.0 EXECUTIVE SUMMARY

On February 5, 2019, The Stack Test Group, Inc. performed a relative accuracy test audit (RATA) on the boiler #9 exhaust stack continuous emissions monitoring system (CEMS) at the Pfizer facility located in Kalamazoo, Michigan. Presented below is the relative accuracy of this system.

NOx Relative Accuracy:	4.94 Percent
Allowable Limit:	20.0 Percent

2.0 INTRODUCTION

The Stack Test Group, Inc. conducted a relative accuracy test audit (RATA) on the CEMS system associated with the #9 boiler exhaust stack. Testing was performed at the Pfizer facility located in Kalamazoo, Michigan on February 5, 2019. Ten RA test runs lasting 21 minutes in duration were conducted on CEMS system. Runs 1 through 9 were used to calculate the RA. The purpose of this testing was to determine the RA of the existing CEMS systems associated with the boiler #9 exhaust and to prove compliance with the existing permit.

Testing was conducted while Pfizer personnel operated the boiler at greater than 50% capacity and normal conditions. The boiler averaged 64,944 LBS/HR of steam and 73.416 MMBTU/HR which is greater than 50% of maximum capacity. The boiler is rated at 120,000 lbs. /hr. of steam or a heat input of 144.5 MMBTU/HR. A copy of the boiler operating data is included in Appendix C.

The serial number of the Pfizer TAPI T200M dual bench NOx/O2 certified during this test series is 470.

Testing was supervised by Mr. Gary Kohnke of the Stack Test Group, Inc. and coordinated by Mr. Jeff Robey, EH&S of Pfizer. The testing was witnessed by representatives of the Michigan Department of Environmental Quality (MDEQ).

All testing was in accordance with U.S. EPA Reference Methods 3A, 7E and 19 and Appendix B Performance Specifications 2, 3 & 4A. This report contains a summary of results for the above mentioned tests and all the supporting field, process, and computer generated data.

3.0 SAMPLING AND ANALYTICAL PROCEDURES

3.1 Nitrogen Oxides (NOx) & Oxygen (O_2)

3.1.1 Sample Collection

Oxygen and nitrogen oxides emissions and the RA of the CEMS system were determined in accordance with USEPA Reference Methods 3A, 7E and 19 and Appendix B Performance Specifications 2 and 3. These Methods are titled:

Method 3 A	Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)
Method 7E	Determination of Nitrogen Oxides Emissions from Stationary Sources (Instrumental Analyzer Procedure)
Method 19	Determination of Sulfur Dioxide Removal Efficiency and Particulate Matter, Sulfur Dioxide, and Nitrogen Oxides Emission Rates
Perf. Spec. 2	Specifications and Test Procedures for SO_2 and NOx Continuous Emission Monitoring Systems in Stationary Sources
Perf. Spec. 3	Specifications and Test Procedures for O_2 and CO_2 Continuous Emission Monitoring Systems in Stationary Sources

These methods appear in detail in Title 40 of the Code of Federal Regulations (CFR), Part 60, and Appendix A & B.

Oxygen and nitrogen oxides emissions were determined using U.S. EPA Methods 3A and 7E, respectively. A gas sample was drawn from the exhaust stack through a sintered filter, heated stainless steel probe, and transported to a Universal gas conditioner through a heated Teflon line set to 250° F. The gas conditioner removed moisture from the gas stream and pumped a dry gas sample through a Teflon line and manifold flow system to a TECO Model 42C NOx analyzer and a Servomex Model 1440C O_2 analyzer.

3.1.2 Sample Duration and Frequency

Ten continuous samples were collected with each test lasting twenty-one minutes in duration. A sample was drawn for at least twice the analyzer response time before beginning the test run. The response time of the NOx analyzer was approximately 50 seconds and the response time of the O_2 analyzer was approximately 30 seconds.

3.1.3 Calibration

At the beginning of the test series, the analyzers were calibrated and then checked for calibration error by introducing zero, mid-range and high-range calibration gases to the back of the analyzers. Before and after every other test run, a system bias was performed by introducing a zero and mid-range NOx and O_2 calibration gas to the outlet of the probe. Calibration gases used were U.S. EPA Protocol 1 certified. A copy of the calibrations are included in Appendix D and the gas certification sheets are included in Appendix E. The raw ppm readings were corrected for calibration drift and bias per the requirements of Method 7E. The corrected and uncorrected reading are also included in Appendix D.

3.1.4 Data Reduction

The analyzer outputs were recorded on a data logger and down-loaded on to a laptop computer. An average output was recorded every ten seconds and every minute, however only the minute averages were used in the calculations. All data reduction was performed using Microsoft Excel software.

4.0 TEST RESULTS

Presented in this section are the results of this test series. Test results are reported in Tables 4.1. Table 4.1 presents the relative accuracy results for the CEMS system. The ten individual test runs are reported for both the CEMS and the Reference Method. Table 4.1 also presents the standard deviation, confidence coefficient and the relative accuracy.

Table 4.1 also presents the relative accuracy results (RA). The results are presented in terms of pounds per million BTU (lb. /MMBTU) for each analyzer and the absolute difference in lb. /MMBTU. The relative accuracy is presented in terms of percent.

Copies of the calculations used to determine these emission rates may be found in Appendix A. Copies of the field parameter sheets are presented in Appendix B. Copies of the raw CEMS data is presented in Appendix C. Copies of analyzer calibrations are presented in Appendix D. Copies of the raw data from the reference method can be found in appendix F.

PFIZER INC.
KALAMAZOO, MI

STG PROJECT No: 18-3114

SAMPLE CALCULATIONS

The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

1. Volume of water collected (wscf)

$$V_{wstd} = (0.04707)(V_{lc})$$

Where:

V_{lc}	total volume of liquid collected in impingers and silica gel (ml)
V_{wstd}	volume of water collected at standard conditions (ft^3)
0.04707	conversion factor (ft^3/ml)

2. Volume of gas metered, standard conditions (dscf)

$$V_{mstd} = \frac{(17.64)(V_m)\left(P_{bar} + \frac{\Delta H}{13.6}\right)(Y_d)}{(460 + T_m)}$$

Where:

P_{bar}	barometric pressure (in. Hg)
T_m	average dry gas meter temperature (°F)
V_m	volume of gas sample through the dry gas meter at meter conditions (ft^3)
V_{mstd}	volume of gas sample through the dry gas meter at standard conditions (ft^3)
Y_d	gas meter correction factor (dimensionless)
ΔH	average pressure drop across meter box orifice (in. H_2O)
17.64	conversion factor (°R/in. Hg)
13.6	conversion factor (in. H_2O/in. Hg)
460	°F to °R conversion constant

SAMPLE CALCULATIONS (CONTINUED)

3. Volume of gas metered, standard conditions (dscm)

$$V_{mstd(m)} = \frac{\left(V_{mstd(ft)}\right)}{35.35}$$

Where:

$V_{mstd(ft)}$	volume of gas sample through the dry gas meter at standard conditions (ft^3)
$V_{mstd(m)}$	volume of gas sample through the dry gas meter at standard conditions (m^3)
35.35	conversion factor (ft^3 to m^3)
13.6	conversion factor (in. H_2O/in. Hg)

