IN MACES

11/26/14 emailed to R. Dickman

BTEC Inc.

NZ313

EUDRYER Emissions Test Report

Prepared for:

Towns Brothers Construction Co.

Ludington, Michigan

Towns Brothers Construction Co.
679 S. Pere Marquette Hwy
P.O. Box 608
Ludington, Michigan

Project No. 14-4603.00
November 26, 2014

BT Environmental Consulting, Inc.
4949 Fernlee Avenue
Royal Oak, Michigan 48071
(248) 548-8070

EXECUTIVE SUMMARY

BT Environmental Consulting, Inc. (BTEC) was retained by Towns Brothers Construction Company (Towns Brothers) to conduct compliance emissions testing at the Towns Brothers facility in Ludington, Michigan. The test program consisted of sampling for filterable particulate matter (PM) and visual opacity emissions from the EUDRYER exhaust stack.

Testing of the source consisted of triplicate 120-minute test runs for PM and 60-minute opacity readings at the EUDRYER exhaust stack. Sampling was performed utilizing United States Environmental Protection Agency (USEPA) reference test methods. Testing occurred on October 14, 2014. The results of the emissions test program will be used to demonstrate compliance with MDEQ Permit No. 158-94C and are summarized by Table I.

Table I
EUDRYER Emission Summary
Test Date: October 14th, 2014

Source	Pollutant	Average Test Result	Emission Limit
EUDRYER	Particulate Matter (PM)	0.117 lb/ 1000 lb of exhaust gas	0.01lb/ 1000 lb of exhaust gas
	VE	0	10%

1. Introduction

BT Environmental Consulting, Inc. (BTEC) was retained by Towns Brothers Construction Company (Towns Brothers) to conduct compliance emissions testing at the Towns Brothers facility in Ludington, Michigan. The test program consisted of sampling for filterable particulate matter (PM) and visual opacity emissions from the EUDRYER exhaust stack. The emissions test program was conducted on October 14, 2014. The purpose of this report is to document the results of the test program.

AQD has published a guidance document entitled "Format for Submittal of Source Emission Test Plans and Reports" (December 2013). The following is a summary of the emissions test program and results in the format suggested by the aforementioned document.

1.a Identification, Location, and Dates of Test

Sampling and analysis for the emission test program was conducted on October 14, 2014 at the Towns Brothers facility located in Ludington, Michigan. The test program included evaluation of PM and opacity from EUDRYER.

1.b Purpose of Testing

AQD issued Permit to Install 158-94C to Towns Brothers on October 11, 2012. This permit limits emissions as summarized by Table 1.

Table 1
Emission Limitations

Source	Pollutant	Emission Limit
EUDRYER	Particulate Matter (PM)	0.01lb/ 1000 lb of exhaust gas
	VE	10%

1.c Source Description

The EUDRYER, 30.00 MMBtu/hr natural gas-fired rotary drum dryer for drying chrome ore or sand and is controlled by a dry fabric filter dust collector.

1.d Test Program Contacts

Names, addresses, and telephone numbers of the contacts for information regarding the test and the test report, and names and affiliations of all personnel involved in conducting the testing.

The contact for the source and test report is:

Mr. Bob Towns
General Manager
Towns Brothers Construction Co.
679 S. Pere Marquette Hwy
P.O. Box 608
Ludington, Michigan 49431

Mr. Barry P. Boulianne
Senior Project Manager
BT Environmental Consulting, Inc.
4949 Fernlee Avenue
Royal Oak, MI 48073
313-449-2361

Names and affiliations for personnel who were present during the testing program are summarized by Table 2.

Table 2
Test Personnel

Name and Title	Affiliation	Telephone
Mr. Bob Towns General Manager	Towns Brothers Construction Co. 679 S. Pere Marquette Hwy P.O. Box 608 Ludington, Michigan 49431	(586)-336-5086
Mr. Todd Wessel Senior Project Manager	BTEC 4949 Fernlee Royal Oak, MI 48073	(616) 885-4013
Mr. Kenny Felder Environmental Technician	BTEC 4949 Fernlee Royal Oak, MI 48073	(248) 548-8070
Mr. Paul Draper Environmental Technician	BTEC 4949 Fernlee Royal Oak, MI 48073	(248) 548-8070
Mr. Rob Dickman	MDEQ Air Quality Division	(231) 876-4412

2. Summary of Results

Sections 2.a through 2.d summarize the results of the emissions compliance test program.

