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**RESULTS OF THE JUNE 28 AND JULY 19, 2016  
AIR EMISSION MACT COMPLIANCE TESTING  
AT THE LP CORP FACILITY LOCATED  
IN SAGOLA, MICHIGAN  
(SRN N1315)  
PERMIT #MI-ROP-N1315-2013**

Submitted to:

**LOUISIANA PACIFIC CORPORATION**  
N8504 Highway M-95  
Sagola, Michigan 49881

Attention:

Rich Menard

Reviewed by:

  
Kathleen Eickstadt  
Source Testing Department

Report Number 16-35280(TOH)  
August 16, 2016  
EHJ

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**1 INTRODUCTION**

On June 28 and July 19, 2016, Interpoll Laboratories personnel conducted ICI MACT Emission compliance testing on the Thermal Oil Heater at the Louisiana Pacific Corporation (LP) OSB Plant located in Sagola, Michigan. On-site testing was performed by Steve Edson and Kevin Chesler. Coordination between testing activities and plant operation was provided by Rich Menard of Louisiana Pacific Corp. The tests were witnessed by Jeremy Howe of the Michigan Department of Environmental Quality.

The Sagola plant operates three TSI single pass dryers fired with Model 230 FYR Coen Inner Air Heater primary burners each coupled with Duel Air Zone DAZ-24 register burners, a press and one GEKA thermal oil heater. Dryer emissions are controlled by three parallel Geoenergy WESP's and a MEGTEC two-cell RTO. Press emissions are ducted to a Huntington Environmental Systems Inc., five cell RCO prior to exhaust to the atmosphere. The Geka bark burning thermal oil heater emissions are controlled by dry ESP particulate removal system.

Hydrogen chloride and Total Filterable Particulate Matter (PM) samples were collected using EPA Methods 1-5, 26A. A preliminary determination of the gas linear velocity profile was made before the first particulate/HCl determination to allow selection of the appropriate nozzle diameter required for isokinetic sample withdrawal. An Interpoll Labs sampling train, which meets or exceeds specifications in the above-cited reference was used to extract particulate samples by means of a heated glass-lined probe. After the samples were collected, the front half filterable particulate sample were recovered according to EPA Method 5 specifications, and the 0.1 N H<sub>2</sub>SO<sub>4</sub> impinger catch was quantitatively recovered into all glass sample containers closed with teflon-lined caps. The samples were returned to the laboratory, where the Filterable PM and HCl samples were logged in and analyzed. The HCl samples were diluted and analyzed for chloride by automated ion chromatography (IC) as per EPA Method 26A. An audit sample for analysis of HCl was procured and analyzed to satisfy the requirements of the Stationary Source Audit Program (SSAP). During the audit ordering procedures an incorrect date was entered, and the sample did not accompany the tester into the field. This was discussed with the Michigan DEQ, and the sample was sent directly to Interpoll Labs where it was analyzed.

Mercury testing was performed using EPA Method 30B-"Determination of Total Vapor Phase Mercury Emissions from Coal Fired Combustion Sources Using Carbon Sorbent Traps." An EPA Method 30B train was used to extract known volumes of flue gas from the stack through paired 10mm diameter dual section iodinated carbon sorbent traps. All sorbent traps used in this testing were prepared by Ohio Lumex Co. Analysis was performed by Interpoll Laboratories personnel using an Ohio Lumex Company direct thermal analyzer with Atomic Absorption Spectrometry (AAS). A spike recovery test was incorporated into the first test, and spike levels were estimated to match the level of mercury expected at the source emission limit.

Oxygen, Carbon Dioxide, and Carbon Monoxide concentrations were determined in accordance with Methods 3A and 10. A slipstream of sample gas was withdrawn from the exhaust gas stream using a heat-traced probe and filter assembly. After passing through the filter, the gas passed through two condenser-type moisture removal systems operating in series. The particulate-free dry gas was then transported to the analyzers with the excess exhausted to the atmosphere through a calibrated orifice, which was used to ensure that the flow from the stack exceeds the requirements of the analyzers. The analog response of each analyzer was recorded with a computer datalogger. The O<sub>2</sub>, CO<sub>2</sub>, and CO analyzers were calibrated with EPA Protocol 1 Standard gases. The instruments were calibrated before and after each run as per EPA Method 3A and 10.

