CONTINUOUS EMISSIONS MONITORING SYSTEM
RELATIVE ACCURACY DETERMINATION

Performed At

Pharmacia & Upjohn Company, LLC
A subsidiary of Pfizer, Inc
Natural Gas Boilers #9 (EUEBLR43-9-S1), #10 (EUEBLR43-10-S1)
and #11 (EUEBLR43-11-S1)
Kalamazoo, Michigan

Test Date(s)

February 21, 22 and 23, 2023

Report No.

TRC Environmental Corporation Report 521454

Report Submittal Date

March 29, 2023

TRC Environmental Corporation
207C Eisenhower Lane South
Lombard, Illinois 60148
USA

T (312) 533-2042

B3610_test_20230222

Report Certification

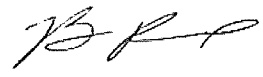
I certify that to the best of my knowledge:

- Testing data and all corresponding information have been checked for accuracy and completeness.
- Sampling and analysis have been conducted in accordance with the approved protocol and applicable reference methods (as applicable).
- All deviations, method modifications, or sampling and analytical anomalies are summarized in the appropriate report narrative(s).

Doug Ryan
Midwest Regional Manager – AMS

March 29, 2023
Date

TRC was operating in conformance with the requirements of ASTM D7036-04 during this test program.



Bruce Randall
TRC Emission Testing Technical Director

TABLE OF CONTENTS

CONTINUOUS EMISSIONS MONITORING SYSTEM
RELATIVE ACCURACY DETERMINATION

1.0 INTRODUCTION

TRC Environmental Corporation (TRC) performed a continuous emissions monitoring system (CEMS) relative accuracy test on February 21, 22 and 23, 2023 on natural gas Boilers #9 (EUEBLR43-9-S1), #10 (EUEBLR43-10-S1) and #11 (EUEBLR43-11-S1) exhaust stacks for Pfizer at the Pharmacia & Upjohn Company, LLC in Kalamazoo, Michigan. The tests were authorized by and performed for Pharmacia & Upjohn Company, LLC.

The purpose of this test program was to evaluate the relative accuracy (RA) of the nitrogen oxides (NO_x), and oxygen (O_2) CEMS on Boilers #9, #10 and #11, while operating at >50% normal load. Emission rates are expressed in terms of the applicable source standard(s). All tests were performed in accordance with methods described in the Code of Federal Regulations, Title 40, Part 60 (40CFR60), Appendix B, Performance Specifications 2, 3 and the TRC Test Protocol 521454, dated December 9, 2022.

1.1 Project Contact Information

Participants		
Test Facility	Pharmacia & Upjohn Company, LLC A subsidiary of Pfizer, Inc 7000 Portage Road Kalamazoo, Michigan 49001-0199 Permit No. MI-ROP-B3610-2021 Facility No. B3610	Mr. Jeffrey Robey Manager EHS (269) 833-3842 (phone) jeffrey.robey@pfizer.com
Air Emissions Testing Body (AETB)	TRC Environmental Corporation 207C Eisenhower Lane South Lombard, Illinois 60148	Mr. Gregory Rock Field Team Leader (262) 960-3379 (phone) grock@trccompanies.com

The tests were conducted by Ted Kalisz and Gregory Rock of TRC. Documentation of the on-site ASTM D7036-04 Qualified Individual(s) (QI) can be located in the appendix to this report.

Monica Brothers of the Lansing Michigan Department of EGLE observed the testing.

1.2 Facility and Process Description

Pharmacia & Upjohn Company, owns and operates Boiler #9 designated as EUEBLR43-9-S1 in the Renewable Operating Permit (ROP)# MI-ROP-B3610-2021. One (1) 120,000 pound steam/hr boiler with a maximum nameplate heat input capacity of 144.7 MMBtu/hr for natural gas and 138.3 MMBtu/hr for #2 fuel oil. The boiler primarily burns natural gas with #2 fuel oil as a backup fuel.

