Custom Stack Analysis, LLC.

1-800-824-4274

Toledo Shredding, LLC.
275 Millard Ave.
Toledo, Ohio 43605

Report

Performed Velocity, Moisture, Temperature, Volumetric Flow Rate, Volatile Organic Compounds, Condensable Particulate Matter and Particulate Emissions Testing

Sampling performed on the P902 Scrap Metal Shredder Outlets

Toledo, OH

Test Date: 7/18/17 & 7/19/17

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X

Signed by: Custom Stack Analysis, LLC.

Brian E. Lemasters
Custom Stack Analysis, LLC.

REPORT CERTIFICATION

Custom Stack Analysis, LLC. has used its professional experience and best professional efforts in performing this compliance test. I have reviewed the results of these tests and to the best of my knowledge and belief they are true and correct.

8/18/2017

X

Signed by: Custom Stack Analysis, LLC.
Brian E. Lemasters

TABLE OF CONTENTS

Executive Summary	.....	1-2
Test Results	.....	3-4
Methods Description	.....	5-9
Sampling Train Diagrams	.....	10-14
Sampling Point Description	.....	15-16
Calculations	.....	17-25

APPENDIX

Test Data	.....	1
Laboratory Data	.....	2
Calibration Data	.....	3

EXECUTIVE SUMMARY

Custom Stack Analysis, LLC. conducted emissions sampling using USEPA Methods 1-5, 25 and 202. Testing was conducted on the P902 Scrap Metal Shredder Stack #1 Scrubber and Stack #2 Cyclone Outlets on July 18th & 19th, 2017. The testing was conducted on the P902 Scrap Metal Shredder Outlets to determine compliance status of Toledo Shredding, LLC. - ID# - 0448011575 – Permit # - P0122392.

The Custom Stack Analysis, LLC. test crew consisted of Mr. James Gray, Mr. Brian Lemasters, Mr. Dylan Gray, Mr. Justin Schillig and Mr. Jonathan Augustein. The testing procedures were coordinated by Mr. Mike Valentine of Toledo Shredding, LLC. All testing procedures were witnessed by Mr. Craig Miles of City of Toledo Department of Environmental Services (see Table 1.1).

Table 1.1: Emissions Testing Program Contact Personnel

Name, Title	Company Address	Phone, Fax, email
Mr. Mike Valentine	Toledo Shredding, LLC. 275 Millard Avenue Toledo, OH 43605	(419) 698-5146 (Phone)
Mr. Craig Miles	City of Toledo Department of Environmental Services	
Mr. James Gray	Custom Stack Analysis,LLC. 14614 Cenfield St. N.E. Alliance, OH 44601	(330) 525-5119 (Phone) (330) 525-7908 (Fax)

Test results are located on pages 3-4. A description of the testing protocol is included on pages 5-9. All testing calculations are located on pages 17-25. Appendix 1 includes field test data. Appendix 2 contains laboratory data from Custom Stack Analysis, LLC. and VOC Reporting, Inc. Appendix 3 contains calibration data for the equipment used on test day.

Table 1.2 demonstrates how Toledo Shredding, LLC. in Toledo, OH is operating in compliance with the applicable emission standards.

Table 1.2: Emission Limits and Test Results Summary

Pollutant	Emission Limitations	Test Result Average	Compliance Demonstrated
Particulate Matter	1.11 lbs/hr	Stack #1 Scrubber Outlet 0.708 lbs/hr	Yes
	0.35 lbs/hr	Stack #2 Cyclone Outlet 6.34 lbs/hr	No
Volatile Organic Compounds	29.82 lbs/hr	Stack #1 Scrubber Outlet 8.79 lbs/hr	Yes

Test Results

Toledo Shredding, LLC. - Stack #1 Scrubber Outlet
7/18/2017
Methods 1-5, 25 & 202

		Run #1	Run #2	Run #3	Avg.
Stack Gas Velocity (ft/sec)		54.31	55.53	53.93	54.59
Standard Cubic Feet an Hour		1,189,170	1,220,606	1,199,330	1,203,035
Actual Cubic Feet per Minute		21,994	22,489	21,842	22,108
Stack Temperature (F)		100	101	94	98
Moisture % (Measured)		3.17%	2.62%	2.75%	2.85%
Isokinicity %		97.9%	99.5%	98.7%	98.7%
Carbon Dioxide %		0.00%	0.00%	0.00%	0.00%
Oxygen %		20.90%	20.90%	20.90%	20.90%
Nitrogen %		79.10%	79.10%	79.10%	79.10%
Particulate	**(lbs/hr)**	0.4107	0.5009	0.7549	0.5555
Particulate	**(gr/dscf)**	0.00242	0.00287	0.00441	0.00323
Particulate	**(lbs/dscf)**	3.45E-07	4.10E-07	6.29E-07	4.62E-07
Particulate	**(tons/yr)**	0.61602	0.75140	1.13229	0.83323
Condensable Particulate Matter	**(lbs/hr)**	0.16881	0.13887	0.15009	0.15259
Condensable Particulate Matter	**(gr/dscf)**	0.00099	0.00080	0.00086	0.00088
Condensable Particulate Matter	**(lbs/dscf)**	1.42E-07	1.14E-07	1.25E-07	1.27E-07
Condensable Particulate Matter	**(tons/yr)**	0.25321	0.20831	0.22513	0.22888
Total PM & CPM					
(lbs/hr)		0.5795	0.6398	0.9049	0.7081
(gr/dscf)		0.0034	0.0037	0.0053	0.0041
(lbs/dscf)		4.87E-07	5.24E-07	7.55E-07	5.89E-07
(tons/yr)		0.8692	0.9597	1.3574	1.0621
Method 25					
Outlet					
VOC	**(lbs/hr VOC)**	14.032	5.233	7.101	8.789

Test Results

Toledo Shredding, LLC. - Stack #2 Cyclone Outlet
7/18/2017 & 7/19/2017
Methods 1-5

	Run #1	Run #2	Run #3	Avg.
Stack Gas Velocity (ft/sec)	46.97	47.26	45.29	46.51
Standard Cubic Feet an Hour	463,250	459,609	449,671	457,510
Actual Cubic Feet per Minute	8,344	8,397	8,046	8,262
Stack Temperature (F)	98	100	90	96
Moisture % (Measured)	1.10%	2.02%	1.82%	1.65%
Isokinicity %	98.2%	100.1%	99.7%	99.3%
Carbon Dioxide %	0.00%	0.00%	0.00%	0.00%
Oxygen %	20.90%	20.90%	20.90%	20.90%
Nitrogen %	79.10%	79.10%	79.10%	79.10%
Particulate (lbs/hr)	8.4200	8.8671	1.7405	6.3425
Particulate (gr/dscf)	0.12723	0.13505	0.02709	0.09646
Particulate (lbs/dscf)	1.82E-05	1.93E-05	3.87E-06	1.38E-05
Particulate (tons/yr)	12.62999	13.30063	2.61070	9.51377

METHOD 1

Sample and velocity traverses for stationary sources.

To aid in the representative measurement of pollutant emissions and/ or total volumetric flow rate from a stationary source, a measurement site where the effluent stream is flowing in a known direction is selected, and the cross-section of the stack is divided into a number of equal areas. A traverse point is then located within each of these equal areas.

METHOD 2

Determination of stack gas velocity and volumetric flow rate.

The average gas velocity in a stack is determined from the gas density and from measurement of the average velocity head with a Type S (Stausscheibe or reverse type) pitot tube.

METHOD 3

Gas analysis for the determination of dry molecular weight.

This method is applicable for determining carbon dioxide and oxygen concentrations and dry molecular weight of a sample from a gas stream of a fossil-fuel combustion process.

METHOD 4

Determination of moisture content in stack gases.

A gas sample is extracted at a constant rate from the source. It is determined either volumetrically or gravimetrically.

METHOD 5 TESTING DESCRIPTION

Particulate samples were collected following EPA Methods 1-5. The equipment used for testing consisted of a Custom Stack Analysis Stack Train Sampler (EPA type). A type “S” pitot and a heated sampling probe were used with the sampling train. All equipment was calibrated in the laboratory prior to the test. The sampling nozzle and the pitot tubes were measured on the day of the test. All calibrations can be found in the appendix. The dust laden gases are passed through a heated pyrex probe and a heated glass four inch filter holder containing Gelman Type A-E fiberglass filter media. The gases leaving the filter were collected in a series of four impingers packed in ice. The first, third, and fourth impingers were the modified Greenburg-Smith type and the second one was a standard Greenburg-Smith type. The first and second impinger contained 100 ml of distilled water. After leaving the third and fourth empty impingers the gases passed through a “Drierite” column containing about 500 grams of indicating silica gel to remove any remaining water vapor. The dry gas then passed through the hose portion of the umbilical cord to a Custom Stack Analysis Model #3000 “Stacksampler” module. In the module the gas was moved through the system by a leakless air pump to a Rockwell 175-S dry test meter. The dry test meter exhausted to a calibrated orifice to measure the flow rate of the gases passing through the sampling apparatus. A type “S” pitot tube was attached to the sheath of the heated probe and nozzle. The orifice pressure taps and the pitot tube were connected to a Dwyer duel 10 inch combination inclined-well type manometer. One half of the manometer measured the orifice differential pressure (^H) and the other half measured the flue gas velocity head (^P). The temperature of the flue gas was measured by a type “K” thermocouple connected to a Marlin Digital Temperature controller. The $C0_2$ and 0_2 levels were analyzed using a Bacharach Fyrite analyzer.

METHOD 25 DESCRIPTION

This method applies to the measurement of volatile organic compounds (VOC) as total gaseous nonmethane organics (TGNMO) as carbon in source emissions. The minimum detectable for the method is 50 ppm as carbon.

An emission sample is withdrawn from the stack at a constant rate through a heated filter and a chilled condensate trap by means of an evacuated sample tank. After sampling was completed, the TGNMO are determined by independently analyzing the condensate trap and sample tank fractions and combining the analytical results. The organic content of the condensate trap fraction is determined by oxidizing the NMO to CO_2 and quantitatively collecting the effluent in an evacuated vessel; then a portion of the CO_2 is reduced to CH_4 and measured by an FID. The organic portion of the sample tank fraction is measured by injecting a portion of the sample into a gas chromatograph column to separate the NMO from carbon monoxide (CO), CO_2, and CH_4; the NMO are oxidized to CO_2, reduced to CH_4, and measured by an FID.

The sampling equipment used for testing consisted of a heated probe capable of maintaining a gas temperature at the exit end of at least 129 degrees Celsius (265 degrees Fahrenheit) monitored with a thermocouple at the exit end. A nozzle consisting of an elbow fitting was attached to the probe. The filter assembly consisted of a 25-mm Gelman filter holder with a stainless steel body. The filter was maintained at a gas temperature of 121+- 3 degrees Celsius (250 +- 5 degrees Fahrenheit). The condensate trap consisted of 316 stainless steel tubing bent into a U-shape packed with coarse quartz wool, to a density of approximately .11 g/cc before being bent. The traps were packed with dry ice during sampling and until analysis was performed. The sample tank consisted of a tank with a minimum volume of 4 liters.

Pretest cleaning of all tanks and traps was handled according to procedures in Method 25 by VOC Reporting, Inc.

Before the start of the testing the sample tanks were evacuated to 10 mm Hg absolute pressure or less. The tank was left to sit for 60 minutes. If their was no change in pressure the leak check was acceptable. Just before the assembly the tank vacuum was measured using an absolute pressure gauge and recorded. The ambient temperature, and the barometric pressure was then recorded. Then the sample condensate traps were immersed in dry ice so that where the inlet tube joins the trap body was 2.5 to 5 cm above the top of the dry ice.

Pretest leak checking was conducted by plugging the probe tip, and closing the sample tank valve. Then the vacuum pump was turned on and evacuated to absolute pressure or less. After train evacuation the purge valve is closed and the system is left to stand for a minimum of 10 minutes. The vacuum is rechecked and verified to be less then 1 percent of the sampling rate.

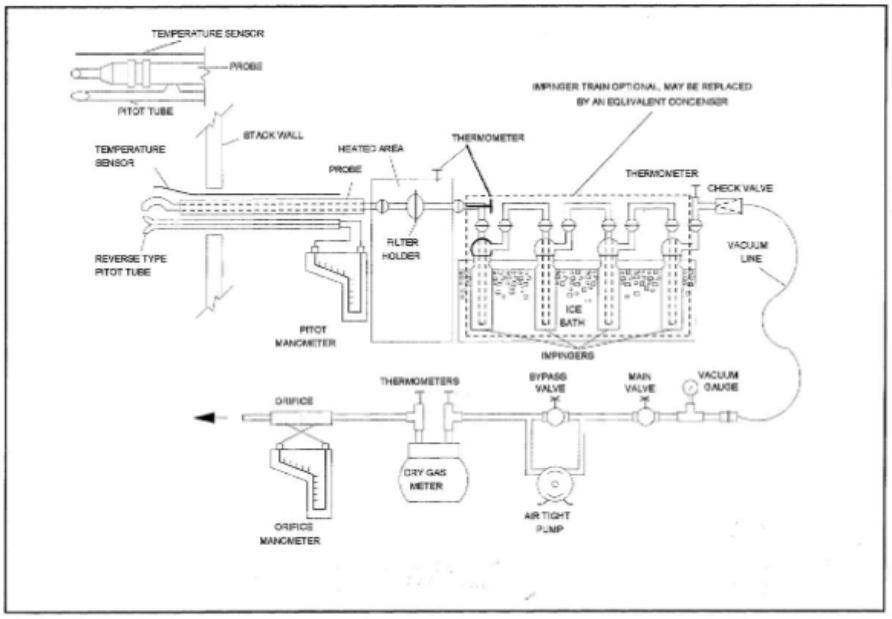
METHOD 25 DESCRIPTION CONTINUED

During sampling operation the probe was placed in the stack so that the tip was facing away from the flow. The probe was placed in the stack at a point of average velocity. The purge valve was then opened with the flow rate being set between 60 and 100 cc/min. It was allowed to purge for 10 minutes before sampling began. The flow rate was maintained between (+-10 percent) throughout the duration of the sampling period. Recording of sample tank vacuum and flow meter setting was performed at 5 minute intervals. At the conclusion of the test period the flow control valve in closed. A final reading was taken of the tank vacuum, tank temperature, and barometric pressure. The sample tank and traps were then disconnected and sealed. The traps were kept packed in dry ice until analysis was performed.

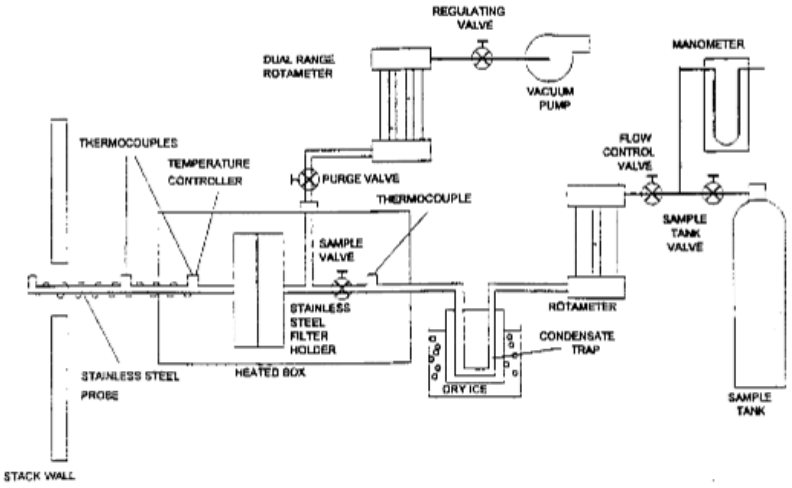
METHOD 202 TESTING DESCRIPTION

Particulate and condensable samples were collected following EPA Method 202. Three 60 minute test repetitions were performed. The equipment used for testing consisted of a Custom Stack Analysis Stack Train Sampler (EPA type). A type “S” pitot and a heated sampling probe were used with the sampling train. All equipment was calibrated in the laboratory prior to the test. The sampling nozzle and the pitot tubes were measured on the day of the test. All calibrations can be found in the appendix. The dust laden gases are passed through a heated Pyrex probe and a heated glass elbow to a condenser, two knock out impingers that are left dry, CPM filter between second and third impinger. The First and second impinger are immersed in a cold water bath while the third and fourth are in a ice water bath. The second, third and forth impingers were the modified Greenburg-Smith type and the first impinger was a short modified Greenburg-Smith type. The first and second impinger are empty. The third contains 100 ml water. The fourth empty impinger contains a “Drierite” column containing about 500 grams of indicating silica gel to remove any remaining water vapor. The dry gas then passed through the hose portion of the umbilical cord to a Custom Stack Analysis Model #3000 “Stacksampler” module. In the module the gas was moved through the system by a leakless air pump to a Rockwell 175-S dry test meter. The dry test meter exhausted to a calibrated orifice to measure the flow rate of the gases passing through the sampling apparatus. A type “S” pitot tube was attached to the sheath of the heated probe and nozzle. The orifice pressure taps and the pitot tube were connected to a Dwyer duel 10 inch combination inclined-well type manometer. One half of the manometer measured the orifice differential pressure (^H) and the other half measured the flue gas velocity head (^P). The temperature of the flue gas was measured by a type “K” thermocouple connected to a Marlin Digital Temperature controller. The $C0_2$ and 0_2 levels were analyzed using a Bacharach Fyrite. All the sampling train glassware was cleaned prior to the test with soap and tap water, and rinsed using tap water, acetone, and finally, Hexane. All the silicone grease was removed from the train. At the conclusion of the test run the post-test nitrogen purge was ran at 14 liters/min. During sample recovery the impinger contents are measured to within 1ml and placed in a container labeled CPM No. 1. The impingers including probe extensions are then rinsed twice with water and placed in container CPM No. 1. The impingers including probe extensions are then rinsed with acetone once and Hexane twice and placed in container No. 2. CPM container contains the CPM filter. CPM container #4 contains cold impinger water. CPM container No. 6 contains the acetone blank with acetone 150 ml. Container No. 7 will have 150 ml of water placed in it as a blank. The sample are then determined for the organic and inorganic fractions.

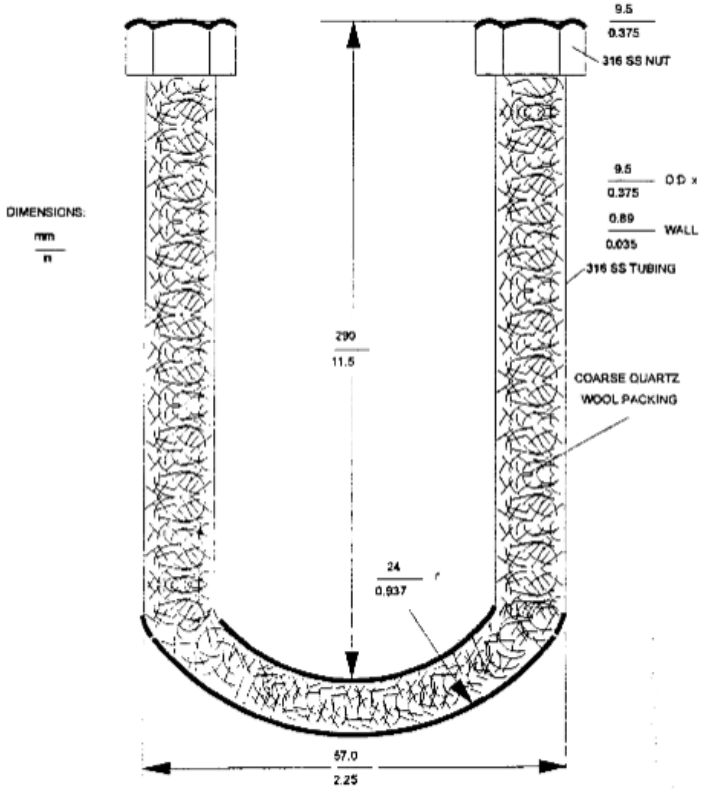
5 Sampling System



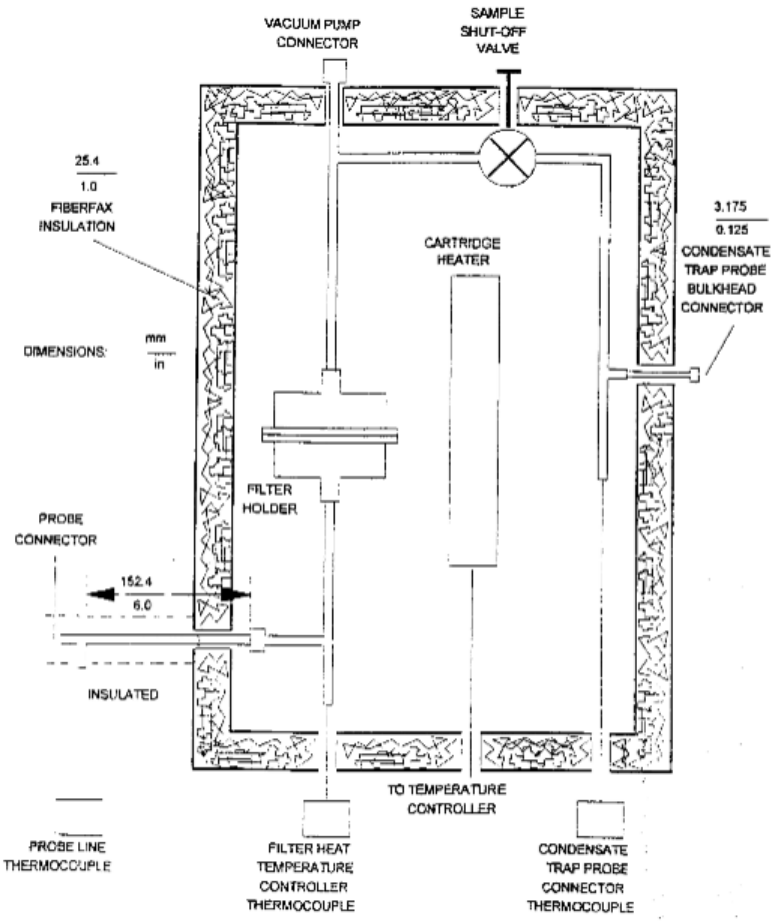
METHOD 25 SAMPLING SYSTEM



METHOD 25 TRAP



METHOD 25 FILTER BOX



202 Sampling System

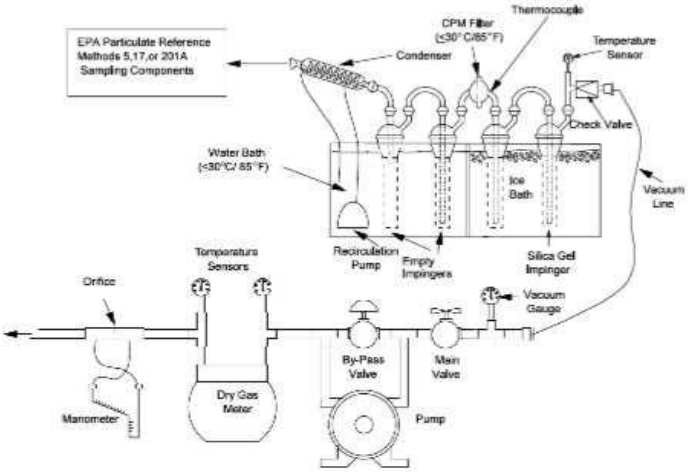
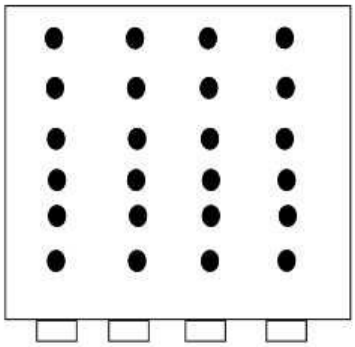


