

FOUR-FACTOR REASONABLE PROGRESS ANALYSIS

ROSEBURG FOREST PRODUCTS—MISSOULA PARTICLEBOARD



MAUL
FOSTER
ALONGI

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ROSEBURG FOREST PRODUCT
MISSOULA PARTICLEBOARD
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Prepared by
Maul Foster & Alongi, Inc.
6 Centerpointe Drive, Suite 360, Lake Oswego, OR 97035

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*The material and data in this report were prepared
under the supervision and direction of the undersigned.*

MAUL FOSTER & ALONGI, INC.



*Geoff Scott PE
Senior Engineer*



*Chad Darby
Principal Engineer*

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1 INTRODUCTION

The Montana Department of Environmental (MDEQ) quality is developing a State Implementation Plan (SIP) as part of the Regional Haze program in order to protect visibility in Class I areas. The SIP developed by the MDEQ must be submitted to the U.S. Environmental Protection Agency (US EPA) for approval and covers the second implementation period ending in 2028. The second implementation period focuses on making reasonable progress towards national visibility goals, and assesses progress made since the 2000 through 2004 baseline period.

In a letter dated March 14, 2019, MDEQ informed Roseburg Forest Products (RFP) that an initial Regional Haze screening analysis of emissions from the RFP particleboard facility in Missoula had been performed. The results of this screening assessment indicated that further review of process controls specifically related to nitrogen oxides (NO_x) were needed.

The MDEQ indicated in the March 14 letter that a detailed review of additional controls would eventually be requested. The letter provided a brief discussion of the four factors that the review would need to address, which are;

- (1) the cost of control,
- (2) the time required to achieve control,
- (3) the energy and non-air quality environmental impacts of control, and
- (4) the remaining useful life of the source of emissions.

These four factors are statutorily required and codified in Section 169A(g)(1) of the CAA.

The MDEQ formally requested that RFP prepare a four-factor reasonable progress analysis (RP analysis) in a letter dated April 19, 2019.

RFP previously submitted an RP analysis for sanderdust combustion devices on February 3, 2011 (2011 RP analysis). The current RP analysis builds off the 2011 RP analysis, but it should be noted that the facility has undergone several configuration changes since 2011.

1.1 Applicable Emission Sources, Configuration, and Useful Life

RFP owns and operates a particleboard manufacturing facility in Missoula, Montana. The facility has historically had two production lines, one with a multi-platen batch press (Line 1) and one with a continuous press (Line 2).

RFP underwent the Line 1 modernization project in an effort to increase the production efficiency of the facility. As part of the Line 1 modernization project, the facility went from the historic two-line production configuration, to a single production line configuration. Line 1 historically consisted of four dryers (dryer 100 through dryer 103, referred to by the facility as dryers 1 through 4) which dry both face and core material. These dryers did not change configuration nor were they physically

modified as part of the Line 1 modernization project. All four dryers continue to exhaust through a single, common stack.

The Line 2 production line had consisted of two dryers, dryer 200 and dryer 201 (referred to as dryers 5 and 6). Dryer 5 was reconfigured to supply the Line 1 storage bins, and dryer 6 was removed from service. Dryer 5 exhausts to atmosphere through a dedicated stack.

A pre-dryer is used to reduce the moisture of green wood materials received at the facility and was unchanged during the Line 1 modernization project. Heat for the pre-dryer is provided by a 45 MMBtu/hr SolaGen sanderdust burner.

Heat input for the five final dryers associated with Line 1 (post Line 1 modernization project; dryers 1 through 5) is provided by the combined exhaust of a 50 MMBtu/hr ROEMMC sanderdust burner and a sanderdust-fired Babcock & Wilcox low NO_x suspension-type boiler, which also provides steam for facility processes. The newer Babcock & Wilcox boiler was installed in 2015. It was subsequently upgraded, also in 2015, with a low-NO_x burner, and resulted in a decrease in heat input rating from 55 MMBtu/hr to the current 52 MMBtu/hr. Unlike the other facility sanderdust burners, the boiler serves the function of producing steam for facility processes in addition to providing heat input to the final dryers. The useful remaining life of the boiler is likely 30 years.