4. Sample gas pressure (in. Hg)

$$P_s = P_{bar} + \left(\frac{P_g}{13.6}\right)$$

Where:

P_{bar}	barometric pressure (in. Hg)
P_g	sample gas static pressure (in. H_2O)
P_s	absolute sample gas pressure (in. Hg)
13.6	conversion factor (in. H_2O/in. Hg)

5. Actual vapor pressure (in. Hg)[1]

$$P_v = P_s$$

Where:

P_v	vapor pressure, actual (in. Hg)
P_s	absolute sample gas pressure (in. Hg)

6. Moisture content (%)

$$B_{wo} = \frac{V_{wstd}}{V_{mstd} + V_{wstd}}$$

Where:

B_{wo}	proportion of water vapor in the gas stream by volume (%)
V_{mstd}	volume of gas sample through the dry gas meter at standard conditions (ft^3)
V_{wstd}	volume of water collected at standard conditions (ft^3)

[1] For effluent gas temperatures over 212°F, P_v is assumed to be equal to P_s.

SAMPLE CALCULATIONS (CONTINUED)

7. Saturated moisture content (%)

$$B_{ws} = \frac{(P_v)}{(P_s)}$$

Where:

B_{ws}	proportion of water vapor in the gas stream by volume at saturated conditions (%)
P_s	absolute sample gas pressure (in. Hg)
P_v	vapor pressure, actual (in. Hg)

Whichever moisture value is smaller is used for B_{wo} in the following calculations.

8. Molecular weight of dry gas stream (lb/lb·mole)

$$M_d = M_{CO_2}\frac{(CO_2)}{(100)} + M_{O_2}\frac{(O_2)}{(100)} + M_{CO+N_2}\frac{(CO+N_2)}{(100)}$$

Where:

Md	dry molecular weight of sample gas (lb/lb·mole)
M_{CO_2}	molecular weight of carbon dioxide (lb/lb·mole)
M_{O_2}	molecular weight of oxygen (lb/lb·mole)
M_{CO+N_2}	molecular weight of carbon monoxide and nitrogen (lb/lb·mole)
CO_2	proportion of carbon dioxide in the gas stream by volume (%)
O_2	proportion of oxygen in the gas stream by volume (%)
$CO+N_2$	proportion of carbon monoxide and nitrogen in the gas stream by volume (%)
100	conversion factor (%)

9. Molecular weight of sample gas (lb/lb·mole)

$$M_s = (M_d)(1 - B_{wo}) + (M_{H_2O})(B_{wo})$$

Where:

B_{wo}	proportion of water vapor in the gas stream by volume
M_d	dry molecular weight of sample gas (lb/lb·mole)
M_{H_2O}	molecular weight of water (lb/lb·mole)
M_s	molecular weight of sample gas, wet basis (lb/lb·mole)

SAMPLE CALCULATIONS (CONTINUED)

10. Velocity of sample gas (ft/sec)

$$V_s = (K_p)(C_p)(\overline{\sqrt{\Delta P}})\sqrt{\frac{(\overline{T_s}+460)}{(M_s)(P_s)}}$$

Where:

K_p	velocity pressure coefficient (dimensionless)
C_p	pitot tube constant
M_s	molecular weight of sample gas, wet basis (lb/lb·mole)
P_s	absolute sample gas pressure (in. Hg)
T_s	average sample gas temperature (°F)
V_s	sample gas velocity (ft/sec)
$\sqrt{\Delta P}$	average square roots of velocity heads of sample gas (in. H_2O)
460	°F to °R conversion constant

11. Total flow of sample gas (acfm)

$$Q_a = (60)(A_s)(V_s)$$

Where:

A_s	cross sectional area of sampling location (ft^2)
Q_a	volumetric flow rate at actual conditions (acfm)
V_s	sample gas velocity (ft/sec)
60	conversion factor (sec/min)

12. Total flow of sample gas (dscfm)

$$Q_{std} = \frac{(Q_a)(P_s)(17.64)(1-B_{wo})}{(\overline{T_s}+460)}$$

Where:

B_{wo}	proportion of water vapor in the gas stream by volume
P_s	absolute sample gas pressure (in. Hg)
Q_a	volumetric flow rate at actual conditions (acfm)
Q_{std}	volumetric flow rate at standard conditions, dry basis (dscfm)
T_s	average sample gas temperature (°F)
17.64	conversion factor (°R/in. Hg)
460	°F to °R conversion constant

SAMPLE CALCULATIONS (CONTINUED)

13. NOx concentration (lb/dscf)

$$E_{lb/dscf} = \frac{(ppm)(MW)}{(385.3 \times 10^6)}$$

Where:

$E_{lb/dscf}$	emission rate
C_{ppm}	measured concentration in the gas stream (ppmdv)
MW	molecular weight of NOx (46)
385.3	conversion factor

14. NOx emission (lb/hr)

$$E_{lb/hr} = (lb/dscf)(60)(dscfm)$$

Where:

$E_{lb/hr}$	emission rate
$E_{lb/dscf}$	concentration
E_{dscf}	concentration
$60_{min/hr}$	conversion factor

15. NOx emission (lb/MMBTU)

$$E_{lb/MMBTU} = (lb/dscf)(F - Factor)(20.9/(20.9 - O2))$$

Where:

$E_{lb/MMBTU}$	emission rate
$E_{lb/dscf}$	concentration

APPENDIX B

FIELD PARAMETER PRINTOUT

STACK TEST GROUP, INC.
Air Quality Services

NOx & 02 Sampling Train Calculations

Client:	Pharmacia & Upjohn Co., LLC
Project No:	18-3114
Date:	02/05/19
Source:	Boiler #9-Firing Natural Gas

Test No:	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	Avg.
Start Time	08:15 AM	08:40 AM	09:05 AM	09:26 AM	09:52 AM	10:13 AM	10:39 AM	11:00 AM	11:25 AM	11:46 AM	
Finish Time	08:36 AM	09:01 AM	09:26 AM	09:47 AM	10:13 AM	10:34 AM	11:00 AM	11:21 AM	11:46 AM	12:07 PM	

NOx Calculations:

Oxygen, %:	4.7	4.6	4.6	4.5	4.5	4.5	4.5	4.5	4.5	4.4	4.5
NOx, ppmv:	30.8	32.4	32.1	32.0	32.0	32.5	32.4	32.5	32.8	33.0	32.3
NOx, lb/DSCF:	3.68E-06	3.87E-06	3.83E-06	3.82E-06	3.82E-06	3.88E-06	3.87E-06	3.88E-06	3.92E-06	3.94E-06	3.85E-06
LBS/MMBTU (F-Factor = 8,710):	0.041	0.043	0.043	0.042	0.042	0.043	0.043	0.043	0.043	0.043	0.043