The facility also owns and operates two identical boilers designated as EUEBLR43-10-S1 (Boiler #10) and EUEBLR43-11-S1 (Boiler #11) in the ROP# MI-ROP-B3610-2021. Two (2) 120,000 pound steam/hr boilers, each with a maximum nameplate heat input capacity of 143.2 MMBtu/hr for natural gas and 138.5 MMBtu/hr for #2 fuel oil. The boilers primarily burn natural gas with #2 fuel oil as a backup fuel.

Pollution control equipment for each boiler includes low NO_X burners and flue gas recirculation.

2.0 SUMMARY OF RESULTS

The relative accuracies of the CEMS are as follows:

Load	Parameter	Units	Performance Specifications (40CFR60)		CEMS Performance Relative Accuracy		
			Specification No.	Acceptance Criteria	Boiler #9 2/21/2023	Boiler #10 2/22-23/2023	Boiler #11 2/23/2023
> 50%	NO_X	lb/MMBtu	2	RA ≤ 20% of the Reference Method	9.41 %	4.71 %	4.03 %
	O_2	%	3	RA ≤ 1.0% difference	0.02 %	0.00 %	0.01 %

CEMS RATA Test Matrix (Boilers 9, 10 & 11)

Parameter	Reference Methods (RM)	No. of Test Runs	Test Run Length (min)
NO_X	7E, 3A	10	21
O_2	3A	10	21

3.0 DISCUSSION OF RESULTS

The complete test results from this program are tabulated in Section 6.0.

The data acquisition and handling system (DAHS) computer printout for the same time periods as the RM testing was used to determine the relative accuracy. The watches of the test crew were synchronized with the CEMS prior to testing.

On February 22nd the Boiler 10 RATA was paused after Run #7. Adverse weather conditions prevented continued work at heights. The Boiler 10 RATA was resumed on February 23rd and runs 8-10 were completed.

No problems were encountered with the testing equipment during the course of the test program. Source operation appeared normal during the entire test program and operated at more than 50 percent of normal load. The CEMS operation appeared normal with no apparent problems during sampling. No changes or problems were encountered that required modification of any procedures presented in the test plan. Operating data was recorded by plant personnel and is appended to this report.

4.0 TEST PROCEDURES

All testing, sampling, analytical, and calibration procedures used for this test program were performed in accordance with the methods presented in the following sections. Where applicable, the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods, USEPA 600/R-94/038c, September 1994 was used to supplement procedures.

4.1 Determination of Sample Point Locations by USEPA Method 1

This method is applicable to gas streams flowing in ducts, stacks, and flues and is designed to aid in the representative measurement of pollutant emissions and/or total volumetric flow rates from stationary sources. In order to qualify as an acceptable sample location, it must be located at a position at least two stack or duct equivalent diameters downstream and a half equivalent diameter upstream from any flow disturbance.

4.2 Determination of the Concentration of Gaseous Pollutants Using a Multi-Pollutant Sampling System

Concentrations of the pollutants in the following sub-sections were determined using one sampling system. The number of points at which sample was collected was determined in accordance with 40CFR60 specifications.

A straight-extractive sampling system was used. A data logger continuously recorded pollutant concentrations and generated one-minute averages of those concentrations. All calibrations and system checks were conducted using USEPA Protocol gases. Three-point linearity checks were performed prior to sampling, and in the event of a failing system bias or drift test (and subsequent corrective action). System bias and drift checks were performed using the low-level gas and either the mid- or high-level gas prior to and following each test run.

The Low Concentration Analyzers (those that routinely operate with a calibration span of less than 20 ppm) used by TRC are ambient-level analyzers. Per Section 3.12 of Method 7E, a Manufacturer's Stability Test is not required for ambient-level analyzers. Analyzer interference tests were conducted in accordance with the regulations in effect at the time that TRC placed an analyzer model in service.

4.2.1 O_2 Determination by USEPA Method 3A

This method is applicable for the determination of O_2 concentrations in controlled and uncontrolled emissions from stationary sources only when specified within the regulations. The O_2 analyzer was equipped with a paramagnetic-based detector.