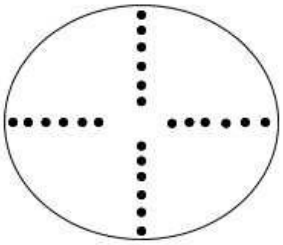
Figure 1. Schematic of Condensable Particulate Sampling Train

Sampling Point Locations



Location	Stack #1 Scrubber Outlet		
Upstream		346"	
Downstream		97"	
Stack Diameter		36 x 27	Inches
Stack Point #	1	2.3	Inches
	2	6.8	
	3	11.3	
	4	15.7	
	5	20.2	
	6	24.7	

Location of Sampling Points



Location:		Stack #2 Cyclone Outlet	Method 1-5
Upstream		23.5"	
Downstream		226"	
Stack Diameter		23.3	Inches
Sample Point #			
	1	.5	Inches
	2	1.6	
	3	2.7	
	4	4.1	
	5	5.8	
	6	8.3	
	7	15	
	8	17.5	
	9	19.2	
	10	20.6	
	11	21.7	
	12	22.8	

CALCULATIONS

Stack #1 **Methods 1-5, 25 & 202**

		RUN #1	RUN #2	RUN #3		
1.	**Vm (std)**	51.92	54.14	52.78	=	$VM * 17.64 * \frac{PBAR + \frac{\hat{}H}{13.6}}{Tm} * Y$

			RUN #1	RUN #2	RUN #3
Vm (std)	= Volume of gas collected, corrected to standard conditions, cuft.	=	51.92	54.14	52.78
Vm	= Volume of gas sampled at meter box, cuft.	=	54.08	57.04	53.60
17.64	= Standard temperature, 528 Rankine / std pressure, 29.92.	=	17.64	17.64	17.64
Tm	= Average dry gas meter temperature, + 460 Rankine.	=	545.6	552.1	531.9
Pbar	= Barometric pressure, inches of mercury (Hg)	=	29.5	29.5	29.5
^H	= Average pressure differential across orifice.	=	2.89	3.06	2.85
13.6	= Specific gravity of mercury.	=	13.6	13.6	13.6
Y	= Calibration factor of meter box.	=	0.9994	0.9994	0.9994

		RUN #1	RUN #2	RUN #3		
2.	**Vw (std)**	1.70	1.46	1.49	=	$Vlc * \frac{P\ H20}{Mh20} * \frac{R\ Tstd}{Pstd} = K2 * Vlc$

			RUN #1	RUN #2	RUN #3
Vlc	= Volume of water and silica colected.	=	36.1	30.9	31.7
P H20	= Density of water, 0.002201 lb/ml.	=	0.002201	0.002201	0.002201
M H20	= Molecular weight of water, 18.01 lb/lb-mole.	=	18.01	18.01	18.01
R	= Ideal gas constant, 21.85 in. hg - ft3/R-lb-mole.	=	21.85	21.85	21.85
Tstd	= Standard absolute temperature, 528 R.	=	528	528	528
Pstd	= Standard absolute pressure, 29.92 in. Hg.	=	29.92	29.92	29.92
K2	= 0.0471 ft3 / ml.	=	0.0471	0.0471	0.0471

		RUN #1	RUN #2	RUN #3		
3.	**Bws**	0.0317258	0.0261893	0.027523	=	$\frac{Vw(std)}{Vm(std) + Vw(std)}$

			RUN #1	RUN #2	RUN #3
Bws	= Water vapor in the gas stream, proportion.	=	0.0317258	0.0261893	0.027523
Vw(std)	= Volume of water vapor in the gas sample, scf.	=	1.70	1.46	1.49
Vm(std)	= Volume of gas sampled at meter box, scf.	=	51.92	54.14	52.78

		RUN #1	RUN #2	RUN #3		
4.	**Md**	28.836	28.836	28.836	=	0.44 (%CO2) + 0.32 (%O2) + 0.28 (%N2) + %CO)

			RUN #1	RUN #2	RUN #3
Md	= Dry molecular weight, lb / lb-mole.	=	28.836	28.836	28.836
0.44	= Molecular weight of CO2 divided by 100.	=	0.44	0.44	0.44
0.32	= Molecular weight of O2 divided by 100.	=	0.32	0.32	0.32
0.28	= Molecular weight of N2 or CO divided by 100.	=	0.28	0.28	0.28

Co2, O2, N2, and CO are in percent by volume, dry basis.

		RUN #1	RUN #2	RUN #3		
5.	**Ms**	28.49	28.55	28.54	=	Md * (1-Bws) + M H20 * (Bws)

			RUN #1	RUN #2	RUN #3
Ms	= Molecular weight of gas , wet basis, lb /lb-mole.	=	28.49	28.55	28.54
M H20	= Molecular weight of water, 18 lb / lb-mole.	=	18	18	18

		RUN #1	RUN #2	RUN #3		
6.	**Vs**	54.31	55.53	53.93	=	$85.49 * Cp * \sqrt{^p} * \sqrt{\frac{Ts + 460}{Ps * Ms}}$

			RUN #1	RUN #2	RUN #3
Vs	= Average stack gas velocity, ft / sec.	=	54.31	55.53	53.93
85.49	= Pitot tube constant, ft / sec.	=	85.49	85.49	85.49
Cp	= Pitot tube coefficient, dimensionless.	=	0.84	0.84	0.84
^P	= Velocity head of stack gas, avg. sq rt.	=	0.927	0.948	0.926
Ts	= Temperature of stack gas, + 460 (Rankine).	=	559.9	561.0	553.7
Ps	= Absolute stack gas pressure, barometric + static.	=	29.53	29.53	29.53
Ms	= Molecular weight of stack gas, wet basis.	=	28.49	28.55	28.54

		RUN #1	RUN #2	RUN #3		
7.	**ACFM**	21994	22489	21842	=	Stack Area * 60 * Vs

			RUN #1	RUN #2	RUN #3
Vs	= Average stack gas velocity, ft / sec.	=	54.31	55.53	53.93

		RUN #1	RUN #2	RUN #3		
8.	**Isokinicity**	97.9	99.5	98.7	=	$\frac{K4 * Ts * Vmstd}{Ps * Vs * An * Min * (1-Bws)}$

			RUN #1	RUN #2	RUN #3
K4	= 0.09450 for English units.	=	0.0945	0.0945	0.0945
Ts	= Stack temperature + 460 R.	=	559.9	561.0	553.7
Vmstd	= Volume of gas collected, scf.	=	51.92	54.14	52.78
Ps	= Stack pressure, inches Hg.	=	29.53	29.53	29.53
Vs	= Stack velocity, ft / sec.	=	54.31	55.53	53.93
An	= Area of the sampling nozzle, cuft.	=	0.0003012	0.0003012	0.0003012
Min.	= Minutes of test	=	60	60	60
Bws	= Water vapor in the gas stream, proportion.	=	0.0317258	0.0261893	0.027523

		RUN #1	RUN #2	RUN #3		
9.	**Lbs/Hr**	0.41	0.50	0.75	=	$2.205 * E-6 * \frac{Mn}{Vm\ std} * scfh$

			RUN #1	RUN #2	RUN #3
2.205 * E-6	= Conversion from mg to lbs.	=	2.205 * E-6	2.205 * E-6	2.205 * E-6
Mn	= Weight gain of filter and wash minus blank.	=	8.15	10.1	15.1
scfh	= Standard stack volumetric flow rate.	=	1189170	1220606	1199330
Vm std	= Volume of air sampled at stp.	=	51.92	54.14	52.78

		RUN #1	RUN #2	RUN #3		
10.	**Gr/Dscf**	0.00242	0.00287	0.00441	=	$0.0154 * \frac{Mn}{Vmstd}$

			RUN #1	RUN #2	RUN #3
0.0154	= Conversion to grains from mg.	=	0.0154	0.0154	0.0154
Vm std	= Volume of air sampled at stp.	=	51.92	54.14	52.78
Mn	= Weight gain of filter and wash minus blank.	=	8.15	10.1	15.1

		RUN #1	RUN #2	RUN #3		
11	**SCFH**	1189170	1220606	1199330	=	$3600 * (1 - Bws) * Vs * A * \frac{Tstd}{Ts} * \frac{Ps}{Pstd}$

					RUN #1	RUN #2	RUN #3
3600	=	Seconds per hour.	=		3600	3600	3600
Bws	=	Water vapor in the gas stream, proportion.	=		0.0317258	0.0261893	0.027523
A	=	Area of stack in sq ft.	=		6.75	6.75	6.75
Tstd	=	Standard absolute temperature, 528 R.	=		528	528	528
Pstd	=	Standard absolute pressure, 29.92 in. Hg.	=		29.92	29.92	29.92
Ts	=	Temperature of stack gas, + 460 (Rankine).			559.9	561.0	553.7
Ps	=	Absolute stack gas pressure, barometric + static.			29.5	29.5	29.5
Vs	=	Average stack gas velocity, ft / sec.			54.31	55.53	53.93

Data

	Flow (SCFH)	VOC ppmc	mgC/dscm
Outlet			
Run 1	1189170.247	289	144.2
Run 2	1220605.508	105	52.41
Run 3	1199329.926	145	72.28

Method 25 Calculations

(lbs C/hr VOC)

Test #1 (Outlet)

144.20 mgC/cu.m / 35.314 cu. Ft per cu. M x 2.205 x 10E-6 = 9.00E-06 lbs/cu. ft

9.00E-06 lbs/ cu. ft x 1,189,170 scfh = 1.07E+01 lbs C/hr

Test #2 (Outlet)

52.41 mgC/cu.m / 35.314 cu. Ft per cu. M x 2.205 x 10E-6 = 3.27E-06 lbs/cu. ft

3.27E-06 lbs/ cu. ft x 1,220,606 scfh = 3.99E+00 lbs C/hr

Test #3 (Outlet)

72.28 mgC/cu.m / 35.314 cu. Ft per cu. M x 2.205 x 10E-6 = 4.51E-06 lbs/cu. ft

4.51E-06 lbs/ cu. ft x 1,199,330 scfh = 5.41E+00 lbs C/hr

CALCULATIONS

Stack #2 **Methods 1-5**

		RUN #1	RUN #2	RUN #3		
1.	**Vm (std)**	51.91	52.50	51.18	=	$VM * 17.64 * \frac{PBAR + \frac{\hat{}H}{13.6}}{Tm} * Y$

			RUN #1	RUN #2	RUN #3
Vm (std)	= Volume of gas collected, corrected to standard conditions, cuft.	=	51.91	52.50	51.18
Vm	= Volume of gas sampled at meter box, cuft.	=	54.45	55.86	52.83
17.64	= Standard temperature, 528 Rankine / std pressure, 29.92.	=	17.64	17.64	17.64
Tm	= Average dry gas meter temperature, + 460 Rankine.	=	548.4	556.5	539.5
Pbar	= Barometric pressure, inches of mercury (Hg)	=	29.56	29.56	29.56
^H	= Average pressure differential across orifice.	=	2.67	2.70	2.51
13.6	= Specific gravity of mercury.	=	13.6	13.6	13.6
Y	= Calibration factor of meter box.	=	0.9962	0.9962	0.9962

		RUN #1	RUN #2	RUN #3		
2.	**Vw (std)**	0.58	1.08	0.95	=	$Vlc * \frac{P\ H20}{Mh20} * \frac{R\ Tstd}{Pstd} = K2 * Vlc$

			RUN #1	RUN #2	RUN #3
Vlc	= Volume of water and silica colected.	=	12.3	23	20.1
P H20	= Density of water, 0.002201 lb/ml.	=	0.002201	0.002201	0.002201
M H20	= Molecular weight of water, 18.01 lb/lb-mole.	=	18.01	18.01	18.01
R	= Ideal gas constant, 21.85 in. hg - ft3/R-lb-mole.	=	21.85	21.85	21.85
Tstd	= Standard absolute temperature, 528 R.	=	528	528	528
Pstd	= Standard absolute pressure, 29.92 in. Hg.	=	29.92	29.92	29.92
K2	= 0.0471 ft3 / ml.	=	0.0471	0.0471	0.0471

		RUN #1	RUN #2	RUN #3		
3.	**Bws**	0.0110416	0.0202285	0.0181689	=	$\frac{Vw(std)}{Vm(std) + Vw(std)}$

			RUN #1	RUN #2	RUN #3
Bws	= Water vapor in the gas stream, proportion.	=	0.0110416	0.0202285	0.0181689
Vw(std)	= Volume of water vapor in the gas sample, scf.	=	0.58	1.08	0.95
Vm(std)	= Volume of gas sampled at meter box, scf.	=	51.91	52.50	51.18

		RUN #1	RUN #2	RUN #3		
4.	**Md**	28.836	28.836	28.836	=	0.44 (%CO2) + 0.32 (%O2) + 0.28 (%N2) + %CO)

			RUN #1	RUN #2	RUN #3
Md	= Dry molecular weight, lb / lb-mole.	=	28.836	28.836	28.836
0.44	= Molecular weight of CO2 divided by 100.	=	0.44	0.44	0.44
0.32	= Molecular weight of O2 divided by 100.	=	0.32	0.32	0.32
0.28	= Molecular weight of N2 or CO divided by 100.	=	0.28	0.28	0.28

Co2, O2, N2, and CO are in percent by volume, dry basis.

		RUN #1	RUN #2	RUN #3		
5.	**Ms**	28.72	28.62	28.64	=	Md * (1-Bws) + M H20 * (Bws)

			RUN #1	RUN #2	RUN #3
Ms	= Molecular weight of gas , wet basis, lb /lb-mole.	=	28.72	28.62	28.64
M H20	= Molecular weight of water, 18 lb / lb-mole.	=	18	18	18

		RUN #1	RUN #2	RUN #3		
6.	**Vs**	46.97	47.26	45.29	=	$85.49 * Cp \sqrt{^p} * \sqrt{\frac{Ts + 460}{Ps * Ms}}$

			RUN #1	RUN #2	RUN #3
Vs	= Average stack gas velocity, ft / sec.	=	46.97	47.26	45.29
85.49	= Pitot tube constant, ft / sec.	=	85.49	85.49	85.49
Cp	= Pitot tube coefficient, dimensionless.	=	0.84	0.84	0.84
^P	= Velocity head of stack gas, avg. sq rt.	=	0.807	0.809	0.783
Ts	= Temperature of stack gas, + 460 (Rankine).	=	557.7	560.4	550.0
Ps	= Absolute stack gas pressure, barometric + static.	=	29.57	29.57	29.57
Ms	= Molecular weight of stack gas, wet basis.	=	28.72	28.62	28.64

		RUN #1	RUN #2	RUN #3		
7.	**ACFM**	8344	8397	8046	=	Stack Area * 60 * Vs

			RUN #1	RUN #2	RUN #3
Vs	= Average stack gas velocity, ft / sec.	=	46.97	47.26	45.29

		RUN #1	RUN #2	RUN #3		
8.	**Isokinicity**	98.2	100.1	99.7	=	$\frac{K4 * Ts * Vmstd}{Ps * Vs * An * Min * (1-Bws)}$

			RUN #1	RUN #2	RUN #3
K4	= 0.09450 for English units.	=	0.0945	0.0945	0.0945
Ts	= Stack temperature + 460 R.	=	557.7	560.4	550.0
Vmstd	= Volume of gas collected, scf.	=	51.91	52.50	51.18
Ps	= Stack pressure, inches Hg.	=	29.57	29.57	29.57
Vs	= Stack velocity, ft / sec.	=	46.97	47.26	45.29
An	= Area of the sampling nozzle, cuft.	=	0.0003382	0.0003382	0.0003382
Min.	= Minutes of test	=	60	60	60
Bws	= Water vapor in the gas stream, proportion.	=	0.0110416	0.0202285	0.0181689

		RUN #1	RUN #2	RUN #3		
9.	**Lbs/Hr**	8.42	8.87	1.74	=	$2.205 * E-6 * \frac{Mn}{Vm\ std} * scfh$

			RUN #1	RUN #2	RUN #3
2.205 * E-6	= Conversion from mg to lbs.	=	2.205 * E-6	2.205 * E-6	2.205 * E-6
Mn	= Weight gain of filter and wash minus blank.	=	428.9	460.35	90.05
scfh	= Standard stack volumetric flow rate.	=	463250	459609	449671
Vm std	= Volume of air sampled at stp.	=	51.91	52.50	51.18

		RUN #1	RUN #2	RUN #3		
10.	**Gr/Dscf**	0.12723	0.13505	0.02709	=	$0.0154 * \frac{Mn}{Vmstd}$

			RUN #1	RUN #2	RUN #3
0.0154	= Conversion to grains from mg.	=	0.0154	0.0154	0.0154
Vm std	= Volume of air sampled at stp.	=	51.91	52.50	51.18
Mn	= Weight gain of filter and wash minus blank.	=	428.9	460.35	90.05

		RUN #1	RUN #2	RUN #3		
11	**SCFH**	463250	459609	449671	=	$3600 * (1 - Bws) * Vs * A * \frac{Tstd}{Ts} * \frac{Ps}{Pstd}$

					RUN #1	RUN #2	RUN #3
3600	=	Seconds per hour.	=		3600	3600	3600
Bws	=	Water vapor in the gas stream, proportion.	=		0.0110416	0.0202285	0.0181689
A	=	Area of stack in sq ft.	=		2.9610056	2.9610056	2.9610056
Tstd	=	Standard absolute temperature, 528 R.	=		528	528	528
Pstd	=	Standard absolute pressure, 29.92 in. Hg.	=		29.92	29.92	29.92
Ts	=	Temperature of stack gas, + 460 (Rankine).			557.7	560.4	550.0
Ps	=	Absolute stack gas pressure, barometric + static.			29.56	29.56	29.56
Vs	=	Average stack gas velocity, ft / sec.			46.97	47.26	45.29

Appendix #1

Test Data

Custom Stack Analysis, LLC.
Pitot Traverse Data Sheet for Cyclonics

Plant Toledo Shredding, LLC. Date 7/18/2017 & 7/19/2017

Location Stack #1 Scrubber Outlet By an L, Dylan G, Justin S, J

Point #	Angle
1	5
2	3
3	7
4	5
5	2
6	5
7	8
8	4
9	3
10	6
11	3
12	2
B-1	8
2	6
3	3
4	7
5	5
6	5
7	4
8	6
9	3
10	7
11	5
12	4
Avg	5

TEST DATA

COMPANY NAME	Toledo Shredding, LLC. - Stack #1 Scrubber Ou
ADDRESS	275 Millard Ave
CITY	Toledo
STATE	OH
ZIP	43605
TEST METHODS	Methods 1-5, 25 & 202
CREW MEMBERS	Jim G, Brian L, Dylan G, Justin S, Jonathan A
LOCATION	Scrubber Outlet
SOURCE	Stack #1 Scrubber Outlet
CONTROL	Stack #1

	RUN #1	RUN #2	RUN #3
DATE	7/18/2017	7/18/2017	7/19/2017
TIME	11:30-14:35	15:49-17:14	7:36-9:27
RUN LENGTH (min)	60.00	60.00	60.00
VOLUME (cubic feet)	54.08	57.04	53.602
BAROMETRIC (in. Hg)	29.50	29.50	29.50
METER TEMP. (R)	545.6	552.1	531.9
STACK TEMP. (R)	559.9	561.0	553.7
AVERAGE ?P (in. WC)$^{1/2}$	0.93	0.95	0.93
AVERAGE ?H (in. WC)	2.89	3.06	2.85
IMPINGER VOLUME (ml)	36.10	30.90	31.70
PITOT COEF.	0.84	0.84	0.84
Static Pressure (in. WC)	0.38	0.38	0.38
STACK AREA (sq/ft)	7.45	7.45	7.45
NOZZLE SIZE (sq/ft)	0.0003012	0.000301	0.000301
CARBON DIOXIDE (%)	0.00	0.00	0.00
OXYGEN (%)	20.90	20.90	20.90
NITROGEN (%)	79.1	79.1	79.1

WEIGHTS			
INITIAL PROBE #1 (mg)	119505.3	114317.8	103434.5
POST PROBE #1 (mg)	119506.9	114327.3	103449.5
TOTAL (mg)	1.6	9.5	15
INITIAL PROBE #2 (mg)	119505.5	114317.7	103434.7
POST PROBE #2 (mg)	119507.2	114327.5	103449.8
TOTAL (mg)	1.7	9.8	15.1
AVG Probe Weight (mg)	1.65	9.65	15.05
INITIAL FILTER #1 (mg)	20438.3	26499.4	26302.9
POST FILTER #1 (mg)	20444.8	26499.8	26303.1
TOTAL (mg)	6.5	0.4	0.2
INITIAL FILTER #2 (mg)	20437.9	26498.9	26302.9
POST FILTER #2 (mg)	20444.6	26499.6	26303
TOTAL (mg)	6.7	0.7	0.1
AVG Filter Weight (mg)	6.6	0.55	0.15
INITIAL ACE. BLANK	109656.3	109656.3	109656.3
POST ACE. BLANK	109656.4	109656.4	109656.4
TOTAL	0.1	0.1	0.1

TEST RESULTS

OUTLET

	RUN #1	RUN #2	RUN #3
VM (std) ft^3	51.92	54.14	52.78
VW (std) ft^3	1.70	1.46	1.49
BWS Fraction (measured)	0.032	0.026	0.028
MD (lb/lb-mole (dry))	28.84	28.84	28.84
MS (lb/lb-mole (wet))	28.49	28.55	28.54
VS (ft/sec)	54.31	55.53	53.93

SCFH	1312834	1347538	1324050
ACFM	24282	24828	24113
DCFM	21881	22459	22068
ISOKINETIC %	97.9	99.5	98.7

PARTICULATE			
LBS/HR	0.453385	0.553027	0.833357
GR/DSCF	0.002417	0.002873	0.004406
LBS/DSCF	3.45E-07	4.10E-07	6.29E-07

Vm (std) = Volume of gas sampled at standard conditions.

