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April 24, 1999

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BUREAU OF AIR REGULATION

Florida Department of Environmental Protection
New Source Review Section Bureau of Air Regulations
2600 Blair Stone Road
Tallahassee, FL 32399-2400

1070005-006-AC
PSD-FL-264

Attention: Syed Arif, P.E.

RE: GEORGIA-PACIFIC CORPORATION
NO. 3 BLEACH PLANT - PSD PERMIT APPLICATION
ADDENDUM NO. 2

Dear Mr. Arif:

On behalf of Georgia Pacific Corporation (G-P), Golder Associates Inc. (Golder) is submitting additional information as an addendum to the No. 3 Bleach Plant PSD permit application submitted in early February. This information supplements Golder's Addendum No. 1, dated March 8, 1999, sent in response to a meeting with the Florida Department of Environmental Protection (FDEP) held in late February. The FDEP also issued a letter dated March 9 regarding issues stemming from review of G-P's construction permit application for the proposed No. 3 Bleach Plant. This letter addresses Comment 2 of the FDEP's letter, since Comments 3, 4, and 5 have already been addressed in Golder's March 8th submittal. G-P's response to Comment 1 will be submitted in the near future.

The FDEP has indicated that the BACT analysis for carbon monoxide (CO) is incomplete. The FDEP has requested that G-P address additional control techniques for the reduction of bleach plant CO emissions. Specifically, the FDEP has requested that G-P perform a feasibility and cost analysis, as necessary, for catalytic oxidation and thermal oxidation of CO. Typically, thermal oxidation control methods are more expensive than catalytic oxidation methods due to the high temperatures at which thermal oxidizers operate and the associated fuel cost. Therefore, the feasibility and cost analysis for catalytic oxidation was reviewed first.

Regenerative Catalytic Oxidation

Catalytic oxidation involves the use of a catalytic material that reacts with pollutants in the gas stream and reduces them to compounds such as carbon dioxide and water. In order to render catalytic oxidation more effective, thermal oxidation using direct flame burners is often implemented in conjunction with catalytic methods. This also allows oxidation to occur at lower temperatures than thermal oxidation methods alone. This combination of control techniques is called a regenerative catalytic oxidizer (RCO). The cost analysis for an RCO that could be installed on the exhaust of the proposed No. 3 Bleach Plant wet scrubber is presented in Table 1.

The cost analysis includes a new stack equal to the height of the current bleach plant wet scrubber stack. It also accounts for all ductwork necessary to connect the control device, the installation, startup and testing, and operation and maintenance costs. The total estimated capital investment cost for a CO destruction efficiency of 95% is approximately $1.6 million. The total annual cost is $808,000/yr. Based on reduction of 191 TPY of CO, the total cost effectiveness is $4,200 per ton of CO emitted. It is noted that this cost may be low due to the fact that this technology has not previously been applied to a bleach plant at any other paper mill in the United States. Therefore, actual costs associated with installation and operation may be higher than shown in Table 1. In any event, the total annual cost exceeding $800,000/yr is considered as economically infeasible for control of a pollutant (CO) that is not a concern in regards to pulp and paper mills and environmental impacts of the CO emissions are low.

In addition to the cost analysis, technical feasibility was considered. Since this technology has not been applied to bleach plants at other facilities, the feasibility for application of this technology is uncertain. For instance, the gas stream will contain pollutants such as chlorine and chlorine dioxide which, in the presence of water vapor from the wet scrubber, will create a very corrosive environment. Even though the shell of the unit was designed with stainless steel, corrosion of the catalyst is likely to occur. Additional pollutants that may be in the gas stream include total reduced sulfur (TRS) compounds which can not only be corrosive, but can also cause deposits to form on the equipment, in turn clogging and fouling the catalytic mechanism.

A feasibility and economic analysis for the control of CO emissions from pulp and paper facilities was presented in a paper given at the TAPI 1997 Environmental Conference and Exhibit. A copy of the paper is attached for reference. The paper examines the feasibility of both catalytic and thermal oxidation control technologies for the control of CO emissions. The paper concludes that the use of catalytic oxidation is infeasible for similar reasons as those given in the preceding paragraph. Since catalytic oxidation was found to be infeasible, the paper presented an analysis for thermal oxidation.

Thermal Oxidation

Instead of relying on vendor quotes for control equipment, the TAPPI paper cited above paper references the background information document (BID) for the proposed pulp and paper cluster rule (EPA-453/R-93-050a; 1993). The relevant portion of the BID is attached for reference. The BID establishes that thermal oxidation is technically feasible and so an economic analysis is performed for a generic case. The generic case assumes that the bleach plant capacity is 1,000 air dried tons of bleached pulp (ADTBP) per day, maximum bleach plant CO emissions from bleaching operations are 1.07 lb/ADTBP, and that the nearest space available for installation of a new thermal oxidizer is 1,000 ft away from the bleach plant.