4.2.2 NO_x Determination by USEPA Method 7E

This method is applicable for the determination of NO_x concentrations in controlled and uncontrolled emissions from stationary sources only when specified within the regulations. The NOx analyzer utilized a photomultiplier tube to measure the linear and proportional luminescence caused by the reaction of nitric oxide and ozone.

4.3 Determination of F-Factors by USEPA Method 19

This method is applicable for the determination of the pollutant emission rate using oxygen (O_2) or carbon dioxide (CO_2) concentrations and the appropriate F factor (the ratio of combustion gas volumes to heat inputs) and the pollutant concentration. The appropriate F-Factor was selected from Table 19-2 of Method 19.

5.0 QUALITY ASSURANCE PROCEDURES

TRC integrates our Quality Management System (QMS) into every aspect of our testing service. We follow the procedures specified in current published versions of the test Method(s) referenced in this report. Any modifications or deviations are specifically identified in the body of the report. We routinely participate in independent, third party audits of our activities, and maintain:

- Accreditation from the Louisiana Environmental Laboratory Accreditation Program (LELAP).
- Accreditation from the Stack Testing Accreditation Council (STAC) and the American Association for Laboratory Accreditation (A2LA) that our operations conform with the requirements of ASTM D 7036 as an Air Emission Testing Body (AETB).

These accreditations demonstrate that our systems for training, equipment maintenance and calibration, document control and project management will fully ensure that project objectives are achieved in a timely and efficient manner with a strict commitment to quality.

All calibrations are performed in accordance with the test Method(s) identified in this report. If a Method allows for more than one calibration approach, or if approved alternatives are available, the calibration documentation in the appendices specifies which approach was used. All measurement devices are calibrated or verified at set intervals against standards traceable to the National Institute of Standards and Technology (NIST). NIST traceability information is available upon request.

ASTM D7036-04 specifies that: *"AETBs shall have and shall apply procedures for estimating the uncertainty of measurement. Conformance with this section may be demonstrated by the use of approved test protocols for all tests. When such protocols are used, reference shall be made to published literature, when available, where estimates of uncertainty for test methods may be found."* TRC conforms with this section by using approved test protocols for all tests.

6.0 TEST RESULTS SUMMARY

RATA Type: **Nitrogen Oxides (NO_X), lb/MMBtu**
Regulation: **40CFR60**
RM Used: **3A, 7E**

Customer:	Pfizer	Project #:	521545
Unit ID:	Boiler #9	CEM Model:	Teledyne API T200M
Sample Loc:	Stack	CEM Serial #:	470

Use? 1 = Y 0 = N	Test Run	Date	Start Time	End Time	RM NO_X lb/MMBtu	CEM NO_X lb/MMBtu	(RM-CEM) Difference (di)
1	1	2/21/2023	8:21	8:41	0.031	0.028	0.003
1	2	2/21/2023	8:59	9:19	0.032	0.029	0.003
1	3	2/21/2023	9:37	9:57	0.032	0.029	0.003
1	4	2/21/2023	10:13	10:33	0.032	0.029	0.003
1	5	2/21/2023	10:50	11:10	0.032	0.029	0.003
1	6	2/21/2023	11:25	11:45	0.032	0.029	0.003
1	7	2/21/2023	12:02	12:22	0.032	0.029	0.003
1	8	2/21/2023	12:40	13:00	0.032	0.029	0.003
1	9	2/21/2023	13:15	13:35	0.032	0.029	0.003
0	10	2/21/2023	13:58	14:18	0.032	0.029	0.003

n	9	
t(0.975)	2.306	
Mean RM Value	0.032	RM avg
Mean CEM Value	0.029	CEM avg
Sum of Differences	0.027	di
Mean Difference	0.0030	d avg
Sum of Differences^2	0.000	di^2
Standard Deviation	0.000	sd
Confidence Coefficient	0.000	CC
RA based on RM	9.41 %	