The ROEMMC burner was installed in 1979, although it is a 1978 model burner. The sole purpose of this burner is to provide heat input for the final dryers. The ROEMMC burner is currently 40 years old. The facility replaced a sanderdust fired COEN burner in 2005 that was 29 years old. It is suspected that the ROEMMC burner is nearing its life expectancy and probably has less than 10 years of service remaining.

The SolaGen burner was installed in 2006, although it is a 2005 model. The sole purpose of this burner is to provide heat input to the pre-dryer. Based on the previous COEN burner, it is expected that the SolaGen has approximately 15 years of useful life remaining.

1.1.1 Boiler-ROEMMC Configuration

A horizontal manifold connects the boiler and ROEMMC burner exhaust stacks to provide combined exhaust to the five final dryers for the single manufacturing Line 1. Both the boiler and ROEMMC burner stacks allow exhaust to be diverted to atmosphere in the event of an emergency or upset condition. Line 1 dryers (referred to as Dryers 1-4 by the facility) exhaust to multi-clones for particulate control. The multi-clone exhaust is combined and released from a single Line 1 dryer stack. Dryer 200 (referred to as Dryer 5 by the facility) exhausts to a multi-clone, which emits to atmosphere.

1.1.2 SolaGen Burner Configuration

The SolaGen burner exhaust is utilized to dry green furnish materials in the pre-dryer. Green materials are typically about 50% moisture, so the primary purpose of the pre-dryer is to reduce the moisture by approximately 80% or more so that the pre-dried material is suitable for final drying in the Line 1 dryers. The SolaGen burner is equipped with a low NO_x burner and flue gas reinjection to reduce NO_x emissions. Exhaust from the pre-dryer is controlled by a cyclone, a wet electrostatic precipitator

(WESP) and a regenerative thermal oxidizer (RTO). These controls significantly reduce emissions of particulate matter (PM).

1.2 Exhaust Parameters

1.2.1 Boiler-ROEMMC Burner

The temperature of the boiler exhaust was measured at 347.1°F, during a May 24 2018 source test, while the ROEMMC exhaust temperature has been measured at 700-1050°F. However, after combining with ambient air and passing through the final dryers, the exhaust stream cools. The following source parameters were taken from a source test of the Line 1 dryer exhaust stack conducted on February 16 and 17, 2016.

Table 1. Source Parameters for Dryers 1 through 4 Common Exhaust

Parameter	Value
Temperature	152.3 F
Moisture Content	5.0%
Velocity	39 fps
Flowrate	117,733 acfm

Dryer 5 exhausts through a dedicated stack with the following source parameters which are taken from a source test conducted on February 18, 2016.

Table 2. Source Parameters for Dryer 5

Parameter	Value
Temperature	130.4 F
Moisture Content	17.4%
Velocity	85.2 fps
Flowrate	34,148 acfm

1.2.2 SolaGen Burner

The SolaGen burner exhausts through the pre-dryer where a significant amount of moisture is released from the green furnish. The resulting exhaust from the pre-dryer is approximately 240°F with a moisture content of 42%. This exhaust is then directly conveyed through the WESP and then the RTO.

1.3 Emission Rates

Emissions from the boiler, ROEMCC burner, and the SolaGen burner were compiled from RFP's annual emission reports. RFP has selected the 2014 through 2017 period as the baseline period. A

summary of NO_x emissions is presented in the following table. Emissions related to the combustion of natural gas have been included for completeness. Additionally, an annual average emission rate across the four years of the baseline period has been calculated.

