RE ED

1984

Potlatch

Potlatch Corporation
Pulp, Paperboard & Packaging Group
Idaho Division

P.O. Box 1016
Lewiston, Idaho 83501
Telephone (208) 799-0123

July 5, 1984

Mr. Ray Nye
U.S.Environmental Protection Agency
1200 6th Avenue
Seattle, Washington 98101

Dear Ray:

Enclosed is a revised technical review of our proposed No. 5 recovery boiler which incorporates an SO_2 scrubber analysis. At 80% of capacity, where the boiler will be operated until funds are available to modernize the pulping and bleaching operations, the cost to remove SO_2 is nearly $3,000/ton. We believe such a cost to be excessive and that the 200 ppm limit we have requested represents Best Available Control Technology.

As soon as you have had an opportunity to review our submittal, we would like to schedule a meeting with you in Seattle to discuss our permit application and answer any questions you might have.

Sincerely,

Joseph R.Rippee
Environmental Engineer
North Idaho Units

Enclosure

JRR:dd

xc: K. Brooks, Idaho Dept. of Health & Welfare
L. McKee, USEPA

AIR QUALITY TECHNICAL REVIEW FOR PROPOSED NO. 5 RECOVERY BOILER
AT POTLATCH CORPORATION, LEWISTON, IDAHO

1.0 Background

Potlatch Corporation is proposing to retire three older recovery boilers and replace them with one new larger boiler. All three of the older boilers are of the direct contact evaporator type. The new boiler will be of "low odor" design without a direct contact evaporator and will meet New Source Performance Standards for total reduced sulfur (TRS). Emissions of TRS will be lower than present levels when the new boiler is installed.

Since Potlatch Corporation's Lewiston facility is located in a non-attainment area for particulates, a permit to construct for that pollutant was obtained from the State of Idaho. The permit specifies an emission concentration of 0.03 grains per standard dry cubic foot. This emission concentration satisfies the State of Idaho requirements for 120% offset of emissions in a non-attainment area. Potlatch Corporation is applying to EPA Region 10 for a permit to construct for those pollutants subject to prevention of significant deterioration (PSD) since the State of Idaho does not yet have authority for the PSD program. The applicable pollutants include sulfur dioxide (SO_2), oxides of nitrogen (NOx), and carbon monoxide (CO).

Engineering on this project is expected to begin in September of 1984. Construction is expected to start in July of 1985 and be completed in September of 1988

1.1 Air Quality Impact

Potlatch Corporation contracted with North American Weather Consultants for an air quality modeling study to determine the impact of the proposed new boiler on ambient air quality. The study was completed in December 1983 and a copy of the report was submitted to EPA Region 10. The report describes the ambient monitoring and air quality modeling efforts and demonstrates compliance with PSD requirements for air quality impact. Maximum emissions for the boiler, which are listed in Section 2.0, were assumed in the modeling study.

2.0 Boiler Specifications

Technical information and specifications for the proposed recovery boiler are listed below:

Black liquor solids maximum burning rate:	4,290,000 lb/day
Equivalent tons per day of air dried brown stock production	1,250 tons/day
Maximum heat input rating	1,212 million BTU/hr.
Stack dimensions	350' high x 11' dia.

2.0 Boiler Specifications (continued)

Stack gas flow	418,260 actual cu.ft./minute 225,200 dry standard cu.ft./minute
Stack gas temperature	320°F
Maximum gaseous emission ratings	
Sulfur dioxide	447 lb/hr.(200 ppm)
Oxides of nitrogen	321 lb/hr.(200 ppm)
Carbon monoxide	1,223 lb/hr.(1250 ppm)
Total reduced sulfur	143 lb/day (5 ppm)

3.0 Emission Controls

The boiler will be of "low odor" design without a cascade evaporator to minimize TRS emissions. A high efficiency electrostatic precipitator will be installed to control emissions of particulate matter. State-of-the-art boiler design and operational controls will be employed to minimize emissions of sulfur dioxide, carbon monoxide, and oxides of nitrogen.

It should be pointed out that the control of some of these pollutants can influence the emission levels of others. For instance, a reduction in TRS is usually accompanied by a reduction in carbon monoxide. However, control of sulfur emissions requires maintaining a high smelt bed temperature, which may cause an increase in oxides of nitrogen emissions. There has not been much research on the interrelationship of the various pollutants from recovery boilers to determine if they all can be minimized or if sometimes one is minimized at the expense of another.