2.a Operating Data

Process data monitored during the emissions test program includes baghouse pressure drop and sand production and is available in Appendix E.

2.b Applicable Permit

The applicable permit for this emissions test program is Permit to Install 158-94C.

2.c Results

The overall results of the emission test program are summarized by Table 3 (see Section 5.a).

3. Source Description

Sections 3.a through 3.e provide a detailed description of the process.

3.a Process Description

A 30.0 MMBtu/hr natural gas-fired rotary drum dryer for drying chrome ore or sand and is controlled by a dry fabric filter dust collector.

3.b Process Flow Diagram

Due to the simplicity of the sand dryer, a process flow diagram is not necessary.

3.c Raw and Finished Materials

The raw material used by the process is natural gas and sand.

3.d Process Capacity

Permittee shall not process more than 3,600 tons of sand per day nor 1,314,000 tons of sand product per 12-month rolling time period, as determined at the end of each calendar month, through EUDRYER.

Permittee shall not process more than 20 tons of chrome ore per hour nor 129,000 tons of chrome ore per 12-month rolling time period, as determined at the end of each calendar month through EDRYER.

Permittee shall burn only natural gas in EUDRYER.

Permittee shall not process any asbestos tailing or asbestos containing waste materials in EUDRYER pursuant to the National Emission Standards for Hazardous Air Pollutants, 40 CFR Part 61 Subpart M.

3.e Process Instrumentation

Process data monitored during the emissions test program includes baghouse pressure drop and sand production and is available in Appendix E.

4. Sampling and Analytical Procedures

Sections 4.a through 4.d provide a summary of the sampling and analytical procedures used.

4.a Sampling Train and Field Procedures

The emissions test program utilized the following test methods codified at Title 40, Part 60, Appendix A of the Code of Federal Regulations (40 CFR 60, Appendix A):

- Method 1 - "Sample and Velocity Traverses for Stationary Sources"
- Method 2 - "Determination of Stack Gas Velocity and Volumetric Flowrate"
- Method 3 - "Determination of Molecular Weight of Dry Stack Gas"(Fyrite)
- Method 4 - "Determination of Moisture Content in Stack Gases"
- Method 5 - "Determination of Particulate Matter Emissions from stationary sources"
- Method 9 - "Determination of Visual Opacity from Stationary Sources"

Stack gas velocity traverses were conducted in accordance with the procedures outlined in Method 1 and Method 2. S-type pitot tubes with thermocouple assemblies, calibrated in accordance with Method 2, Section 4.1.1, were used to measure exhaust gas velocity pressures (using a manometer) and temperatures during testing. The S-type pitot tube dimensions outlined in Sections 2-6 through 2-8 are within specified limits, therefore, a baseline pitot tube coefficient of 0.84 (dimensionless) is assigned. A diagram of the sample points is provided in Figure 1.

Cyclonic flow checks were performed at each sampling location. The existence of cyclonic flow is determined by measuring the flow angle at each sample point. The flow angle is the angle between the direction of flow and the axis of the stack. If the average of the absolute values of the flow angles is greater than 20 degrees, cyclonic flow exists.

The Molecular Weight of the gas stream was evaluated according to procedures outlined in Title 40, Part 60, Appendix A, Method 3. The O_2/CO_2 content of the gas stream was measured using a Fyrite combustion analyzer.

Exhaust gas was extracted as part of the Method 5 sampling train. Exhaust gas moisture content was determined gravimetrically.

40 CFR 60, Appendix A, Method 5, *"Determination of Particulate Emissions from Stationary Sources"* was used to measure PM concentrations and calculate PM emission rates (see Figure 2 for a schematic of the sampling train).

BTEC's Nutech® Model 2010 modular isokinetic stack sampling system consists of (1) a steel nozzle, (2) a glass probe, (3) a Teflon connecting line to the impingers, (4) a set of four Greenburg-Smith (GS) impingers with the first two with 100 ml of deionized water (ii) an empty impinger, (iii) and an impinger filled with approximately 300 grams of silica gel. (5) a length of sample line, and (6) a Nutech® control case equipped with a pump, dry gas meter, and calibrated orifice.