Based on the fact that the parameters are relatively similar to G-P's proposed No. 3 Bleach Plant, a cost comparison was performed to determine the economic feasibility of using thermal oxidation to control bleach plant CO emissions at G-P. Since the BID costs were established for a thermal oxidizer capable of 51,400 scfm and G-P would require a unit sized at approximately 20,000 scfm, an appropriate cost was determined from the ratio of unit sizes. The total annualized cost for the 51,400 scfm thermal oxidizer in the BID is $3,840,000. Using the unit size ratio, the annualized cost for a 20,000 scfm unit at G-P would be (20,000 scfm ÷ 51,400 scfm * $3,840,000) approximately $1,500,000/yr. For a CO destruction of 191 TPY, the cost effectiveness is $7,850 per ton of CO removed. Although this is a rough estimate, it shows that even though the thermal oxidizer may be technically feasible for controlling emissions from G-P's proposed No. 3 Bleach Plant, it is not economically feasible. The EPA, in determining MACT standards for bleach plants, dismissed thermal oxidation on the basis of economic impacts. Since BACT is considered to be less stringent than MACT, thermal or catalytic oxidation should not be imposed on G-P's proposed bleach plant.

Given the fact that thermal oxidation is not proven technically on bleach plants and the relatively high cost per ton of CO removed, the use of add-on control equipment to control CO emissions from the proposed bleach plant is rejected. G-P considers that the best method to control CO emissions is through the use of best operational practices. This was the control method recommended for the only other bleach plant PSD/BACT evaluation listed in the EPA's BACT/LAER Clearinghouse database.

If you have any questions concerning this submittal, please contact me at (352)-336-5600 ext. 545.

Sincerely,

GOLDER ASSOCIATES INC.

David A. Buff

David A. Buff, P.E.
Principal Engineer
Florida P.E. # 19011
SEAL

cc:
EPA
NPS

PW/jkk

Enclosures

cc: Al Linero, FDEP Tallahassee
Chris Kirtis, FDEP NE District
Joe Taylor, G-P
Paul Wesson, Golder
Tammy Wyles, G-P

Table 1. Cost Effectiveness for Using an RCO to Control CO Emissions From Proposed ECF Bleach Plant, Georgia Pacific, Palatka FL

Cost Items	Cost Factors	Cost ($) 90% removal	Cost ($) 95% removal
DIRECT CAPITAL COSTS (DCC):			
(1) Purchased Equipment Cost			
(a) Basic Equipment/Services	Based on Vendor Quote	412,000	427,250
(b) New Stack (118 ft total)	Based On Cost Control Manual Ch. 10	159,121	159,121
(c) Ductwork - 240 feet	Based On Cost Control Manual Ch. 10	32,417	32,417
(d) Structural Support (a)	0.1 x (1a..1c)	60,354	61,879
(e) Instrumentation & Controls	Based on Vendor Quote	included	included
(f) Exhaust Fan	Based on Vendor Quote	included	included
(g) Freight (a)	0.05 x (1a..1f)	33,195	34,033
(h) Sales Tax (Florida)	0.06 x (1a..1g)	41,825	42,882
(i) Subtotal	(1a..1h)	738,912	757,582
(2) Direct Installation	0.30 x (1i)	295,565	303,033
Total DCC:	(1i) + (2)	1,034,476	1,060,615
INDIRECT CAPITAL COSTS (ICC): (a)			
(3) Indirect Installation Costs			
(a) Engineering	(0.1) x (DCC)	103,448	106,061
(b) Construction & Field Expenses	(0 05) x (DCC)	51,724	53,031
(c) Construction Contractor Fee	(0.10) x (DCC)	103,448	106,061
(d) Contingencies (b)	(0.40) x (DCC)	258,619	265,154
(4) Other Indirect Costs			
(a) Startup	Based on Vendor Quote	included	included
(a) Testing	(0.01) x (DCC)	10,345	10,606
(b) Working Capital	30-day DOC	33,545	34,128
Total ICC:	(3) + (4)	561,128	575,042
TOTAL CAPITAL INVESTMENT (TCI):	DCC + ICC	1,595,604	1,635,657
DIRECT OPERATING COSTS (DOC): (a)			
(1) Operating Labor			
Operator	$22/hr; 1,460 hr/yr	32,120	32,120
Supervisor	15% of operator cost	4,818	4,818
(2) Maintenance			
Labor	Equivalent to Operating Labor	36,938	36,938
Materials	Equivalent to Maintenance Labor	36,938	36,938
(3) Utilities			
(a) Electricity	$0.059/kWh; 26.7 kW; 8,760 hr/yr	13,800	13,800
(b) Natural Gas	6 MMBtu/h; 8,760 hr/yr; $4.736/MMBtu	248,924	248,924
(4) Chemicals and Materials			
Catalyst Replacement	Once per 2 yrs @ $58,000 for 90% and $72,000 for 95%	29,000	36,000
Total DOC:	(1) + (2) + (3) + (4)	402,538	409,538
INDIRECT OPERATING COSTS (IOC): (b)			
(7) Overhead	60% of oper. labor & maintenance	66,488	66,488
(8) Property Taxes	1% of total capital investment	15,956	16,357
(9) Insurance	1% of total capital investment	15,956	16,357
(10) Administration	2% of total capital investment	31,912	32,713
Total IOC:	(7) + (8) + (9) + (10)	130,313	131,915
CAPITAL RECOVERY COSTS (CRC):	CRF of 0.1627 times TCI (10 yrs @ 10%)	259,605	266,121
ANNUALIZED COSTS (AC):	DOC + IOC + CRF	792,455	807,574
UNCONTROLLED CO EMISSIONS (TPY) (c)		201	201
TOTAL VOC REMOVED:		181	191
COST EFFECTIVENESS:	$ per ton of CO Removed	4,381	4,229

Vendor: Anguil

Notes:

TAB1RCO
4/21/99

(a) Based on Cost Control Manual Ch. 3

(b) 40% installation cost choosen due to RCO's have never been used for this application.