RATA Type: **Oxygen (O_2), % by volume**
Regulation: **40CFR60**
RM Used: **3A**

Customer:	Pfizer	Project #:	521545
Unit ID:	Boiler #9	CEM Model:	Teledyne API T200M
Sample Loc:	Stack	CEM Serial #:	470

Use? 1 = Y 0 = N	Test Run	Date	Start Time	End Time	RM O_2 % v/v dry	CEM O_2 % v/v dry	(RM-CEM) Difference (di)
1	1	2/21/2023	8:21	8:41	3.8	3.8	0.000
1	2	2/21/2023	8:59	9:19	3.8	3.9	-0.100
1	3	2/21/2023	9:37	9:57	3.9	3.9	0.000
1	4	2/21/2023	10:13	10:33	3.9	3.9	0.000
1	5	2/21/2023	10:50	11:10	3.9	3.9	0.000
1	6	2/21/2023	11:25	11:45	3.9	3.9	0.000
1	7	2/21/2023	12:02	12:22	3.9	3.9	0.000
1	8	2/21/2023	12:40	13:00	3.9	3.9	0.000
1	9	2/21/2023	13:15	13:35	3.8	3.9	-0.100
0	10	2/21/2023	13:58	14:18	4.4	3.9	0.500

n	9	
t(0.975)	2.306	
Mean RM Value	3.867	RM avg
Mean CEM Value	3.889	CEM avg
Mean Difference	-0.022	d avg
Standard Deviation	0.044	sd
Confidence Coefficient	0.034	CC
RA (Absolute Mean Difference)	0.02	% vol diff.

RATA Type: **Nitrogen Oxides (NO_X), lb/MMBtu**
Regulation: **40CFR60**
RM Used: **3A, 7E**

Customer:	Pfizer	Project #:	521545
Unit ID:	Boiler #10	CEM Model:	TAPI T200M
Sample Loc:	Stack	CEM Serial #:	1126

Use? 1 = Y 0 = N	Test Run	Date	Start Time	End Time	RM NO_X lb/MMBtu	CEM NO_X lb/MMBtu	(RM-CEM) Difference (di)
1	1	2/22/2023	8:45	9:05	0.030	0.029	0.001
1	2	2/22/2023	9:24	9:44	0.030	0.029	0.001
1	3	2/22/2023	10:01	10:21	0.029	0.028	0.001
0	4	2/22/2023	10:40	11:00	0.030	0.028	0.002
1	5	2/22/2023	11:19	11:39	0.029	0.028	0.001
1	6	2/22/2023	11:57	12:17	0.029	0.028	0.001
1	7	2/22/2023	12:37	12:57	0.029	0.028	0.001
1	8	2/23/2023	7:11	7:31	0.028	0.027	0.001
1	9	2/23/2023	7:48	8:08	0.029	0.027	0.002
1	10	2/23/2023	8:30	8:50	0.028	0.027	0.001

n	9	
t(0.975)	2.306	
Mean RM Value	0.029	RM avg
Mean CEM Value	0.028	CEM avg
Sum of Differences	0.010	di
Mean Difference	0.0011	d avg
Sum of Differences^2	0.000	di^2
Standard Deviation	0.000	sd
Confidence Coefficient	0.000	CC
RA based on RM	4.71 %	

RATA Type: **Oxygen (O_2), % by volume**
Regulation: **40CFR60**
RM Used: **3A**

Customer:	Pfizer	Project #:	521545
Unit ID:	Boiler #10	CEM Model:	TAPI T200M
Sample Loc:	Stack	CEM Serial #:	1126