Table 3. Annual NO_x Emission Summary for 2014 through 2017

	2014	2015	2016	2017	Baseline Annual Average
	NO _x (tpy)	NO _x (tpy)	NO _x (tpy)	NO _x (tpy)	
Boiler - Natural Gas	1.1	1.2	0.9	0.9	1.0
Boiler - Sanderdust	65.2	20.2	44.4	52.1	45.5
ROEMMC - Natural Gas	0.2	0.2	0.2	0.2	0.2
ROEMMC - Sanderdust	165.6	190.9	202.1	146.2	176.2
SolaGen - Natural Gas	7.8	9.4	9.9	11.3	9.6
SolaGen - Sanderdust	43.8	83.0	67.1	58.2	63.1
Source Total (including Natural Gas Combustion)	283.7	304.8	324.7	268.9	295.5
Facility Wide Emissions	285.2	309.5	329.1	273.3	299.3

RFP has chosen to use baseline emissions for the 2028 “on the books/on the way” (OTB/OTW) scenario that will be assessed by MDEQ. This is due to the fact that no change in emissions, or in production, is anticipated through 2028, and that the baseline emission period is representative of typical facility operation.

1.4 RP Analysis Methodology

The following analysis has been conducted consistent with the July 2016 “*Draft Guidance on Progress Tracking Metrics, Long-term Strategies, Reasonable Progress Goals and Other Requirements for Regional Haze State Implementation Plans for the Second Implementation Period*” (draft guidance). The draft guidance has a significant reliance on the “BART Guidelines”, which continue to be relevant for the four-factor analysis. The BART Guidelines was published in Appendix Y to Title 40 of the Code of Federal Regulations (CFR), Part 51 - GUIDELINES FOR BART DETERMINATION UNDER THE REGIONAL HAZE RULE.

Additionally, the draft guidance also permits states to rely on previous assessments, as stated on Page 93;

“It may be appropriate for a state to rely on the results of a previous analysis of a factor, for example information developed in the first planning period on the availability, cost and effectiveness of controls for categories of sources, if the previous analysis was sound and no significant new information is available.”

This RP analysis will rely on the work conducted on the previous 2011 RP analysis. This is largely due to the challenges articulated in the 2011 PR analysis that still exist at the facility, since they are a function of how the facility dries furnish, and the need of the facility to protect product quality.

The following steps were used in this RP determination:

1.4.1 Step 1: Identify all available retrofit control technologies

Available and applicable technologies were identified through EPA data sources. Control technologies were considered available if they were licensed and commercially available as discussed in 40 CFR Part 51, Appendix Y. Table 4 lists the available control technologies that were evaluated for the RP analysis with respect to each source of NO_x.

1.4.2 Step 2: Eliminate technically infeasible options

Each of the control options were evaluated for technical feasibility. For retrofit situations, space limitations, residence time at appropriate temperatures, moisture, particulate loading, and process quality control can all affect the feasibility of the control options. As will be discussed in subsequent sections, the issue of adding ammonia and sorbent upstream of the dryers for NO_x control was a concern because of the contact these additives would have with the wood furnish.

1.4.3 Step 3: Evaluate control effectiveness of the remaining control technologies

After the elimination of technically infeasible controls, the remaining controls were evaluated for effectiveness and ranked from highest to lowest.

1.4.4 Step 4: Evaluate impacts and document results

The impact analysis has four parts. The first part is the analysis of the cost of retrofit control options that are feasible. Based on design parameters, source configuration, life expectancy of the control option, and the cost of operation, the average cost effectiveness is calculated and the incremental cost effectiveness between ranked options. The second part of the analysis is the evaluation of energy impacts. Costs associated with energy use are included in the cost determination. However, energy use can also result in greenhouse gas emissions, the impact of which is difficult to quantify, but is still a concern with some options. The third part of the analysis is the evaluation of non-air quality impacts in a qualitative manner. These include impacts such as disposal of spent catalyst and collected dust; or treatment and discharge of scrubber water. Finally, the fourth part of the analysis is the determination of useful life.

1.4.5 Note: Step 5: Evaluate Visibility Impacts (Not conducted as part of this analysis)

Evaluation of visibility impacts is not a source-specific requirement of an RP determination under the Clean Air Act. No visibility assessment is required or has been prepared as part of this RP control technology assessment. In the April 19, 2019 letter from MDEQ to RFP, Rebecca Harbage confirmed that dispersion modeling was not required as part of the four-factor analysis.

