1.0 Introduction

1.1 Summary of Test Program

BASF Corporation (State Registration No.: B4359) contracted Montrose Air Quality Services, LLC (Montrose) to perform a compliance test program for the Regenerative Thermal Oxidizer (RTO) (FG-RTO) located at the BASF Corporation's Wyandotte Dispersions and Resins Plant (WYDR) in Wyandotte, Michigan. Testing was performed on April 26, 2022, for the purpose of satisfying the emission testing requirements pursuant to Michigan Department of Environment, Great Lakes, and Energy (EGLE) Permit-to-Install (PTI) No. 113-07A.

The specific objectives were to:

- Verify the volatile organic compound (VOC) destruction efficiency (DE) of the RTO serving WYDR
- 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)
4/26/2022	SV-RTO Inlet and Exhaust	Velocity/Volumetric Flow Rate	EPA 1 & 2	3	8-13
4/26/2022	SV-RTO Inlet and Exhaust	O_2, CO_2	EPA 3	3	60
4/26/2022	SV-RTO Inlet and Exhaust	Moisture	EPA 4	3	60
4/26/2022	SV-RTO Inlet and Exhaust	VOC	EPA 25A	3	60

To simplify this report, a list of Units and Abbreviations is included in Appendix C.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 March 9, 2022, that was submitted to EGLE on March 14, 2022.

Table 1-2
Summary of Average Compliance Results – WYDR RTO

April 26, 2022

Parameter/Units	Average Results	Emission Limits
VOC Destruction Efficiency (DE)		
%	98	98

1.2 Key Personnel

A list of project participants is included below:

Facility Information

Source Location:	BASF Corporation Wyandotte Dispersions and Resins Plant 1609 Biddle Avenue Wyandotte, MI 48192
Project Contact:	Thomas Wharton
Role:	EHS Specialist
Company:	BASF Corporation
Telephone:	734-324-5042
Email:	thomas.wharton@basf.com

Agency Information

Regulatory Agency:	EGLE	
Agency Contact:	Karen Kajiya-Mills	Regina Angellotti
Telephone:	517-335-3122	313-418-0895
Email:	kajiya-millsk@michigan.gov	angellottir1@michigan.gov

Testing Company Information

Testing Firm:	Montrose Air Quality Services, LLC	
Contact:	Robert J. Lisy, Jr.	Christopher Trevillian
Title:	Reporting Hub Manager	Field Project Manager
Telephone:	440-262-3760	440-262-3760
Email:	rlisy@montrose-env.com	ctrevillian@montrose-env.com

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

Table 1-3
Test Personnel and Observers

Name	Affiliation	Role/Responsibility
Christopher Trevillian	Montrose	Field Project Manager, QI
Shane Downey	Montrose	Field Technician
David Koponen	Montrose	Field Technician
Catalin Oana	BASF Corporation	Observer/Client Liaison/Test Coordinator
Tom Wharton	BASF Corporation	Observer
Bryan Hughes	BASF Corporation	Observer
Regina Angellotti	EGLE	Observer
Sam Liveson	EGLE	Observer
Andrew Riley	EGLE	Observer

2.0 Plant and Sampling Location Descriptions

2.1 Process Description, Operation, and Control Equipment

The BASF Corporation's Wyandotte Dispersions and Resins Plant (WYDR) operates an emulsion polymer batch production. Emissions from WYDR emission units are controlled by an RTO. The WYDR and RTO (FG-RTO) were in operation for this test event. See Appendix D.2 for a more detailed description of process operations.

2.2 Flue Gas Sampling Locations

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

Table 2-1
Sampling Locations

Sampling Location	Stack Inside Diameter (in.)	Distance from Nearest Disturbance		Number of Traverse Points
		Downstream EPA "B" (in./dia.)	Upstream EPA "A" (in./dia.)	
SV-RTO Inlet Duct	24.6 X 23.8 elliptical	95.5 / 3.9	27.0 / 1.1	Flow: 16 (8/port) Gaseous: 1
SV-RTO Exhaust Stack	38.8 X 16.8 rectangular	65.0 / 2.8	48.0 / 2.1	Flow: 16 (4/port) Gaseous: 1

Sample location were verified in the field to conform to EPA Method 1. Acceptable cyclonic flow conditions were confirmed prior to testing using EPA Method 1, Section 11.4. See Appendix A.1 for more information.

2.3 Operating Conditions and Process Data

Emission tests were performed while the WYDR was operating at maximum routine 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:

- RTO firebox temperature, °F

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 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.

