ADDENDUM TO BEST AVAILABLE RETROFIT TECHNOLOGY APPLICABILITY ANALYSIS AND DETERMINATION REPORT
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Prepared for:

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1. INTRODUCTION

Port Townsend Paper Company (PTPC) submitted a Best Available Retrofit Technology (BART) Applicability and Determination Report (BART Report) to the Washington Department of Ecology (Ecology) on December 19, 2008. In August through October of 2008, Mr. Robert Burmark requested additional information regarding the control equipment on the BART-eligible equipment at the PTPC Mill.[1] Mr. Burmark also requested further information regarding SO_2 emissions from PTPC's No. 10 Power Boiler, including a discussion of how the SO_2 emissions relate to the firing of waste water solids in the boiler.[2]

This addendum provides clarification and additional details regarding the control equipment installed on each of the BART-eligible units at the PTPC Mill. Additionally, further information regarding SO_2 emissions from the No. 10 Power Boiler are included to demonstrate that the SO_2 emission rates used for the boiler in the BART analysis were sufficiently conservative to account for the sulfur content from waste water solids firing.

[1] Email correspondence between Mr. Robert Burmark, Ecology, and Ms. Kristin Marshall, PTPC, August 18, 2008. Phone conversation between Mr. Robert Burmark, Ecology, and Ms. Eveleen Muehlethaler, PTPC, October 7, 2008.

[2] Email correspondence between Mr. Robert Burmark, Ecology, and Ms. Kristin Marshall, PTPC, September 10, 2008. Phone conversation between Mr. Robert Burmark, Ecology, and Ms. Eveleen Muehlethaler, PTPC, October 7, 2008.

Table 2-1 below summarizes the control devices used to control emissions from the BART-eligible emission units at the PTPC Mill. Each control device is further described in the subsequent paragraphs.

TABLE 2-1. SUMMARY OF CONTROL DEVICES SERVING BART-ELIGIBLE EMISSION UNITS

Emission Unit	Control Device	Installation Date	Notes
Recovery Furnace	Research Cottrell ESP (2)	Rebuilt 1993	Three ESPs total; parallel single chamber, dry bottom
	Environmental Elements ESP(1)	1986-1987	
Smelt Tank	Ducon UW4Model 4 scrubber	1970s	Modified by APTech in 2003 for MACT II compliance
No. 10 Power Boiler	Multiclones and Turbotak Scrubber	Turbotak installed in1988	Multiclones for coarse PM and Turbotak for fine PM
Lime Kiln	Venturi scrubber	Modified 2003	Scrubber showers modified for MACT II compliance

PTPC's Recovery Boiler is equipped with three Electrostatic Precipitators (ESPs). Each ESP is a parallel single chamber, dry bottom ESP. Two of the ESP units, manufactured by Research Cottrell, were rebuilt in 1993. The third ESP, manufactured by Environmental Elements, was installed as part of a Prevention of Significant Deterioration (PSD) permitting effort in approximately 1986 to 1987.

The Smelt Tank is controlled with a Ducon UW4 Model 4 scrubber. The scrubber was originally installed during the 1970's and was modified by APTech in 2003. The modification in 2003 included the installation of new spray header and nozzles, spin breakers, and chevrons in order to further reduce particulate matter emissions and allow for compliance with MACT II requirements.

The No. 10 Power Boiler employs multiclones and a Turbotak scrubber to control particulate matter emissions. The multiclones remove the coarse particulate using centrifugal action. The Turbotak was installed in 1988 as a replacement of an existing venturi scrubber. The Turbotak scrubber is a wet scrubber that exposes the exhaust gas stream to a series of atomized water sprays. The multiple water sprays allow for optimizing the ratio between the water droplet diameter and the particulate matter diameter. The Turbotak also employs removal equipment including a knockout chamber, a fan, and chevrons.

The Lime Kiln employs a venturi scrubber to control particulate matter emissions. The showers of lime kiln's venturi scrubber were modified in 2003 for MACT II compliance.