(c) Maximum potential emissions, based on NACASI Technical Bulletins and Manufacturer's design data.

PERMITTING CARBON MONOXIDE EMISSIONS FROM BLEACHING OPERATIONS AT PULP AND PAPER FACILITIES

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ABSTRACT

Recent studies indicate that bleaching operations at pulp and paper facilities are major sources of carbon monoxide (CO) emissions. Some of these studies suggest a direct link between emissions of CO and the use of chlorine dioxide (ClO_2) substitution in the bleaching process, which may be required under the cluster rule. In most mills this increase in CO is significant enough to trigger a prevention of significant deterioration (PSD) review. This paper addresses the impact the CO emissions will have on PSD permitting, and a preliminary determination of Best Achievable Control Technology (BACT) for the control of CO from bleaching operations.

DISCUSSION

The release of dioxins and furans in the wastewater streams leaving bleaching operations at pulp and paper mills have raised environmental concerns in recent years. Partly in response to these concerns the industry has made a move towards elemental chlorine free (ECF) bleaching and total chlorine free (TCF) bleaching. Chlorine dioxide (ClO_2) is often substituted for chlorine as part of these new technologies. By applying ClO_2 substitution technologies, pulp and paper mills are able to reduce or eliminate the amount of chlorine used in the bleaching operation and thereby lower the overall impact on the waste water stream. Commonly, the waste water stream from these alternate bleaching operations are non-detectable for both dioxins and furans.

However, the ClO_2 substitution technologies have been linked to an increase in the amount of CO present in the off gases from the bleaching process.

CO testing at several pulp mills has been conducted by the National Council of the Paper Industry for Air and Stream Improvement (NCASI). The testing results ranged from 0.089 to 1.073 lb CO / air dried tons bleached pulp (ADTBP) and averaged 0.83 lb CO / ADTBP. The testing has also indicated that there is a direct relationship between CO emissions and the percent of chlorine dioxide (ClO_2) substitution. As the percent substitution increases so does the amount of CO emissions.

IMPACT ON PSD REVIEWS

These emissions are significant enough to impact the permitting of a new fiberline. For example, if a 1,000 ADTBP/day bleach plant emits the average tested CO of 0.83 lb CO / ADTBP, this would equate to 151 tons of CO emissions from the fiberline operation per year. Any new or modified emissions sources which emit more than 100 tons CO/year are required to go through a PSD review.

Therefore, new or modified fiberlines of this size (roughly 660 ADTBP/day or greater) which are applying substitution technology will probably be required to go through the PSD application process. The exact size determination would depend on the amount of substitution as well as other factors, including the bleaching sequence used in the specific situation. The PSD review process requires completing a Best Achievable Control Technology (BACT) analysis and air quality modeling.

BACT for CO Emissions from Fiberlines

Approach to determining BACT. The regulatory agencies consider BACT an emission limit rather than a technology. Any control device that results in the agreed upon emission limit can, potentially, be defined as BACT. BACT determinations were made for CO emissions from bleach plants utilizing EPA's "top-down" approach. This method compares demonstrated control of emission rates for similar units in similar applications, with the most restrictive rate taken as the standard for comparison. If the owner proposes an emission factor for the new equipment that is at least as low as the standard then the analysis is complete. If a higher emissions factor is proposed for implementation, then it must be justified by overriding economic and/or technological considerations. Only those emissions levels that have been clearly demonstrated in practice are considered for comparison. It was never EPA's intent for BACT to be based upon emerging technologies or unsubstantiated vendor claims that have not yet been demonstrated.

Because CO emissions are linked with the use of chlorine dioxide, the possibility of not making a process change and staying with chlorine bleaching was considered. However, the benefits of reducing the dioxins and furans in the waste water stream far outweigh the possible negative impacts of an increase in CO emissions from the use of chlorine substitution technology. Also, pending legislature (Cluster Rule) will likely require the new bleaching sequence. Therefore, the feasibility of an add on control device to control CO emissions was then evaluated.

Several resources were used to determine BACT for the control of CO from fiberline operations. These included discussions with pulp and paper mills, a review of the BACT/LAER Information System (BLIS) to determine what levels were being achieved by others in industry, a review of industry association testing data (NCASI data), and discussions with engineers and chemists involved in the design of bleaching systems.

Proposed BACT. Due to the wide range of CO emissions seen, it is unlikely that a single BACT can be fairly applied to all the various bleaching sequences in the pulp and paper industry. Additionally, with the limited data it will be difficult to accurately predict the expected CO emissions. It is therefore recommended that facilities propose high conservative values in order to insure meeting their proposed BACT emission rate. Facilities will therefore be required to make technical or economic arguments against additional control. The following is a discussion of the viable control options and their cost implications.