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

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

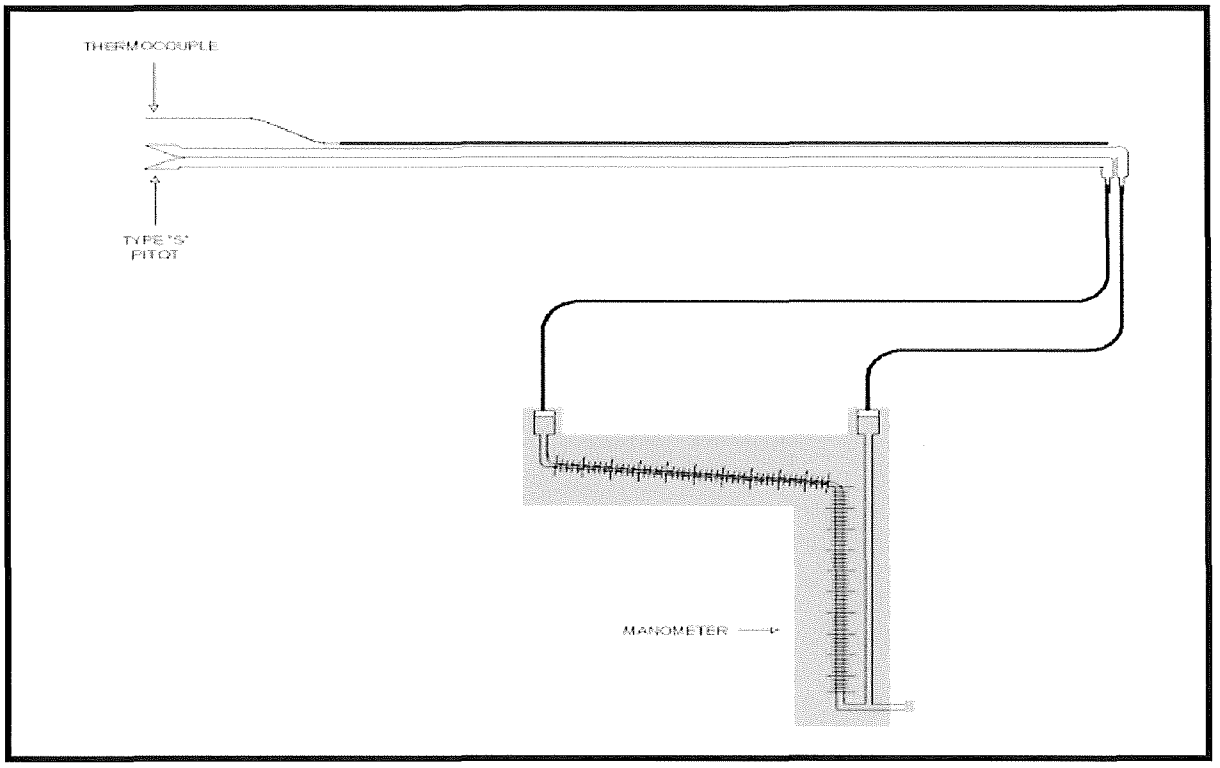
EPA Method 2 is used to measure the gas velocity using an S-type pitot tube connected to a pressure measurement device, and to measure the gas temperature using a calibrated thermocouple connected to a thermocouple indicator. Typically, Type S (Staußcheibe) pitot tubes conforming to the geometric specifications in the test method are used, along with an inclined manometer. The measurements are made at traverse points specified by EPA Method 1.

The 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.

