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EMISSIONS COMPLIANCE TEST PROGRAM

Performed At The
Occidental Chemical Company
Ludington Plant
EUDGDCCFIBC, S-300
Ludington, Michigan

Test Dates
July 8 and 9, 2015

Report No.
TRC Environmental Corporation Report 233966.COMP A

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August 12, 2015

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1.0 INTRODUCTION

TRC Environmental Corporation (TRC) performed a particulate emission compliance test program on the EUDGDCCFIBC, S-300 at the Ludington Plant of Occidental Chemical Company (OxyChem) in Ludington, Michigan on July 8 and 9, 2015. 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. The test program was conducted according to the TRC Test Protocol 233966A dated May 15, 2015.

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. Steve Jones Environmental Manager (231) 845 - 4390 (phone) Steven_W_Jones@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@trcsolutions.com

The tests were conducted by Rome Rothgeb and Paul Coleman of TRC. Documentation of the on-site ASTM D7036-04 Qualified Individual (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	lb/hr	0.25	2.3
	lb/1000 lb of exhaust gas, dry basis	0.03	0.10

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
EUDGDCCFIBC, S-300	Particulate Matter	USEPA Method 5	3	160 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 CO_2 and O_2 Determination by USEPA Method 3

This method is applicable for the determination of CO_2 and O_2 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 CO_2 and percent O_2 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 ± 14°C (248 ± 25°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;
- 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.

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6.0 TEST RESULTS SUMMARY

PARTICULATE TEST RESULTS SUMMARY

Company: Occidental Chemical
Plant: Ludington, Michigan
Unit: EUDGDCCFIBC
Location: Scrubber S-300

Test Run Number	1	2	3	Average
Source Condition	Normal	Normal	Normal	
Date	7/8/2015	7/9/2015	7/9/2015	
Start Time	12:36	7:45	11:15	
End Time	15:55	10:29	15:05	
Sample Duration (min):	160.0	160.0	160.0	160.0
Average Gas Temp (°F):	109.8	79.6	84.7	91.4
Fractional Gas Moisture Content:	0.080	0.026	0.025	0.043
Gas CO_2 Content (%vol):	0.0	0.0	0.0	0.0
Gas O_2 Content (%vol):	20.0	20.0	20.0	20.0
Gas Wet MW (lb/lbmole-mole):	27.94	28.52	28.53	28.33
Gas Dry Md (lb/lbmole-mole):	28.80	28.80	28.80	28.80
Average Gas Vel (ft/sec):	17.82	14.41	15.63	15.96
Measured Volumetric Flow Rate				
Q (actual ft^3/min):	2,231	1,805	1,957	1,998
Q_{std} (std ft^3/min):	2,032	1,728	1,858	1,873
$Q_{std(dry)}$ (dry std ft^3/min):	1,870	1,684	1,812	1,788
Sample Volume (dry std ft^3):	121.980	105.631	113.233	113.614
PM Collected (mg):				
Filterable	119.060	102.221	142.242	121.174
PM Concentration (lb/1000 lb Dry Basis):				
Filterable	0.029	0.029	0.037	0.032
PM Concentration (gr/dscf):				
Filterable	0.0151	0.0149	0.0194	0.0165
PM Emission Rate (lb/hr based on measured volumetric flow rate):				
Filterable:	0.24	0.22	0.30	0.25
Isokinetic Variance	101.6	97.7	97.3	98.9