A summary of all of the important results of the engineering testing is given in the following section. Supplemental information such as field data sheets, laboratory results, procedures and calculation equations are presented in the appendices.

2 SUMMARY AND DISCUSSION

The air emission results are summarized in the following tables. An overview of all results is presented below:

**Table 1: Summary of the Test Results**

Stack Vent No.: Emission Unit No.	Limitation Basis of Pollutant Tested	Pollutant Tested and Applicable Emission Limit	Test Result
<b>GEKA Thermal Oil Heater (EUTOH)</b>	Table 2(8)(b) to Subpart DDDDD of Part 63	<b>Filterable PM</b> 0.037 lb/MMBtu of heat input	<b>Filterable PM</b> 0.0003 lb/MMBtu of heat input
	Table 2(1)(b) to Subpart DDDDD of Part 63	<b>Mercury</b> 5.7E-06 lb/MMBtu of heat input	<b>Mercury</b> 8.5E-07 lbs/mmBtu
	Table 2(1)(a) to Subpart DDDDD of Part 63	<b>HCl</b> 2.2E-02 lb/MMBtu of heat input	<b>HCl</b> ≤ 7E-04 lbs/mmBtu
	Table 2(8)(a) to Subpart DDDDD of Part 63	<b>Carbon Monoxide</b> 1,500 ppm, dry corrected to 3% oxygen	<b>Carbon Monoxide</b> 72.5 ppm, dry corrected to 3% oxygen

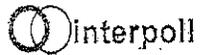
Part 63, Subpart DDDDD, Table 2 classifications for this unit are. 1. Unit designed to burn Solid Fuel (HCl and Mercury), and 8. Stokers/Sloped Grate/others designed to burn wet biomass fuels (CO and Filterable PM).

It should be noted that during the observation and review of the initial testing performed on June 28, 2016, Mr. Jeremy Howe of the Michigan Department of Environmental Quality observed that meter temperatures for the Method 30B testing were being read at the wrong location. This initial test was discarded, and a second test was performed on July 19, 2016. Also, the tester failed to record the results of the initial system bias test, so a second system bias was performed for the Carbon Monoxide test at the 1 hour mark of the first run, and the run was resumed at that time. Results of the system bias were used to correct the second hour of the run. No other difficulties were encountered in the field by Interpoll Labs or in the laboratory analysis of the samples, which were conducted by Interpoll Labs. On the basis of these facts and a complete review of the data and results, it is our opinion that the results reported herein are accurate and closely reflect the actual values, which existed at the time the test was performed.

Test 1 Summary of the June 28, 2016, Particulate Emission Compliance Test on the Thermal Oil Heater (EUTOH) at the LP Corporation Facility Located in Sagola, MI.

Item	Run 1	Run 2	Run 3	Average
Date of test	06-28-16	06-28-16	06-28-16	
Time (Start/Finish) (Hrs)	0800 / 1010	1055 / 1300	1335 / 1539	
Volumetric Flow				
Actual (ACFM)	35,828	36,439	36,809	36,359
Standard (DSCFM)	15,620	15,845	15,865	15,777
Gas Temperature (°F)	496	499	508	501
Moisture Content (%v/v)	18.00	17.95	17.95	17.97
Gas Composition (%v/v, dry)				
Carbon Dioxide	11.02	10.71	10.24	10.66
Oxygen	9.46	9.80	10.31	9.86
Nitrogen	79.52	79.49	79.45	79.49
Sample Volume (dscf)	85.09	83.58	83.58	84.08
Isokinetic Variation (%)	103.2	100.1	100.0	101.1
<b>Particulate Results-EPA Method 5</b>				
<i>Dry Catch Only</i>				
Sample Mass (Nozzle, PW, Filter) (g)	0.0002	0.0016	0.0001	
Concentration - Actual (GR/ACF)	0.00002	0.00013	0.00001	0.00005
Concentration - Standard (GR/DSCF)	0.00004	0.00030	0.00002	0.00012
Emission Rate (LB/HR)	0.005	0.040	0.002	0.016
Emission Factor (LB/MMBTU)	0.0001	0.0008	0.00005	0.0003

\*Note-Run 3 sample mass was -0.0003, so the minimum weighable mass was used to calculate the emissions.