2 NO_x RP ANALYSIS

NO_x emissions result from the combustion of resonated sanderdust due to the nitrogen content of the wood and resin (fuel NO_x) as well as from atmospheric nitrogen in the combustion air (thermal NO_x). However, for reasons that are discussed below, it was necessary to consider control options downstream of the wood particle dryer systems, although the wood particle dryer systems do not themselves contribute NO_x to the combustion air stream.

NO_x emission controls have been analyzed for the boiler, ROEMMC, and SolaGen sanderdust combustion devices. Currently there are no NO_x add-on emission controls on these devices. However, the SolaGen burner was installed in 2006 with a low- NO_x burner and flue gas recirculation, and the boiler was upgraded with a low-NO_x burner in 2015.

2.1 Step 1 - Identify NO_x Retrofit Technologies

2.1.1 Selective Non-catalytic Reduction (SNCR)

SNCR systems have been widely employed for biomass combustion systems globally. SNCR is relatively simple because it utilizes the combustion chamber as the control device reactor, achieving control efficiencies of 30-70%. SNCR systems rely on the reaction of ammonia and nitrogen oxide at temperatures of 1,550°F to 1,950°F to produce molecular nitrogen and water, common atmospheric constituents, in the following reaction:



In the SNCR process, the ammonia or urea is injected into the combustion chamber, where the combustion gas temperature is in the proper range for the reaction. Relative to catalytic control devices, SNCR is inexpensive and easy to install, particularly in new applications where the injection points can be placed for optimum mixing of ammonia and combustion gases. The reduction reaction between ammonia and NO is favored over other chemical reactions at the appropriate combustion temperatures and is, therefore, a selective reaction. One major advantage of SNCR is that it is effective in combustion gases with a high particulate loading. Sanderdust combustion devices can produce exhaust that has a very high particulate loading rate from ash carryover to the downstream particulate

control device. With use of SNCR, the particulate loading is irrelevant to the gas-phase reaction of the ammonia and NO.

One disadvantage of SNCR, and any control systems that rely on the ammonia and NO reaction, is that excess ammonia (commonly referred to as “ammonia slip”) must be injected to ensure the highest level of control. Higher excess ammonia generally results in a higher NO_x control efficiency. However, ammonia is also a contributor to atmospheric formation of particulate that can contribute to regional haze. Therefore, the need to reduce NO_x emissions must be balanced with the need to keep ammonia slip levels acceptable. Careful monitoring to ensure an appropriate level of ammonia slip, not too high or too low, is necessary.

2.1.2 Selective Catalytic Reduction (SCR) and SNCR/SCR Hybrid Systems

Unlike SNCR, SCR reduces NO_x emissions with ammonia in the presence of a catalyst. The major advantages of this are the higher control efficiency (70%-90%) and the lower temperatures at which the reaction can take place (400°F to 800°F, depending upon the catalyst selected). SCR is widely used for combustion processes where the type of fuel produces a relatively clean combustion gas, such as natural gas turbines. In an SNCR/SCR hybrid system, ammonia or urea is injected into the combustion chamber to provide the initial reaction with NO_x emissions, followed by a catalytic (SCR) section that further enhances the reduction of NO_x emissions. The primary reactions that take place in the presence of the catalyst are:



SCR is not widely used with wood fired combustion units due to the amount of particulate that is generated by combustion of wood. The particulate, if not removed completely, can cause plugging in the catalyst and coat the catalyst such that the surface area for reaction is reduced. Another challenge with wood fired combustion is the presence of alkali metals such as sodium and potassium, which are commonly found in wood, but not fossil fuels. Sodium and potassium will poison catalysts and the effects are irreversible. Other naturally occurring catalyst poisons found in wood are phosphorous and arsenic.