PTPC fires waste water solids from the primary clarifier in their No. 10 Power Boiler. The primary clarifier waste water solids are referred to as primary sludge. This section addresses how the firing of primary sludge in PTPC's No. 10 Power Boiler may affect the SO_2 emissions and whether the sulfur content in the sludge should be considered in PTPC's BART determination analysis.

3.1 CLARIFIER SLUDGE DESCRIPTION

Secondary sludge has been shown to contribute significantly to SO_2 emissions from boilers firing secondary sludge. However, the characteristics of primary sludge differ considerably from secondary sludge. Primary sludge generally contains fiber escaping the pulping and papermaking areas as the main constituent, while secondary sludge is generally made up of biological solids.

3.2 MODELED SO_2 EMISSIONS FROM THE NO. 10 POWER BOILER

As described in Section 3.2 of the BART Report, the modeled emission rate of SO_2 from the No. 10 Power Boiler was calculated using a NCASI correlation based on the daily firing rate of hog fuel and of fuel oil.[3] The NCASI correlation was applied for each day using measurements of fuel oil sulfur content and the amounts of hog fuel and fuel oil fired that day. The maximum estimated daily SO_2 emission rate over 2003 to 2005 calculated using this correlation was used as the maximum 24-hour average SO_2 emission rate modeled in the BART analysis. This modeled SO_2 emission rate was 1,713 pounds SO_2 per day (71.39 lb/hr).

Because the sulfur content in the fuel oil is typically considerably higher than the average sulfur content in the hog fuel, it is no surprise that the day with the highest calculated SO_2 emissions is also the day with the highest fuel oil firing rate. The modeled SO_2 emission rate used in the BART analysis conservatively accounts for the maximum amount of sulfur fired in the boiler by applying the NCASI factor on the day with the highest calculated SO_2 emission rate resulting from a high fuel oil firing rate on that day. The oil firing rate of 619 barrels (3,686 MMBtu) on the day with the maximum estimated SO_2 emission rate results in 1,370 pounds of sulfur per day fed to the boiler from the fuel oil. This amount of sulfur would likely outweigh any contribution of sulfur from waste water solids.

3.3 SOURCE TEST SO_2 EMISSIONS FROM THE NO. 10 POWER BOILER

In order to provide additional supporting documentation that the SO_2 emission rates from the No. 10 Power Boiler used in the BART analysis were sufficiently conservative to account for the sulfur content from waste water solids firing, the available SO_2 emissions source tests on the No.10 Power Boiler are presented in this section. These source tests were conducted during normal boiler

[3] NCASI Technical Bulletin No. 884, *Compilation of Criteria Air Pollutant Emissions Data for Sources at Pulp and Paper Mills Including Boilers,* August 2004, page 40 and 41.

operation when primary sludge was being fired. Therefore, the results of these tests represent normal SO_2 emissions from the boiler operating under normal primary sludge firing rates.

The NCASI SO_2 emission correlation was used to determine the maximum 24-hour SO_2 emissions for the BART analysis because source test data during the 2003-2005 BART analysis period are not available. However, the results from three source tests measuring SO_2 from the No. 10 Power Boiler that were conducted since the installation of the Turbotak scrubber are presented below. These source test emission rates indicate that the actual SO_2 emission rate from the No. 10 Power Boiler is lower than the modeled SO_2 emission rate (i.e., that the modeled SO_2 emission rate is conservative). Copies of the source test results summarized below are provided in Appendix A.

TABLE 3-1. SOURCE TEST NO. 10 BOILER SO_2 EMISSION RATE

Source Test Description	Date	SO_2 Emission Rate [a]
Valid Results, Inc.	September 16, 1997	10.29 lb/hr
Valid Results, Inc.	September 17, 1997	25.55 lb/hr
Big Horn Environmental	February 22, 2006	7.37 lb/hr

[a] Average SO_2 emission rate from three runs conducted during each source test.

