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AIR QUALITY DIVISION

1.0 INTRODUCTION

1.1 SUMMARY OF TEST PROGRAM

BASF Corporation - Wyandotte contracted Montrose Air Quality Services, LLC (Montrose) to perform a compliance emissions test program on the Wyandotte Dispersions and Resins Plant Operations (WYDR) at the BASF Corporation - Wyandotte facility located in Wyandotte, Michigan. The tests were conducted to satisfy the emissions testing requirements pursuant to Michigan Department of Environment, Great Lakes, and Energy (EGLE) Permit No. 113-07B.

The specific objectives were to:

- Verify the total gaseous organic (TGO) destruction efficiency (DE) of the regenerative thermal oxidizer (RTO) serving WYDR
- Conduct the test program with a focus on safety

The testing was conducted by the Montrose personnel listed in Table 1-3 on May 13, 2020. The tests were conducted according to the test plan (protocol) dated October 2, 2019 that was submitted to and approved by EGLE.

**TABLE 1-1
SUMMARY OF TEST PROGRAM**

Test Date(s)	Unit ID/ Source Name	Activity/ Parameters	Test Methods	No. of Runs	Duration (Minutes)
05/13/2020	RTO/ WYDR	Velocity/Volumetric Flow Rate	EPA 1 & 2	3 (Inlet) 3 (Exhaust)	~10
05/13/2020	RTO/ WYDR	O ₂ , CO ₂	EPA 3	3 (Inlet) 3 (Exhaust)	~3
05/13/2020	RTO/ WYDR	Moisture	EPA 4	1 (Exhaust)	30
05/13/2020	RTO/ WYDR	TGO	EPA 25A	3 (Inlet) 3 (Exhaust)	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.

**TABLE 1-2
SUMMARY OF AVERAGE COMPLIANCE RESULTS -
WYDR RTO
MAY 13, 2020**

Parameter/Units	Average Results	Permit Limit
TGO DE %	98.0	98

1.2 KEY PERSONNEL

A list of project participants is included below:

Facility Information

Source Location: BASF Corporation - Wyandotte
1609 Biddle Avenue
Wyandotte, MI 48192
Project Contact: Jordan Thompson
Role: Senior EHS Specialist
Company: BASF Corporation
Telephone: 734-324-6102
Email: jordan.thompson@basf.com

Agency Information

Regulatory Agency: EGLE
Agency Contact: Todd Zynda
Telephone: 313-456-2761
Email: zyndat@michigan.gov
Regina Angellotti
313-418-0895
angelottir1@michigan.gov

Testing Company Information

Testing Firm: Montrose Air Quality Services, LLC
Contact: Matthew Young
Title: District Manager
Telephone: 248-548-8070
Email: myoung@montrose-env.com
Mason Sakshaug
Field Project Manager
248-548-8070
msakshaug@montrose-env.com

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

**TABLE 1-3
TEST PERSONNEL AND OBSERVERS**

Name	Affiliation	Role/Responsibility
Mason Sakshaug	Montrose	Field Project Manager, QI
David Trahan	Montrose	Field Technician, QI
Benjamin Durham	Montrose	Field Technician
Jordan Thompson	BASF Corporation	Client Liaison/Test Coordinator
Bryan Hughes	BASF Corporation	Observer
Regina Angelotti	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. The WYDR was in operation for this test event. See Appendix D for more information about process operations.

During this test, emissions from WYDR emission units were controlled by an RTO.

2.2 FLUE GAS SAMPLING LOCATION(S)

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

**TABLE 2-1
SAMPLING LOCATION(S)**

Sampling Location	Stack Inside Dimensions (in.)	Distance from Nearest Disturbance		Number of Traverse Points
		Downstream EPA "B" (in./dia.)	Upstream EPA "A" (in./dia.)	
WYDR RTO Inlet	24.0	96 / 4	30 / 1.25	Flow: 16 (8/port); TGO: 1
WYDR RTO Exhaust	39.0 x 18.0	60 / 2.4	36 / 1.5	Flow: 16 (4/port); Moisture: 1 TGO: 1

Sample location(s) 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 source/units and air pollution control devices were operating during normal operations. The unit was tested when operating normally.

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:

Production rate for the emulsion polymer production, resin polymer production,

- Production rate for the emulsion polymer production, resin polymer production polymer resin cutting, and product drumming, units
- Raw material storage filling, units
- RTO firebox temperature, °F

3.0 SAMPLING AND ANALYTICAL PROCEDURES

3.1 TEST METHODS

The test methods for this test program were presented previously 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.

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.