Vw (std) = Volume of water vapor collected at standard conditions.

Bws = Stack moisture content.

Md = Determination of dry molecular weight of stack gas.

Ms = Determination of stack gas molecular weight.
Vs = Average gas stack velocity. (ft/sec.)

ACFM = Actual cubic feet per minute of gas velocity.

DCFM = Dry standard cubic feet per minute of gas velocity.

Lbs/Hr = Pounds per Hour.

Gr/Dscf = Grains per dry standard cubic feet.

Toledo Shredding, LLC. - Stack #1 Scrubber Outlet							Methods 1-5, 25 & 202		Test Date	7/18/2017	Run 1
Meter Box Id:	1	Probe ID	3p-5		Cold Box ID:	23		EPA Observer:			

As ft^2	Pbar	Pq (static)	Ps		Avg. Ts F	CO2 - F_{CO2}	O2	N2+C	Md	Ms	Pitot Ck
7.45	29.50	0.38	29.53		100	0.00	20.90	79.10	28.84	28.62	ok

Y	ΔH :	Cp	Vm cf	Vlc	Avg. Tm F	Vm std	Vw std	Bws	S Bws		Leak Ck
0.9994	1.967	0.84	54.080	36.10	85.63	51.919	1.699	0.032	0.066		.006 @ 11"
								Assumed Bws:	2.000		

Avg. Sqrt Dlp	Vs	scfm wet	acfm		Qsd dscfh	# Sample Points	Dn	Total Test time	Time @ point	Avg. Dlh	Test Time
0.927	54.19	22,547	24,228		1.31E+06	24	0.235	60	2.50	2.893188	11:30-14:35

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Point No.	Meter (cf)	dl "p"	Target dl "h"	Actual dl "h"	Ts F	tm F (in)	tm F (out)	Cond Temp F	Filter Temp F	Probe Temp F	Vacuum	Imp. Liquid Collected		
A-1	670.73	0.87	2.90	2.90	100	79	77	67	253	259	6	Wt. (end)	Wt. (start)	lc
2	673.023	0.88	2.94	2.94	100	80	79	58	252	257	6	464.7	448.6	16.1
3	675.008	0.85	2.85	2.85	100	83	78	50	252	258	6	495.5	481.6	13.9
4	677.268	0.86	2.89	2.89	99	84	78	48	251	257	6	552.2	562.1	-9.9
5	679.404	0.83	2.79	2.79	100	86	79	49	251	258	6	0.0	0.0	0.0
6	681.581	0.85	2.86	2.86	99	87	79	49	250	258	6	0.0	0.0	0.0
B-1	683.823	0.82	2.75	2.75	100	82	80	61	250	258	6	0.0	0.0	0.0
2	685.951	0.84	2.82	2.82	101	84	81	49	250	257	6	907.1	891.1	16.0
3	688.312	0.90	3.03	3.03	100	86	81	48	251	260	7			
4	690.574	0.91	3.07	3.07	100	87	82	49	247	258	7	Isokinetics	98.1	
5	693.035	0.88	2.98	2.98	99	88	82	50	252	257	7	Test Date	3/2017 & 7/19/2017	
6	695.377	0.87	2.94	2.94	100	89	82	51	245	259	6			
C-1	697.746	0.86	2.90	2.90	99	85	82	60	245	258	6			
2	699.997	0.89	3.01	3.01	99	87	82	53	245	258	7			
3	702.260	0.90	3.05	3.05	98	87	83	59	246	257	7			
4	704.573	0.88	2.98	2.98	98	87	83	51	245	258	7			
5	706.858	0.86	2.91	2.91	98	87	82	50	245	258	7			
6	709.186	0.87	2.93	2.93	100	84	82	66	247	257	7			
D-1	711.413	0.83	2.79	2.79	101	84	82	67	247	257	6			
2	713.767	0.80	2.69	2.69	102	86	82	50	246	257	6			
3	715.850	0.81	2.72	2.72	102	87	82	49	246	257	6			
4	718.011	0.82	2.76	2.76	101	88	82	50	246	258	7			
5	720.207	0.86	2.90	2.90	101	89	82	52	246	258	7			
6	722.513	0.89	3.00	3.00	101	89	82	51	245	256	7			
0	724.812													

Toledo Shredding, LLC. - Stack #1 Scrubber Outlet							Methods 1-5, 25 & 202	Test Date	7/18/2017	Run 2
Meter Box Id:	1	Probe ID	3p-5		Cold Box ID:	20		EPA Observer:		

As ft^2	Pbar	Pq (static)	Ps		Avg. Ts F	CO2 - F_{CO2}	O2	N2+C	Md	Ms	Pitot Ck
7.45	29.50	0.38	29.53		101	0.00	20.90	79.10	28.84	28.62	ok

Y	ΔH :	Cp	Vm cf	Vlc	Avg. Tm F	Vm std	Vw std	Bws	S Bws		Leak Ck
0.9994	1.967	0.84	57.041	30.90	92.08	54.143	1.454	0.026	0.068		0 @ 10"
								Assumed Bws:	2.000		

Avg. Sqrt Dlp	Vs	scfm wet	acfm		Qsd dscfh	# Sample Points	Dn	Total Test time	Time @ point	Avg. Dlh	Test Time
0.948	55.46	23,036	24,799		1.35E+06	24	0.235	60	2.50	3.057073	15:49-17:14

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Point No.	Meter (cf)	dl "p"	Target ΔH	Actual dl ΔH	Ts F	tm F (in)	tm F (out)	Cond Temp F	Filter Temp F	Probe Temp F	Vacuum	Imp. Liquid Collected		
A-1	725.012	0.86	2.90	2.90	102	87	85	68	239	257	6	Wt. (end)	Wt. (start)	lc
2	727.375	0.88	2.98	2.98	101	88	86	66	240	258	6	464.8	462.6	2.2
3	729.597	0.90	3.05	3.05	101	89	86	62	242	258	7	519.8	516.2	3.6
4	731.932	1.00	3.39	3.39	101	90	86	60	244	258	8	641.0	640.5	0.5
5	734.328	1.00	3.39	3.39	101	92	86	59	244	258	8	0.0	0.0	0.0
6	736.811	0.98	3.33	3.33	101	92	86	60	245	256	8	0.0	0.0	0.0
B-1	739.236	1.00	3.38	3.38	102	90	87	67	245	257	8	0.0	0.0	0.0
2	741.745	0.84	2.86	2.86	101	93	87	62	247	257	7	921.7	897.1	24.6
3	744.004	0.85	2.88	2.88	102	93	86	60	246	258	7			
4	746.293	0.84	2.86	2.86	100	94	87	60	248	258	7	Isokinetics	99.6	
5	748.658	0.83	2.82	2.82	101	94	87	62	248	258	7	Test Date	7/2017 & 7/19/2017	
6	750.979	1.00	3.41	3.41	101	94	88	63	248	255	9			
C-1	753.481	0.88	3.00	3.00	100	92	88	68	247	258	8			
2	755.926	0.91	3.10	3.10	98	92	85	65	242	258	8			
3	758.387	0.93	3.17	3.17	101	94	88	62	245	257	8			
4	760.757	0.91	3.11	3.11	101	95	89	60	242	258	8			
5	763.088	0.95	3.24	3.24	102	95	89	59	243	258	9			
6	765.529	0.91	3.10	3.10	102	95	89	60	242	258	9			
D-1	768.014	0.87	2.96	2.96	102	93	89	67	244	259	8			
2	770.411	0.84	2.85	2.85	101	91	88	66	247	258	7			
3	772.779	0.85	2.89	2.89	100	91	88	64	247	258	7			
4	775.056	0.83	2.82	2.82	100	90	86	61	247	259	7			
5	777.358	0.88	2.99	2.99	101	93	88	60	247	257	7			
6	779.772	0.85	2.89	2.89	101	93	88	58	247	259	7			
0	782.053													

Toledo Shredding, LLC. - Stack #1 Scrubber Outlet							Methods 1-5, 25 & 202		Test Date	7/19/2017	Run 3
Meter Box Id:	1	Probe ID	3p-5		Cold Box ID:	13		EPA Observer:			

As ft^2	Pbar	Pq (static)	Ps		Avg. Ts F	CO2 - F_{CO2}	O2	N2+C	Md	Ms	Pitot Ck
7.45	29.50	0.38	29.53		94	0.00	20.90	79.10	28.84	28.62	ok

Y	ΔH :	Cp	Vm cf	Vlc	Avg. Tm F	Vm std	Vw std	Bws	S Bws		Leak Ck
0.9994	1.967	0.84	53.602	31.70	71.92	52.780	1.492	0.027	0.054		.004 @ 16"
								Assumed Bws:	2.000		

Avg. Sqrt Dlp	Vs	scfm wet	acfm		Qsd dscfh	# Sample Points	Dn	Total Test time	Time @ point	Avg. Dlh	Test Time
0.926	53.85	22,660	24,079		1.32E+06	24	0.235	60	2.50	2.851281	7:36-9:27

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Point No.	Meter (cf)	dl "p"	Target dl "h"	Actual dl "h"	Ts F	tm F (in)	tm F (out)	Cond Temp F	Filter Temp F	Probe Temp F	Vacuum	Imp. Liquid Collected Wt. (end)	Wt. (start)	lc
A-1	782.62	0.76	2.51	2.51	93	66	64	57	244	257	8			
2	784.733	0.84	2.77	2.77	93	67	65	59	246	257	9	473.9	473.7	0.2
3	786.812	0.87	2.88	2.88	92	68	65	58	248	257	10	489.4	489.3	0.1
4	789.038	0.88	2.91	2.91	93	70	65	59	253	258	10	717.6	706.5	11.1
5	791.259	0.86	2.85	2.85	93	69	66	61	252	258	10	0.0	0.0	0.0
6	793.498	0.85	2.82	2.82	93	71	66	63	253	257	10	0.0	0.0	0.0
B-1	795.702	0.92	3.05	3.05	93	70	66	59	254	256	11	0.0	0.0	0.0
2	798.032	0.89	2.95	2.95	94	71	67	66	253	257	11	965.0	944.7	20.3
3	800.249	0.91	3.01	3.01	94	71	67	63	253	258	11			
4	802.531	0.87	2.89	2.89	93	72	67	61	253	257	11			
5	804.781	0.86	2.86	2.86	92	72	67	60	254	258	11			
6	807.052	0.82	2.73	2.73	93	73	68	61	254	258	11			
C-1	809.272	0.85	2.82	2.82	93	70	68	64	255	257	11			
2	811.587	0.90	2.99	2.99	94	73	69	61	253	257	11			
3	813.837	0.92	3.06	3.06	94	72	69	63	253	257	11			
4	816.142	0.89	2.96	2.96	94	72	70	59	253	257	11			
5	818.473	0.90	2.99	2.99	94	73	70	58	253	257	11			
6	820.725	0.87	2.89	2.89	95	74	70	59	254	257	11			
D-1	822.945	0.80	2.66	2.66	95	74	71	65	253	257	10			
2	825.131	0.83	2.76	2.76	95	75	71	61	253	258	10			
3	827.334	0.81	2.70	2.70	94	75	71	59	253	257	10			
4	829.565	0.85	2.83	2.83	95	76	71	58	254	257	10			
5	831.782	0.82	2.74	2.74	95	76	72	60	253	257	10			
6	833.973	0.84	2.80	2.80	95	76	72	61	254	258	10			
0	836.225													

Isokinetics	98.8

Test Date /2017 & 7/19/2017

Custom Stack Analysis, LLC.
Pitot Traverse Data Sheet for Cyclonics

Plant Toledo Shredding, LLC. Date 7/18/2017

Location Stack #2 Cyclone Outlet By lan G, Justin S, Jonathan

Point #	Angle
1	8
2	6
3	3
4	7
5	5
6	9
7	6
8	5
9	4
10	8
11	5
12	7
B-1	8
2	6
3	5
4	5
5	4
6	7
7	9
8	6
9	5
10	5
11	7
12	4
Avg	6

TEST DATA

COMPANY NAME	Toledo Shredding, LLC. - Stack #2 Cyclone Out
ADDRESS	275 Millard Ave
CITY	Toledo
STATE	OH
ZIP	43605
TEST METHODS	Methods 1-5
CREW MEMBERS	Jim G, Dylan G, Justin S, Jonathan A, Brian L
LOCATION	Cyclone Outlet
SOURCE	Stack #2 Cyclone Outlet
CONTROL	Stack #2

	RUN #1	RUN #2	RUN #3
DATE	7/18/2017	7/18/2017	7/19/2017
TIME	11:31-14:36	15:50-17:24	7:37-9:26
RUN LENGTH (min)	60.00	60.00	60.00
VOLUME (cubic feet)	54.447	55.86	52.833
BAROMETRIC (in. Hg)	29.56	29.56	29.56
METER TEMP. (R)	548.4	556.5	539.5
STACK TEMP. (R)	557.7	560.4	550.0
AVERAGE ?P (in. WC)$^{1/2}$	0.81	0.81	0.78
AVERAGE ?H (in. WC)	2.67	2.70	2.51
IMPINGER VOLUME (ml)	12.30	23.00	20.10
PITOT COEF.	0.84	0.84	0.84
Static Pressure (in. WC)	0.08	0.08	0.08
STACK AREA (sq/ft)	2.96	2.96	2.96
NOZZLE SIZE (sq/ft)	0.0003382	0.000338	0.000338
CARBON DIOXIDE (%)	0.00	0.00	0.00
OXYGEN (%)	20.90	20.90	20.90
NITROGEN (%)	79.1	79.1	79.1

WEIGHTS			
INITIAL PROBE #1 (mg)	114675.9	112754.6	98751.6
POST PROBE #1 (mg)	114759.2	112790.3	98764.3
TOTAL (mg)	83.3	35.7	12.7
INITIAL PROBE #2 (mg)	114676.2	112754.4	98751.9
POST PROBE #2 (mg)	114759.4	112790.6	98764.6
TOTAL (mg)	83.2	36.2	12.7
AVG Probe Weight (mg)	83.25	35.95	12.7
INITIAL FILTER #1 (mg)	21358.2	21466.2	20552.2
POST FILTER #1 (mg)	21704.1	21890.9	20629.7
TOTAL (mg)	345.9	424.7	77.5
INITIAL FILTER #2 (mg)	21358.4	21466.4	20552.2
POST FILTER #2 (mg)	21704	21890.7	20629.6
TOTAL (mg)	345.6	424.3	77.4
AVG Filter Weight (mg)	345.75	424.5	77.45
INITIAL ACE. BLANK	109656.3	109656.3	109656.3
POST ACE. BLANK	109656.4	109656.4	109656.4
TOTAL	0.1	0.1	0.1

TEST RESULTS

OUTLET

	RUN #1	RUN #2	RUN #3
VM (std) ft^3	51.91	52.50	51.18
VW (std) ft^3	0.58	1.08	0.95
BWS Fraction (measured)	0.011	0.020	0.018
MD (lb/lb-mole (dry))	28.84	28.84	28.84
MS (lb/lb-mole (wet))	28.72	28.62	28.64
VS (ft/sec)	46.97	47.26	45.29

SCFH	463250	459609	449671
ACFM	8344	8397	8046
DCFM	7721	7660	7495
ISOKINETIC %	98.2	100.1	99.7

PARTICULATE			
LBS/HR	8.419993	8.867088	1.740469
GR/DSCF	0.127231	0.135049	0.027094
LBS/DSCF	1.82E-05	1.93E-05	3.87E-06

Vm (std) = Volume of gas sampled at standard conditions.

Vw (std) = Volume of water vapor collected at standard conditions.

Bws = Stack moisture content.

Md = Determination of dry molecular weight of stack gas.

Ms = Determination of stack gas molecular weight.
Vs = Average gas stack velocity. (ft/sec.)

ACFM = Actual cubic feet per minute of gas velocity.

DCFM = Dry standard cubic feet per minute of gas velocity.

Lbs/Hr = Pounds per Hour.

Gr/Dscf = Grains per dry standard cubic feet.

Toledo Shredding, LLC. - Stack #2 Cyclone Outlet							Methods 1-5		Test Date	7/18/2017	Run 1
Meter Box Id:	2	Probe ID	4p-1		Cold Box ID:	1		EPA Observer:			

As ft^2	Pbar	Pq (static)	Ps		Avg. Ts F	CO2 - F_{CO2}	O2	N2+C	Md	Ms	Pitot Ck
2.96	29.56	0.08	29.57		98	0.00	20.90	79.10	28.84	28.62	ok

Y	ΔH :	Cp	Vm cf	Vlc	Avg. Tm F	Vm std	Vw std	Bws	S Bws		Leak Ck
0.9962	1.875	0.84	54.447	12.30	88.42	51.914	0.579	0.011	0.061		.009 @ 10"
								Assumed Bws:	2.000		

Avg. Sqrt Dlp	Vs	scfm wet	acfm		Qsd dscfh	# Sample Points	Dn	Total Test time	Time @ point	Avg. Dlh	Test Time
0.807	47.05	7,820	8,359		4.64E+05	24	0.249	60	2.50	2.665048	11:31-14:36

Tab

Protect

Unprotect

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0.00033816

TRUE

Point No.	Meter (cf)	dl "p"	Target dl "h"	Actual dl "h"	Ts F	tm F (in)	tm F (out)	Cond Temp F	Filter Temp F	Probe Temp F	Vacuum	Imp. Liquid Collected		
A-1	505.08	0.50	2.02	2.02	96	80	78	68	224	268	5	Wt. (end)	Wt. (start)	lc
2	507.179	0.82	3.32	3.32	95	82	78	65	227	266	6	636.7	636.6	0.1
3	509.321	0.80	3.25	3.25	95	84	79	61	232	268	7	637.1	626.3	10.8
4	511.995	0.80	3.04	3.04	96	87	7	60	234	267	7	593.1	591.1	2.0
5	514.471	0.88	3.58	3.58	96	88	79	60	234	266	9	0.0	0.0	0.0
6	516.953	0.82	3.34	3.34	96	88	79	61	233	268	9	0.0	0.0	0.0
7	519.462	0.81	3.30	3.30	97	90	80	63	233	268	9	0.0	0.0	0.0
8	522.081	0.85	3.47	3.47	97	90	80	65	233	269	9	958.6	959.2	-0.6
9	524.815	0.53	2.15	2.15	97	84	82	68	223	268	5			
10	526.907	0.58	2.36	2.36	98	87	82	66	242	267	6	Isokinetics	98.0	
11	529.055	0.56	2.28	2.28	98	88	82	59	245	266	6	Test Date	3/2017 & 7/19/2017	
12	531.179	0.60	2.45	2.45	97	89	82	55	244	266	6			
B-1	533.235	0.59	2.41	2.41	95	86	84	68	225	265	6			
2	535.459	0.62	2.54	2.54	96	88	84	64	246	267	6			
3	537.691	0.61	2.50	2.50	95	89	84	59	249	266	6			
4	539.933	0.49	1.99	1.99	101	87	84	68	248	268	5			
5	541.962	0.58	2.35	2.35	101	88	84	65	249	266	6			
6	544.129	0.56	2.28	2.28	100	89	83	62	249	267	6			
7	546.278	0.59	2.40	2.40	101	91	84	60	248	268	6			
8	548.448	0.62	2.52	2.52	102	92	84	61	246	267	6			
9	550.594	0.61	2.49	2.49	100	93	84	60	244	267	6			
10	552.829	0.62	2.54	2.54	99	93	84	61	242	267	6			
11	554.726	0.64	2.63	2.63	98	94	85	63	241	266	7			
12	557.124	0.67	2.75	2.75	98	95	85	78	240	265	7			
0	559.525													

Toledo Shredding, LLC. - Stack #2 Cyclone Outlet							Methods 1-5		Test Date	7/18/2017	Run 2
Meter Box Id:	2	Probe ID	4p-1		Cold Box ID:	3		EPA Observer:			

As ft^2	Pbar	Pq (static)	Ps		Avg. Ts F	CO2 - F_{CO2}	O2	N2+C	Md	Ms	Pitot Ck
2.96	29.56	0.08	29.57		100	0.00	20.90	79.10	28.84	28.62	ok

Y	ΔH :	Cp	Vm cf	Vlc	Avg. Tm F	Vm std	Vw std	Bws	S Bws		Leak Ck
0.9962	1.875	0.84	55.863	23.00	96.50	52.495	1.083	0.020	0.066		.014 @ 10.5"
								Assumed Bws:	2.000		

Avg. Sqrt Dlp	Vs	scfm wet	acfm		Qsd dscfh	# Sample Points	Dn	Total Test time	Time @ point	Avg. Dlh	Test Time
0.809	47.26	7,818	8,397		4.60E+05	24	0.249	60	2.50	2.702716	15:50-17:24

Tab

Protect

Unprotect

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TRUE

Point No.	Meter (cf)	dl "p"	Target ΔH	Actual dl ΔH	Ts F	tm F (in)	tm F (out)	Cond Temp F	Filter Temp F	Probe Temp F	Vacuum	Imp. Liquid Collected		
												Wt. (end)	Wt. (start)	lc
A-1	560.290	0.59	2.41	2.41	100	90	88	68	225	269	5			
2	562.518	0.53	2.16	2.16	101	91	88	65	228	268	4	573.6	569.3	4.3
3	564.678	0.51	2.09	2.09	101	93	88	62	234	267	5	639.7	630.7	9.0
4	566.689	0.63	2.57	2.57	102	94	88	59	235	269	5	492.6	492.5	0.1
5	568.921	0.63	2.58	2.58	102	95	88	57	236	271	5	0.0	0.0	0.0
6	571.215	0.66	2.71	2.71	102	97	89	58	236	270	5	0.0	0.0	0.0
7	573.568	0.65	2.66	2.66	102	97	88	57	237	240	5	0.0	0.0	0.0
8	575.916	0.67	2.75	2.75	102	98	88	56	237	269	6	904.9	895.3	9.6
9	578.312	0.70	2.88	2.88	101	99	89	57	236	269	6			
10	580.731	0.65	2.68	2.68	100	99	89	58	235	268	5			
11	583.069	0.62	2.56	2.56	99	99	89	58	235	269	5			
12	585.367	0.63	2.60	2.60	100	99	90	60	236	269	5			
B-1	587.678	0.65	2.67	2.67	100	93	90	68	226	266	5			
2	590.014	0.66	2.72	2.72	99	95	92	65	234	270	5			
3	592.302	0.73	3.00	3.00	99	94	90	68	225	270	6			
4	594.784	0.78	3.21	3.21	99	95	90	67	232	270	6			
5	597.285	0.84	3.46	3.46	100	96	90	68	236	269	7			
6	599.836	0.80	3.29	3.29	101	97	90	65	238	268	7			
7	602.447	0.83	3.42	3.42	100	98	91	63	239	269	7			
8	605.005	0.74	3.05	3.05	100	98	91	63	240	269	6			
9	607.463	0.55	2.27	2.27	100	99	91	63	240	269	5			
10	609.569	0.61	2.52	2.52	100	100	91	64	241	269	5			
11	611.821	0.57	2.36	2.36	99	100	91	63	241	270	5			
12	614.022	0.54	2.23	2.23	100	100	91	64	241	268	5			
0	616.153													