APPENDIX C

RAW CEMS DATA & BOILER OPERATING DATA

Boiler 9 EUEBLR43-9-S1 RATA Report

Facility Name: Pfizer

Location: Kalamazoo, MI

Source: B9

	B9 NOx	B9 NOx Rate	B9 O2	B9 Steam Flow	B9 Heat Input
	PPM	LBMMBTU	PCT	LBHR	MMBTUHR
02/05/2019 08:15	33.4	0.044	4.50	64673	73.318
02/05/2019 08:16	33.2	0.044	4.57	64981	73.356
02/05/2019 08:17	33.1	0.044	4.67	64848	73.386
02/05/2019 08:18	32.8	0.044	4.81	64783	73.401
02/05/2019 08:19	32.8	0.044	4.78	65162	73.423
02/05/2019 08:20	32.9	0.044	4.76	65318	73.324
02/05/2019 08:21	32.9	0.044	4.78	65134	73.187
02/05/2019 08:22	32.8	0.044	4.84	64929	73.124
02/05/2019 08:23	32.7	0.044	4.80	64878	73.072
02/05/2019 08:24	32.9	0.044	4.72	64762	73.081
02/05/2019 08:25	33.2	0.044	4.68	64790	73.115
02/05/2019 08:26	33.1	0.044	4.73	64972	73.222
02/05/2019 08:27	33.0	0.044	4.66	65142	73.168
02/05/2019 08:28	32.9	0.044	4.74	65179	73.285
02/05/2019 08:29	32.9	0.044	4.65	65078	73.284
02/05/2019 08:30	33.1	0.044	4.66	64875	73.443
02/05/2019 08:31	33.2	0.044	4.62	64850	73.517
02/05/2019 08:32	33.4	0.045	4.61	65029	73.483
02/05/2019 08:33	33.5	0.045	4.61	65252	73.458
02/05/2019 08:34	33.5	0.045	4.58	64950	73.567
02/05/2019 08:35	33.6	0.045	4.56	65045	73.552
Average	33.1	0.044	4.68	64982	73.322

Report generated on: 02/05/2019 08:53

Data is expressed in Standard Time

Boiler 9 EUEBLR43-9-S1 RATA Report

Facility Name: Pfizer | Location: Kalamazoo, MI | Source: B9

	B9 NOx	B9 NOx Rate	B9 O2	B9 Steam Flow	B9 Heat Input
	PPM	LBMMBTU	PCT	LBHR	MMBTUHR
02/05/2019 08:36	33.6	0.045	4.56	65104	73.583
02/05/2019 08:37	33.6	0.045	4.60	64802	73.431
02/05/2019 08:38	33.5	0.045	4.65	64517	73.342
02/05/2019 08:39	33.4	0.045	4.60	64463	73.386
02/05/2019 08:40	33.4	0.045	4.59	64406	73.358
02/05/2019 08:41	33.3	0.044	4.63	64914	73.359
02/05/2019 08:42	33.3	0.044	4.62	65474	73.414
02/05/2019 08:43	33.3	0.044	4.61	65059	73.583
02/05/2019 08:44	33.4	0.045	4.61	65084	73.620
02/05/2019 08:45	33.4	0.045	4.64	64666	73.529
02/05/2019 08:46	33.2	0.044	4.65	64788	73.600
02/05/2019 08:47	33.3	0.044	4.61	64404	73.717
02/05/2019 08:48	33.4	0.044	4.58	64223	73.736
02/05/2019 08:49	33.6	0.044	4.46	64494	73.773
02/05/2019 08:50	33.8	0.045	4.47	64873	73.954
02/05/2019 08:51	33.8	0.045	4.46	65243	73.940
02/05/2019 08:52	33.7	0.045	4.48	65197	73.983
02/05/2019 08:53	33.7	0.045	4.48	65045	73.841
02/05/2019 08:54	33.6	0.045	4.53	64864	73.632
02/05/2019 08:55	33.4	0.045	4.60	64784	73.505
02/05/2019 08:56	33.3	0.044	4.59	64972	73.467
02/05/2019 08:57	33.4	0.044	4.55	64973	73.407
02/05/2019 08:58	33.3	0.044	4.62	64521	73.334
02/05/2019 08:59	33.2	0.044	4.65	64332	73.248
02/05/2019 09:00	33.1	0.044	4.66	64402	73.223
Average	33.4	0.045	4.58	64784	73.559

Report generated on: 02/05/2019 09:32 | Data is expressed in Standard Time |

Boiler 9 EUEBLR43-9-S1 RATA Report

Facility Name: Pfizer

Location: Kalamazoo, MI

Source: B9

	B9 NOx	B9 NOx Rate	B9 O2	B9 Steam Flow	B9 Heat Input
	PPM	LBMMBTU	PCT	LBHR	MMBTUHR
02/05/2019 09:05	33.3	0.044	4.59	64253	73.292
02/05/2019 09:06	33.1	0.044	4.71	64250	73.438
02/05/2019 09:07	33.0	0.044	4.69	64431	73.453
02/05/2019 09:08	33.1	0.044	4.64	64467	73.458
02/05/2019 09:09	33.3	0.044	4.54	64690	73.480
02/05/2019 09:10	33.4	0.044	4.56	64636	73.437
02/05/2019 09:11	33.2	0.044	4.66	64788	73.429
02/05/2019 09:12	33.0	0.044	4.65	64673	73.436
02/05/2019 09:13	33.0	0.044	4.67	64873	73.400
02/05/2019 09:14	32.9	0.044	4.70	65369	73.281
02/05/2019 09:15	32.9	0.044	4.72	64955	73.213
02/05/2019 09:16	32.9	0.044	4.68	64690	73.209
02/05/2019 09:17	33.2	0.044	4.56	64807	73.203
02/05/2019 09:18	33.4	0.044	4.43	65172	73.258
02/05/2019 09:19	33.6	0.044	4.36	65368	73.186
02/05/2019 09:20	33.7	0.044	4.35	64870	73.215
02/05/2019 09:21	33.7	0.044	4.32	64822	73.278
02/05/2019 09:22	33.8	0.044	4.30	65096	73.317
02/05/2019 09:23	33.7	0.044	4.35	65005	73.405
02/05/2019 09:24	33.6	0.044	4.34	65105	73.566
02/05/2019 09:25	33.7	0.044	4.35	65132	73.617
Average	33.3	0.044	4.53	64831	73.361

Report generated on: 02/05/2019 09:49

Data is expressed in Standard Time

Boiler 9 EUEBLR43-9-S1 RATA Report

Facility Name: Pfizer | Location: Kalamazoo, MI | Source: B9

	B9 NOx	B9 NOx Rate	B9 O2	B9 Steam Flow	B9 Heat Input
	PPM	LBMMBTU	PCT	LBHR	MMBTUHR
02/05/2019 09:26	33.8	0.044	4.34	64844	73.523
02/05/2019 09:27	33.8	0.044	4.36	65209	73.511
02/05/2019 09:28	33.6	0.044	4.44	65283	73.458
02/05/2019 09:29	33.5	0.044	4.36	65161	73.462
02/05/2019 09:30	33.5	0.044	4.40	64907	73.466
02/05/2019 09:31	33.3	0.044	4.44	64888	73.504
02/05/2019 09:32	33.3	0.044	4.42	64622	73.553
02/05/2019 09:33	33.3	0.044	4.45	64722	73.381
02/05/2019 09:34	33.3	0.044	4.50	64799	73.326
02/05/2019 09:35	33.3	0.044	4.44	65055	73.325
02/05/2019 09:36	33.5	0.044	4.39	64987	73.320
02/05/2019 09:37	33.7	0.044	4.43	64936	73.287
02/05/2019 09:38	33.4	0.044	4.54	64696	73.318
02/05/2019 09:39	33.2	0.044	4.50	64745	73.327
02/05/2019 09:40	33.3	0.044	4.50	64774	73.343
02/05/2019 09:41	33.3	0.044	4.50	64936	73.273
02/05/2019 09:42	33.3	0.044	4.49	64467	73.438
02/05/2019 09:43	33.4	0.044	4.42	64906	73.380
02/05/2019 09:44	33.6	0.044	4.37	64759	73.438
02/05/2019 09:45	33.6	0.044	4.37	64786	73.358
02/05/2019 09:46	33.6	0.044	4.37	64656	73.374
Average	33.5	0.044	4.43	64864	73.398

