AMERICAN ENGINEERING TESTING, INC.

CONSULTANTS
- ENVIRONMENTAL
- GEOTECHNICAL
- MATERIALS
- FORENSICS

February 21, 2020

Air Quality Compliance
Nebraska Department of Environmental and Energy
Suite 400, The Atrium Building
1200 N Street
Lincoln, NE 68509-8922

Subject: **Test Protocol for Gasifier/Thermal Oxidizer Air Emissions Testing**
AltEn, LLC – Mead, Nebraska
AET Project No. 14-20298

To Whom it may Concern:

On behalf of AltEn, LLC, American Engineering Testing, Inc. is resubmitting the above titled test protocol for the emissions testing at the facility located in Mead, NE.

The testing has been scheduled for March 25, 2020 with March 26, 2020 reserved for contingency.

If you have any questions or comments, please feel free to contact me at (651) 603-6611.

Sincerely,

Austin J. Lesmeister
Manager
Environmental Field Department

Enc: Test Protocol

cc: Mr. Brad Anderson – AltEn, LLC
Mr. Ken Peterson – AltEn, LLC
Mr. Scott Tinglehoff – AltEn, LLC

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Test Protocol for Gasifier/Thermal Oxidizer Air Emissions Testing

AltEn, LLC
1344 County Road 10
Mead, Nebraska 68041

Facility ID Nos. 084069, 111532
AET Project No. 14-20298

Date:

February 21, 2020

Proposed Test Date:

March 25, 2020

Prepared for:

Mr. Brad Anderson
AltEn, LLC
1344 County Road 10
Mead, Nebraska 68041

Prepared By:

American Engineering Testing, Inc.
550 Cleveland Avenue North
Saint Paul, Minnesota 55114

TABLE OF CONTENTS
AET PROJECT No. 14-20298

PART I. GENERAL INFORMATION

1. Name and address of emission facility:

AltEn, LLC
1344 County Road 10
Mead, Nebraska 68041

Contact Mr. Brad Anderson
Phone No: (402) 624-2000 ext. 1010
E-Mail: banderson@mrgkc.com

2. Reason the emission units are to be tested:

Testing is being conducted to comply with NDEE Administrative Compliance Order No. 3469 to generate emission factors for VOC, HAP, CO and PM_{10}.

3. Physical description of the emission unit to be tested:

Gasifier/Thermal Oxidizer – Distillers grains are fed from the adjacent ethanol production facility into a gasifier. The gasifier removes moisture and gases from the solids, leaving an activated carbon charcoal. The exhaust gases are routed to a thermal oxidizer for emission control.

Testing will be conducted on the following emission point:

4. Name of independent testing company, contact person and telephone number:

American Engineering Testing, Inc
550 Cleveland Avenue North
St. Paul, MN 55114

Contact: Austin J. Lesmeister
Phone No: (651)-603-6611
E-Mail: alesmeister@amengtest.com

5. Safety precautions and personal protective equipment:

AltEn, LLC requires the use of hard hats, steel-toed footwear, hearing protection and safety glasses while in all production areas.

PART II. TESTING REQUIREMENTS

1. The following is a description of the source and pollutants to be tested, the applicable emission limits, rules or regulations, and test methodologies for each:

Emission Unit No.	Limitation Basis of Pollutant Tested	Pollutant Tested and Applicable Emission Limit	Specific Methods/Procedures Required Citation
GASIFIER/THERMAL OXIDIZER	NDEE Administrative Compliance Order 3469	$PM/PM_{10}/PM_{2.5}$ (1)	EPA Methods 1-4 and 5/202
		CO	EPA Methods 1-4 and 10
		VOC/HAP	EPA Methods 1-4, 18 and NCASI 94.02

(1) Total PM will be used as a surrogate for PM_{10} and $PM_{2.5}$.