Figure 3-1
EPA Method 2 Sampling Train

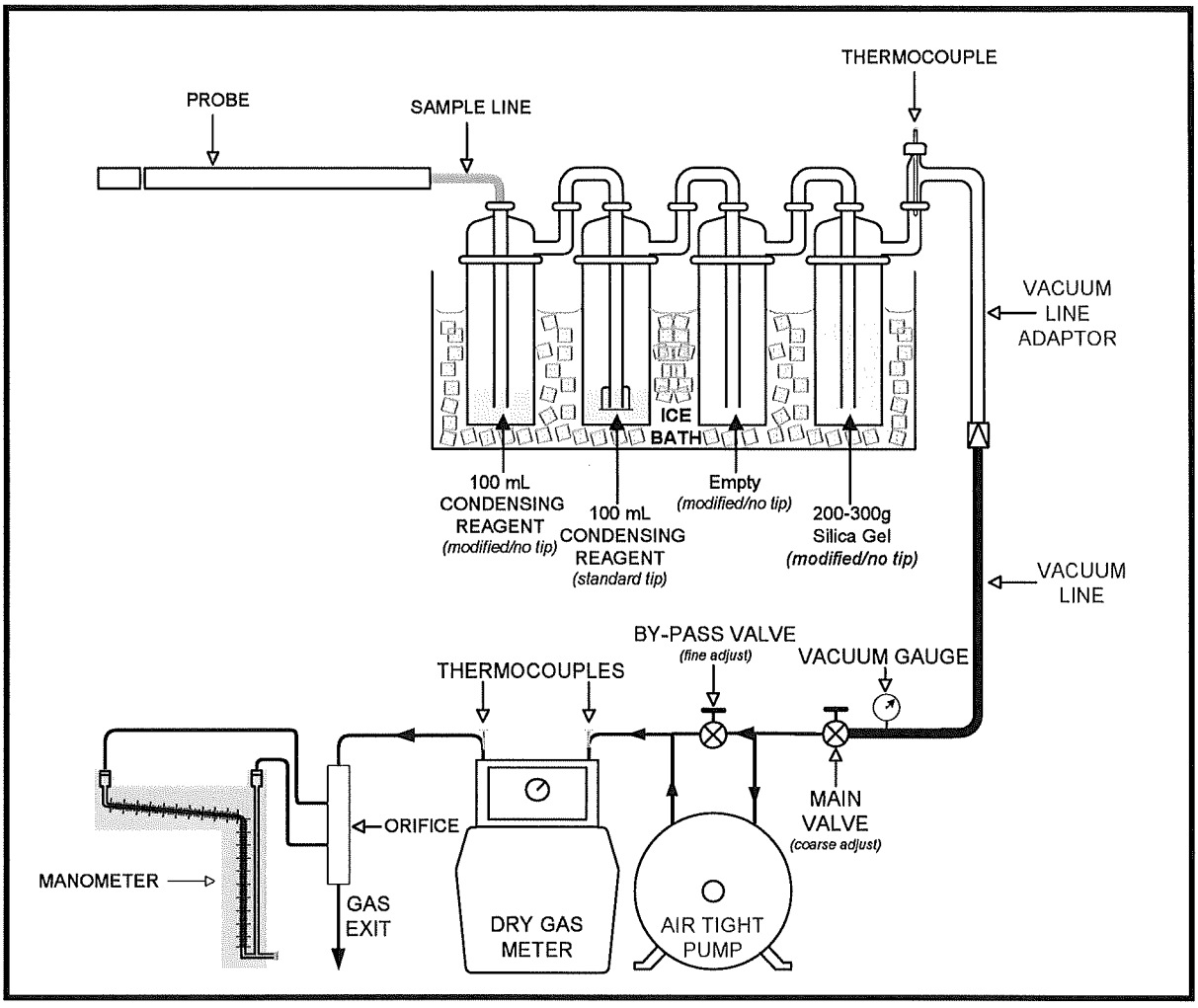


3.1.4 EPA Method 4, Determination of Moisture Content in Stack Gas

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.

The typical sampling system is detailed in Figure 3-2.