Isokinetics	100.1

Test Date 7/2017 & 7/19/2017

Toledo Shredding, LLC. - Stack #2 Cyclone Outlet							Methods 1-5		Test Date	7/19/2017	Run 3
Meter Box Id:	2	Probe ID	4p-1		Cold Box ID:	4		EPA Observer:			

As ft^2	Pbar	Pq (static)	Ps		Avg. Ts F	CO2 - F_{CO2}	O2	N2+C	Md	Ms	Pitot Ck
2.96	29.56	0.08	29.57		90	0.00	20.90	79.10	28.84	28.62	ok

Y	ΔH :	Cp	Vm cf	Vlc	Avg. Tm F	Vm std	Vw std	Bws	S Bws		Leak Ck
0.9962	1.875	0.84	52.833	20.10	79.54	51.184	0.946	0.018	0.048		.003 @ 11"
								Assumed Bws:	2.000		

Avg. Sqrt Dlp	Vs	scfm wet	acfm		Qsd dscfh	# Sample Points	Dn	Total Test time	Time @ point	Avg. Dlh	Test Time
0.783	45.30	7,636	8,049		4.50E+05	24	0.249	60	2.50	2.512324	7:37-9:26

Tab

Protect

Unprotect

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TRUE

Point No.	Meter (cf)	dl "p"	Target dl "h"	Actual dl "h"	Ts F	tm F (in)	tm F (out)	Cond Temp F	Filter Temp F	Probe Temp F	Vacuum	Imp. Liquid Collected		(
A-1	619.99	0.52	2.10	2.10	87	70	68	68	224	270	4	Wt. (end)	Wt. (start)	lc
2	622.013	0.46	1.85	1.85	87	70	68	58	227	266	4	571.8	576.8	-5.0
3	623.986	0.51	2.06	2.06	88	72	68	55	232	267	5	600.7	591.6	9.1
4	626.024	0.55	2.23	2.23	87	74	69	55	240	265	5	518.9	516.2	2.7
5	627.941	0.48	1.94	1.94	88	75	69	55	238	267	5	0.0	0.0	0.0
6	629.865	0.46	1.86	1.86	88	74	70	57	235	266	5	0.0	0.0	0.0
7	631.747	0.52	2.10	2.10	88	74	70	63	236	260	5	0.0	0.0	0.0
8	633.799	0.55	2.23	2.23	89	77	71	61	238	270	5	847.3	834.0	13.3
9	635.811	0.54	2.19	2.19	89	79	71	60	239	267	5			
10	637.860	0.51	2.07	2.07	88	79	71	62	236	269	5			
11	639.918	0.56	2.28	2.28	88	80	71	63	234	267	5			
12	641.963	0.53	2.16	2.16	89	80	72	65	233	270	5			
B-1	644.005	0.65	2.63	2.63	91	76	74	68	224	269	6			
2	646.311	0.68	2.76	2.76	91	80	74	57	243	269	6			
3	648.661	0.73	2.97	2.97	91	82	75	55	239	267	6			
4	651.084	0.77	3.14	3.14	91	83	75	57	239	269	6			
5	653.526	0.79	3.23	3.23	91	84	76	59	238	268	6			
6	656.093	0.82	3.35	3.35	91	84	76	60	237	268	6			
7	658.628	0.84	3.43	3.43	92	85	76	60	237	267	6			
8	661.162	0.80	3.27	3.27	92	85	77	66	245	268	7			
9	663.745	0.69	2.82	2.82	93	86	77	62	246	269	7			
10	666.058	0.66	2.69	2.69	93	86	77	60	246	268	7			
11	668.327	0.58	2.37	2.37	93	87	77	59	245	268	7			
12	670.546	0.63	2.57	2.57	94	87	78	61	244	268	7			
0	672.823													

Isokinetics	99.7

Test Date /2017 & 7/19/2017

7-18-17

Stack No 1 | Stack No 2

Run 1

11:30-11:45 80 70 81 83
11:50-11:51 77 80 80
12:18-12:32 80 81 75
12:39-12:43 68 79 76 79
12:50-12:57 66 77 80 78
14:12-14:16
14:20-14:35

11:31-11:51
12:16-12:26
12:51-12:57
14:12-14:36

IC= .009 @ 10"

IC= .006 @ 11"

Run 2 84 81 81 82

15:49-16:04 77 79 80 77
16:06-16:21 76 79 80 76
16:23-16:38 75 80 80 77
16:59-17:14 76 81 81 77
77 81 82 77

15:50-16:20
16:41-16:45
16:57-17:24

IC= 0 @ 10"

IC= .014 @ 10.5"

7-19-17

Stack No 1

Run 3

7:36-7:42	75 77 84 78
7:50-7:59	69 77 83 80
8:06-8:21	71 79 78 79
8:25-8:29	74 82 77 79
8:51-9:02	75 81 80 80
9:12-9:27	77 79 81 80

IC = .004 @ 16"

Stack No 2

7:37-7:42	
7:50-7:59	
8:07-8:22	
8:50-9:06	
9:12-9:26	

IC = .003 @ 11"

Stack #1

Fyrite

Date: 7-18-17 **Technician:** Jon A

		1		2		3		Avg
Run #1	Time		Time		Time			
	CO^2	0	CO^2	0	CO^2	0	CO^2	0
	O^2	21	O^2	21	O^2	21	O^2	21

		1		2		3		Avg
Run #2	Time		Time		Time			
	CO^2	0	CO^2	0	CO^2	0	CO^2	0
	O^2	21	O^2	21	O^2	21	O^2	21

7-19-17

		1		2		3		Avg
Run #3	Time		Time		Time			
	CO^2	0	CO^2	0	CO^2	0	CO^2	0
	O^2	21	O^2	21	O^2	21	O^2	21

Stack #2

Fyrite

Date: 7-18-17 Technician: Dylan G

		1		2		3		Avg
Run #1	Time		Time		Time			
	CO^2	0	CO^2	0	CO^2	0	CO^2	0
	O^2	21	O^2	21	O^2	21	O^2	21

		1		2		3		Avg
Run #2	Time		Time		Time			
	CO^2	0	CO^2	0	CO^2	0	CO^2	0
	O^2	21	O^2	21	O^2	21	O^2	21

7-19-17

		1		2		3		Avg
Run #3	Time		Time		Time			
	CO^2	0	CO^2	0	CO^2	0	CO^2	0
	O^2	21	O^2	21	O^2	21	O^2	21

US EPA Reference Method 25 Field Data Sheet - Fill out COMPLETELY

Testing Company Name and Job Number:

Facility: Toledo Shredding, LLC	Sample ID:
Location: Toledo, OH Stack #1	Controller ID: G
Source: P902	Tank No(s).: 185
Test Date: 7-18-17	Trap No(s).: 1865
Operator: Jonathan Augustin	Filter ID: B
Run No.: 1 Stack Temp (°F): 100	Wet Bulb (°F): %H_2O 3 %CO_2 0

LEAK CHECKS	INITIAL ABS. PRES. or VAC (units)	DATE/TIME	FINAL ABS. PRES. or VAC (units)	DATE/TIME
TANK	2 mb	7-14-17/15:35	2 mb	7-17-17/8:05
TRAIN	29" Hg	7-17-17/16:02	29" Hg	7-17-17/16:12

Calculate allowed sample train leak rate as pressure increase in 10 minutes at **X** *ml/min sample rate using this equation:*

*(BP)(0.01)(***X** *ml/min)(10 min)/(sample train+trap+manifold volume, ml)* =

TEMP. & PRES. MEASUREMENTS	TANK ABS. PRES. or VAC (units)	*BAROMETRIC PRESSURE (units)	TANK TEMPERATURE (°F)
PRE TEST	2 mb	29.5" Hg	67
POST TEST	641 mb	28.61" Hg	68

**It is not necessary to record the barometric pressure when using an absolute pressure sensor.*

Clock times: Trap in Dry Ice: 7:30 Probe in Stack: 10:55 Start Purge: 11:55 End Purge: 12:05

ELAPSED TIME (MIN)	CLOCK TIME	GAUGE READING (in. Hg vac)	FLOW METER SETTING (units)	FILTER TEMP (°F)	PROBE TEMP (°F)	COMMENTS
START 0	11:32	29	80	250	265	
5	11:37	28	80	250	265	
10	11:42	27	80	250	265	
15	11:47	25	80	250	265	
20	12:12 11:52	24	80	250	265	
25	12:22 11:57	22	80	250	265	
30	12:27 12:02	21	80	250	265	
35	12:32 12:07	19	80	250	265	
40	12:35 12:12	18	80	250	265	
45	12:40 12:17	16	80	250	265	
2:11 50	12:45 12:22	15	80	250	265	
2:10 55	12:50 12:27	13	80	250	265	
END 2:12 60	12:57 12:32	10	80	250	265	
	1:05					

Operator signature & date

Field team leader signature/date

US EPA Reference Method 25 Field Data Sheet - Fill out COMPLETELY

Testing Company Name and Job Number:

Facility: Toledo shredding LLC	Sample ID:
Location: Toledo, OH stack #1	Controller ID: 6
Source:	Tank No(s).: 129
Test Date: 7-18-17	Trap No(s).: 1057
Operator: Jonathan Augustin	Filter ID: B
Run No.: 2 Stack Temp (°F): 100	Wet Bulb (°F): %H_2O 3 %CO_2 0

LEAK CHECKS	INITIAL ABS. PRES. or VAC (units)	DATE/TIME	FINAL ABS. PRES. or VAC (units)	DATE/TIME
TANK	2 mb	7-14-17/15:35	2 mb	7-17-17/8:25
TRAIN	29" Hg	7-18-17/15:20	29" Hg	7-18-17/15:30

Calculate allowed sample train leak rate as pressure increase in 10 minutes at **X** *ml/min sample rate using this equation:*

*(BP)(0.01)(***X** *ml/min)(10 min)/(sample train+trap+manifold volume, ml) =*

TEMP. & PRES. MEASUREMENTS	TANK ABS. PRES. or VAC (units)	*BAROMETRIC PRESSURE (units)	TANK TEMPERATURE (°F)
PRE TEST	2 mb	29" Hg	78
POST TEST	6/3 mb	28.61" Hg	78

**It is not necessary to record the barometric pressure when using an absolute pressure sensor.*

Clock times: Trap in Dry Ice: 3:05 Probe in Stack: 3:35 Start Purge: 3:35 End Purge: 3:45

ELAPSED TIME (MIN)	CLOCK TIME	GAUGE READING (in. Hg vac)	FLOW METER SETTING (units)	FILTER TEMP (°F)	PROBE TEMP (°F)	COMMENTS
START 0	3:47	29	80	250	265	
5	3:52	28	80	250	265	
10	3:57	27	80	250	265	
15	4:02	25	80	250	265	
20	4:07	24	80	250	265	
25	4:12	22	80	250	265	
30	4:17	21	80	250	265	
35	4:22	19	80	250	265	
40	4:27	17	80	250	265	
45	4:32	15	80	250	265	
50	4:37	14	80	250	265	
55	4:42	13	80	250	265	
END 60	4:47	11	80	250	265	

Operator signature & date	
Field team leader signature/date	

US EPA Reference Method 25 Field Data Sheet - Fill out COMPLETELY

Testing Company Name and Job Number:

Facility: Toledo shredding, LLC	Sample ID:
Location: Toledo, OH Stack #10	Controller ID: 5
Source:	Tank No(s).: 132
Test Date: 7-19-17	Trap No(s).: 1058
Operator: Jonathan Augusten	Filter ID: B
Run No.: 3 Stack Temp (°F): 100	Wet Bulb (°F): %H_2O 3 %CO_2 0

LEAK CHECKS	INITIAL ABS. PRES. or VAC (units)	DATE/TIME	FINAL ABS. PRES. or VAC (units)	DATE/TIME
TANK	2 mb	7-14-17/15:35	2 mb	7-17-17/8:05
TRAIN	29" Hg	7-19-17/6:31	29" Hg	7-19-17/6:41

Calculate allowed sample train leak rate as pressure increase in 10 minutes at **X** *ml/min sample rate using this equation:*

*(BP)(0.01)(***X** *ml/min)(10 min)/(sample train+trap+manifold volume, ml) =*

TEMP. & PRES. MEASUREMENTS	TANK ABS. PRES. or VAC (units)	*BAROMETRIC PRESSURE (units)	TANK TEMPERATURE (°F)
PRE TEST	2 mb	29" Hg	~~2 mb~~ 79
POST TEST	681 mb	28.61" Hg	68

**It is not necessary to record the barometric pressure when using an absolute pressure sensor.*

Clock times: Trap in Dry Ice: 6:25 Probe in Stack: 6:50 Start Purge: 6:50 End Purge: 7:00

ELAPSED TIME (MIN)	CLOCK TIME	GAUGE READING (in. Hg vac)	FLOW METER SETTING (units)	FILTER TEMP (°F)	PROBE TEMP (°F)	COMMENTS
START 0	7:35	29	80	250	265	
5	7:40	27	80	250	265	
10	7:45	26	80	250	265	
15	7:50	24	80	250	265	
20	7:55	22	80	250	265	
25	8:00	20	80	250	265	
30	8:05	19	80	250	265	
35	8:10	17	80	250	265	
40	8:15	16	80	250	265	
45	8:20	14	80	250	265	
50	8:25	13	80	250	265	
55	8:30	11	80	250	265	
END 60	8:35	9	80	250	265	

Stop @ 6:40

Operator signature & date	
Field team leader signature/date	

Appendix #2

Laboratory Data

Lab Data Sheet For: Toledo Shredding, LLC. - Stack #1 Scrubber Outlet By: Brian L

Moisture Weights

Method 5 Moisture

			grams	grams	grams	grams	grams	grams	grams
RUN # 1		Box ID	1	2	3	4	5	6	Drierite
	Gross	23	464.7	495.5	552.2				907.1
	Tare		448.6	481.6	562.1				891.1
	Net		16.1	13.9	-9.9	0.0	0.0	0.0	16.0
		Reagent	H2O	H2O	H2O	H2O			
		mLs	100.0	100.0	100.0	100.0			

		grams			grams
Intial Imp mL =	300.0	Impinger Total =	20.1	Total =	36.1

			grams	grams	grams	grams	grams	grams	grams
RUN # 2		Box ID	1	2	3	4	5	6	Drierite
	Gross	20	464.8	519.8	641.0				921.7
	Tare		462.6	516.2	640.5				897.1
	Net		2.2	3.6	0.5	0.0	0.0	0.0	24.6
		Reagent	H2O	H2O	H2O	H2O			
		mLs	100.0	100.0	100.0	100.0			

		grams			grams
Intial Imp mL =	300.0	Impinger Total =	6.3	Total =	30.9

			grams	grams	grams	grams	grams	grams	grams
RUN # 3		Box ID	1	2	3	4	5	6	Drierite
	Gross	13	473.9	489.4	717.6				965.0
	Tare		473.7	489.3	706.5				944.7
	Net		0.2	0.1	11.1	0.0	0.0	0.0	20.3
		Reagent	H2O	H2O	H2O	H2O			
		mLs	100.0	100.0	100.0	100.0			

		grams			grams
Intial Imp mL =	300.0	Impinger Total =	11.4	Total =	31.7

Lab Data Sheet For: Toledo Shredding, LLC. - Stack #1 Scrubber Outlet By: Brian L

Filter Weight Method 5

Run #	ID#	Temp	RH	Barometric	Time	Date	Gross	Temp	RH	Barometric	Time	Date	Tare	Net Gain
1	2451	67	44	28.61	12:17	8/7/2017	20444.8	63	40	28.79	10:11	12/28/2016	20438.3	6.5
1	2451	65	44	28.85	12:31	8/8/2017	20444.6	64	36	28.32	16:01	12/29/2016	20437.9	6.7
													AVG	6.6
2	2456	67	44	28.61	12:18	8/7/2017	26499.8	59	35	28.32	12:42	3/6/2017	26499.4	0.4
2	2456	65	44	28.85	12:33	8/8/2017	26499.6	56	30	28.56	8:22	3/15/2017	26498.9	0.7
													AVG	0.55
3	2435	67	44	28.61	12:20	8/7/2017	26303.1	64	33	28.7	17:00	12/2/2016	26302.9	0.2
3	2435	65	44	28.85	12:35	8/8/2017	26303	62	33	28.88	14:06	12/3/2016	26302.9	0.1
													AVG	0.15

Scale Serial # 39080133 Total Gain 7.3

Lab Data Sheet For: Toledo Shredding, LLC. - Stack #1 Scrubber Outlet By: Brian L

Probe Rinse Weight

Run #		Temp	RH	Barometric	Time	Date	Gross	Temp	RH	Barometric	Time	Date	Tare	Net Gain
1		67	44	28.61	12:22	8/7/2017	119506.9	70	68	28.76	7:01	7/21/2017	119505.3	1.6
1		65	44	28.85	12:38	8/8/2017	119507.2	68	47	28.88	11:23	8/2/2017	119505.5	1.7
													AVG	1.65
2		67	44	28.61	12:24	8/7/2017	114327.3	70	68	28.76	7:03	7/21/2017	114317.8	9.5
2		65	44	28.85	12:39	8/8/2017	114327.5	68	47	28.88	11:24	8/2/2017	114317.7	9.8
													AVG	9.65
3		67	44	28.61	12:25	8/7/2017	103449.5	70	68	28.76	7:05	7/21/2017	103434.5	15
3		65	44	28.85	12:41	8/8/2017	103449.8	68	47	28.88	11:26	8/2/2017	103434.7	15.1
													AVG	15.05

Scale Serial # 39080133

Total Gain 26.35

Lab Data Sheet For: Toledo Shredding, LLC. - Stack #1 Scrubber Outlet By: Brian L

Method 202 CPM filter (organic portion)

Run #		Temp	RH	Barometric	Time	Date	Gross	Temp	RH	Barometric	Time	Date	Tare	Net Gain
1	294	67	44	28.61	12:43	8/7/2017	8677.1	59	45	28.56	9:22	4/5/2017	8676.5	0.6
1	294	65	44	28.85	12:28	8/8/2017	8677	60	48	27.96	10:22	4/6/2017	8676.4	0.6
													AVG	0.6
2	322	67	44	28.61	12:44	8/7/2017	8657.7	59	45	28.56	10:18	4/5/2017	8657.4	0.3
2	322	65	44	28.85	12:29	8/8/2017	8657.6	60	48	27.96	11:18	4/6/2017	8657.2	0.4
													AVG	0.35
3	320	67	44	28.61	12:46	8/7/2017	8608.9	59	45	28.56	10:14	4/5/2017	8608.5	0.4
3	320	65	44	28.85	12:31	8/8/2017	8608.7	60	48	27.96	11:14	4/6/2017	8608.5	0.2
													AVG	0.3

Scale Serial # 39080133 Total Gain 1.25

Lab Data Sheet For: Toledo Shredding, LLC. - Stack #1 Scrubber Outlet By: Brian L

Method 202 Aqueous (inorganic portion)

Run #		Temp	RH	Barometric	Time	Date	Gross	Temp	RH	Barometric	Time	Date	Tare	Net Gain
1		67	44	28.61	12:48	8/7/2017	109547.3	70	68	28.76	7:08	7/21/2017	109546	1.3
1		65	44	28.85	12:34	8/8/2017	109547.4	68	47	28.88	11:30	8/2/2017	109545.9	1.5
													AVG	1.4
2		67	44	28.61	12:50	8/7/2017	107855.6	70	68	28.76	7:10	7/21/2017	107854.6	1
2		65	44	28.85	12:35	8/8/2017	107855.6	68	47	28.88	11:32	8/2/2017	107854.5	1.1
													AVG	1.05
3		67	44	28.61	12:52	8/7/2017	107116.4	70	68	28.76	7:11	7/21/2017	107115.3	1.1
3		65	44	28.85	12:36	8/8/2017	107116.5	68	47	28.88	11:33	8/2/2017	107115.2	1.3
													AVG	1.2

Scale Serial # 39080133

Total Gain 3.65

Lab Data Sheet For: Toledo Shredding, LLC. - Stack #1 Scrubber Outlet By: Brian L

Method 202 Acetone (organic portion)

Run #		Temp	RH	Barometric	Time	Date	Gross	Temp	RH	Barometric	Time	Date	Tare	Net Gain
1		67	44	28.61	12:55	8/7/2017	105472.1	70	68	28.76	7:14	7/21/2017	105470.9	1.2
1		65	44	28.85	12:38	8/8/2017	105472.3	68	47	28.88	11:35	8/2/2017	105470.8	1.5
													AVG	1.35
2		67	44	28.61	12:56	8/7/2017	107425.8	70	68	28.76	7:16	7/21/2017	107424.5	1.3
2		65	44	28.85	12:40	8/8/2017	107425.9	68	47	28.88	11:37	8/2/2017	107424.4	1.5
													AVG	1.4
3		67	44	28.61	12:57	8/7/2017	101359.9	70	68	28.76	7:18	7/21/2017	101358.6	1.3
3		65	44	28.85	12:42	8/8/2017	101360	68	47	28.88	11:38	8/2/2017	101358.4	1.6
													AVG	1.45