PART III. OPERATING CONDITIONS

1. The following contains a detailed description of the operating conditions for each emission unit to be tested including the specific time interval, process rates, operating capacity, control device parameters, and other special operating conditions:

Gasifier/Thermal Oxidizer

Process equipment description for units to be tested: Gasifier producing biochar from DDGS received from adjacent ethanol facility
Process equipment parameter monitoring during performance test: Operating condition: Normal, approximate maximum of 14 Tons per day Process rates: Product Manufactured, Tons per Day
Control equipment description: Thermal Oxidation
Control Equipment Operating Parameter During Test: Thermal Oxidizer Chamber Temperature, °F

2. The approximate maximum process rates for each emission unit are listed in the previous tables. The average/normal process and operating rates will be verified onsite and included in the final report.

PART IV. TEST METHODS AND LOCATIONS

1. The following is description of the methods, number of test runs and length of test runs for determination of air emissions:

A. Volumetric Airflow Measurement:

- EPA Method 1 for the location of sampling ports and traverse points. Stack measurements will be verified on-site. The absence of cyclonic flow will be verified for all locations. Stack schematics will be provided in the final report.

- EPA Method 2 for velocity and volumetric flow rate. One measurement will be conducted at the outlet during each run.
- EPA Method 3A will be performed for the determination of stack gas molecular weight. Three, sixty-minute test runs will be conducted.
- EPA Method 4 for the determination of stack gas moisture. The large impinger technique will be employed.

B. Total PM/PM_{10} Concentrations:

- EPA Methods 5 or 17 and 202 will be performed for determination of particulate matter. A minimum of three, 60-minute test runs will be conducted. EPA Method 202 will only be performed if the stack temperature exceeds 85°F.

C. Carbon Monoxide Concentrations:

- EPA Method 10 will be conducted for the instrumental determination of carbon monoxide concentration. Three, 60-minute runs will be performed.

D. VOC/HAP Concentrations:

- Modified NCASI 94.02/EPA Method 18 for the determination of acetaldehyde, acrolein, ethanol, ethyl acetate, formaldehyde, formic acid, isoamyl alcohol, and methanol for the calculation of VOC and HAP emissions. The sum of the detected and undetected speciated VOC/HAP will be used to determine the VOC/HAP mass emission rate. One spiked sample will be collected to verify QC standards for the method. Three, sixty-minute test runs will be conducted.

2. The following identifies proposed deviations from EPA methods:

A. VOC/HAP Concentrations

- EPA Method 18/NCASI CI/SG/PULP- 94.02 will be modified as follows:
  - Acetaldehyde and acrolein samples will be collected in Tedlar bags with an iced condensate knockout impinger located prior to the bag. The knockout impinger will be analyzed only if a quantifiable amount of liquid is obtained.
  - Formaldehyde will be analyzed using UV Spectrophotometric techniques.

PART V. SCHEDULES

1. Testing is anticipated to be conducted according to the following schedule:

Wednesday March 25, 2020	Thursday March 26, 2020
Compliance Testing	Contingency Day

2. Two copies of the comprehensive test report will be submitted to the Nebraska Department of Environmental and Energy (NDEE) within 35 days after the date of the test.

Appendix A

Field Data Sheets

AMERICAN ENGINEERING TESTING, INC.

EPA Method 2
(Except where noted)

Client Name:	Project Title:
Contact:	Project Number:
Unit Tested:	Test Location:

Test Data						
Test Time						
Test Date						
Pitot Tube Leak Check						
Ambient Pressure in. Hg						
Static Pressure in. H20						
Pitot Tube Coefficient , C_p						
O_2 % (Method)						
CO_2 % (Method)						
Wet Bulb °F (EPA Method 4)						
Dry Bulb °F (EPA Method 4)						

No.	T-Ins. in.	a°	Δ p	Δ p	Δ p	Δ p	Δ p	Δ p
Average:			-----		-----		-----	

Stack/Duct Information
Configuration:
Orientation:
Dimensions in:
A Distance in.:
B Distance in.:
Port Dia. in:
Port Length in:
Traverse Points:
Traverse Matrix:
Conducted By:

Equipment Information
Manometer ID:
Thermometer ID:
Thermocouple ID:
Thermocouple ID:
Pitot Tube ID:
Barometer ID:

<u>Schematic of Stack</u>

Data Reviewed By :

AMERICAN ENGINEERING TESTING, INC.