Figure 3-2
EPA Method 4 (Detached) Sampling Train

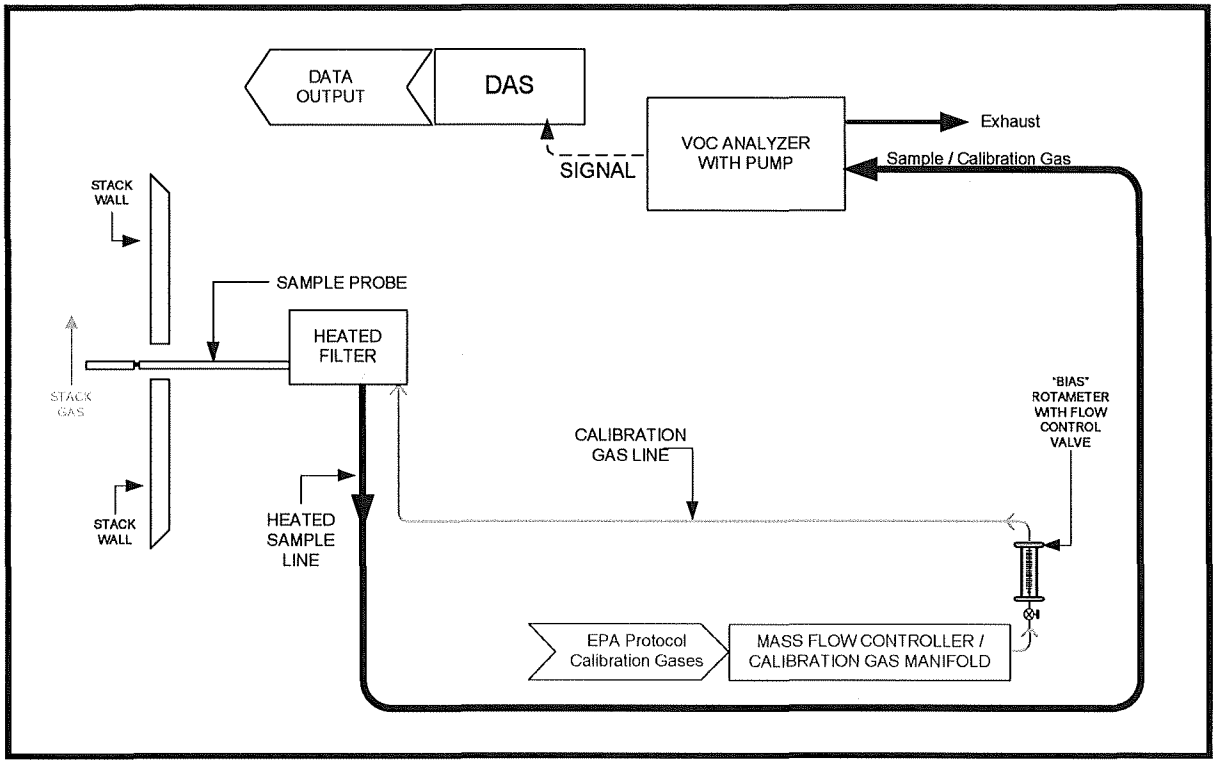


3.1.5 EPA Method 25A, Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer

EPA Method 25A is an instrumental test method used to measure the concentration of THC in stack gas. A gas sample is extracted from the source through a heated sample line and glass fiber filter to a flame ionization analyzer (FIA). Results are reported as volume concentration equivalents of the calibration gas or as carbon equivalents.

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

Figure 3-3
EPA Method 25A 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 Tables 4-1 and 4-2. 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
VOC Emissions Results -
SV-RTO Inlet Duct

Run Number	1	2	3	Average
Date	4/26/2022	4/26/2022	4/26/2022	--
Time	10:21-11:21	12:25-13:25	14:05-15:05	--
Sampling & Flue Gas Parameters				
O_2, % volume dry	20.50	20.50	20.50	20.50
CO_2, % volume dry	0.00	0.00	0.00	0.00
flue gas temperature, °F	119.8	119.8	119.9	119.8
moisture content, % volume	1.18	1.08	1.11	1.12
volumetric flow rate, scfm	7,643	8,047	7,986	7,892
Volatile Organic Compounds (VOC), as propane				
ppmvw	380	303	268	317
lb/hr	20.0	16.8	14.7	17.2

Table 4-2
VOC Emissions and DE Results -
SV-RTO Exhaust Stack

Run Number	1	2	3	Average
Date	4/26/2022	4/26/2022	4/26/2022	--
Time	10:21-11:21	12:25-13:25	14:05-15:05	--
Process Data *				
RTO firebox temperature, °F	1,546	1,554	1,546	1,549
Sampling & Flue Gas Parameters				
O_2, % volume dry	20.50	20.50	20.50	20.50
CO_2, % volume dry	0.00	0.00	0.00	0.00
flue gas temperature, °F	227.9	229.6	231.8	229.7
moisture content, % volume	1.40	1.28	1.26	1.31
volumetric flow rate, scfm	6,486	6,707	6,441	6,545
Volatile Organic Compounds (VOC), as propane				
ppmvw	11.6	7.3	6.6	8.5
lb/hr	0.52	0.34	0.29	0.38
VOC Destruction Efficiency (DE)				
%	97	98	98	98

* Process data was provided by BASF-WYDR personnel.

5.0 Internal QA/QC Activities

5.1 QA/QC Audits

The meter boxes and sampling trains used during sampling performed within the requirements of their respective methods. All post-test leak checks, minimum metered volumes 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 25A FIA calibration audits were within the measurement system performance specifications for the calibration drift checks and calibration error checks.

An EPA Method 205 field evaluation of the calibration gas dilution system was conducted. The dilution accuracy and precision QA specifications were met.

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).