Source Test Report for 2024 Compliance Testing
EUPELLETCDRY Scrubber S-701
Occidental Chemical Company
Ludington Plant, B1846
Ludington, MI

Prepared For:

Occidental Chemical Company
1600 S. Madison Street
Ludington, MI 49431

Prepared By:

Montrose Air Quality Services, LLC
4949 Fernlee Avenue
Royal Oak, MI 48073

For Submission To:

Michigan Department of Environmental, Great Lakes, and Energy
525 W. Allegan Street
Lansing, MI 48933

Document Number: MW023AS-045859-RT-2419
Test Dates: October 22-23, 2024
Submittal Date: December 20, 2024

MONTROSE
AIR QUALITY SERVICES

STAC
ACCREDITED
TO ASTM D7036 ONLY
CERT #3925.01

MONTROSE
AIR QUALITY SERVICES

Review and Certification

All work, calculations, and other activities and tasks performed and presented in this document were carried out by me or under my direction and supervision. I hereby certify that, to the best of my knowledge, Montrose operated in conformance with the requirements of the Montrose Quality Management System and ASTM D7036-04 during this test project.

Signature:	John Nestor	**Date:**	12 / 18 / 2024
Name:	John Nestor	**Title:**	District Manger

I have reviewed, technically and editorially, details, calculations, results, conclusions, and other appropriate written materials contained herein. I hereby certify that, to the best of my knowledge, the presented material is authentic, accurate, and conforms to the requirements of the Montrose Quality Management System and ASTM D7036-04.

Signature:	Henry M. Taylor	**Date:**	12 / 18 / 2024
Name:	Henry Taylor	**Title:**	Reporting QC Specialist IV

Table of Contents

Section **Page**

1.0 Introduction 5
1.1 Summary of Test Program 5
1.2 Key Personnel 6
2.0 Plant and Sampling Location Descriptions 8
2.1 Process Description, Operation, and Control Equipment 8
2.2 Flue Gas Sampling Location 8
2.3 Operating Conditions and Process Data 9
3.0 Sampling and Analytical Procedures 10
3.1 Test Methods 10
3.1.1 EPA Method 1 10
3.1.2 EPA Method 2 10
3.1.3 EPA Method 3 11
3.1.4 EPA Method 4 11
3.1.5 EPA Method 5 11
3.2 Process Test Methods 13
4.0 Test Discussion and Results 14
4.1 Field Test Deviations and Exceptions 14
4.2 Presentation of Results 14
5.0 Internal QA/QC Activities 15
5.1 QA/QC Audits 15
5.2 QA/QC Discussion 15
5.3 Quality Statement 15

List of Appendices

A Field Data and Calculations 16
A.1 Sampling Locations 17
A.2 S-701 Data Sheets 22
A.3 S-701 Calculations/Results 30
A.4 Example Calculations 33
B Facility Process Data 46
C Laboratory Analysis Data 49
D Quality Assurance/Quality Control 51
D.1 Units and Abbreviations 52
D.2 QA/QC Data 61
D.3 Accreditation Information/Certifications 65

List of Tables

1-1 Summary of Test Program 5
1-2 Summary of Average Compliance Results – EUPELLETCDRY 6
1-3 Test Personnel and Observers 7
2-1 Sampling Location 8
4-1 PM Emissions Results - EUPELLETCDRY 13

List of Figures

3-1 EPA Method 5 Sampling Train 14

1.0 Introduction

1.1 Summary of Test Program

Occidental Chemical Company (OxyChem) contracted Montrose Air Quality Services, LLC (Montrose) to perform a compliance emissions test program on the dry calcium chloride pellet material handling process (EUPELLETCDRY, Stack ID: SV06052) at the Ludington facility located in Ludington, MI.

The tests were conducted to determine compliance with the emission limits listed in permit number MI-ROP-B1846-2021 issued by Michigan Department of Environmental, Great Lakes and Energy (EGLE).