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

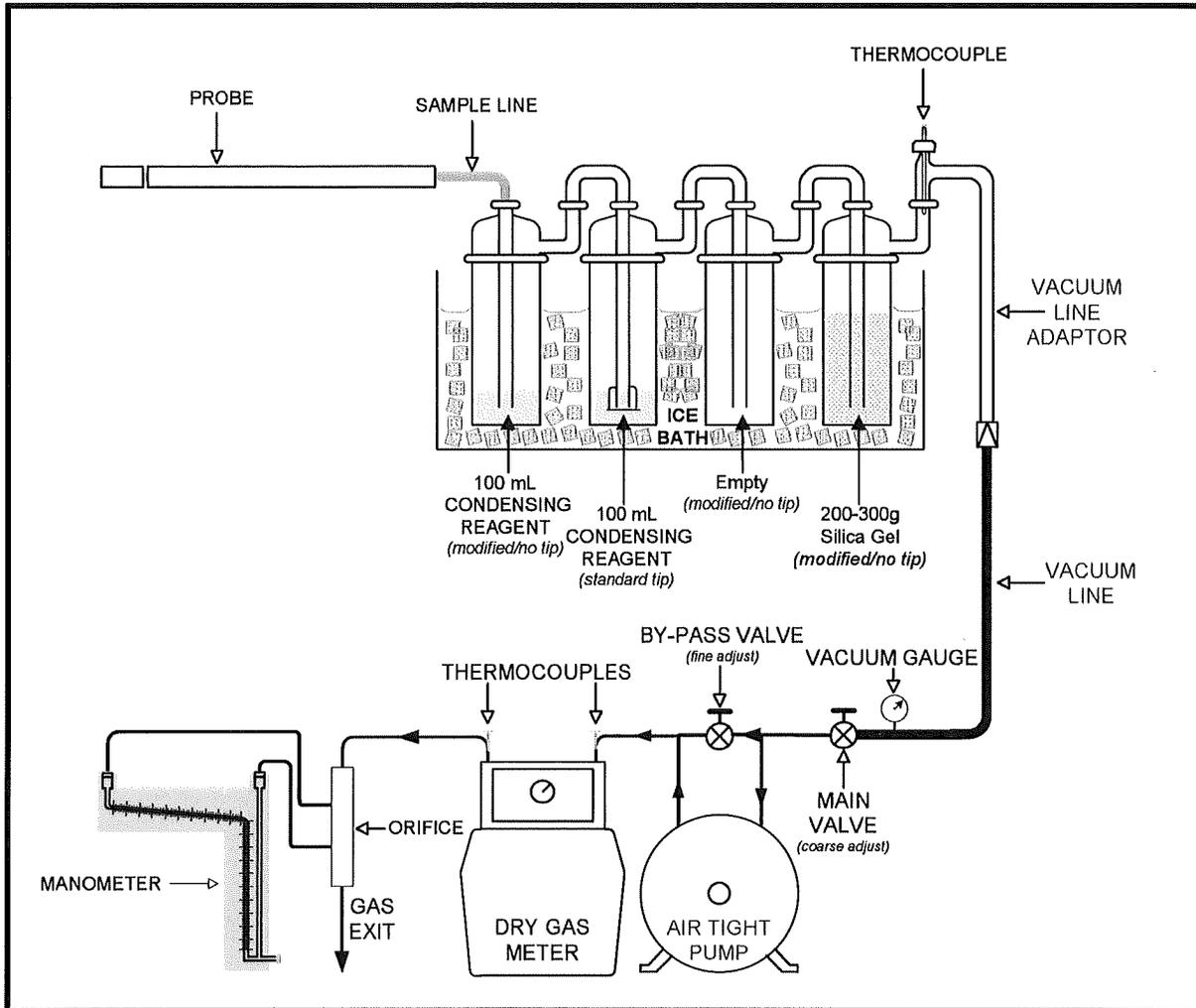
EPA Method 3 is used to calculate the dry molecular weight of the stack gas using one of three methods. The first choice is to measure the percent O₂ and CO₂ in the gas stream. A gas sample is extracted from a stack by one of the following methods: (1) single-point, grab sampling; (2) single-point, integrated sampling; or (3) multi-point, integrated sampling. The gas sample is analyzed for percent CO₂ and percent O₂ using either an Orsat or a Fyrite analyzer.