In order to prevent the plugging, blinding, and/or poisoning of the SCR catalyst, it is necessary to first remove particulate from the exhaust gases. It is not considered technically feasible to place an SCR unit upstream of the particulate control device in a wood-fired boiler or burner application due to the potential for decreasing the useful life of the catalyst and decreasing the control efficiency, which can happen relatively quickly. Use of SCR on a wood-fired boiler or burner application requires a high temperature particulate control device so that the downstream temperature is still in the range of 400°F to 800°F, which is necessary for the reduction of NO_x in the presence of the catalyst. In situations where NO_x emissions are being controlled downstream of a dryer where the outlet temperature is well below 200°F, the catalyst is essentially ineffective at reducing emissions.

2.1.3 Regenerative Selective Catalytic Reduction (RSCR)

RSCR is a commercially available add-on control technology by Babcock Power Inc. that combines the technology of a regenerative thermal oxidizer device and SCR. Ammonia is injected upstream of the catalyst just as with a traditional SCR unit. The reactions between ammonia and NO are the same. Intended to be placed downstream of emission control systems where the exhaust gas is clean, but the temperature is below the optimal temperature range for catalytic reduction of NO_x, the RSCR unit has a front-end preheating section that reheats the exhaust stream with a regenerative thermal device. An RSCR unit is approximately 95% efficient at thermal recovery. The exhaust is heated to a temperature in the range optimal for catalytic reduction (600°F to 800°F) prior to entering an SCR unit. These systems have been shown to reduce NO_x emissions to less than 0.075 lbs/MMBtu and can achieve emission reductions to as low as 0.05 lbs/MMBtu.

2.1.4 Low NO_x Burner

Low NO_x burners are a viable technology for a number of fuels including sanderdust and gasified biomass. Generally, staged combustion and sub-stoichiometric conditions can be used to limit the amount of NO_x formation. The SolaGen burner and the sanderdust boiler at the Missoula facility both already utilize low-NO_x burners.

2.2 Step 2 - Eliminate Technically Infeasible Options

2.2.1 Selective Non-catalytic Reduction

SNCR relies on the injection of ammonia in the combustion chamber of the sanderdust fired device. The ROEMMC and SolaGen burners would not have the residence time needed at the critical temperatures for the reaction to take place. It is unknown whether sufficient residence time would occur in the boiler combustion zone. Because these combustion units provide exhaust to the dryers, there is a great deal of concern about the impact of ammonia on the wood furnish. In making particleboard, the wood furnish is combined with a formaldehyde-based resin. Ammonia acts as a scavenger of free formaldehyde, which could have some effect on resin curing if ammonia is trapped within the furnish during forming.

Another concern is that ammonia can darken or blacken certain wood species. It is unknown what impact ammonia would have on the wood species being used by Roseburg for the period of time it would be exposed, the concentrations of excess ammonia, and at the elevated temperatures that occur in the dryers. As part of developing the 2011 RP analysis, the National Council of Air and Stream Improvement was contacted to inquire as to whether they were aware of any installations where ammonia was injected upstream of a wood particle dryer. No instances where ammonia injection was conducted upstream of a wood particle dryer were identified.

Due to the uncertain impact that ammonia could have on wood furnish and resin curing, SNCR is not considered an applicable technology with proven feasibility for any of the sanderdust combustion devices due to their location upstream of the wood particle dryers.

2.2.2 Selective Catalytic Reduction

Where wood combustion is concerned, SCR requires a clean exhaust stream with temperatures between 400°F and 800°F. PM in the exhaust from wood combustion can poison, blind, or plug catalyst beds very rapidly in certain conditions. As a result, it is industry practice to have a good PM control device upstream of the catalyst bed. For the boiler and ROEMMC burner at the Missoula facility, there is not sufficient room for particulate controls and a catalyst bed upstream of the particle dryers. Additionally, the exhaust temperature exiting the catalyst bed would be significantly cooler, which would provide less heat to the dryers. The SCR unit could be located downstream of the dryers and particulate controls, but the dryer exhaust temperature is well below 400°F (see Tables 1 and 2). With regard to the SolaGen burner, the same concerns are valid. Additionally, the location of an SCR unit upstream of any of the dryers would result in ammonia slip into the dryers. For the reasons stated in section 2.2.1 above, ammonia slip into the dryers could have unintended consequences for the wood furnish, thereby affecting the manufacturing process. For these reasons, SCR is not considered an applicable technology with proven feasibility for any of the sanderdust combustion devices.