A sampling train leak test was conducted before and after each test run. After completion of the final leak test for each test run, the filter was recovered, and the nozzle and the front half of the filter holder assembly were brushed and triple rinsed with acetone. The acetone rinses will were collected in a pre-cleaned sample container.

4.b Recovery and Analytical Procedures

See section 4.a.

4.c Sampling Ports

A diagram of the stack showing sampling ports in relation to upstream and downstream disturbances is included as Figure 1.

4.d Traverse Points

A diagram of the stack indicating traverse point locations and stack dimensions is included as Figure 1.

5. Test Results and Discussion

Sections 5.a through 5.k provide a summary of the test results.

5.a Results Tabulation

The overall results of the emissions test program are summarized by Table 3. Detailed results for the emissions test program are summarized by Table 4.

Table 3
EUDRYER Overall Emission Summary
Test Date: October 14th, 2014

Source	Pollutant	Average Test Result	Emission Limit
EUDRYER	Particulate Matter (PM)	0.117 lb/ 1000 lb of exhaust gas	0.01lb/ 1000 lb of exhaust gas
	VE	0	10%

5.b Discussion of Results

PM emissions from the EUDRYER are above the corresponding emission limit of 0.01 lb/ 1000 lb of exhaust gas. Visible emissions are below the limit of 10%.

5.c Sampling Procedure Variations

There were no sampling variations used during the emission compliance test program.

5.d Process or Control Device Upsets

No upset conditions occurred during testing.

5.e Control Device Maintenance

There was no control equipment maintenance performed during the emissions test program. A new bag house was installed 10 days before the test. The process was run for two days through the baghouse. This may have not been enough time to adequately seed the bags. Please see attached letter detailing the baghouse issues.

5.f Re-Test

The emissions test program was not a re-test.

5.g Audit Sample Analyses

No audit samples were collected as part of the test program.

5.h Calibration Sheets

Relevant equipment calibration documents are provided in Appendix B.

5.i Sample Calculations

Sample calculations are provided in Appendix C.

5.j Field Data Sheets

Field documents relevant to the emissions test program are presented in Appendix A.

5.k Laboratory Data

Laboratory analytical results are presented in Appendix E.

Tables

Table 3
EUDRYER Particulate Matter Emission Rates

Company	**Towns Brothers Construction**			
Source Designation	**Sand Dryer**			
Test Date	**10/14/2014**	**10/14/2014**	**10/14/2014**	
Meter/Nozzle Information	P-1	P-2	P-3	Average
Meter Temperature Tm (F)	79.5	87.9	86.3	84.5
Meter Pressure - Pm (in. Hg)	29.2	29.2	29.2	29.2
Measured Sample Volume (Vm)	83.3	92.6	94.8	90.3
Sample Volume (Vm-Std ft3)	79.4	86.9	89.3	85.2
Sample Volume (Vm-Std m3)	2.25	2.46	2.53	2.41
Condensate Volume (Vw-std)	24.834	24.094	27.804	25.577
Gas Density (Ps(std) lbs/ft3) (wet)	0.0690	0.0696	0.0690	0.0692
Gas Density (Ps(std) lbs/ft3) (dry)	0.0760	0.0760	0.0760	0.0760
Total weight of sampled gas (m g lbs) (wet)	7.19	7.72	8.08	7.66
Total weight of sampled gas (m g lbs) (dry)	6.03	6.60	6.78	6.47
Nozzle Size - An (sq. ft.)	0.000524	0.000524	0.000524	0.000524
Isokinetic Variation - I	92.4	94.5	100.1	95.7
Stack Data				
Average Stack Temperature - Ts (F)	290.8	290.8	299.0	293.6
Molecular Weight Stack Gas- dry (Md)	29.4	29.4	29.4	29.4
Molecular Weight Stack Gas-wet (Ms)	26.7	26.9	26.7	26.8
Stack Gas Specific Gravity (Gs)	0.921	0.930	0.922	0.924
Percent Moisture (Bws)	23.83	21.71	23.75	23.10
Water Vapor Volume (fraction)	0.2383	0.2171	0.2375	0.2310
Pressure - Ps ("Hg)	29.1	29.1	29.1	29.1
Average Stack Velocity -Vs (ft/sec)	43.8	45.6	45.9	45.1
Area of Stack (ft2)	5.1	5.1	5.1	5.1
Exhaust Gas Flowrate				
Flowrate ft^3(Actual)	13,299	13,840	13,934	13,691
Flowrate ft^3 (Standard Wet)	9,080	9,450	9,411	9,314
Flowrate ft^3 (Standard Dry)	6,916	7,399	7,176	7,164
Flowrate m^3 (standard dry)	196	210	203	203
Total Particulate Weights (mg)				
Nozzle/Probe/Filter	382.8	407.0	371.8	387.2
Total Particulate Concentration				
lb/1000 lb (wet)	0.117	0.116	0.101	0.112
lb/1000 lb (dry)	0.140	0.136	0.121	0.132
mg/dscm (dry)	170.3	165.4	147.1	160.9
gr/dscf	0.0744	0.0723	0.0643	0.0703
Total Particulate Emission Rate				
lb/ hr	4.43	4.60	3.97	4.33