Report generated on: 02/05/2019 09:50

Data is expressed in Standard Time

Boiler 9 EUEBLR43-9-S1 RATA Report

Facility Name: Pfizer

Location: Kalamazoo, MI

Source: B9

	B9 NOx	B9 NOx Rate	B9 O2	B9 Steam Flow	B9 Heat Input
	PPM	LBMMBTU	PCT	LBHR	MMBTUHR
02/05/2019 09:52	33.5	0.044	4.44	64963	73.420
02/05/2019 09:53	33.4	0.044	4.43	64938	73.495
02/05/2019 09:54	33.4	0.044	4.44	65392	73.491
02/05/2019 09:55	33.3	0.044	4.43	65269	73.489
02/05/2019 09:56	33.3	0.044	4.43	65265	73.389
02/05/2019 09:57	33.3	0.044	4.46	64860	73.323
02/05/2019 09:58	33.2	0.044	4.49	64929	73.274
02/05/2019 09:59	33.0	0.044	4.51	64775	73.277
02/05/2019 10:00	33.3	0.044	4.38	65067	73.311
02/05/2019 10:01	33.7	0.044	4.35	65208	73.309
02/05/2019 10:02	33.6	0.044	4.46	65581	73.296
02/05/2019 10:03	33.3	0.044	4.52	64776	73.430
02/05/2019 10:04	33.2	0.044	4.49	65228	73.423
02/05/2019 10:05	33.4	0.044	4.47	65246	73.540
02/05/2019 10:06	33.4	0.044	4.44	65467	73.538
02/05/2019 10:07	33.4	0.044	4.43	65371	73.612
02/05/2019 10:08	33.3	0.044	4.41	65182	73.658
02/05/2019 10:09	33.5	0.044	4.32	65093	73.638
02/05/2019 10:10	33.8	0.044	4.29	65334	73.669
02/05/2019 10:11	33.8	0.044	4.29	65479	73.789
02/05/2019 10:12	33.7	0.044	4.37	65720	73.826
Average	33.4	0.044	4.42	65197	73.486

Report generated on: 02/05/2019 11:08

Data is expressed in Standard Time

Boiler 9 EUEBLR43-9-S1 RATA Report

Facility Name: Pfizer | Location: Kalamazoo, MI | Source: B9

	B9 NOx	B9 NOx Rate	B9 O2	B9 Steam Flow	B9 Heat Input
	PPM	LBMMBTU	PCT	LBHR	MMBTUHR
02/05/2019 10:13	33.5	0.044	4.42	65774	73.835
02/05/2019 10:14	33.6	0.044	4.33	65804	73.832
02/05/2019 10:15	33.9	0.044	4.32	65985	73.787
02/05/2019 10:16	33.9	0.044	4.33	66168	73.733
02/05/2019 10:17	33.8	0.044	4.36	66077	73.508
02/05/2019 10:18	33.6	0.044	4.43	64935	73.379
02/05/2019 10:19	33.4	0.044	4.48	65343	73.263
02/05/2019 10:20	33.3	0.044	4.51	65055	73.257
02/05/2019 10:21	33.2	0.044	4.54	64910	73.192
02/05/2019 10:22	33.1	0.044	4.56	64915	73.244
02/05/2019 10:23	33.1	0.044	4.49	64830	73.197
02/05/2019 10:24	33.2	0.044	4.57	65042	73.195
02/05/2019 10:25	33.0	0.044	4.56	64663	73.113
02/05/2019 10:26	33.0	0.044	4.55	64360	73.209
02/05/2019 10:27	33.0	0.044	4.54	64520	73.289
02/05/2019 10:28	33.2	0.044	4.46	64861	73.299
02/05/2019 10:29	33.3	0.044	4.46	64676	73.268
02/05/2019 10:30	33.2	0.044	4.51	64598	73.287
02/05/2019 10:31	33.3	0.044	4.48	65023	73.330
02/05/2019 10:32	33.6	0.044	4.38	64520	73.309
02/05/2019 10:33	33.4	0.044	4.51	64526	73.339
Average	33.4	0.044	4.47	65075	73.375

Report generated on: 02/05/2019 11:07 | Data is expressed in Standard Time |

Boiler 9 EUEBLR43-9-S1 RATA Report

Facility Name: Pfizer

Location: Kalamazoo, MI

Source: B9

	B9 NOx	B9 NOx Rate	B9 O2	B9 Steam Flow	B9 Heat Input
	PPM	LBMMBTU	PCT	LBHR	MMBTUHR
02/05/2019 10:39	33.4	0.044	4.42	64535	73.558
02/05/2019 10:40	33.6	0.044	4.38	64791	73.614
02/05/2019 10:41	33.7	0.044	4.41	64764	73.598
02/05/2019 10:42	33.6	0.044	4.43	64737	73.595
02/05/2019 10:43	33.4	0.044	4.50	64773	73.600
02/05/2019 10:44	33.2	0.044	4.45	64852	73.619
02/05/2019 10:45	33.5	0.044	4.36	64891	73.548
02/05/2019 10:46	33.5	0.044	4.42	64758	73.584
02/05/2019 10:47	33.4	0.044	4.46	65020	73.542
02/05/2019 10:48	33.4	0.044	4.45	65325	73.453
02/05/2019 10:49	33.3	0.044	4.48	65397	73.420
02/05/2019 10:50	33.3	0.044	4.52	65386	73.287
02/05/2019 10:51	33.2	0.044	4.57	65336	73.350
02/05/2019 10:52	33.3	0.044	4.47	64988	73.340
02/05/2019 10:53	33.4	0.044	4.53	64101	73.438
02/05/2019 10:54	33.2	0.044	4.58	64189	73.599
02/05/2019 10:55	33.2	0.044	4.51	64548	73.651
02/05/2019 10:56	33.3	0.044	4.48	64519	73.606
02/05/2019 10:57	33.3	0.044	4.46	64404	73.621
02/05/2019 10:58	33.5	0.044	4.44	64037	73.605
02/05/2019 10:59	33.3	0.044	4.62	63817	73.571
02/05/2019 11:00	32.9	0.044	4.77	63824	73.584
Average	33.4	0.044	4.49	64681	73.536

