Golder Associates Inc.

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Gainesville, FL 32653-1500
Telephone (352) 336-5600
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March 6, 2003

0237624

Florida Department of Environmental Protection
2600 Blair Stone Road
Twin Towers Office Building
Tallahassee, Florida 32399

RECEIVED
MAR 07 2003
BUREAU OF AIR REGULATION

Attention: Mr. Syed Arif

Re: DEP FILE NO. 1070005-019-AC (PSD-FL-264A)
GEORGIA-PACIFIC PALATKA OPERATIONS
NO. 3 BLEACH PLANT
SUPPLEMENTAL INFORMATION

Dear Mr. Arif:

Based on our recent conversations, the purpose of this correspondence is to clarify and correct certain information contained in the Golder Associates Inc. (Golder) letter to the Department dated January 28, 2003, regarding the above-referenced project. Each item addressed is identified below.

Baseline CO Emissions and Cost Effectiveness Calculations

The first point of clarification is in regard to the calculation of baseline carbon monoxide (CO) emissions from the No. 3 Bleach Plant. These data were presented in Table 1 and in the text of the January 28 letter. Upon review of the data, Georgia-Pacific (G-P) has determined that the fractions of softwood and hardwood shown in Table 1 were transposed for the years 1999 and 2001 (i.e., the year 2001 fractions were really the year 1999 fractions, and vice versa). The following table presents the correct operating rates:

Table 1. BACT Baseline Operating Data for Bleaching Operations, G-P Palatka (revised 03-05-2003)

Year	Net Throughput[a] (Bleached pulp, tons/yr)	Total Throughput (Bleached pulp, tons/yr)	Fraction Softwood	Fraction Hardwood
2001	285,801	317,557	0.578	0.422
2000	281,756	313,062	0.574	0.426
1999	273,803	304,226	0.633	0.367

---

[a] Net throughput reflects a 10% loss of pulp. The amount of pulp entering the bleach plant is equal to net value ÷ 90%

The calculated baseline CO emissions then become:

1999: [(317,557 tons/yr x 0.578 softwood x 1.68 lb CO/ton softwood) +
(317,557 tons/yr x 0.422 hardwood x 0.64 lb CO/ton hardwood)] / 2000 lb/ton
= 197 TPY CO emissions

2000: [(313,062 tons/yr x 0.574 softwood x 1.68 lb CO/ton softwood) +
(313,062 tons/yr x 0.426 hardwood x 0.64 lb CO/ton hardwood)] / 2000 lb/ton
= 194 TPY CO emissions

2001: [(304,226 tons/yr x 0.633 softwood x 1.68 lb CO/ton softwood) +
(304,226 tons/yr x 0.367 hardwood x 0.64 lb CO/ton hardwood)] / 2000 lb/ton
= 197 TPY CO emissions

Consistent with the BACT guidance cited in the January 28 letter, using the highest historic rate among these three years yields a baseline emission rate of 197 TPY. The controlled emission rate for the cost effectiveness calculation is equal to:

Baseline emission rate x (1-control efficiency).

For oxidation in a boiler or a stand-alone oxidizer, the control efficiency is approximately 95%. Thus, the controlled emission rate is equal to: 197 TPY x (1-0.95) = 9.9 TPY

The net reduction in CO emissions from such a control device is then equal to:

197 TPY – 9.9 TPY = 187 TPY

Thus, 187 TPY CO removed should be used in the cost effectiveness calculations. Using this figure, G-P has revised the CO cost effectiveness calculations, previously presented in Table B-2 of the January 28 letter. For both scenarios of controlling CO emissions with either the existing boilers or a new thermal oxidizer, the cost effectiveness is calculated to be greater than $5,300 per ton of CO removed. This cost effectiveness is higher than presented in the January 28 letter. Therefore, for the reasons presented in the January 28 letter, G-P believes these costs are also excessively high.

Calculation of Percent ClO_2 Applied in Bleach Plant

The data provided in the chart in our submittal to the Department dated January 28, 2003, described the ClO_2 application rates in terms of pounds of ClO_2 applied per ton of pulp. In order to calculate %ClO_2 as ClO_2 use the following formula using the previously mentioned chart.

79 lbs/ton x ton/2000 lbs x 100% = 3.95% ClO_2 applied as Total ClO_2 on both the Do and D1 Stages

The process data included with each of the compliance tests submitted in the January 28th package lists the %ClO_2 application rates as ClO_2 in both the Do and D1 Stages. As an aside, our on-line instrumentation calculates %ClO_2 as equivalent Cl_2 in the Do stage because this information is used in the control logic to determine the appropriate application rates based on several operating parameters (incoming Kappa number, brightness, etc.). In this case, the %ClO_2 as equivalent Cl_2 is converted to %ClO_2 as ClO_2 by dividing by 2.63. The 2.63 is the ratio of the number of pounds of Cl_2 to the number of pounds of ClO_2 that would yield an equivalent oxidizing potential. In the D1 stage, the %ClO_2 is measured directly as %ClO_2.

Thank you for consideration of this information. Please call if you have any questions concerning this submittal.

Sincerely,

GOLDER ASSOCIATES INC.

David A. Buff

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

cc: M. Carpenter
M. Aguilar
S. Matchett
W. Jernigan

DB/jkw

Enclosures:

4. Professional Engineer Statement:

I, the undersigned, hereby certify, except as particularly noted herein, that:*

(1) To the best of my knowledge, there is reasonable assurance that the air pollutant emissions unit(s) and the air pollution control equipment described in this Application for Air Permit, when properly operated and maintained, will comply with all applicable standards for control of air pollutant emissions found in the Florida Statutes and rules of the Department of Environmental Protection; and

(2) To the best of my knowledge, any emission estimates reported or relied on in this application are true, accurate, and complete and are either based upon reasonable techniques available for calculating emissions or, for emission estimates of hazardous air pollutants not regulated for an emissions unit addressed in this application, based solely upon the materials, information and calculations submitted with this application.

If the purpose of this application is to obtain a Title V source air operation permit (check here [ ], if so), I further certify that each emissions unit described in this Application for Air Permit, when properly operated and maintained, will comply with the applicable requirements identified in this application to which the unit is subject, except those emissions units for which a compliance schedule is submitted with this application.

If the purpose of this application is to obtain an air construction permit for one or more proposed new or modified emissions units (check here [ ], if so), I further certify that the engineering features of each such emissions unit described in this application have been designed or examined by me or individuals under my direct supervision and found to be in conformity with sound engineering principles applicable to the control of emissions of the air pollutants characterized in this application.

If the purpose of this application is to obtain an initial air operation permit or operation permit revision for one or more newly constructed or modified emissions units (check here [X], if so), I further certify that, with the exception of any changes detailed as part of this application, each such emissions unit has been constructed or modified in substantial accordance with the information given in the corresponding application for air construction permit and with all provisions contained in such permit.

David a. Buff
Signature

03/05/2003
Date

(seal)

* Attach any exception to certification statement.

Table B-2. Cost Effectiveness for Control of CO Emissions From ECF No. 3 Bleach Plant, Georgia-Pacific, Palatka FL (revised 03/05/2003)

Cost Items	Cost Factors	Cost ($) Duct to Boiler	Cost ($) Thermal Ox
DIRECT CAPITAL COSTS (DCC):			
(1) Purchased Equipment Cost			
(a) Oxidizer/Air Injection Equip/Services	Based on On-site Engineering Estimate	2,491,934	3,299,584
(b) New Stack	included	0	0
(c) Ductwork and Electronic controls	included	0	0
(d) Structural Support	included	0	0
(f) Exhaust Fan	included	0	0
(g) Freight	included	0	0
(h) Sales Tax (Florida)	6%	149,516	197,975
(i) Instrumentation	included	0	0
(j) Subtotal - Purchased Equipment	included	2,641,450	3,497,559
(2) Direct Installation	included	0	0
Total DCC:		2,641,450	3,497,559
INDIRECT CAPITAL COSTS (ICC):			
(3) Indirect Installation Costs			
(a) Engineering	(0.10) x (PEC) (EPA Factor)	264,145	349,756
(b) Construction & Field Expenses	(0.05) x (PEC) (EPA Factor)	132,073	174,878
(c) Construction Contractor Fee	(0.10) x (PEC) (EPA Factor)	264,145	349,756
(d) Contingencies for retrofit	(0.25) x (PEC) (EPA Factor)	660,363	874,390
(4) Other Indirect Costs			
(a) Startup	(0.02) x (PEC) (EPA Factor)	52,829	69,951
(a) Testing	(0.01) x (PEC) (EPA Factor)	26,415	34,976
(b) Working Capital	30-day DOC (EPA Factor)	19,230	20,210
Total ICC:	(3) + (4)	1,419,199	1,873,916
TOTAL CAPITAL INVESTMENT (TCI):	DCC + ICC	4,060,649	5,371,475
DIRECT OPERATING COSTS (DOC):			
(1) Operating Labor			
Operator	$22/hr; 1 hr/day for Boiler; 3 hr/day for RTO	8,030	24,090
Supervisor	15% of operator cost	1,205	3,614
(2) Maintenance			
Labor (includes inspection of boiler)	2xOperating Labor for Boiler, 10% of operating labor for RTO	18,469	2,770
Materials	Equivalent to Maintenance Labor	18,469	2,770
(3) Utilities			
(a) Electricity	$0.075/kWh; 8,760 hr/yr 112 kw Boiler; 201 kw RTO	73,584	132,057
(b) Natural Gas	1.56 MMBtu/hr; $4.736/MMBtu	--	64,720
(c) Fuel Oil for recoup steam losses	3.52 MMBtu/hr $3.6/MMBtu (2002 actual average)	111,007	--
(4) Chemicals and Materials			
Ceramic Bed Replacement	Once per 8 yrs @ $100,000	--	12,500
Total DOC:	(1) + (2) + (3) + (4)	230,763	242,521
INDIRECT OPERATING COSTS (IOC):			
(7) Overhead	60% of oper. labor & maintenance (EPA Factor)	27,704	19,947
(8) Property Taxes	1% of total capital investment (EPA Factor)	40,606	53,715
(9) Insurance	1% of total capital investment (EPA Factor)	40,606	53,715
(10) Administration	2% of total capital investment (EPA Factor)	81,213	107,430
Total IOC:	(7) + (8) + (9) + (10)	190,129	234,806
CAPITAL RECOVERY COSTS (CRC):	CRF of 0.1424 times TCI (10 yrs @ 7%)	578,236	764,898
ANNUALIZED COSTS (AC):	DOC + IOC + CRF	999,129	1,242,225
UNCONTROLLED BASELINE CO EMISSIONS (TPY)		197	197
TOTAL CO REMOVED:	95% removal efficiency	187.2	187.2
COST EFFECTIVENESS:	$ per ton of CO Removed	5,339	6,638

Source: Georgia-Pacific Corp, 2003; Golder Associates Inc., 2003.

GEORGIA-PACIFIC PALATKA OPERATIONS
P.O. BOX 919
PALATKA, FLORIDA 32178-0919
TELEPHONE: (386) 325-2001
FAX NUMBER: (386) 328-0014

Fax

To:	Syed Arif	**From:**	Myra Carpenter
Attn:			Environmental Department
Fax:		**Phone:**	386-325-2001
Phone:		**Fax:**	386-328-0014
Pages:	2 (including cover)	**Date:**	

Comments

Is this ok? I will fax it again tomorrow if it is ok with the notary seal.

Myra Carpenter

WAIVER OF PERMIT APPLICATION PROCESSING TIME PERIODS UNDER SECTIONS 120.60(1), 403.0872 AND 403.0876 FLORIDA STATUTES

Permit Application/Project: Bleach Plant PSD Permit
Facility ID No.: 1070005
Applicant's Name: Georgia-Pacific Corporation

The undersigned has read sections 120.60(1), 403.0872 and 403.0876, Florida Statues, and fully understands the applicant's rights under those sections. With regard to the above referenced permit application, the applicant hereby with full knowledge and understanding of its rights under Sections 120.60(1) and 403.0867, Florida Statutes, waives the 30-day completeness review of the information provided to the Department on January 28, 2003.

This waiver shall in no way limit the Department's ability to request information prior to the expiration of this waiver. This waiver shall expire 03/15/03, at which time all processing time clocks will resume.

With regard to the above reference permit application, the applicant hereby with full knowledge and understanding of its rights under Section 403.0872, Florida Statutes, waives the right under Section 403.0872, Florida Statutes, to have the application processed by the State of Florida Department of Environmental Protection within the time periods prescribed in Section 403.0872, Florida Statutes.

Said waiver is made freely and voluntarily by the applicant, is in its self interest and without any pressure or coercion by anyone employed by the State of Florida Department of Environmental Protection.

This waiver shall expire on the 15th day of March, 2003.

The undersigned is authorized to make this waiver on behalf of the applicant.

Signature Myra J. Carpenter Date 2/27/03

By: Myra J. Carpenter, Environmental Superintendent

State of Florida
County of Putnam
Sworn to (or affirmed) and subscribed before me this 28th day of February 2003. Who is personally known or has produced ________________ identification.

Sealed by Notary Public

Golder Associates Inc.

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

Golder Associates

January 28, 2003

0237624

Florida Department of Environmental Protection
2600 Blair Stone Road
Twin Towers Office Building
Tallahassee, Florida 32399

RECEIVED

JAN 28 2003

BUREAU OF AIR REGULATION

Attention: Mr. Syed Arif

Re: DEP FILE NO. 1070005-019-AC (PSD-FL-264A)
GEORGIA-PACIFIC PALATKA OPERATIONS
NO. 3 BLEACH PLANT
RESPONSES TO REQUESTS 15 THROUGH 20

Dear Mr. Arif:

On behalf of Georgia-Pacific Corporation (G-P), Golder Associates Inc. (Golder) is pleased to submit the following information as the second response to the Department's request for additional information, dated November 26, 2002, regarding the above referenced project. Please note that the items are listed in the same order as in the letter for convenience. The responses below address the requests numbered 15 through 20 of the letter. Responses for Questions 1 through 14 were provided in an earlier letter to the Department, dated January 3, 2003.

G-P has revised both the operating costs and emissions for the carbon monoxide (CO) cost effectiveness calculations, previously presented in Table B-1 of the 2002 application. As explained throughout several of the responses below, G-P contracted Jacobs Engineering to refine and document a site-specific estimate of direct costs. Jacobs investigated all possible incineration points to control the No. 3 Bleach Plant CO emissions. The conclusion regarding technically feasible incineration points is: 1) use the combination boiler and power boiler together, or 2) a stand-alone regenerative thermal oxidizer (RTO). Detailed costs are developed and presented for both of these alternatives.

Costs for other thermal oxidizers types (*e.g.*, catalytic oxidizers) are similar to an RTO and have similar destruction efficiencies. Because no oxidizers of any type have been demonstrated to control emissions from a bleach plant, a BACT analysis may consider these controls as equivalent choices. Thus, the Jacobs cost estimates address the RTO. The computed cost effectiveness described below for an RTO is economically infeasible, and changing the oxidizer type would not affect this determination.

In the November 2002 application, G-P used the maximum annual CO emissions from the No. 3 Bleach Plant in the cost effectiveness calculations. For the revised analysis presented herein, the emissions rate applied to the cost effectiveness calculations reflect guidance presented in Section B V.D.2.b of the New Source Review Workshop Manual - Draft (EPA 1990):

> *"In addition, historic upper bound operating data, typical for the source or industry, may be used in defining baseline emissions in evaluating the cost effectiveness of a control option for a specific source. For example, if for a source or industry, historical upper bound operations call for two shifts a day, it is not necessary to assume full time (8760 hours) operation on an annual basis in calculating baseline emissions." (EPA, 1990)*

Thus, G-P reviewed the recent years of operating data to define the baseline emissions (*i.e.*, uncontrolled emissions). The following table presents the most recent operating rates:

Table 1. BACT Baseline Operating Data for Bleaching Operations, G-P Palatka

Year	Net Throughput[a] (Bleached pulp, tons/yr)	Total Throughput (Bleached pulp, tons/yr)	Fraction Softwood	Fraction Hardwood
2001	285,801	317,557	0.633	0.367
2000	281,756	313,062	0.574	0.426
1999	273,803	304,226	0.578	0.422

[a] Net throughput reflects a 10% loss of pulp. The amount of pulp entering the bleach plant is equal to net value ÷ 90%

The calculated baseline CO emissions then becomes:
1999: (317,557 tons/yr x 0.633 softwood x 1.68 lb CO/ton softwood +
317,557 tons/yr x 0.367 hardwood x 0.64 lb CO/ton hardwood) / 2000 lbs/ton
= 206 TPY CO emissions

2000: (313,062 tons/yr x 0.574 softwood x 1.68 lb CO/ton softwood +
313,062 tons/yr x 0.426 hardwood x 0.64 lb CO/ton hardwood) / 2000 lbs/ton
= 194 TPY CO emissions

2001: (304,226 tons/yr x 0.578 softwood x 1.68 lb CO/ton softwood +
304,226 tons/yr x 0.422 hardwood x 0.64 lb CO/ton hardwood) / 2000 lbs/ton
=189 TPY CO emissions

Consistent with the BACT guidance cited above, using the highest historic rate among these three years yields a baseline emission rate of 206 TPY. The controlled emission rate for the cost effectiveness calculation is equal to:
Baseline emission rate x (1-control efficiency).

For oxidation in a boiler or a stand-alone oxidizer, the control efficiency is approximately 95%. Thus, the controlled emission rate is equal to: 206 TPY x (1-0.95) = 10.3 TPY
The net reduction in CO emissions from such a control device is then equal to:
206 TPY – 10.3 TPY = 195.7 TPY

Thus the cost effectiveness calculations divide the annualized costs by 195.7 TPY CO removed. Using this information, Questions 15 through 20 are addressed in turn in the following sections.

15. Request: *Please provide the information submitted by you to the vendors in getting the quote for CO removal using thermal oxidation, catalytic incineration or incineration in an existing boiler. Provide copies of the quotes received for the three options listed. Also, indicate if the thermal* *oxidizer and the catalytic incinerator are designed to be located upstream or downstream of the existing scrubber. What advantage does one location have over the other?*

Response:
The appendix attached to this letter contains the Jacobs Engineering summary of a site-specific cost estimate for thermal oxidation in the on-site boilers or an RTO. Also included are three RTO vendor quotes for other projects, which Jacobs used in developing the site-specific costs for the Palatka Mill.

G-P has applied this site-specific quote developed by Jacobs in recalculating the cost effectiveness. The revised cost effectiveness calculations are presented in Table B-2 attached. In the calculations, an equipment life of 10 years and 7% interest has been assumed, based on the OAQPS Cost Control Manual, Section 3.2, Chapter 2, Incinerators.

For both scenarios of controlling CO emissions with either the existing boilers or a new thermal oxidizer, G-P has determined the cost effectiveness to be greater than $5,000 per ton of CO removed. These costs are excessively high. Other recent BACT determinations for CO issued by the Department, with cost effectiveness values ranging between $2,500 and $4,400 per ton of CO removed, have been determined to be economically infeasible. Thus, G-P maintains that these add-on controls are not economically feasible, especially in light of the fact that no other bleach plant is known to have installed CO controls. Efficient bleaching operations remains as BACT for the No. 3 Bleach Plant.

The oxidizer location for any option must be downstream of an acid scrubber. The concentrations of chlorine compounds in the No. 3 Bleach Plant exhaust stream are much lower after the scrubber. Without scrubbing these compounds, conventional materials cannot withstand the corrosive attack of the acid gases. However, the existing scrubber on the No. 3 Bleach Plant has not been included in the cost estimates.

16. Request: *Please provide cost analysis in modifying (if required) the existing thermal oxidizer used for NCG's control to accommodate the bleach plant exhaust for CO control.*

Response:
The No. 3 Bleach Plant exhaust stream has a flow rate of approximately 15,000 cubic feet per minute (cfm). The volumetric flowrate of the existing thermal oxidizer used for non-condensible gas (NCG) control is approximately 12,000 cfm. The existing thermal oxidizer is completely loaded and cannot accept any additional gas streams. The thermal oxidizer uses a mist eliminator filter as a post-combustion control device to remove fine particles including sulfuric acid. This control system has a design flowrate of approximately 12,000 cfm. Thus, the mist eliminator filters would also be incapable of filtering the additional volumetric flow. As a result, the existing NCG thermal oxidizer is technically infeasible for oxidizing the No.3 Bleach Plant exhaust gases.

17. Request: *The BACT analysis refers to the removal of some VOC and HAPs with the control options selected for CO removal. Explain the reasons for not including the removal of VOC and HAPs in the cost effectiveness ($/ton) figure obtained for CO removal.*

Response:
Although considering the reduction of collateral pollutants, including toxic pollutants, is part of the BACT analysis, it is problematic to include such reductions in the cost effectiveness calculations. This is because the cost effectiveness for a particular project is compared to what has been determined to be unreasonable for other projects. As a result, the cost effectiveness for CO control

presented for G-P's project must be compared to other BACT determinations for CO. Including VOCs and toxic/hazardous pollutants in the cost effectiveness calculation makes it difficult to fairly compare projects. Furthermore, CO was the only pollutant that triggered PSD review for this project.

An updated estimate of HAP and VOC emissions from the No. 3 Bleach Plant is presented in Attachment GP-EU2-G8 attached. Two scenarios are presented: the first based on the maximum permitted production rate, and the second based on the expected actual production rate, as calculated above. As shown, expected VOC and HAP emissions are 9.8 and 49.9 TPY, respectively. The revised VOC emissions are based on a NCASI factor for total hydrocarbons using EPA Method 25A. This factor provides a more accurate estimate of VOC emissions based on the reference method for VOC. The previously used factor for VOC was based on summing the volatile organic HAP emissions for the No. 3 Bleach Plant.

The majority of HAP emissions are due to methanol. It is noted that the emission factor utilized for methanol is based on very limited NCASI data for bleaching with 100-percent chlorine dioxide (ClO_2) substitution, and therefore has a high degree of uncertainty. Actual emissions from the No. 3 Bleach Plant could be much lower.

18. Request: *EPA Air Pollution Control Cost Manual recommends using a flat 10 percent over the operations labor wage rate for maintenance labor costs. Table B-2 of the application indicates the maintenance labor cost to be twice the operating labor cost. Please explain the discrepancy.*

Response:
G-P has revised the referenced Table B-2 using a site-specific engineering estimate. The operating labor is estimated by assuming 1 hour per day for the Boiler option, and 3 hours per day for the RTO option.

The revised figures, presented in the attached Table B-2, apply two different methods to estimate the maintenance labor. For the Boiler option, the maintenance cost is estimated at twice the operating labor. The Boiler option maintenance includes inspecting the boiler interior nearest the No.3 Bleach Plant exhaust injection point. To conduct such a detailed inspection along with the external inspections of new fans and a demister, would require a significant amount of time. Thus, for the Boiler option, G-P assumed a total of 730 hours per year, which is equal to an average of 2 hours per day. In contrast, for the RTO option, G-P applied the conservative default recommendation of 10% of the operating labor.

19. Request: *Please explain the reasons for adding the cost of a new stack in Table B-2 using thermal oxidation or catalytic incineration when a stack already exists.*

Response:
Table B-2 included a new stack for exhaust from an oxidizer because it is the lowest cost option. The existing No.3 Bleach Plant scrubber stack sits adjacent to the bleaching equipment. For the hypothetical scenario of a stand-alone thermal/catalytic oxidizer, the new equipment requires more space than is available in the bleach plant area. A new oxidizer would be sited as close as possible, but no less than 700 feet away. The cost to return the post-control gas stream (i.e., an additional 700 feet back to the existing scrubber stack) is approximately $515,000. The cost for a new oxidizer stack

would be less than this amount. Thus, the lower cost option is to include the cost of a new stack, and not include additional piping to return the exhaust back to the existing stack.

20. Request: *In the original PSD permitting done in 1999, the purchased equipment cost for Regenerative Catalytic Oxidation providing 95% removal of CO emissions was given as $427,250. The same equipment cost for this modification is given to be $1,163,400. Please justify the increase of over $0.7M in a three-year period. Also, explain the reasons for not including the cost of gas conditioning equipment in the original project.*

Response:
The cost estimates cannot be directly compared for differences. The 1999 cost estimate only included oxidizer costs, and did not include piping from the bleach plant area, gas conditioning, and most other miscellaneous equipment. The 1999 estimate was very low in an attempt to predict a conservatively low cost effectiveness. Thus, the original cost estimate was sufficiently complete to demonstrate the economic infeasibility of controls without including all capital items. The enclosed cost estimate reflects all anticipated equipment, including a mist elimination system to protect against corrosive attack on the metallic components. The 1999 cost estimate was not detailed or site-specific enough to identify these protective requirements. However, the updated costs estimates attached demonstrate that CO oxidation is still economically infeasible.

The Department had also requested that G-P's previous response letter, addressing the first fifteen questions in the Department's letter, be sealed by a registered professional engineer. In order to comply with this request, the G-P response package is included in this submittal as an attachment.

Thank you for consideration of this information. Please call if you have any questions concerning this submittal.

Sincerely,

GOLDER ASSOCIATES INC.