EPA METHOD 3A ANALYZER MONITORING DATA SHEET

Client Name:		Project Title:	
Project Number:		Client Contact:	
Test Location:		Test Number:	Test Date: / Duct Diameter:

Calibration Gas Composition	Cylinder No.	Cylinder Values O_2 [%d]	Cylinder Values CO_2 [%d]
Zero Nitrogen			
High-Level Span O_2/CO_2 in N_2			
Mid-Level Span O_2/CO_2 in N_2			

Test Times:
Run #1
Run #2
Run #3

O_2 Analyzer System		Calibration Time, hr:		
O_2 Analyzer ID #:		O_2 Analyzer Range, %:		
O_2 Analyzer Calibration	Cylinder Value, %	Analyzer Response, %	Absolute Difference, %	Difference, % of Span
Zero Gas, %				
High-Level Span, %				
Mid-Level Span, %				

CO_2 Analyzer System		Calibration Time, hr:		
CO_2 Analyzer ID #:		CO_2 Analyzer Range, %:		
CO_2 Analyzer Calibration	Cylinder Value, %	Analyzer Response, %	Absolute Difference, %	Difference, % of Span
Zero Gas, %				
High-Level Span, %				
Mid-Level Span, %				

System Bias Check	Cylinder Value, %	System Response, %	Absolute Difference, %	Difference, % of span
Zero Gas, %				
Upscale Gas, %				

System Bias Check	Cylinder Value, %	System Response, %	Absolute Difference, %	Difference, % of span
Zero Gas, %				
Upscale Gas, %				

Stratification Test Time, hrs:		O_2 %, 1 min average	O_2 %, Deviation from Mean	CO_2 %, 1 min average	CO_2 %, Deviation from Mean
Diameter x 0.167, in					
Diameter x 0.500, in					
Diameter x 0.833, in					

Result:	Response Test	O_2 Time, sec	CO_2 Time, sec	Response Time, sec:
	Zero Gas to High Span			
	High Span to Zero Gas			

System Drift Checks	Time, Hrs	Initial System Response, %	Final System Response, %	Post Run System Drift, % of Span	System Performance, % of Span
Zero Gas, %					
Upscale Gas, %					
Zero Gas, %					
Upscale Gas, %					
Zero Gas, %					
Upscale Gas, %					
Zero Gas, %					
Upscale Gas, %					
Zero Gas, %					
Upscale Gas, %					

System Drift Checks	Time, Hrs	Initial System Response, %	Final System Response, %	Post Run System Drift, % of Span	System Performance, % of Span
Zero Gas, %					
Upscale Gas, %					
Zero Gas, %					
Upscale Gas, %					
Zero Gas, %					
Upscale Gas, %					
Zero Gas, %					
Upscale Gas, %					
Zero Gas, %					
Upscale Gas, %					

Analyzer Calibration Error =

$$\frac{\text{Analyzer Response - Cylinder Value}}{\text{Span}} \times 100$$

Criteria ≤ 2% of Span or ≤ 0.5 % (whichever is larger)

Pre-Run System Bias =

$$\frac{\text{System Response - Cylinder Value}}{\text{Span}} \times 100$$

Criteria ≤ 5% of Span or ≤ 0.5 % (whichever is larger)

Post-Run System Bias and Drift =

$$\frac{\text{Final System Response - Initial System Response}}{\text{Span}} \times 100$$

Criteria ≤ 5% of Span or ≤ 0.5 % (whichever is larger)

Recalibration Required if System Drift ≥ 3%

Form Completed by:	Date Completed:	Present on Site:
Data Reviewed by:	American Engineering Testing, Inc 550 Cleveland Ave N. St. Paul, MN 55114	REV - 041217

AMERICAN ENGINEERING TESTING, INC.

