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EMISSIONS COMPLIANCE TEST PROGRAM

Performed At The
**Occidental Chemical Company
Ludington Plant
EUPELLETCDRY
Ludington, Michigan**

Test Date
November 19 and 20, 2014

Report No.
TRC Environmental Corporation Report 219921B

Report Submittal Date
January 8, 2015

TRC Environmental Corporation
7521 Brush Hill Road
Burr Ridge, Illinois 60527
USA

T (312) 533-2042
F (312) 533-2070



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).

Paul Coleman
Project Manager

January 8, 2015
Date

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

Jeffrey W. Burdette
TRC Air Measurements Technical Director



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EMISSIONS COMPLIANCE TEST PROGRAM

1.0 INTRODUCTION

TRC Environmental Corporation (TRC) performed a particulate emission compliance test program on the EUPELLETCDRY Scrubber S-701 at the Ludington Plant of Occidental Chemical Company (OxyChem) in Ludington, Michigan on November 19 and 20, 2014. The tests were authorized by and performed for OxyChem.

The purpose of this test program was to determine particulate emission rates at maximum normal operating conditions.

1.1 Project Contact Information

Participants		
Test Facility	Occidental Chemical Company Ludington Plant 1600 S. Madison Ludington, Michigan 49431	Ms. Kathryn Nixon Project Coordinator (231) 845 - 4368 (phone) Kathryn_Nixon@oxy.com Mr. Randy Haight Analytical Specialist (231) 845 - 4500 (phone) Randolph_Haight@oxy.com Mr. Mike Ryder Environmental Manager (231) 845 - 4390 (phone) Michael_ryder@oxy.com
Air Emissions Testing Body (AETB)	TRC Environmental Corporation 7521 Brush Hill Road Burr Ridge, Illinois 60527	Mr. Paul Coleman Project Manager (312) 533-2023 (phone) (312) 533-2070 (fax) pcoleman@tresolutions.com

The tests were conducted by Ricardo Nunez and Paul Coleman of TRC. Documentation of the on-site ASTM D7036-04 Qualified Individual(s) (QI) can be located in the appendix to this report.



2.0 SUMMARY OF RESULTS

The results of this test program are summarized in the table below. Detailed individual run results are presented in Section 6.0.

Parameter		Measured Emissions	Emission Limit
Particulate Matter	grains/dscf	0.01	---
	lb/hr	10.86	---
	lb/1000 lb of exhaust gas, dry Basis	0.02	0.03

The table below summarizes the test methods used, as well as the number and duration of each at each test location:

Unit ID/ Sample Location	Parameter Measured	Test Method	No. of Runs	Run Duration
EUPELLETCDRY	Particulate Matter	USEPA Method 5	3	168 min

3.0 DISCUSSION OF RESULTS

No problems were encountered with the testing equipment during the test program. Source operation appeared normal during the entire test program. Unit operating data was recorded by plant personnel, and is appended to this report. Laboratory analysis of samples was performed by OxyChem personnel and is appended.

4.0 SAMPLING AND ANALYSIS 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.

The cross-section of the measurement site was divided into a number of equal areas, and the traverse points were then located in the center of these areas. The minimum number of points were determined from Figure 1-1 (particulate) of USEPA Method 1.

4.2 Volumetric Flow Rate Determination by USEPA Method 2

This method is applicable for the determination of the average velocity and the volumetric flow rate of a gas stream.

The gas velocity head (ΔP) and temperature were measured at traverse points defined by USEPA Method 1. The velocity head was measured with a Type S (Stausscheibe or reverse type) pitot tube and oil-filled manometer; and the gas temperature was measured with a Type K thermocouple. The average gas velocity in the flue was calculated based on: the gas density (as determined by USEPA Methods 3 and 4); the flue gas pressure; the average of the square roots of the velocity heads at each traverse point, and the average flue gas temperature.

4.3 CO₂ and O₂ Determination by USEPA Method 3

This method is applicable for the determination of CO₂ and O₂ concentrations and dry molecular weight of a sample from an effluent gas stream of a fossil-fuel combustion process or other process.

Gas samples were extracted from the stack by integrated bag sampling during each test and analyzed for percent CO₂ and percent O₂ using a Fyrite.

4.4 Filterable PM Determination by USEPA Method 5

This method is applicable for the determination of PM emissions from stationary sources. USEPA Methods 2-4 were performed concurrently with, and as an integral part of, these determinations.

Flue gas was withdrawn isokinetically from the source at traverse points determined per USEPA Method 1, and PM was collected in the nozzle, probe liner, and on a glass fiber filter. The probe liner and filter were maintained at a



temperature of $120 \pm 14^{\circ}\text{C}$ ($248 \pm 25^{\circ}\text{F}$) or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator for a particular application. The PM mass, which included any material that condensed at or above the filtration temperature, was determined gravimetrically after the removal of uncombined water, by OxyChem personnel.

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:

- Louisiana Environmental Lab Accreditation Program (LELAP) accreditation;
- Interim accreditation from the Stack Testing Accreditation Council (STAC) that our operations conform with the requirements of ASTM D 7036-04

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.



6.0 TEST RESULTS SUMMARY

PARTICULATE TEST RESULTS SUMMARY

Company: Occidental Chemical
 Plant: Ludington, Michigan
 Unit: EUPELLETCDRY
 Location: Scrubber S-701

Test Run Number	1	2	3	Average
Source Condition	MP-94_1	MP-94_2	MP-94_3	
Date	11/19/2014	11/19/2014	11/20/2014	
Start Time	9:10	13:45	14:03	
End Time	12:12	16:51	17:25	
Sample Duration (min):	168.0	168.0	168.0	168.0
Average Gas Temp (°F):	205.4	204.8	205.3	205.2
Fractional Gas Moisture Content:	0.198	0.206	0.193	0.199
Gas CO ₂ Content (%vol):	0.0	0.0	0.0	0.0
Gas O ₂ Content (%vol):	20.9	20.9	20.9	20.9
Gas Wet MW (lb/lbmole-mole):	26.69	26.61	26.74	26.68
Average Gas Vel (ft/sec):	34.99	35.25	35.86	35.37
Measured Volumetric Flow Rate				
Q (actual ft ³ /min):	199,504	200,999	204,490	201,664
Q _{std} (std ft ³ /min):	155,800	157,110	160,968	157,959
Q _{std(dry)} (dry std ft ³ /min):	124,894	124,808	129,880	126,527
Sample Volume (dry std ft ³):	109.464	111.054	117.874	112.797
PM Collected (mg):				
Filterable	69.508	74.693	75.479	73.227
PM Concentration (lb/1000 lb Dry Basis):				
Filterable	0.02	0.02	0.02	0.02
PM Concentration (gr/dscf):				
Filterable	0.0098	0.0104	0.0099	0.0100
PM Emission Rate (lb/hr based on measured volumetric flow rate):				
Filterable:	10.49	11.10	11.00	10.86
Isokinetic Variance	97.8	99.3	101.2	99.4