Report generated on: 02/05/2019 11:09

Data is expressed in Standard Time

Boiler 9 EUEBLR43-9-S1 RATA Report

Facility Name: Pfizer | Location: Kalamazoo, MI | Source: B9

	B9 NOx	B9 NOx Rate	B9 O2	B9 Steam Flow	B9 Heat Input
	PPM	LBMMBTU	PCT	LBHR	MMBTUHR
02/05/2019 11:00	32.9	0.044	4.77	63824	73.584
02/05/2019 11:01	32.9	0.044	4.66	64053	73.567
02/05/2019 11:02	33.1	0.044	4.49	64228	73.595
02/05/2019 11:03	33.3	0.044	4.46	64369	73.551
02/05/2019 11:04	33.3	0.044	4.45	64720	73.516
02/05/2019 11:05	33.3	0.044	4.45	65044	73.494
02/05/2019 11:06	33.6	0.044	4.35	65264	73.416
02/05/2019 11:07	33.6	0.044	4.43	65542	73.479
02/05/2019 11:08	33.4	0.044	4.44	65681	73.355
02/05/2019 11:09	33.1	0.044	4.59	65402	73.141
02/05/2019 11:10	32.6	0.043	4.60	65389	73.106
02/05/2019 11:11	32.8	0.044	4.52	65146	73.024
02/05/2019 11:12	32.6	0.044	4.80	64773	72.959
02/05/2019 11:13	32.2	0.044	4.90	64504	73.049
02/05/2019 11:14	32.5	0.043	4.66	64474	73.114
02/05/2019 11:15	33.1	0.044	4.50	64385	73.040
02/05/2019 11:16	33.3	0.044	4.44	64420	73.154
02/05/2019 11:17	33.3	0.044	4.48	64396	73.327
02/05/2019 11:18	33.3	0.044	4.45	64189	73.293
02/05/2019 11:19	33.4	0.044	4.43	64380	73.342
02/05/2019 11:20	33.4	0.044	4.42	64776	73.427
Average	33.1	0.044	4.54	64712	73.311

Boiler 9 EUEBLR43-9-S1 RATA Report

Facility Name: Pfizer

Location: Kalamazoo, MI

Source: B9

	B9 NOx	B9 NOx Rate	B9 O2	B9 Steam Flow	B9 Heat Input
	PPM	LBMMBTU	PCT	LBHR	MMBTUHR
02/05/2019 11:25	33.6	0.044	4.40	65573	73.286
02/05/2019 11:26	33.3	0.044	4.51	65295	73.335
02/05/2019 11:27	33.1	0.044	4.52	65043	73.377
02/05/2019 11:28	33.3	0.044	4.46	65360	73.326
02/05/2019 11:29	33.6	0.044	4.42	65581	73.323
02/05/2019 11:30	33.7	0.044	4.41	65427	73.389
02/05/2019 11:31	33.5	0.044	4.49	65345	73.389
02/05/2019 11:32	33.4	0.044	4.46	65311	73.374
02/05/2019 11:33	33.4	0.044	4.44	65452	73.326
02/05/2019 11:34	33.3	0.044	4.47	65324	73.431
02/05/2019 11:35	33.4	0.044	4.42	65377	73.449
02/05/2019 11:36	33.5	0.044	4.42	65623	73.488
02/05/2019 11:37	33.4	0.044	4.49	65769	73.458
02/05/2019 11:38	33.4	0.044	4.42	65864	73.454
02/05/2019 11:39	33.7	0.044	4.36	65581	73.471
02/05/2019 11:40	33.6	0.044	4.44	65429	73.316
02/05/2019 11:41	33.5	0.044	4.43	65114	73.411
02/05/2019 11:42	33.6	0.044	4.43	65153	73.382
02/05/2019 11:43	33.4	0.044	4.49	65087	73.437
02/05/2019 11:44	33.3	0.044	4.47	65201	73.428
02/05/2019 11:45	33.4	0.044	4.42	64863	73.431
Average	33.4	0.044	4.45	65370	73.394

Report generated on: 02/05/2019 12:14

Data is expressed in Standard Time

Boiler 9 EUEBLR43-9-S1 RATA Report

Facility Name: Pfizer | Location: Kalamazoo, MI | Source: B9

	B9 NOx	B9 NOx Rate	B9 O2	B9 Steam Flow	B9 Heat Input
	PPM	LBMMBTU	PCT	LBHR	MMBTUHR
02/05/2019 11:46	33.4	0.044	4.43	64852	73.514
02/05/2019 11:47	33.4	0.044	4.44	64799	73.478
02/05/2019 11:48	33.3	0.044	4.47	64827	73.512
02/05/2019 11:49	33.2	0.044	4.52	64649	73.418
02/05/2019 11:50	33.1	0.044	4.50	64504	73.433
02/05/2019 11:51	33.3	0.044	4.47	64574	73.579
02/05/2019 11:52	33.6	0.044	4.38	64369	73.544
02/05/2019 11:53	33.8	0.044	4.38	64332	73.576
02/05/2019 11:54	33.8	0.044	4.37	64492	73.643
02/05/2019 11:55	33.8	0.044	4.36	64663	73.701
02/05/2019 11:56	33.7	0.044	4.38	64719	73.636
02/05/2019 11:57	33.5	0.044	4.41	64351	73.695
02/05/2019 11:58	33.4	0.044	4.40	64406	73.730
02/05/2019 11:59	33.5	0.044	4.39	64826	73.679
02/05/2019 12:00	33.5	0.044	4.41	64861	73.710
02/05/2019 12:01	33.5	0.044	4.41	64846	73.720
02/05/2019 12:02	33.5	0.044	4.42	64819	73.626
02/05/2019 12:03	33.5	0.044	4.41	64477	73.597
02/05/2019 12:04	33.6	0.044	4.36	64414	73.634
02/05/2019 12:05	33.8	0.044	4.32	64603	73.727
02/05/2019 12:06	33.7	0.044	4.41	64871	73.642
Average	33.5	0.044	4.41	64631	73.609

Report generated on: 02/05/2019 12:14

Data is expressed in Standard Time

APPENDIX D

CALIBRATIONS

Pfizer Project# 18-3114
Kalamazoo, MI
2/5/2019
Boiler #9

Analyte	Oxygen		Dry
Initial Calibration	Value	Response	Calibration Error
High	24.01	24.0	0.04%
Mid	12.2	12.2	0.00%
Low (Zero)	0	0.1	0.42%

*Corrected Run Average and Upscale System Bias cell formulas must be adjusted if the high calibration gas is used for post calibration upscale checks.