Scale Serial # 39080133 Total Gain 4.2

Lab Data Sheet For: Toledo Shredding, LLC. - Stack #2 Cyclone Outlet By: Brian L

Moisture Weights

Method 5 Moisture

			grams	grams	grams	grams	grams	grams	grams
RUN # 1		Box ID	1	2	3	4	5	6	Drierite
	Gross	1	636.7	637.1	593.1				958.6
	Tare		636.6	626.3	591.1				959.2
	Net		0.1	10.8	2.0	0.0	0.0	0.0	-0.6
		Reagent	H2O	H2O	H2O	H2O			
		mLs	100.0	100.0	100.0	100.0			

			grams		grams
Intial Imp mL =	300.0	Impinger Total =	12.9	Total =	12.3

			grams	grams	grams	grams	grams	grams	grams
RUN # 2		Box ID	1	2	3	4	5	6	Drierite
	Gross	3	573.6	639.7	492.6				904.9
	Tare		569.3	630.7	492.5				895.3
	Net		4.3	9.0	0.1	0.0	0.0	0.0	9.6
		Reagent	H2O	H2O	H2O	H2O			
		mLs	100.0	100.0	100.0	100.0			

			grams		grams
Intial Imp mL =	300.0	Impinger Total =	13.4	Total =	23

			grams	grams	grams	grams	grams	grams	grams
RUN # 3		Box ID	1	2	3	4	5	6	Drierite
	Gross	4	571.8	600.7	518.9				847.3
	Tare		576.8	591.6	516.2				834.0
	Net		-5.0	9.1	2.7	0.0	0.0	0.0	13.3
		Reagent	H2O	H2O	H2O	H2O			
		mLs	100.0	100.0	100.0	100.0			

			grams		grams
Intial Imp mL =	300.0	Impinger Total =	6.8	Total =	20.1

Lab Data Sheet For: Toledo Shredding, LLC. - Stack #2 Cyclone Outlet By: Brian L

Filter Weight Method 5

Run #	ID#	Temp	RH	Barometric	Time	Date	Gross	Temp	RH	Barometric	Time	Date	Tare	Net Gain
1	2449	67	44	28.61	12:05	8/7/2017	21704.1	63	40	28.79	10:09	12/28/2017	21358.2	345.9
1	2449	65	44	28.85	12:20	8/8/2017	21704	64	36	28.32	15:59	12/29/2017	21358.4	345.6
													AVG	345.75
2	2454	67	44	28.61	12:06	8/7/2017	21890.9	63	40	28.79	10:14	12/28/2017	21466.2	424.7
2	2454	65	44	28.85	12:22	8/8/2017	21890.7	64	36	28.32	16:04	12/29/2017	21466.4	424.3
													AVG	424.5
3	2453	67	44	28.61	12:08	8/7/2017	20629.7	63	40	28.79	10:13	12/28/2017	20552.2	77.5
3	2453	65	44	28.85	12:23	8/8/2017	20629.6	64	36	28.32	16:03	12/29/2017	20552.2	77.4
													AVG	77.45

Scale Serial # 39080133 Total Gain 847.7

Lab Data Sheet For: Toledo Shredding, LLC. - Stack #2 Cyclone Outlet By: Brian L

Probe Rinse Weight

Run #		Temp	RH	Barometric	Time	Date	Gross	Temp	RH	Barometric	Time	Date	Tare	Net Gain
1		67	44	28.61	12:11	8/7/2017	114759.2	70	45	28.73	7:11	7/21/2017	114675.9	83.3
1		65	44	28.85	12:25	8/8/2017	114759.4	65	52	28.88	11:02	8/2/2017	114676.2	83.2
													AVG	83.25
2		67	44	28.61	12:12	8/7/2017	112790.3	70	45	28.73	7:13	7/21/2017	112754.6	35.7
2		65	44	28.85	12:27	8/8/2017	112790.6	65	52	28.88	11:04	8/2/2017	112754.4	36.2
													AVG	35.95
3		67	44	28.61	12:14	8/7/2017	98764.3	70	45	28.73	7:15	7/21/2017	98751.6	12.7
3		65	44	28.85	12:28	8/8/2017	98764.6	65	52	28.88	11:05	8/2/2017	98751.9	12.7
													AVG	12.7

Scale Serial # 39080133

Total Gain 131.9

EPA Method-25 Laboratory Report

VRi Job No: M25-1727

NJDEP Laboratory Certification No. FL018

Client Name and Sample Receipt Date: CSA/Toledo Shredding, 7/27/2017

Sample Recovery and Analysis Date: July 29, 2017 by C.G. Simon

Case Narrative: Authorized signature: Charles G. Simon 7-29-17

This laboratory report is presented in 11 parts. The Introduction is followed by a Summary of Analytical Results, Sample Volumetric Data, Normalized Method 25 Analyzer Daily Calibration Data, Normalized Sample Analysis Data, Raw Method 25 Analyzer Daily Calibration Data, Raw Sample Analysis Data, Sample Chain of Custody with Field Data, Method 25 Calculations, Initial Method 25 Sample Recovery System Performance data, and M25 Calibration Gas Certifications.

The following notes apply to this test series.

1.) Samples were received on July 27, 2017. All traps were in dry ice. All tanks and traps were sealed and in good condition.

2.) All lab tank pressures/temperatures matched field values to within ~1%. Field values were used in all calculations

3.) All sample trap purges were stopped when the trap effluent contained <5 ppm CO2 at a flow rate of ~100 ml/min.

4.) All trap recoveries were stopped when the oxidation catalyst effluent contained <10 ppm CO2 at a flow rate of ~100 ml/min.

5.) The Method-25 Sample Recovery System catalyst efficiency was measured as 100.1% prior to sample recovery.

6.) No Method-25 Audit samples were submitted with this set of samples.

7.) Permanent gas concentrations are listed for informational use only.

8.) Example calculations for one sample are presented on the following page.

Example calculations for sample: M251727-Tol-1

Sample Volume

Vs = (0.38573) (V) [(Pt /Tt) - (Pti/Tti)]

Where:	V= sample tank volume =	0.006075	m3
	Pt = sample tank pressure after sampling =	480.8	mm Hg
	Tt = sample tank temperature after sampling =	293.15	K
	Pti = sample tank pressure before sampling =	1.5	mm Hg
	Tti = sample tank temperature before sampling =	292.6	K
	Vs = sample volume =	0.003831	m3

Condensable Organics, *Cc* *Note that Cc is defined by Method 25 at 11.2.2 as the sum of CO2 and any NMO measured in the ICV.*

Cc =

$\{[(0.38573)(Vv)(Pf)]/[(Vs)(Tf)]\}\{[1/3][(X_1+X_2+X_3)/DRF_{CO2}+(Y_1+Y_2+Y_3)/DRF_{NMO})]\}$

Where:

Vv = ICV volume =	0.003159	m3	
Pf = ICV final pressure =	1062.8	mm Hg	
Vs= sample volume =	0.003831	m3	
Tf = final ICV temp. =	297.0	K	
$X_{1,2,3}$ = GC area responses for CO2 in the ICV =	222.03	225.21	225.00
DRF_{CO2} = CO2 response factor =	0.9969	area counts/ppmC	
$Y_{1,2,3}$ = GC area responses for NMO in the ICV	2.70	1.03	1.46
DRF_{NMO} = normalized NMO response factor =	1.0071	area counts/ppmC	
Cc = condensable VOC =	**257.77**	**ppmC**	

Noncondensable Organics

$Ct = \{(Ptf/Ttf)/[(Pt/t)-(Pti/Tti)]\}\{(1/3)(X_1+X_2+X_3)/DRF_{NMO}\}$

Where:

Ptf = final sample tank pressure =	1063.6	mm Hg
Ttf = final sample tank temp. =	297.7	K
Pt = sample tank pres. after sampling =	480.8	mm Hg
Tt = sample tank temp. after sampling =	293.2	K
Pti = sample tank pres. before sampling =	1.5	mm Hg
Tti = sample tank temp. before sampling =	292.6	K
X_1 = 1st GC response, NMO in tank =	13.3	area units
X_2 = 2nd GC response, NMO in tank =	14.4	area units
X_3 = 3rd GC response, NMO in tank =	15.1	area units
'DRF_{NMO} = NMO response factor =	1.0071	area units /ppmC
Ct = Noncondensable VOC =	**30.97**	**ppmC**

TGNMO Mass Concentration

Where:

Mc = 0.4993 (Ct+Cc) = **C**

Where:

Ct = Noncondensable VOC =	30.97	ppmC
Cc = condensable VOC =	257.77	ppmC
C = total VOC mass conc. =	**144.17**	**mgC/m3**

VRi Job No: M25-1727 **NJDEP Laboratory Certification No. FL018**

Client Name and Sample Receipt Date: CSA/Toledo Shredding, 7/27/2017

Sample Recovery and Analysis Date: July 29, 2017 by C.G. Simon

Authorized signature: Charles G. Simon 7-29-17

Permanent gas concentrations listed for informational use only.					TGNMO concentrations in the dry sample gas			
Sample Run and ID	*CO2 ppm	CO ppm	CH4 ppm		***Ct*** Non-condensable @ -78°C, ppmC	**Cc** Condensable @ -78°C, ppmC	***C*** Total VOC ppmC	**Mc** **Total VOC mgC/dscm**
Shredder Outlet								
M251727-Tol-1	1,588	4	4		31	258	289	144.2
M251727-Tol-2	6,437	4	4		16	89	105	52.41
M251727-Tol-3	6,496	5	4		27	117	145	72.28

*CO2 concentrations in the sample tanks may not be accurate or directly comparable due to a potential interference of up to ~8000 ppm from the dry ice used to store and process the samples. This does not affect the VOC results.

VRi Job No: M25-1727

Client Name and Sample Receipt Date:	CSA/Toledo Shredding, 7/27/2017
Sample Recovery and Analysis Date:	July 29, 2017 by C.G. Simon

Sample ID	Vessel	*Vol. (ml)*	*Pti* mm Hg	*Tti* °F	*Tti* K	*Pt* mbar	*Pt* mmHg	*Tt* °F	*Tt* K	*Ptf* & *Pf* mbar	*Ptf* & *Pf* mm Hg	*Ttf* & *Tf* °F	*Ttf* & *Tf* K	Vs Sample Volume ml	Analysis Volume ml	Anal Vol / Samp Vol	Lab tank pres mbar	Lab tank temp °F	% vol diff v field value
Shredder Outlet																			
M251727-Tol-1	Tank-185	6,075	1.5	67	293	641	481	68	293	1418	1064	76.2	298	3,831	8,372	2.185	661	79	1.0%
trap-1065	ICV-138	3,159								1417	1063	75.0	297	3,831	4,360	1.138			
M251727-Tol-2	Tank-129	6,108	1.5	78	299	643	482	68	293	1428	1071	75.5	297	3,864	8,488	2.196	663	78.9	1.0%
trap-1057	ICV-139	3,164								1520	1140	75.3	297	3,864	4,682	1.212			
M251727-Tol-3	Tank-132	6,121	1.5	78	299	681	511	68	293	1421	1066	76.3	298	4,102	8,451	2.060	703	79.2	1.1%
trap-1058	ICV-140	3,160								1413	1060	75.9	298	4,102	4,342	1.058			

VRi Job No: M25-1727

Client Name and Sample Receipt Date: CSA/Toledo Shredding, 7/27/2017

Sample Recovery and Analysis Date: July 29, 2017 by C.G. Simon

Calib. Species	Cal gas conc. ppmC	Response x_1 Normal Area Counts	Response x_2 Normal Area Counts	Response x_3 Normal Area Counts	Mean Response X Normal Area Counts	RF Normal Area Counts/ ppmC	% RSD (must be <2%)	Average RF
A -- CO	50.0	49.77	50.22	50.01	50.00	1.0000	0.45	
B -- CO	50.0	49.53	49.92	49.85	49.77	0.9953	0.42	0.9977
A -- CH4	49.5	49.55	48.95	50.00	49.50	1.0000	1.07	
B -- CH4	49.5	48.83	48.75	49.15	48.91	0.9881	0.44	0.9940
A -- CO2	10,010	9,986	10,012	10,033	10,010	1.0000	0.23	
B -- CO2	10,010	9,958	9,948	9,937	9,947	0.9937	0.10	0.9969
A -- NMO	60.0	60.86	59.75	59.39	60.00	1.0000	1.27	
B -- NMO	60.0	60.96	60.77	60.84	60.86	1.0143	0.16	1.0071

CO =	372.7	normalization factors
CH4 =	369.6	
CO2 =	390.7	
NMO =	382.3	

VRi Job No: M25-1727

Client Name and Sample Receipt Date:	CSA/Toledo Shredding, 7/27/2017
Sample Recovery and Analysis Date:	July 29, 2017 by C.G. Simon

Requirement for NMO and VOC as CO2: triplicate analyses must have an RSD of <2%, or <2 ppmC, whichever is greater.

Sample ID	Vessel	Species	*Ctmj* and *Ccmk* Analyzer Responses in normalized area counts			*Ctm* & *Ccm*, Mean normal counts	Calib. factors	*RF* Normal Area counts /ppmC	ppm in Sample Gas	TGNMO ppmC, *Ct* & *Cc*
M251727-Tol-1	Tank-185	CO	2.08	2.26	1.42	1.9	A, B	0.9977	4.2	
AV/SV =	2.185	CH_4	1.86	1.81	1.47	1.7	A, B	0.9940	3.8	
		CO_2	727.0	720.8	725.6	724.5	A, B	0.9969	1,588	
		C_t NMO as C	13.28	14.40	15.14	14.3	A, B	1.0071	31.0	31.0
trap-1065	ICV-138	C_c VOC as CO_2	222.0	225.2	225.0	224.1	A, B	0.9969	255.8	
AV/SV =	1.138	NMO	2.70	1.03	1.46	1.7	A, B	1.0071	2.0	257.8
M251727-Tol-2	Tank-129	CO	2.66	1.78	1.35	1.9	A, B	0.9977	4.2	
AV/SV =	2.196	CH_4	1.95	1.54	1.93	1.8	A, B	0.9940	4.0	
		CO_2	2,922	2,916	2,926	2,921	A, B	0.9969	6,437	
		C_t NMO as C	7.71	7.29	7.33	7.4	A, B	1.0071	16.2	16.2
trap-1057	ICV-139	C_c VOC as CO_2	71.3	70.9	70.2	70.8	A, B	0.9969	86.1	
AV/SV =	1.212	NMO	1.86	2.71	2.13	2.2	A, B	1.0071	2.7	88.7
M251727-Tol-3	Tank-132	CO	2.26	2.55	2.20	2.3	A, B	0.9977	4.8	
AV/SV =	2.060	CH_4	2.09	1.66	1.79	1.8	A, B	0.9940	3.8	
		CO_2	3,152	3,162	3,115	3,143	A, B	0.9969	6,496	
		C_t NMO as C	12.49	14.49	12.99	13.3	A, B	1.0071	27.3	27.3
trap-1058	ICV-140	C_c VOC as CO_2	108.0	108.0	107.5	107.8	A, B	0.9969	114.5	
AV/SV =	1.058	NMO	3.86	2.53	2.17	2.9	A, B	1.0071	3.0	117.5

VRi Job No: M25-1727

Sample Recovery and Analysis Dates: July 29, 2017 by C.G. Simon

5/21/17 Full calibration performance test		7/29/17 Daily Response Factors		% of last full calibration value	requirement
RFCO	378.0	RFCO	372.7	98.6%	none
RFCH4	386.7	RFCH4	369.6	95.6%	none
RFCO2	393.9	**RFCO2**	390.7	99.2%	±5%
RFNMO	381.6	**RFNMO**	382.3	100.2%	±10%

Calib. Species	Cal gas conc. ppmC	Response x1 Area Counts	Response x2 Area Counts	Response x3 Area Counts	Mean Response X Area Counts	RF Area Counts/ ppmC	% RSD	Notes
A -- CO	zero air	496	303	432	410		24	
A -- CO	50.0	18,551	18,718	18,639	18,636	372.7	0.45	
B -- CO	50.0	18,460	18,607	18,581	18,549	371.0	0.42	
A -- CH4	49.5	18,316	18,092	18,483	18,297	369.6	1.07	
B -- CH4	49.5	18,050	18,018	18,169	18,079	365.2	0.44	
A -- CO2	zero air	157	249	310	239		32	
A -- CO2	10,010	3,901,181	3,911,210	3,919,411	3,910,601	390.7	0.23	
A -- CO2	10,317	4,011,785	4,049,290	4,044,007	4,035,027	391.1	100.11%	7/29/17 SRS catox test
B -- CO2	10,010	3,890,198	3,886,190	3,882,040	3,886,143	388.2	0.10	
A -- NMO	zero air	1,329	1,517	1,171	1,339		13	
A -- NMO	60.0	23,264	22,841	22,703	22,936	382.3	1.27	
B -- NMO	60.0	23,303	23,229	23,257	23,263	387.7	0.16	

VRi Job No: M25-1727 Sample Recovery and Analysis Date: July 29, 2017 by C.G. Simon

Sample ID	Vessel	Species	Ctmj and Ccmk Analyzer Responses			Ctm & Ccm avg. counts	RSD %	RSD ppmC
M251727-Tol-1	Tank-185	CO	1,184	1,251	940	1,125	15%	0
		CH4	687	669	543	633	12%	0
		CO2	284,008	281,590	283,485	283,028	0%	3
		Ct, NMO as C	6,416	6,844	7,126	6,795	5%	1
trap-1065	ICV-138	**Cc,** VOC as CO2	86,742	87,984	87,900	87,542	1%	2
		NMO	2,372	1,732	1,898	2,001	17%	1
M251727-Tol-2	Tank-129	CO	1,402	1,073	914	1,130	22%	1
		CH4	719	569	712	667	13%	0
		CO2	1,141,693	1,139,005	1,143,139	1,141,279	0%	5
		Ct, NMO as C	4,286	4,124	4,141	4,184	2%	0
trap-1057	ICV-139	**Cc,** VOC as CO2	27,854	27,701	27,431	27,662	1%	1
		NMO	2,051	2,376	2,155	2,194	8%	0
M251727-Tol-3	Tank-132	CO	1,252	1,359	1,230	1,280	5%	0
		CH4	774	614	662	683	12%	0
		CO2	1,231,263	1,235,410	1,216,975	1,227,883	1%	25
		Ct, NMO as C	6,114	6,878	6,306	6,433	6%	1
trap-1058	ICV-140	**Cc,** VOC as CO2	42,174	42,193	42,016	42,128	0%	0
		NMO	2,816	2,305	2,170	2,430	14%	1

VOC Reporting, Inc. 14260 West Newberry Rd., No. 136, Newberry, Florida 32669. Phone 352-472-2899

EPA Method-25 Chain of Custody

Testing Company/Job Number:	Custom Stack Analysis, LLC
Facility/Location Tested:	Toledo Shredding, LLC / Stack No. 1 Outlet
Source Tested:	Shredder
Test Date:	7-18-17 & 7-19-17

Note: Measure tank absolute pressures directly with a calibrated absolute pressure gauge, ***or*** record the tank vacuum with a Hg manometer and record the local barometric pressure at the same time. Tape a thermocouple to the tank and record the tank temperature each time a tank pressure is recorded.

IT IS NOT NECESSARY TO RECORD THE BAROMETRIC PRESSURE IF YOU USE A CALIBRATED ABSOLUTE PRESSURE GAUGE TO MEASURE THE TANK PRESSURES.

Sample Location	Run No.	Trap No.	Tank No.	Tank Initial Pres/Units	Tank Initial Temp/Units	Tank Initial Vac/Units	Initial BP/Units	Tank Final Pres/Units	Tank Final Temp/Units	Tank Final Vac/Units	Final BP/Units	Lab use only mbar	°F
Outlet	1	1065	185	2 mb	67°F	29 in Hg	29.5 in Hg	641 mb	68°F	10 in Hg	28.61 in Hg	661	79.0
Outlet	2	1057	129	2 mb	78°F	29 in Hg	29.5 in Hg	643 mb	68°F	11 in Hg	28.61 in Hg	663	78.9
Outlet	3	1058	132	2 mb	79°F	29 in Hg	29.5 in Hg	681 mb	68°F	9 in Hg	28.61 in Hg	703	79.2

Source	~%H2O	~%CO2	~ppmC VOC
Outlet	2	0	100

Ship to: VOC Reporting, Inc., 14260 W. Newberry Rd., No. 136, Newberry, FL 32669 phone: 352-472-2899

Relinquished by:	[signature]	Date: 7-24-17	All seals intact? yes
Received by	Charles Sumner	Date: 7-27-17	Dry ice OK? yes
VRi Job No.	M251727	Comments:	

VOC Reporting, Inc.

14260 W. Newberry Rd., No. 136
Newberry, Florida, 32669
Phone (352) 472-2899

US EPA Reference Method-25 Calculations

Nomenclature.

C = TGNMO concentration of the effluent, ppm C equivalent.
C_c = Calculated condensible organic (condensate trap) concentration of the effluent, ppm C equivalent.
C_{cm} = Measured concentration (NMO analyzer) for the condensate trap ICV, ppm CO_2.
C_t = Calculated noncondensible organic concentration (sample tank) of the effluent, ppm C equivalent.
C_{tm} = Measured concentration (NMO analyzer) for the sample tank, ppm NMO.
F = Sampling flow rate, cc/min.
L = Volume of liquid injected, µl.
M = Molecular weight of the liquid injected, g/gmole.
M_c = TGNMO mass concentration of the effluent, mg C/dsm^3.
N = Carbon number of the liquid compound injected (N = 10 for decane, N = 6 for hexane).
n = Number of data points.
P_f = Final pressure of the intermediate collection vessel, mm Hg absolute.
P_b = Barometric pressure, mm Hg.
P_{ti} = Gas sample tank pressure before sampling, mm Hg absolute.
P_t = Gas sample tank pressure after sampling, but before pressurizing, mm Hg absolute.
P_{tf} = Final gas sample tank pressure after pressurizing, mm Hg absolute.
q = Total number of analyzer injections of intermediate collection vessel during analysis (where k = injection number, 1 ... q).
r = Total number of analyzer injections of sample tank during analysis (where j = injection number, 1 ... r).
r = Density of liquid injected, g/cc.
T_f = Final temperature of intermediate collection vessel, Kelvins.
T_{ti} = Sample tank temperature before sampling, Kelvins.
T_t = Sample tank temperature at completion of sampling, Kelvins.
T_{tf} = Sample tank temperature after pressurizing, Kelvins.
V = Sample tank volume, m^3.
V_t = Sample train volume, cc.
V_v = Intermediate collection vessel volume, m^3.
V_s = Gas volume sampled, dsm^3.
X_i = Individual measurements.

$\overline{X}$ = Mean value.

Tank Volume, V

Procedure: Each tank was weighed to the nearest gram while evacuated and while filled with degassed distilled water. The temperature of the water was measured and the volume of the tank was calculated using Equation 1 where V is volume.

$$V = \frac{[wt.\ of\ tank + water] - [wt.\ of\ evacuated\ tank]}{density\ of\ water\ at\ recorded\ temp} \qquad \textbf{(1)}$$

Pre-Sampling Leak Check Allowable Pressure Change, ΔP

Maximum allowable pressure change is calculated using equation 2, where P_b is the barometric pressure, F is sample flow rate, V_t is sample train volume and Θ is leak-check time. For a PAL heated M25 system (controller, probe, trap and vacuum manifold), Vt = 65 cc. For a sample rate of 80 cc/min at one atmosphere pressure, the allowed pressure increase for the leak check is:

$$\Delta P = \frac{(0.01)(F)(P_b)(\Theta)}{V_t} = \frac{0.01(80\frac{cc}{min})(P_b)(10\ min)}{65cc}$$

ΔP = 3.7 in. Hg, or 94 mm Hg, or 125 mbar **(2)**

Sample Volume, Vs

The sample volume is calculated with Equation 3 where: V is the tank volume, Pti and Tti are the initial tank absolute pressure in mm Hg and absolute temperature in Kelvins, and , Pt and Tt are the tank absolute pressure and absolute temperature after sample collection.

$$V_s = (0.3857)(V) \times [\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}}] \quad \textbf{(3)}$$

Noncondensable Organics, Ct

First, equation 4 is used to calculate the non-methane organic compound response factor, R, from the integrated instrument response, I, and the calibration gas concentration, C, expressed in ppm carbon.

$$R = \frac{I}{C} \quad \textbf{(4)}$$

Next, Ct is calculated using Equation (5).

$$C_t = \frac{\frac{P_{tf}}{T_{tf}}}{\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}}} \times \frac{1}{r}\sum_{j=1}^{r}(C_{tmj}) = \frac{analysis\ V}{V_s} \times C_{tm} \quad \textbf{(5)}$$

Condensable Organics, Cc

$$C_c = 0.3857 \times \frac{V_v P_f}{V_s T_f} \times \frac{1}{q}\sum_{k=1}^{q}(c_{cmk}) \quad \textbf{(6)}$$

TGNMO Concentration

C = Ct + Cc **(7)**

TGNMO Mass Concentration

Mc, mg/dscm = 0.4993 x C

(8)

US EPA Reference Method 25 Sample Recovery System Performance Test, February 2-3, 2012.