The specific objectives were to:

- Determine the emission of particulate matter (PM) at the outlet of the EUPELLETCDRY Scrubber S-701 exhaust stack
- Conduct the test program with a focus on safety

Montrose performed the tests to measure the emission parameters listed in Table 1-1.

Table 1-1
Summary of Test Program

Test Date(s)	Unit ID/ Source Name	Activity/Parameters	Test Methods	No. of Runs	Duration (Minutes)
10/22-23/2024	EUPELLETCDRY	Velocity/Volumetric Flow Rate	EPA 1 & 2	3	168
		O_2, CO_2	EPA 3	3	168
		Moisture	EPA 4	3	168
		FPM	EPA 5	3	168

To simplify this report, a list of Units and Abbreviations is included in Appendix D.1. Throughout this report, chemical nomenclature, acronyms, and reporting units are not defined. Please refer to the list for specific details.

This report presents the test results and supporting data, descriptions of the testing procedures, descriptions of the facility and sampling locations, and a summary of the quality assurance procedures used by Montrose. The average emission test results are summarized and compared to their respective permit limits in Table 1-2. Detailed results for individual test runs can be found in Section 4.0. All supporting data can be found in the appendices.

The testing was conducted by the Montrose personnel listed in Table 1-3. The tests were conducted according to the test plan (protocol) dated September 22, 2024, that was submitted to and approved by EGLE.

Table 1-2
Summary of Average Compliance Results – EUPELLETCDRY
October 22-23, 2024

Parameter/Units	Average Results	Emission Limits
Particulate Matter (PM)		
lb/hr	13.73	--
lb/1,000 lbs dry exhaust gas	0.02	0.03

1.2 Key Personnel

A list of project participants is included below:

Facility Information

Source Location: Occidental Chemical Company
Ludington Plant
1600 S. Madison Street
Ludington, MI 49431
Project Contact: Seth Garrity
Role: Environmental Engineer
Company: OxyChem Ludington
Telephone: 231-845-4213
Email: seth_garrity@oxy.com

Agency Information

Regulatory Agency: EGLE
Agency Contact: Jeremy Howe
Telephone: 231-878-6687
Email: HoweJ1@Michigan.gov

Testing Company Information

Testing Firm: Montrose Air Quality Services, LLC

Contact:	John Nestor	Matt Libman
Title:	District Manager	Regional Vice President
Telephone:	248-765-5032	630-625-2114
Email:	jonestor@montrose-env.com	mlibman@montrose-env.com

Laboratory Information

Laboratory: Occidental Chemical Corporation
City, State: Ludington, MI
Method: EPA 5

Test personnel and observers are summarized in Table 1-3.

Table 1-3
Test Personnel and Observers

Name	Affiliation	Role/Responsibility
John Nestor	Montrose	Project Manager, Qualified Individual
Matthew D'Anna	Montrose	Senior Field Technician
Ryan Soehren	Montrose	Field Technician
Olivia Rosario	Montrose	Calculations and report preparation
Seth Garrity	Occidental Chemical Corporation	Test Coordinator

2.0 Plant and Sampling Location Descriptions

2.1 Process Description, Operation, and Control Equipment

EUPELLETCDRY dries calcium chloride pellets on a continuous basis to produce concentrated calcium chloride product. The exhaust air from the dryer passes through the process scrubber, S-701, before being vented to the atmosphere.

A slight negative pressure is maintained on the material handling equipment to induce a draft in order to contain the dust generated during handling operations.

A venturi scrubber followed by a liquid-air separator is used to remove contaminants from process air. The venturi pressure drop and flow rate are monitored and controlled above the preset minimum. The liquid-air separator portion of the scrubber removes excess droplets by gravity due to lower air velocity. The air passes through a mist elimination section before being exhausted through the vent. The venturi pressure drop and the scrubbing fluid flow rate are monitored and controlled.