Test Number 1  
Thermal Oil Heater

Results of Draft Method 30B Mercury Determinations

		Run 1			Run 2			Run 3			Average
Date of test		07-19-16			07-19-16			07-19-16			
Time of Runs (CDT)	Start (Hrs)	0800			1000			1155			
	End (Hrs)	0937			1137			1333			
Total Sampling Time	(Min.)	96.0			96.0			96.0			
Gas Composition	(%v/v)										
	Carbon Dioxide, d	9.39			10.16			9.94			
	Oxygen, d	11.34			10.47			10.72			
	Nitrogen	79.27			79.37			79.34			
Fuel Factor	(dscf/mmBtu)	9,600			9,600			9,600			
		<u>A</u>	<u>B</u>	<u>Avg.</u>	<u>A</u>	<u>B</u>	<u>Avg.</u>	<u>A</u>	<u>B</u>	<u>Avg.</u>	
Standard Liters Sampled		79.0711	81.9579		79.4962	79.4163		82.8870	82.5125		
DSCM Sampled		0.079071	0.0820		0.0795	0.0794		0.0829	0.0825		
Target Sample volume (%)		1.79	-1.79		1.26	1.36		-2.95	-2.48		
Mercury											
Trap ID #		OL326738	OL314550		OL326743	OL326507		OL326716	OL353198		
Spike mass	(ng)	50			50			50			
Sample Mass	(ng)	52.8			59.8			52.8			
Sample Mass	(ug)	0.0528			0.0598			0.0528			
Concentration	(ug/m <sup>3</sup> )	0.668	0.58	0.63	0.75	0.78	0.77	0.64	0.69	0.66	0.68
f-factor method**	(lb/mmBtu)	0.00000087	0.00000076	0.00000082	0.00000090	0.00000093	0.00000092	0.00000078	0.00000085	0.00000082	0.00000085
f-factor method	(lb/trillionBtu)	0.87	0.76	0.82	0.90	0.93	0.92	0.78	0.85	0.82	0.851
Paired train Agreement RD	(%)	6.76			1.69			3.88			
Paired train Agreement	(Abs. diff.)	0.08			0.03			0.05			
Crec	(ug/m <sup>3</sup> )	0.53			0.66			0.66			
Spike Recovery-R	(%)	86.14			104.12			108.48			99.58

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Test 1 Summary of the Results of the June 28, 2016 Hydrogen Chloride Emission Compliance Test on the Thermal Oil Heater (EUTOH) at the LP Corporation Facility Located in Sagola, MI.

Item		Run 1	Run 2	Run 3	Average		
Date of test		06-28-16	06-28-16	06-28-16			
Time runs were done (Hrs)		0800 / 1010	1055 / 1300	1335 / 1539			
Volumetric Flow							
Actual	(ACFM)	35,828	36,439	36,809	36,359		
Standard	(DSCFM)	15,620	15,845	15,865	15,777		
Gas Temperature	(°F)	496.0	499.1	507.6	500.9		
Moisture Content	(%v/v)	18.00	17.95	17.95	17.97		
Gas Composition (%v/v, dry)							
Carbon Dioxide		11.02	10.71	10.24	10.66		
Oxygen		9.46	9.80	10.31	9.86		
Nitrogen		79.52	79.49	79.45	79.49		
<b>Analytical Results</b>							
<i>Hydrogen Chloride</i>							
Analytical results	(ug/sample)	1350.0	<	1410.0	<	1380.0	1380.0
Concentration	(MG/DSCM)	0.576	<	0.612	<	0.599	0.6
Concentration	(GR/DSCF)	0.0003	<	0.0003	<	0.0003	0.0003
Concentration	(ppm, dry)	0.38	<	0.40	<	0.40	0.39
Mass Rate	(LB/HR)	0.03	<	0.04	<	0.04	0.04
Emission Rate	(LB/mmBtu)	0.0006	<	0.0007	<	0.0007	0.0007
Limit	0.022 LB/mmBtu						

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Test 2 Summary of the June 28, 2016, Carbon Monoxide Emission  
 Test on the Thermal Oil Heater Stack at the Louisiana Pacific Facility located in Sagola, MI.