David A. Buff

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

cc: M. Carpenter
M. Aguilar
S. Matchett
W. Jernigan

DB/jkw

Enclosures: Appendix

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cc: C. Kirts, NED
J. Little, EPA
J. Bunyak, NPS

Table B-2. Cost Effectiveness for Control of CO Emissions From ECF No. 3 Bleach Plant, Georgia-Pacific, Palatka FL (01/27/2003)

Cost Items	Cost Factors	Cost ($) Duct to Boiler	Cost ($) Thermal Ox
DIRECT CAPITAL COSTS (DCC):			
(1) Purchased Equipment Cost			
(a) Oxidizer/Air Injection Equip/Services	Based on On-site Engineering Estimate	2,491,934	3,299,584
(b) New Stack	included	0	0
(c) Ductwork and Electronic controls	included	0	0
(d) Structural Support	included	0	0
(f) Exhaust Fan	included	0	0
(g) Freight	included	0	0
(h) Sales Tax (Florida)	6%	149,516	197,975
(i) Instrumentation	included	0	0
(j) Subtotal - Purchased Equipment	included	2,641,450	3,497,559
(2) Direct Installation	included	0	0
Total DCC:		2,641,450	3,497,559
INDIRECT CAPITAL COSTS (ICC):			
(3) Indirect Installation Costs			
(a) Engineering	(0.10) x (PEC) (EPA Factor)	264,145	349,756
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(b) Working Capital	30-day DOC (EPA Factor)	19,230	20,210
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Labor (includes inspection of boiler)	2xOperating Labor for Boiler, 10% of operating labor for RTO	18,469	2,770
Materials	Equivalent to Maintenance Labor	18,469	2,770
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(c) Fuel Oil for recoup steam losses	3.52 MMBtu/hr $3.6/MMBtu (2002 actual average)	111,007	--
(4) Chemicals and Materials			
Ceramic Bed Replacement	Once per 8 yrs @ $100,000	--	12,500
Total DOC:	(1) + (2) + (3) + (4)	230,763	242,521
INDIRECT OPERATING COSTS (IOC):			
(7) Overhead	60% of oper. labor & maintenance (EPA Factor)	27,704	19,947
(8) Property Taxes	1% of total capital investment (EPA Factor)	40,606	53,715
(9) Insurance	1% of total capital investment (EPA Factor)	40,606	53,715
(10) Administration	2% of total capital investment (EPA Factor)	81,213	107,430
Total IOC:	(7) + (8) + (9) + (10)	190,129	234,806
CAPITAL RECOVERY COSTS (CRC):	CRF of 0.1424 times TCI (10 yrs @ 7%)	578,236	764,898
ANNUALIZED COSTS (AC):	DOC + IOC + CRF	999,129	1,242,225
UNCONTROLLED BASELINE CO EMISSIONS (TPY)		206	206
TOTAL CO REMOVED:	95% removal efficiency	195.7	195.7
COST EFFECTIVENESS:	$ per ton of CO Removed	5,105	6,348

Source: Georgia-Pacific Corp, 2003; Golder Associates Inc., 2003.

REVISIONS TO APPLICATION FORM

D. EMISSION POINT (STACK/VENT) INFORMATION
(Regulated Emissions Units Only)

Emission Point Description and Type

1. Identification of Point on Plot Plan or Flow Diagram? **Bleach Plant Alkaline Scrubber Stack**	2. Emission Point Type Code: **2**

3. Descriptions of Emission Points Comprising this Emissions Unit for VE Tracking (limit to 100 characters per point):

4. ID Numbers or Descriptions of Emission Units with this Emission Point in Common:

5. Discharge Type Code: **V**	6. Stack Height: **118** feet	7. Exit Diameter: **3.5** feet
8. Exit Temperature: **130-145** °F	9. Actual Volumetric Flow Rate: **16,000** acfm	10. Water Vapor: **5-10** %

11. Maximum Dry Standard Flow Rate: **13,500** dscfm	12. Nonstack Emission Point Height: feet

13. Emission Point UTM Coordinates:

Zone: East (km): North (km):

14. Emission Point Comment (limit to 200 characters):

Values representative of scrubber exhaust stack. Based on October 2002 testing. Exit temperature and actual volumetric flow rate values are constantly changing with ambient conditions.

Emissions Unit Information Section 1 of 1 **No. 3 Bleach Plant**

Pollutant Detail Information Page 1 of 6 **Volatile Organic Compounds**

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units -
Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: **VOC**

2. Total Percent Efficiency of Control:

3. Potential Emissions: **3.7** **lbs/hr** **15.28** tons/year

4. Synthetically Limited? [**X**]

5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 ______ to ______ tons/year

6. Emission Factor:

Reference: **NCASI**

7. Emissions Method Code: **5**

8. Calculation of Emissions (limit to 600 characters):

See Attachment GP-EU1-G8.

9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters):

VOCs are from bleach plant alkaline wet scrubber.

Allowable Emissions Allowable Emissions ______ of ______

1. Basis for Allowable Emissions Code:

2. Future Effective Date of Allowable Emissions:

3. Requested Allowable Emissions and Units:

4. Equivalent Allowable Emissions: lbs/hour tons/year

5. Method of Compliance (limit to 60 characters):

6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):

Emissions Unit Information Section 1 of 1 **No. 3 Bleach Plant**

Pollutant Detail Information Page 2 of 6 **Total Hazardous Air Pollutants**

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units - Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: **HAPS**

2. Total Percent Efficiency of Control:

3. Potential Emissions: **18.9 lbs/hr** **77.6** tons/year

4. Synthetically Limited? [X]

5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 ______ to ______ tons/year

6. Emission Factor:
Reference: **Manuf. Info & NCASI**

7. Emissions Method Code: **5**

8. Calculation of Emissions (limit to 600 characters):

See Attachment GP-EU1-G8.

9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters):

Allowable Emissions Allowable Emissions ______ of ______

1. Basis for Allowable Emissions Code:

2. Future Effective Date of Allowable Emissions:

3. Requested Allowable Emissions and Units:

4. Equivalent Allowable Emissions:
lbs/hour tons/year

5. Method of Compliance (limit to 60 characters):

6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units - Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: **H115-Methanol**
2. Total Percent Efficiency of Control:
3. Potential Emissions: **17.4** **lbs/hr** **71.5** tons/year
4. Synthetically Limited? [**X**]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 ______ to ______ tons/year
6. Emission Factor:
   Reference: **NCASI**
7. Emissions Method Code: **5**
8. Calculation of Emissions (limit to 600 characters):

   See Attachment GP-EU1-G8.

9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters):

Allowable Emissions Allowable Emissions ______ of ______

1. Basis for Allowable Emissions Code:
2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units:
4. Equivalent Allowable Emissions:
   lbs/hour tons/year
5. Method of Compliance (limit to 60 characters):
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):

Emissions Unit Information Section 1 of 1 **No. 3 Bleach Plant**

Pollutant Detail Information Page 4 of 6 **Chloroform**

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units - Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: **H043-Chloroform**

2. Total Percent Efficiency of Control:

3. Potential Emissions: **0.49** **lbs/hr** **2.02** tons/year

4. Synthetically Limited? [**X**]

5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 ______ to ______ tons/year

6. Emission Factor:

   Reference: **NCASI**

7. Emissions Method Code: **5**

8. Calculation of Emissions (limit to 600 characters):

   See Attachment GP-EU1-G8.

9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters):

Allowable Emissions

Allowable Emissions ______ of ______

1. Basis for Allowable Emissions Code:

2. Future Effective Date of Allowable Emissions:

3. Requested Allowable Emissions and Units:

4. Equivalent Allowable Emissions: lbs/hour tons/year

5. Method of Compliance (limit to 60 characters):

6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units - Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: **CO**
2. Total Percent Efficiency of Control:
3. Potential Emissions: **100** **lbs/hr** **324** tons/year
4. Synthetically Limited? [**X**]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 ______ to ______ tons/year
6. Emission Factor: **1.68 lbs/ADTBP (100% softwood factor)**
   Reference: **See Attachment A**
7. Emissions Method Code: **0**
8. Calculation of Emissions (limit to 600 characters):

   See Table 2-1 for presentation of emission rates. Detailed calculations provided in Appendix A to Attachment A.
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters):

Allowable Emissions Allowable Emissions 1 of 1

1. Basis for Allowable Emissions Code: **OTHER**
2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units: **324 TPY**
4. Equivalent Allowable Emissions: **100** lbs/hour **324** tons/year
5. Method of Compliance (limit to 60 characters):

   EPA Method 10
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):

   See Attachment A.

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units - Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: **H038-Chlorine**	2. Total Percent Efficiency of Control:
3. Potential Emissions: **0.8** **lbs/hr** **3.3** tons/year	4. Synthetically Limited? [X]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 ______ to ______ tons/year	
6. Emission Factor: **10 ppmvd** Reference: **Permit No. 1070005-006-AC**	7. Emissions Method Code: **0**
8. Calculation of Emissions (limit to 600 characters): **See Attachment GP-EU1-G8.**	
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters):	

Allowable Emissions Allowable Emissions 1 of 1

1. Basis for Allowable Emissions Code: **RULE**	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units: **10 ppmvd**	4. Equivalent Allowable Emissions: **0.8** lbs/hour **3.3** tons/year
5. Method of Compliance (limit to 60 characters): **Initial compliance testing by EPA Method 26A.**	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters): **Permit No. 1070005-006-AC and 40 CFR 63, Subpart S.**	

Attachment GP-EU2-G8. Estimated HAP and VOC Emissions From the No. 3 Bleach Plant, Georgia-Pacific, Palatka (revised 01/27/03)

Pollutant Name	HAP?	Avg Factor (lb/ADTBP) (a)	Maximum ADTBP/hr (b)	Maximum ADTBP/yr (b)	Actual ADTBP/yr (c)	Maximum Hourly Emissions (lb/hr)	Maximum Annual Emissions (TPY)	Actual Annual Emissions (TPY)
Acetaldehyde	YES	ND	--	--	--	--	--	--
Benzene	YES	1.80E-04	60.0	492,750	317,557	0.011	0.04	0.03
Carbon Tetrachloride	YES	ND	--	--	--	--	--	--
Chlorine (d)	YES	0.0133	60.0	492,750	317,557	0.800	3.29	2.12
Chlorine Dioxide (e)	NO	0.0380	60.0	492,750	317,557	2.283	9.37	6.04
Chlorobenzene	YES	2.10E-04	60.0	492,750	317,557	0.013	0.05	0.03
Chloroform (f)	YES	8.19E-03	60.0	492,750	317,557	0.491	2.02	1.30
1,2-Dichloroethane (Ethylene Dichloride)	YES	ND	--	--	--	--	--	--
Dimethyl Sulfide	NO	ND	--	--	--	--	--	--
Formaldehyde (g)	YES	ND	--	--	--	--	--	--
Methanol	YES	2.90E-01	60.0	492,750	317,557	17.40	71.45	46.05
Methyl Ethyl Ketone	YES	6.70E-04	60.0	492,750	317,557	0.040	0.17	0.11
Methyl Isobutyl Ketone	YES	4.50E-04	60.0	492,750	317,557	0.027	0.11	0.07
Methyl Mercaptan	NO	3.80E-02	60.0	492,750	317,557	2.280	9.36	6.03
Methylene Chloride	YES	ND	--	--	--	--	--	--
Alpha-Pinene	NO	4.70E-04	60.0	492,750	317,557	0.028	0.12	0.07
Beta-Pinene	NO	2.20E-04	60.0	492,750	317,557	0.013	0.05	0.03
Styrene	YES	3.50E-04	60.0	492,750	317,557	0.021	0.09	0.06
Tetrachloroethyene	YES	ND	--	--	--	--	--	--
Toluene	YES	1.70E-04	60.0	492,750	317,557	0.010	0.04	0.03
1,2,4-Trichlorobenzene	YES	5.00E-04	60.0	492,750	317,557	0.030	0.12	0.08
1,1,1-Trichloroethane (Methyl Chloroform)	YES	ND	--	--	--	--	--	--
1,1,2-Trichloroethane	YES	ND	--	--	--	--	--	--
Trichloroethylene	YES	ND	--	--	--	--	--	--
M&P-Xylene	YES	4.80E-04	60.0	492,750	317,557	0.029	0.12	0.08
O-Xylene	YES	2.70E-04	60.0	492,750	317,557	0.016	0.07	0.04
TOTAL HAPS					Total HAPs =	18.89	77.56	49.98
Total Hydrocarbons (Method 25A)		0.062	60.0	492,750	317,557	3.720	15.28	9.84

ND = Non Detectable
ADTBP = Air Dried Tons of Bleached Pulp
ODTBP = Oven Dried Tons of Bleached Pulp
lb/hr = pounds per hour
TPY = tons per year

Footnotes:

(a) All emission factors (except chlorine, chlorine dioxide, chloroform and formaldehdye) based on data in NCASI Technical Bulletin No. 701: Compilation of Air Toxic and Total Hydrocarbon Emissions Data for Sources at Chemical Wood Pulp Mills. Mill codes BPF and BPME1 are most representative of the proposed ECF bleach plant at Georgia Pacific's Palatka mill. If values were given for both mill codes, then the values were averaged. Non-detectable limits not used.

(b) Maximum hourly based on 1,440 ADTBP/day. Maximum annual based on a production rate of 1,350 ADTBP times 365 days/yr.

(c) Based on actual annual production rate for 1999.

(d) Based on Permit No. 1070005-006-AC, Specific Condition 7.(a), 10 ppmvd limit for chlorinated HAPs (as chlorine) and flow rate of 13,500 dscfm, equal to 0.75 lb/hr. Then divide by 1,350 ADTBP per day (56.25 ADTBP/hr).

(e) Based on design information provided by scrubber manufacturer. Factor based on 1,350 ADTBP/day and 214.25 lb/hr uncontrolled chlorine dioxide and 99% scrubber removal efficiency.

(f) Based on data in NCASI Technical Bulletin No. 679: Volatile Organic Emissions From Pulp and Paper Mill Sources, Part V - Kraft Mill Bleach Plants. Mill Code E "c" Line is most representative of the proposed ECF bleach plant at Georgia Pacific's Palatka mill. Chloroform emission factor converted to lb/ADTBP using the following formula: 9.1 e-3 lb/ODTBP * (0.90 ODTBP/ADTBP) = 8.19 e-3 lb/ADTBP.

(g) Based on data in NCASI Technical Bulletin No. 701: Compilation of Air Toxic and Total Hydrocarbon Emissions Data for Sources at Chemical Wood Pulp Mills. Formaldehyde data based on Mill Code BPMN.

JACOBS ENGINEERING QUOTE

JE JACOBS

1041 East Butler Road (29607)
Post Office Box 5456
Greenville, SC 29606-5456
864-676-6000 FAX 864-676-6368

January 27, 2003

Ms. Elizabeth Sellers
Georgia-Pacific
John Campbell Highway 216
Palatka, Florida 32177

Re: Georgia-Pacific
Palatka, Florida
Jacobs Job No. 16AZ1380
Study of Thermal Oxidation of
Bleach Plant Scrubber Vent CO

Dear Beth:

As requested by Georgia-Pacific, we have studied the potential options for controlling the carbon monoxide, CO, discharged from the No. 3 Bleach Plant Scrubber at Palatka, Florida and have prepared budgetary estimates (P-1) for two options. After analysis as described below, the selected two options were identified as follows:

Option 1: Incinerate the gases in the No. 5 Power Boiler and use the No. 4 Combination Boiler as a backup.

Option 2: Incinerate the gases in a new Regenerative Thermal Oxidizer (RTO).

Jacobs visited the mill to gather data and obtain information, which has been used as the basis for the option evaluations and cost estimates. The accuracy of the estimates is consistent with the P-1 requirement.

Option Analysis

Test results of Georgia-Pacific's Palatka, FL mill show that it's No. 3 Bleach Plant scrubber discharge is approximately 15,500 ACFM at 130^{0}F, saturated. This discharge has CO as one of its constituents. The recommended design flow rate is 16,000 ACFM at 150°F. The dry gas is primarily air.

The mill has seven existing units that are thermal oxidation devices. The following chart summarizes their potential utilization to control CO emissions:

Existing Thermal Oxidation Device	Comments	Uptime
No. 5 Power Boiler	Good average steam load to accommodate bleach plant gas stream. Furnace is positive pressure, allowing furnace gas leaks, which is less desirable with CO gas stream incineration. Good air heater exit gas temperature @ 400 Deg. F.	94.5%
No. 4 Combination Boiler	Good average steam load to accommodate bleach plant gas stream. Bark firing on grate can produce inconsistent furnace conditions and less than ideal CO gas stream oxidation. Good air heater exit gas temperature @ 400 Deg. F.	94.5%
No. 4 Recovery Boiler	Chlorides in bleach plant gas stream will lower chemical ash melting temperature, increasing plugging of superheater and boiler bank.	95%
New Thermal Oxidizer (Installed 2002)	Does not have adequate capacity for volume of gas from bleach plant scrubber	(Not Applicable)
No. 4 Package Boiler	A standby unit. Does not have necessary uptime.	<50%
No. 6 Package Boiler	A rental standby unit. Does not have necessary uptime.	<50%
Lime Kiln	Lime Kiln does not have capacity for additional air.	

From the above choices, there are several devices, which are not technically feasible. The recovery boiler has potential operational issues that need to be avoided (e.g., reaction and conversion of recovery products beyond design of recovery system). In addition, the last four units in the chart are not acceptable.

In contrast, the No. 5 Power Boiler is the best oxidation device option. The No. 4 Combination Boiler is a second choice or could serve as a backup as in Option 1. The power boiler should be able to provide very good oxidation of CO. However, in a furnace of the power boiler's size, there can be some CO at the furnace outlet, which may interfere with identifying oxidation of the bleach plant's CO. By combining the two boilers, the uptime is at least 98%, as either boiler is typically operating. The limiting factor for uptime is the operating condition of low steam demand, and thus low-fuel usage rates. These low-load conditions limit the amount of additional air, such as the bleach plant stream, that can be added. Destruction efficiency of CO from the Bleach Plant Scrubber Vent stream for both the Power Boiler and Combination Boiler would be approximately 95%.

Besides using existing thermal oxidation devices for the bleach plant gas stream, a new unit can be installed. For this application, an RTO is recommended. It will have approximately 98% uptime. If additional uptime is needed, a second RTO may be considered. Destruction efficiency of CO is guaranteed at 95%.

For the estimate, we will consider two alternates, the No. 5 Power Boiler backed up by the No. 4 Combination Boiler and an RTO without a backup device. Deciding the merits of a backup unit (either alternate) will be part of the BACT analysis.

Cost Summary

Our cost estimates for the two defined options are shown below. These costs are direct costs, which include labor, equipment and materials only without any contingency allowance. Indirect costs are also not included.

Option 1 Direct Cost	$2,491,934
Option 2 Direct Cost	$3,299,584

Utilities Requirements

	Option 1	Option 2
Fuel	3.52 MM Btu/hr of Fuel Oil	1.56 MM Btu of Natural Gas
Steam	300 pph of 50 psig steam	0
Electric Power	112 kW	201 kW

The scope, for the two options reflected in the Direct Costs above, is described as follows. Collection and transport is common to both options.

Collection and Transport of Gases

The No. 3 Bleach Plant scrubber exhaust gases will be ducted to the CO thermal oxidation device by tying a duct into the bleach plant scrubber stack. There will be a damper that isolates the stack and a damper that isolates the duct to the oxidizer. This arrangement allows startup of the scrubber through the existing stack initially, before transporting the gases through the new duct.

The new duct will be routed either to an area under the No. 4 Combination Boiler precipitator for oxidation in the No. 5 Power Boiler, or across the effluent channel to the area of the existing oxygen storage facility for oxidation in an RTO.

Power Boiler (Option 1)

The transport duct will feed a mist eliminator followed by a constant speed motor driven fan. A steam coil air heater follows the fan and will elevate the gas temperature enough to avoid condensation on existing metal surfaces at the No. 5 Power Boiler. A tee after the heater will allow the gases to either vent to atmosphere or continue to the boiler. The vent will only be used on startup for proving proper operation. The tee will have a damper on its vent leg and on its downstream leg. If both the power boiler and combination boiler will be used as thermal oxidation devices, with the combination boiler as a backup, the duct split to feed either boiler will be located after the vent tee.

Leaving the fan and steam heater location, the duct will be routed around the boiler building to the No. 5 Power Boiler where it will be fed into the combustion air duct between the air heater and the burner windbox. There will be a perforated distribution header added inside the existing combustion air duct.

The No. 4 Combination Boiler is used to back up the power boiler. For this, the line to the combination boiler will feed the gas into the undergrate air plenum. This must be done at the ground floor, which has minimal headroom, so the duct will transition to a shallow rectangular section. It will enter the undergrate plenum near the rear of the grate and have an internal perforated distribution header. Control of the fan, heater and injection will be by the boiler operators.

Regenerative Thermal Oxidizer (Option 2)

The transport duct will feed a mist eliminator followed by a constant speed motor driven fan. A tee after the fan will allow the gases to either vent to atmosphere or continue to the RTO. The vent will only be used on startup or during an upset condition. The tee will have a damper on its vent leg and on its downstream leg. The RTO system will include a valveless style unit equipped with a variable speed motor driven I.D. fan, combustion fan, and stack. A propane fuel system will be included as a back up to natural gas.

Structural

All new equipment will be supported at grade on either concrete slabs on grade or on concrete foundation mats supported on piling. Pipe support will be provided at 20 foot spacing on existing pipe bridges and within existing buildings along routes provided by the piping engineer. Existing pipe bridges will be modified as needed to support the vent gas piping. Steel has been included for fan and air heater access platforms. For the RTO option, mat foundations and piling have been included for all equipment at grade.

Piping

The estimator made piping material take-offs using the block flow diagrams and the overall site layout drawings developed for this project. The piping estimate was developed using overall lengths of pipe runs and applying a factor based on a cost per diameter inch of pipe per foot. For this phase of the estimate Fiberglass pipe was used for gas transmission lines from the scrubber to the incineration point. Schedule 40 Carbon Steel was used for all steam and steam condensate lines and natural gas lines. The estimate included all above ground process piping. Piping designed by other departments or other vendors was excluded.

A visit to the jobsite was made to establish the scope definition, and to meet with the client to establish approximate tie-in locations, locations of utility bridges, interface with other design groups and/or vendors for space availability, etc.

Instrumentation

Allowances for instrumentation and controls are based on an estimated loop count for the gas transport system and for any additional loops needed for the RTO options. Allowances for DCS additions or upgrades are added as a line item in the estimate as needed for the particular option.

Electrical

Power Boiler Option for Total Oxidation

The new 200 hp fan motor required for transport of the vent gas to incineration in the Power Boiler is a 4160 volt motor. A new starter is included for the new fan motor. Instrument wiring is included for the new loops. No electrical heat tracing is included.

RTO Option for Total Oxidation

The new 200 hp fan motor required for transport of the vent gas to incineration in the RTO is a 4160 volt motor. All other motors required for the RTO are 460 volt motors. New starters are included for the new motors. New electrical equipment will be located in existing facilities and in the RTO facility. Instrument wiring is included for the new loops from the RTO to the existing DCS. No electrical heat tracing is included.

We trust this evaluation and the cost estimates meet your requirements and thank you for this opportunity to assist Georgia-Pacific.

Sincerely.