Use? 1 = Y 0 = N	Test Run	Date	Start Time	End Time	RM O_2 % v/v dry	CEM O_2 % v/v dry	(RM-CEM) Difference (di)
1	1	2/22/2023	8:45	9:05	3.6	3.6	0.000
1	2	2/22/2023	9:24	9:44	3.6	3.6	0.000
1	3	2/22/2023	10:01	10:21	3.6	3.6	0.000
0	4	2/22/2023	10:40	11:00	3.6	3.6	0.000
1	5	2/22/2023	11:19	11:39	3.6	3.6	0.000
1	6	2/22/2023	11:57	12:17	3.6	3.6	0.000
1	7	2/22/2023	12:37	12:57	3.6	3.6	0.000
1	8	2/23/2023	7:11	7:31	3.6	3.6	0.000
1	9	2/23/2023	7:48	8:08	3.6	3.6	0.000
1	10	2/23/2023	8:30	8:50	3.6	3.6	0.000

n	9	
t(0.975)	2.306	
Mean RM Value	3.600	RM avg
Mean CEM Value	3.600	CEM avg
Mean Difference	0.000	d avg
Standard Deviation	0.000	sd
Confidence Coefficient	0.000	CC
RA (Absolute Mean Difference)	0.00	% vol diff.

RATA Type: **Nitrogen Oxides (NO_X), lb/MMBtu**
Regulation: **40CFR60**
RM Used: **3A, 7E**

Customer:	Pfizer	Project #:	521545
Unit ID:	Boiler #11	CEM Model:	TAPI T200M
Sample Loc:	Stack	CEM Serial #:	1125

Use? 1 = Y 0 = N	Test Run	Date	Start Time	End Time	RM NO_X lb/MMBtu	CEM NO_X lb/MMBtu	(RM-CEM) Difference (di)
1	1	2/23/2023	12:33	12:53	0.029	0.028	0.001
0	2	2/23/2023	13:07	13:27	0.029	0.025	0.004
1	3	2/23/2023	13:43	14:03	0.029	0.028	0.001
1	4	2/23/2023	14:19	14:39	0.028	0.027	0.001
1	5	2/23/2023	14:54	15:14	0.028	0.027	0.001
1	6	2/23/2023	15:33	15:53	0.028	0.028	0.000
1	7	2/23/2023	16:10	16:30	0.028	0.027	0.001
1	8	2/23/2023	16:45	17:05	0.028	0.027	0.001
1	9	2/23/2023	17:19	17:39	0.029	0.028	0.001
1	10	2/23/2023	17:54	18:14	0.029	0.028	0.001

n	9	
t(0.975)	2.306	
Mean RM Value	0.028	RM avg
Mean CEM Value	0.028	CEM avg
Sum of Differences	0.008	di
Mean Difference	0.0009	d avg
Sum of Differences^2	0.000	di^2
Standard Deviation	0.000	sd
Confidence Coefficient	0.000	CC
RA based on RM	4.03 %	

RATA Type: **Oxygen (O_2), % by volume**
Regulation: **40CFR60**
RM Used: **3A**

Customer:	Pfizer	Project #:	521545
Unit ID:	Boiler #11	CEM Model:	TAPI T200M
Sample Loc:	Stack	CEM Serial #:	1125

Use? 1 = Y 0 = N	Test Run	Date	Start Time	End Time	RM O_2 % v/v dry	CEM O_2 % v/v dry	(RM-CEM) Difference (di)
1	1	2/23/2023	12:33	12:53	3.3	3.3	0.000
0	2	2/23/2023	13:07	13:27	3.2	3.3	-0.100
1	3	2/23/2023	13:43	14:03	3.2	3.3	-0.100
1	4	2/23/2023	14:19	14:39	3.3	3.3	0.000
1	5	2/23/2023	14:54	15:14	3.3	3.3	0.000
1	6	2/23/2023	15:33	15:53	3.3	3.3	0.000
1	7	2/23/2023	16:10	16:30	3.3	3.3	0.000
1	8	2/23/2023	16:45	17:05	3.3	3.3	0.000
1	9	2/23/2023	17:19	17:39	3.3	3.3	0.000
1	10	2/23/2023	17:54	18:14	3.3	3.3	0.000

n	9
t(0.975)	2.306
Mean RM Value	3.289 RM avg
Mean CEM Value	3.300 CEM avg
Mean Difference	-0.011 d avg
Standard Deviation	0.033 sd
Confidence Coefficient	0.026 CC
RA (Absolute Mean Difference)	0.01 % vol diff.