2.2 Flue Gas Sampling Location

Information regarding the sampling location is presented in Table 2-1.

Table 2-1
Sampling Location

Sampling Location	Stack Inside Diameter (in.)	Distance from Nearest Disturbance		Number of Traverse Points
		Downstream EPA "B" (in./dia.)	Upstream EPA "A" (in./dia.)	
S-701 Pellet C SV06052	132	520.8/>3.95	372/2.82	Isokinetic: 24 (12/port) Flow: 24 (12/port) Gaseous: 1

The sample location was verified in the field to conform to EPA Method 1. See Appendix A.1 for more information.

2.3 Operating Conditions and Process Data

Emission tests were performed while the EUPELLETCDRY and air pollution control devices were operating at normal operating conditions.

Plant personnel were responsible for establishing the test conditions and collecting all applicable unit-operating data. The process data that was provided is presented in Appendix B. Data collected includes the following parameters:

- Venturi dP, inches H_2O
- Venturi Scrubbing Fluid, gpm
- Natural Gas Flow to Dryer, scfm

3.0 Sampling and Analytical Procedures

3.1 Test Methods

The test methods for this test program have been presented in Table 1-1. Additional information regarding specific applications or modifications to standard procedures is presented below.

3.1.1 EPA Method 1, Sample and Velocity Traverses for Stationary Sources

EPA Method 1 is used to assure that representative samples or measurements of volumetric flow rate are obtained by dividing the cross-section of the stack or duct into equal areas, and then locating a traverse point within each of the equal areas. Acceptable sample locations must be located at least two stack or duct equivalent diameters downstream from a flow disturbance and one-half equivalent diameter upstream from a flow disturbance.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - None
- Method Exceptions:
  - None

The sample port and traverse point locations are detailed in Appendix A.

3.1.2 EPA Method 2, Determination of Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)

EPA Method 2 is used to measure the gas velocity using an S-type pitot tube connected to a pressure measurement device, and to measure the gas temperature using a calibrated thermocouple connected to a thermocouple indicator. Typically, Type S (Stausscheibe) pitot tubes conforming to the geometric specifications in the test method are used, along with an inclined manometer. The measurements are made at traverse points specified by EPA Method 1. The molecular weight of the gas stream is determined from independent measurements of O_2, CO_2, and moisture. The stack gas volumetric flow rate is calculated using the measured average velocity head, the area of the duct at the measurement plane, the measured average temperature, the measured duct static pressure, the molecular weight of the gas stream, and the measured moisture.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - S-type pitot tube coefficient is 0.84
- Method Exceptions:
  - None

The typical sampling system is detailed in Figure 3-1.

3.1.3 EPA Method 3, Gas Analysis for the Determination of Dry Molecular Weight

EPA Method 3 is used to calculate the dry molecular weight of the stack gas using one of three methods. The first choice is to measure the percent O_2 and CO_2 in the gas stream. A gas sample is extracted from a stack by one of the following methods: (1) single-point, grab sampling; (2) single-point, integrated sampling; or (3) multi-point, integrated sampling. The gas sample is analyzed for percent CO_2 and percent O_2 using either an Orsat or a Fyrite analyzer. The second choice is to use stoichiometric calculations to calculate dry molecular weight. The third choice is to use an assigned value of 30.0, in lieu of actual measurements, for processes burning natural gas, coal, or oil.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - A Fyrite-type combustion gas analyzer is used to measure the analyte concentrations
- Method Exceptions:
  - None
- Target Analytes: O_2 and CO_2

The typical sampling system is detailed in Figure 3-1.

3.1.4 EPA Method 4, Determination of Moisture Content in Stack Gas

EPA Method 4 is a manual, non-isokinetic method used to measure the moisture content of gas streams. Gas is sampled at a constant sampling rate through a probe and impinger train. Moisture is removed using a series of pre-weighed impingers containing methodology-specific liquids and silica gel immersed in an ice water bath. The impingers are weighed after each run to determine the percent moisture.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - The method 5 sampling train is used to measure moisture
- Method Exceptions:
  - None

The typical sampling system is detailed in Figure 3-1.