Type	Run Average	Pre Zero	Post Zero	Pre Upscale	Post Upscale	*Corrected Run Average	Zero System Bias	*Upscale System Bias	Zero Drift	Upscale Drift
Initial System Bias Check			0.1		12.2		0.00%	0.00%		
Run 1	4.7	0.1	0.1	12.2	12.1	4.7	0.00%	0.42%	0.00%	0.42%
Run 2	4.6	0.1	0.1	12.1	12.1	4.6	0.00%	0.42%	0.00%	0.00%
Run 3	4.6	0.1	0.1	12.1	12.1	4.6	0.00%	0.42%	0.00%	0.00%
Run 4	4.5	0.1	0.1	12.1	12.1	4.5	0.00%	0.42%	0.00%	0.00%
Run 5	4.5	0.1	0.1	12.1	12.1	4.5	0.00%	0.42%	0.00%	0.00%
Run 6	4.5	0.1	0.1	12.1	12.1	4.5	0.00%	0.42%	0.00%	0.00%
Run 7	4.5	0.1	0.1	12.1	12.1	4.5	0.00%	0.42%	0.00%	0.00%
Run 8	4.5	0.1	0.1	12.1	12.1	4.5	0.00%	0.42%	0.00%	0.00%
Run 9	4.5	0.1	0.1	12.1	12.1	4.5	0.00%	0.42%	0.00%	0.00%
Run 10	4.4	0.1	0.1	12.1	12.1	4.4	0.00%	0.42%	0.00%	0.00%

Pfizer Project# 18-3114
Kalamazoo, MI
2/5/2019
Boiler #9

Analyte	Nitrous Oxides		Dry
Initial Calibration	Value	Response	Calibration Error
High	97.5	97.7	0.21%
Mid	50.25	50.5	0.26%
Low (Zero)	0	0.3	0.31%

*Corrected Run Average and Upscale System Bias cell formulas must be adjusted if the high calibration gas is used for post calibration upscale checks.

Type	Run Average	Pre Zero	Post Zero	Pre Upscale	Post Upscale	*Corrected Run Average	Zero System Bias	*Upscale System Bias	Zero Drift	Upscale Drift	lb/dscf
Initial System Bias Check			0.2		50.4		0.10%	0.10%			
Run 1	31.0	0.2	0.4	50.4	50.3	**30.8**	0.10%	0.21%	0.21%	0.10%	3.68E-06
Run 2	32.5	0.4	0.4	50.3	50.2	**32.4**	0.10%	0.31%	0.00%	0.10%	3.86E-06
Run 3	32.2	0.4	0.4	50.2	50.2	**32.1**	0.10%	0.31%	0.00%	0.00%	3.83E-06
Run 4	32.5	0.4	0.5	50.2	51.3	**32.0**	0.21%	0.82%	0.10%	1.13%	3.82E-06
Run 5	32.9	0.5	0.5	51.3	51.3	**32.0**	0.21%	0.82%	0.00%	0.00%	3.83E-06
Run 6	33.3	0.5	0.5	51.3	51.2	**32.5**	0.21%	0.72%	0.00%	0.10%	3.88E-06
Run 7	33.2	0.5	0.5	51.2	51.2	**32.4**	0.21%	0.72%	0.00%	0.00%	3.87E-06
Run 8	33.2	0.5	0.5	51.2	51.0	**32.5**	0.21%	0.51%	0.00%	0.21%	3.88E-06
Run 9	33.5	0.5	0.6	51	51.0	**32.8**	0.31%	0.51%	0.10%	0.00%	3.92E-06
Run 10	33.7	0.6	0.6	51	51.0	**33.0**	0.31%	0.51%	0.00%	0.00%	3.94E-06

APPENDIX E

CALIBRATION GAS CERTIFICATION SHEETS

Airgas
an Air Liquide company

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Airgas Specialty Gases
Airgas USA, LLC
12722 South Wentworth Ave.
Chicago, IL 60628
773-785-3000 Fax: 773-785-1928
Airgas.com

Part Number:	E03NI52E15A38Q7	Reference Number:	54-124572686-1
Cylinder Number:	CC7607	Cylinder Volume:	163.9 CF
Laboratory:	ASG - Chicago - IL	Cylinder Pressure:	2015 PSIG
PGVP Number:	B12016	Valve Outlet:	296
Gas Code:	CO2,O2,BALN	Certification Date:	Aug 26, 2016

Expiration Date: Aug 26, 2024

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON DIOXIDE	24.00 %	23.62 %	G1	+/- 1.2% NIST Traceable	08/26/2016
OXYGEN	24.00 %	24.01 %	G2	+/- 0.6% NIST Traceable	08/26/2016
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	13060817	CC416652	24.04 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 16, 2019
NTRM	06120112	CC195607	9.898 % OXYGEN/NITROGEN	+/- 0.7%	Jun 26, 2018

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
CO2-1 HORIBA VIA-510 V1E3H7P5	NDIR	Aug 13, 2016
O2-1 HORIBA MPA-510 3VUYL9NR	Paramagnetic	Aug 22, 2016

Triad Data Available Upon Request

Approved for Release

Airgas

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E03NI76E15A0295	Reference Number:	54-124528695-1
Cylinder Number:	CC100644	Cylinder Volume:	152.5 CF
Laboratory:	ASG - Chicago - IL	Cylinder Pressure:	2015 PSIG
PGVP Number:	B12015	Valve Outlet:	590
Gas Code:	CO2,O2,BALN	Certification Date:	Dec 15, 2015

Expiration Date: Dec 15, 2023

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which effect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON DIOXIDE	12.00 %	12.26 %	G1	+/- 1.0% NIST Traceable	12/15/2015
OXYGEN	12.00 %	12.18 %	G1	+/- 1.0% NIST Traceable	12/15/2015
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	06120402	CC184369	19.66 % CARBON DIOXIDE/NITROGEN	+/- 0.5%	May 01, 2016
NTRM	98051016	SG9163074BAL	12.05 % OXYGEN/NITROGEN	+/- 0.7%	Dec 02, 2017

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
CO2-1 HORIBA VIA-510 V1E3H7P5	NDIR	Dec 04, 2015
O2-1 HORIBA MPA-510 3VUYL9NR	Paramagnetic	Dec 12, 2015

Triad Data Available Upon Request

Approved for Release

Airgas

Airgas Specialty Gases
12722 South Wentworth Avenue
Chicago, IL 60628
(773) 785-3000 Fax: (773) 785-1928
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E02NI99E15A0147	Reference Number:	54-124496423-1
Cylinder Number:	CC349435	Cylinder Volume:	144.3 CF
Laboratory:	ASG - Chicago - IL	Cylinder Pressure:	2015 PSIG
PGVP Number:	B12015	Valve Outlet:	660
Gas Code:	NO,NOX,BALN	Certification Date:	Jun 11, 2015

Expiration Date: Jun 11, 2023

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	50.00 PPM	50.25 PPM	G1	+/- 0.9% NIST Traceable	06/04/2015, 06/11/2015
NITRIC OXIDE	50.00 PPM	50.25 PPM	G1	+/- 0.9% NIST Traceable	06/04/2015, 06/11/2015
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	13061007	CC422721	99.86 PPM NITRIC OXIDE/NITROGEN	+/- 0.8%	Nov 19, 2019
PRM	12312	680179	10.01 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.0%	Feb 14, 2012
GMIS	0207201402	CC500987	4.845 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.0%	Feb 07, 2017

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nexus 470 AEP0000428	FTIR	May 28, 2015
Nexus 470 AEP0000428	FTIR	May 28, 2015

