The tests were conducted by Chris Miller and Austin Petersen 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

Complete test results of this test program for the various test conditions are detailed in Section 6.0.

Parameter		Measured Emission	Emission Limit
PM (filterable)	lb/1000 lb of exhaust gas, dry basis	0.004	0.016 lb/1000 lb exhaust gas, dry basis

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
Scrubber S-1308, Stack SV06043	PM (filterable)	USEPA Method 1, 2, 3, and 5	3 runs	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. No changes or problems were encountered that required modification of any procedures presented in the test plan. No adverse test or environmental conditions were encountered during the conduct of this 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:

- 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

PARTICULATE TEST RESULTS SUMMARY **Page 1 of 1**

Company:	OxyChem
Plant:	Ludington, Michigan
Unit:	S-1308 Scrubber
Location:	Stack

Test Run Number:	1	2	3	Average
Source Condition:	Normal	Normal	Normal	
Date:	3/3/2021	3/3/2021	3/4/2021	
Start Time:	8:20	13:05	8:05	
End Time:	12:00	16:30	11:50	
Sample Duration (min):	160.0	160.0	160.0	160.0
Average Gas Temp, T_s, (^oF):	68.4	75.1	79.1	74.2
Fractional Gas Moisture Content, B_{ws}:	0.015	0.016	0.024	0.018
Gas CO_2 Content (%vol):	0.0	0.0	0.0	0.0
Gas O_2 Content (%vol):	20.5	20.5	21.0	20.7
Gas Wet MW, M_s, (lb/lbmole-mole):	28.663	28.643	28.585	28.630
Gas Dry MW, M_d, (lb/lbmole-mole):	28.820	28.820	28.840	28.827
Average Gas Velocity, V_s, (ft/sec):	38.06	38.32	38.91	38.43
Measured Volumetric Flow Rate:				
Q (actual ft^3/min):	4,983	5,016	5,093	5,030
Q_{std} (std ft^3/min):	4,836	4,823	4,903	4,854
$Q_{std(dry)}$ (dry std ft^3/min):	4,766	4,744	4,787	4,766
Sample Volume, $V_{m(std)}$, (dry std ft^3):	105.280	104.932	105.136	105.116
Sample Volume, $V_{w(std)}$, (std ft^3):	1.556	1.751	2.539	1.949
PM Collected, m_n, (mg):				
Filterable	4.10	4.60	30.70	13.13
PM Concentration, C_s, (gr/dscf):				
Filterable	0.0006	0.0007	0.0045	0.0019
PM Emission Rate, ER_{M2}, (lb/hr based on measured volumetric flow rate):				
Filterable:	0.0245	0.0275	0.1849	0.0790
PM Emission Rate, ER_{M2}, (lb/1000 lb dry basis):				
Filterable:	0.001	0.001	0.009	0.004
Isokinetic Variance (I)	97.5	97.6	96.9	97.4

English Units: Standard conditions of 29.92 inHg and 68° F