

EXECUTIVE SUMMARY

United Ethanol, LLC – Milton, Wisconsin
American Engineering Testing, Inc. Test Dates August 26-27, 2009

Emissions testing were conducted on the Fermentation (S07) and Process Vent Gas (S08) Scrubbers on August 26-27, 2009. The results are summarized below:

Emission Unit Tested	Pollutant	Emission Unit Limit	Test Result
Fermentation Scrubber (S07)	VOC	0.543 Lbs/Hr per 1000 gallons of Ethanol Produced 98% Removal Efficiency	0.097 Lbs/Hr ⁽¹⁾ per 1000 gallons 99.3 % Removal Efficiency
	Acetaldehyde	0.36 Lbs/Hr	< 0.026 Lbs/Hr ⁽²⁾
	Acrolein	0.105 Lbs/Hr	< 0.017 Lbs/Hr ⁽³⁾
Process Vent Gas Scrubber (S08)	VOC	1.0 Lbs/hr 98% Removal Efficiency	< 0.0158 Lbs/hr ⁽¹⁾ 99.8 % Removal Efficiency
	Acetaldehyde	0.32 Lbs/Hr	< 0.0013 Lbs/hr ⁽²⁾

(1) Sum of the detected and non-detected compounds.

(2) Acetaldehyde was not detected. The test result represents the detection limit of the method.

(3) Acrolein was not detected. The test result represents the detection limit of the method.

<u>Fermentation Scrubber (S07) Emissions – August 27, 2009</u>				
	<u>Run #1</u>	<u>Run #2</u>	<u>Run #3</u>	<u>Average</u>
Acetaldehyde (LB/HR)	< 0.022	< 0.025	< 0.031	< 0.026
Acetic Acid (LB/HR)	< 0.028	0.027	0.024	0.026
Acrolein (LB/HR)	< 0.015	< 0.017	< 0.021	< 0.017
Ethanol (LB/HR)	0.062	0.088	1.248	0.466
Formaldehyde (LB/HR)	< 0.006	< 0.006	< 0.007	< 0.006
Formic Acid (LB/HR)	< 0.028	< 0.029	< 0.035	< 0.030
2-Furaldehyde (LB/HR)	< 0.009	< 0.010	< 0.011	< 0.010
Methanol (LB/HR)	< 0.003	< 0.007	< 0.004	< 0.005
Total Detected and Non-Detected VOC's (LB/HR)	< 0.171	< 0.207	< 1.381	< 0.587
Total Detected and Non-Detected HAP's (LB/HR)	< 0.045	< 0.054	< 0.063	< 0.054
Inlet VOCs, lbs/hr as Propane (EPA Method 25A)	147	163	278	196
Outlet VOCs, lbs/hr as Propane (EPA Method 25A)	1.0	1.1	2.2	1.4
VOC Removal Efficiency (%)	99.3	99.3	99.2	99.3
<u>Operating Data</u>				
Scrubber Water Flow Rate, gpm	61.8	61.3	61.5	61.5
Bisulfite Injection Rate, ml/min	80	80	80	80
Scrubber Pressure, inches of water	2.8	2.9	5.1	3.6
Ethanol Flow Rate, gallons produced	6091	5947	6014	6017

EXECUTIVE SUMMARY (continued)

Process Vent Gas Scrubber (S08) Emissions – August 26, 2009

	<u>Run #1</u>	<u>Run #2</u>	<u>Run #3</u>	<u>Run #4</u>	<u>Average</u>
Acetaldehyde (LB/HR)	*	< 0.0014	< 0.0013	< 0.0012	< 0.0013
Acetic Acid (LB/HR)	*	< 0.0020	< 0.0024	< 0.0020	< 0.0021
Acrolein (LB/HR)	*	< 0.0009	< 0.0008	< 0.0007	< 0.0008
Ethanol (LB/HR)	*	0.0081	0.0104	< 0.0049	< 0.0078
Formaldehyde (LB/HR)	*	< 0.0004	< 0.0005	< 0.0004	< 0.0004
Formic Acid (LB/HR)	*	< 0.0020	< 0.0024	< 0.0020	< 0.0021
2-Furaldehyde (LB/HR)	*	< 0.0007	< 0.0008	< 0.0007	< 0.0007
Methanol (LB/HR)	*	< 0.0005	< 0.0006	< 0.0005	< 0.0005
Total Detected and Non-Detected VOC's (LB/HR)	*	< 0.0158	< 0.0192	< 0.0123	< 0.0158
Total Detected and Non-Detected HAP's (LB/HR)	*	< 0.0031	< 0.0032	< 0.0028	< 0.0030
Inlet VOCs, lbs/hr as Propane (EPA Method 25A)	24	28	30	-	27
Outlet VOCs, lbs/hr as Propane (EPA Method 25A)	0.0371	0.0489	0.0452	-	0.0437
VOC Removal Efficiency (%)	99.8	99.8	99.8	-	99.8
Operating Data					<u>Average 2-4</u>
Scrubber Water Flow Rate, gpm	18.2	18.1	18.2	18.3	18.2
Bisulfite Injection Rate, ml/min	30	30	30	30	30
Scrubber Pressure, inches of water	3.3	3.4	3.1	3.6	3.4
Ethanol Flow Rate, gallons produced	4431	4909	4907	4856	4891