James R. Uz

James R. Uz
Project Manager

Distribution

G-P
Eric Allen
Mark Aguilar
Mike Evans
Jeff Brown

Jacobs
John Rickard
James Cantrell
Tod Flathmann

Golder Associates
David A. Buff

TOTAL COST SUMMARY - JE PRIME CODE

JOB: ESTIMATE 1 - BLEACH PLANT SCRUBBER DISCHARGE TO POWER BOILER
CLIENT: GEORGIA PACIFIC
LOCATION: PALATKA, FLORIDA
JOB NUMBER: 16AZ1380
CONSTRUCTION DURATION: TBD
ESTIMATE TYPE: +/- 25%
G:\ESTIMATI\GEORPAC\HVLC STUDIES\PALATKA, FLORIDA\16AZ1380\[EMAIL_Bleach Plant Scrubber Disch to Power Boiler_R1.xls]PRIME CODE TCS

ESTIMATE DATE: 01/17/03
REVISION: 1
ESTIMATED BY: MICHAEL WATSON
CHECKED BY:
EST. FILE #: 02052

PRIME CODE	DESCRIPTION	W-H	QTY	UNIT	LABOR	EQUIPMENT	MATERIAL	SUBCONTRACT	TOTAL COST
	DIRECT COSTS								
50	MAJOR EQUIPMENT	300	0	0	$12,313	$133,282	$3,235	$0	$148,830
51	DEMOLITION	0	0	0	$0	$0	$0	$50,000	$50,000
52	SITE EARTHMOVING	0	0	0	$0	$0	$0	$0	$0
53	SITE IMPROVEMENTS	0	0	0	$0	$0	$0	$0	$0
54	PILING, CAISSONS	0	0	LF	$0	$0	$0	$0	$0
55	BUILDINGS	0	1	LOT	$0	$0	$0	$0	$0
56	CONCRETE	787	53	CY	$24,755	$0	$11,191	$0	$35,945
57	MASONRY, REFRACTORY	0	0	0	$0	$0	$0	$0	$0
58	STRUCTURAL STEEL	900	22	TN	$32,093	$0	$55,525	$2,700	$90,318
59	ROOFING AND SIDING	0	0	0	$0	$0	$0	$0	$0
60	FIRE PROOFING	0	0	0	$0	$0	$0	$0	$0
61	PROCESS DUCTWORK (NON-BUILDING)	0	0	0	$0	$0	$0	$0	$0
62	PIPING	13,687	1,560	LF	$561,190	$0	$582,879	$0	$1,144,069
63	INSULATION - PIPE, EQUIPMENT & DUCTWORK	0	0	0	$0	$0	$0	$3,900	$3,900
64	INSTRUMENTATION	680	0	0	$27,879	$300,000	$0	$0	$327,879
65	ELECTRICAL	832	5,297	LF	$34,111	$134,150	$13,671	$0	$181,932
66	PAINTING, PROTECTIVE COATINGS	0	0	0	$0	$0	$0	$15,000	$15,000
67	FURNITURE, LAB & SHOP EQUIPMENT	0	0	0	$0	$0	$0	$0	$0
75	CONSTRUCTION SERVICE LABOR	3,437	0	0	$122,686	$0	$0	$0	$122,686
	TOTAL DIRECT COSTS	20,623			$815,026	$567,432	$666,501	$71,600	$2,120,559

TOTAL COST SUMMARY - JE PRIME CODE

JOB: ESTIMATE 1A - ADDER FOR BLEACH PLANT SCRUBBER DISCHARGE TO POWER & COMBINATION BOILER
CLIENT: GEORGIA PACIFIC
LOCATION: PALATKA, FLORIDA
JOB NUMBER: 16AZ1380
CONSTRUCTION DURATION: TBD
ESTIMATE TYPE: +/- 25%
G:\ESTIMATI\GEORPAC\HVLC STUDIES\PALATKA, FLORIDA\16AZ1380\[EMAIL_Bleach Plant Scrubber Disch to Power & Combination Boilers_R0.xls]PRIME CODE TCS

ESTIMATE DATE: 01/16/03
REVISION: 0
ESTIMATED BY: MICHAEL WATSON
CHECKED BY:
EST. FILE #: 02052

PRIME CODE	DESCRIPTION	W-H	QTY	UNIT	LABOR	EQUIPMENT	MATERIAL	SUBCONTRACT	TOTAL COST
	DIRECT COSTS								
50	MAJOR EQUIPMENT	0	0	0	$0	$0	$0	$0	$0
51	DEMOLITION	0	0	0	$0	$0	$0	$50,000	$50,000
52	SITE EARTHMOVING	0	0	0	$0	$0	$0	$0	$0
53	SITE IMPROVEMENTS	0	0	0	$0	$0	$0	$0	$0
54	PILING, CAISSONS	0	0	LF	$0	$0	$0	$0	$0
55	BUILDINGS	0	1	LOT	$0	$0	$0	$0	$0
56	CONCRETE	0	0	CY	$0	$0	$0	$0	$0
57	MASONRY, REFRACTORY	0	0	0	$0	$0	$0	$0	$0
58	STRUCTURAL STEEL	47	1	TN	$1,684	$0	$2,913	$0	$4,598
59	ROOFING AND SIDING	0	0	0	$0	$0	$0	$0	$0
60	FIRE PROOFING	0	0	0	$0	$0	$0	$0	$0
61	PROCESS DUCTWORK (NON-BUILDING)	0	0	0	$0	$0	$0	$0	$0
62	PIPING	1,410	102	LF	$57,814	$0	$70,200	$0	$128,014
63	INSULATION - PIPE, EQUIPMENT & DUCTWORK	0	0	0	$0	$0	$0	$1,000	$1,000
64	INSTRUMENTATION	480	0	0	$19,679	$150,000	$0	$0	$169,679
65	ELECTRICAL	40	216	LF	$1,640	$0	$329	$0	$1,969
66	PAINTING, PROTECTIVE COATINGS	0	0	0	$0	$0	$0	$2,000	$2,000
67	FURNITURE, LAB & SHOP EQUIPMENT	0	0	0	$0	$0	$0	$0	$0
75	CONSTRUCTION SERVICE LABOR	395	0	0	$14,115	$0	$0	$0	$14,115
	TOTAL DIRECT COSTS	2,373			$94,932	$150,000	$73,442	$53,000	$371,375

TOTAL COST SUMMARY - JE PRIME CODE

JOB: ESTIMATE 2 - BLEACH PLANT SCRUBBER DISCHARGE TO RTO
CLIENT: GEORGIA PACIFIC
LOCATION: PALATKA, FLORIDA
JOB NUMBER: 16AZ1380
CONSTRUCTION DURATION: TBD
ESTIMATE TYPE: +/- 25%
G:\ESTIMATI\GEORPAC\HVLC STUDIES\PALATKA, FLORIDA\16AZ1380\[EMAIL_Bleach Plant Scrubber Disch to RTO_R2.xls]PRIME CODE TCS

ESTIMATE DATE: 01/27/03
REVISION: 2
ESTIMATED BY: MICHAEL WATSON
CHECKED BY:
EST. FILE #: 02052

PRIME CODE	DESCRIPTION	W-H	QTY	UNIT	LABOR	EQUIPMENT	MATERIAL	SUBCONTRACT	TOTAL COST
	DIRECT COSTS								
50	MAJOR EQUIPMENT	888	0	0	$36,423	$287,782	$6,985	$1,356,000	$1,687,190
51	DEMOLITION	0	0	0	$0	$0	$0	$50,000	$50,000
52	SITE EARTHMOVING	0	0	0	$0	$0	$0	$0	$0
53	SITE IMPROVEMENTS	0	0	0	$0	$0	$0	$5,000	$5,000
54	PILING, CAISSONS	0	0	LF	$0	$0	$0	$60,000	$60,000
55	BUILDINGS	0	1	LOT	$0	$0	$0	$0	$0
56	CONCRETE	1,357	200	CY	$42,661	$0	$29,995	$0	$72,656
57	MASONRY, REFRACTORY	0	0	0	$0	$0	$0	$0	$0
58	STRUCTURAL STEEL	755	18	TN	$26,950	$0	$46,616	$2,700	$76,265
59	ROOFING AND SIDING	0	0	0	$0	$0	$0	$0	$0
60	FIRE PROOFING	0	0	0	$0	$0	$0	$0	$0
61	PROCESS DUCTWORK (NON-BUILDING)	0	0	0	$0	$0	$0	$0	$0
62	PIPING	10,442	1,960	LF	$428,141	$0	$444,516	$0	$872,657
63	INSULATION - PIPE, EQUIPMENT & DUCTWORK	0	0	0	$0	$0	$0	$500	$500
64	INSTRUMENTATION	680	0	0	$27,879	$200,000	$0	$0	$227,879
65	ELECTRICAL	1,307	7,358	LF	$53,585	$36,450	$32,256	$0	$122,291
66	PAINTING, PROTECTIVE COATINGS	0	0	0	$0	$0	$0	$15,000	$15,000
67	FURNITURE, LAB & SHOP EQUIPMENT	0	0	0	$0	$0	$0	$0	$0
75	CONSTRUCTION SERVICE LABOR	3,086	0	0	$110,146	$0	$0	$0	$110,146
	TOTAL DIRECT COSTS	18,515			$725,784	$524,232	$560,368	$1,489,200	$3,299,584

RTO VENDOR QUOTES

MEGTEC Systems
830 Prosper Road
P.O. Box 5030
De Pere, WI 54115-5030

920/336-5715

CLEANSWITCH™ -100-90
REGENERATIVE THERMAL OXIDIZER

Proposal Number 114973A

Prepared For:

Mr. Bruce Payne
Georgia Pacific Corporation
133 Peachtree Street NE
Atlanta, GA 30303

Mr. Pat Braud
Naheola Mill
7530 Highway 114
Pennington, AL 36916

By: Lisa Mencheski
Inside Sales Representative
Industrial and Emission Control Products

March 20, 2002

A unit of Sequa Corporation

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Dear Gentlemen:

Thank you for considering MEGTEC Systems as your solution to your abatement requirements. I look forward to assisting you in your upcoming projects. I am forwarding you this package of information detailing MEGTEC's product offerings. Included in this package is a book *The Clean Air Compliance Handbook* that may be used for your reference.

MEGTEC Systems continually strives to build upon our reputation as a leading oxidizer manufacturer for VOC emission control. The statement "The Bottom Line is Process Knowledge" summarizes our core focus. We work to fully understand your process and how our equipment is to be integrated with your facility.

MEGTEC Systems differentiates itself from the competition through experience, innovation, product offerings, in-house fabrication and service.

Experience – Since 1971, MEGTEC Systems has been building oxidation systems, and has over 2,000 systems in operation worldwide. With installations in about every industry, our knowledge base is confidently applied to your specific application.

Innovation – MEGTEC Systems continually researches ways to offer abatement solutions. Our in-house Research & Development Department is dedicated to developing the latest technologies in oxidation with practical designs to meet challenging applications.

Product offerings – MEGTEC Systems offers the widest selection of abatement designs that can be tailored to meet your specific needs. Whether it's adsorption, thermal, recuperative, regenerative or catalytic, we have your solution.

In-house fabrication - MEGTEC Systems engineers and builds your equipment at our headquarters in DePere, WI. Our 250,000 ft^2 shop is equipped with the latest fabrication tools. Implementation of 6sigma quality program throughout engineering and fabrication assures your complete satisfaction.

Service - MEGTEC Systems has a manned 24/7/365 emergency parts and service assistance with 13 regional service centers located across the country and in Canada. Modem connection allows remote diagnostics of your equipment. Along with a $5 million revolving spare parts inventory, we have fifty (50) service representatives throughout North America.

I look forward to working with you and would like to offer my assistance in any way that I can. In the mean time, feel free to contact me with any comments or questions that you may have.

Respectfully yours,

Wade S. Klos
MEGTEC Systems
Account Executive
920-337-1505
wklos@megtec.com

cc: ROD, LMM Inside Sales Representative - MEGTEC Systems

PRICE, TERMS, DELIVERY AND WARRANTY

PRICE

	Pricing
One (1) 10,000 SCFM CLEANSWITCH™ Regenerative Thermal Oxidizer	$560,900
Level 1 Spare Parts	$1,900
Level 2 Spare Parts	$4,700
Freight	$9,100
Installation Supervision	$8,500
Start-up	$14,700
Training	$4,200
Total	**$604,000**

All prices are FOB Pennington, AL and are valid for 60 days.

TERMS

Purchase orders should be made out to MEGTEC Systems.

30% with purchase order
30% 60 days prior to shipment
30% upon notification of shipment
10% 30 days after shipment

CONDITIONS OF SALE

"The conditions of sale under date of July 15, 1999 shall constitute a part of this proposal and are incorporated herein by reference as if fully set forth herein."

DELIVERY

This equipment can be manufactured and ready for shipment 16-18 weeks from the receipt of your purchase order and down payment.

CONSTRUCTION TIME ON SITE

This equipment would require five (5) days for mechanical and electrical installation.

PRICE, TERMS, DELIVERY, AND WARRANTY

PRODUCT WARRANTY

Equipment sold and commissioned by a MEGTEC Systems representative will be warranted for a period of one (1) year from the date of commissioning; startup not to exceed one hundred eighty (180) days from the date of shipment. This warranty will provide service for one (1) year to repair or replace warranted parts at no charge for labor or material. Only incurred airfare, car rental, living expenses (food and lodging) and overtime premiums (the difference between the applicable overtime rate and the standard straight time rate) will be billed to the customer.

Warranty service means remedying any defects in workmanship and material found in the equipment.

Expendable parts will not be included under warranty.

For further data, see the MEGTEC Systems' Terms and Conditions sheet.

UPTIME

The MEGTEC Systems ENTERPRISE II® oxidizer system we are quoting for this project is the latest generation of regenerative oxidizers supplied by MEGTEC Systems. The design of this unit includes engineering and manufacturing practices we have developed over our 30-year history of building oxidation systems for outdoor industrial installations. Our goal is to have 24 hours, 7 days a week trouble free operation. To the extent that we do not meet this goal we have a commitment to our customer to react as fast as possible to get our equipment operational after any unanticipated fault or failure. In addition, we provide several options for preventative maintenance services to avoid any unforeseen problems.

PROCESS CONDITIONS

The **CLEANSWITCH™** Regenerative Thermal Oxidation System is designed to operate with the following pulp and paper process.

Design Criteria

Process:	Naheola Mill
Process Lines:	Chemiwasher, Knotters, Screens and Filtrate Tanks
Process Volume:	9,000 SCFM
Process Temperature:	120° - 160° F
Process Solvent:	Primarily acetone; Exhaust also contains sulfide compounds
Solvent Concentration:	17.4 lbs/hr – total hydrocarbon and sulfide loading

EQUIPMENT RECOMMENDATION

MEGTEC Systems proposes a CLEANSWITCH™ Regenerative Thermal Oxidizer to meet your pollution control needs.

The CLEANSWITCH™ Regenerative Thermal Oxidizer System provides destruction of Volatile Organic Compounds (VOC's) and odor control. It combines high temperature thermal oxidation with a regenerative heat exchange to efficiently convert VOC's and other odor causing organic compounds to carbon dioxide and water vapor.

The CLEANSWITCH™ consists of two (2) energy recovery columns connected by a high temperature combustion chamber. The unit is internally lined with ceramic fiber insulation.

Flow is directed through the unit by a single valve such where one column is in a gas-heating (inlet) mode and the other column is in a gas-cooling (outlet) mode. The single switch valve incorporates a sealing system to ensure no bypass or leakage of process gas to clean exhaust gas.

VOC-laden air enters the oxidizer through the inlet manifold and is fed into the base of column A, where it passes vertically up through ceramic heat exchange media and is preheated almost to the combustion chamber temperature. The burner in the combustion chamber raises the air temperature to the operating set point where the oxidation process, which started in the ceramic media, is completed. Hot purified air then enters column B and passes vertically down through the ceramic media and is cooled before being exhausted to atmosphere.

EQUIPMENT SIZE

• Length	382 inches
• Width	104 inches
• Height	195 inches
• Weight (approx.)	63,000 lbs.
• Packing weight	18,200 lbs.

Also refer to General Arrangement Drawing #114973-0104

EXTERIOR APPEARANCE OF UNIT

Exterior will be painted #15 charcoal.

EQUIPMENT SPECIFICATIONS

• Maximum air flow:	10,000 scfm
• Maximum solvent capacity:	2,160,000 Btu/hr
	174 lbs/hr solvent[1]
• Maximum Process Inlet Temperature:	150° F
• Natural gas @ 5 psi with 1,000 Btu/ft^3 ± ¼ psig	1,675 CFH
• Air required	@ 80-100 psig, -40°F dew point, 5 CFM
• Voltage:	460v/3Φ/60hz
• Electrical service required at:	211 KVA
• Oxidizer differential pressure drop at design conditions	14 inches

[1] Solvent heat value of 12,400 BTU/lb.

OPERATING COSTS

Process Exhaust Parameters				Energy Consumption		Flow to Stack	
Flow Rate [scfm]	Inlet Temp. [°F]	Water Concentration [% by volume]	Solvent Load [lbs/hr]	Fuel [MMBtu/hr]	Electrical [KW]	Flow Rate [scfm]	Stack Temp. [°F]
8,941	140	20	17	2.2	48.0	9,237	372
8,941	140	0	17	2.1	48.0	–	–
3,750	140	0	0	0.58	8.0	–	–

Operating Costs are based on:

- 12,400 Btu/# for VOC's
- 950 BTU/Ft^3 for Natural Gas
- The above fuel consumption values include burner efficiency and thermal radiation.

BILL OF MATERIAL

ENCLOSURE

- The main housing consists of two (2) insulated energy recovery columns connected by a common insulated combustion chamber.
- The shell is constructed of 316L stainless steel
- The unit is shop assembled to the greatest extent possible to simplify field erection.
- Insulated with ceramic fiber
- Casing is coated with Therma-Cover thermal barrier
- All welded joints to eliminate any leakage of fumes or vapors.
- Normal operating temperature of 1650° F and maximum operating temperature of 1800° F
- Residence time of 0.75 seconds at 1600° F
- Time required to reach operating temperature from a cold start is one and one half (1½) hours.

HEAT EXCHANGE MEDIA

- High Al_2O_3 Acid Resistant ceramic heat exchange media to resist acid attack
- Media is chemically inert and thermally stable up to 2200° F.
- Sufficient quantity of ceramic media will be provided to obtain 90% nominal thermal efficiency.

BURNER

- Maxon Kinemax Burner or equivalent
- Fuel source is natural gas
- Electric modulating actuator
- 20:1 maximum turndown (on natural gas)
- Flame safeguard with Self-Checking Ultraviolet Scanner
- High temperature protection device
- Necessary interlocks to achieve safe starts and fail-safe operation (FM or IRI compatible)

BURNER ACCESS PLATFORM

- Allows for complete access to burner provided with an OSHA approved access platform. Safety rails, ladder and grating are included.

SYSTEM FAN

- Twin City Fan or equivalent
- 125 HP, High Efficiency TEFC Motor
- Complete with couplings or belts and OSHA approved guard
- Constructed of 316L stainless steel
- Insulated to prevent condensation and for personnel protection
- AC variable frequency fan speed control to maintain proper exhaust rates
- Teflon coated expansion joints
- Arrangement 1

VARIABLE FREQUENCY DRIVE (VFD)

- Yaskawa AC variable frequency speed drive is provided to vary fan motor speed, controlling the air volume to the oxidizer using negative pressure ductwork as the indication of flow.
- The drive is shipped mounted in the control house.

BILL OF MATERIAL

COMBUSTION BLOWER

- Twin City Blower or equivalent
- 10 HP, High Efficiency TEFC Motor
- Direct Drive, Arrangement 4 with inlet filter
- Across-the-line starters, circuit breakers and thermal overload relays for each motor

OXIDIZER FAN TO INLET DUCT

- Insulated to prevent condensation and for personnel protection
- Fabricated from 316L stainless steel and welded air tight

SWITCH VALVE

- Pneumatically Actuated
- Valve sealing included
- Constructed of 316L stainless steel

COMPRESSED AIR TANK

Provided to maintain sufficient volume of air for a switch valve change. Included are:

- 30 gallon ASME Code tank
- Mounted to CLEANSWITCH frame
- Prepiped
- Pressure gauge included

FRESH AIR DAMPER

- Enables the oxidizer exhaust fan to run without drawing air from the process during idle, standby and oxidizer purge periods. Damper is constructed of 316L stainless steel. Damper is actuated by a 120-volt motor with limit switches and NEMA 4 enclosure. Internal limit switches verify damper position. Damper is mounted in the ductwork prior to the oxidizer system fan. Damper is preset and pinned for positive action.

- The system automatically opens the fresh air damper to allow air into the fan inlet and maintain minimum flow if process air volumes are below the minimum turndown of the unit. In addition, this package is used for temperature control in high solvent situations.

CONTROL HOUSE

The CLEANSWITCH™ provides a unit mounted electrical control house that contains the following:

- Power distribution panel and programmable controller and oxidizer control panel
- AC drive
- Environmental control system (HVAC)
- Circuit breaker panel for lighting and outlets
- A single power feed is required for oxidizer power and all auxiliary power

BILL OF MATERIAL

VIDEO DISPLAY OPERATOR INTERFACE

- PanelMate grayscale touch screen display operator interface
- Video display operator interface
- One button start-up
- By-pass key switches wired to common terminal strip

PROGRAMMABLE LOGIC CONTROLLER (PLC)

- Allen Bradley SLC 5/04 Series PLC
- RS Logix software
- First-out indication for ease of trouble shooting
- Alarm history

CHART RECORDER

- Yokogawa one point chart recorder provides method to record operating temperature for proof of compliance as required by regulatory agencies.
- The chart recorder is mounted in the control house

MODEM

- Provided for remote access to PLC for trouble shooting, alarms, program modifications, and monitoring process variables.
- Auto-answer
- Shipped mounted in control cabinet
- Dedicated phone (voice and data) lines to be provided by customer

BAKE OUT CYCLE

- For applications where organic particulate, aerosols or condensables may exist in the process exhaust, the optional bake out cycle provides a method of cleaning the cold side of the oxidizer of these deposits. During this cycle, each of the energy recovery columns will be held in an extended gas-cooling (outlet) mode until the cold side of the oxidizer is raised to an appropriate temperature where any organic build up will burn off.

DOCUMENTATION

- Documentation – Five (5) sets of operator manuals and drawings are provided. Additional manuals are available at $200.00 each.

BILL OF MATERIAL

SPARE PARTS

Level 1 Spare Parts

Qty	Part No.	Description
3	198675	RELAY,3PDT,110VAC,10 A,IDEC RH 3B-ULAC110V
2	290290	THERMOCOUPLE,DUAL,TYPE K,12LG, MGO,PYRO KK43U-012-00-8HN31
1	179471	SWITCH-TEMP,DIGITAL,32-2502 DE G F,AIR,EUROTHERM 93
1	134031	IGNITER-SPARK,AUBURN #I-P17/MO DIFIED
1	289654	CYLINDER-AIR,6.00 BORE,18.875, PARKER,6.00CJ2MAUS14AC18.875
1	299489	CYLINDER-AIR,8.00 BORE,3.00 ST ROKE,COMPACT AIR,R8X3
1	299802	VALVE-SOLENOID,AAA,0.75 NPT,12 0V,50/60 HZ,391V-120V
1	213466	RELAY,120V AC,ALLEN BRADLEY #7 00-CF220-D
2	285177	SENSOR-PROXIMITY,SHIELDED,2 WI RE,PEPPER & FUCHS,NJ15+U4+W-T
1	121860	CIRCUIT BREAKER,5A,250V,SINGLE POLE, A-B 1492-GH050
1	267185	SCANNER-UV,SELF CHECKING,HONEY WELL C7061A1012
1	122030	TIMER,MULTI RANGE,FM,CE,24-240 V,50/60 HZ,10A,11 PIN,ATC 328D
1	121861	CIRCUIT BREAKER,10A,250V,SINGL E POLE,A-B 1492-G100
1	121862	CIRCUIT BREAKER,15A,250V,SINGL E POLE,A-B 1492-GH150

Level 2 Spare Parts

Qty	Dwg No.	Description
3	191998	SAFEGUARD-COMBUSTION,RELAY MOD ULE,HONEYWELL RM7890B1014B
1	267904	REMOTE RESET WITH DISPLAY,SAFE GUARD,HONEYWELL S7800A1001
1	278564	AMPLIFIER-UV,2 OR 3 SEC RESPON SE,CE,HONEYWELL,R7861A1026
1	256850	SWITCH-PRESS,GAS/AIR,100-500MB AR,40-200WC,SCHRODER,DG 500T.
1	168109	SWITCH-PRESS,GAS/AIR,1-10MBAR, 0.4-4"WC,KROMSCHRODER DG 10T
1	168110	SWITCH-PRESS,GAS/AIR,2.5-50MBA R,1-20WC,KROMSCHRODER,DG 50T
1	185672	SWITCH-PRESS,GAS/AIR,0.5-6MBAR ,0.2-2.4"WC,KROMSCHRODER DG 6T
1	169182	SWITCH-PRESSURE,0-100 PSI,ASHC ROFT,B4-24B100 PSI
1	126553	PAPER-CHART,Z-FOLD,F/STRIP CHA RT RECORDER,YOKOGAWA B9565AW
1	269130	TRANSMITTER,PRESS,0 TO 50 IN W C,ASHCROFT XL-5-F02-42-ST-50IW
1	121500	TRANSFORMER-IGNITION,120V PRI, 10,000V SEC,DONGAN A10-LA22
1	174526	FILTER,RFI,120/250VAC @ 3A,0.2 5 QUICK CONNECT,CORCOM 3VW1
1	289960	MODULE-THERMOCOUPLE/MV,8 CHANN ELS,24VDC,SLC 500,A-B 1746-NT8
1	251731	MODULE-INPUT,120 VAC,16 INPUTS ,SLC 500,A-B 1746-IA16
1	253172	MODULE-ANALOG INPUTS,4 CHAN,A/ V,24VDC,SLC 500,A-B 1746-NI4
1	122431	VALVE-SOLENOID,PILOT,2-WAY,0.5 O NPT,110/120V,NC,ASCO 8214G20
1	251732	MODULE-OUTPUT,120 VAC,16 OUTPU TS,SLC 500,A-B 1746-0A16
1	120944	REGULATOR-MINATURE,0.125NPT,AR ROW R161-P
1	284929	REGULATOR-PRESS,0.50 NPT,12.0- 28.0 WC,ORN,EQUIMETER 043-180
1	253173	MODULE-ANALOG OUT,4 CHAN,0-20M A,24VDC,SLC 500,A-B 1746-N04I
1	254526	MODULE-ANALOG,2 INPUT/2 OUTPUT ,A-B 1746-NI041
1	291346	PEN,PLOTTER,PURPLE,MICRO 1000C HART RECORDER,YOKOGAWA B9902A
1	255542	SWITCH-PRESS,GAS/AIR,30-150MBA R,12-60WC,KROMSCHRODER,DG 150T
1	290596	TRANSMITTER-PRESS,0-100PSI,4-2 0MA,ASH,K1-7-MO2-42-C1-100
1	253179	MOTOR-ACTIONATOR,10-150 DEG,60 SEC,HONEYWELL M740A1046 S&C
1	299175	REGULATOR,PRECISION,2-150 PSI, .250 NPT,PARKER FRL 3550 1040P
1	281102	REGULATOR/FILTER,COMPRESSED AI R,GRAINGER 6B312
1	294402	PEN,RED,MICRO 1000 CHART RECORDER,YOKOGAWA B9902AM
1	282265	RECORDER-CHART,STRIP,1 POINT,M ICRO-R1000,YOKOGAWA 436001
1	260554	TRANSMITTER,PRESSURE,0-5WC,4- 20MA,ASHCROFT,ASH-XL-DP-050
1	269131	TRANSMITTER-PRESS,0-15WC,4-20M A,ASHCROFT XL-5-F02-42-ST-15IW

PERFORMANCE WARRANTY

GUARANTEE

MEGTEC Systems makes the following Performance Warranty:

If all of the performance conditions, as defined in the performance tabulation, are satisfied, then the oxidation equipment:

Total Reduced Sulfur

...will reduce the concentration of sulfur measured at the oxidizer stack by 99% or to a lower limit of 10 ppmv.

Hydrocarbons

...will reduce the concentration of gaseous phase hydrocarbons measured at the inlet of the oxidizer as compared to the concentration of gaseous phase hydrocarbons measured at the outlet (i.e.: discharge stack) of the oxidizer by 99% or to a lower limit of 40 ppmv average as C_1 as verified by U.S. EPA test methods 25A. The Performance Conditions are defined in this specification under the heading of "Design Criteria". The equipment must be operated no lower than 1600° F oxidation temperature.

Oxides of Nitrogen (NOx)

...when operated on natural gas and according to equipment specifications, the equipment will perform such that the total concentration of NOx as measured (i.e. uncorrected to 3% oxygen) at the discharge stack will not exceed 25 ppmv, 95% thermal efficiency average NOx as NO_2.

This guarantee is predicated upon an inlet NOx concentration of 0 ppmv and no nitrogen containing hydrocarbons or ammonia type compounds are in the process exhaust.

Carbon Monoxide

...when operated on natural gas and according to equipment specifications, the equipment will perform such that it will reduce the concentration of carbon monoxide measured (uncorrected to 3% oxygen) at the oxidizer stack to a lower limit of 20 ppmv average.