2.2.3 Regenerative Selective Catalytic Reduction

The RSCR control device was assessed in the 2011 RP analysis. In that assessment, issues with technical feasibility of the RSCR on wood combustion units were raised. These concerns were based on direct comments from the RSCR vendor and were specific to catalyst performance. The vendor would not guarantee the catalyst life due to potential blinding. The 2011 RP analysis states;

“It should be noted that the RSCR vendor would not guarantee catalyst life beyond three years due to the potential for poisoning and blinding associated with the combustion products of wood fuels.”

Additionally, the 2011 RP analysis describes the challenges encountered with trying to obtain a quote from the RSCR vendor. Ultimately, a quote was not provided in time for the analysis. The RSCR units were being heavily marketed at the time but concerns across the air pollution control industry relating to the catalyst performance, unit cost, and thermal efficiency inhibited widespread adoption. The same three units installed on clean wood boilers in New England have been pointed to as examples of demonstrated performance.

The work related to the 2011 RP analysis was conducted almost 10 years ago. In that time, one might expect that, if technical feasibility issues had been addressed, then RSCR units would appear in the U.S. EPA’s “RACT, BACT and LAER Clearinghouse”, commonly referred to as the RBLC. This is a US EPA database populated with RACT, BACT and LAER determinations across the country.

The RBLC was queried for any BACT, RACT or LAER determinations in the past 10 years for NO_x emissions resulting from combustion of wood, wood products, or biomass. This RBLC search criteria were left purposely broad to gather as many NO_x determinations as possible.

Table 5 presents the results of the RBLC search. No determinations made in the past 10 years for control of NO_x emissions from units combusting wood, wood products, or biomass included an RSCR unit. This supports a determination that the RSCR unit is not feasible for wood combustion units.

Based on the comments from the RSCR vendor relating to catalyst poisoning, and the fact that RSCR units do not appear in the RBLC search for NO_x controls, the RSCR unit is deemed to be technically infeasible.

2.2.4 Low-NO_x Burners

A low-NO_x burner technology is already in use for the SolaGen sanderdust burner as well as the sanderdust boiler. The ROEMMC burner still has several years of useful life remaining.

2.3 Step 3 - Evaluate Control Effectiveness

Since there were no NO_x control devices deemed technical feasible, control effectiveness was not determined for any NO_x control device.

2.4 Step 4 - Evaluate Impacts and Document Results

2.4.1 Cost Impact

Cost impacts were not assessed for any NO_x control devices since no unit was found to be technically feasible. It should be noted that, in the 2011 PR analysis, cost impacts were assessed for the RSCR unit. These costs ranged from \$17,603 per ton of controlled NO_x for Line 1, to \$22,709 per ton of control NO_x for the SolaGen. These costs demonstrate that, even when a costing analysis is performed, the \$/ton cost is extremely high for a unit of unknown performance and reliability.

2.4.2 Energy Impacts

Energy impacts were not assessed for any NO_x control devices since no unit was found to be technically feasible.

However, it should be noted that the RSCR units require both fossil fuel and electricity. Fossil fuel would be used to reheat the dryer exhaust gas from approximately 140°F to 600°F or higher. Additionally, electricity is used to operate the powerful fans required to overcome the pressure drop across the catalyst bed.

Another less quantifiable impact from energy use is the impact from producing the electricity and mining the fossil fuel. Both the production of electricity and the use of fossil fuel for combustion would result in greenhouse gases and other pollutant emissions. In Missoula, the electricity is most likely generated by a coal-fired electrical generator.

2.4.3 Environmental Impacts

Environmental impacts were not assessed for any NO_x control devices since no unit was found to be technically feasible.