* Run 1 was not analyzed due to complications in the field during sample recovery

1 Introduction

This document reports the results of the test program conducted at:

United Ethanol, LLC
Milton, Wisconsin

Compliance testing was conducted August 26-27, 2009 on the Fermentation Scrubber (S07) and Process Vent Gas Scrubber (S08). Testing was performed to demonstrate compliance with Wisconsin Department of Natural Resources (WDNR) air permit No. 07-DCF-239.

On-site American Engineering Testing personnel included Mr. Luke Westrich and Mr. Andy Frechette. Testing was coordinated by Mr. Dennis Hatfield of RMT, Inc. and Mr. Norm Scheels of United Ethanol, LLC. Testing was witnessed by Mr. Brian Barbieur and Andy Seeber from the (WDNR).

2 Process and Control Equipment Descriptions

United Ethanol, LLC is an ethanol production facility. This facility produces ethanol utilizing the dry-mill process.

The Fermentation Scrubber (S07) controls the emissions from the fermentation operations. These operations include three fermenters and one beer well.

The Process Vent Gas Scrubber (S08) controls emissions from various processes including evaporation, molecular sieve, and condensation.

2.1 Testing Conditions

Testing was conducted near the maximum production rates. Scrubber operating data was provided by United Ethanol, LLC and is included in Appendix H.

3 Summary of Results

3.1 Fermentation Scrubber Emissions Testing

The speciated VOC/HAP emission rate and control efficiency of the Fermentation Scrubber (S07) were determined on August 27, 2009. This test condition included the injection of ammonium bisulfite into the scrubber water.

Testing was conducted during the time frame listed below:

Run #1 – 08:20-09:20 hrs. – 08/27/09

Run #2 – 10:20-11:20 hrs. – 08/27/09

Run #3 – 15:00-16:00 hrs. – 08/27/09

A summary of the monitoring follows:

1. Samples were collected at the Fermentation Scrubber outlet for the determination of acetaldehyde, acrolein, acetic acid, ethanol, formaldehyde, formic acid, 2-furaldehyde, and methanol emissions in accordance with modified EPA Method 18/NCASI 94.02. Analytical laboratory results are enclosed in Appendix E. The complete laboratory report can be made available upon request.
2. The VOC control efficiency was determined utilizing EPA Method 25A. Two continuously recording flame ionization analyzers (FIA) were deployed at the Fermentation Scrubber's inlet and outlet (simultaneously) for the determination of the VOC control efficiency. Average results were used for all emission calculations. The three run average indicates the VOC control efficiency rate at 99.3 %. A summary of emission results is shown in Table 1. Emission results for individual locations are enclosed in Appendix A. Analyzer field data sheets, raw FIA results (datalogger and charts) are enclosed in Appendix B.
3. The stack gas oxygen and carbon dioxide content were determined in accordance with EPA Method 3A and stack gas moisture content was determined in accordance with EPA Method 4 using the wet bulb/dry bulb technique. A summary of emission results is shown in Table 2 and detailed results are included in Appendix C.
4. Volumetric airflow measurements were conducted in accordance with EPA Method 2. Two measurements were conducted during each run and the average of the two airflows was used for the determination of the mass emission rate. Individual detailed air flow results and field data sheets are enclosed in Appendix D.
5. Based on the test results, the total non-detected and detected speciated VOC emission rate averaged 0.097 lbs/hr per 1000 gallons of Ethanol produced during the three test runs. Ethanol and Acetic Acid were the only two compounds detected during the testing. Acetaldehyde was not detected during the testing and the emission rate averaged < 0.026 lbs/hr based on the detection limit. Acrolein was also not detected during the testing and the emission rate averaged < 0.017 lbs/hr based on the detection limit. A summary of the results is shown in Table 2.

3.2 Process Vent Gas Scrubber Emissions Testing

The speciated VOC/HAP emission rate and the VOC control efficiency of the Process Vent Gas Scrubber (S08) were determined on August 26, 2009. This test condition included the injection of ammonium bisulfite into the scrubber water.