Item		Run 1	Run 2	Run 3	Average
Date of test		06-28-16	06-28-16	06-28-16	
Time runs were done	(Hrs)	920 / 1020	1055 / 1155	1335 / 1435	
Volumetric Flow					
Actual	(ACFM)	35,831	36,445	36,770	36,349
Standard	(DSCFM)	15,621	15,848	15,848	15,773
Gas Temperature	(°F)	496	499	508	501
Moisture Content	(%v/v)	18.00	17.95	17.95	17.97
Gas Composition	(%v/v, dry)				
Carbon Dioxide		10.95	10.61	10.84	10.80
Oxygen		9.62	9.93	9.68	9.74
Nitrogen		79.43	79.46	79.47	79.46
<b>Results</b>					
CO					
Concentration - ppm, wet	(ppm, w)	39.249	42.661	29.103	37.004
Concentration - ppm, dry	(ppm, d)	47.865	51.993	35.470	45.110
Concentration- ppm, dry @3%O2	(ppm, d)	75.932	84.856	56.605	72.465
Emission Rate	(LB/MMBTU)	0.060	0.067	0.044	0.057
Emission Rate	(LB/HR)	3.26	3.59	2.45	3.102

### 3 RESULTS

The results of all field and laboratory evaluations are presented in this section. Orsat (gas composition) and moisture is presented first followed by the computer printout of the particulate results. Preliminary measurements including test port locations are given in the appendices.

The results have been calculated on a personal computer using programs written specifically for source testing calculations. EPA-published equations have been used as the basis of the calculation techniques in these programs. The emission rates have been calculated using the product of the concentration times flow method.

### 3.1 Results of Gas Composition and Moisture Determinations

Test Number 1  
Thermal Oil Heater

**Results of Gas Composition and Moisture Analyses --- Methods 3A and 4 (% v/v)**

Date of Run		Run 1 06-28-16	Run 2 06-28-16	Run 3 06-28-16
<b>Dry basis</b>				
Carbon Dioxide.....	( % )	11.02	10.71	10.24
Oxygen.....	( % )	9.46	9.80	10.31
Nitrogen.....	( % )	79.52	79.49	79.45
<b>Wet basis</b>				
Carbon Dioxide.....	( % )	9.04	8.79	8.40
Oxygen.....	( % )	7.76	8.04	8.46
Nitrogen.....	( % )	65.21	65.22	65.19
Water Vapor.....		18.00	17.95	17.95
Dry Molecular Weight.....	(g/gmole)	30.14	30.11	30.05
Wet Molecular Weight.....	(g/gmole)	27.96	27.93	27.89
Specific Gravity.....		0.966	0.965	0.963
Water Mass Flow.....	(lb/hr)	9622	9722	9736
Fo.....		1.038	1.036	1.034

Test Number 1  
Thermal Oil Heater

**Results of Gas Composition and Moisture Analyses**

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		<b>Run 1</b>	<b>Run 2</b>	<b>Run 3</b>
<b>Date of Run</b>		07-19-16	07-19-16	07-19-16
<b>Dry basis</b>				
Carbon Dioxide	(% v/v,d)	9.39	10.16	9.94
Oxygen	(% v/v,d)	11.34	10.47	10.72
Nitrogen	(% v/v,d)	79.27	79.37	79.34
<b>Wet basis</b>				
Carbon Dioxide	(% v/v)	9.39	10.16	9.94
Oxygen	(% v/v)	11.34	10.47	10.72
Nitrogen	(% v/v)	79.27	79.37	79.34
Dry Molecular Weight	(lb/lb mol)	29.96	30.04	30.02
Wet Molecular Weight	(lb/lb mol)	29.96	30.04	30.02
Specific Gravity		1.035	1.038	1.037
Fo		1.018	1.027	1.024