It should be noted, however, that RSCR units require the use of catalysts that must be disposed of. The catalysts will most likely be considered a hazardous waste. Additionally, SNCR, SCR, and RSCR units all require the use of ammonia injected into the exhaust stream and unreacted excess ammonia would be released to the atmosphere. Ammonia slip to the atmosphere is a contributor to fine particle formation, which further exacerbates the regional haze issue. Therefore, there is a trade-off between maximizing NO_x emission reductions and minimizing ammonia slip.

2.4.4 Useful Life

Useful life was not assessed for any of the NO_x control devices since none were found to be technically feasible.

3 CONCLUSION

Based on the analysis above, the utilization of the existing controls constitutes the appropriate requirements for reasonable progress. The RP factors, identified in CAA Section 169A(g)(1) are: (1) the costs of compliance, (2) the time necessary for compliance, (3) the energy and non-air quality environmental impacts, and (4) the remaining useful life.

None of the control options identified in this analysis were deemed technically feasible.

Based on the statutory criteria, the above assessment for the sanderdust burners all support the conclusion that the current controls are adequate and should be the basis for Montana's reasonable progress goal. The current controls include the newer sanderdust boiler installed in 2015 with a low NO_x burner, which has contributed to a decrease in the NO_x emission rate from the facility since the 2011 assessment.

LIMITATIONS

The services undertaken in completing this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this report.

TABLES



Table 4
RP Analysis Source Control Options
Roseburg Forest Products
Missoula, MT



Potential Control Strategy	Dryers 1 through 4		Dryer 5		SolaGen Predryer	
	Feasible? Yes/No	Reasoning	Feasible? Yes/No	Reasoning	Feasible? Yes/No	Reasoning
SNCR	No	Potential ammonia staining of furnish	No	Potential ammonia staining of furnish	No	Potential ammonia staining of furnish
SCR	No	Potential ammonia staining of furnish, potential catalyst poisoning/plugging, temperature issues for location	No	Potential ammonia staining of furnish, potential catalyst poisoning/plugging, temperature issues for location	No	Potential ammonia staining of furnish, potential catalyst poisoning/plugging, temperature issues for location
RSCR	No	Potential catalyst poisoning/plugging	No	Potential catalyst poisoning/plugging	No	Potential catalyst poisoning/plugging
Low NO _x Burner	N/A	Boiler Only - Currently Installed	N/A	Boiler Only - Currently Installed	N/A	Currently installed
Good Combustion Practices	Yes		Yes		N/A	

Table 5
RACT/BACT/LAER Clearinghouse Search Results
Roseburg Forest Products
Missoula, MT