EPA METHOD 10 ANALYZER MONITORING DATA SHEET

Client Name:		Project Title:	
Project Number:		Client Contact:	
Test Location:		Test Number:	Test Date:	Duct Diameter:

Calibration Gas Composition	Cylinder No.	Cylinder Values CO [ppm_{vd}]
Zero Nitrogen		
High-Level Span CO in N_2		
Mid-Level Span CO in N_2		

Test Times:
Run #1
Run #2
Run #3

CO Analyzer System		Calibration Time, hr:		
CO Analyzer ID #:		CO Analyzer Range [ppm_v]:		
CO Analyzer Calibration	Cylinder Value, ppm_{vd}	Analyzer Response, ppm_{vd}	Absolute Difference, ppm_{vd}	Difference, % of Span
Zero Gas, ppm_{vd}				
High-Level Span, ppm_{vd}				
Mid-Level Span, ppm_{vd}				

CO Analyzer System		Calibration Time, hr:		
CO Analyzer ID #:		CO Analyzer Range [ppm_v]:		
CO Analyzer Recalibration	Cylinder Value, ppm_{vd}	Analyzer Response, ppm_v	Absolute Difference, ppm_{vd}	Difference, % of Span
Zero Gas, ppm_{vd}				
High-Level Span, ppm_{vd}				
Mid-Level Span, ppm_{vd}				

System Bias Check	Cylinder Value, ppm_{vd}	System Response, ppm_{vd}	Absolute Difference, ppm_{vd}	Difference, % of span
Zero Gas, ppm_{vd}				
Upscale Gas, ppm_{vd}				

System Bias Check	Cylinder Value, ppm_{vd}	System Response, ppm_{vd}	Absolute Difference, ppm_{vd}	Difference, % of span
Zero Gas, ppm_{vd}				
Upscale Gas, ppm_{vd}				

Stratification Test Time, hrs:		CO ppm_{vd}, 1 min average	CO Deviation from Mean
Diameter x 0.167, in			
Diameter x 0.500, in			
Diameter x 0.833, in			

Result:	Response Test	Time, sec	Response Time, sec:
	Zero Gas to High Span		
	High Span to Zero Gas		

System Drift Checks	Time, Hrs	Initial System Response, ppm_{vd}	Final System Response, ppm_{vd}	Post Run System Drift, % of Span	System Performance, % of Span
Zero Gas, ppm_{vd}					
Upscale Gas, ppm_{vd}					
Zero Gas, ppm_{vd}					
Upscale Gas, ppm_{vd}					
Zero Gas, ppm_{vd}					
Upscale Gas, ppm_{vd}					
Zero Gas, ppm_{vd}					
Upscale Gas, ppm_{vd}					
Zero Gas, ppm_{vd}					
Upscale Gas, ppm_{vd}					

System Drift Checks	Time, Hrs	Initial System Response, ppm_{vd}	Final System Response, ppm_{vd}	Post Run System Drift, % of Span	System Performance, % of Span
Zero Gas, ppm_{vd}					
Upscale Gas, ppm_{vd}					
Zero Gas, ppm_{vd}					
Upscale Gas, ppm_{vd}					
Zero Gas, ppm_{vd}					
Upscale Gas, ppm_{vd}					
Zero Gas, ppm_{vd}					
Upscale Gas, ppm_{vd}					
Zero Gas, ppm_{vd}					
Upscale Gas, ppm_{vd}					

Analyzer Calibration Error =

$$\frac{\text{Analyzer Response - Cylinder Value}}{\text{Span}} \times 100$$

Criteria ≤ 2% of Span or ≤ 0.5 ppm (whichever is larger)

Pre-Run System Bias =

$$\frac{\text{System Response - Cylinder Value}}{\text{Span}} \times 100$$

Criteria ≤ 5% of Span or ≤ 0.5 ppm (whichever is larger)

Post-Run System Bias and Drift =

$$\frac{\text{Final System Response - Initial System Response}}{\text{Span}} \times 100$$

Criteria ≤ 5% of Span or ≤ 0.5 ppm (whichever is larger)

Recalibration Required if System Drift ≥ 3%.

Form Completed by:	Date Completed:	Present on Site:
Data Reviewed by:	American Engineering Testing, Inc 550 Cleveland Ave N. St. Paul, MN 55114	REV - 041217

AMERICAN ENGINEERING TESTING, INC.