As presented in Table 3-1 above, the maximum SO_2 emission rate from the No. 10 Power Boiler based on source testing is 25.55 pounds per hour, well below the modeled SO_2 emission rate of 71.39 pounds per hour. During the source tests presented above, the firing rate of the boiler was near maximum capacity. Therefore, if the results from these source tests are scaled to represent the maximum firing rate of the boiler during the 2003 to 2005 BART analysis period, the maximum emission rate based on testing still would be well below the modeled SO_2 emission rate. Thus, the source test results indicate that the modeled SO_2 emission rate from the No. 10 Power Boiler used in the BART analysis was conservative compared to source test results for which the firing of primary sludge was accounted.

APPENDIX A

SOURCE TEST RESULTS

AIR EMISSIONS TEST
(O_2, CO_2, SO_2, NO_X, CO & TOC)

PORT TOWNSEND PAPER COMPANY
#10 BOILER

September 16-17, 1997

Prepared for
Port Townsend Paper Company

By
Valid Results, Inc.
Seattle, WA

November 13, 1997

VALID RESULTS, INC.: EPA Method 6C: Sulfur Dioxide (SO2) Emission Rate Calculation Sheet

Client: Port Townsend Paper
Date: 9/16/97
Operator: T. Prevo
Plant Location: Port Townsend, WA
Source: #10 Boiler
Standard Pressure (P_{std}): 29.92
Standard Temperature (T_{std}): 68

MAXIMUM LOAD (100% - 240,000 LBS OF STEAM/HR) COMPLIANCE TEST

Test Run Number	Barometric Pressure (P_{bar}) "Hg	Stack Gas Volumetric Flow Rate (dscf/m)	SO_2 Concentration (ppm)	O_2 Concentration (%)	SO_2 Concentration (ppm) @ 7% O_2	SO_2 Concentration (mg/dscm)	SO_2 Concentration (lbs/dscf)	SO_2 Emission Rate (lbs/hour)	SO_2 Emission Rate (tons/year)
1	29.67	107,900	8.16	9.26	9.74	21.70	1.35E-06	8.74	38.28
2	29.57	99,790	13.31	9.39	16.07	35.39	2.20E-06	13.17	57.68
3	29.47	101,000	8.91	9.72	11.08	23.69	1.48E-06	8.97	39.29
<Average>	<29.57>	<102,897>	<10.13>	<9.46>	<12.30>	<26.93>	<1.68E-06>	<10.29>	<45.08>

Stack Gas Volumetric Flow Rate (dscf/m) = calculated on Volumetric Flow Rate Calculation Sheet — *dry standard cubic feet per minute*

SO_2 Concentration (ppm) = bias calibration corrected value — *parts per million*

*SO_2 Concentration (ppm @ 7% O_2) = (ppm) * ((20.9 - 7.0)/(20.9 - stack O_2)* — *parts per million at seven percent oxygen*

SO_2 Concentration (mg/dscm) = ((ppm)(64.07 g/g-mole)*(41,500)/(1,000,000))*
by 40CFR60, Subpart A, Section 60.45, Paragraph F(2) — *milligrams per dry standard cubic meter*

SO_2 Concentration (lbs/dscf) = ((mg/dscm)(0.01543 grains/mg)/((7,000 grains/lb)*(35.32 cubic feet/cubic meter)))* — *pounds per dry standard cubic foot*

SO_2 Emission Rate (lbs/hr) = ((lbs/dscf)(dscf/m)*60 min/hr))* — *pounds per hour*

SO_2 Emission Rate (tons/yr) = ((lbs/hr)(24 hr/day)*(365 day/yr)/(2,000 lb/ton))* — *tons per year*

SO_2 Emission Rate (lbs/MMBtu) = ((lbs/dscf)(Mixed Fuel F-Factor)*(20.9)/(20.9 - Stack Oxygen)*
by 40CFR60, Appendix A, Method 19, Equation 19-1 — *pounds per million Btu*

VALID RESULTS, INC.: EPA Method 6C: Sulfur Dioxide (SO2) Emission Rate Calculation Sheet