RBLC ID	Company Name	Source Type	Fuel	Pollutant	Determination
FL-0322	SWEET SORGHUM-TO-ETHANOL ADVANCED BIOREFINERY	Cogeneration Biomass Boiler	biomass	Nitrogen Oxides (NOx)	Controls: Good combustion practices (GCP) leading to the efficient combustion of biomass in the boiler, including an over-fired air (OFA) system, to minimize formation of PM, nitrogen oxides (NOX), Selective Non-Catalytic Reduction (SNCR), Selective Catalytic Reduction (SCR) or a combination of the two with urea or anhydrous ammonia (NH3) injection to destroy NOX.
FL-0323	GAINESVILLE RENEWABLE ENERGY CENTER	Biomass bubbling fluidized bed (BFB) boiler	biomass	Nitrogen Oxides (NOx)	Efficient Combustion. SCR system
FL-0332	HIGHLANDS BIOREFINERY AND COGENERATION PLANT	Biomass Boiler, Emission Unit 002	biomass	Nitrogen Oxides (NOx)	Selective Non-Catalytic Reduction (SNCR) with urea or anhydrous ammonia (NH3) injection to destroy NOX;; use of natural gas fired in low-NOX burners (LNB)
GA-0143	HUBER ENGINEERED WOODS, LLC	WELLONS FURNACE	WOOD WASTE	Nitrous Oxide (N2O)	BASED ON ADVERSE CRITERIA POLLUTANT IMPACTS NO CONTROL HAS BEEN ESTABLISHED TO MINIMIZE N2O EMISSIONS.
GA-0143	HUBER ENGINEERED WOODS, LLC	WELLONS FURNACE	WOOD WASTE	Nitrogen Oxides (NOx)	CONTROLLED BURN IN FURNANCE; LOW NOX BURNERS IN REGENERATIVE THERMAL OXIDIZERS (RTOS).
GA-0143	HUBER ENGINEERED WOODS, LLC	DRYER SYSTEM	WOOD WASTE	Nitrous Oxide (N2O)	BASED ON ADVERSE CRITERIA POLLUTANT IMPACTS NO CONTROL HAS BEEN ESTABLISHED TO MINIMIZE N2O EMISSIONS
GA-0143	HUBER ENGINEERED WOODS, LLC	DRYER SYSTEM	WOOD WASTE	Nitrogen Oxides (NOx)	CONTROLLED BURN IN FURNANCE: LOW NOX BURNERS IN REGENERATIVE THERMAL OXIDIZERS (RTOS)
ME-0040	ROBBINS LUMBER, INC.	Biomass Boiler #3	Biomass	Nitrogen Oxides (NOx)	Flue Gas Recirculation (FGR) and Selective Non-Catalytic Reduction (SNCR) SNCR only required if facility cannot meet 0.15 lb/MMBtu emission limit within 365 days
MI-0421	GRAYLING PARTICLEBOARD	Thermal Energy Plant (EUENERGY in FGDRYERRTO)	Wood-derived fuel & biomass	Nitrogen Oxides (NOx)	Good combustion practices and low NOx burners.
MI-0425	GRAYLING PARTICLEBOARD	EUENERGY in FGDRYERRTO (Thermal Energy Plant)	Wood derived fuel and biomass	Nitrogen Oxides (NOx)	Good combustion practices and low NOx burners
OH-0343	SMART PAPERS-HAMILTON MILL	Spreader Stoker Boiler	Biomass	Nitrogen Oxides (NOx)	No Controls
OK-0145	BROKEN BOW OSB MILL	Energy System/Dryers and RTO Burners	Wood	Nitrogen Oxides (NOx)	Staged Combustion
PA-0272	CLARION BOARDS, INC	EPI ENERGY UNIT & FIBER DRYING SYSTEM	WOOD	Nitrogen Oxides (NOx)	No Controls
SC-0115	GP CLARENDON LP	334 MILLION BTU/HR WOOD FIRED FURNACE #2	WOOD	Nitrogen Oxides (NOx)	NOX EMISSIONS CONTROLLED THROUGH A COMBINATION OF STAGED COMBUSTION AND FLUE GAS RECIRCULATION.
SC-0115	GP CLARENDON LP	197 MILLION BTU/HR WOOD FIRED FURNACE	WOOD	Nitrogen Oxides (NOx)	NOX EMISSIONS CONTROLLED THROUGH A COMBINATION OF STAGED COMBUSTION AND FLUE GAS RECIRCULATION.
SC-0115	GP CLARENDON LP	334 MILLION BTU/HR WOOD FIRED FURANCE #1	WOOD	Nitrogen Oxides (NOx)	NOX EMISSIONS CONTROLLED THROUGH A COMBINATION OF STAGED COMBUSTION AND FLUE GAS RECIRCULATION.
SC-0149	KLAUSNER HOLDING USA, INC	BIOMASS BOILER EU001	WET BARK, WOOD	Nitrous Oxide (N2O)	No Controls
SC-0149	KLAUSNER HOLDING USA, INC	BIOMASS BOILER EU001	WET BARK, WOOD	Nitrogen Oxides (NOx)	SNCR
SC-0149	KLAUSNER HOLDING USA, INC	BIOMASS BOILER EU002	WET BARK, WOOD	Nitrous Oxide (N2O)	No Controls
SC-0149	KLAUSNER HOLDING USA, INC	BIOMASS BOILER EU002	WET BARK, WOOD	Nitrogen Oxides (NOx)	SNCR