PERFORMANCE WARRANTY

CRITERIA

- The length of term for this guarantee is twelve (12) months (one (1) year) from date of start-up, not to exceed eighteen (18) months from shipment date by MEGTEC Systems.
- MEGTEC Systems reserves the right to adjust the oxidation temperature within 100° F of design set point to achieve conformance.
- For the purposes of this warranty, U.S. EPA Method 25A (FID) or equivalent must be used unless another test method is mutually agreed upon. U.S. EPA Method 18 should be used to measure and subtract methane.
- Use of the oxidizer must be in accordance with MEGTEC Systems operating instructions. Guaranteed performance is based on the use of the solvent description listed in the proposal.
- Non-conformance with this warranty shall be demonstrated to the satisfaction of MEGTEC Systems by and at the expense of the buyer. MEGTEC Systems reserves the right to assist in the development of testing protocol in cooperation with the BUYER and their assigned consultants and/or testing contractor.

Note: *Compounds such as, but not limited to, heavy metals, halogens, sulfur, can degradate the ceramic fiber insulation and oxidizer internal components. These compounds will void the warranty if found in process stream. These can originate from chlorinated solvents, fluorides, et cetera.*

INSTALLATION AND FIELD SERVICE

INSTALLATION SUPERVISION, START-UP AND TRAINING

MEGTEC Systems proposes to furnish start-up as indicated below.

- One (1) installation engineer for five (5) consecutive ten (10) hour days will be provided for installation supervision. This quotation also includes one (1) round trip travel and incurred lodging expenses.
- One (1) field service representative for seven (7) consecutive ten (10) hour days will be provided for start-up and training. This quotation also includes one (1) round trip travel and incurred lodging expenses.
- To ensure that a field service representative is available, please contact us at least fourteen (14) days prior to your scheduled start-up.
- To prepare for start-up services the equipment should be fully installed according to specifications and all utilities should be complete, operable and in compliance with local codes.
- Our equipment will be checked mechanically and electrically and all operational data will be verified. A copy of the data form will be provided to the customer. Associated equipment by others should be functional to the point that it will enable us to completely test our equipment.
- Operational and basic maintenance training will be provided for user personnel by the field service representative upon completion of start-up. Twenty (20) hours of training includes four (4) 4-hour segments covering four (4) shifts.
- The service rates found on the following page will apply to any hours required beyond the normal eight hour day or for delays encountered that are not attributable to our equipment.

OTHER SERVICE OFFERINGS

- $5 million revolving spare parts inventory available
- 24 hour emergency parts and service assistance available 365 days a year
- Regional service centers located in California, Florida, Maryland, New Jersey, West Virginia, Wisconsin and Ontario, Canada. Overseas service is available through offices in England, France, Germany, Singapore, Australia, Sweden and Hong Kong

FIELD SERVICE RATES

EQUIPMENT SERVICE RATES

Start-up services, installation supervision, and service calls are provided at the following rates:

Straight Time	$ 95.00/hour	Up to 8 hours per day on weekdays
Time & One-Half	$140.00/hour	Over 8 hours up to 12 hours on weekdays; Up to 8 hours on Saturday
Premium Time	$186.00/hour	Over 12 hours on week-days; over 8 hours Saturday; Sunday and Holidays
Travel Time	$ 75.00/hour	Travel will be based on actual hours
Weekend & Holiday Travel Time	$115.00/hour	Same as above
Weekend Layover	8 Hrs straight time/day	Plus actual expenses
Field Training	$105.00/hour (straight time)	Customer plant training

24/7 Technical & Modem (Effective June 1, 2001) MEGTEC Systems provides 24-hour, 365/day on-line real time modem & phone technical support for a charge of $150.00/per incident after warranty. An incident is defined as the time required to resolve one (1) problem.

- *MEGTEC Systems offers preventive maintenance programs, which can be tailored to meet your requirements. Please contact us at 920-336-5715 for details*
- *The above prices are subject to change without notice.*
- *All service calls are subject to a four (4) hour minimum billing plus travel.*

Expenses Expenses will be invoiced as incurred, plus a 6% service charge. These may include:

Actual: Airfare, lodging, car rental, and general expenses
Meal allowance billed at federal per diem
At Rate: Company Car - $40.00/day.

CUSTOMER RESPONSIBILITY

The following responsibilities are borne by the customer unless included in a MEGTEC Systems installation package offered with this document.

- If power capacitors are installed in your facility, please notify MEGTEC Systems at once as an isolation transformer may be necessary.
- Any special regulatory codes must be submitted to MEGTEC Systems before or with order placement.
- Fuel and vent piping to MEGTEC Systems connection points sized in accordance to MEGTEC Systems specifications.
- Electrical services to MEGTEC Systems connection points sized in accordance to MEGTEC Systems specifications.
- Natural gas @ 5 psi ± ¼ psig with 950 Btu/ft^3.
- Instrument quality compressed air @ 80 – 100 psig, -40° F dew point, and 5 CFM (per oxidizer) to MEGTEC Systems connection points sized in accordance to MEGTEC Systems specifications.
- Exhaust duct from process to inlet of oxidizer unit. If the run exceeds 75 feet (23 meters) with three (3) or more elbows, please notify MEGTEC Systems for fan sizing verification.
- Modifications to any existing equipment, building structures or other obstructions at the installation site.
- Wiring inside of non-MEGTEC Systems equipment and termination of wires related to the interface between non-MEGTEC Systems manufactured equipment and the proposed MEGTEC Systems equipment.
- Hand railing, ladder, service platform and heat insulation if required by OSHA.
- Roof or floor supports, as required.
- Flashing for through-roof ductwork
- Provide information / documentation identifying any special codes, permits or requirements specific to the installation site. Costs incurred to meet requirements not identified to MEGTEC Systems prior to this proposal will be the responsibility of the customer.
- Necessary engineering drawings and information related to non-MEGTEC Systems-manufactured equipment for interface between process and MEGTEC Systems equipment.
- EPA type air permit testing
- Clear and unobstructed access to the worksite for installation is required

CUSTOMER RESPONSIBILITY

- Area lighting unless specifically in the electrical installation scope
- Soils testing unless specifically referenced in the general installation scope
- **Noise – OSHA Compliance**
- Data on the noise levels of rotating equipment such as fans, motors, blowers, compressors, etc., as determined by the manufacturers, will be supplied upon request. The combined noise levels of the system, in conjunction with the surroundings, cannot be predetermined. If the noise levels from the system exceed OSHA or local code requirements, MEGTEC Systems can provide sound attenuation equipment, which will be the financial responsibility of the customer.

EXCEPTIONS

MEGTEC SYSTEMS TAKES EXCEPTION TO THE FOLLOWING ITEMS AS NOTED:

Instructions To Vendors/Destruction Criteria - #4

The MEGTEC Systems ENTERPRISE II® oxidizer system we are quoting for this project is the latest generation of regenerative oxidizers supplied by MEGTEC Systems. The design of this unit includes engineering and manufacturing practices we have developed over our 30-year history of building oxidation systems for outdoor industrial installations. Our goal is to have 24 hours, 7 days a week trouble free operation. To the extent that we do not meet this goal we have a commitment to our customer to react as fast as possible to get our equipment operational after any unanticipated fault or failure. In addition, we provide several options for preventative maintenance services to avoid any unforeseen problems.

Instructions To Vendors/Destruction Criteria - #5

Georgia Pacific requests Total Reduced Sulfur (TRS) emissions of less than 5 ppm averaged over a 12-hour period. MEGTEC Systems' destruction efficiency guarantee includes TRS emissions of 10 ppm maximum with a destruction efficiency of 98.5%.

Instructions To Vendors/Vendor's Design - #7

Georgia Pacific's specifies the use of controls and natural gas equipment for enrichment of the incoming gases to reduce NOx formation. The oxidizer will not be equipped with Natural Gas Injection since the application has the potential for particulate buildup and is designed for operation below 95% thermal efficiency.

Instructions To Vendors/Vendor's Design - #14

Although MEGTEC Systems has taken every precaution against acid attack, including construction materials of 316L stainless steel and the application of Therma-Cover insulation, there are still unknown variations in the tank vent loading. Therefore, MEGTEC Systems will not warranty the life of the shell for ten (10) years against any corrosion.

Instructions To Vendor/Vendor's Design - #24

MEGTEC Systems reserves the right to remedy any deficiencies of supplied equipment. Therefore, MEGTEC Systems takes exception to the buyer having the right to refund the entire purchase price.

Instructions To Vendors/Vendor's Design - #26

It has been requested that the structural steel be painted per Georgia Pacific specifications. Georgia Pacific paint specifications have not been supplied and therefore the cost is not adjusted for this.

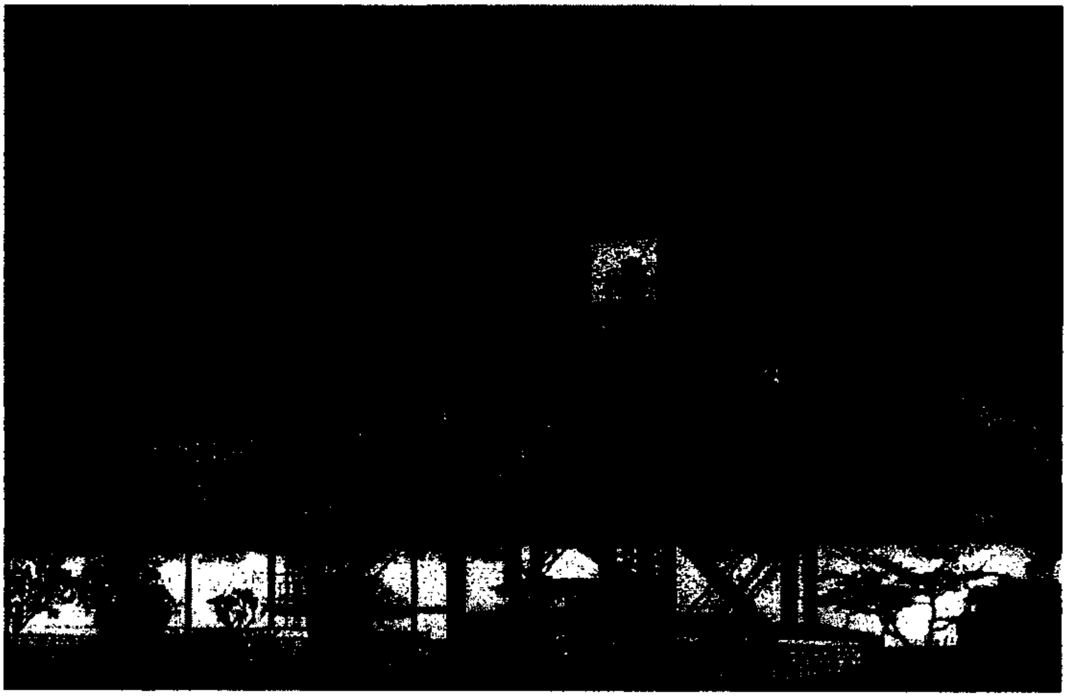
Georgia Pacific's Purchase Order Conditions

MEGTEC Systems takes exception to Georgia Pacific's Purchase Order Conditions. All conditions can be negotiated at time of order placement.

DÜRR

AN ENGINEERED SOLUTION
TO SUPPLY

A Durr Air Emission Control System



TO

Georgia Pacific Corporation

(1) Wa, (2) Or, (1) Me, (1) AL, (1) Ms, (1) Ga

August 16, 2001

DURR PROPOSAL NO. 01-RLP-0816

This proposal contains confidential and proprietary information of DURR and is not to be disclosed to any third parties without the express prior written consent of DURR.

This proposal is submitted solely for the purpose of enabling client to evaluate DURR's bid on the within project and shall be returned to DURR or destroyed if so requested by DURR

Durr Environmental, Inc.
31285 Durr Drive, PO box 930459, Wixom, MI 48393
Telephone: (248) 668-500 / Fax: (248) 926-6570

DÜRR

Georgia Pacific Corporation
133 Peachtree St., NE (30303)
PO Box 105605
Atlanta, Ga. 30348-5605

Attention: Mr. Jeffrey W. Brown
Phone: 404-652-4615

Subject: DURR Revised Budgetary Proposal # 01-RLP-0816

Dear Jeff,

I want thanks you and your associated again for taking the time to visit our installation at Guardian. Based on our discussions, I have attached a revised budgetary proposal for a modular RL10 RTO system for your brown stock washer applications. The system can handle the full range of process flows at all the various locations you indicated.

The enclosed system, which is proposed, includes an additional spool piece to provide a three quarter (3/4) second retention time at 1600'F. It also includes 304 and nitronic stainless steel for all of the wetted surfaces, including the fan, valve, and stack. The nitronic stainless steel is used for the piston rings and stator.

I have also included an optional VER (variable energy recovery) system, which will handle VOC/HAP concentration up to four times greater than your present indicated loading.

As I indicated in our discussions, NCG streams can be direct injected into the combustion chamber. We have install systems of this type into the pharmaceutical industry.

Again, I thank you for your continued interest in our products and services, and I will be happy to meet with you and your associates to discuss our equipment and system approach in detail for each process.

Regards,

Rodney L Pennington, PE
Director of Sales
Phone 407-822-9203
Cell 407-496-1911
rpennington@de.durr-usa.com

cc: Trent Moberg (GP)
Lawrence Otwell (GP)
Robert H. Orender (GP)
Steve Lowe (Air Techniques Inc.)
Mike Anderson (Caldwell Mckay Co., Inc)
Phil Audit (A&A Engineering)
Jeff Maser (ZWM Co.)

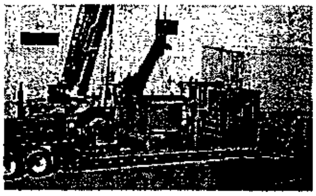
Budget Pricing

D) Core Dryer

Engineer, fabricate, supply and commission one (1) pre-piped/pre-wired Durr Modular Model RL10 RTO including:

- Added spool for ¾ second @ 1600'F
- Stainless Steel construction
- VER
- all the standard features and services described below:

Budget Price, including start up	$455,000
Budget Price, optional installation	$ 20,000



All prices are in U.S. dollars and subject to Durr's Standard Conditions of Sale, installation, ductwork and structural steel support or foundation by others, unless otherwise note,

By: ____________________________

Rodney L Pennington, PE
Director of Sales
407-822-9203

Payment Terms

30%	of Price with Purchase Order.
65%	of Price based on monthly progress payments.
5%	of Price after successful performance testing.
-OR-	thirty days after equipment is ready for operation.
-OR-	ninety days after final material shipment, whichever comes first, if successful performance testing is delayed through no fault of DURR.

Delivery

Based on present workload, our delivery for this equipment is (24) after receipt and acceptance of your purchase order. Installation and start-up will take an additional 4 weeks.

NOTES: All prices exclude any taxes, duties, broker fees, value added taxes, income taxes, or any other allowance.

Standard RL Equipment

Mechanical Components

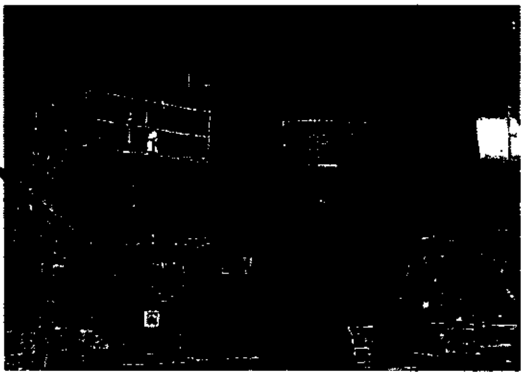
- Unitized base skid
- Pre-piped / pre-wired skid
- Rotary valve with pneumatic drive
- RTO housing
- Regenerative heat exchange 95% TER
- FM or IRI combustion system
- **Fresh air damper for purge or idle**
- Chamber flushing
- Valve sealing
- Delivered fully painted
- Expansion joints
- Nema 4 enclosure for Flex I/O

Miscellaneous

- Two maintenance manuals
- 8 hours training course
- Start up

Controls

- PLC controls
- Digital Flex I/O cards
- Analog Flex I/O cards
- T/C cards
- Control loops
- Self checking UV flame safeguard
- Labeled terminals and wires
- Power distribution
- Area lighting
- Pressure volume control
- Motor starters
- 120 V transformer



Optional RL Equipment

	Included	**Not included**	**Optional Price**
• Installation			X
• Foundations		X	
• 3O4 /nitronic SS wetted surfaces, valve, fan, and stack	X		
• Positive draft fan and motor	X		
• Induced draft fan and motor		X	
• Variable Frequency Drive (VFD)	X		
• Free-standing exhaust stack & manifolds	X		
• Stack platform		X	

• ~~Re-circulation for maximum turn down~~		~~X~~	
• Wonderware with AB PLC	X		
• Natural Gas Injection	X		

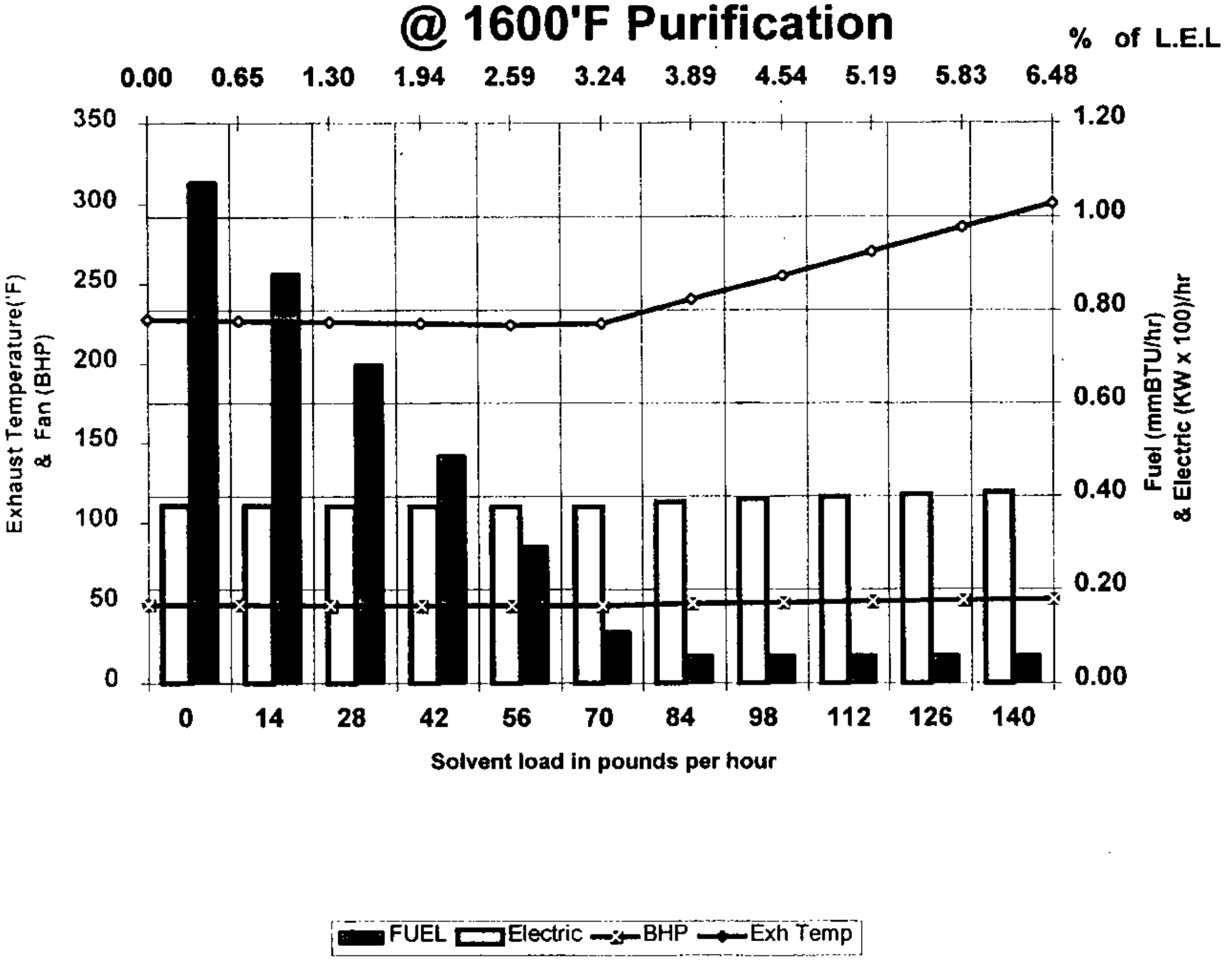
DURR RL Process Design Data

Date :	20-Jul-01	**N.G.I.**	yes
Data input by :	Durr Environmental Inc.	**Thermal Efficiency**	95
Company Name :	GP	**Number of Units**	1
Location:	Various	**Type**	RTO
Re-Therm Model RL	10	**Proposal #**	01-RLP-0720

Process Data Input

====================	Maximum Design	Operating Case	Units
Process Exhaust Volume	10,000	10,000	wSCFM
	11,500	11,500	ACFM
Process Exhaust Temp	150	150	deg F
Total Contaminants	140	35	lb/hr
TRS	400	100	PPMv
Methanol		200	PPMv
other		150	PPMv
Heat Value	12,500	12,500	BTU/lb
Average MW of VOC	44	44	as propane
Maximum BTU/HR Load	437,500	437,500	BTUs/HR
Solvent Auto-ignition Temp.	450	450	deg F
Inlet Concentration as VOC.	2,052	376	PPM propane
Inlet Concentration as CH4.	5,644	1,411	PPMv CH4
Approx. % of LEL	56	16	% of LEL
Purification Temperature	1,800	1,600	deg F
Inlet Static Pressure	2.00	2.00	inches W.C.
Site Elevation A.S.L	100	100	feet

Durr RL RTO Operating Conditions @ 10,000 wSCFM @ 150 'F with NGI @ 1600'F Purification



Guarantees

VOCs

DURR guarantees that the RL will convert 99% or more of the total volatile organic in the inlet stream to carbon dioxide, water, and non-combustibles, down to a minimum of **20 PPMv measured as carbon** in the exhaust stream.

NO_x

DURR guarantees that the RL outlet emissions of NO_x will not exceed 10 PPMv measured as NO_2 (uncorrected), provided there are no NO_x or nitrogen bearing compounds contained in the inlet stream to the RL.

CO

DURR guarantees that the RL outlet emissions of CO will not exceed 50 PPMv_v measured as CO (uncorrected).

General

The following provisions apply to all of the above guarantees:

- The process exhaust flow will not exceed specified value and the process conditions are as given in the process design data page of this proposal.
- The performance will be based on five test samples taken consecutively, of which the high and low value will be discarded. The test result will be arithmetic average of the three remaining tests.
- The performance guarantees apply only during normal operation, not during any maintenance procedures.
- If DURR fails to meet the Performance Guarantee, DURR will be given reasonable time to investigate and take corrective action within the scope of this contract.
- All performance tests will be arranged and paid for by Purchaser. DURR will be notified in writing 14 days prior to the tests.
- EPA Methods 7E, 10 and 25A are used to determine NO_x, CO and VOC performance, respectively.
- Methane is excluded from outlet emissions.
- The RL is installed and operated in accordance with DURR's Operating and Maintenance Instructions.

Field Service & Installation

Start-up and Training

Forty hours of start-up and training are included in the base equipment price. As part of the forty hours, DURR will conduct one 8-hour training course at Purchaser's site.

Installation (Optional)

- Installation is not included unless specified as an option on the price page.
- DURR can provide complete installation services at an additional cost. Call your sales representative for pricing.

Installation Supervision (Optional)

- No installation supervision is included unless specified as an option on the price page.
- DURR can provide a qualified representative at an additional cost. Call your sales representative for current pricing.