Testing was conducted during the time frame listed below:

Run #1 – 08:13-09:13 hrs. – 08/26/09

Run #2 – 10:10-11:10 hrs. – 08/26/09

Run #3 – 12:10-13:10 hrs. – 08/26/09

Run #4 – 14:00-15:00 hrs. – 08/26/09

A summary of the monitoring follows:

1. Samples were collected at the Process Vent Scrubber outlet for the determination of acetaldehyde, acrolein, acetic acid, ethanol, formaldehyde, formic acid, 2-furaldehyde, and methanol emissions in accordance with modified EPA Method 18/NCASI 94.02. Analytical laboratory results are enclosed in Appendix E. The complete laboratory report can be made available upon request.
2. The VOC control efficiency was determined utilizing EPA Method 25A. Two continuously recording flame ionization analyzers (FIA) were deployed at the Process Vent Scrubber's inlet and outlet (simultaneously) for the determination of the VOC control efficiency. Average results were used for all emission calculations. The three run average indicates the VOC control efficiency rate at 99.8 %. A summary of emission results is shown in Table 3. Emission results for individual locations are enclosed in Appendix A. Analyzer field data sheets, raw FIA results (datalogger and charts) are enclosed in Appendix B.
3. The stack gas oxygen and carbon dioxide content were determined in accordance with EPA Method 3A and stack gas moisture content was determined in accordance with EPA Method 4 using the wet bulb/dry bulb technique. A summary of emission results is shown in Table 4 and detailed results are included in Appendix C.
4. Volumetric airflow measurements were conducted in accordance with EPA Method 2. Two measurements were conducted during each run and the average of the two airflows was used for the determination of the mass emission rate. Individual detailed air flow results and field data sheets are enclosed in Appendix D.
5. Based on the test results, the total non-detected and detected speciated VOC emission rate averaged 0.0158 lbs/hr during the three test runs. Ethanol was the only compound detected during the testing. Acetaldehyde was not detected during the testing and the emission rate averaged < 0.0013 lbs/hr based on the detection limit. Samples from run #1 were not analyzed due to a small spillage of the impinger catch during sample recovery. Results from Run #2-4 were used for this report. A summary of the results is shown in Table 4.

4 Test Procedures

Testing was conducted in accordance with the methods and procedures detailed in the following sections.

4.1 Volumetric Airflow Measurement

The location of the sampling sites and sampling points were determined in accordance with EPA Method 1. Upstream and downstream distances to flow disturbances were measured and used to determine the minimum number of traverse points. Test locations are included in Figures 1 and 2.

The stack gas velocity and volumetric flow rate were determined in accordance with EPA Method 2. An electronic digital manometer in conjunction with an S-type pitot tube was used to measure the pressure differential at each traverse point. The stack temperature was measured using a digital thermometer and a type-k thermocouple. Ambient pressure was determined using a calibrated altimeter. EPA Method 3A was used to determine the stack gas molecular weight.

EPA Method 4 was used to determine the stack gas moisture content. Stack gas moisture content was determined using wet-bulb/dry-bulb temperatures. Temperatures were measured using a digital thermometer and two fast-responding, low-mass thermocouples.

Calibration data for equipment used during testing is enclosed in Appendix G. Calculations and nomenclatures used are enclosed in Appendix F.

4.2 Speciated VOC Concentration Measurements

4.2.1 Speciated VOC/HAP by EPA Method

18/NCASICI/SG/PULP-94.02

Acetaldehyde, acrolein, acetic acid, ethanol, formaldehyde, formic acid, 2-furaldehyde, and methanol were quantified using modified EPA Method 18/NCASI CI/SG/PULP-94.02. Stack gas was collected through a heated probe and filter; then condensed through iced midget impingers containing HPLC grade water followed by a silica gel tube. Sample volume was determined using a dry gas meter. Acetaldehyde and Acrolein concentrations were quantified using modified EPA Method 18. Samples were collected using an evacuated tedlar bag preceded by a knockout impinger. Subsequent analyses were performed using gas chromatography with a flame ionization detector (GC/FID).

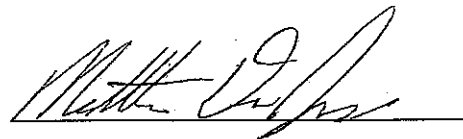
Calculations and nomenclatures used are enclosed in Appendix F. Calibration data for equipment used during testing is enclosed in Appendix G.

5 Signatures

The services performed by American Engineering Testing, Inc. for this project have been conducted in a manner consistent with that level of skill and care ordinarily exercised by other members of the profession currently practicing in this area. The results included in this report relate only to the items being tested and at the time and conditions present during this test.

We verify that the data presented in this test report are, to the best of our knowledge and belief, true, accurate, and complete.

Report Prepared By:
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Report Reviewed By:
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