Performance Requirements: Average Recovery = 100±5%, triplicate analyses agree within a relative standard deviation (RSD) of 2%.

Syringe loads of hexane and decane were weighed to the nearest 0.1 mg before and after injection using a Metler AE240 analytical microbalance (N01264, certified July 2011) . Analyst: Charles G. Simon, Ph.D.

Hexane carbon content = 83.623% by weight Decane carbon content = 84.412% by weight

Calculations: (mg C recovered)(100%)/mg C injected) = % recovery

ppmC in ICV = [(ICV CO2 area counts) / (avg before and after CO2 cal gas response, area counts/ppm)] + [ppmC hydrocarbon in ICV]

(ppmC in ICV)(ICV analysis volume in cubic meters)(0.4993) = mg C recovered

Sample ID	mg injected	mg Carbon injected	ICV No.	ICV Vol. ml	Pf mbar	Tf °F	Analysis Vol. ml	CO2 Rf before	CO2 Rf after	avg. ICV CO2 area counts	ppm CO2 in ICV	ppm HC in ICV	mg C recovered	% Recovery
Run-4 **hexane**	6.9	5.77	138	3,159	1422	77.2	4,357	284.67	284.65	786,735	2,764	<2	6.01	104.2%
Run-5 **hexane**	6.8	5.69	139	3,164	1485	76.8	4,561	284.67	284.65	757,896	2,662	<2	6.06	106.6%
Run-6 **hexane**	6.6	5.52	140	3,160	1455	76.6	4,465	284.67	284.65	743,160	2,611	<2	5.82	105.5%
													Average Low Hexane Recovery:	105%
									PASS				***Relative Standard Deviation***	1.1%
Run-1 **hexane**	37.0	30.94	141	3,160	2617	75.3	8,050	284.67	284.65	2,203,410	7,740	<2	31.11	100.6%
Run-2 **hexane**	36.0	30.10	142	3,154	2599	74.4	7,993	284.67	284.65	2,229,748	7,833	<2	31.26	103.8%
Run-3 **hexane**	34.2	28.60	143	3,159	2401	74.8	7,390	284.65	283.51	2,209,201	7,777	<2	28.70	100.3%
													Average High Hexane Recovery:	101.6%
									PASS				***Relative Standard Deviation***	1.9%
Run-7 **decane**	6.8	5.74	144	3,173	2113	75.8	6,521	284.65	283.51	513,717	1,808	<2	5.89	102.6%
Run-8 **decane**	7.9	6.67	146	3,173	2291	72.8	7,110	284.60	286.44	565,579	1,981	<2	7.03	105.4%
Run-9 **decane**	8.0	6.75	147	3,174	2126	74.3	6,581	284.60	286.44	596,524	2,089	<2	6.87	101.7%
													Average Low Decane Recovery:	103.2%
									PASS				***Relative Standard Deviation***	1.9%
Run-11 **decane**	36.6	30.89	8	8,701	1432	75.9	12,116	286.44	286.39	1,465,514	5,117	<2	30.95	100.2%
Run-12 **decane**	37.6	31.74	3	8,737	1440	76.4	12,222	286.44	286.39	1,487,588	5,194	<2	31.70	99.9%
Run-13 **decane**	36.8	31.06	1	8,723	1450	76.0	12,297	286.44	284.95	1,429,960	5,005	<2	30.73	98.9%
													Average High Decane Recovery:	99.7%
									PASS				***Relative Standard Deviation***	0.7%

LIQUID TECHNOLOGY CORPORATION

"INDUSTRY LEADER IN SPECIALTY GASES"

CERTIFICATE OF ANALYSIS

EPA PROTOCOL

Customer:	Minneapolis Oxygen	Reference#:	042117SY-J
CGA:	590	Certification Date:	05/01/2017
Customer PO#:	LT-9496	Expiration Date:	05/01/2025
Cylinder #:	EB0051161	Pressure, psig:	2000

Method: This standard was analyzed according to EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards, Procedure G1 (May 2012).

Analyzed Cylinder-

Components	Certified Concentration	Expanded Uncertainty	Assay Dates
Propane	20.0ppm	0.7%	5/1/17
Carbon Monoxide	50.0ppm	0.8%	5/1/17
Methane	49.5ppm	1.0%	5/1/17
Carbon Dioxide	10,010ppm	1.0%	5/1/17
Air	Balance	-	-

Reference Standard-

Type/SRM Sample	Cylinder #	Concentration
Propane/ GMIS	GCG-4745988Y	48.8ppm
Propane/ SRM	CAL018130	48.83ppm
Carbon Monoxide/ GMIS	EB0052148	49.2ppm
Carbon Monoxide/ SRM	CAL018039	98.85ppm
Methane/ GMIS	EB0026425	95.0ppm
Methane/ SRM	FF23127	98.23ppm
Carbon Dioxide/ GMIS	EB0053460	2.497%
Carbon Dioxide/ SRM	CAL016053	15.63%

Instrument-

Instrument/ Model	Serial Number	Last Date Calibrated	Analytical Method
Micro GC/ MTI M200	170612	5/1/2017	Thermal Conductivity

These mixtures were prepared gravimetrically using a high load high sensitivity electronic scale. Prior to filling the scale is verified for accuracy throughout the target mass range against applicable NIST traceable weights. We certify that the weights are calibrated to ASTM E617-97 Echelon 1 tolerances.

This report states accurately the results of the investigation made upon the material submitted to the analytical laboratory. Every effort has been made to determine objectively the information requested. However, in connection with this report, Global Calibration Gases LLC shall have no liability in excess of the established charge for this service. Assayed at Global Calibration Gases LLC, Sarasota, Florida. No correction required for interfering gases

The calibration results published in this certificate were obtained using equipment and standards capable of producing results that are traceable to National Institute of Standards and Technology (NIST) and through NIST to the International System of Units (SI). The expanded uncertainties, if included on this certificate, use a coverage factor of k=2 to approximate the 95% confidence level of the measurement, unless otherwise noted. If uncertainties are not included on this certificate, they are available upon request. This calibration certificate applies only to the item described and shall not be reproduced other than in full, without written approval from the calibration facility. Calibration certificates without signatures are not valid. This calibration meets the requirements of ISO/IEC 17025:2005. Do not use this standard when cylinder pressure is below 100 psig.

GLOBAL CALIBRATION GASES LLC

Produced by:
Global Calibration Gases LLC.
1090 Commerce Blvd N.
Sarasota, Florida 34243 USA
PGVP Vendor ID.: N22017

Principal Analyst: _____
Date: 05/01/2017

Principal Reviewer: _____
Date: 05/01/2017

LIQUID TECHNOLOGY CORPORATION

"INDUSTRY LEADER IN SPECIALTY GASES"

Certificate of Analysis

- EPA PROTOCOL GAS -

* Extended Certificate *

Customer	VOC Reporting, Inc (Gainesville, FL)
Date	August 26, 2011
Delivery Receipt	DR-38222
Gas Standard	10,000 ppm Methane Ultra Zero Air - EPA PROTOCOL
Final Analysis Date	August 25, 2011
Expiration Date	August 25, 2019

Component	Methane
Balance Gas	Ultra Zero Air

Analytical Data: **DO NOT USE BELOW 100 psig**

EPA Protocol, Section No. 2.2, Procedure G-1

Reported Concentrations

Methane: 10,317 ppm +/- 103 ppm

Ultra Zero Air: Balance

Reference Standards:

SRM/GMIS:	GMIS
Cylinder Number:	EB-0016001
Concentration:	4957.66 ppm Methane
Expiration Date:	05/19/13

Certification Instrumentation

Component:	Methane
Make/Model:	Agilent 7890A
Serial Number:	CN10736166
Principal of Measurement:	GC-FID
Last Calibration:	August 10, 2011

Cylinder Data

Cylinder Serial Number:	CC-233228	Cylinder Outlet:	CGA 590
Cylinder Volume:	140 Cubic Feet	Cylinder Pressure:	2000 psig, 70°F

Analytical Uncertainty and NIST Traceability are in compliance with EPA-600/R-97/121.

Certified by:

David Scott

PGVP Vendor ID: E12013

* Extended shelf life established June 14, 2013

Appendix #3

Calibration Data

APEX INSTRUMENTS
EPA Method 5
560 Series Meter Box Calibration
Pre-Test Orifice Method
Metric Meter Box Volume Units, English K' Factor

Filename: \\JAMESGRAY-PC\Customer Project Files\APPENDIX\Cal Sheets\Meter Boxes\[Meter Box 1 4517.xls]A
Revised: 7/25/95 Version: 2.2

CONVERSION FACTORS

1 mm Hg =	0.13330	kPa
1 inch =	0.39370	cm
1 inch =	0.03937	mm
1 cu ft =	28.32	liters

Model #: 1
Serial #:

Date: ----------> 4/5/2017
Barometric Pressure: ----------> 28.56 (in. Hg)
Theoretical Critical Vacuum:---> 13.47 (in. Hg)

!!!!!!!!
IMPORTANT For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.
IMPORTANT The Critical Orifice Coefficient, K', must be entered in English units, (ft)^3*(deg R)^0.5/((in.Hg)*(min)).
!!!!!!!!

---------- DRY GAS METER READINGS ----------									-CRITICAL ORIFICE READINGS-						-- Average Temperatures --		
dH (in H2O)	Time (min)	Volume Initial (ft^3)	Volume Final (ft^3)	Volume Total (liters)	Initial Temps. Inlet (deg F)	Initial Temps. Outlet (deg F)	Final Temps. Inlet (deg F)	Final Temps. Outlet (deg F)	Orifice Serial# (number)	K' Orifice Coefficient (see above)	Actual Vacuum (in Hg)	-- Ambient Temperature -- Initial (deg F)	Final (deg F)	Average (deg F)	DGM Outlet (deg R)	DGM Overall (deg R)	Ambient Temp (deg R)
0.53	10	205.363	209.498	117.1032	62	62	62	62	12	0.31969146	15	61	62	61.5	522	522	521.5
0.97	10	209.498	214.929	153.80592	62	62	63	62	16	0.42026418	15	63	63	63	522	522.25	523
1.4	10	214.929	221.271	179.60544	63	63	64	63	19	0.49083186	15	64	64	64	523	523.25	524
2.2	5	221.271	225.247	112.60032	64	63	65	63	23	0.61640457	15	65	65	65	523	523.75	525
3.9	5	225.247	230.446	147.23568	65	63	65	63	31	0.80932258	15	65	65	65	523	524	525

********** RESULTS **********

--- DRY GAS METER ---		-------- ORIFICE --------			-- DRY GAS METER --		--------- ORIFICE ---------		
VOLUME CORRECTED Vm(std) (cu ft)	VOLUME CORRECTED Vm(std) (liters)	VOLUME CORRECTED Vcr(std) (cu ft)	VOLUME CORRECTED Vm(std) (liters)	VOLUME NOMINAL Vcr (cu ft)	CALIBRATION FACTOR Y Value (number)	CALIBRATION FACTOR Y Variation (number)	CALIBRATION FACTOR dH@ Value (in H2O)	Value (mm H2O)	Variation (in H2O)
3.9962624	113.17	3.9981777	113.22839	4.13866	1.00048	0.0011	1.80064143	45.74	-0.16619
5.2522013	148.74	5.248434	148.63565	5.44847	0.99928	-9.8E-05	1.91243992	48.58	-0.05439
6.128248	173.55	6.1238608	173.42774	6.36942	0.99928	-9.6E-05	2.02358652	51.40	0.05676
3.8462016	108.92	3.84162	108.79468	4.00329	0.99881	-0.00057	2.02012496	51.31	0.0533
5.0487542	142.98	5.0439435	142.84448	5.25621	0.99905	-0.00033	2.07734459	52.76	0.11052
			Average Y ------->		0.99938		1.96682748	49.96	<------ Average dH@

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +-0.02.

For Orifice Calibration Factor dH@, the orifice differential pressure in inches of H20 that equates to 0.75 cfm of air at 68 F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +-0.2.

SIGNED:_____ Brian Lemasters

Date:_____ 4/5/2017

7410 Worthington-Galena Road
Worthington, Ohio 43085
Phone: (614) 436-4933
Fax: (614) 436-9144

Industrial Environmental Monitoring Instruments, Inc.

Website: www.ierents.com

Temperature Calibration Certificate

Instrument: H-B Thermometer
Serial #: 4B5200

Date: 2/13/2017
Technician: Sam Shults
Calibration Due: 2/13/2018

Lab Standard	Actual Reading
22.0	22.0
40.7	40.8
60.4	60.4
80.2	80.0

Accuracy = .2 C

Reference Standards
PIE 525B sn. 116765 Cal Due: 7/11/2017
Hart 9103 Temp Well Calibration Due: 6/24/2017

Instrument must be calibrated and operated according to manufacturers specifications
The calibration standards used are NIST traceable

7410 Worthington-Galena Road
Worthington, Ohio 43085
Phone: (614) 436-4933
Fax: (614) 436-9144

Industrial Environmental Monitoring Instruments, Inc.

Website: www.ierents.com

Temperature Calibration Certificate

Instrument: H-B Thermometer
Serial #: 4A6108

Date: 2/13/2017
Technician: Sam Shults
Calibration Due: 2/13/2018

Lab Standard	Actual Reading
178.1	178.1
200.0	200.0
210.0	210.0
220.0	219.9

Accuracy = .2 C

Reference Standards
PIE 525B sn. 116765 Cal Due: 7/11/2017
Hart 9103 Temp Well Calibration Due: 6/24/2017

Instrument must be calibrated and operated according to manufacturers specifications
The calibration standards used are NIST traceable

#

BRECHBUHLER SCALES, INC. An ISO Company

SCALE INSPECTION REPORT

570877

Jim Grey
330-821-2694

FOR CUSTOM STACK 593P - COD!!!!!!

14614 CENFIELD ST ALLIANCE, OH 44601

P.O. _____ DATE 6-8-2017

- ❑ 14941 Liberty Hi Rd. BOWLING GREEN, OH 43402 419-354-2030
- ❑ 1414 Scale St. S.W. CANTON, OH 44706-3096 330-453-2424
- ❑ 7550 Jacks Lane CLAYTON, OH 45315 937-832-2040
- ❑ 520 Brookpark Rd. CLEVELAND, OH 44109-5898 216-661-2660
- ❑ 4070 Perimeter Dr. COLUMBUS, OH 43228 614-274-9009
- ❑ 1001 Findlay Rd. LIMA, OH 45801 419-228-5021
- ❑ 1080 National Parkway MANSFIELD, OH 44906 419-529-3006
- ❑ 9930 Crescent Park Drive WEST CHESTER, OH 45069 513-777-5800
- ❑ 4005 South Ave. YOUNGSTOWN, OH 44512 330-259-0414
- ❑ 980 South Marr Rd. COLUMBUS, IN 47201 812-372-8374
- ❑ 3306 Cavalier Dr. FORT WAYNE, IN 46808 260-496-8469
- ❑ 5525 Galaeo Court INDIANAPOLIS, IN 46241 317-548-7821
- ❑ 5200 Grand Avenue PITTSBURGH, PA 15225 412-299-7960
- ❑ 477 North Pike Rd. SARVER, PA 16055 724-224-7180
- ❑ 526 31st St. PARKERSBURG, WV 26101 304-428-1792
- ❑ 100 McJunkin Road NITRO, WV 25143 304-755-0686

TEST WEIGHTS USED ARE CERTIFIED TO COMPLY WITH STANDARD MASSES, AND ARE NIST TRACEABLE.

STATE OF Ohio TRACEABLE TO NIST CALIBRATION LAB TEST REPORT NO. 2016-0013

WEIGHT S/N'S 70458KIT

SCALE TECHNICIAN: BbB 351378 SIGNATURE

ACCEPTED BY: _____ SIGNATURE

PARTS USED _____

TAG NO.	MFG	MOD NO.	S/N	LOC.	CAP.	GRAD. SIZE	NORM RNG	CAL FRQ	CLEAN TEST	CAL STICK	NEXT CAL
-	OHAUS	SCOUT PRO	7124111434	LAB	2000 --	.1 --	HI 2000 --	6 Months	Yes	YES ✓	12-2017
	-	-	-				LO 500 --			NO	

WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1 500	499.9	-0.1	+/-.2%	YES / NO	500.0	Recalibrated
2 1000	999.8	-0.2	+/-.2%	YES / NO	1000.0	
3 1500	1499.7	-0.3	+/-.2%	YES / NO	1500.0	$ 216.02
4 2000	1999.5	-0.5	+/-.2%	YES / NO	2000.0	paid in full
5				YES / NO		Check# 12416
6				YES / NO		

PARTS USED _____

The above indicated equipment has been tested/calibrated by Brechbuhler Scales, Inc. in conformance to ISO 9001 and ANSI/NCSL Z540.

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL FROM BRECHBUHLER SCALES, INC.

BRECHBUHLER SCALES, INC. An ISO Company

SCALE INSPECTION REPORT

574970

FOR CUSTOM STACK 5937 COD

14614 Cen Field St. Alliance, OH

P.O. _____ DATE 6-8-2017

☐ 14941 Liberty Hi Rd. BOWLING GREEN, OH 43402 419-354-2030	☑ 1414 Scale St. S.W. CANTON, OH 44706-3096 330-453-2424	☐ 7550 Jacks Lane CLAYTON, OH 45315 937-832-2040	☐ 520 Brookpark Rd. CLEVELAND, OH 44109-5898 216-661-2660	☐ 4070 Perimeter Dr. COLUMBUS, OH 43228 614-274-9009	☐ 1001 Findlay Rd. LIMA, OH 45801 419-228-5021	☐ 1080 National Parkway MANSFIELD, OH 44906 419-529-3006	☐ 9930 Crescent Park Drive WEST CHESTER, OH 45069 513-777-5800
☐ 4005 South Ave. YOUNGSTOWN, OH 44512 330-259-0414	☐ 980 South Marr Rd. COLUMBUS, IN 47201 812-372-8374	☐ 3306 Cavalier Dr. FORT WAYNE, IN 46808 260-496-8469	☐ 5525 Galaeo Court INDIANAPOLIS, IN 46241 317-548-7821	☐ 5200 Grand Avenue PITTSBURGH, PA 15225 412-299-7960	☐ 477 North Pike Rd. SARVER, PA 16055 724-224-7180	☐ 526 31st St. PARKERSBURG, WV 26101 304-428-1792	☐ 100 McJunkin Road NITRO, WV 25143 304-755-0686

TEST WEIGHTS USED ARE CERTIFIED TO COMPLY WITH STANDARD MASSES, AND ARE NIST TRACEABLE.

STATE OF OHIO TRACEABLE TO NIST CALIBRATION LAB TEST REPORT NO. 2016-0013

WEIGHT S/N'S 70458KIT

SCALE TECHNICIAN: Bob B 351378 SIGNATURE

ACCEPTED BY: SIGNATURE

PARTS USED

TAG NO.	MFG	MOD NO.	S/N	LOC.	CAP.	GRAD. SIZE	NORM RNG	CAL FRQ	CLEAN TEST	CAL STICK		NEXT CAL
	AED	GF1200	14632225	LAB	1210g	0.01g	HI 1000g LO 0g	6 months	Yes	YES	✓	12-2017
										NO		

	WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1	200	200.05	+0.05	.2%	NO	200.00	INITIAL CALIBRATION
2	500	500.12	+0.12	.2%	NO	500.00	Recalibrated
3	1000	1000.24	+0.24	.2%	Yes	1000.00	Add to PM List
4							
5							
6							

PARTS USED

The above indicated equipment has been tested/calibrated by Brechbuhler Scales, Inc. in conformance to ISO 9001 and ANSI/NCSL Z540.

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL FROM BRECHBUHLER SCALES, INC.

Nozzle Calibration Data

Facility: Toledo Shredding Date: 7-18-17

Location: Cyclone Outlet Source: Stack #2

Method: 1-5 Analyst: Brian L

Run #1			Mean
.249	.250	.249	.249

Run #2			Mean
.249	.249	.249	.249

Run #3			Mean
.249	.250	.249	.249

BRECHBUHLER SCALES, INC. An ISO Company

SCALE INSPECTION REPORT

574971

FOR CUSTOM STACK 593P (OD)

14614 Centfield ST NE. ALLIANCE, OH 44601

P.O. _____ DATE 6-8-2017

- ☐ 14941 Liberty Hi Rd. BOWLING GREEN, OH 43402 419-354-2030
- ☑ 1414 Scale St. S.W. CANTON, OH 44706-3096 330-453-2424
- ☐ 7550 Jacks Lane CLAYTON, OH 45315 937-832-2040
- ☐ 520 Brookpark Rd. CLEVELAND, OH 44109-5898 216-661-2660
- ☐ 4070 Perimeter Dr. COLUMBUS, OH 43228 614-274-9009
- ☐ 1001 Findlay Rd. LIMA, OH 45801 419-228-5021
- ☐ 1080 National Parkway MANSFIELD, OH 44906 419-529-3006
- ☐ 9930 Crescent Park Drive WEST CHESTER, OH 45069 513-777-5800
- ☐ 4005 South Ave. YOUNGSTOWN, OH 44512 330-259-0414
- ☐ 980 South Marr Rd. COLUMBUS, IN 47201 812-372-8374
- ☐ 3306 Cavalier Dr. FORT WAYNE, IN 46808 260-496-8469
- ☐ 5525 Galaeo Court INDIANAPOLIS, IN 46241 317-548-7821
- ☐ 5200 Grand Avenue PITTSBURGH, PA 15225 412-299-7960
- ☐ 477 North Pike Rd. SARVER, PA 16055 724-224-7180
- ☐ 526 31st St. PARKERSBURG, WV 26101 304-428-1792
- ☐ 100 McJunkin Road NITRO, WV 25143 304-755-0686

TEST WEIGHTS USED ARE CERTIFIED TO COMPLY WITH STANDARD MASSES, AND ARE NIST TRACEABLE.