Technology Review. Because the bleach technology is new, little information is available to be used in the determination of BACT for the operation. The BLIS system had three bleach plants listed for chlorine, chlorine dioxide, and chloroform but included no references to CO emissions.

The methods considered for CO control from the bleach plants were thermal oxidation through incineration to further oxidize the CO into CO_2 or the use of platinum catalysts to convert CO into CO_2. The incineration of the gases could be accomplished in an existing combustion unit or a dedicated incinerator.

Platinum catalysts were eliminated as technically infeasible. The platinum catalyst requires the gas temperature to be in excess of 500 F and typical exhaust streams from bleaching operations fall well below this level. Table I summarizes the options considered and the critical factors for each. Table II summarizes the major disadvantages and benefits associated with the two technically feasible options.

Economic Impact. Next, an economic analysis was conducted for each of the technologically viable control options. The economic argument addressed the capital investment for equipment, operational costs, administrative, taxes, maintenance, and all other costs associated with the proposed control systems.

The EPA has previously considered the economic impact of the incineration of emissions from bleach plants at pulp and paper mills. This analysis was presented in a document entitled "Pulp, Paper, and Paperboard Industry - Background Information for Proposed Air Emission Standards" - EPA-453/R-93-050a. In the document, an economic analysis was performed to determine the costs associated with the incineration of emissions from bleach plants. The analysis included the option of installing a dedicated incinerator or incinerating the gases in an existing combustion unit.

These estimates were developed as part of a cost benefit analysis to determine if VOC emissions from bleaching operations should be controlled. Though not intended for the control of CO, this study was utilized because it was felt that the same technologies being considered (incineration) could be applied. Since its completion, this cost benefit analysis has been criticized for underestimating the costs associated with applying these technologies. Because the projected costs generated are thought to be underestimated, the conclusions reached by this study would be conservative.

The standardized costs which were presented by the EPA would need to be modified in order to match the estimations to the specific situation at a mill. The ductwork lengths required from the bleach plant scrubber to the incinerator would need to be determined. The cost estimates for the ductwork in the EPA document were converted to a $/ft basis for comparison. This relationship was assumed to be a constant relationship regardless of length. This assumption was made for the total capital investment (TCI) as well as the total annual costs (TAC).

It is suspected that the temperatures and retention time that the gas stream would be subjected to in a large hog fuel or coal boiler would be sufficient to convert the CO into CO_2, but an exact efficiency is not known. A 95 % CO control efficiency was assumed for the BACT analysis for both the dedicated incinerator and the existing combustion unit.

In order to estimate the possible costs associated with the application of the two proposed control options, a typical mill configuration was considered. The specific layout and type of the mill are as follows:

- Kraft Pulp and Paper Facility
- Applying ClO_2 Substitution Technologies
- Bleach Plant Capacity of 1,000 ADTBP/day
- Access to Natural Gas
- Estimated 1000 feet from the existing Bleach Plant Scrubber to the nearest Operational Boiler
- Maximum CO emissions from the bleaching operation of 1.07 lb/ADTBP
- 4 stage bleaching with 3 emission points per stage (washers, towers, seal tanks)
- Estimated 1,000 feet to nearest available space for installation of a combustion unit.

The cost value at which state agencies generally consider projects economically reasonable is less than 3,000 $/ton pollutant removed. The EPA BID document estimated the total annual costs (TAC) for the ducting of the vents from the sample bleach plant to an existing combustion device to be $650,000. This equates to an annualized cost of $3,504 per ton of CO controlled for the example mill. The document also estimated the TAC for ducting the bleach plant vents to a new incinerator to be $3,480,000. This would equate to an annualized cost of $18,759 per ton of CO controlled. Both options exceed what is presently considered economically reasonable and would therefore not be required to be applied.

The value at which a project is considered reasonable varies from state agency to state agency and can be effected by more recent applications submitted to the agency. It should be noted that the PSD regulations do not allow for the modification of this value from pollutant to pollutant. Even though CO is probably the PSD pollutant of least concern with state agencies, this can not be considered when determining if add on control technology is economically reasonable.

Air Quality Modeling

The second stage of a PSD application is the completion of the air quality modeling analysis. The facility will therefore be required to model the increase in CO emissions from a bleach plant to determine the impact the increased emissions will have on the air quality. The first step is to complete a PSD screen analysis. This analysis compares the CO emissions before and after the completion of the proposed construction. In this case it would apply to the construction of a new bleach plant or the reconstructing of an existing bleach plant.

The modified or new emission units would be modeled before and after the construction in order to determine the increase in the ambient air quality concentrations. These maximum ambient air concentrations would next be compared to the significant impact levels to determine if additional modeling is required. The CO emissions would be compared against the 8 hour standard of 500 ug/m^3 and the 1 hour standard of 2,000 ug/m^3

The completion of modeling is highly specific to a facility, therefore generic results could not be presented. Typically, however, CO emissions are expected to model as insignificant. If the maximum ambient air impacts were to exceed the significance level, then refined modeling would have to be completed for the construction project. This refined modeling would require completion of an emission inventory for the other facility sources of CO as well as outside sources of CO.