3.1.5 EPA Method 5, Determination of Particulate Matter Emissions from Stationary Sources

EPA Method 5 is a manual, isokinetic method used to measure FPM emissions. FPM is withdrawn isokinetically from the source and collected on a glass fiber filter maintained at a

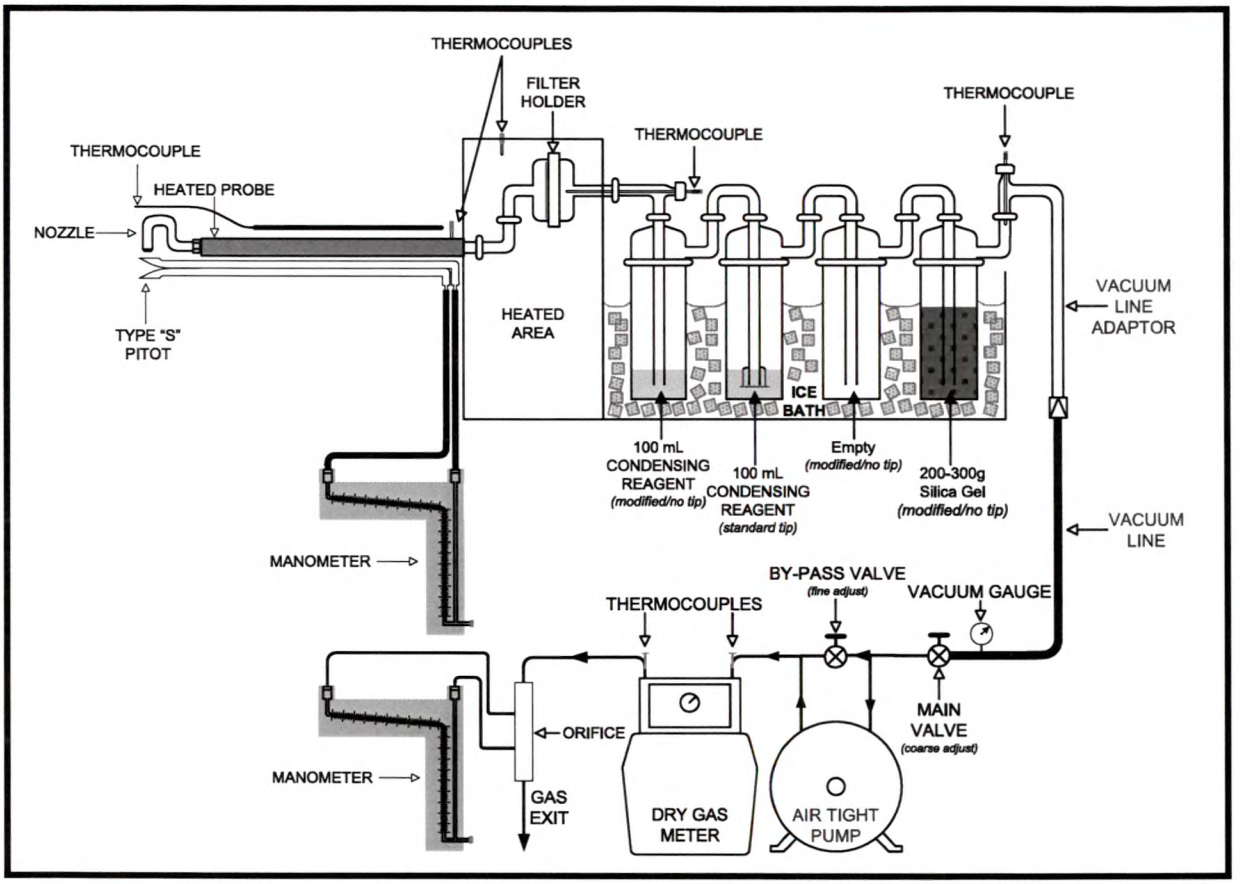
temperature of 120 ± 14 °C (248 ± 25 °F) or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator for a particular application. The FPM mass, which includes any material that condenses at or above the filtration temperature, is determined gravimetrically after the removal of uncombined water.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - Glass sample nozzles and probe liners are used
- Method Exceptions:
  - None
- Analytical Laboratory: Ludington, MI

The typical sampling system is detailed in Figure 3-1.