Triad Data Available Upon Request

Approved for Release

LIQUID TECHNOLOGY CORPORATION

"INDUSTRY LEADER IN SPECIALTY GASES"

Certificate of Analysis

- EPA PROTOCOL GAS -

Customer	Stack Test Group (Ottawa, IL)
Date	February 14, 2013
Delivery Receipt	DR-45816
Gas Standard	100 ppm Nitric Oxide/Nitrogen - EPA PROTOCOL
Final Analysis Date	February 11, 2013
Expiration Date	February 11, 2021
Component	Nitric Oxide
Balance Gas	Nitrogen

Analytical Data:

DO NOT USE BELOW 100 psig

EPA Protocol, Section No. 2.2, Procedure G-1

Reported Concentrations

Nitric Oxide: 96.5 ppm +/- 0.47 ppm

Nitrogen: Balance

Total Oxides of Nitrogen: 97.5 ppm

** Total NOX for Reference Use Only **

Reference Standards:

SRM/GMIS:	GMIS
Cylinder Number:	ND-45697
Concentration:	97.47 ppm NO/Nitrogen
Expiration Date:	07/18/14

Certification Instrumentation

Component:	Nitric Oxide
Make/Model:	Thermo 42i-LS
Serial Number:	1033445889
Principal of Measurement:	Chemiluminescence
Last Calibration:	January 31, 2013

Cylinder Data

Cylinder Serial Number:	EB-0040614	Cylinder Outlet:	CGA 660
Cylinder Volume:	140 Cubic Feet	Cylinder Pressure:	2000 psig, 70°F

Analytical Uncertainty and NIST Traceability are in compliance with EPA-600/R-12/531.

Certified by: David Scott

PGVP Vendor ID: E12013

2048 APEX COURT APOPKA, FLORIDA 32703 ~ PHONE (407)-292-2990 FAX (407)-292-3313
WWW.LIQUIDTECHCORP.COM

APPENDIX F

RAW REFERENCE METHOD DATA

Pfizer
Kalamazoo, MI
Boiler #9

Run #1

Date	Time	02	NOX
2019/02/05	08:15:00	4.6	30.9
2019/02/05	08:16:00	4.8	30.8
2019/02/05	08:17:00	4.9	30.7
2019/02/05	08:18:00	4.7	30.7
2019/02/05	08:19:00	4.8	30.7
2019/02/05	08:20:00	4.9	30.8
2019/02/05	08:21:00	4.9	30.4
2019/02/05	08:22:00	4.8	30.9
2019/02/05	08:23:00	4.7	31.0
2019/02/05	08:24:00	4.7	31.1
2019/02/05	08:25:00	4.8	30.7
2019/02/05	08:26:00	4.6	31.2
2019/02/05	08:27:00	4.8	30.4
2019/02/05	08:28:00	4.6	31.2
2019/02/05	08:29:00	4.8	30.7
2019/02/05	08:30:00	4.7	31.3
2019/02/05	08:31:00	4.6	31.2
2019/02/05	08:32:00	4.7	31.1
2019/02/05	08:33:00	4.6	31.6
2019/02/05	08:34:00	4.6	31.4
2019/02/05	08:35:00	4.6	31.3
	Average=	4.7	31.0

Pfizer
Kalamazoo, MI
Boiler #9

Run #2

Date	Time	02	NOX
2019/02/05	08:40:00	4.7	31.5
2019/02/05	08:41:00	4.6	32.1
2019/02/05	08:42:00	4.6	32.3
2019/02/05	08:43:00	4.6	32.4
2019/02/05	08:44:00	4.7	32.3
2019/02/05	08:45:00	4.7	32.2
2019/02/05	08:46:00	4.7	32.5
2019/02/05	08:47:00	4.6	32.4
2019/02/05	08:48:00	4.4	33.2
2019/02/05	08:49:00	4.5	32.9
2019/02/05	08:50:00	4.5	33.0
2019/02/05	08:51:00	4.6	32.8
2019/02/05	08:52:00	4.5	32.8
2019/02/05	08:53:00	4.6	32.7
2019/02/05	08:54:00	4.7	32.6
2019/02/05	08:55:00	4.7	32.3
2019/02/05	08:56:00	4.6	32.7
2019/02/05	08:57:00	4.7	32.4
2019/02/05	08:58:00	4.7	32.3
2019/02/05	08:59:00	4.7	32.4
2019/02/05	09:00:00	4.8	32.3
	Average=	4.6	32.5

Pfizer
Kalamazoo, MI
Boiler #9

Run #3

Date	Time	02	NOX
2019/02/05	09:05:00	4.8	31.3
2019/02/05	09:06:00	4.7	31.6
2019/02/05	09:07:00	4.7	31.7
2019/02/05	09:08:00	4.6	32.2
2019/02/05	09:09:00	4.6	32.1
2019/02/05	09:10:00	4.8	31.6
2019/02/05	09:11:00	4.7	31.9
2019/02/05	09:12:00	4.7	31.7
2019/02/05	09:13:00	4.7	31.8
2019/02/05	09:14:00	4.7	31.7
2019/02/05	09:15:00	4.8	31.7
2019/02/05	09:16:00	4.6	32.4
2019/02/05	09:17:00	4.4	32.1
2019/02/05	09:18:00	4.4	32.4
2019/02/05	09:19:00	4.4	32.8
2019/02/05	09:20:00	4.3	32.8
2019/02/05	09:21:00	4.3	32.8
2019/02/05	09:22:00	4.4	32.7
2019/02/05	09:23:00	4.3	32.7
2019/02/05	09:24:00	4.4	32.7
2019/02/05	09:25:00	4.3	32.7
	Average=	4.6	32.2

Pfizer
Kalamazoo, MI
Boiler #9

Run #4

Date	Time	02	NOX
2019/02/05	09:26:00	4.4	32.7
2019/02/05	09:27:00	4.5	32.4
2019/02/05	09:28:00	4.3	32.9
2019/02/05	09:29:00	4.5	32.7
2019/02/05	09:30:00	4.5	32.4
2019/02/05	09:31:00	4.5	32.4
2019/02/05	09:32:00	4.5	32.3
2019/02/05	09:33:00	4.5	32.5
2019/02/05	09:34:00	4.4	32.2
2019/02/05	09:35:00	4.4	32.9
2019/02/05	09:36:00	4.4	32.8
2019/02/05	09:37:00	4.6	32.0
2019/02/05	09:38:00	4.5	32.3
2019/02/05	09:39:00	4.6	32.4
2019/02/05	09:40:00	4.5	32.4
2019/02/05	09:41:00	4.5	32.4
2019/02/05	09:42:00	4.4	32.6
2019/02/05	09:43:00	4.4	32.8
2019/02/05	09:44:00	4.4	32.8
2019/02/05	09:45:00	4.4	32.8
2019/02/05	09:46:00	4.4	32.7
	Average=	4.5	32.5