SUMMARY AND RECOMMENDATIONS

The Cluster Rule is requiring mills to consider ECF bleaching technology. This process change will likely cause a PSD significant increase in CO emissions. The requirement of a PSD review could cause an application, which might otherwise be minor, to undergo a time intensive review which could create delays in the permitting process as well as add to project costs. The expected CO emissions should be determined early in the permitting process so that the impact on air quality can be determined before delays occur. The case study presented did not require additional control. This determination is a case by case analysis and should be made before any construction is considered.

REFERENCES

1. NCASI Technical Bulletin No. 701, "Compilation of 'Air Toxic' and Total Hydrocarbon Emissions Data for Sources at Chemical Wood Pulp Mills," Volume I, October 1995, pg. 59.

2. United States Environmental Protection Agency *NESHAP*, "Pulp, Paper, and Paperboard Industry - Background Information for Proposed Air Emission Standards, Manufacturing Processes at Kraft, Sulfite, Soda, and Semi-Chemical Mills," EPA-453/R-93-050a, October 1993.

Table I. Viable Control Options

Control Option	Critical Factors	Applied	Technically Feasible
Combustion in Dedicated Incinerator	Incinerator sizing, flow rate, % moisture in exhaust stream.	No	Yes
Combustion in Existing Unit	Distance to combustion unit, flow rate, % moisture in exhaust stream.	No	Yes
Platinum Catalyst	Flow rate, % moisture in exhaust stream, type and amount of other contaminants.	No	No

Table II. Benefits and Disadvantages

Control Option	Benefits	Disadvantages
Combustion in Dedicated Incinerator	CO, VOC reduction; Ease of use	Products of combustion emissions added fuel costs high capital costs.
Combustion in Existing Unit	CO, VOC reduction; No added fuel costs; and Lower capital costs.	Concerns with impact on the boiler integrity, possible flame quenching reduction in boiler efficiency.

PB94-121357

United States Environmental Protection Agency
Office of Air Quality Planning and Standards
Research Triangle Park NC 27711
EPA-453/R-93-050a
October 1993
Air

EPA

Pulp, Paper, and Paperboard Industry - Background Information for Proposed Air Emission Standards

Manufacturing Processes at Kraft, Sulfite, Soda, and Semi-Chemical Mills

NESHAP

REPRODUCED BY:
U.S. Department of Commerce
National Technical Information Service
Springfield, Virginia 22161

$$\text{Capital recovery cost} = \text{Total capital investment} * \text{Capital recovery factor (10 years, 10\%)}$$

Taxes, insurance, and administrative costs are assumed to be 4 percent of the total capital investment. Overhead is conservatively estimated to be 60 percent of the total labor and maintenance costs.[12]

5.1.3 Thermal Incineration System Costs

Thermal incinerator costs were developed using the cost equations presented in Chapter 3.0 of the OCCM.[13] As discussed in Chapters 3.0 and 4.0 of this document, a thermal incinerator may be used to control HAP and VOC emissions from halogenated bleaching vent streams. Thermal incinerators may also be used to control pulping vent streams if desired; however, for this analysis it was assumed that pulping vent streams would be controlled by an existing combustion device. Costs for a thermal incinerator for an example bleaching process are given in Section 5.2, and the design consideration for halogenated streams are given below.

5.1.3.1 Thermal Incinerator Design Considerations Affecting Costs. The thermal incinerator system for halogenated streams consists of the following equipment: combustion chamber, instrumentation, blower, collection fan, ductwork, and stack. The OCCM contains further discussion of incinerator control system design.[13] General thermal incinerator design parameters are presented in Table 5-3. Other key variables that affect costs are: vent stream flow rate and type of heat recovery (capital costs) and vent stream flow rate, vent stream heat content, and fuel requirements (annual costs).

The amount of oxygen in the vent stream or bound in the VOC establishes the supplemental combustion air requirement. In pulp mills (including pulping and bleaching vents), most of the vent streams are dilute streams and contain an oxygen percentage sufficient to support combustion.[14] Therefore,

TABLE 5-3. THERMAL INCINERATOR GENERAL DESIGN SPECIFICATIONS FOR HALOGENATED VENT STREAMS

Item	Specification
Emission control efficiency	98 percent or greater destruction of VOC
Minimum incinerator capacity[a]	500 scfm
Maximum incinerator capacity	50,000 scfm
Incinerator temperature	1,100 °C (2,000 °F)
Chamber residence times	1.00 sec
Supplemental fuel requirement	Natural gas required to maintain incinerator temperature

a Five hundred scfm is the minimum incinerator size used to determine capital cost.

for pulp mill vent streams, supplemental combustion air is not expected to be required. In fact, certain pulping vent gases, such as digester relief and blow gases, may have heat contents greater than approximately 100 Btu/scf due to the presence of turpentine compounds. In such cases, the vent stream may be used as supplemental fuel in combustion devices.[15] (See Chapter 3.0 for discussions on vent streams and their heat contents.)

The minimum and maximum incinerator flow rate for this cost analysis were 500 and 50,000 scfm, respectively. Flow rates greater than 50,000 scfm were assumed to be controlled by multiple incinerators.