EPA METHOD 25A ANALYZER MONITORING DATA SHEET

Client Name:		Project Title:	
Project Number:		Client Contact:	
Test Location:	Test Number:	Test Date:	Duct Diameter:

Calibration Gas Composition	Cylinder No.	Cylinder Value
Zero Air, ppm_v		
High Span Propane in Air, ppm_v		
Mid Span Propane in Air, ppm_v		
Low Span Propane in Air, ppm_v		

Test Times:

Run #1

Run #2

Run #3

Sample Line Length, ft:	
Sample Line Temp, °F	
Response Test #1, sec	
Response Test #2, sec	
Response Test #3, sec	
Response Time, sec:	

THC Analyzer System: Time, hr:

THC Analyzer ID #: THC Analyzer Range, ppm_v:

System Calibration	Cylinder Value, ppm_v	System Response, ppm_v	Absolute Difference, ppm_v	Difference, % of Cyl. Value
Zero Gas, ppm_v				
High Span, ppm_v				
Mid Span, ppm_v				
Low Span, ppm_v				

System Drift Checks	Time, hrs	Initial System Response, ppm_v	Final System Response, ppm_v	System Drift, % of Span
Zero Gas, ppm_v				
Upscale Gas, ppm_v				
Zero Gas, ppm_v				
Upscale Gas, ppm_v				
Zero Gas, ppm_v				
Upscale Gas, ppm_v				
Zero Gas, ppm_v				
Upscale Gas, ppm_v				
Zero Gas, ppm_v				
Upscale Gas, ppm_v				
Zero Gas, ppm_v				
Upscale Gas, ppm_v				

THC Analyzer System Cal #2: Time, hr:

THC Analyzer ID #: THC Analyzer Range, ppm_v:

System Calibration	Cylinder Value, ppm_v	System Response, ppm_v	Absolute Difference, ppm_v	Difference, % Cyl. Value
Zero Gas, ppm_v				
High Span, ppm_v				
Mid Span, ppm_v				
Low Span, ppm_v				

System Drift Checks	Time, hrs	Initial System Response, ppm_v	Final System Response, ppm_v	System Drift, % of Span
Zero Gas, ppm_v				
Upscale Gas, ppm_v				
Zero Gas, ppm_v				
Upscale Gas, ppm_v				
Zero Gas, ppm_v				
Upscale Gas, ppm_v				
Zero Gas, ppm_v				
Upscale Gas, ppm_v				
Zero Gas, ppm_v				
Upscale Gas, ppm_v				
Zero Gas, ppm_v				
Upscale Gas, ppm_v				

Analyzer Calibration Error = $\frac{\text{System Response - Cylinder Value}}{\text{Span}} \times 100$

Criteria ≤ 5% of Cylinder Value

System Drift = $\frac{\text{Final System Response - Initial System Response}}{\text{Span}} \times 100$

Criteria ≤ 3% of Span

Form Completed by:	Date Completed:	Present on Site:
Data Reviewed by:	American Engineering Testing, Inc 550 Cleveland Ave N. St. Paul, MN 55114	REV - 041217

Speciated VOC Sampling Data

Client Name - City, State
Name of Unit Tested
AET #14-XXXXX

Run Number:	
Test Date:	
Start Time, hrs:	
Duration, min:	60
Test Method:	NCASI/Modified Method 18
Meter Box ID:	
Stack Thermocouple ID:	
DGM Correction Factor:	
Probe Material:	
Probe Temp. °F:	
Filter Temp. °F:	
Ambient Pressure, in. Hg:	

Time, hrs.	Dry Gas Meter Reading, L	Vacuum In. Hg	Probe Temp. °F	Filter Temp. °F	Meter IN Temp. °F	Meter OUT Temp. °F	Stack Temp. °F
		---	---	---	---	---	---
	Average:						

Train Data	Compound	Mass Collected, ug	Flow Rate, DSCFM	Rate, Lbs/Hr
			Total, lbs/hr:	

Leak Test Parameters	Result		Test Parameters	Result
Initial DGM Reading:			Test Run Duration, min:	
Final DGM Reading:			Volume Metered, L:	
Duration, min:			DGM Absolute Temperature, °R:	
Leak Rate, LPM:			Volume Metered, DSL:	
Max Leak Rate, LPM:			Volume Metered, DSM^3:	
Test Result, Pass/Fail:			Volume Metered, DSCF:	
Form Completed by:			Date Completed:	
Data Reviewed by:				REV-010715