Pfizer
Kalamazoo, MI
Boiler #9

Run #5

Date	Time	02	NOX
2019/02/05	09:52:00	4.5	32.5
2019/02/05	09:53:00	4.5	32.7
2019/02/05	09:54:00	4.5	32.4
2019/02/05	09:55:00	4.5	32.7
2019/02/05	09:56:00	4.5	32.8
2019/02/05	09:57:00	4.5	32.3
2019/02/05	09:58:00	4.5	32.4
2019/02/05	09:59:00	4.3	32.8
2019/02/05	10:00:00	4.4	33.2
2019/02/05	10:01:00	4.5	32.7
2019/02/05	10:02:00	4.5	32.6
2019/02/05	10:03:00	4.5	32.7
2019/02/05	10:04:00	4.5	32.5
2019/02/05	10:05:00	4.5	33.3
2019/02/05	10:06:00	4.5	32.8
2019/02/05	10:07:00	4.4	32.9
2019/02/05	10:08:00	4.3	33.6
2019/02/05	10:09:00	4.3	33.4
2019/02/05	10:10:00	4.3	33.3
2019/02/05	10:11:00	4.5	33.6
2019/02/05	10:12:00	4.5	33.1
	Average=	4.5	32.9

Pfizer
Kalamazoo, MI
Boiler #9

Run #6

Date	Time	02	NOX
2019/02/05	10:13:00	4.4	33.4
2019/02/05	10:14:00	4.3	33.3
2019/02/05	10:15:00	4.4	33.9
2019/02/05	10:16:00	4.4	33.4
2019/02/05	10:17:00	4.5	33.2
2019/02/05	10:18:00	4.5	33.6
2019/02/05	10:19:00	4.5	33.0
2019/02/05	10:20:00	4.6	33.1
2019/02/05	10:21:00	4.6	33.2
2019/02/05	10:22:00	4.5	33.9
2019/02/05	10:23:00	4.6	32.8
2019/02/05	10:24:00	4.6	33.0
2019/02/05	10:25:00	4.5	33.0
2019/02/05	10:26:00	4.6	32.7
2019/02/05	10:27:00	4.5	32.9
2019/02/05	10:28:00	4.6	33.8
2019/02/05	10:29:00	4.6	33.1
2019/02/05	10:30:00	4.6	32.9
2019/02/05	10:31:00	4.4	34.3
2019/02/05	10:32:00	4.6	33.2
2019/02/05	10:33:00	4.7	32.8
	Average=	4.5	33.3

Pfizer
Kalamazoo, MI
Boiler #9

Run #7

Date	Time	02	NOX
2019/02/05	10:39:00	4.5	33.6
2019/02/05	10:40:00	4.4	33.0
2019/02/05	10:41:00	4.5	33.5
2019/02/05	10:42:00	4.5	32.8
2019/02/05	10:43:00	4.5	33.1
2019/02/05	10:44:00	4.4	33.8
2019/02/05	10:45:00	4.5	33.3
2019/02/05	10:46:00	4.5	33.3
2019/02/05	10:47:00	4.5	33.4
2019/02/05	10:48:00	4.5	33.1
2019/02/05	10:49:00	4.5	33.1
2019/02/05	10:50:00	4.6	33.0
2019/02/05	10:51:00	4.5	33.4
2019/02/05	10:52:00	4.6	33.2
2019/02/05	10:53:00	4.6	33.0
2019/02/05	10:54:00	4.6	33.3
2019/02/05	10:55:00	4.5	33.1
2019/02/05	10:56:00	4.5	33.4
2019/02/05	10:57:00	4.5	33.5
2019/02/05	10:58:00	4.7	33.1
2019/02/05	10:59:00	4.8	32.8
	Average=	4.5	33.2

Pfizer
Kalamazoo, MI
Boiler #9

Run #8

Date	Time	02	NOX
2019/02/05	11:00:00	4.7	32.7
2019/02/05	11:01:00	4.5	33.2
2019/02/05	11:02:00	4.5	33.4
2019/02/05	11:03:00	4.5	33.2
2019/02/05	11:04:00	4.5	33.1
2019/02/05	11:05:00	4.4	33.7
2019/02/05	11:06:00	4.5	33.3
2019/02/05	11:07:00	4.5	33.5
2019/02/05	11:08:00	4.6	33.0
2019/02/05	11:09:00	4.6	32.8
2019/02/05	11:10:00	4.5	33.6
2019/02/05	11:11:00	4.9	32.3
2019/02/05	11:12:00	5.0	32.2
2019/02/05	11:13:00	4.7	33.0
2019/02/05	11:14:00	4.5	33.1
2019/02/05	11:15:00	4.4	33.5
2019/02/05	11:16:00	4.4	33.2
2019/02/05	11:17:00	4.5	33.2
2019/02/05	11:18:00	4.4	33.6
2019/02/05	11:19:00	4.4	33.5
2019/02/05	11:20:00	4.4	33.6
	Average=	4.5	33.2

Pfizer
Kalamazoo, MI
Boiler #9

Run #9

Date	Time	02	NOX
2019/02/05	11:25:00	4.6	33.1
2019/02/05	11:26:00	4.6	33.1
2019/02/05	11:27:00	4.4	33.3
2019/02/05	11:28:00	4.5	33.4
2019/02/05	11:29:00	4.4	33.7
2019/02/05	11:30:00	4.6	33.3
2019/02/05	11:31:00	4.5	33.4
2019/02/05	11:32:00	4.5	33.5
2019/02/05	11:33:00	4.5	33.4
2019/02/05	11:34:00	4.4	33.5
2019/02/05	11:35:00	4.5	33.6
2019/02/05	11:36:00	4.5	33.4
2019/02/05	11:37:00	4.5	33.4
2019/02/05	11:38:00	4.4	34.1
2019/02/05	11:39:00	4.4	33.4
2019/02/05	11:40:00	4.4	33.7
2019/02/05	11:41:00	4.5	33.5
2019/02/05	11:42:00	4.5	33.4
2019/02/05	11:43:00	4.5	33.3
2019/02/05	11:44:00	4.5	33.6
2019/02/05	11:45:00	4.5	33.7
	Average=	4.5	33.5

Pfizer
Kalamazoo, MI
Boiler #9

Run #10

Date	Time	02	NOX
2019/02/05	11:46:00	4.5	33.7
2019/02/05	11:47:00	4.5	33.6
2019/02/05	11:48:00	4.6	33.2
2019/02/05	11:49:00	4.5	33.3
2019/02/05	11:50:00	4.5	33.3
2019/02/05	11:51:00	4.4	33.9
2019/02/05	11:52:00	4.4	33.8
2019/02/05	11:53:00	4.4	33.9
2019/02/05	11:54:00	4.4	34.0
2019/02/05	11:55:00	4.4	33.9
2019/02/05	11:56:00	4.5	33.6
2019/02/05	11:57:00	4.4	33.8
2019/02/05	11:58:00	4.4	33.8
2019/02/05	11:59:00	4.4	33.8
2019/02/05	12:00:00	4.4	33.7
2019/02/05	12:01:00	4.5	33.8
2019/02/05	12:02:00	4.5	33.6
2019/02/05	12:03:00	4.4	34.1
2019/02/05	12:04:00	4.3	34.3
2019/02/05	12:05:00	4.5	33.6
2019/02/05	12:06:00	4.4	34.0
	Average=	4.4	33.7