Halogenated vent streams were not considered to be candidates for heat recovery systems and were costed assuming zero percent heat recovery. This design assumption was imposed because of the potential for corrosion in the heat exchanger and incinerator. Based on an analysis of chlorine, chlorine dioxide, extraction, and hypochlorite bleach plant stages, vent streams that would likely contain higher concentrations of halogens would be from the hypochlorite stage (chloroform) and the chlorination stage (chlorine). If the temperature of the flue gas leaving the heat exchanger were to drop below the acid dew point temperature for these vent streams, acid gases would condense. In cases such as bleaching vents steams where heat is not recovered, the annual fuel costs would be higher than for cases where heat recovery is practiced, other factors being held constant.

The destruction of VOC's is a function of incinerator temperature, residence time in the combustion chamber, and concentration of VOC's in the vent stream. Since these parameters affect capital and annual costs, their values had to be established. Previous EPA studies show that at least 98 percent destruction efficiency can be met in a thermal incinerator operated at a temperature of 1600°F and a residence time of 0.75 seconds.[16] Thermal oxidation of halogenated VOC requires higher temperatures. Available data indicate that a temperature of 2,000°F and a residence time of one second are necessary to achieve at least 98 percent VOC destruction efficiency for halogenated vent streams.[17]

Auxiliary fuel will almost always be necessary for start-up of the unit. Also, in most cases, additional fuel must be added to maintain the incinerator temperature. With the following assumptions, the amount of auxiliary fuel required was estimated using the heat and energy balance around the combustion chamber.[18]

- The reference temperature is taken as the inlet temperature of the auxiliary fuel (77°F).
- No auxiliary combustion air is required (i.e., it is assumed that the oxygen content of the vent stream is at least 18 percent).
- Energy losses are assumed to be 10 percent of the total energy input to the incinerator above ambient conditions.
- At a constant moisture content, the heat capacities of the bleach plant vent streams entering and leaving the combustion chamber are approximately the same regardless of composition of the organics. This is true for waste streams which are dilute mixtures of organics in air, the properties of the streams changing only slightly on combustion.

These assumptions and subsequent calculations of the fuel requirements for a model vent stream are presented in a separate document.[19]

5.1.3.2 Development of Thermal Incinerator Capital Costs. The cost analysis for thermal incinerators presented below follows the methodology outlined in the OCCM. Equipment cost correlations are based on data provided by various vendors; each correlation is valid for incinerators in the 500 to 50,000 scfm range.[20] Thus, the smallest incinerator size used for determining equipment costs is 500 scfm; for flow rates greater than 50,000, additional incinerators are costed.

Equipment costs are given as a function of total volumetric flow through the incinerator and are accurate to within 30 percent. For halogenated streams, the equation used in the costing analysis, after converting to 4th Quarter 1991 dollars, is as follows:[21]

$$EC = 10,930\ Q_{TOT}^{0.2355}$$

where:

EC = Equipment costs (4th Quarter 1991 dollars); and

Q_{TOT} = Total volumetric flow rate through the incinerator including any additional air and fuel.

The cost for the conveyance of bleaching process vent streams to the incinerator is not included in the incinerator equipment cost. The methodology for calculating costs for the conveyance system for an incinerator is presented in Section 5.1.2.

Installation costs are estimated as a percentage of purchased equipment costs and include auxiliary equipment, instrumentation, sales taxes, and freight. Direct and indirect installation costs for thermal incinerators have been incorporated into the total capital investment. The total capital investment is estimated at 1.61 times the purchased equipment cost.

5.1.3.3 Development of Thermal Incinerator Total Annual Cost. Annual costs for the incinerator system include direct operating and maintenance costs, as well as annualized capital charges. The bases for determining thermal incinerator annual costs are presented below.

The utilities considered in the annual cost estimates include natural gas (auxiliary fuel) and electricity (incinerator fan). The fuel and electricity costs were assumed to equal $3.48 per 1,000 cubic feet of natural gas and $0.04/kW-hr, respectively. The procedure for estimating the electricity requirement is described in Chapter 3.0 of the OCCM.[13] The procedure for estimating the natural gas requirement was presented in Section 5.1.3.1.

For this cost analysis it was assumed that the incinerator requires 0.5 hour of operating labor per 8-hour shift. Maintenance labor requirements are assumed to be identical to operating labor requirements. Supervisory cost is estimated to be 15 percent of the operating labor cost.[22] Maintenance material costs are assumed to be equal to maintenance labor costs.

The annualized capital charges include capital recovery charges as well as taxes, insurance, administrative and overhead charges. The capital recovery cost was calculated as described in previous sections. Taxes, insurance, and administrative costs were assumed to be 4 percent of the total capital investment. Overhead was estimated to be 60 percent of the total labor and maintenance costs.[23]

5.1.4 Scrubber System Costs

Scrubber costs were developed for two scenarios. Scrubber systems were applied as secondary control to remove acid gases from the incinerator exhaust after combustion of halogenated bleach plant streams (i.e., post-incineration scrubbers). Scrubbers were also used as a primary control for bleach plant vent streams, without incineration (i.e., stand-alone scrubbers). (However, based on recent industry comments, stand-alone scrubbers could be acting as emission points for methanol. Scrubber effluent could also emit volatile HAP's.) Design considerations for the two scrubbing scenarios described above are presented in the following two sections.

