TEST REPORT
COMPLIANCE EMISSION TEST
THE ANDERSONS ALBION ETHANOL, LLC
8 STATIONARY SOURCES
ALBION, MICHIGAN

Prepared For:

The Andersons Albion Ethanol, LLC
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Document No.: **024AS-544420-RT-302**
Test Dates: **March 19 through 22, 2019**
Submittal Date: **April 24, 2019**

STAC
A2LA ACCREDITED TO ASTM D7036 ONLY CERT #3925.01

MONTROSE AIR QUALITY SERVICES

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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: D. Chapman Date: 04/24/2019

Name: Donald Chapman, QSTI Title: Vice President, Technical

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: 04/23/2019

Name: Henry M. Taylor, QSTO Title: Senior Quality Assurance Specialist

1.0 SUMMARY OF TEST PROGRAM AND RESULTS

1.1 TEST PROGRAM OBJECTIVES

Montrose Air Quality Services, LLC (Montrose) was contracted by The Andersons Albion Ethanol, LLC to perform a compliance emission test at their facility located in Albion, Michigan.

The purpose of the test was to determine the concentrations and emission rates of total particulate matter (PM) as PM less than 2.5 microns ($PM_{2.5}$) and PM less than 10 microns (PM_{10}), condensable PM (CPM), nitrogen oxides (NO_x), carbon monoxide (CO), sulfur dioxide (SO_2), volatile organic compounds (VOC), and hazardous air pollutants (HAP) as well as the opacity of visible emissions (VE).

Testing was conducted in accordance with the sampling and analytical procedures presented in Test Plan No. 024AS-544420-PP-104 dated January 24, 2019. A summary of the test program is presented in Table 1-1.

TABLE 1-1
SUMMARY OF TEST PROGRAM

Date	Source	Compliance Test Pollutants	Test Methods	No. of Runs	Run Duration
3/19/19	Combined Heat and Power (CHP) System (Turbine Only)	Total PM/$PM_{2.5}$/PM_{10}, CPM, NO_x, CO, VOC, Methane	1, 2, 3A, 4, 5, 7E, 10, 19, 25A, 202, 320	3	60 Minutes
3/19/19	CHP System (Duct Burner Only)	Total PM/$PM_{2.5}$/PM_{10}, CPM, NO_x, CO, VOC	1, 2, 3A, 4, 5, 7E, 10, 19, 25A, 202, 320	3	60 Minutes
3/20/19	CHP System (Turbine and Duct Burner)	Total PM/$PM_{2.5}$/PM_{10}, CPM, NO_x, CO, VOC	1, 2, 3A, 4, 5, 7E, 10, 19, 25A, 202, 320	3	60 Minutes
3/19/19	Grain Receiving Baghouse Stack* (C20)	Filterable PM/$PM_{2.5}$/PM_{10}, VE	1, 2, 9, 17	3	60 Minutes
3/19/19	Corn Milling (Hammermills 1-4) Baghouse Stack* (C30)	Filterable PM/$PM_{2.5}$/PM_{10}, VE	1, 2, 9, 17	3	60 Minutes
3/20/19	Truck Loadout Baghouse Stack* (P91)	Filterable PM/$PM_{2.5}$/PM_{10}, VE	1, 2, 9, 17	3	60 Minutes
3/20/19	Rail Loadout Baghouse Stack* (P90)	Filterable PM/$PM_{2.5}$/PM_{10}, VE	1, 2, 9, 17	3	60 Minutes
3/21/19	Thermal Oxidizer (TO) System (C10)	Stack: Total PM/$PM_{2.5}$/PM_{10}, CPM, NO_x, VE, CO, SO_2, VOC, HAP	1, 2, 3A, 4, 5, 7E, 9, 10, 25A, 202, 320	3	60 Minutes
		Inlet**: VOC	25A	3	60 Minutes
3/22/19	CO_2 Scrubber Stack (C40)	VOC, HAP	1, 2, 3A, 25A, 320	3	60 Minutes
3/22/19	CO_2 Scrubber Stack (C40A)	VOC, HAP	1, 2, 3A, 25A, 320	3	60 Minutes

*Due to stack temperatures of < 85 °F, USEPA Method 202 was not performed for CPM determination.

**The volumetric flow rates measured at the TO stack were used to calculate the inlet loading rates to determine destruction efficiency (DE).

Where applicable, speciated VOC and HAP, SO_2, methane, and moisture sampling was conducted using Fourier transform infrared (FTIR) instrumentation in accordance with USEPA Method 320 and ASTM Method D6348-12.