### 3.2 EPA Method 26A (HCl and Filterable PM) Sampling Data

**Test Number 1**  
**Thermal Oil Heater**

**Results of EPA Method 5/26A Sampling Data**

		Run 1	Run 2	Run 3
Date of Test		06-28-16	06-28-16	06-28-16
Time of Runs	(Hrs)	0800 / 1010	1055 / 1300	1335 / 1539
Static Pressure	(In. of WC)	-0.10	-0.10	-0.10
Cross Sectional Area	(Sq. ft)	12.31	12.31	12.31
Pitot Tube Coefficient		0.84	0.84	0.84
Water in Sample Gas				
Impingers	(g)	372.4	362.6	362.6
Desiccant	(g)	23.8	25.2	25.3
Total	(g)	396.2	387.8	387.9
Gas Meter Coefficient		1.0028	1.0028	1.0028
Barometric Pressure	(In. of Hg)	28.81	28.81	28.81
Avg. Orifice Pressure Drop	(In. of WC)	1.67	1.62	1.63
Avg. Gas Meter Temperature	(°F)	77.2	79.1	82.8
Volume Through Gas Meter				
Meter Conditions	(CF)	89.31	88.05	88.66
Standard Conditions	(DSCF)	85.09	83.58	83.58
Total Sampling Time	(Min.)	120.00	120.00	120.00
Nozzle Diameter	(In.)	0.315	0.315	0.315
Avg. Stack Gas Temperature	(°F)	496	499	508
Volumetric Flow Rate				
Actual	(ACFM)	35,828	36,439	36,809
Dry Standard	(DSCFM)	15,620	15,845	15,865
Isokinetic Variation	(%)	103.2	100.1	100.0

### 3.3 EPA Method 30B Sampling and QA/QC Data

LP Sagola  
 Sagola, MI  
 Thermal Oil Heater  
 7/19/2016

30B QA/QC Table

	Field Spike		Paired Train		Breakthrough		Breakthrough		Sample Volume (L)			
	Recovery	Pass/Fail	Agreement	Pass/Fail	A	Pass/Fail	B	Pass/Fail	A	B	Diff	Pass/Fail
Run 1	86.14		6.76	Pass	1.56	Pass	0.84	Pass	79.1	82.0	-3.65%	Pass
Run 2	104.12		1.69	Pass	1.37	Pass	0.73	Pass	79.5	79.4	0.10%	Pass
Run 3	108.48		3.88	Pass	1.56	Pass	0.76	Pass	82.89	82.51	0.45%	Pass
Avg.	99.58	Pass										

QA/QC Specifications/requirements

Field Spike Recovery Test: 85-115% average of three runs

Paired Train Agreement: <10% RD for concentrations > 1ug/dscm, <20% or <0.2ug/dscm absolute difference for conc < 1ug/dscm

Breakthrough: < 10% of section 1 Hg mass for Hg concentrations >1 ug/dscm; < 20% RD of section 1 Hg mass for Hg concentrations <1 ug/dscm