5.1.4.1 Post-Incineration Scrubber Design Considerations Affecting Costs. Scrubber systems consist of the following major equipment: quench chamber, packed tower, pump, ductwork, and fan. Post-incineration scrubber systems are designed to remove acid gases formed during combustion of halogenated organics. System elements and design assumptions

TABLE 5-11. COSTS FOR CONTROL OF MODEL MILL BLEACHING VENT STREAMS USING AN INCINERATOR FOLLOWED BY A SCRUBBER[a]

Cost component	Equipment size or cost factor	Component cost ($)	Total cost ($)
Equipment costs:[b]			
Incinerator = EC	1 incinerator 51,400 scfm	132,000	
Purchased equipment cost (PEC)	1.18 (EC)	156,000	
Total capital investment (TCI):			
$TCI_{incinerator}$	1.61 * PEC	250,000	
$TCI_{duct\ to\ incinerator}$	1 duct 1000 ft. length 48 in. diameter 20 elbows	2,830,000	
$TCI_{duct\ to\ scrubber}$	300 ft length 48 in. diameter 6 elbows	595,000	
$TCI_{scrubber}$	15 ft. diameter 27 ft. height	650,000	
TCI	$TCI_{incinerator} + TCI_{duct\ to\ incinerator} + TCI_{duct\ to\ scrubber} + TCI_{scrubber}$		4,320,000

TABLE 5-11. COSTS FOR CONTROL OF MODEL MILL BLEACHING VENT STREAMS USING AN INCINERATOR FOLLOWED BY A SCRUBBER (Concluded)

Cost component	Equipment size or cost factor	Component cost ($)	Total cost ($)
Total annual costs (TAC)			
$TAC_{incinerator}$		2,830,000	
$TAC_{duct\ to\ incinerator}$		650,000	
$TAC_{duct\ to\ scrubber\ and\ scrubber}$[b]		370,000	
TAC	$TAC_{incinerator} + TAC_{duct\ to\ incinerator} + TAC_{duct\ to\ scrubber\ and\ scrubber}$		3,840,000

[a] Based on tower, washer and seal tank vents from C, D, E, and H stages.
[b] Detailed equipment size and cost procedures for duct are presented in Table 5-8 and for scrubber in Table 5-10.

Department of
Environmental Protection

Jeb Bush
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

David B. Struhs
Secretary

March 9, 1999

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. David Spraley, Vice President
Palatka Operations
Georgia-Pacific Corporation
Post Office Box 919
Palatka, Florida 32178-0919

Re: DEP File No. 1070005-006-AC (PSD-FL-264)
Kraft Pulp Facility, New Bleach Plant

Dear Mr. Spraley:

The Department has received the application on February 9, 1999 for the replacement of the existing No.1 and No. 2 Bleach Plants with a new bleach plant at the above referenced facility in Putnam County. Based on our initial review of the proposed project, we have determined that additional information is needed in order to continue processing this application package. Please submit the information requested below to the Department's Bureau of Air Regulation:

1. Based on the response by e-mail received on March 9, 1999, and the definition of modification pursuant to Rule 62-210.200, F.A.C., actual pollutant emission from both the pulping side and the chemical recovery side of the facility must be based on the 1997 and 1998 calendar years. These two years represent the highest pulp production in the last five years and should be used to calculate the baseline actual pollutant emissions for all pollutants emitted from both the pulping production side and the chemical recovery side. These emissions should then be compared to the future potential pollutant emissions from the facility. Any net pollutant emissions increases above the significant levels contained in Table 400-2 in Rule 62-212.400, F.A.C., are subject to PSD New Source Review (NSR) requirements pursuant to Rule 62-212.400(5), F.A.C. Please provide all calculations for the baseline pollutants and future potential pollutants, and any PSD NSR requirements (i.e., BACT analysis) where applicable.
2. The Best Available Control Technology (BACT) determination to control CO emissions did not include different control technologies being utilized for CO control. If the control technologies are not technically feasible for this operation, then it must be qualified in the BACT write-up. If the control technologies are technically feasible then economic analyses must be performed for various control technologies suggested in the BACT analyses.

3. Section 2.1 of the application fails to list the third major change associated with this proposed modification. Please submit the information for our review.

4. Please provide copies of the pertinent sections of the NCASI Technical Bulletin Nos. 679, 701 and 760 that were used for determining the potential pollutant emission estimates in the PSD application.

5. Please provide data for the bleach pulp production for the last five years.

We have not yet received comments from the U.S. Fish and Wildlife Service or from the EPA. Their comments will be forwarded to you as soon as we receive them.

The Department will resume processing this application after receipt of the requested information. If you have any questions regarding this matter, please call Syed Arif, P.E. at (850) 921-9528.

Sincerely,

3/9

A. A. Linero, P.E. Administrator
New Source Review Section

AAL/sa

cc: Gregg Worley, EPA
John Bunyak, NPS
C. Kirts, DEP-NED
D. Buff, Golder Associates

Z 333 618 082

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070005-006-AC 050-F1-264	

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GA - Pacific Corp
PO BOX 919
Palatka, Fl 32178-0919

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Golder Associates Inc.