The total VOC concentration at the TO and CO_2 Scrubbers was determined in accordance with USEPA Method 25A using a total hydrocarbon analyzer equipped with a heated flame ionization detector (FID). The total VOC emission rate was determined using the USEPA Midwest Scaling Factor (MSF) sampling procedures and subsequent calculations. The VOC sampling strategy is based on the USEPA "VOC Mass Emissions" MSF Method as listed in the publication "VOC Mass Emissions" Midwest Scaling Method – VOC Sampling at Wet and Dry Grain Mills and Other VOC Sources. The total VOC emission rate for each source was calculated using the default MSFs of 2.2 for the TO and 1.92 for the CO_2 Scrubbers. The scaling factor along with the total VOC (as carbon [C_1]) mass emissions were used to calculate the total VOC as actual molecular weight emission rate.

1.2 TEST PROGRAM PARTICIPANTS

A list of project participants is included below:

Facility Information

Source Location:	The Andersons Albion Ethanol, LLC 26250 B Drive North Albion, MI 49224
Project Contact:	Mr. Lyle Blausey
Role:	Senior Specialist, EH&S
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Testing Company Information

Testing Firm:	Montrose Air Quality Services, LLC
Contact:	Mr. Don Chapman
Title:	Vice President, Technical
Telephone:	847-487-1580 Ext. 12406
Email:	dchapman@montrose-env.com

Mr. Lyle Blausey, Ms. Melissa Farrington, and Mr. Daniel Scheub of The Andersons coordinated the test and monitored process operations during testing. Mr. Don Chapman, Mr. Paul Diven, Mr. Shane Rabideau, Mr. Mason Sakshaug, and Mr. Rob Salek of Montrose performed the test. Mr. Don Chapman was the onsite field test supervisor and qualified source testing individual for the test. Ms. Regina Angellotti, Ms. Amanda Chapel, and Mr. Mark Dziadosz of the Michigan Department of Environmental Quality witnessed the test.

1.3 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 presented in the report appendices.

1.4 SUMMARY OF TEST RESULTS

The test results are detailed in Section 4.0 of this document. A summary of the average test results is presented in Table 1-2.

TABLE 1-2
SUMMARY OF AVERAGE TEST RESULTS

Source	Test Date	Parameter	Units	Average Result[1]	Compliance Limit
CHP System (Turbine Only)	3/19/19	Total PM	lb/hr	0.67	2.9
		NO_x	ppmv db @ 15% O_2	8.1	42
		NO_x	lb/hr	2.67	15.6
		NO_x	lb/MMBtu	0.030	0.1
		CO	lb/hr	0.31	42.8
		Total VOC as Methane	lb/hr	0.008	3.2
CHP System (Duct Burner Only)	3/19/19	Total PM	lb/hr	0.20	2.9
		NO_x	ppmv db @ 15% O_2	10.6	54
		NO_x	lb/hr	4.92	35.0
		NO_x	lb/MMBtu	0.039	0.1
		CO	lb/hr	0.43	42.8
		Total VOC as Methane	lb/hr	0.022	3.2
CHP System (Turbine and Duct Burner)	3/20/19	Total PM	lb/hr	0.27	2.9
		NO_x	ppmv db @ 15% O_2	13.4	42
		NO_x	lb/hr	9.94	15.6
		NO_x	lb/MMBtu	0.050	0.1
		CO	lb/hr	0.71	42.8
		Total VOC as Methane	lb/hr	0.014	3.2
Grain Receiving Baghouse (C20)	3/19/19	Filterable PM	lb/hr	0.04	0.78
		VE	%	0	5
Corn Milling (Hammermills 1-4) Baghouse (C30)	3/19/19	Filterable PM	lb/hr	0.49	0.73
		VE	%	0	5
Truck Loadout Baghouse (P91)	3/20/19	Filterable PM	lb/hr	0.06	0.13
		VE	%	0	5
Rail Loadout Baghouse (P90)	3/20/19	Filterable PM	lb/hr	0.02	0.13
		VE	%	0	5
TO (C10)	3/21/19	Total PM	lb/hr	1.40	TBD
		VE	%	0	5
		SO_2	lb/hr	< 0.15	N/A
		NO_x	lb/hr	13.31	27.50
		CO	lb/hr	2.47	21.40
		Total VOC as Propane	DE, %	99.96	> 98
		Total VOC (M25A-MSF)	lb/hr	0.62	4.2
		Total VOC (FTIR)	lb/hr	< 1.51	4.2
		Acetaldehyde	lb/hr	0.13	0.35
CO_2 Scrubber Stack (C40)	3/22/19	Total VOC (M25A-MSF)	lb/hr	9.09	14.0
		Total VOC (FTIR)	lb/hr	< 9.27	14.0
		Acetaldehyde	lb/hr	0.19	1.3
CO_2 Scrubber Stack (C40A)	3/22/19	Total VOC (M25A-MSF)	lb/hr	10.06	13.0
		Total VOC (FTIR)	lb/hr	< 10.42	13.0
		Acetaldehyde	lb/hr	0.39	0.93

[1]Average values labeled as 'less than' identify emission rates which include one or more compounds reported at the method detection limit.