Figures

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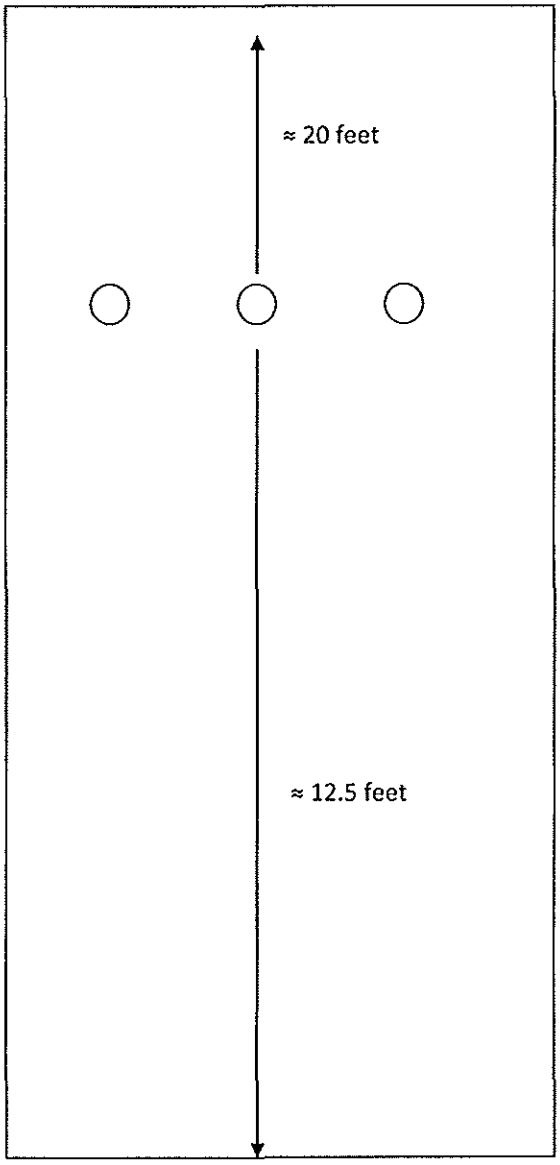
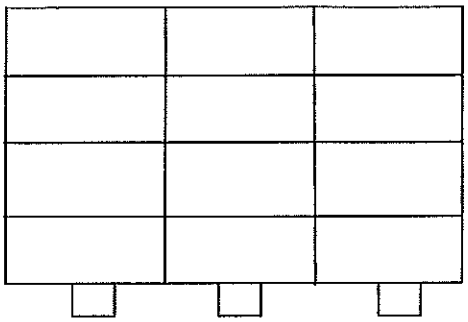
Stack Dimensions:

Depth:	27	inches
Width:	27	inches





Not to Scale

Points	Distance "
1	3.4
2	10.1
3	16.9
4	23.6

Figure No. 1

Site: **EUDRYER Exhaust** **Towns Brothers Construction Company** **Ludington, Michigan**	**Sampling Date:** **October 14, 2014**