6241 NW 23rd Street, Suite 500
Gainesville, FL 32653-1500
Telephone (352) 336-5600
Fax (352) 336-6603

Golder Associates

March 8, 1999

9737574A/3

Florida Department of Environmental Protection
New Source Review Section Bureau of Air Regulations
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Attention: Syed Arif, P.E.

RE: GEORGIA PACIFIC PSD PERMIT APPLICATION ADDENDUM NO. 1

Dear Mr. Arif:

On behalf of Georgia Pacific Corporation (G-P), Golder Associates Inc. (Golder) is submitting additional information as an addendum to the No. 3 Bleach Plant PSD permit application submitted in early February. This information is being submitted pursuant to the meeting between G-P and the Florida Department of Environmental Protection (FDEP) on February 24, 1999. The following five bullets address concerns raised by the FDEP at the meeting.

- Excerpts from NCASI Technical Bulletins 679, 701, and 760 which are referenced in the permit application are included with this letter for FDEP's reference.

- Actual bleach plant production rates used to estimate existing carbon monoxide (CO) emissions were based on values from 1995 and 1996. This 2-year period was selected instead of the most recent consecutive 2-year period because it is the most representative of maximum production rates during the last 5 years. The most recent 5-years of production data is given below.

Year	Tons of Bleached Pulp
1998	261,829
1997	262,828
1996	266,727
1995	269,830
1994	244,227

- Attachment A, Page 2-1, 3rd paragraph indicates that the proposed construction will include three major changes. This is a typographical error. It should read "The proposed construction will include two major changes."

- The FDEP has requested further explanation of how the maximum daily and annual bleach plant production rates were derived. These rates were used to develop short and long term pollutant emissions.

The proposed bleach plant will be designed for a maximum monthly average production rate of 1,350 Air Dried Tons of Bleached Pulp (ADTBP) per day and a maximum daily production rate of 1,702 ADTBP per day. The daily production rate represents the maximum rate at which bleached pulp can be produced by the new plant. However, this rate is not typically sustained hence, a maximum monthly average rate of 1,350 ADTBP per day is a more accurate representation of the typical production rate for the proposed bleach plant.

The maximum daily process rate of 1,702 ADTBP was used to estimate short term (hourly) pollutant emissions. Conversely, long term (annual) pollutant emissions were estimated using the maximum monthly average production rate of 1,350 ADTBP per day.

- The FDEP has indicated that the BACT analysis for CO is incomplete as it is currently written. The FDEP requires that G-P address additional control techniques for the reduction of bleach plant CO emissions. Specifically, the FDEP has requested that G-P perform a feasibility and cost analysis, as necessary, for catalytic oxidation and thermal oxidation of CO. Golder is currently researching these control techniques and will submit the results as Addendum No. 2 as soon as it is complete.

If you have any questions concerning this submittal, please contact me at (352)-336-5600 ext. 539 or the professional engineer of record for the application at ext.545.

Sincerely,

GOLDER ASSOCIATES INC.

Paul Wesson
Staff Environmental Engineer

PJW/arz

cc: Chris Kirts, FDEP NE District
Joe Taylor, G-P
David Buff, Golder

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Department of Environmental Protection

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Jeb Bush
Governor

David B. Struhs
Secretary

February 11, 1999

Mr. Gregg Worley, Chief
Air, Radiation Technology Branch
Preconstruction/HAP Section
U.S. EPA – Region IV
61 Forsyth Street
Atlanta, Georgia 30303

Re: Georgia-Pacific Corporation
1070005-006-AC, PSD-FL-264

Dear Mr. Worley:

Enclosed for your review and comment is an application for the above mentioned project. The purpose of the project is to comply with Phase I of the MACT Cluster Rule. Although it will result in reductions of emissions and discharges, it will also result in PSD significant emission increases of carbon monoxide.

Your comments can be forwarded to my attention at the letterhead address or faxed to the Bureau at (850)922-6979. If you have any questions, please contact Syed Arif at (850)921-9528

Sincerely,

A. A. Linero, P.E.
Administrator
New Source Review Section

AAL/kt

Enclosures

cc: S. Arif, BAR

Department of
Environmental Protection

Jeb Bush
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

David B. Struhs
Secretary

February 11, 1999

Mr. John Bunyak, Chief
Policy, Planning & Permit Review Branch
NPS-Air Quality Division
Post Office Box 25287
Denver, CO 80225

Re: Georgia-Pacific Corporation
1070005-006-AC, PSD-FL-264

Dear Mr. Bunyak:

Enclosed for your review and comment is an application for the above mentioned project. The purpose of the project is to comply with Phase I of the MACT Cluster Rule. Although it will result in reductions of emissions and discharges, it will also result in PSD significant emission increases of carbon monoxide.

Your comments can be forwarded to my attention at the letterhead address or faxed to the Bureau at (850)922-6979. If you have any questions, please contact Syed Arif at (850)921-9528

Sincerely,

Teri Tober for

A. A. Linero, P.E.
Administrator
New Source Review Section

AAL/kt

Enclosures

cc: S. Arif, BAR