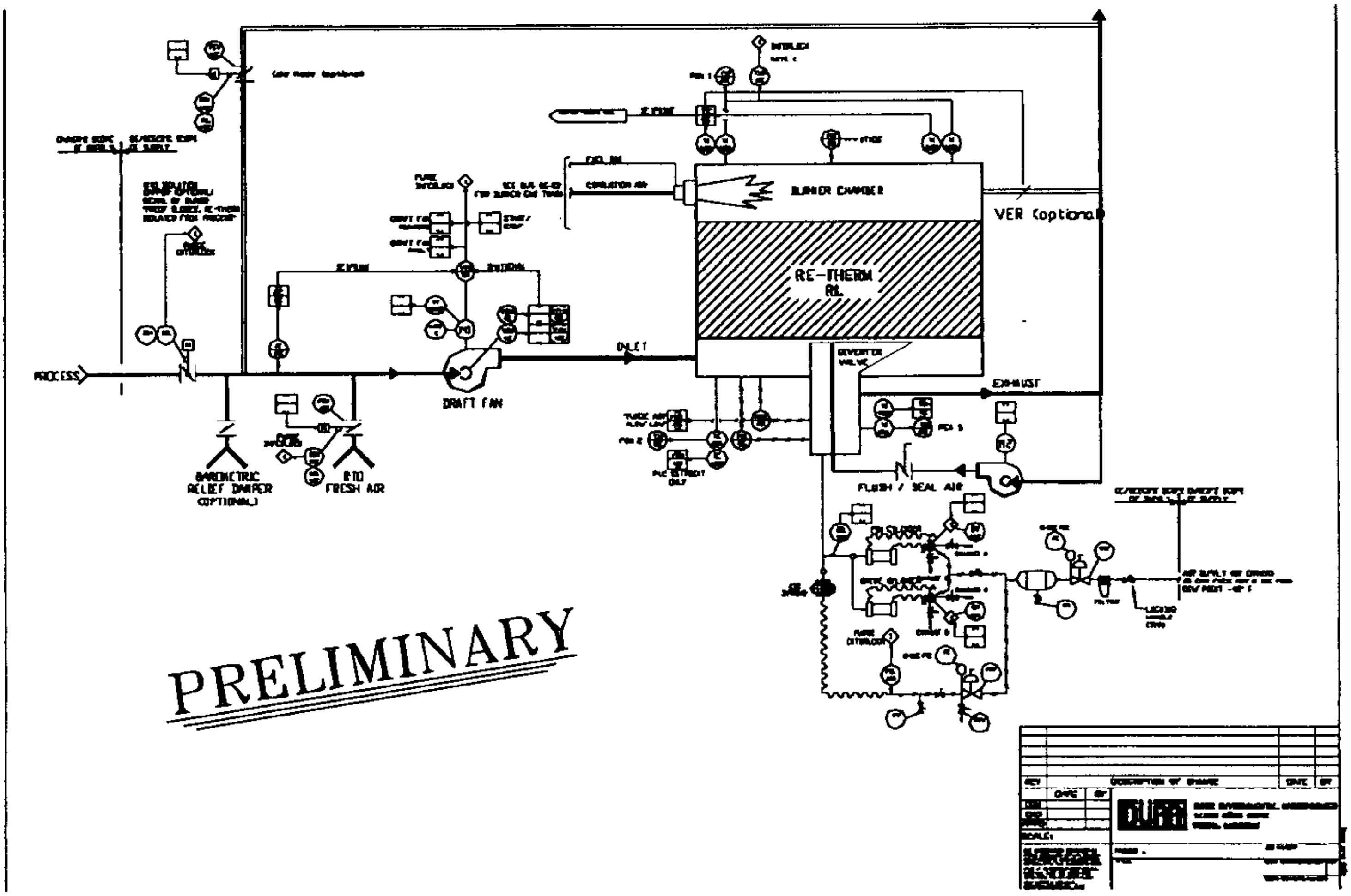
Supplied by Purchaser

- Locate, supply and install foundations including anchor bolts.
- Supply the following utilities to the connection point on the RE-THERM RL unit:
- Power voltage: 480V (or 4160V), 3 Ph, 60 Hz - 1 feed required.
- Fuel: adequate supply of natural gas at 1,000 BTU/ft^3 and regulated to 5.0 psig steady.
- Compressed air: 10 cfm supply of clean, dry compressed air at 80 psig and a -40'F dewpoint.
- Sub-station transformers and line isolators, if required.
- Sprinkler system or other fire or explosion protection systems as may be required by insurance company, governmental or local authorities.
- System ductwork including process isolation, spill dampers, inlet manifold, outlet manifold, and pressure relief dampers unless specifically quoted and purchased from DURR.
- Insulation (if necessary) of RE-THERM inlet and outlet duct manifolds, fans and other hot exposed ductwork.
- FM or IRI approval submittals.
- Necessary permits and approvals as may be required by any and all insurance, governmental agencies or local authorities.
- Applicable sales, use, excise or similar taxes.

Additional Field Services

- Additional field services are available, if necessary, at DURR's standard start-up/instructional service rates. Please contact your sales representative for current pricing.

Typical P&ID


PROCESS
BAROMETRIC RELIEF DAMPER (OPTIONAL)
RTO FRESH AIR
DRAFT FAN
INLET
BURNER CHAMBER
RE-THERM RL
VER (optional)
DIVERTER VALVE
EXHAUST
FLUSH / SEAL AIR
COMBUSTION AIR
DÜRR

EISENMANN CORPORATION
BUDGETARY PROPOSAL NO. A82-068

COMPACT VALVELESS REGENERATIVE THERMAL OXIDIZER

FOR

GEORGIA PACIFIC
ATLANTA, GA

SEPTEMBER 6, 2001

TABLE OF CONTENTS

GENERAL TECHNICAL DATA

Operating Conditions

Exhaust Flow Rate	:	8,310 scfm (10,000 acfm)
Exhaust Inlet Temperature	:	160°F
Combustion Temperature	:	1,500°F
Burner Operating (No VOC)	:	1.4 MMBtu/hr
Burner Installed	:	4 MMBtu/hr
Fan Motor Operating (Incl. -2.0" W.C. Inlet & +1" W.C. for Stack)	:	42 bhp
Fan Motor Installed	:	50 hp
Fan Motor Turndown (Max. to Min.)	:	60 Hz to 15 Hz
System Pressure Drop	:	13.5 inches W.C.
System Destruction Efficiency	:	99%
System Thermal Efficiency	:	93%
Clean Air Outlet Temperature	:	94°F+ above inlet
System Weight	:	60 tons
Dimensions	:	12 feet x 38 feet

GENERAL SYSTEM DESCRIPTION

The process stream from the system exhaust vents is collected and sent to the VRTO-C system.

The process fan is operated by a VFD, which maintains a constant pressure in the duct. The fan directs the flow to the inlet of the VRTO-C.

Once within the VRTO-C unit, the exhaust will be directed by the rotating distributor to the appropriate sections of hot ceramic heat exchanger media. The heat exchanger bed is comprised of eight separate chambers. At any given moment, the exhaust moves upward through three and downward through three. The remaining chambers act as a sealed buffer between dirty and clean air. The exhaust will pass vertically upward through media taking on the heat and raising the air temperature close to the combustion temperature.

In the combustion area, the burner will provide additional energy to reach the temperature of approximately 1,500°F. This operating temperature oxidizes the VOCs and cleans the air. The clean heated air passes down through separate sections of the exchanger media returning its heat back to the system. A continuous purge cleanses the chambers before allowing cleaned air to exhaust through.

The patented EISENMANN rotating distributor continuously turns, shifting which section of the media is in the upward, downward or purge cycle. In this manner, a constant thermal efficiency and pressure drop is maintained.

The cleaned exhaust then passes from the VRTO-C to the EISENMANN provided 50 ft. clean air stack.

Vessel material of construction 316L.

UTILITY DATA

Electrical

Operating Conditions

VRTO-C Supply Fan
Quantity : 1
Operating : 1 x 42 bhp @ 460 vac
Connected : 1 x 50 hp @ 460 vac

Combustion Blower
Quantity : 1
Operating : 1 x 8.0 bhp @ 460 vac
Connected : 1 x 15.0 hp @ 460 vac

Air Distributor Drives
Quantity : 1
Operating : 1 x 0.75 bhp @ 460 vac
Connected : 1 x 1.0 hp @ 460 vac

Natural Gas

VRTO Burner
Quantity : 1
Operating (No VOC) : 1 x 1.4 MMBtu/hr
Connected : 1 x 4 MMBtu/hr

Compressed Air : None

Water : None

Ventilation : None

Steam : None

OPERATING COSTS

Natural Gas

Rate : $5.00 per MMBtu

Total Btu (Including VOC) : 1.4 MMBtu/hr

Hourly Cost : $ 7.00 per hour

Electrical Power

Rate : $0.05 per kW

Total Operating : 51 bhp/38 kW

Hourly Cost : $ 1.90

Yearly Maintenance Costs

Routine maintenance requirements, 50 man hours.
Yearly Eisenmann supervised inspection, 2 man days at rates shown on page 9. Parts, materials, labor and equipment not included.

GUARANTEES

100% Uptime Guarantee

EISENMANN guarantees that the VRTO will be able to treat exhaust 100% of the time when the system is operated in accordance to EISENMANN's operating and maintenance manual and within the design parameters of the system. In the event that the VRTO system is unable to treat exhaust during the base one (1) year warranty period, EISENMANN will extend the warranty an additional 3 months on the VRTO housing, ceramic and insulation for every occurrence during the base warranty period. The total warranty period with any extension(s) is limited to five (5) years after initial start-up. Supporting documentation will be required prior to the extension of the warranty.

24/7/365 Response Emergency Response

EISENMANN provides 24/7/365, 24 hours a day and 7 days a week, response to emergency calls. On calls outside of the normal business hours of 8 a.m. to 5 p.m. CST, Monday through Friday, the emergency pager will be activated. Upon receiving a page, an EISENMANN engineer will respond to the emergency call within 60 minutes. If your call is not responded to within 60 minutes, EISENMANN will dispatch a field technician to the plant to inspect the system free of charge.

ADVANTAGES OVER OTHER RTO SYSTEMS

- EISENMANN's patented design is the only damperless, single vessel unit proven in the market. A rotating distributor shifts the exhaust through the heat exchanger eliminating the pressure shocks associated with dampers. Standard EISENMANN design guarantees inlet pressure fluctuations of less than +/- 0.10 inches wc fluctuation. Typically, less than +/-0.05 inches wc is achieved. Multiple vessel RTOs with dampers and valves achieve no better than +/-0.50 inches wc.

- The high maintenance associated with damper type RTOs is eliminated. Valved or dampered systems require activation of valves every two minutes at the minimum. During vessel "switchover", untreated fumes may escape to the exhaust stack. The EISENMANN system replaces the pneumatics, actuators, dampers, linkage and lubricants with a simple rotating distributor that is driven by one exterior mounted 0.75 Bhp motor and gearbox. The inner shell and wedge walls (heat transfer area) of the vessel are constructed of 309 stainless steel for a long service life.

- A simpler design with fewer moving parts results in higher uptime reliability.

- The damperless design enables the fan to be located at the inlet to the oxidizer which reduces the cost of the fan and lowers the motor sizing by up to 15%.

- The EISENMANN VRTO-C offers consistent VOC removal efficiency. A damper RTOs removal efficiency deteriorates over time because of poor seating of the dampers. The VRTO-C will have the same DRE after 50,000 hours of operation.

SCOPE OF DELIVERY

By EISENMANN

- Skid Mounted Compact Valveless Regenerative Thermal Oxidizer - Complete with fuel gas burner, forced draft fan and VFD, structured ceramic media, rotary exhaust distributor and insulation
- Interconnecting ductwork between EISENMANN supplied components
- Flexible connectors to allow for thermal expansion as required
- Insulation and cladding to maintain OSHA standards
- Turnkey control panel with graphic interface
- Clean air stack
- Mechanical and electrical installation
- Installation supervision and start-up
- Freight to Alabama site

By Others

- Concrete pad
- Gas drops (5 psi) to the skid connection point
- Required power connection to tie-in points
- Exhaust duct from the process equipment to the fan inlet
- Emissions testing and certification
- DCS connection
- Fan inlet flexible connector and isolation damper

Per Diem Costs

Per diem (8 hour day) time:

- $ 1,000 per day Monday through Friday
- $ 1,500 Saturdays
- $ 2,000 Sundays

Plus travel and living expenses will be billed at cost.

Drawings

This is the typical drawing list from our VRTO-C operating and maintenance manual.

- VRTO-C flow schematic
- Block schematic
- General arrangement
- Lower section assembly
- Gas train

BUDGETARY PRICING

Base Price

Supply one (1) compact valveless regenerative thermal oxidizer (VRTO-C) as described in this proposal including site supervision and training. The system is designed for 8,310 scfm @ 160°F.

Total Lump Sum Equipment, Design, Freight and Installation .... $ 450,000.00

Option 1 – Budgetary Option Pricing

Three (3) year spare parts. Rotor drive motor and gear box, drive shaft, rotor support bearing, damper actuator, high temperature grease, door gasket, process fan bearings, flame rod, burner spark plug, combustion thermal couple.

Option 1 .... $ 25,000.00

Delivery

Delivery to Site : 14 weeks
Installation : 1 week
Start-Up and Training : 1 week
Total : 16 weeks

EISENMANN CORPORATION

Wade S. Klos
Sales Group Leader
Clean Air Technology

Howard Hohl
Sales Manager
Clean Air Technology

Brown, Jeffrey W.

From: HHohl@aol.com

Sent: Friday, September 07, 2001 5:04 PM

To: Brown, Joe E.; jonbake@bellsouth.net; wade.klos@eisenmann.com; mark.west@eisenmann.com; egmcgee@hotmail.com

Subject: Georgia Pacific MACT I, Phase 2 Budgetary A82-068

Jeff:

Here is our budgetary proposal to abate vapors from a series of brownstock washers and storage tanks. The vent stream will be mostly methanol with small amounts of TRS compounds.

We look forward to speaking with you in the near future. Our local contact is Mr. Jon Baker with Crocker and Assoc. Jon can be reached at 770.246.6195. In the interim if you have any questions or comments please do not hesitate to contact Eisenmann direct at the numbers shown below.

Thank you.

Howard Hohl
DIRECT PH: 630.681.9604
CELL PH: 630.215.3979
CORP PH: 815.455.4100, x6066

GEORGIA-PACIFIC PREVIOUSLY SUBMITTED RESPONSES

Dave Buff

Georgia-Pacific

Palatka Pulp and Paper Operations
Consumer Products Division

P.O. Box 919
Palatka, FL 32178-0919
(386) 325-2001

January 3, 2003

Mr. Syed Arif
State of Florida
Department of Environmental Protection
2600 Blair Stone Road
Twin Towers Office Building
Tallahassee, Florida 32399

Re: DEP File No. 1070005-019-AC (PSD-FL-264A)
Georgia-Pacific Palatka Operations
No. 3 Bleach Plant

Dear Mr. Arif,

The following is in response to your request for additional information dated November 26, 2002. Please note that the items are listed in the same order as in the letter mentioned above for convenience.

1. **Request**: *Please provide the total pulp production at the facility for the years 1999, 2000 and 2001. Also, give a breakdown of where this pulp was utilized in the facility (bleached and unbleached areas). Additionally, provide a detailed accounting of this pulp when utilized in the tissue-making mill. If additional pulp was bought during those years, please include that in the accounting. The Department is expecting a complete material balance of the pulp produced in the facility and the pulp bought by the facility when compared to the material shipped from the facility.*

   Response: Please see Table 1 (see Attachment A). Note that pulp produced is back calculated from actual paper machine production. The mill also purchases both pulp and finished tissue in "parent" rolls. The purchased pulp, along with the virgin pulp, is utilized in manufacturing product at the Palatka Mill. The tissue "parent" rolls are converted into finished goods at the Mill – these rolls are only processed in the converting area of the Mill and do not add additional production to the pulp mill, bleach plant, or machine areas.

2. **Request**: *Please give a detailed accounting of how much of softwood and hardwood was utilized in the total pulp production at the facility for the years 1999, 2000 and 2001. How are the two types of woods segregated when feeding*

to the digesters? How is the pulp kept segregated and is there any blending of the pulp taking place prior to making final product.

Response: Please see Table 1. Hardwood and softwood chips are segregated into different chip silos prior to use, and are cooked separately in the digesters. The subsequent pulp is also segregated by species in different high-density pulp storage towers and is blended just prior to the paper machines as needed for the various paper grades.

3. **Request**: *During the plant trip on November 12, the No. 3 Bleach Plant was operating at 30 tph. Please indicate if the production rate was 30 ADTBP per hour.*

   Response: The production rate was 30 unbleached oven-dry standard tons per hour as measured going into the pre-bleach washer.

4. **Request**: *During the plant trip on November 12, the facility personnel talked about a chart at the No. 3 Bleach Plant presentation, which indicated reduced usage of ClO_2 and increased usage of oxygen and hydrogen peroxide to get the same bleach ability. If testing was done to authenticate this fact, please provide the necessary documents. Also, provide a detailed written description as well as the chart showed to the Department.*

   Response: No lab simulated testing was done to authenticate the results of the work done in reducing ClO_2 by using more hydrogen peroxide. No permanent changes to oxygen application rates were made during this time period based on trial and error results. The results presented were based on lb/ton application rates as measured by the inline instrumentation, and were obtained by trial and error experimentation.

   Charts 1 and 2 below illustrate the trial and error work that was completed, demonstrating a shift of work from ClO_2 in the first stage to hydrogen peroxide in the second stage. The last six weeks of data that were in the original presentation have been omitted due to an instrumentation failure that was identified subsequent to DEP's visit. (note, this paragraph needs to be indented to match the prior paragraph)

Chart 1

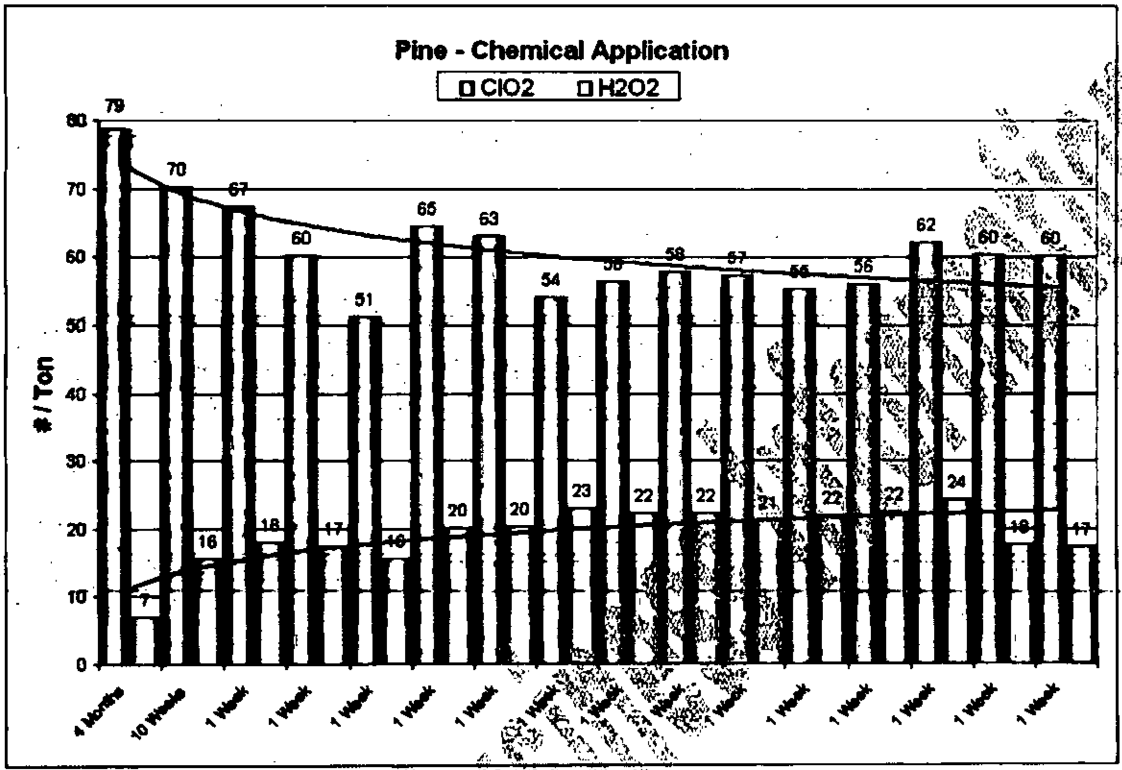
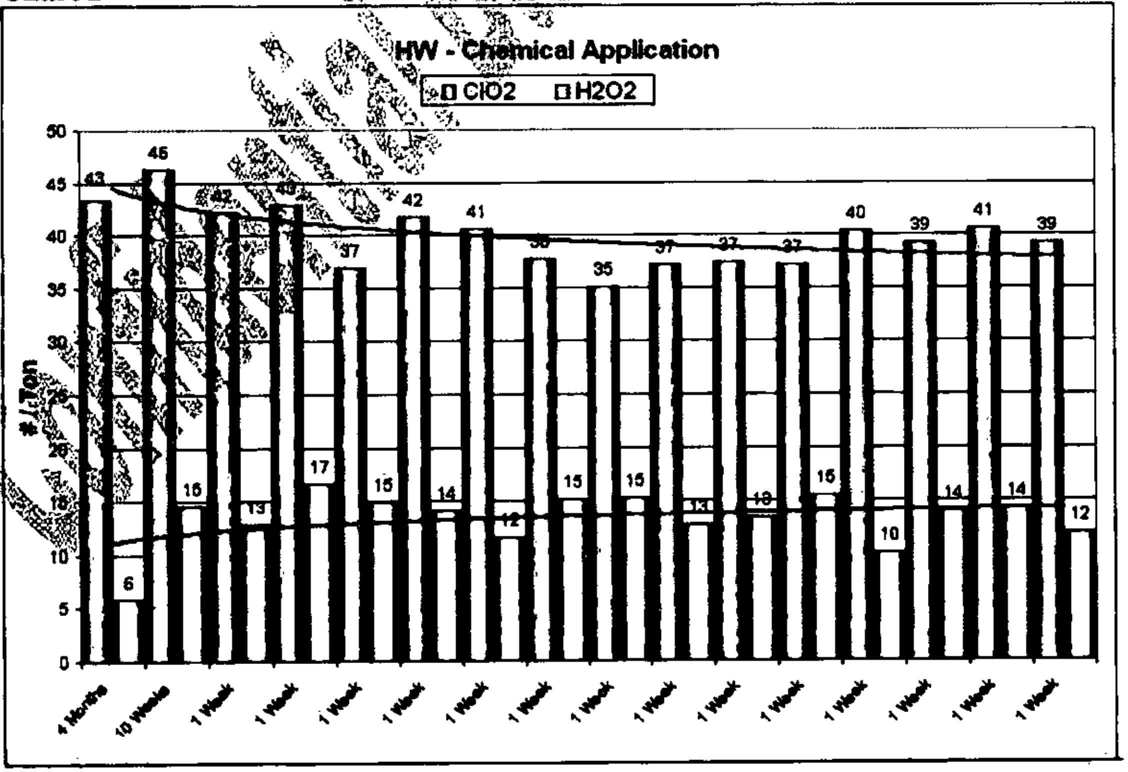


Chart 2



5. **Request**: *Please indicate if 100% of softwood pulp or 100% of hardwood pulp is processed through the bleach plant at any given time. Are there occasions when a mix of the two types of wood pulp is processed at the same time? What indicators are available in the control room to help the operators know what type and how much of either hardwood or softwood pulp is being processed.*

   Response: Softwood and hardwood are almost always processed in the bleach plant separately and are never intentionally mixed. However, the grade mix required by the machines requires the bleach plant to make frequent species changes. Therefore, it is not uncommon for more than one species to be in different stages of bleaching within the bleach plant at a given point in time. The bleach plant was designed to minimize mixing; however, there is a small amount of inadvertent mixing (typically 10~20 ADTBP) that occurs with each transition. The operators are able to approximately monitor the location of each species volumetrically in the bleach plant by tracking the origin of the pulp flow since the pulp is segregated in different pulp storage towers. This allows the distributed control system (DCS) to display the current species in each sequence of bleaching, allowing the operator to make adjustments as required.

6. **Request**: *Please explain how the ClO_2 application rate to the pulp is monitored. If data is kept on the application rate, how often is it recorded?*

   Response: Both the ClO_2 flow rate and strength are measured continuously by inline instrumentation. The pulp tonnage rate is measured by inline flow and consistency measurement instrumentation as well. This information is then converted into a lb/ton application rate. Operators record ClO_2 application information on their log sheets on an hourly basis during normal operation.

7. **Request**: *Please provide a copy of the initial and annual compliance tests done for this plant. The report should include information on the production rate of the bleach plant during the compliance tests.*

   Response: The reports are attached (Attachment B).

8. **Request**: *The Department is in receipt of daily pulp production data covering a period from January 2000 until October 2002 (34 months). The daily bleached pulp production data indicates a highest daily production rate of 1197.9 tons on June 30, 2002, and a highest monthly average of 884 tons per day in September 2002. Please explain the reasons for not achieving the permitted production rates of 1702 tons daily maximum and 1350 tons per day monthly average for the No. 3 Bleach Plant.*

   Response: The Bleach Plant, as built, is capable of producing 1440 bleached air-dry standard tons per day rather than the initial design rate of 1702 tons per day. As such, this update has been reflected in the more recent application.

Current grade mix on the paper machines does not require us to produce at the "as built", maximum rate. However, market conditions change frequently based on customer preferences and economic conditions. Therefore, the bleach plant was designed and built to meet these changing market conditions, and G-P wishes to be permitted for such operations.

9. **Request**: *Please provide detail test reports of the series of tests conducted in October 2002 to measure actual CO emissions from the plant.*

   Response: See Attachment C.

10. **Request**: *Please provide the ClO_2 application rate for the series of tests conducted in October 2002.*

    Response: See Attachment C. (See yellow page).

11. **Request**: *Please list the pertinent information (% ClO_2 applied, kappa number, temperature etc.) that a compliance inspector should gather during an inspection of a bleach plant to ensure that the source is complying with the permitted CO emission limits. How will these parameters or others provide assurance that the limit is not exceeded?*

    Response: Emissions data for carbon monoxide emissions from bleach plant scrubbers first became available to the pulp and paper industry through the National Council for Air and Stream Improvement, Inc. (NCASI). NCASI Technical Bulletin 760 (TB 760) (July 1998) provides information on carbon monoxide emissions associated with oxygen delignification and chlorine dioxide bleaching of wood pulp. In numerous sections of the document, NCASI repeatedly states that the operating parameter correlations are not strong, and in many cases are non-existent (in the case of hardwood bleaching). For example, in the Introduction to TB 760, it is stated that, "Data from mill-conducted tests for CO emissions from 14 bleach plants at kraft pulp mills have already been reported in NCASI Technical Bulletin No. 701 (NCASI 1995). These data showed tremendous variability between mills, with CO emissions ranging from 0.003 to 1.73 lb per air dry ton of bleached pulp (lb/ADTBP). The causes for this variability were, however, unclear."

    Further, later in TB 760, when comparing CO emissions between two mills (Mills B and C),NCASI specifically states that, "The magnitude of CO emissions at Mill C appear comparable to those recorded at Mill B. This is in spite of ClO_2 application rates in this mill being less than half of those at Mill B." In the concluding paragraph of this same section, NCASI states that, "The available literature suggests that the lignin content of the brownstock entering the bleach plant and the ClO_2 charge would be the two main parameters controlling CO formation. However, since the ClO_2 charge for a desired pulp brightness is determined by the lignin content or kappa number of pulp entering the bleaching sequence, the ClO_2 charge by itself would be expected to be the controlling parameter in CO formation...A general trend of increasing CO emissions with increasing percent ClO_2 applied is seen, but the correlation is not strong".

In recent conversations, NCASI staff have strongly discouraged Georgia-Pacific from using the NCASI data from TB 760 in establishing emission factors. In TB 760, NCASI has attempted to simply present data for varying operating configurations (*e.g.*, bleach plant stages/configurations, percent chlorine dioxide applied, wood species, presence/absence of oxygen delignification, etc.). While some trends appear, as they state clearly and repeatedly in TB 760, the correlations are not strong.