STATE OF OHIO TRACEABLE TO NIST CALIBRATION LAB TEST REPORT NO. 2017-0305

WEIGHT S/N'S LAB 2

SCALE TECHNICIAN: Bob B. BSI 328 SIGNATURE

ACCEPTED BY: SIGNATURE

PARTS USED

TAG NO.	MFG	MOD NO.	S/N	LOC.	CAP.	GRAD. SIZE	NORM RNG	CAL FRQ	CLEAN TEST	CAL STICK		NEXT CAL
	A&D	HR-200	12323498	LAB	210g	0.0001g	HI 100g LO 0g	6 months	Yes	YES NO	✓	12-2017

	WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1	10	9.9969	-0.0031	.2%	NO	10.0001	INITIAL CALIBRATION
2	20	20.0074	+0.0074	.2%	NO	20.0002	Levelled, Calibrates at 200g
3	50	50.0175	+0.0175	.2%	NO	49.9997	Add to PI LIST
4	100	100.0368	+0.0368	.2%	NO	100.0007	
5	200	200.0734	+0.0734	.2%	Yes	200.0001	
6							Add to 593P

PARTS USED

The above indicated equipment has been tested/calibrated by Brechbuhler Scales, Inc. in conformance to ISO 9001 and ANSI/NCSL Z540.

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL FROM BRECHBUHLER SCALES, INC.

BRECHBUHLER SCALES, INC. An ISO Company

SCALE INSPECTION REPORT

570875

FOR CUSTOM STACK 593P - COD!!!!!!

14614 CENFIELD ST ALLIANCE, OH 44601

P.O. _____ DATE 6-8-2017

❑ 14941 Liberty Hi Rd. BOWLING GREEN, OH 43402 419-354-2030	☑ 1414 Scale St. S.W. CANTON, OH 44706-3096 330-453-2424	❑ 7550 Jacks Lane CLAYTON, OH 45315 937-832-2040	❑ 520 Brookpark Rd. CLEVELAND, OH 44109-5898 216-661-2660	❑ 4070 Perimeter Dr. COLUMBUS, OH 43228 614-274-9009	❑ 1001 Findlay Rd. LIMA, OH 45801 419-228-5021	❑ 1080 National Parkway MANSFIELD, OH 44906 419-529-3006	❑ 9930 Crescent Park Drive WEST CHESTER, OH 45069 513-777-5800
❑ 4005 South Ave. YOUNGSTOWN, OH 44512 330-259-0414	❑ 980 South Marr Rd. COLUMBUS, IN 47201 812-372-8374	❑ 3306 Cavalier Dr. FORT WAYNE, IN 46808 260-496-8469	❑ 5525 Galaeo Court INDIANAPOLIS, IN 46241 317-548-7821	❑ 5200 Grand Avenue PITTSBURGH, PA 15225 412-299-7960	❑ 477 North Pike Rd. SARVER, PA 16055 724-224-7180	❑ 526 31st St. PARKERSBURG, WV 26101 304-428-1792	❑ 100 McJunkin Road NITRO, WV 25143 304-755-0686

TEST WEIGHTS USED ARE CERTIFIED TO COMPLY WITH STANDARD MASSES, AND ARE NIST TRACEABLE.

STATE OF OHIO TRACEABLE TO NIST CALIBRATION LAB TEST REPORT NO. 2016-0013

WEIGHT S/N'S 70458KIT

SCALE TECHNICIAN: Bob B, BSI 308 SIGNATURE

ACCEPTED BY: _____ SIGNATURE

PARTS USED _____

TAG NO.	MFG	MOD NO.	S/N	LOC.	CAP.	GRAD. SIZE	NORM RNG	CAL FRQ	CLEAN TEST	CAL STICK		NEXT CAL
-	OHAUS	ADVENTURER	1203240794	LAB	4100 g	.1 g	HI - g	6 Months	Yes	YES	✓	12-2017
	-	-	-	-			LO - g			NO		

	WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1	10g	10.0	Ø	+/-.2%	YES / (NO)	10.0	Tested in tolerance
2	20g	20.0	Ø	+/-.2%	YES / (NO)	20.0	
3	50g	50.0	Ø	+/-.2%	YES / (NO)	50.0	
4	100g	100.0	Ø	+/-.2%	YES / (NO)	100.0	
5	1kg	999.9	-0.1	+/-.2%	YES / (NO)	999.9	
6	2kg	1999.8	-0.2	+/-.2%	YES / (NO)	1999.8	

PARTS USED _____

The above indicated equipment has been tested/calibrated by Brechbuhler Scales, Inc. in conformance to ISO 9001 and ANSI/NCSL Z540.

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL FROM BRECHBUHLER SCALES, INC.

BRECHBUHLER SCALES, INC. An ISO Company

SCALE INSPECTION REPORT

570876

FOR CUSTOM STACK 593P - COD!!!!!!

14614 CENFIELD ST ALLIANCE, OH 44601

P.O. _____ DATE 6-8-2017

☐ 14941 Liberty Hi Rd. BOWLING GREEN, OH 43402 419-354-2030	☑ 1414 Scale St. S.W. CANTON, OH 44706-3096 330-453-2424	☐ 7550 Jacks Lane CLAYTON, OH 45315 937-832-2040	☐ 520 Brookpark Rd. CLEVELAND, OH 44109-5898 216-661-2660	☐ 4070 Perimeter Dr. COLUMBUS, OH 43228 614-274-9009	☐ 1001 Findlay Rd. LIMA, OH 45801 419-228-5021	☐ 1080 National Parkway MANSFIELD, OH 44906 419-529-3006	☐ 9930 Crescent Park Drive WEST CHESTER, OH 45069 513-777-5800
☐ 4005 South Ave. YOUNGSTOWN, OH 44512 330-259-0414	☐ 980 South Marr Rd. COLUMBUS, IN 47201 812-372-8374	☐ 3306 Cavalier Dr. FORT WAYNE, IN 46808 260-496-8469	☐ 5525 Galaeo Court INDIANAPOLIS, IN 46241 317-548-7821	☐ 5200 Grand Avenue PITTSBURGH, PA 15225 412-299-7960	☐ 477 North Pike Rd. SARVER, PA 16055 724-224-7180	☐ 526 31st St. PARKERSBURG, WV 26101 304-428-1792	☐ 100 McJunkin Road NITRO, WV 25143 304-755-0686

TEST WEIGHTS USED ARE CERTIFIED TO COMPLY WITH STANDARD MASSES, AND ARE NIST TRACEABLE.

STATE OF OHIO TRACEABLE TO NIST CALIBRATION LAB TEST REPORT NO. 2017-0305

WEIGHT S/N'S LAB 2

SCALE TECHNICIAN: Bob B. BSI 328 SIGNATURE

ACCEPTED BY: SIGNATURE

PARTS USED

TAG NO.	MFG	MOD NO.	S/N	LOC.	CAP.	GRAD. SIZE	NORM RNG	CAL FRQ	CLEAN TEST	CAL STICK		NEXT CAL
-	SARTORIUS	A2005	39080133	LAB	100 GM g	0.1 g	HI - g	6 Months	Yes	YES	✓	12-2017
	-	-	-				LO - g			NO		

WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1 10g	1000.0mg	ϕ	+/-.2%	YES / NO	1000.0	Balance tested in-tolerance
2 20g	1999.7mg	-0.7	+/-.2%	YES / NO	1999.7	
3 50g	4998.4mg	-1.6	+/-.2%	YES / NO	4998.4	
4 100g	9998.0mg	-2.0	+/-.2%	YES / NO	9998.0	
5 g				YES / NO		
6 g				YES / NO		

PARTS USED

The above indicated equipment has been tested/calibrated by Brechbuhler Scales, Inc. in conformance to ISO 9001 and ANSI/NCSL Z540.

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL FROM BRECHBUHLER SCALES, INC.

BRECHBUHLER SCALES, INC. An ISO Company

SCALE INSPECTION REPORT

570570

FOR Custom Stack 593P CoD
14614 Cenfield St Alliance, OH

P.O. _____ DATE 6-8-2017

- ☐ 14941 Liberty Hi Rd. BOWLING GREEN, OH 43402 419-354-2030
- ☑ 1414 Scale St. S.W. CANTON, OH 44706-3096 330-453-2424
- ☐ 7550 Jacks Lane CLAYTON, OH 45315 937-832-2040
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- ☐ 1001 Findlay Rd. LIMA, OH 45801 419-228-5021
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- ☐ 9930 Crescent Park Drive WEST CHESTER, OH 45069 513-777-5800
- ☐ 4005 South Ave. YOUNGSTOWN, OH 44512 330-259-0414
- ☐ 980 South Marr Rd. COLUMBUS, IN 47201 812-372-8374
- ☐ 3306 Cavalier Dr. FORT WAYNE, IN 46808 260-496-8469
- ☐ 5525 Galaeo Court INDIANAPOLIS, IN 46241 317-548-7821
- ☐ 5200 Grand Avenue PITTSBURGH, PA 15225 412-299-7960
- ☐ 477 North Pike Rd. SARVER, PA 16055 724-224-7180
- ☐ 526 31st St. PARKERSBURG, WV 26101 304-428-1792
- ☐ 100 McJunkin Road NITRO, WV 25143 304-755-0686

TEST WEIGHTS USED ARE CERTIFIED TO COMPLY WITH STANDARD MASSES, AND ARE NIST TRACEABLE.

STATE OF OHIO TRACEABLE TO NIST CALIBRATION LAB TEST REPORT NO. 2017-0305

WEIGHT S/N'S LAB 2

SCALE TECHNICIAN: BobB, BSI 328 SIGNATURE

ACCEPTED BY: SIGNATURE

PARTS USED

TAG NO.	MFG	MOD NO.	S/N	LOC.	CAP.	GRAD. SIZE	NORM RNG	CAL FRQ	CLEAN TEST	CAL STICK	NEXT CAL
	VSSOLID	NONE	NONE	TRAVELLER	500g	0.001g	HI 200g / LO 0g	6 months	Yes	YES ✓ / NO	12-2017

	WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1	10	10.005	+0.005	±2%	NO	10.005	Tested in-tolerance
2	20	20.013	+0.013	±2%	NO	20.013	Please add to PI List
3	50	50.029	+0.029	±2%	NO	50.029	
4	100	100.053	+0.053	±2%	NO	100.053	
5	200	200.083	+0.083	±2%	NO	200.083	
6							

PARTS USED

The above indicated equipment has been tested/calibrated by Brechbuhler Scales, Inc. in conformance to ISO 9001 and ANSI/NCSL Z540.

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL FROM BRECHBUHLER SCALES, INC.

Calibration Certificate No. 1750.01

Calibration complies with ISO/IEC 17025, ANSI/NCSL Z540-1, and 9001

Cert. No.: 3415-7886014

Traceable® Certificate of Calibration for Digital Calipers

Cust ID:Custom Stack Analysis, LLC, 14614 Cenfield Street NE, , Alliance, OH 44601 U.S.A. (RMA:1007367)

Instrument Identification:

Model Numbers: 14-648-17, 11783217 S/N: 130402110 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Gage Block Set	99146223	10/29/16	1000382986

Certificate Information:

Technician: 57 Procedure: CAL-05 Cal Date: 8/16/16 Due Date: 8/16/17

Test Conditions: 23.7°C 63.0 %RH 1012 mBar

Calibration Data:

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
in		N.A.		0.1000	0.0995	Y	0.0990	0.1010	0.00041	2.4:1
in		N.A.		2.0000	1.9995	Y	1.9980	2.0020	0.00043	>4:1
in		N.A.		4.0000	3.9995	Y	3.9960	4.0040	0.00049	>4:1
in		N.A.		6.0000	6.0005	Y	5.9940	6.0060	0.00058	>4:1
in depth		N.A.		2.0000	1.9990	Y	1.9980	2.0020	0.00043	>4:1
in step		N.A.		2.0000	1.9990	Y	1.9980	2.0020	0.00043	>4:1
in inside		N.A.		1.0000	1.0000	Y	0.9990	1.0010	0.00042	2.4:1

This Instrument was calibrated using Instruments Traceable to National Institute of Standards and Technology.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of Control Company.

Nominal=Standard's Reading; As Left=Instrument's Reading; In Tol=In Tolerance; Min/Max=Acceptance Range; ±U=Expanded Measurement Uncertainty; TUR=Test Uncertainty Ratio; Accuracy=±(Max-Min)/2; Min = As Left Nominal(Rounded) - Tolerance; Max = As Left Nominal(Rounded) + Tolerance; Date=MM/DD/YY

Nicol Rodriguez, Quality Manager

Aaron Judice, Technical Manager

Maintaining Accuracy:

In our opinion once calibrated your Digital Calipers should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Digital Caliperss change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

CONTROL COMPANY 12554 Galveston RD Suite B230 Webster TX USA 77598
Phone 281 482-1714 Fax 281 482-9448 service@control3.com www.control3.com

Control Company is an ISO 17025:2005 Calibration Laboratory Accredited by (A2LA) American Association for Laboratory Accreditation, Certificate No. 1750.01.
Control Company is ISO 9001:2008 Quality Certified by (DNV) Det Norske Veritas, Certificate No. CERT-01805-2006-AQ-HOU-RvA.
International Laboratory Accreditation Cooperation (ILAC) - Multilateral Recognition Arrangement (MRA).

Traceable® is a registered trademark of Control Company

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TRANSCAT® CERTIFICATE OF CALIBRATION

Trust in every measure

Customer: CUSTOM STACK ANALYSIS
14614 CENFIELD STREET NE
ALLIANCE, OH 44601

NVLAP LAB CODE
200867-0

PO Number: 00-20814

Certificate/SO Number: 15-A8D8X-20-1 Revision 0

Manufacturer: Altek Industries Corp
Model Number: 22
Description: Thermocouple Calibrator
Serial Number: 148946
ID: NONE

As-Found: In Tolerance
As-Left: In Tolerance

Calibration Date: August 01, 2016
Due Date: August 01, 2017

Calibrated To: Manufacturer Specification
Calibration Procedure: 1-AC23545-0

Transcat Calibration Laboratories have been audited and found in compliance with ISO/IEC 17025:2005. Accredited calibrations performed within the Lab's Scope of Accreditation are indicated by the presence of the Accrediting Body's Logo and Certificate Number on this Certificate of Calibration. Any measurements on an accredited calibration not covered by that Lab's Scope of Accreditation are listed in the notes section of the certificate. This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, SCC, NRC, CLAS, ANAB or any agency of the Federal Government. NVLAP, NIST, SCC, NRC, CLAS or ANAB do not guarantee the accuracy of an individual calibration by accredited laboratories.

Transcat calibrations, as applicable, are performed in compliance with the requirements of the Transcat Quality Manual Revision I, ISO 9001:2008, ANSI/NCSL Z540.1-1994 (R2002), and ISO 10012:2003. When specified contractually, the requirements of ISO TS16949:2009, 10CFR21, 10CFR50 App. B and ASME NQA-1:2012 are also covered. Complete records of work performed are maintained by Transcat and are available for inspection. Laboratory standards used in the performance of this calibration are shown on the Supplemental Report.

Transcat documents the traceability of measurements to the SI units through the National Institute of Standards and Technology (NIST), or the National Research Council of Canada (NRC), or other recognized national measurement institutes (NMI) that are signatories to the CIPM Mutual Recognition Arrangement, or accepted fundamental and/or natural physical constants, or by the use of specified methods, consensus standards or ratio type measurements. Documentation supporting traceability information is available for review at a Transcat facility. The measured quantity and the measurement uncertainty are required for further dissemination of traceability.

Uncertainties are reported with a coverage factor k=2, providing a level of confidence of approximately 95%. All calibrations have been performed using processes having a TUR of 4:1 or better (3:1 for mass calibrations), unless otherwise noted on the Supplemental Report. The Test Uncertainty Ratio (TUR) is calculated in accordance with NCSL International RP-18. For mass calibrations: Conventional mass referenced to 8.0 g/cm³.

The results in this report relate only to the item calibrated or tested, and the determination of in or out of tolerance is specific to the model/serial no. referenced above based on the tolerances shown on the supplemental report; these tolerances are either the original equipment manufacturer's (OEM's) warranted specifications or the client's requested specifications. Any number of factors can cause a unit to drift out of tolerance at any time following its calibration. Limitations on the uses of this instrument are detailed in the OEM's operating instructions. This certificate may not be reproduced except in full, without the written approval of Transcat. Additional information, if applicable may be included on separate report(s).

Notes:

Calibrated At:
2056 S. Alex Road
West Carrollton, OH 45449

Facility Responsible:
2056 S. Alex Road
West Carrollton, OH 45449
800-828-1470

Calibrated By:
Digitally Signed By
Robert D. Powell
Date: August 01, 2016

Robert D. Powell
Calibration Technician

Reviewed By:
Digitally Signed By
Derek Atkinson
Date: August 01, 2016

Derek Atkinson
Lab Manager

Unit Barcode: 900B0149155
Date Received: July 29, 2016

Customer Number: 1-597810-000

F0013R29 1/4/16

Calibration Certificate No. 1750.01

Calibration complies with ISO/IEC 17025, ANSI/NCSL Z540-1, and 9001

Cert. No.: 1870-8149352

Traceable® Certificate of Calibration for Digital Barometer Module

Cust ID:Custom Stack Analysis, LLC, 14614 Cenfield Street NE, , Alliance, OH 44601 U.S.A. (RMA:1010249)

Instrument Identification:

Model: 23609-208 S/N: 61542879 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Digital Barometer	D4540001	9/27/17	1000398691
Chilled Mirror Hygrometer	31874/H2048MCR	10/19/17	14489
Digital Thermometer	221197993	10/04/17	4000-8017448

Certificate Information:

Technician: 57 Procedure: CAL-31 Cal Date: 11/30/16 Due Date: 11/30/17

Test Conditions: 23.2°C 49.0 %RH 1014 mBar

Calibration Data:

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
mb/hPa	0.00	0		805.77	802	Y	795	816	0.83	>4:1
mb/hPa	0.00	0		908.50	906	Y	898	919	0.83	>4:1
mb/hPa	0.00	0		1.01	1	Y	-9	12	0.83	>4:1
°C	0.00	0		24.66	26	Y	24	26	0.58	1.7:1
%RH	0.00	0		41.22	38	Y	31	51	1.3	>4:1

This Instrument was calibrated using Instruments Traceable to National Institute of Standards and Technology.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of Control Company.

Nominal=Standard's Reading; As Left=Instrument's Reading; In Tol=In Tolerance; Min/Max=Acceptance Range; ±U=Expanded Measurement Uncertainty; TUR=Test Uncertainty Ratio; Accuracy=±(Max-Min)/2; Min = As Left Nominal(Rounded) - Tolerance; Max = As Left Nominal(Rounded) + Tolerance; Date=MM/DD/YY

Nicol Rodriguez, Quality Manager

Aaron Judice, Technical Manager

Maintaining Accuracy:

In our opinion once calibrated your Digital Barometer Module should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Digital Barometer Modules change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

CONTROL COMPANY 12554 Galveston RD Suite B230 Webster TX USA 77598
Phone 281 482-1714 Fax 281 482-9448 service@control3.com www.control3.com

Control Company is an ISO 17025:2005 Calibration Laboratory Accredited by (A2LA) American Association for Laboratory Accreditation, Certificate No. 1750.01.
Control Company is ISO 9001:2008 Quality Certified by (DNV) Det Norske Veritas, Certificate No. CERT-01805-2006-AQ-HOU-RvA
International Laboratory Accreditation Cooperation (ILAC) - Multilateral Recognition Arrangement (MRA).