Figure 3-1
EPA Method 5 Sampling Train



3.2 Process Test Methods

The test plan did not require that process samples be collected during this test program; therefore, no process sample data are presented in this test report.

4.0 Test Discussion and Results

4.1 Field Test Deviations and Exceptions

No field deviations or exceptions from the test plan or test methods occurred during this test program.

4.2 Presentation of Results

The average results are compared to the permit limits in Table 1-2. The results of individual compliance test runs performed are presented in Table 4-1. Emissions are reported in units consistent with those in the applicable regulations or requirements. Additional information is included in the appendices as presented in the Table of Contents.

Table 4-1
PM Emissions Results -
EUPELLETCDRY

Parameter/Units	Run 1	Run 2	Run 3	Average
Date	10/22/2024	10/22/2024	10/23/2024	--
Time	10:46-14:08	14:46-18:02	7:23-10:39	--
Process Data*				
Venturi dP, in H_2O	23.5	23.4	23.4	23.4
Venturi Scrubbing Fluid, gpm	1548	1551	1551	1550
Natural Gas Flow, scfm	1701	1702	1717	1706
Sampling & Flue Gas Parameters				
sample duration, minutes	168	168	168	--
O_2, % volume dry	19.8	19.8	19.6	19.7
CO_2, % volume dry	1.8	1.6	1.8	1.7
flue gas temperature, °F	206	206	206	206
moisture content, % volume	20.3	19.7	19.7	19.9
volumetric flow rate, dscfm	133,934	138,187	138,597	136,906
Particulate Matter (PM)				
lb/hr	14.02	13.88	13.30	13.73
lb/1,000 lbs dry exhaust gas	0.02	0.02	0.02	0.02

*Process data provided by OxyChem personnel.

5.0 Internal QA/QC Activities

5.1 QA/QC Audits

The meter box and sampling train used during sampling performed within the requirements of their respective methods. All post-test leak checks, minimum metered volumes, minimum sample durations, and percent isokinetics met the applicable QA/QC criteria.

Fyrite analyzer audits were performed during this test in accordance with EPA Method 3, Section 10.1 requirements. The results were within ± 0.5% of the respective audit gas concentrations.

EPA Method 5 analytical QA/QC results are included in the laboratory report. The method QA/QC criteria were met, except if noted in Section 5.2. An EPA Method 5 reagent blank was analyzed. The maximum allowable amount that can be subtracted is 0.001% of the weight of the acetone used. The blank did not exceed the maximum residue allowed.

5.2 QA/QC Discussion

All QA/QC criteria were met during this test program.

5.3 Quality Statement

Montrose is qualified to conduct this test program and has established a quality management system that led to accreditation with ASTM Standard D7036-04 (Standard Practice for Competence of Air Emission Testing Bodies). Montrose participates in annual functional assessments for conformance with D7036-04 which are conducted by the American Association for Laboratory Accreditation (A2LA). All testing performed by Montrose is supervised on site by at least one Qualified Individual (QI) as defined in D7036-04 Section 8.3.2. Data quality objectives for estimating measurement uncertainty within the documented limits in the test methods are met by using approved test protocols for each project as defined in D7036-04 Sections 7.2.1 and 12.10. Additional quality assurance information is included in the report appendices. The content of this report is modeled after the EPA Emission Measurement Center Guideline Document (GD-043).