Given this information, and general lack of data, Georgia-Pacific feels strongly that it is not appropriate to establish parametric values to be used in demonstrating compliance. This is not only supported by testing at the Palatka Mill, but by the full array of mills that was tested by NCASI. Georgia-Pacific feels that the annual stack-testing requirement should be sufficient to demonstrate compliance with the emission limit. If additional information becomes available in the industry in the future, indicating that the correlations are stronger, it might be possible to revisit this possibility. However, at this time, the correlations are simply not developed.

For the same reasons stated above (*e.g.*, lack of correlation with operating parameters), Georgia-Pacific felt that it was necessary to incorporate a safety margin into the emission factors that were utilized in the permit application. TB 760 indicates that, for given testing scenarios and runs, the emission values can vary considerably - the standard deviations that are presented in TB 760 are often very high.

12. **Request**: *Please explain if there is a nexus between ClO_2 application rate and HAP emissions from a bleach plant. If a nexus exists, how is it being applied to keep HAP emissions to a minimum from the plant?*

Response: In attempting to answer this question, Georgia-Pacific has reviewed various literature that is readily available in the industry, primarily through NCASI. NCASI Technical Bulletin 701 (TB 701) states that, "Volatile organic and chlorinated compounds most prominent in bleach plant emissions included Cl_2, ClO_2, methanol (CH_3OH) and chloroform ($CHCl_3$)". Of these, only ClO_2 is not a regulated hazardous air pollutant (HAP) under Section 112(d) of the Clean Air Act.

For the most prominent of these, methanol, TB 701 states that, "Emissions of methanol from bleach plant vents are affected by various factors including (a) the type of wood pulped (hardwood vs softwood), (b) O_2 delignification preceding the bleach plant, (c) percent substitution by ClO_2, (d) amount of methanol in ClO_2 solution used in bleaching, and (e) degree of removal of methanol from pulp in brownstock washing." NCASI does not identify ClO_2 application rate as a contributing factor to methanol formation. In Technical Bulletin 666 (TB 666), NCASI discusses some of these other factors in more detail. For example, with regard to ClO_2 substitution rate, TB 666 states that, "These data show, however, that when the impact of methanol entering with the pulp and the ClO_2 liquor was eliminated, the amount of methanol generated in the bleach plant decreased with increasing levels of ClO_2 substitution. This decrease in methanol formation was gradual up to 70 percent ClO_2 substitution but was very significant at 100 percent ClO_2 substitution". The Cluster Rule targets methanol emission reductions at the brownstock washers. Therefore, we expect that the quantity of methanol entering the bleach plant with the pulp will be reduced as the Cluster Rule is fully implemented at the Palatka Mill (by April 2006).

For chloroform, TB 701 states that, "The bleaching sequence (which influences the bleaching chemicals used) and level of bleaching (final brightness) are expected to affect emissions of Cl_2, ClO_2, and $CHCl_3$...The use of hypochlorite is perhaps the single largest factor influencing the formation and emission of $CHCl_3$ from bleach plant vents". The preamble to the Cluster Rule, which is targeted at reducing HAPs in the bleach plant and other mill areas, states that, "...the technology basis for MACT control of chloroform is complete chlorine dioxide substitution and elimination of hypochlorite as a bleaching agent. These process modifications were determined to reduce chloroform emissions significantly". Again, there is confirmation of the fact that the primary contributor to the formation of chloroform, a chlorinated HAP, is the use of hypochlorite in bleaching. In order to comply with the MACT/Cluster Rule requirements for reducing HAPs, the Palatka Mill practices 100 percent chlorine dioxide substitution. Hypochlorite bleaching is not utilized. Variation in ClO_2 application rate was not identified by NCASI or EPA (as part of the MACT development process) as a significant contributing factor to the formation or reduction of chloroform. It should also be noted that the Cluster Rule establishes a very tight control level for chlorinated HAPs of 0.002 pound per ton of oven-dried pulp (lb/ODTP). Based on recent testing, measured levels at the Palatka Mill were roughly an order of magnitude lower.

13. **Request**: *Please explain how the quantity of lignin in the pulp entering the bleach plant is being monitored and what role, if any, is that playing in the ClO_2 application rate.*

    Response: Kappa number has been proven to be a good relative indicator of lignin content in pulp. An inline kappa analyzer measures the kappa number of the pulp entering the bleach plant. The DCS uses this kappa measurement as one of the criteria for determining ClO_2 application rate, but final pulp brightness is the principal parameter used to control the operation of the Bleach Plant. (question – do we want to say something about the fact that final pulp brightness is something that is dictated by the customer and the specific product being manufactured.

14. **Request**: *The application pages under Section I, Page 20 proposes 3-hour average basis for monitoring pH of the gas scrubbing medium, fan amperage of the bleaching system vent gas fan and the scrubber recirculation flow. Please indicate if continuous monitoring of these parameters is required in 40 CFR 60, Subpart S. If so, EPA will have to approve this request.*

    Response: Continuous monitoring is required by 40 CFR 63.453 (c). Paragraph (n) of this same section requires that the Administrator approve the rationale for the selected operating parameter value, and monitoring frequency, and averaging time. Attachment C includes information provided to both the Department and the Administrator relative to this provision. The Northeast District worked with EPA on specific language in the draft Title V Permit Revision recently provided to us incorporating the parameter values, monitoring frequency, and averaging time (see Attachment D).

The responses to the remaining items (Nos. 15-20) in your letter dated November 26, 2002 will be provided under separate cover. We have contracted with an outside engineering firm to finalize our BACT analysis and expect to have the final response to the Department by February 1, 2003.

With the "completed responses" provided above, and those regarding the BACT analysis to be provided by February 1, we believe we will have fulfilled our obligation to submit a "complete application" no later than February 1, as required by paragraph 17 of the November 8, 2002 Consent Order and consistent with Rules 62-212.400 and 62-4.055. Please let me know promptly if the Department disagrees, so that we can consider whether we need to seek an extension to the Consent Order deadline.

If you have any further questions, please do not hesitate to call me at (386) 329-0918.

Sincerely,

Myra J. Carpenter

Myra J. Carpenter
Environmental Superintendent

Cc: W.M. Jernigan
T. Wyles
M. Aguilar
S.Matchett

Attachment A

Georgia-Pacific Palatka Pulp & Paper Operations

Analysis of Material Shipments to Pulp Tons

	1999	2000	2001
Material Shipments out of Mill			
Kraft Shipments	317,527	302,430	284,872
Tissue Shipments	244,152	240,394	219,563
Total	561,679	542,824	504,435
Inventory Change	(7,436)	7,141	6,840
Net Shipments +/- Inventory Change	554,243	549,965	511,275
Purchased Paper Consumed	19,833	19,697	6,853
Net Tons Requiring Fiber	534,410	530,268	504,422
Pulp Tons Utilized			
Hard Pine Pulp	272,878	267,656	235,545
Soft Pine Pulp	192,533	179,778	183,869
Hardwood Pulp	111,674	133,276	134,049
Total Production	577,085	580,710	553,463
Average Moisture Loss of 5%	28,854	29,036	27,673
Bleaching Loss of 10%	27,380	28,176	28,580
Net Pulp Tons	520,850	523,499	497,210
Purchased Pulp	11,574	5,557	5,403
Total Pulp Consumed	532,424	529,056	502,613
Variance	1,986	1,212	1,809
Note:			
Bleached Pulp Tons by Year	273,803	281,756	285,801

Variance reflects less than 0.5% of total shipments out of mill

Attachment B

Georgia-Pacific

Palatka Pulp and Paper Operations
Consumer Products Division

P.O. Box 919
Palatka, FL 32178-0919
(386) 325-2001

November 13, 2002

VIA FAX (904) 448-4363

Mr. Christopher L. Kirts, P.E.
State of Florida
Department of Environmental Protection
7825 Baymeadows Way, Suite 200B
Jacksonville, Florida 32256-7590

RE: Georgia-Pacific Corporation
Facility 1070005

Dear Mr. Kirts:

As you know, the Palatka mill conducted an initial performance test on the bleach plant scrubber stack in May 2001 and submitted the throughput rates and stack test results to the Department on June 11, 2001. The mill's submittal did not include other detailed information about chemical application rates, Kappa number, or the specific production mix (in terms of hardwood/softwood) being run at the time.

Enclosed is a table that contains additional information about the three test runs from that event. Also enclosed is a stack test report from the first three stack tests that were conducted during the week of October 28, 2002. Georgia-Pacific considers information about its chemical application rates, Kappa number, and other detailed production parameters to be confidential business information, pursuant to Section 403.111, F.S. This data relates to secret processes or secret methods of manufacture or production and is exempted from the public records act. G-P respectfully requests that you not copy or distribute it except to others in DEP who need to see it.

I hereby certify, based on the information and belief formed after reasonable inquiry, that the statements made and data contained in this document are true, accurate, and complete.

Feel free to call Myra Carpenter if you have any questions about this information. She can be reached at (386) 329-0918.

Sincerely,

Theodore D. Kennedy

Theodore D. Kennedy
Vice President

tk

cc. W. M. Jernigan
S Matchett

MAY 25, 2001 PRODUCTION DATA FOR TESTS

Times

5/25/01 21:50 Run 1
5/25/01 22:49

5/25/01 23:02 Run 2
5/26/01 0:01

5/26/01 0:12 Run 3
5/26/01 0:42

5/26/01 1:43
5/26/01 2:13

		Do Stage				Eop Stage		D1 Stage		
	ADTBPH	%SW	%HW	Kappa	%ClO2	%SW	%HW	%SW	%HW	%ClO2
Run 1	50.0	0	100	13.4	0.8	44.1	55.9	100	0	1.0
Run 2	52.6	0	100	13.2	0.8	0	100	67.9	32.1	1.0
Run 3	49.4	0	100	13.8	0.8	0	100	8.0	92.0	0.9

Notes:
ADTBPH is air-dried tons of bleached pulp per hour
Kappa is the pre-washer kappa
%ClO2 is the %ClO2 applied in that stage

Please note that the Kappa and Chemical Application Rates are considered Confidential Business Information.

Attachment C

Georgia-Pacific

Palatka Pulp and Paper Operations
Consumer Products Division

P O Box 919
Palatka, FL 32178-0919
(386) 325-2001

November 13, 2002

VIA FAX (904) 448-4363

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Theodore D. Kennedy

Theodore D Kennedy
Vice President

tk

cc A. M. Jernigan
S. Matchett

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5/26/01 2:13

		Do Stage				Eop Stage		D1 Stage		
	ADTBPH	%SW	%HW	Kappa	%ClO2	%SW	%HW	%SW	%HW	%ClO2
Run 1	50.0	0	100	13.4	0.8	44.1	55.9	100	0	1.0
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Run 3	49.4	0	100	13.8	0.8	0	100	8.0	92.0	0.9

Notes ADTBPH is air dried tons of bleached pulp per hour
Kappa is the pre-washer kappa
%ClO2 is the %ClO2 applied in that stage on weight basis

Please note that the Kappa and Chemical Application Rates are considered Confidential Business Information

TEST REPORT
On
STACK EMISSIONS

From the
BLEACH PLANT WET SCRUBBER OUTLET

In service at
GEORGIA-PACIFIC PALATKA OPERATIONS

Located in
PALATKA, PUTNAM COUNTY, FLORIDA

Prepared for
GEORGIA-PACIFIC CORPORATION

Test Completion Date: October 28th, 2002
Report Submittal Date: November 8th, 2002

Cubix Project No. 7382-FL1

Prepared by

Cubix Corporation

CORPORATE HEADQUARTERS
9225 US Hwy. 183 South, Austin, TX 78747

TABLE OF CONTENTS

INTRODUCTION

Emission testing was conducted on a Bleach Plant wet scrubber at the Georgia-Pacific Corporation (GaPac) Palatka Operations facility located on County Road 216 in Palatka, Putnam County, Florida. Carbon monoxide (CO) and other combustion products were measured in the outlet of the scrubber stack. Cubix Corporation, Southeast Regional Office conducted these tests on October 28th, 2002.

The purpose of this testing was to determine the CO emission rates of the scrubber while bleaching softwood in lieu of hardwood as an engineering study. Three one-hour test runs were conducted on the unit documenting process operating data, emission concentrations, and mass emission rates.

The tests followed the principles of the procedures set forth in the Code of Federal Regulations, Title 40, Part 60, Appendix A, Methods 1, 2, 3a, 4, and 10. Table 1 summarizes the background information pertinent to these tests.

This report has been reviewed and is approved for submittal by the following representative:

Leonard

Cubix Corporation

TABLE 1
Background Data

Source Owner:

Georgia-Pacific Corporation
County Road 216
Palatka, Florida 32177
Attention: Joe E. Taylor
(386) 329-0027 Phone
(386) 328-0014 Facsimile
Email: JETAYLOR@GAPAC.com

Test Contractor:

Cubix Corporation, SE Regional Office
3709 SW 42nd Avenue, Suite 2
Gainesville, Florida 32608
Attention: Roger Osier, Project Foreman
(352) 378-0332 Phone
(352) 378-0354 Facsimile
Email: rosier@cubixcorp.com

Process Description:

This pulp and paper mill produces both natural and bleached Kraft paper grades. Wood pulp is processed at the Bleach Plant in the manufacture of bleached paper products. The process utilizes chlorine dioxide (ClO_2) for the bleaching of pulp. Emissions from all stages of the bleaching process are sent to an alkaline wet scrubber.

Test Date(s): October 28th, 2002.

Location:

Georgia-Pacific Palatka Operations is located on County Road 216 in Palatka, Putnam County, Florida.

Emission Sampling Point:

The Bleach Plant scrubber (outlet) stack has two 3" diameter flanged NPT sample ports located 90° to each other in the vertical stack before venting to atmosphere, see Appendix A for stack diagram.

Test Participants:

Georgia-Pacific Corporation
Joe Taylor, Test Coordinator

Test Participants (continued):

Cubix Corporation
Roger Paul Osier, Project Foreman
James Hastings, Field Technician

Test Methods:

Environmental Protection Agency (EPA) Method 1 was used for selection of velocity traverse point locations.

EPA Method 2 was used for conducting stack gas pitot tube measurements used in determination of stack gas velocity.

EPA Method 3a was used for determination of oxygen (O_2) and carbon dioxide (CO_2) concentrations.

EPA Method 4 was used for determination of stack gas moisture content.

EPA Method 10 was used for determination of carbon monoxide (CO) concentrations.

SUMMARY OF RESULTS

GaPac owns and operates Georgia-Pacific Palatka Operations facility in Palatka, Putnam County, Florida. At this facility a wet scrubber is used to collect and control emissions from the Bleach Plant in the bleaching process of wood pulp. The emissions from this scrubber are the subject of this report.

Table 2 is a summary of the testing results for the emissions from the wet scrubber. The summary table contains data recorded during the test from the process feed rate and scrubber operation as supplied by GaPac personnel, ambient conditions, and the measured emissions. The emission rates for CO are reported in terms of parts per million by volume (ppmv) on a dry basis and pounds per hour (lbs/hr).

TABLE 2: Summary of Results
Bleach Plant Scrubber - Softwood Testing

Test Run No.	Run 1	Run 2	Run 3	
Date	10/28/02	10/28/02	10/28/02	
Start Time	09:34	11:27	13:17	
Stop Time	10:34	12:27	14:17	
Unit Operation				**Averages**
Wood Type	Softwood	Softwood	Softwood	-
Production Rate (adtbph)	49.7	49.7	35.0	**44.8**
#ClO_2 (adtbp)	45.8	46.8	49.9	**47.5**
Ambient Conditions				
Atmospheric Pressure ("Hg)	29.98	29.96	29.91	**29.95**
Temperature (°F) : Dry bulb	80.5	84.2	87.6	**84.1**
(°F): Wet bulb	75.5	74.3	74.8	**74.8**
Humidity (lbs moisture/lb air)	0.0174	0.0155	0.0151	**0.0160**
Measured Emissions				
CO (ppmv, dry basis)	955.3	1083.6	951.3	**996.7**
O_2 (% volume, dry basis)	20.76	20.67	20.69	**20.71**
CO_2 (% volume, dry basis)	1.04	1.22	1.03	**1.10**
Stack Volumetric Flow Rates				
via Pitot Tube (SCFH, dry basis)	7.70E+05	8.06E+05	8.19E+05	**7.98E+05**
Mass Emission Rates				
CO (lbs/hr)	53.5	63.5	56.7	**57.9**

Please note that ClO2 Application Rate is considered Confidential Business Information

Three one-hour test runs were conducted for each required EPA test method on the wet scrubber outlet. CO, O_2, and CO_2 emissions were continuously monitored during each of these runs. Moisture content was determined gravimetrically during each test run using a chilled water impingement system. Stack velocity measurements were performed during each test run.

Pollutant mass emission rates were calculated using the volumetric flow rates determined by EPA Methods 1-4. Examples of mass emission rate calculations and other calculations necessary for the presentation of the results of this section are contained in Appendix B.

Appendix A contains all field data sheets used during these tests. Appendix B contains examples of all calculations necessary for the reduction of the data presented in this report. Operational data obtained during the testing is presented in Appendix C. Records of quality assurance activities are in Appendix D. Certifications of calibration gases and equipment used to conduct tests at this facility are in Appendix E. Appendix F contains a copy of the logged data records of the analyzer monitored emission concentrations.

PROCESS DESCRIPTION

Georgia-Pacific Corporation owns and operates the Georgia-Pacific Palatka Operations facility. In operation since 1947, this pulp and paper mill produces natural and bleached Kraft paper grades. The emissions from the outlet of the wet scrubber located at the Bleach Plant, a stage of the manufacture of bleached Kraft paper products, were measured as an engineering study to determine the effects of bleaching softwood pulp in lieu of hardwood pulp in the system. This section of the report provides a brief description of the process and the wet scrubber outlet.

The bleaching process is an elemental chlorine-free (ECF) process. The process utilizes ClO_2 for the pulp bleaching process. No elemental chlorine or hypochlorite salts are used in the process. The ClO_2 is produced on site.

The bleaching process consists of the staged introduction of ClO_2 to the pulp slurry followed by washing of the bleached pulp. G-P Palatka utilizes a 3-stage bleach plant for this process. The pulp comes across a pre-washer, followed by the D0 stage where ClO_2 is introduced, the E or extraction stage, and the D1 stage where additional ClO_2 is applied. The off gases from all stages of the process are collected and passed through a wet scrubber utilizing an alkaline scrubbing solution.

Sample ports meeting the criteria of EPA Method 1 were located in a straight vertical section of the scrubber stack outlet. The sample ports were greater than 2 stack diameters upstream from the nearest flow disturbance, the elbow just prior to the stack outlet, and greater than 8 diameters downstream from the nearest flow disturbance. Access to the stack was made available via a permanent steel frame platform equipped with a caged safety ladder. The diameter of the exhaust stack was 41.75 inches. Appendix A contains a field sketch of the stack configuration and sample port locations.

GaPac personnel provided operational data from the process instrumentation. Data sets were recorded during each test run; the average of this data was recorded in the summary table. Copies of the original data are contained in Appendix C of this report.

ANALYTICAL TECHNIQUE

The emissions from a bleach plant scrubber were measured to determine the quantity of emissions being emitted to the atmosphere under various operating conditions. The sampling and analysis procedures used during these tests conformed with those outlined in The Code of Federal Regulations, Title 40. Part 60, Appendix A, Methods 1, 2, 3a, 4, and 10. This section of the report describes the analytical techniques and procedures used during the testing.

The test matrix for the scrubber outlet consisted of three one-hour test runs following each test method specified by GaPac. The stack gas was analyzed for CO, O_2, and CO_2 by continuous instrumental monitors. All exhaust gas analyses were performed on a dry basis. Table 3 lists the instruments and detection principles used for these analyses.

Provisions were made to introduce the calibration gases to the instrumental monitors via two paths: 1) directly to the instruments via the sample manifold quick-connects and rotameters, and 2) through the complete sampling system including the sample probe, filter, heat trace, condenser, sample line, manifold, and rotameters. The former method was used for quick, convenient calibration checks. The latter method was used to demonstrate that the sample was not altered due to leakage, reactions, or adsorption within the sampling system (sample system bias check). An O_2 standard calibration gas was introduced into the O_2 analyzer directly. Then the response from the O_2 analyzer was noted as the calibration gas was introduced at the probe. Any difference between the two responses in the instrument was attributed to the bias of the sample system. Following the span gas bias check, a zero gas bias check was performed on the O_2 analyzer using nitrogen to check for any zero gas bias of the sample system. In accordance with EPA Method 3a, this span and zero bias check procedure was repeated for the CO_2 analyzer. This procedure was also used for the CO analyzer although not required by EPA Method 10.

As shown in Figure 1, a 1-inch diameter stainless steel probe was inserted into the sample port of the stack. The gas sample was continuously pulled through the probe and transported via a 100-foot long, $^3/_8$-inch diameter heat-traced Teflon® line into the mobile laboratory using a stainless steel/Teflon® diaphragm pump. At the pump exit the pressurized sample was pushed into a heated sample manifold. The bulk of the gas stream then passed into a stainless steel minimum contact condenser to dry the sample stream and into the (dry) sample manifold. From the manifold, the sample was partitioned to the analyzers through glass and stainless steel rotameters for flow control of the sample.

Instrumental monitors were housed in an air-conditioned trailer-mounted mobile laboratory. Gaseous calibration standards were provided in aluminum cylinders with concentrations certified by the vendor. EPA Protocol No. 1 was used to determine the cylinder concentrations where applicable (i.e., NO_x calibration gases).

EPA Method 1 was used to determine the velocity traverse point locations. Prior to conducting the tests, a cyclonic flow check was conducted. No significant cyclonic flow was encountered. The stack met the minimum criteria set forth in the method. Pitot tube measurements were made at eight (8) separate traverse points in each stack cross section for a total of sixteen (16) traverse points. The location of the sample ports and the pitot tube traverse point distances for the scrubber stack are denoted in the "Circular Stack Sampling Traverse Point Layout" data sheet, see Appendix A.

EPA Method 2 was used for determination of stack gas velocity during each run. A pitot tube and inclined gauge oil manometer were used to measure the differential pressure at each traverse point. The stack temperature was determined with a K-type thermocouple and digital thermometer.

The stack gas analyses for CO_2 and O_2 concentrations were performed in accordance with procedures set forth in EPA Method 3a. Instrumental analyses were used in lieu of an Orsat or Fyrite procedure due to the greater accuracy and precision provided by the instruments. The CO_2 analyzer was based on the principle of infrared absorption. The O_2 analyzer operated using a paramagnetic detector.

EPA Method 4 was used to measure the moisture content of the stack gas. A chilled water impingement system was used in conjunction with a calibrated dry gas meter to pull a sample greater than 21 scf coincident with each test run. A K-type (chromel-alumel) thermocouple was used in conjunction with a digital thermometer to determine the exit temperatures in the chilled water impingement sampling train. This parameter is measured to ensure that the gas stream is cooled to a minimum of 68 degrees Fahrenheit as required by sampling methodology. Determination of the moisture content was necessary to determine stack gas molecular weights and volumetric flow rates.

CO emission concentrations were quantified in accordance with procedures set forth in EPA Method 10. A continuous non-dispersive infrared (NDIR) analyzer was used for this purpose. This reference method analyzer was equipped with a gas correlation filter that removes most interference from moisture, CO_2, and other combustion products.

All data from the continuous monitoring instruments were logged into a computer file in 1-minute intervals and rolling 1-minute averages. A data logging system with a computer generated display screen monitored, recorded and averaged the emission concentrations. The program controlling the logging of data was also used to log QA data. See Appendix F of this report for copies of the raw data and Appendix D for the QA data.

Cubix personnel collected ambient absolute pressure, temperature and humidity data. A wet/dry bulb sling psychrometer was used to determine ambient temperature and humidity conditions. An aircraft-type aneroid barometer (altimeter) was used to measure absolute atmospheric pressure.