3.1 Sulfur Dioxide (SO_2)

Kraft recovery boilers are designed to retain sulfur compounds in the smelt bed. One of the primary functions of the recovery boiler is to recover cooking chemicals used in the pulp manufacturing process by burning black liquor. The black liquor is sprayed into the recovery boiler. Air for combustion is blown into the furnace on different levels. During combustion, the water in the liquor is evaporated and the organic matter burns. The inorganic components react and form a bed on the furnace bottom which results in melting of the inorganics. The melted inorganics (smelt) are discharged out of the furnace into a tank filled with water and the smelt is dissolved and then pumped to the causticizing plant for further reprocessing. The smelt discharged from the recovery boiler contains mainly sodium sulfide (Na_2S), sodium carbonate (Na_2CO_3), and sodium sulfate (Na_2SO_4).

3.1 Sulfur Dioxide (SO_2) (continued)

When the boiler is operated at full load with optimum air distribution, smelt bed temperature, liquor sulfidity, and liquor droplet size, Potlatch Corporation expects average emissions from the proposed No. 5 recovery boiler to be approximately the same as the existing recovery boilers. However, until No. 5 recovery boiler is operating at its design capacity, it may be difficult to maintain the optimum smelt bed temperature due to a reduction in heat input, with the result being an increase in SO_2 emissions. However, even when the recovery boiler is operated below the design capacity, SO_2 emmisions, will not exceed 200 ppm.

In summary, state-of-the-art Kraft recovery boilers are designed to retain approximately 97% of the sulfur in the boiler smelt bed, to control SO_2 emissions, and thus represent Best Available Control Technology.

3.1.1 Alternate SO_2 Control Analysis

Although an SO_2 limit of 200 ppm complies with the State of Idaho requirements for new Kraft recovery boilers, and most Federal PSD permits have contained SO_2 limits of 300 ppm, an analysis was conducted to determine the costs and benefits of installing a flue gas scrubber to remove 90% of the SO_2 in the stack gas.

The scrubber could use sodium hydroxide as a scrubbing medium and the scrubbing chemical could be recovered for use in the pulping process. This approach would eliminate the landfilling costs associated with "throwaway" systems and allow for recovery of useful chemicals.

When the boiler is at full production with maximum SO_2 emissions, the scrubber could remove 4.83 tons per day of SO_2. However, during the initial phase of boiler operation, until the pulping operation can be modernized, it will only be operated at about 80% of capacity and the scrubber could only remove 3.86 tons per day of SO_2.

3.1.2 Cost/Benefit Calculations

An order of magnitude cost estimate of $13.8 million was obtained to purchase and install an SO_2 scrubber using an equipment life of 10 years. The following table was developed.

		Dollars Per Day
Capital Recovery		$7,570
Taxes and Insurance		330
	Subtotal	$7,900

Operating Costs

1.	Stack gas reheat above the acid dewpoint	$1,680
2.	Scrubber water	$ 20
3.	Steam to evaporate chemical slurry	$ 300
4.	Additional fan horsepower to overcome pressure differential across scrubber and supply combustion air.	$ 390
5.	Additional gas to operate lime kilns for chemical recovery.	$ 530
6.	Sodium hydroxide scrubbing medium	$2,850
7.	Operating labor	$ 250
8.	Maintenance labor and material	$ 570
	Subtotal	$6,590

Sodium hydroxide and sodium sulfate, which are used in the pulping process, will be recovered from the scrubber slurry:

1.	Sodium hydroxide	($1,870/day)
2.	Sodium sulfate	($1,180/day)
	TOTAL CHEMICAL RECOVERY CREDIT	($3,050/day)

The total estimated daily cost summary is $11,440.

The cost per ton to remove SO_2 is $2,370/ton when the boiler is at full capacity and emitting 200 ppm. The boiler will be operated at 80% of load for an indefinite period of time until the pulp mill is modernized. During this time, the cost increases to $2,960/ton at 80% of load and 200 ppm. Both of these cost figures will increase if actual SO_2 emissions are less than 200 ppm.

3.1.3 Energy Consumption for Scrubber

The scrubber will require an increase in fan capacity of about 750 horsepower. Additional steam requirements for evaporation are 55 million BTU/day. Additional natural gas requirements are 500 million BTU/day.

3.1.4 Environmental Impact of Scrubber

Although the stack gas is reheated to just above the sulfuric acid dewpoint, the plume height will be about 20% less than the 320°F stack gas without the scrubber. Additional modeling would have to be completed to verify the impact on the other pollutants, but there would be less plume dispersion with the scrubber unless additional stack gas reheat were applied.

3.1.5 Selection of BACT for SO_2

The SO_2 scrubber is not cost effective and is not required to protect ambient air quality in the Lewiston-Clarkston area. In addition, a considerable energy penalty of approximately 650 million BTU/day is required to operate the scrubber. The 200 ppm level is: (1) lower than other new pulp mills are required to meet, (2) adequate to protect air quality, and (3) represents Best Available Control Technology for this project, taking into account economic, energy, and environmental impacts.