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 EPA Method 4 sampling train is depicted in Figure 3-1

**FIGURE 3-1
 EPA METHOD 4(DETACHED) SAMPLING TRAIN**

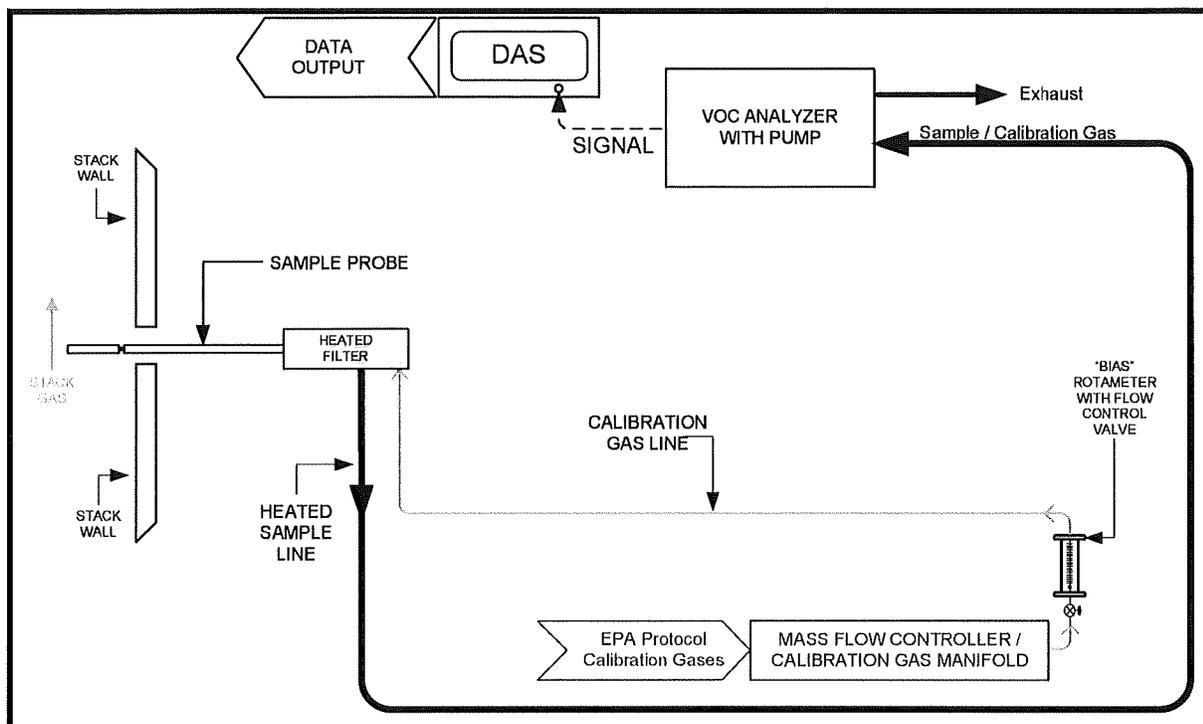


3.1.5 EPA Method 25A, Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer

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 EPA Method 25A sampling train is depicted in Figure 3-2.

FIGURE 3-2
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 engineering 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.

Moisture measured during Run 1 at the WYDR RTO Exhaust Stack was applied to Runs 2 and 3 at the WYDR RTO Exhaust Stack and Runs 1 through 3 at the WYDR RTO Inlet Duct.

**TABLE 4-1
TGO EMISSIONS RESULTS -
WYDR RTO INLET DUCT**

Run Number	1	2	3	Average
Date	05/13/20	05/13/20	05/13/20	--
Time	09:25-10:25	10:58-11:58	12:52-13:52	--
Flue Gas Parameters				
O ₂ , % volume dry	21.0	21.0	21.0	21.0
CO ₂ , % volume dry	0.0	0.0	0.0	0.0
flue gas temperature, °F	120	121	123	121
moisture content, % volume	2.55	2.55	2.55	2.55
volumetric flow rate, scfm	7,588	7,241	6,896	7,242
volumetric flow rate, dscfm	7,394	7,056	6,720	7,057
Total Gaseous Organics (TGO), as Propane				
ppmvw	300	340	334	325
lb/hr	15.6	16.9	15.8	16.1

**TABLE 4-2
TGO EMISSIONS AND TGO DE RESULTS -
WYDR RTO EXHAUST STACK**

Run Number	1	2	3	Average
Date	05/13/20	05/13/20	05/13/20	05/13/20
Time	09:25-10:25	10:58-11:58	12:52-13:52	09:25-10:25
Process Data				
RTO temperature, °F	1549.4	1544.6	1546.0	1546.7
Flue Gas Parameters				
O ₂ , % volume dry	21.0	21.0	21.0	21.0
CO ₂ , % volume dry	0.0	0.0	0.0	0.0
flue gas temperature, °F	233	224	223	227
moisture content, % volume	2.55	2.55	2.55	2.55
volumetric flow rate, scfm	7,039	6,642	6,709	6,797
volumetric flow rate, dscfm	6,860	6,472	6,537	6,623
Total Gaseous Organics (TGO), as Propane				
ppmvw	7.71	8.17	6.75	7.54
lb/hr	0.35	0.31	0.30	0.32
TGO, as Propane Destruction Efficiency (DE)				
%	97.8	98.1	98.1	98.0

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 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 $\pm 0.5\%$ 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).