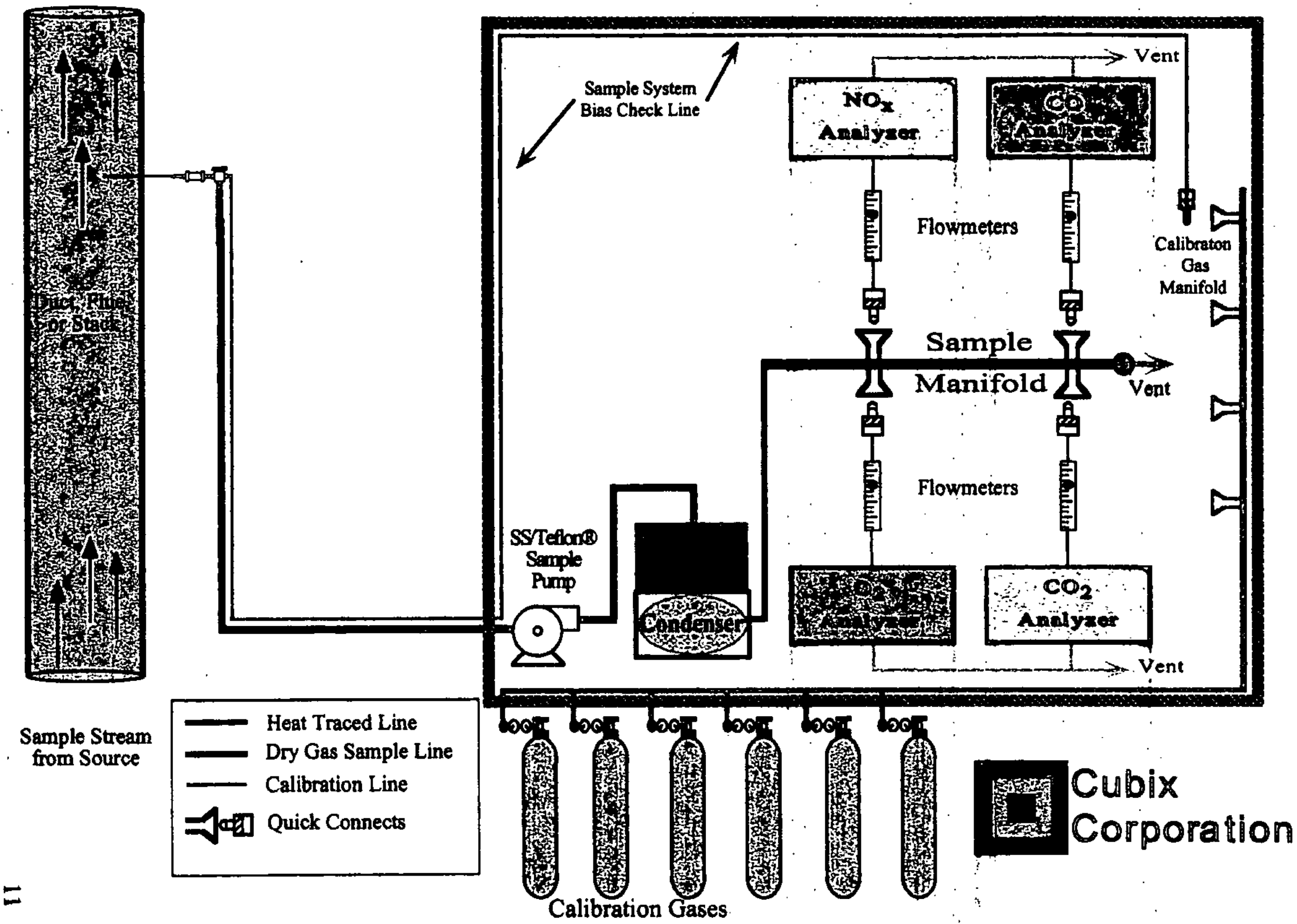
Emission calculations were conducted by a computer spreadsheet as shown in Table 2 of this report. Example calculations were performed manually using a hand-held calculator in order to verify the formulas used in the spreadsheet. Example calculations are in Appendix B of this report.

TABLE 3
ANALYTICAL INSTRUMENTATION

Parameter	Model and Manufacturer	Common Use Ranges	Sensitivity	Response Time (sec.)	Detection Principle
CO	TECO Model 48C	0-1 ppm 0-10 ppm 0-30 ppm 0-50, 0-100 ppm 0-200 ppm 0-500 ppm 0-1000 ppm	0.1 ppm	60	Infrared absorption, gas filter correlation detector, microprocessor based linearization.
CO_2	Servomex 1400	0-5% 0-10% 0-15%	0.025% 0.05% 0.075%	< 10	Non-dispersive infrared absorption, electronic linearization of a logarithmic signal (Beer's Law)
O_2	Servomex 1400	0-5% 0-10% 0-25%	0.02% 0.02% 0.02%	< 10	Paramagnetic cell detector, inherently linear.

NOTE: Higher ranges available by sample dilution.
Other ranges available via signal attenuation.

FIGURE 1
INSTRUMENTAL SAMPLE SYSTEM DIAGRAM



QUALITY ASSURANCE ACTIVITIES

A number of quality assurance activities were undertaken before, during and after this testing project. This section of the report in conjunction with the documentation in Appendix D describes each of those activities.

Each instrument's response was checked and adjusted in the field prior to the collection of data via a multi-point calibration. The instrument's linearity was checked by first adjusting the instrument's zero and span responses to zero nitrogen and an upscale calibration gas in the range of the expected concentrations. The instrument response was then challenged with other calibration gases of known concentration. For CO. O_2, and CO_2, the instrument's response was accepted as being linear if the response of the other calibration gases agreed within ±2% span of the predicted values. The responses of the infrared absorption type CO and CO_2 analyzers are made linear through electronic suppression.

System bias checks were performed both before and after the sampling system was used for emissions testing. The sampling system's integrity was tested by comparing the responses of the O_2 analyzer to a calibration gas (and a zero gas) introduced via two paths as previously described in the *Analytical Techniques* section of this report. This system bias test was performed to assure that no alteration of the sample had occurred during the test due to leakage, reactions, or absorption. Similarly, system bias checks were performed with CO and CO_2 for added assurance of sample system integrity. Examination of the logged QA data records and Instrumental Analysis Quality Assurance Data worksheet in Appendix D shows that the analyzer response via both sample paths agreed within ±5%.

The residence time of the sampling and measurement system was estimated using the pump flow rate and the sampling system volume. The pump's rated flow rate is 0.8 scfm at 5 psig. The sampling system volume was approximately 0.175 scf. Therefore, the minimum sample residence time was approximately 13 seconds.

Cubix Corporation and instrument vendors conducted interference response tests on the CO, O_2, and CO_2 analyzers. The sum of the interference responses for H_2O, C_3H_8, CO, CO_2 and O_2 is less than 2 percent of the applicable full-scale span value. The instruments used for the tests meet the performance specifications for EPA Methods 3a and 10. The results of the interference tests are available in Appendix D of this report.

The sampling system was leak checked by demonstrating that it could hold a vacuum greater than 15 inches of mercury (Hg) for at least 1 minute with a decline of less than 1 inch Hg. A leak test was conducted after the sample system was set up and before testing began and after testing was completed before the system was dismantled. This test was conducted to insure that ambient air was not diluting the sampling system. The actual vacuum was greater than 24 inches Hg during the leak tests with no leakage detected.

As a minimum, before and after each test run, the analyzers were checked for zero and span drift. This allows test runs to be bracketed by calibrations and documents the precision of the data just collected. Calibration gases were introduced to the analyzers through the entire sampling system. Based on the applicable test method, the criterion for acceptable data is that each instrument drifts no more than ±3% of the full-scale response. Appendix D contains quality assurance tables and logged QA calibration records that summarize the zero and span checks that were performed for each test run. The worksheets also contain the data used to correct the data for drift per EPA Method 6c, Equation 6c-1. O_2 and CO_2 emissions data were corrected for drift as required by the test methods. CO emissions data was also corrected for drift to provide more accurate results and consistent quality assurance procedures.

The control gases used to calibrate the instruments were analyzed and certified by the compressed gas vendors to ±1% accuracy for each calibration gas. EPA Protocol No. 1 was used, where applicable (i.e., NO_X gases), to assign the concentration values traceable to the National Institute of Standards and Technology (NIST), Standard Reference Materials (SRM's). The gas calibration sheets as prepared by the vendor are contained in Appendix E.

The pitot tube tips used during the testing were visually inspected to insure that they met the criteria of EPA Method 2. The pitot tube lines were leak checked in the field in accordance with EPA Method 2 guidelines each time connection to the oil manometer was made.

The working dry gas meter used for the moisture train was calibrated prior to testing in accordance with EPA Method 4. A laboratory grade dry gas meter calibrated against a NIST reference instrument, a bell prover, was used for this calibration. Calibration certification documentation of the working meter can be found in Appendix E.

Appendix E also contains calibration data on ancillary measurement equipment used during this testing. The altimeter/barometer was used for determination of atmospheric pressure. Thermometers and thermocouples were used to determine stack gas temperatures and moisture train temperatures.

Cubix collected and reported the enclosed test data in accordance with the procedures and quality assurance activities described in this test report. Cubix makes no warranty as to the suitability of the test methods. Cubix assumes no liability relating to the interpretation and use of the test data by others.

APPENDIX A:
FIELD DATA SHEETS

Sign In Sheet

Job Name: GEORGIA-PACIFIC - PALATKA PLANT

Date(s): OCTOBER 28, 2002

Job Number: CUBIX # 7382

Permit No. NA

Plant Name/Location: GEORGIA-PACIFIC CORP. PALATKA OPERATIONS / CR 216 PALATKA, PUTNAM CO, F

Emission Source(s): BLEACH PLANT WET SCRUBBER

PARTICIPANTS:

Cubix Corporation Test Contractor

GEORGIA PACIFIC CORP. Owner/Operator

NA Regulatory Agency

Name	Affiliation	Position	Phone Number	Job Safety Review(Y/N)
Roger Paul Osier	CUBIX	PROJECT FOREMAN	(352) 378-0332	Y
Jim Hastings	CUBIX	FIELD TECH.	(352) 378-0332	Y
JOE TAYLOR	GEORGIA PACIFIC	TEST COORDINATOR	(386) 329-0027	Y

Cubix Corporation
Air Emission Testing Job Safety Analysis

Date: October 27th and 28th, 2002
Mobile Lab/Cubix Crew: T-13/LJB, RPO, DLD, and JTH
Client: Georgia-Pacific Corporation
Job #/Contact: 7382-FL1/Joe Taylor
Plant Name: Georgia-Pacific Palatka Operations
Unit Name(s): Bleach Pplant Scrubber
Location (city/state): Palatka, Florida

Permits Required

- Hot Work ☐ Check
- Cold Work ☐ Check
- Lock & Tag ☐ Check
- Scaffolding ☐ Check
- Crane/Lift ☐ Check
- Line Break ☐ Check

Comments
No permits required in area where we were working.

Emergency Response

Safe Haven:	Upwind	(Control room? Plant office?
Wind Direction:	East	N NE E SE S SW W NW
Evacuation Route:	Upwind	front gate? Back gate? Crosswind?
Assembly Points:	Down the road	office? Down the road?
Plant Map Reviewed:	Not Applicable	Yes or No or Not Applicable

Emergency Equipment Locations Identified

Emergency Shut Off	___ Located	___ Not Applicable	*manual emergency trip*
Fire Extinguisher	___ Located	___ Not Applicable	*Cubix Mobile Lab & Plant Ext.*
Safety Showers	___ Located	___ Not Applicable	*required for plant?*
Escape Air Pack	___ Located	___ Not Applicable	*required for plant?*

JOB HAZARD IDENTIFIED

Hazardous Material (in plant area)
(flammability, reactivity, health hazards)
List Hazmat?? ClO2.

Environmental Hazards

airborne particulate	☐ Present	☐ No Hazard
burn hazard	☐ Present	☐ No Hazard
rain / fog	☐ Present	☐ No Hazard
electrical shock	☐ Present	☐ No Hazard
heat stress	☐ Present	☐ No Hazard
cold weather/frostbite	☐ Present	☐ No Hazard
inadequate lighting	☐ Present	☐ No Hazard
noise	☐ Present	☐ No Hazard
poor access/egress	☐ Present	☐ No Hazard

Comments: Difficult access to stack and sample ports.

Chemical Hazards (check hazards that are present at jobsite)

asfixiation	☐ Check	carcinogen	☐ Check
poison gas	☐ Check	chemical burns	☐ Check
chemical eye exposure	☐ Check	chemical skin exposure	☐ Check
flammable gas	☐ Check	flamable liquid	☐ Check
strong acid	☐ Check	strong base	☐ Check
OTHER	☐ Check		

Equipment Lifting & Fall Hazard

test equipment hoisting (pulley/boom)	___ Required	___ Not Applicable
portable ladder	___ Required	___ Not Applicable
man lift (cherry picker)	___ Required	___ Not Applicable
personnel basket (crane)	___ Required	___ Not Applicable
Plant Stairs & Ladders	___ Required	___ Not Applicable
rigging sample lines, umbilicle	___ Required	___ Not Applicable
scaffold	___ Required	___ Not Applicable

Description of Testing Activities:

Set-up on 10/27/02. Tested wet scrubber outlet stack at the Bleach Plant on 10/28/02.

Personal Protective Equipment Required

hard hat	☐ Check	acid suit	☐ Check
ear plugs/muffs	☐ Check	rubber boots	☐ Check
safety glasses	☐ Check	monogoggles	☐ Check
steel toed shoes	☐ Check	face shield	☐ Check
gloves	☐ Check	safety harness	☐ Check
hot gloves	☐ Check	respirator	☐ Check

Phone No's. & Alarm Knowledge (list type of sound)

Plant Contact Ph.:	386-329-0027	Evacuate:	
Control Room Ph.:		Fire:	
Emergency Ph.:	911	All Clear:	
Other:		Poison Gas:	yes

If facility has no alarms, verify communication with control room

There was a plant alarm for chlorine gas but they didn't know what the alarm sounded like...They said we would know if we heard it.

PRECAUTIONS TO BE IMPLEMENTED

Cubix MSDS in Mobile Lab ___ Yes ___ No
Plant MSDS reviewed??? ___ Yes ___ Not Available

Protective Equipment		Protective Actions	
respirator	☐ Check	OTHER	☐ Check
work gloves	☐ Check	shade/cool breaks	☐ Check
rain protect elect. equip.	☐ Check	rain gear	☐ Check
inspect extension cords	☐ Check	secure/protect ext.cords	☐ Check
hot gloves	☐ Check	warm up breaks	☐ Check
cold weather clothing	☐ Check	liquid intake	☐ Check
flash light/head lamp	☐ Check	night lighting	☐ Check
hearing protection	☐ Check	hard hat liner	☐ Check
housekeeping	☐ Check	alternate route	☐ Check

Respiratory Safety Equip		Protective Clothing	
supplied fresh air	☐ Check	fire suit	☐ Check
SCBA	☐ Check	acid suit	☐ Check
respirator (correct type?)	☐ Check	rubber boots	☐ Check
escape pack	☐ Check	monogoggles	☐ Check
exposure dosiometer	☐ Check	face shield	☐ Check
OTHER	☐ Check	OTHER	☐ Check

Inspections and Protective Actions

equipment secure	___ Check	clear lift zone	___ Check
operator certification	___ Check	rope inspection	___ Check
guy lines	___ Check	body harness	___ Check
radios/handsignals	___ Check	guard rails, toe plates	___ Check
housekeeping	___ Check	ladder tie-off	___ Check
lines secure	___ Check	monorails secure	___ Check
secure tools	___ Check	hard hats	___ Check

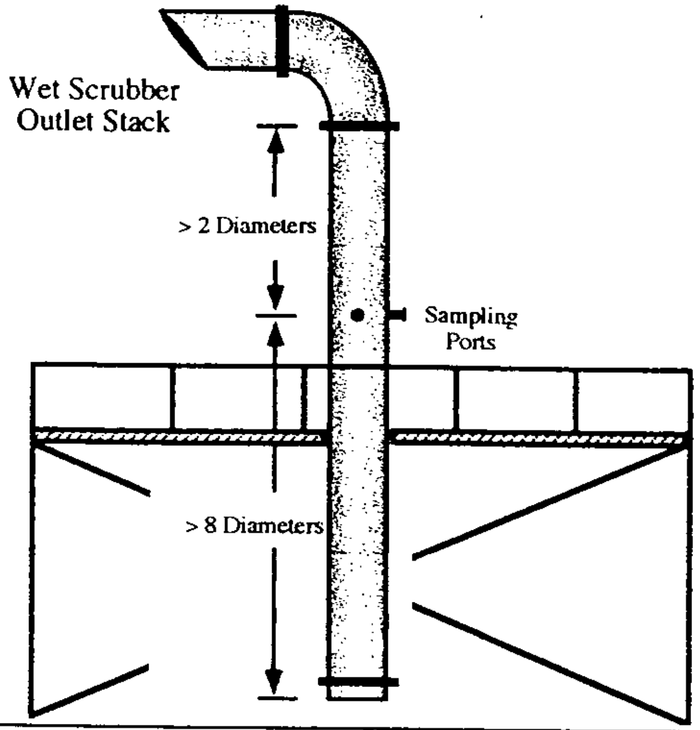
Circular Stack Sampling Traverse Point Layout
(EPA Method 1, Velocity Measurement Traverse Points)

Date: October 27th, 2002
Client: Georgia-Pacific Corporation
Plant: G-P Palatka Operations
Source: Bleach Plant Scrubber
Technician(s): RPO, JTH

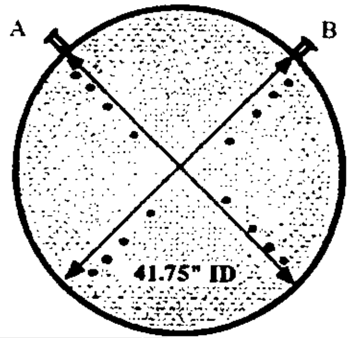
Port + Stack ID (in): 51.25
Port Extension (in): 9.50
Stack ID (in): 41.75
Stack Area (ft²): 9.507
Duct Diameters **upstream** from flow disturbance (A): > 2
Duct Diameters **downstream** from flow disturbance (B): >8
Total Required Traverse Points: 16
No. of Traverse Points per Diameter: 8

Stack Diagram

(Draw side view showing major components, dimensions, upstream downstream flow disturbances)



Cross Section

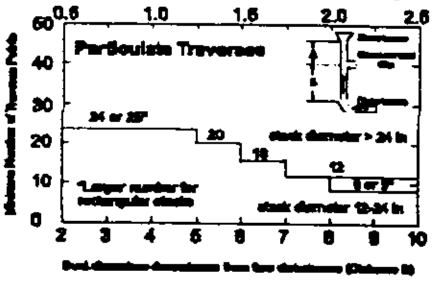


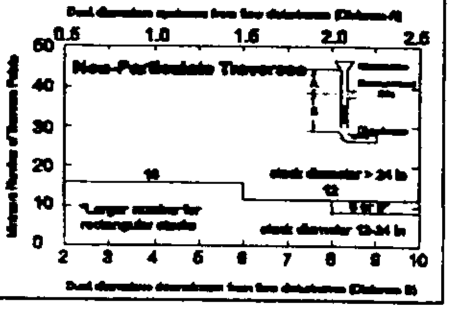
Unit Information

Bleach Plant Scrubber
Wet scrubber that uses an alkaline solution.

Traverse Point Number	Number of Traverse Points on a Diameter				*Calculated Traverse Point	*Traverse Point with Port Extension
	4	6	8	12		
1	6.7	4.4	3.2	2.1	1.34	10.84
2	25.0	14.6	10.5	6.7	4.38	13.88
3	75.0	29.6	19.4	11.8	8.10	17.60
4	93.3	70.4	32.3	17.7	13.49	22.99
5		85.4	67.7	25.0	28.26	37.76
6		95.6	80.6	35.6	33.65	43.15
7			89.5	64.4	37.37	46.87
8			96.8	75.0	40.41	49.91
9				82.3		
10				88.2		
11				93.3		
12				97.9		

Stack diameters > 24 in shall have no traverse points located within 1-inch of the stack wall
Stack diameters ≤ 24 in shall have no traverse points located within 0.5-inch of the stack wall





Testing by Cubix Corporation - Austin, Texas - Gainesville, Florida

EPA Methods 1 through 4: Velocity, Moisture Content, Molecular Weight, and Volumetric Flow Rates

Test Run No.	**Run 1**	**Run 2**	**Run 3**
Date	10/28/02	10/28/02	10/28/02
Start Time (Moisture Run Times)	09:42	11:33	13:24
Stop Time (Moisture Run Times)	10:27	12:14	14:05
Stack Moisture & Molecular Wt. via EPA Methods 3a & 4			
O_2 (% volume, dry basis)	20.76	20.67	20.69
CO_2 (% volume, dry basis)	1.04	1.22	1.03
Beginning Meter Reading (ft^3)	675.970	703.905	739.319
Ending Meter Reading (ft^3)	703.495	726.224	762.465
Beginning Impingers Weight (g)	2235.2	2262.1	2285.0
Ending Impingers Weight (g)	2262.1	2285.0	2316.9
Dry Gas Meter Factor (K_d)	0.9869	0.9869	0.9869
Dry Gas Meter Temperature (°F begin)	96	84	88
Dry Gas Meter Temperature (°F end)	90.6	90	95
Atmospheric Pressure ("Hg, absolute)	29.98	29.96	29.91
Volume of Water Vapor Collected (SCF)	1.268	1.080	1.504
Volume of Air Metered (SCF)	25.964	21.281	21.851
Stack Gas Moisture (% volume)	4.66	4.83	4.50
Dry Gas Fraction	0.9534	0.9517	0.9550
Stack Gas Molecular Wt. (lbs/lb-mole)	28.48	28.49	28.50
Stack Flow Rate via Pitot Tube			
ΔP #1	0.13	0.14	0.18
ΔP #2	0.18	0.19	0.19
ΔP #3	0.22	0.23	0.22
ΔP #4	0.20	0.25	0.22
ΔP #5	0.24	0.27	0.23
ΔP #6	0.24	0.24	0.23
ΔP #7	0.18	0.24	0.25
ΔP #8	0.18	0.22	0.25
ΔP #9	0.18	0.17	0.19
ΔP #10	0.20	0.19	0.22
ΔP #11	0.21	0.23	0.23
ΔP #12	0.22	0.22	0.25
ΔP #13	0.19	0.19	0.21
ΔP #14	0.20	0.23	0.22
ΔP #15	0.18	0.22	0.21
ΔP #16	0.16	0.22	0.23
Pitot Tube Factor	0.84	0.84	0.84
Sum of Square Root of ΔP's	7.0355	7.4085	7.5071
Number of Traverse Points	16	16	16
Average Square Root of ΔP's	0.439721	0.463030	0.469191
Average Temperature (°F)	126.8	130.9	130.8
Static Pressure ("H_2O)	-0.28	-0.14	-0.18
Stack Diameter (inches)	41.75	41.75	41.75
Stack Area (ft^2)	9.507	9.507	9.507
Stack Velocity (ft/min)	1571	1660	1683
Stack Flow, wet (ACFM)	14936	15783	16005
Average Stack Flow, dry (SCFH)	**7.70E+05**	**8.06E+05**	**8.19E+05**

MOISTURE & VELOCITY FIELD DATA SHEET

Date: 10-23-02
Plant: G-P Palatka Plant
Source: Chlorine Plant Scrubber
Technicians: KPO, JTH
Atm. Pressure: 29.98 "Hg (Pb)
Test Run No.: Run 1

Dry Gas Meter ID: T-10 EQUIMETER
Dry Gas Meter Factor: 0.9869 (Kd)
Pitot Tube No/Type: #2110 .7' 3/8" OD SS S-TYPE
Pitot Tube Factor: 0.84
Static Pressure: -.28 "H_2O (Pg)
Ave. Stack Temp. 126.8 °F (Ts)

Collection Data

Sample Box	7	
Leak Check ≤ 0.02 ft³/min		
Pre-Test Leak Check	0.000 ft³/min 24.2 "Hg Vac.	
Post-Test Leak Check	0.000 ft³/min 25.0 "Hg Vac.	
	Initial	Final
Time	9:42	10:27
DGM Reading (ft³ or L)	675.970	703.495
DGM Average Temp (°F)	96	90.6
Last Impinger Temp. (°F)	66	62.4
DGM Flow Rate	40	48
O_2 (% vol.)		
CO_2 (% vol.)		

Impingment System

Impinger	Contents	Initial Weight	Final Weight
1	DiH_2O	545.7	565.0
2	DiH_2O	557.5	559.8
3	Empty	485.9	486.5
4	SiGel	646.1	650.8
5			
6			
Totals		2235.2	2262.1

Velocity Traverse Data
with Stack Temperature and Cyclonic Flow Check

Point	ΔP ("H_2O)	°F	α	Point	ΔP ("H_2O)	°F	α
1-1	.13	125	5	2-1	.18	122	10
1-2	.18	125	10	2-2	.26	123	10
1-3	.22	125	10	2-3	.21	127	7
1-4	.20	126	5	2-4	.22	128	5
1-5	.24	126	6	2-5	.19	130	6
1-6	.24	126	8	2-6	.20	130	6
1-7	.18	126	8	2-7	.18	132	8
1-8	.18	126	10	2-8	.16	132	10

Velocity System Leak Check

Leak Check ≤ 0.1 "H_2O/min at a pressure ≥ 3.0 "H_2O			
	+	−	
Pre-Test Leak Check	0.0	0.0	"H_2O/min
	3.6	4.6	"H_2O Pres.
	+	−	
Post-Test Leak Check	0.0	0.0	"H_2O/min
	4.2	4.1	"H_2O Pres.

Cubix Corporation - Austin, Texas - Gainesville, Florida

MOISTURE & VELOCITY FIELD DATA SHEET

Date: 10-28-2002
Plant: G-P Palatka Plant
Source: Chlorine Plant Scrubber
Technicians: RPO, JTH
Atm. Pressure: 29.96 " Hg (Pb)
Test Run No.: Run 2

Dry Gas Meter ID: T-10 Equimeter
Dry Gas Meter Factor: 0.9869 (Kd)
Pitot Tube No/Type: #2110 7'·3/8"OD SS S-type
Pitot Tube Factor: 0.84
Static Pressure: -.14 "H₂O (Pg)
Ave. Stack Temp. 130.9 °F (Ts)

Collection Data

Sample Box	1	
Leak Check ≤ 0.02 ft³/min		
Pre-Test Leak Check	0.000 ft³/min 22.5 "Hg Vac.	
Post-Test Leak Check	0.000 ft³/min 23.0 "Hg Vac.	
	Initial	Final
Time	1133	12:14
DGM Reading (ft³ or L)	703.905	726.224
DGM Average Temp (°F)	84	90
Last Impinger Temp. (°F)	67	58
DGM Flow Rate	40	40
O_2 (% vol.)		
CO_2 (% vol.)		

Velocity System Leak Check

Leak Check ≤ 0.1 "H₂O/min at a pressure ≥ 3.0 "H₂O		
	+	−
Pre-Test Leak Check	0.0	0.0 "H₂O/min
	3.6	4.6 "H₂O Pres.
Post-Test Leak Check	0.0	0.0 "H₂O/min
	4.2	4.1 "H₂O Pres.