Port Townsend Paper
9/17/97
T. Prevo
ation: Port Townsend, WA
#10 Boiler
Pressure (P_{std}): 29.92
Temperature (T_{std}): 68

E LOAD (77% - 184,000 LBS OF STEAM/HR) COMPLIANCE TEST

er	Barometric Pressure (P_{bar}) "Hg	Stack Gas Volumetric Flow Rate (dscf/m)	SO_2 Concentration (ppm)	O_2 Concentration (%)	SO_2 Concentration (ppm) @ 7% O_2	SO_2 Concentration (mg/dscm)	SO_2 Concentration (lbs/dscf)	SO_2 Emission Rate (lbs/hour)	SO_2 Emission Rate (tons/year)	SO_2 Emission Rate (lbs/MMBtu)
	29.38	109,000	21.72	10.71	29.63	57.75	3.60E-06	23.54	103.11	0.069
	29.41	106,800	29.05	11.46	42.77	77.24	4.81E-06	30.82	134.99	0.100
	29.43	111,200	20.17	12.19	32.19	53.63	3.34E-06	22.28	97.59	0.075
ge>	<29.41>	<109,000>	<23.65>	<11.45>	<34.86>	<62.87>	<3.92E-06>	<25.55>	<111.90>	<0.081>

s Volumetric Flow Rate (dscf/m) = calculated on Volumetric Flow Rate Calculation Sheet — *dry standard cubic feet per minute*

ncentration (ppm) = bias calibration corrected value — *parts per million*

*ncentration (ppm @ 7% O_2) = (ppm) * ((20.9 - 7.0)/(20.9 - stack O_2)* — *parts per million at seven percent oxygen*

ncentration (mg/dscm) = ((ppm)(64.07 g/g-mole)*(41,500)/(1,000,000))*
by 40CFR60, Subpart A, Section 60.45, Paragraph F(2) — *milligrams per dry standard cubic meter*

ncentration (lbs/dscf) = ((mg/dscm)(0.01543 grains/mg)/((7,000 grains/lb)*(35.32 cubic feet/cubic meter)))* — *pounds per dry standard cubic foot*

ssion Rate (lbs/hr) = ((lbs/dscf)(dscf/m)*60 min/hr))* — *pounds per hour*

ssion Rate (tons/yr) = ((lbs/hr)(24 hr/day)*(365 day/yr)/(2,000 lb/ton))* — *tons per year*

ssion Rate (lbs/MMBtu) = ((lbs/dscf)(Mixed Fuel F-Factor)*(20.9)/(20.9 - Stack Oxygen)*
by 40CFR60, Appendix A, Method 19, Equation 19-1 — *pounds per million Btu*

April 13, 2006

Ms. Kristin Marshall
Port Townsend Paper Co.
Port Townsend, WA

RE: #10 Power Boiler TRS and SO_2 testing

Dear Ms. Marshall,

The table below summarizes the results of Bighorn Environmental's additional testing of the #10 Power Boiler on February 22, 2006. This testing was done to quantify the emissions of TRS and SO_2 from the boiler. The raw data are attached if you need more detailed information.

#10 Power Boiler TRS and SO_2 Emissions

Units	Results			
	Run 1	Run 2	Run 3	Average
TRS				
-ppm	0.31	0.48	0.69	0.49
-lbs/hr	0.15	0.26	0.34	0.25
SO_2				
-ppm	5.38	8.28	9.58	7.74
-lbs/hr	4.91	8.25	8.94	7.37
Stack Parameters				
Flow, dscfm	91,591	100,026	93,577	95,064
Flow, acfm	131,591	136,043	128,313	131,995
Velocity, fpm	2,660	2,749	2,593	2,667
Temperature, °F	139	141	137	139
% Moisture	22.78	18.20	19.31	20.10

Please call me if you have any questions.

Sincerely,

Tim Homer

858 River Hills Drive • Springfield, OR 97477 • (541) 726-2689 • FAX (541) 744-5610

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