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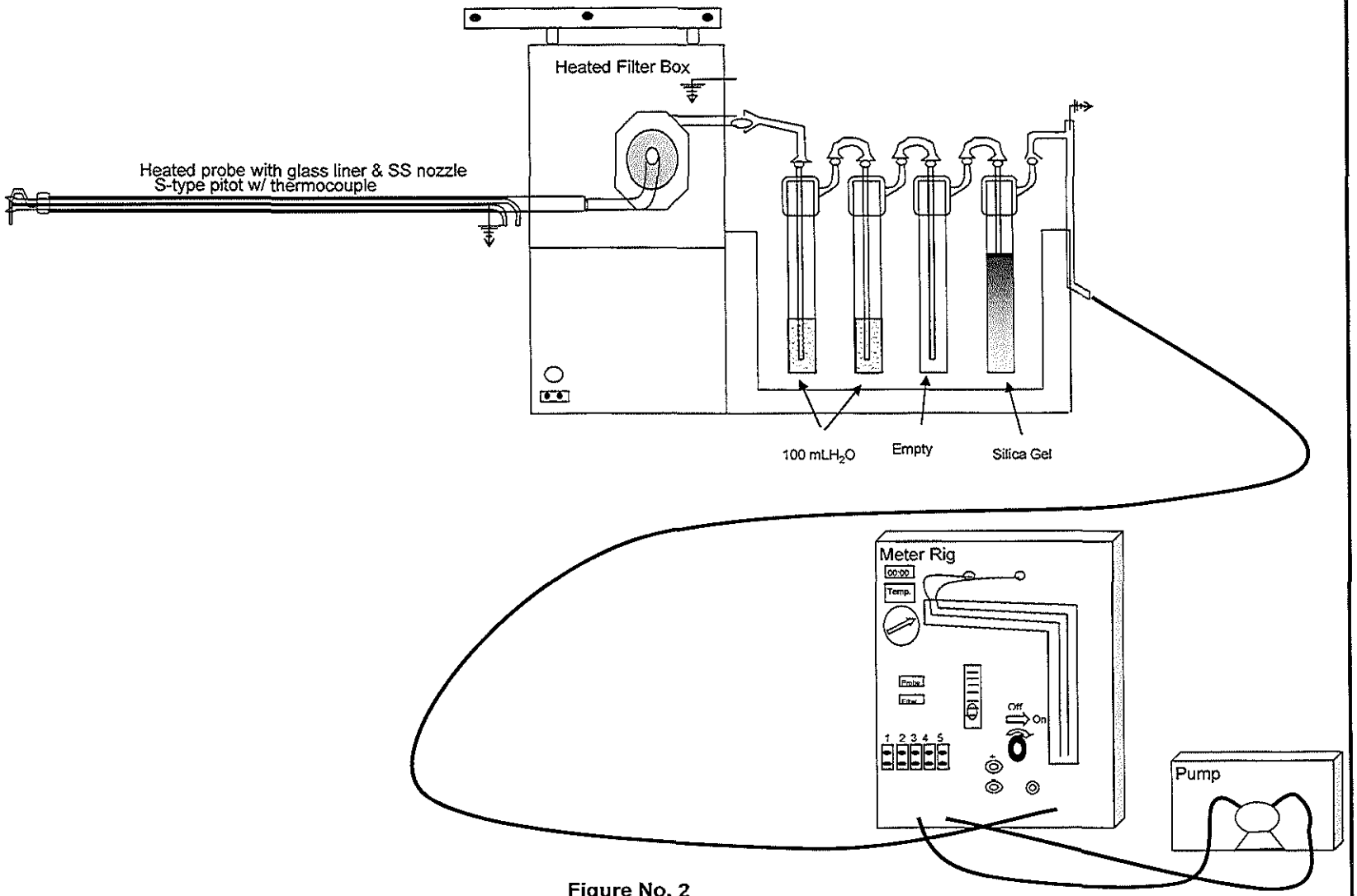

Figure No. 2

Site:	Sampling Date:	
USEPA Method 5 Towns Brothers Construction Company Ludington, Michigan	October 14, 2014	BT Environmental Consulting, Inc. 4949 Fernlee Avenue Royal Oak, Michigan 48073