3.2 Carbon Monoxide (CO)

Carbon monoxide emissions are a function of the air-to-fuel ratio in the boiler. Potlatch Corporation's newest recovery boiler at the Lewiston complex (No. 4 recovery) is fired on carbon monoxide control, as opposed to excess air control, as is the case on many boilers. The proposed No. 5 recovery boiler will also be fired on CO control.

Test data for the three existing recovery boilers which are not fired on CO control shows average carbon monoxide levels between 900 and 1200 ppm, with a range of 400-4500 ppm. Carbon monoxide levels from No. 4 recovery boiler, which is fired on CO control, averaged 750 ppm with a range of 400-900 ppm. Peak levels at or above 1250 ppm have been observed.

After discussions with the various boiler vendors, Potlatch Corporation believes the proposed new recovery boiler will be able to operate at the same low carbon monoxide emission levels as No. 4 Recovery.

3.3 Oxides of Nitrogen

Kraft recovery boilers are not generally considered a significant source of oxides of nitrogen. The fuel contains about 35% moisture which should reduce the flame temperature, and much of the fuel is burned on the walls, not in suspension, which spreads the flame over a greater area than with boilers firing conventional fuels. The more the flame temperature is reduced, the less tendency there is for NOx to be formed.

Test data shows average emissions from the existing recovery boilers between 50 and 125 ppm with a range of 25-250 ppm. The maximum projected value of 200 ppm indicates that the emissions from the proposed boiler will be typically as low as other recovery boilers.

4.0 Test procedures

Test data was collected in 1982 using the following equipment:

SO_2: Impinger train, modified West-Gaeke analysis

CO: Portable infrared analyzer (NDIR) made by Infrared, Inc.

NOx: Portable "fuel cell" type analyzer, made by Theta Sensors

For the portable analyzer, zero and span checks were performed before and after each test. If the instrument drift was more than 10%, the data was discarded.

5.0 Conclusions

The proposed No.5 recovery boiler will be operated in conformance with Best Available Control Technology for Kraft recovery boilers. Emissions of particulate matter and TRS will be controlled with state-of-the-art equipment. The remaining gaseous emissions are expected to be minimized with good operational controls. No adverse air quality impact is projected at the maximum emission potential of the boiler.

Potlatch

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Idaho Division

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Lewiston, Idaho 83501
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FEB 10 1984
AIR PROGRAMS
BRANCH

February 7, 1984

Mr. Ray Nye
Environmental Protection Specialist
U.S. Environmental Protection Agency
1200 6th Avenue
Seattle, Washington 98101

Dear Ray:

Enclosed is the technical review of our proposed No. 5 Recovery furnace which you requested for the purpose of making a determination of Best Available Control Technology.

This technical analysis, along with the modeling study results submitted to you on December 14, 1983, constitute our application for a PSD permit.

As soon as you have had an opportunity to review our permit application, we would like to schedule a meeting with you in Seattle to discuss the application and answer any questions you might have.

Sincerely,

J.R. Rippee

J.R. Rippee
Environmental Engineer
North Idaho Units

Enclosures

JRR:dd

xc: K. Brooks IDHW
L. McKee

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3.1 Sulfur Dioxide (SO_2)

Kraft recovery boilers are designed to retain sulfur compounds in the smelt bed. One of the primary functions of the boiler is to reduce sodium sulfate to sodium sulfide, which, along with sodium carbonate, is used to make green liquor.

Since the boiler is designed to retain sulfur compounds for recycle into the pulping process, there are no add-on devices proposed for control of sulfur dioxide. Sulfur dioxide will be controlled by maintaining proper firing conditions in the boiler and by optimizing the sulfidity of the white liquor to meet pulping requirements and minimize SO_2 emissions.

The most important parameters to be maintained in the boiler are:

1) air distribution between primary, secondary and tertiary air ports;
2) smelt bed temperature; and
3) flow, temperature and pressure of the black liquor being fired

Potlatch Corporation has obtained stack test data on SO_2 emissions from all the recovery boilers at Lewiston and the emissions range from nearly zero to 125 ppm with average emissions from all recovery boilers less than 25 ppm. Potlatch Corporation intends to operate the new boiler in the same manner as the existing ones, but no vendor has guaranteed Potlatch such low emission levels. This is probably due to the variability of SO_2 data from recovery boilers, which indicates it may not be possible to maintain such low emissions 100% of the time.

3.2 Carbon Monoxide (CO)

Carbon monoxide emissions are a function of the air to fuel ratio in the boiler. Potlatch Corporation's newest recovery boiler at the Lewiston complex (No. 4 recovery) is fired on carbon monoxide control, as opposed to excess air control, as is the case on many boilers. The proposed No. 5 recovery boiler will also be fired on CO control.

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