Traceable® is a registered trademark of Control Company

Client: Toledo Shredding

Pitot Tube Inspection

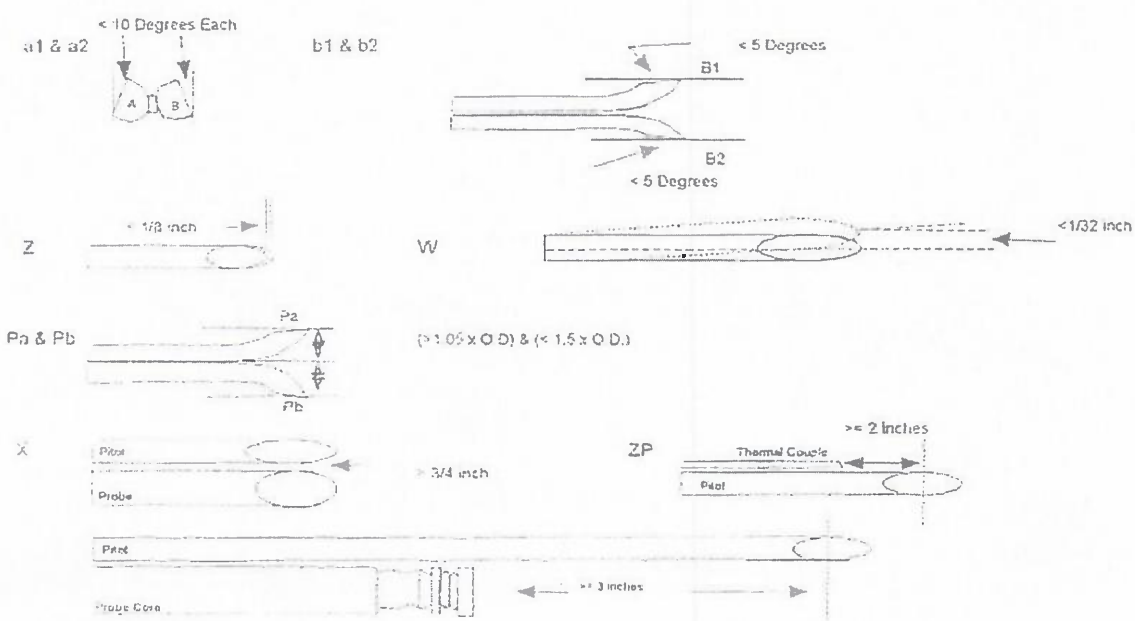
Date: 7-17-17

Probe/Pitot Number	3p-5	A (Pa + Pb)	1.130
Level and Perpendicular	yes	Zs= A tan Y (< 0.125")	0
Obstruction?	no	Ws= A tan 0 (< 0.03125")	0
Damaged?	no	D_t (0.1875" < D_t < 0.375")	.375
a_1 (-10° < a_1< +10°)	0	P_a (1.05 D_t < P_a < 1.5 D_t)	.560
a_2 (-10° < a_2< +10°)	0	P_b (1.05 D_t < P_b < 1.5 D_t)	.570
b_1 (-5° < b_1< +5°)	0	Pa = Pb ± 0.063"	.010
b_2 (-5° < b_2< +5°)	0		

Probe Minimum Interferences

Y (>= 3.0")		D_n	
X (> .75")		X /D_n (>= 1.5")	
Zp (>= .75")			

Pa	Distance between where pitots adjoin to tip of pitot (Must be between 1.05 & 1.50 times O.D. of tubing)
Pb	Distance between where pitots adjoin to tip of pitot (Must be between 1.05 & 1.50 times O.D. of tubing)
Dt	Diameter of pitot tube (0.375 inches on all pitots)
Zs	Distance between the tip of the impact and static line along the length of the pitot (Must be <1/8 inch(0.1250))
Ws	Spacing between Pitot tubes where welded together (Must be <1/32 inch (0.0313))
a1	Angle across opening of Pitot tube from side to side or perpendicular to length of probe (Must be <10 Deg)
a2	Angle across opening of Pitot tube from side to side or perpendicular to length of probe (Must be <10 Deg)
b1	Angle across opening of Pitot tube from side to side or perpendicular to length of probe (Must be <5 Deg)
b2	Angle across opening of Pitot tube from side to side or perpendicular to length of probe (Must be <5 Deg)
X	Distance between side of nozzle and side of pitot tube (Must be >3/4 inch)
Zp	Distance from center of pitot opening back to tip of thermal couple (Must be >=3/4 inch (0.75))
Y	Distance from center of pitot opening back to probe (Must be >=3 inches)



Client: Toledo Shredding

Pitot Tube Inspection

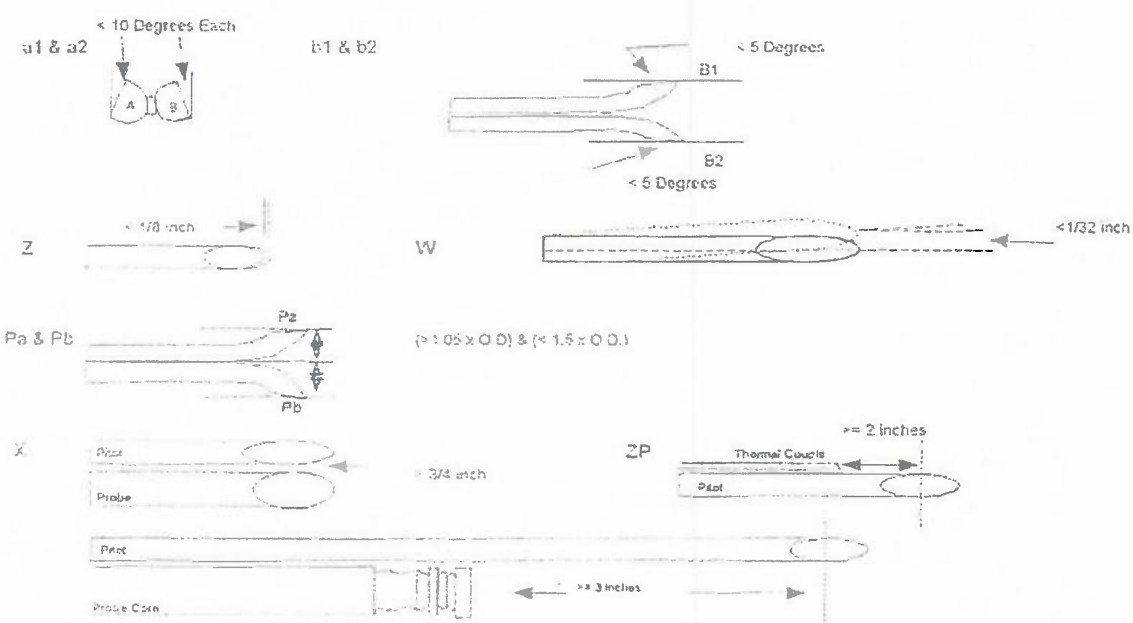
Date: 7-17-17

Probe/Pitot Number	Up-1	A (Pa + Pb)	.926
Level and Perpendicular	yes	Zs= A tan Y (< 0.125")	0
Obstruction?	no	Ws= A tan 0 (< 0.03125")	0
Damaged?	no	D_t (0.1875" < D_t < 0.375")	.375
a_1 (-10° < a_1< +10°)	0	P_a (1.05 D_t < P_a < 1.5 D_t)	.465
a_2 (-10° < a_2< +10°)	0	P_b (1.05 D_t < P_b < 1.5 D_t)	.461
b_1 (-5° < b_1< +5°)	0	Pa = Pb ± 0.063"	.004
b_2 (-5° < b_2< +5°)	0		

Probe Minimum Interferences

Y (>= 3.0")		D_n	
X (> .75")		X /D_n (>= 1.5")	
Zp (>= .75")			

Pa	Distance between where pitots adjoin to tip of pitot (Must be between 1.05 & 1.50 times O.D. of tubing)
Pb	Distance between where pitots adjoin to tip of pitot (Must be between 1.05 & 1.50 times O.D. of tubing)
Dt	Diameter of pitot tube (0.375 inches on all pitots)
Zs	Distance between the tip of the impact and static line along the length of the pitot (Must be <1/8 inch(0.1250))
Ws	Spacing between Pitot tubes where welded together (Must be <1/32 inch (0.0313))
a1	Angle across opening of Pitot tube from side to side or perpendicular to length of probe (Must be <10 Deg)
a2	Angle across opening of Pitot tube from side to side or perpendicular to length of probe (Must be <10 Deg)
b1	Angle across opening of Pitot tube from side to side or perpendicular to length of probe (Must be <5 Deg)
b2	Angle across opening of Pitot tube from side to side or perpendicular to length of probe (Must be <5 Deg)
X	Distance between side of nozzle and side of pitot tube (Must be >3/4 inch)
Zp	Distance from center of pitot opening back to tip of thermal couple (Must be >=3/4 inch (0.75))
Y	Distance from center of pitot opening back to probe (Must be >=3 inches)



THERMOCOUPLE CALIBRATIONS FOR SOURCE SAMPLING APPARATUS

CALIBRATION DATE 6-8-17 BY Jonathan H Pb 28.70

CALIBRATIONS IN ICE WATER AND BOILING WATER USING A H-B PRECISION GLASS THERMOMETER No. 4B5200, ASTM NO. 63F FOR ICE WATER AND H-B NO. 4A6108, ASTM NO. 66F FOR BOILING WATER.

	ICE WATER		BOILING WATER	
TC	PRECISION	TC	PRECISION	TC
CONDENSOR THERMOCOUPLES				
C-1	32	32	212	211
C-2	32	32	212	212
C-3	32	32	212	212
C-4	32	31	212	212
C-5	32	32	212	212
C-6	32	32	212	211
C-7	32	32	212	212
C-8	32	33	212	212
C-9	32	32	212	213
PROBE THERMOCOUPLES				
2P-1	32	32	212	212
2P-2	32	32	212	212
2P-3	32	32	212	212
3P-1	32	32	212	212
3P-2	32	32	212	212
3P-3	32	32	212	212
3P-4	32	32	212	212
3P-5	32	32	212	212
4P-1	32	32	212	212
4P-2	32	32	212	212
4P-3	32	32	212	212
40-4	32	32	212	212
4P-5	32	32	212	212
4P-6	32	32	212	212
5P-1	32	32	212	212
5P-2	32	32	212	212
5P-3	32	32	212	212
6P-1	32	32	212	211
6P-2	32	32	212	212
6P-3	32	32	212	212
6P-4	32	32	212	212
8P-1	32	32	212	212
8P-2	32	32	212	212
10P-1	32	32	212	212
10P-2	32	32	212	212
12P-1	32	32	212	212

THERMOCOUPLE CALIBRATIONS FOR SOURCE SAMPLING APPARATUS

CALIBRATION DATE 6-8-17 BY Jonathan A Pb 28.70

CALIBRATIONS IN ICE WATER AND BOILING WATER USING A H-B PRECISION GLASS THERMOMETER No. 4B5200, ASTM NO. 63F FOR ICE WATER AND H-B NO. 4A6108, ASTM NO. 66F FOR BOILING WATER.

	ICE WATER		BOILING WATER	
TC	PRECISION	TC	PRECISION	TC
OVEN THERMOCOUPLES				
O-1	32	32	212	211
O-2	32	32	212	212
O-3	32	32	212	212
O-4	32	32	212	212
O-5	32	32	212	212
O-6	32	32	212	211
O-7	32	32	212	212
O-8	32	32	212	212
O-9	32	32	212	211
O-10	32	32	212	212
O-11	32	32	212	212
O-12	32	31	212	212
STACK THERMOCOUPLES				
2S-1	32	32	212	212
2S-2	32	32	212	212
2S-3	32	32	212	212
3S-1	32	32	212	211
3S-2	32	32	212	212
3S-3	32	32	212	212
3S-4	32	32	212	212
3S-5	32	32	212	212
4S-1	32	31	212	212
4S-2	32	32	212	212
4S-3	32	32	212	212
4S-4	32	32	212	212
4S-5	32	32	212	212
4S-6	32	32	212	212
5S-1	32	32	212	212
5S-2	32	32	212	212
5S-3	32	32	212	212
6S-1	32	32	212	212
6S-2	32	32	212	212
6S-3	32	32	212	212
6S-4	32	32	212	212
8S-1	32	32	212	212
8S-2	32	32	212	212
10S-1	32	32	212	212
10S-2	32	32	212	212
12S-1	32	32	212	212

THERMOCOUPLE CALIBRATIONS FOR SOURCE SAMPLING APPARATUS

CALIBRATION DATE 6-8-17 BY Jonathan P Pb 28.70

CALIBRATIONS IN ICE WATER AND BOILING WATER USING A H-B PRECISION GLASS THERMOMETER No. 4B5200, ASTM NO. 63F FOR ICE WATER AND H-B NO. 4A6108, ASTM NO. 66F FOR BOILING WATER.

	ICE WATER		BOILING WATER	
TC	PRECISION	TC	PRECISION	TC
METER THERMOCOUPLES				
1M-1	32	32	212	212
1M-2	32	32	212	212
2M-1	32	32	212	212
2M-2	32	32	212	212
3M-1	32	32	212	212
3M-2	32	32	212	212
4M-1	32	32	212	212
4M-2	32	32	212	212
5M-1	32	32	212	212
5M-2	32	32	212	212
6M-1	32	32	212	212
6M-2	32	32	212	212
7M-1	32	32	212	212
7M-2	32	32	212	212
8M-1	32	32	212	212
8M-2	32	32	212	212
9M-1	32	32	212	212
9M-2	32	32	212	212
10M-1	32	32	212	212
10M-2	32	32	212	212
15M-1	32	32	212	212
15M-2	32	32	212	212
17M-1	32	32	212	212
17M-2	32	32	212	212
18M-1	32	32	212	212
18M-2	32	32	212	212

THERMOCOUPLE TEMPERATURES ARE READ ON THE DTI DURING TEST.

DTI CALIBRATED BY ALTEK 22 TC SOURCE S# 148946 OR S# 243783 PRIOR TO TC CAL.

ACCREDITED
Calibration
Certificate No. 1750.01

Calibration complies with ISO/IEC 17025, ANSI/NCSL Z540-1, and 9001

Cert. No.: 3415-8151421

Traceable® Certificate of Calibration for Digital Calipers

Cust ID:Custom Stack Analysis, LLC, 14614 Cenfield Street NE, , Alliance, OH 44601 U.S.A. (RMA:1010249)

Instrument Identification:

Model: 3415 S/N: 12272684 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Gage Block Set	99146223	11/08/17	1000400561

Certificate Information:

Technician: 57 Procedure: CAL-05 Cal Date: 11/30/16 Due Date: 11/30/17
Test Conditions: 23.0°C 45.0 %RH 1015 mBar

Calibration Data:

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
in		N.A.		0.1000	0.0995	Y	0.0990	0.1010	0.00041	2.4:1
in		N.A.		2.0000	1.9995	Y	1.9980	2.0020	0.00043	>4:1
in		N.A.		4.0000	4.0000	Y	3.9960	4.0040	0.00049	>4:1
in		N.A.		6.0000	6.0005	Y	5.9940	6.0060	0.00058	>4:1
in depth		N.A.		2.0000	2.0000	Y	1.9980	2.0020	0.00043	>4:1
in step		N.A.		2.0000	1.9990	Y	1.9980	2.0020	0.00043	>4:1
in inside		N.A.		1.0000	0.9990	Y	0.9990	1.0010	0.00065	1.5:1

This Instrument was calibrated using Instruments Traceable to National Institute of Standards and Technology.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of Control Company.

Nominal=Standard's Reading; As Left=Instrument's Reading; In Tol=In Tolerance; Min/Max=Acceptance Range; ±U=Expanded Measurement Uncertainty; TUR=Test Uncertainty Ratio; Accuracy=±(Max-Min)/2; Min = As Left Nominal(Rounded) - Tolerance; Max = As Left Nominal(Rounded) + Tolerance; Date=MM/DD/YY

Nicol Rodriguez, Quality Manager

Aaron Judice, Technical Manager

Maintaining Accuracy:

In our opinion once calibrated your Digital Calipers should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Digital Caliperss change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

CONTROL COMPANY 12554 Galveston RD Suite B230 Webster TX USA 77598
Phone 281 482-1714 Fax 281 482-9448 service@control3.com www.control3.com

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International Laboratory Accreditation Cooperation (ILAC) - Multilateral Recognition Arrangement (MRA).

Traceable® is a registered trademark of Control Company
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Calibration
Certificate No. 1750.01

Calibration complies with ISO/IEC 17025, ANSI/NCSL Z540-1, and 9001

Cert. No.: 3415-8151420

Traceable® Certificate of Calibration for Digital Calipers

Cust ID:Custom Stack Analysis, LLC, 14614 Cenfield Street NE, , Alliance, OH 44601 U.S.A. (RMA:1010249)

Instrument Identification:

Model: 3415 S/N: 101856179 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Gage Block Set	99146223	11/08/17	1000400561

Certificate Information:

Technician: 57 Procedure: CAL-05 Cal Date: 11/30/16 Due Date: 11/30/17
Test Conditions: 23.0°C 45.0 %RH 1015 mBar

Calibration Data:

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
in		N.A.		0.1000	0.0990	Y	0.0990	0.1010	0.00041	2.4:1
in		N.A.		2.0000	1.9990	Y	1.9980	2.0020	0.00043	>4:1
in		N.A.		4.0000	3.9990	Y	3.9960	4.0040	0.00049	>4:1
in		N.A.		6.0000	5.9995	Y	5.9940	6.0060	0.00058	>4:1
in depth		N.A.		2.0000	1.9990	Y	1.9980	2.0020	0.00043	>4:1
in step		N.A.		2.0000	1.9990	Y	1.9980	2.0020	0.00043	>4:1
in inside		N.A.		1.0000	1.0005	Y	0.9990	1.0010	0.00065	1.5:1

This Instrument was calibrated using Instruments Traceable to National Institute of Standards and Technology.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of Control Company.

Nominal=Standard's Reading; As Left=Instrument's Reading; In Tol=In Tolerance; Min/Max=Acceptance Range; ±U=Expanded Measurement Uncertainty; TUR=Test Uncertainty Ratio; Accuracy=±(Max-Min)/2; Min = As Left Nominal(Roundec) - Tolerance; Max = As Left Nominal(Rounded) + Tolerance; Date=MM/DD/YY

Nicol Rodriguez, Quality Manager

Aaron Judice, Technical Manager

Maintaining Accuracy:

In our opinion once calibrated your Digital Calipers should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Digital Caliperss change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

CONTROL COMPANY 12554 Galveston RD Suite B230 Webster TX USA 77598
Phone 281 482-1714 Fax 281 482-9448 service@control3.com www.control3.com

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Control Company is ISO 9001:2008 Quality Certified by (DNV) Det Norske Veritas, Certificate No. CERT-01805-2006-AQ-HOU-RvA.
International Laboratory Accreditation Cooperation (ILAC) - Multilateral Recognition Arrangement (MRA).

Traceable® is a registered trademark of Control Company
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Nozzle Calibration Data

Facility: Toledo Shredding Date: 7-18-17

Location: Scrubber Outlet Source: Stack #1

Method: 1-5 & 202 Analyst: Brian L

Run #1 Mean

.235	.235	.235	.235

Run #2 Mean

.235	.235	.235	.235

Run #3 Mean

.235	.235	.235	.235

Calibration Certificate No. 1750.01

Calibration complies with ISO/IEC 17025, ANSI/NCSL Z540-1, and 9001

Cert. No.: 1870-8310764

Traceable® Certificate of Calibration for Digital Barometer Module

Cust ID:Custom Stack Analysis, LLC, 14614 Cenfield Street NE, , Alliance, OH 44601 U.S.A. (RMA:1011998)

Instrument Identification:

Model: 1870 S/N: 90724105 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Digital Barometer	D4540001	9/27/17	1000398691
Chilled Mirror Hygrometer	31874/H2048MCR	10/19/17	14489
Digital Thermometer	221197993	10/04/17	4000-8017448

Certificate Information:

Technician: 57 Procedure: CAL-31 Cal Date: 2/10/17 Due Date: 2/10/18

Test Conditions: 23.7°C 46.0 %RH 1024 mBar

Calibration Data:

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
mb/hPa		N.A.		805.30	811	Y	795	816	0.83	>4:1
mb/hPa		N.A.		909.80	915	Y	899	920	0.83	>4:1
mb/hPa		N.A.		1,023.95	1,027	Y	1,013	1,034	0.83	>4:1
°C		N.A.		25.08	25	Y	24	26	0.58	1.7:1
%RH		N.A.		42.68	33	Y	33	53	1.3	>4:1

This Instrument was calibrated using Instruments Traceable to National Institute of Standards and Technology.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of Control Company.

Nominal=Standard's Reading; As Left=Instrument's Reading; In Tol=In Tolerance; Min/Max=Acceptance Range; ±U=Expanded Measurement Uncertainty; TUR=Test Uncertainty Ratio; Accuracy=±(Max-Min)/2; Min = As Left Nominal(Rounded) - Tolerance; Max = As Left Nominal(Rounded) + Tolerance; Date=MM/DD/YY

Nicol Rodriguez, Quality Manager

Aaron Judice, Technical Manager

Maintaining Accuracy:

In our opinion once calibrated your Digital Barometer Module should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Digital Barometer Modules change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

CONTROL COMPANY 12554 Galveston RD Suite B230 Webster TX USA 77598
Phone 281 482-1714 Fax 281 482-9448 service@control3.com www.control3.com

Control Company is an ISO 17025:2005 Calibration Laboratory Accredited by (A2LA) American Association for Laboratory Accreditation, Certificate No. 1750.01.
Control Company is ISO 9001:2008 Quality Certified by (DNV) Det Norske Veritas, Certificate No. CERT-01805-2006-AQ-HOU-RvA.
International Laboratory Accreditation Cooperation (ILAC) - Multilateral Recognition Arrangement (MRA).

Traceable® is a registered trademark of Control Company

APEX INSTRUMENTS
EPA Method 5
560 Series Meter Box Calibration
Pre-Test Orifice Method
Metric Meter Box Volume Units, English K' Factor

Filename: \\JAMESGRAY-PC\Customer Project Files\APPENDIX\Cal Sheets\Meter Boxes\[Meter Box 2 6-12-17.xls]A
Revised: 7/25/95 Version: 2.2

CONVERSION FACTORS

1 mm Hg =	0.13330	kPa
1 inch =	0.39370	cm
1 inch =	0.03937	mm
1 cu ft =	28.32	liters

Model #: 2
Serial #:

Date: ----------> 6/12/2017
Barometric Pressure: ----------> 28.91 (in. Hg)
Theoretical Critical Vacuum:---> 13.64 (in. Hg)

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IMPORTANT For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.
IMPORTANT The Critical Orifice Coefficient, K', must be entered in English units, (ft)^3*(deg R)^0.5/((in.Hg)*(min)).
!!!!!!!!

---------- DRY GAS METER READINGS ----------									-CRITICAL ORIFICE READINGS-						-- Average Temperatures --		
dH (in H2O)	Time (min)	Volume Initial (ft^3)	Volume Final (ft^3)	Volume Total (liters)	Initial Temps. Inlet (deg F)	Initial Temps. Outlet (deg F)	Final Temps. Inlet (deg F)	Final Temps. Outlet (deg F)	Orifice Serial# (number)	K' Orifice Coefficient (see above)	Actual Vacuum (in Hg)	-- Ambient Temperature -- Initial (deg F)	Final (deg F)	Average (deg F)	DGM Outlet (deg R)	DGM Overall (deg R)	Ambient Temp (deg R)
0.57	10	379.357	383.405	114.63936	76	74	78	75	12	0.30894925	15.00	79	79	79	534.5	535.75	539
0.9	10	383.405	388.825	153.4944	76	75	78	76	16	0.41381593	15	79	81	80	535.5	536.25	540
1.2	10	388.825	395.371	185.38272	78	76	80	76	19	0.49958435	15	81	82	81.5	536	537.5	541.5
2.1	5	395.371	399.311	111.5808	80	76	80	76	23	0.6024862	15	82	83	82.5	536	538	542.5
3.5	5	399.311	404.658	151.42704	80	76	82	76	31	0.82015291	15	83	84	83.5	536	538.5	543.5

********** RESULTS **********

--- DRY GAS METER ---		-------- ORIFICE --------			-- DRY GAS METER --		-------- ORIFICE --------		
VOLUME CORRECTED Vm(std) (cu ft)	VOLUME CORRECTED Vm(std) (liters)	VOLUME CORRECTED Vcr(std) (cu ft)	VOLUME CORRECTED Vm(std) (liters)	VOLUME NOMINAL Vcr (cu ft)	CALIBRATION FACTOR Y Value (number)	CALIBRATION FACTOR Y Variation (number)	CALIBRATION FACTOR dH@ Value (in H2O)	Value (mm H2O)	Variation (in H2O)
3.8588167	109.28	3.8471654	108.95172	4.06615	0.99698	0.00077	2.06767066	52.52	0.19223
5.1662051	146.31	5.1482356	145.79803	5.45137	0.99652	0.00031	1.81970985	46.22	-0.05573
6.2297079	176.43	6.2066562	175.7725	6.59037	0.9963	9.3E-05	1.66777331	42.36	-0.20767
3.7546898	106.33	3.7390849	105.89089	3.97758	0.99584	-0.00036	2.01048014	51.07	0.13504
5.1088138	144.68	5.0852599	144.01456	5.41958	0.99539	-0.00082	1.81156071	46.01	-0.06388
			Average Y ------->		0.99621		1.87543893	47.64	<------ Average dH@

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +-0.02.

For Orifice Calibration Factor dH@, the orifice differential pressure in inches of H20 that equates to 0.75 cfm of air at 68 F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +-0.2.

SIGNED:_____ Brandon Bobkoskie

Date:_____ 6/12/2017