2.0 SOURCE DESCRIPTION

2.1 FACILITY AND SOURCE DESCRIPTION

The compliance emission test was conducted on the following sources at The Andersons Albion Ethanol, LLC facility in Albion, Michigan:

- CHP System (FGCHP) at each of 3 Test Conditions:
  - Turbine Only
  - Duct Burner Only
  - Turbine and Duct Burner
- Grain Receiving Baghouse Stack C20 (FGCORNHAND)
- Corn Milling (Hammermills 1-4) Baghouse Stack C30 (FGMILL)
- DDGS Rail Loadout Baghouse Stack P91 (EU-LOADOUTRL)
- DDGS Truck Loadout Baghouse Stack P90 (EU-LOADOUTTRK)
- TO Stack C10 (FGOXID)
- CO_2 Scrubber Stack C40 (FGFERM)
- CO_2 Scrubber Stack C40A (FGFERM2)

2.2 SAMPLING LOCATIONS

The sampling locations and number of sampling points were as follows:

Stack Sampling Location	Stack Diameter (inches)	Port Location Upstream from Disturbance (inches)	Port Location Downstream from Disturbance (inches)	No. of Ports	Sampling Points per Port	Total Points
CHP System	54.0	720	276	2	10	20
Grain Receiving Baghouse	33.5	82	1,440	2	6	12
Corn Milling Baghouse	33.5	82	1,440	2	6	12
Rail Loadout Baghouse	18.0	72	420	2	6	12
Truck Loadout Baghouse	36.0	48	24	2	12	24
TO Stack	84.0	500	184	2	12	24
CO_2 Scrubber C40	23.5	54	192	2	8	16
CO_2 Scrubber C40A	23.5	126	240	2	8	16

2.3 OPERATING CONDITIONS AND PROCESS DATA

Plant personnel established the test conditions and collected all applicable process and control equipment operating data. The process data is included in Appendix F.

3.0 TEST METHOD DETAILS

3.1 LIST OF TEST METHODS

Where applicable, testing was conducted pursuant to the following procedures:

- Code of Federal Regulations, Title 40, Part 60 (40 CFR 60), Appendix A, USEPA Methods 1, 2, 3A, 4, 5, 7E, 9, 10, 17, 19, and 25A
- 40 CFR 51, Appendix M, USEPA Methods 202 and 205
- 40 CFR 63, Appendix A, USEPA Method 320
- ASTM D6348-12 – Standard Test Method for Determination of Gaseous Compounds by Extractive Direct Interface FTIR Spectroscopy
- Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods

3.1.1 Sampling Locations (USEPA Method 1)

The sampling point locations that were used for the determination of gas velocity and volumetric flow rate were determined following the procedural requirements of USEPA Method 1. The sampling locations and number of sampling points are provided in Subsection 2.2.

3.1.2 Gas Velocity and Volumetric Flow Rate Determination (USEPA Method 2)

Gas velocity and volumetric flow rate were determined following USEPA Method 2 procedures. Velocity traverses were performed using a Type-S pitot tube with the velocity head pressure measured on a Dwyer oil gauge inclined manometer to the nearest 0.01-in. H_2O. Temperature measurements were performed with a chromel-alumel thermocouple connected to a digital direct read-out potentiometer.

The volumetric flow rates measured at the TO stack were used to calculate the inlet loading rates to determine the DE.

The grain handling baghouses stack gas composition is equivalent to ambient air; therefore, a dry molecular weight of 29.0 lb/lb-mole was used for the gas density and flow calculations as stated in USEPA Method 2.

3.1.3 O_2, CO_2, NO_x, and CO (USEPA Methods 3A, 7E, and 10)

Where applicable, O_2 and CO_2 sampling was conducted in accordance with USEPA Method 3A using a Servomex, Inc. Model 1440 combination paramagnetic O_2 and non-dispersive infrared CO_2 analyzer.

NO_x sampling was conducted in accordance with USEPA Method 7E using a California Analytical Instruments, Inc. Model 600 chemiluminescent NO_x analyzer. The NO_x converter check was performed following USEPA Method 7E. This procedure uses a nitrogen dioxide (NO_2) cylinder gas (40-60 ppm) to provide direct measurement of the converter efficiency. The converter is acceptable if the NO_2 to nitric oxide (NO) conversion rate is greater than 90%.