Sample Volume: Within +/- 20% of total volume sampled during field recovery test

Table 9-1. Quality Assurance/Quality Control Criteria for Method 30B

QA/QC Test or Specification	Acceptance Criteria	Frequency	Consequences if Not Met	Pass/Fail		
				Pre-Test	Runs	Post Test
Gas flow meter calibration (At 3 settings or points)	Calibration factor (Y) at each flow rate must be within +/- 2% of the average value (Y)	Prior to initial use and when post-test check is not within +/- 5% of Y	Recalibrate at 3 points until the acceptance criteria are met	Pass	N/A	N/A
Temperature sensor calibration	Absolute temperature measured by sensor within +/- 1.5% of a reference sensor	Prior to initial use and before each test event thereafter	Recalibrate; sensor may not be used until specifications are met	Pass	N/A	N/A
Barometer calibration	Absolute pressure measured by instrument within +/- 10 mmHg (0.39 inHg) reading with a mercury barometer	Prior to initial use and before each test event thereafter	Recalibrate; instrument may not be used until specification is met	Pass	N/A	N/A
Pre-test leak check	< 4% of target sample rate	Prior to sampling	Sampling shall not commence until the leak check is passed	N/A	Pass	N/A
Post-test leak check	< 4% of target sample rate	After sampling	Sample invalidated*	N/A	Pass	N/A
Field recovery test	Average recovery between 85% and 115% for Hg <sup>0</sup>	Once per field test	Field sample runs not validated without successful field recovery test	N/A	Pass	N/A
Test run total sample volume	Within +/- 20% of total volume sampled during field recovery test	Every sample	Sample invalidated*	N/A	Pass	N/A
Sorbent trap section 2 breakthrough	≤ 10% of section 1 Hg mass for Hg concentrations > 1 ug/dscm; < 20% RD of section 1 Hg mass for Hg concentrations ≤ 1 ug/dscm	Every run	Sample invalidated*	N/A	Pass	N/A
Paired sorbent trap agreement	≤ 10% Relative Deviation (RD) mass for Hg concentrations > 1 ug/dscm; ≤ 20% RD or ≤ 0.2 ug/dscm absolute difference for Hg concentrations ≤ 1 ug/dscm	Every run	Run invalidated*	N/A	Pass	N/A
Gas flow meter post-test calibration check (Single-point)	Calibration factor (Y) must be within +/- 5% of the Y value from the most recent 3 point calibration	After each field test. For mass flow meters, must be done on site, using stack gas.	Recalibrate gas flow meter at 3 points to determine a new value of Y. For mass flow meters, must be done on site, using stack gas. Apply the new Y value to the field test data.	N/A	N/A	Pass
Analytical Matrix interference test (wet chemical analysis, only)	Establish minimum dilution (if any) needed to eliminate sorbent matrix interference	Prior to analyzing any field samples; repeat for each type of sorbent used	Field sample results not validated	N/A	N/A	N/A
Analytical bias test	Average recovery between 90% and 110% for each Hg <sup>0</sup> and HgCl <sub>2</sub> at each of the 2 spike concentration levels	Prior to analyzing field samples and prior to use of new sorbent media	Field samples shall not be analyzed until the percent recovery criteria has been met	Done 1/26/16	N/A	N/A
Multipoint analyzer calibration	Each analyzer reading within +/- 10% of true value and r <sup>2</sup> ≥ 0.99	On the day of analysis, before analyzing any samples	Recalibrate until successful	Pass	N/A	N/A
Analysis of independent calibration standard	Within +/- 10% of true value	Following daily calibration, prior to analyzing field samples	Recalibrate and repeat independent standard analysis until successful	Pass	N/A	N/A
Analysis of continuing calibration verification standard (CCVS)	Within +/- 10% of true value	Following daily calibration, after analyzing < 10 field samples, and at end of each set of analysis	Recalibrate and repeat independent standard analysis, reanalyze samples until successful, if possible; for destructive techniques, samples invalidated	Pass	Pass	N/A
Sample analysis	Within valid calibration range (within calibration curve)	All section 1 samples where stack Hg concentration is ≥ 0.5 ug/m <sup>3</sup>	Reanalyze at more concentrated level if possible, samples invalidated if not within calibrated range	N/A	Pass	N/A
Sample analysis	Within bounds of Hg <sup>0</sup> and HgCl <sub>2</sub> Analytical Bias Test	All Section 1 samples where stack Hg concentration is ≥ 0.5 ug/m <sup>3</sup>	Expand bounds of Hg <sup>0</sup> and HgCl <sub>2</sub> Analytical Bias Test; if not successful, samples invalidated	N/A	Pass	N/A

LP/Sagola  
TOH Stack  
Wood Waste/Bark

**Determination of Target Sample Volume**  
(EPA Method 30B, Section 8.2.4)

**Determine Minimum Sample Mass (8.2.2.2.1)**

**Target Sample Volume (Section 8.2.4)**

	<u>1</u>	
Estimated Stack Gas Hg Concentration	0.60	ug/m <sup>3</sup> (ng/L)
Target Sample Mass on sorbent Trap	50	ng
Target Sample Volume	83.33	L
Sampling Time	90.00	min.
Approximate Sample Rate	0.926	L/min
Approximate Sample Rate	926	cc/min

**Calculation of Pre-Sampling Spike Levels (Section 8.2.6.1)**

		<u>Upper</u>	
Estimated Stack Gas Hg Concentration	0.60		ug/m <sup>3</sup> (ng/L)
Approximate Sample Rate	900		cc/min
Approximate Sample Rate	0.900		L/min
Sampling Time	90.00		min.
Mass collected on sorbent Trap	48.6		ng
Target Spike Level	50%	24.3	
	100%	48.6	50
	150%	72.9	

For this test, I based spikes on this source tested on 6/28/16 of approximately 0.68 lb/Tbtu (approx 0.6 ug/m<sup>3</sup> at stack conditions)