Impingment System

Impinger	Contents	Initial Weight	Final Weight
1	Di H₂O	565.0	582.6
2	DH₂O	559.8	561.7
3	MT	486.5	486.8
4	Si Gel	650.8	653.9
5			
6			
Totals		2262.1	2285.0

Velocity Traverse Data
with Stack Temperature and Cyclonic Flow Check

Point	ΔP ("H₂O)	°F	α	Point	ΔP ("H₂O)	°F	α
1-1	.14	129		2-1	.17	133	
1-2	.19	129		2-2	.19	133	
1-3	.23	131		2-3	.23	133	
1-4	.25	132		2-4	.22	133	
1-5	.27	133		2-5	.19	131	
1-6	.24	134		2-6	.23	130	
1-7	.24	134		2-7	.22	125	
1-8	.22	133		2-8	.22	121	

MOISTURE & VELOCITY FIELD DATA SHEET

Date: 10-28-2002
Plant: GP Palatka Plant
Source: Chlorine Plant Scrubber
Technicians: RPO, JTH
Atm. Pressure: 29.91 "Hg (Pb)
Test Run No.: Run 3

Dry Gas Meter ID: T-10 Equimeter
Dry Gas Meter Factor: 0.9869 (Kd)
Pitot Tube No/Type: #2110 7'x3/8"OD SS S-TYPE
Pitot Tube Factor: 0.84
Static Pressure: .1 - .18 "H_2O (Ps)
Ave. Stack Temp. 130.8 °F (Ts)

Collection Data

Sample Box	1	
Leak Check ≤ 0.02 ft³/min		
Pre-Test Leak Check	0.000 ft³/min 25.0 "Hg Vac.	
Post-Test Leak Check	0.000 ft³/min 25.5 "Hg Vac.	
	Initial	Final
Time	13:24	14:05
DGM Reading (ft³ or L)	739.319	762.465
DGM Average Temp (°F)	88	95
Last Impinger Temp. (°F)	66	64
DGM Flow Rate	40	40
O_2 (% vol.)		
CO_2 (% vol.)		

Impingment System

Impinger	Contents	Initial Weight	Final Weight
1	DiH_2O	[illegible]	605.0
2	DiH_2O	561.7	565.6
3	MT	486.8	487.7
4	SiGel	653.9	658.6
5			
6			
Totals		2285	2316.9

Velocity System Leak Check

Leak Check ≤ 0.1 "H_2O/min at a pressure ≥ 3.0 "H_2O	+	−	
Pre-Test Leak Check	0.0 3.6	0.0 4.6	"H_2O/min "H_2O Pres.
	+	−	
Post-Test Leak Check	0.0 4.2	0.0 4.1	"H_2O/min "H_2O Pres.

Velocity Traverse Data
with Stack Temperature and Cyclonic Flow Check

Point	ΔP ("H_2O)	°F	α	Point	ΔP ("H_2O)	°F	α
1-1	.18	129		2-1	.19	130	
1-2	.19	129		2-2	.22	130	
1-3	.22	131		2-3	.23	131	
1-4	.22	131		2-4	.25	132	
1-5	.23	131		2-5	.21	131	
1-6	.23	132		2-6	.22	131	
1-7	.25	131		2-7	.21	131	
1-8	~~.23~~ .25	131	↓	2-8	.23	131	↓

Cubix Corporation - Austin, Texas - Gainesville, Florida

APPENDIX B:
EXAMPLE CALCULATIONS

EXAMPLE CALCULATIONS

Moisture Content via EPA Method 4

refers to Test Run # 1

M_{WC} = net impinger weight gain = 2262.1 g – 2235.2 g = 26.9 g

Y = dry gas meter correction factor = 0.9869

V_m = volume metered = (703.495 – 675.970) = 27.525 ft^3

P_{atm} = atmospheric pressure = 29.98 "Hg

P_{met} = average meter pressure = P_{atm} = 29.98 "Hg

T_{met} = average meter temperature = 93.3° F + 460 °F = 553.3° R

K_2 = conversion factor, water weight to vapor = 0.04715 ft^3/g

K_3 = standard temp, pressure (STP) correction factor = 17.64° R/ "Hg

V_{WC} = total volume of water vapor collected at STP

$$= K_2 \times M_{WC}$$

$$= (0.04715 \times 26.9)$$

$$= 1.2683 \text{ ft}^3$$

$V_{m(std)}$ = total volume metered at STP

$$= K_3 \times Y \times V_m \times \frac{P_{met}}{T_{met}}$$

$$= 17.64 \times 0.9869 \times 27.525 \times \frac{29.98}{553.3}$$

$$= 25.964 \text{ ft}^3$$

B_{ws} = moisture content by EPA Method 4

$$= \frac{V_{WC}}{V_{WC} + V_{STP}}$$

$$= \frac{1.2683}{1.2683 + 25.964}$$

B_{ws} = 0.04657

= 4.66 % moisture

Stack Gas Molecular Weight

Refers to Test Run # 1

MW_{H_2O} = molecular wt of H_2O = 18 lb/lb-mole
MW_{CO_2} = molecular wt of CO_2 = 44 lb/lb-mole
MW_{O_2} = molecular wt of O_2 = 32 lb/lb-mole
MW_{N_2} = molecular wt of N_2 = 28 lb/lb-mole
C_{CO_2} = concentration of CO_2 = 0.0104 (from analyzer)
C_{O_2} = concentration of O_2 = 0.2076 (from analyzer)
C_{N_2} = concentration of N_2 = 1 - (C_{CO_2} + C_{O_2}) = 0.782
F_d = dry gas fraction = 1 - B_{ws} = 0.95343

MW = molecular weight of stack gas (lb/lb-mole)

$$= \text{wt. of } H_2O + \text{wt. of } CO_2 + \text{wt. of } O_2 + \text{wt. of } N_2$$

$$= (MW_{H_2O} \times B_{ws}) + (F_d \times ((MW_{CO_2} \times C_{CO_2}) + (MW_{O_2} \times C_{O_2}) + (MW_{N_2} \times C_{N_2})))$$

$$= (18 \times 0.04657) + (0.95343 \times ((44 \times 0.0104) + (32 \times 0.2076) + (28 \times 0.782)))$$

MW = 28.48(4) lb/lb-mole

Stack Gas Flow Rate via Pitot Tube, Q_d

Refers to Test Run # 1

C_p = pitot tube coefficient = 0.84

ΔP = pressure difference in stack as measured (in. H_2O)

$\sqrt{\Delta P_{av}}$ = average of square root of ΔP's = 0.439721

T_s = ave. stack temperature = 126.8° F + 460 = 586.8° R

P_{atm} = site corrected atmospheric pressure = 29.98 "Hg

P_g = stack static pressure (in. H_2O) = -0.28 "H_2O

P_s = absolute stack pressure

= $P_{atm} + (P_g/13.6)$ = 29.959 "Hg

K_p = pitot tube constant $= 85.49 \frac{ft}{sec}\left(\frac{(lb/lb-mole)(in.Hg)}{(^\circ R)(in.H_2O)}\right)^{\frac{1}{2}}$

T_{std} = absolute Temperature = 528° R

P_{std} = standard atmospheric pressure = 29.92 "Hg

V_s = stack velocity (ft/sec)

$$= K_p \text{ x } C_p \text{ x } \sqrt{\Delta P_{av}} \text{ x } \sqrt{\frac{T_s}{(P_s \text{ x } MW)}}$$

$$= 85.49 \text{ x } 0.84 \text{ x } 0.439721 \text{ x } \sqrt{\frac{586.8}{(29.959 \text{ x } 28.484)}}$$

= 26.185 ft/sec x 60 sec/min

V_s = 1571.1 ft/min

Q_a = stack flow rate (ft^3/min, actual)

= V x A , where A = area of stack = 9.507 ft^2

Q_a = 1571.1 x 9.507 = 14936.4 ft^3/min

Q_d = average stack flow rate on a dry basis at standard conditions (DSCFH)

$$= \frac{Q_a \text{ x } T_{std} \text{ x } P_s}{T_s \text{ x } P_{std}} \text{ x } F_d \text{ x } 60$$

$$= \frac{14936.4 \text{ x } 528 \text{ x } 29.959}{586.8 \text{ x } 29.92} \text{ x } 0.95343 \text{ x } 60$$

Q_d = 7.698 x 10^5 DSCFH, Average Flow

Correction of O_2 Gas Concentrations, CO_2

Refers to Test Run # 1

Analytical instruments tend to drift in their calibrations over time and with changes in atmospheric conditions. Span and zero gas bias drift checks (calibrations) were conducted prior to and following each test. The results of these calibrations were used to bracket and thus correct the raw gas concentrations into corrected (more accurate) gas concentrations. The calculation used for these correction is 40 CFR 60, Appendix A, Method 6c, Equation 6c-1. This correction is required for CO_2 exhaust concentrations when using Method 3a. Cubix also conducts this correction for EPA Method 10 in order to present more accurate and consistent test results.

U_{O_2} = analyzer O_2 gas concentration, uncorrected for drift and bias
U_{O_2} = 20.52 ppmv, uncorrected
C_O = Average of initial/final zero gas concentrations
= -0.04 ppmv
C_m = Average of initial/final span gas concentrations
= 11.785 ppmv
C_{ma} = Actual upscale cylinder span gas concentrations
= 11.94 ppmv

C_{O_2} = Effluent O_2 gas concentration, ppmv corrected

$$= (U_{O_2} - C_O) \times \frac{C_{ma}}{C_m - C_O}$$

$$= (20.52 + 0.04) \times \frac{11.94}{11.785 + 0.04}$$

C_{O_2} = **20.76 ppmv O_2, dry basis corrected**

CO Mass Emission Rate (lbs/hr)

Refers to Test Run # 1

C_{CO} = observed concentration of CO = 955.3 ppmv

MW_{CO} = 28.01 lb/lb-mole for carbon monoxide

for ideal gas, 385.15 SCF = 1.0 lb/mole

Q_d = 7.698×10^5 SCFH (from ave. pitot tube volumetric flow)

E_{CO} = mass emission rate of CO in (lb/hr)

$$= C_{CO} \times 10^{-6} \times Q_d \times \frac{MW_{co}}{385.15}$$

$$= 955.3 \times 10^{-6} \times 7.698 \times 10^5 \times \frac{28.01}{385.15}$$

E_{CO} = 53.5 lbs/hr

APPENDIX C:
OPERATIONAL DATA

PRODUCTION RATE DATA

RUN	DATE	TIME	SPECIES	PRODUCTION RATE, adtbph	#ClO2/adtbp
1	10/28/02	0934-1034	softwood	49.7	45.8
2	10/28/02	1127-1227	softwood	49.7	46.8
3	10/28/02	1317-1417	softwood	35.0	49.9

Please note that the Chemical Application Rate is considered Confidential Business Information

APPENDIX D:
QUALITY ASSURANCE ACTIVITIES

Quality Assurance Activities
Calibration Error, Bias, and Drift Checks

Linearity Check	CO	O_2	CO_2
Analyzer Range (ppmv), O_2 & CO_2 in % vol	1250.0	25.00	15.00
Strip Chart Offset	0.0	10.0	2.0
Low Level Certified Value (ppm or % vol)	253.0	4.53	4.48
Mid Level Certified Value (ppm or % vol)	441.0	11.94	7.99
High Level Certified Value (ppm or % vol)	885.0	20.90	12.62
Zero Target (% Chart)	0.0	10.0	2.0
Low Level Target (% Chart)	20.2	28.1	31.9
Mid Level Target (% Chart)	35.3	57.8	55.3
High Level Target (% Chart)	70.8	93.6	86.1
Zero Observed (% Chart)	0.0	10.0	2.0
Low Level Observed (% Chart)	19.6	28.0	32.1
Mid Level Observed (% Chart)	34.5	57.8	55.5
High Level Observed (% Chart)	71.2	93.6	86.1
Zero Observed (ppm or % vol)	0.33	0.00	0.00
Low Level Observed (ppm or % vol)	244.64	4.50	4.52
Mid Level Observed (ppm or % vol)	430.65	11.95	8.02
High Level Observed (ppm or % vol)	889.46	20.90	12.62
% Difference From Zero to Target	0.0	0.0	0.0
% Difference From Low to Target	0.7	0.1	-0.3
% Difference From Mid to Target	0.8	0.0	-0.2
% Difference From High to Target	-0.4	0.0	0.0
EPA Allowable % Difference from Target	±2% Span	±2% Span	±2% Span

Test Run 1	CO	O_2	CO_2
Analyzer Range (ppm), O_2 & CO_2 in %	1250.0	25.00	15.00
Calibration Gas Certified Value (ppm or %)	885	11.94	7.99
Strip Chart Offset	0.0	10.0	2.0
Target Calibration Gas (Chart %)	70.8	57.8	55.3
Actual Zero Gas from Direct (Chart %)	0.0	10.0	2.0
Actual Calibration Gas from Direct (Chart %)	71.2	57.8	55.5
Initial Readings			
Zero Gas (chart %)	-0.2	9.9	2.4
Calibration Gas (chart %)	71.0	57.1	54.9
Zero Gas (ppmv)	-2.97	-0.03	0.06
Calibration Gas (ppmv)	887.15	11.77	7.94
Final Readings			
Zero Gas (chart %)	-0.2	9.8	2.3
Calibration Gas (chart %)	71.1	57.2	55.2
Zero Gas (ppmv)	-2.97	-0.05	0.04
Calibration Gas (ppmv)	888.80	11.80	7.98
Bias and Drift Calculations			
Zero Bias (% Chart) (Run-Direct Cal) ≤5%	-0.3	-0.2	0.3
Calibration Bias (% Chart) ≤5%	-0.1	-0.6	-0.3
Zero Drift (Chart %) (Run-Run) ≤3%	0.0	0.1	0.1
Calibration Drift (Chart %) ≤3%	-0.1	-0.1	-0.3
Run Results			
Raw Results (chart %)	76.7	92.1	9.2
Raw Results (ppmv or % vol)	958.7	20.52	1.08
Corrected Results (ppmv or % vol) from % chart	955.3	20.76	1.04

Quality Assurance Activities
Calibration Error, Bias, and Drift Checks

Test Run 2	CO	O_2	CO_2
Analyzer Range (ppm), O_2 & CO_2 in %	1250.0	25.00	15.00
Calibration Gas Certified Value (ppm or %)	885	20.90	4.48
Strip Chart Offset	0.0	10.0	2.0
Target Calibration Gas (Chart %)	70.8	93.6	31.9
Actual Zero Gas from Direct (Chart %)	0.0	10.0	2.0
Actual Calibration Gas from Direct (Chart %)	71.2	93.6	32.1
Initial Readings			
Zero Gas (chart %)	-0.2	9.8	2.3
Calibration Gas (chart %)	71.1	92.8	32.0
Zero Gas (ppmv)	-2.97	-0.05	0.04
Calibration Gas (ppmv)	888.80	20.70	4.50
Final Readings			
Zero Gas (chart %)	-0.1	9.9	2.4
Calibration Gas (chart %)	71.4	92.5	31.9
Zero Gas (ppmv)	-1.40	-0.03	0.06
Calibration Gas (ppmv)	893.00	20.62	4.48
Bias and Drift Calculations			
Zero Bias (% Chart) (Run-Direct Cal) ≤5%	-0.1	-0.1	0.4
Calibration Bias (% Chart) ≤5%	0.3	-1.1	-0.3
Zero Drift (Chart %) (Run-Run) ≤3%	-0.1	-0.1	-0.1
Calibration Drift (Chart %) ≤3%	-0.3	0.3	0.1
Run Results			
Raw Results (chart %)	87.3	91.7	10.4
Raw Results (ppmv or % vol)	1091.3	20.43	1.26
Corrected Results (ppmv or % vol) from % chart	1083.6	20.67	1.22

Test Run 3	CO	O_2	CO_2
Analyzer Range (ppm), O_2 & CO_2 in %	1250.0	25.00	15.00
Calibration Gas Certified Value (ppm or %)	885	20.90	4.48
Strip Chart Offset	0.0	10.0	2.0
Target Calibration Gas (Chart %)	70.8	93.6	31.9
Actual Zero Gas from Direct (Chart %)	0.0	10.0	2.0
Actual Calibration Gas from Direct (Chart %)	71.2	93.6	32.1
Initial Readings			
Zero Gas (chart %)	-0.1	9.9	2.4
Calibration Gas (chart %)	71.4	92.5	31.9
Zero Gas (ppmv)	-1.40	-0.03	0.06
Calibration Gas (ppmv)	893.00	20.62	4.48
Final Readings			
Zero Gas (chart %)	-0.1	9.9	2.3
Calibration Gas (chart %)	69.8	92.2	31.9
Zero Gas (ppmv)	-1.40	-0.03	0.04
Calibration Gas (ppmv)	873.00	20.55	4.48
Bias and Drift Calculations			
Zero Bias (% Chart) (Run-Direct Cal) ≤5%	-0.1	-0.1	0.3
Calibration Bias (% Chart) ≤5%	-1.3	-1.4	-0.3
Zero Drift (Chart %) (Run-Run) ≤3%	0.0	0.0	0.1
Calibration Drift (Chart %) ≤3%	1.6	0.3	0.0
Run Results			
Raw Results (chart %)	75.9	91.5	9.1
Raw Results (ppmv or % vol)	949.3	20.38	1.07
Corrected Results (ppmv or % vol) from % chart	951.3	20.69	1.03

Georgia-Pacific Palatka Operations, Bleach Plant Scrubber, Logged QA Calibration Records

Run 1 10/28/02 9:34:18 10:34:18

Initial Linearity Test	Zero	Low	Mid	Span	L-Lin	M-Lin	S-Lin
CO (ppmv)	0.33	244.64	430.65	889.46	0.67	0.83	-0.36
O2 (% vol)	0.00	4.50	20.90	11.95	0.12	0.00	-0.04
CO2 (% vol)	0.00	4.52	12.62	8.02	-0.27	0.00	-0.20

Initial and Final Bias and Drift	I-Zero	I-Span	F-Zero	F-Span	Z-Bias	S-Bias	Z-Drift	S-Drift
CO (ppmv)	-2.97	887.15	-2.97	888.80	-0.26	-0.05	0.00	-0.13
O2 (% vol)	-0.03	11.77	-0.05	11.80	-0.20	-0.60	0.08	-0.12
CO2 (% vol)	0.06	7.94	0.04	7.98	0.27	-0.27	0.13	-0.27

Run Results and Cal Gases Used	Raw	Corrected	Ranges	Low Gas	Mid Gas	Span Gas
CO (ppmv)	958.7	955.3	1250.0	253.0	441.0	885.0
O2 (% vol)	20.52	20.76	25.00	4.53	20.90	11.94
CO2 (% vol)	1.08	1.04	15.00	4.48	12.62	7.99

Run 2 10/28/02 11:27:39 12:27:39

Initial Linearity Test	Zero	Low	Mid	Span	L-Lin	M-Lin	S-Lin
CO (ppmv)	0.33	244.64	430.65	889.46	0.67	0.83	-0.36
O2 (% vol)	0.00	4.50	11.95	20.90	0.12	-0.04	0.00
CO2 (% vol)	0.00	8.02	12.62	4.52	-0.20	0.00	-0.27

Initial and Final Bias and Drift	I-Zero	I-Span	F-Zero	F-Span	Z-Bias	S-Bias	Z-Drift	S-Drift
CO (ppmv)	-2.97	888.80	-1.40	893.00	-0.14	0.28	-0.13	-0.34
O2 (% vol)	-0.05	20.70	-0.03	20.62	-0.12	-1.12	-0.08	0.32
CO2 (% vol)	0.04	4.50	0.06	4.48	0.40	-0.27	-0.13	0.13

Run Results and Cal Gases Used	Raw	Corrected	Ranges	Low Gas	Mid Gas	Span Gas
CO (ppmv)	1091.3	1083.6	1250.0	253.0	441.0	885.0
O2 (% vol)	20.43	20.67	25.00	4.53	11.94	20.90
CO2 (% vol)	1.26	1.22	15.00	7.99	12.62	4.48

Georgia-Pacific Palatka Operations, Bleach Plant Scrubber, Logged QA Calibration Records

Run 3 10/28/02 13:17:44 PM 14:17:44 PM

Initial Linearity Test	Zero	Low	Mid	Span	L-Lin	M-Lin	S-Lin
CO (ppmv)	0.33	244.64	430.65	889.46	0.67	0.83	-0.36
O2 (% vol)	0.00	4.50	11.95	20.90	0.12	-0.04	0.00
CO2 (% vol)	0.00	8.02	12.62	4.52	-0.20	0.00	-0.27

Initial and Final Bias and Drift	I-Zero	I-Span	F-Zero	F-Span	Z-Bias	S-Bias	Z-Drift	S-Drift
CO (ppmv)	-1.40	893.00	-1.40	873.00	-0.14	-1.32	0.00	1.60
O2 (% vol)	-0.03	20.62	-0.03	20.55	-0.12	-1.40	0.00	0.28
CO2 (% vol)	0.06	4.48	0.04	4.48	0.27	-0.27	0.13	0.00

Run Results and Cal Gases Used	Raw	Corrected	Ranges	Low Gas	Mid Gas	Span Gas
CO (ppmv)	949.3	951.3	1250.0	253.0	441.0	885.0
O2 (% vol)	20.38	20.69	25.00	4.53	11.94	20.90
CO2 (% vol)	1.07	1.03	15.00	7.99	12.62	4.48

Instrumental Analyses
Quality Assurance Data

Date: October 28, 2002
Company: Georgia-Pacific Corporation
Facility: Georgia-Pacific Palatka Operations
Source ID: Bleach Plany Wet Scrubber
Location: Patatka, Putnam County, Florida
Technicians: RPO, JTH

Instrumental Sample System Leak Checks

Date	Run Number	Vacuum (inches Hg)	Leak Rate (inches Hg/min)	Pass
10/27/02	Set-Up	24.8	0.0	yes
10/28/02	pre Run 1	24.0	0.0	yes
10/28/02	post Run 3	24.2	0.0	yes

Leak check criteria less than 1.0" Hg Vac. Decline at greater than 15.0" Hg Vac.

Continuous Emission Analyzer
Interference Response Tests

Analyzer Interference Response Checks

(Frequency: Prior to initial use of sampling system or after alteration or modification.)

Test Date: *September 27, 2002* *Technician:* *RPO*
Mobile Lab: *T-13* *Location:* *Gainesville, Florida*

Analyzer	**Manufacturer**	**Model**	**Serial Number**	**Detection Method/Comments**
NO_x Analyzer	TECO	42C	42CHL-69541-363	Chemiluminescence with Ozone
CO Analyzer	TECO	48C	48C-70472-365	Infrared Absorption/GFC Detector
O_2 Analyzer	Servomex	1440	1420C/2647	Paramagnetic Cell Detector
CO_2 Analyzer	Servomex	1440	01415/2537	Infrared Absorption/ Solid State Detector
THC	California Analytical	300-HFID CE	4J11003	Flame Ionization Detector

Interferrent Test Gases		**Analyzer Response (ppmv or % as applicable)**				
Type Gas	**Conc.**	**NO_x** **0-25 ppmv**	**CO** **0-50 ppmv**	**O_2** **0-25% vol**	**CO_2** **0-15% vol**	**THC** **0-100 ppmv**
CO/Methane in air	885/919	0.1 ppmv			0.00 %	
Propane in air	2000	0.1 ppmv	0.4 ppmv		0.03 %	
SO_2 in N_2	4400	0.2 ppmv	-0.3 ppmv	0.00 %	0.00 %	no data
Air	dry instrument	< 0.1 ppmv	0.4 ppmv		0.03 %	no data
Nitrogen	pre-purified	0.0 ppmv	0.3 ppmv	0.00 %	0.00 %	no data
Air	UHC, CO free	0.0 ppmv	0.0 ppmv		0.01 %	no data
CO_2/ O_2	4.54%/20.8%	< 0.1 ppmv	-0.2 ppmv			no data
CO_2/ O_2	8.004%/11.91%	< 0.1 ppmv	-0.4 ppmv			no data
CO_2/ O_2	12.62%/4.53%	< 0.1 ppmv	-0.6 ppmv			no data
NO_x in N_2	1209		0.4 ppmv	0.18 %	0.03 %	no data

APPENDIX E:
CALIBRATION CERTIFICATIONS

SPECTRA GASES INC.
3434 Route 22 West • Branchburg, NJ 08876 USA Tel.: (908) 252-9300 • (800) 932-0624 • Fax: (908) 252-0811
Shipped From: 80 Industrial Drive • Alpha, NJ 08865

CERTIFICATE OF ANALYSIS

EPA PROTOCOL MIXTURE

PROCEDURE # : G1

CUSTOMER: Cubix Corporation
SGI ORDER # : 0016436
ITEM# : 7
P.O.# : 2001032 T12 SID

CYLINDER # : CC-94787
CYLINDER PRES: 2000 PSIG
CGA OUTLET: 590

CERTIFICATION DATE: 2/11/02
EXPIRATION DATE: 2/6/2005

CERTIFICATION HISTORY

COMPONENT	DATE OF ASSAY	MEAN CONCENTRATION	CERTIFIED CONCENTRATION	ANALYTICAL ACCURACY
Carbon Monoxide	1/30/02 2/6/02	252.8 ppm 252.5 ppm	253 ppm	+/- 1%
Methane	2/11/02	249 ppm	249 ppm	+/- 1%

BALANCE Air
PREVIOUS CERTIFICATION DATES: None

REFERENCE STANDARDS

COMPONENT	SRM/NTRM#	CYLINDER#	CONCENTRATION
Carbon Monoxide	GMIS-1	CC94699	486 ppm
Methane	GMIS-1	CC52976	503.3 ppm

INSTRUMENTATION

COMPONENT	MAKE/MODEL	SERIAL #	DETECTOR	CALIBRATION DATE(S)
Carbon Monoxide	Horiba VIA-510	570423011	NDIR	1/8/02
Methane	H. Packard 6890	US00001434	GC - FID	2/5/02

THIS STANDARD IS NIST TRACEABLE. IT WAS CERTIFIED ACCORDING TO THE EPA PROTOCOL PROCEDURES.
DO NOT USE THIS STANDARD IF THE CYLINDER PRESSURE IS LESS THAN 150 PSIG.

ANALYST: Ted Neeme
TED NEEME

DATE: 2/11/02

SPECTRA GASES INC.

3434 Route 22 West • Branchburg, NJ 08876 USA Tel. (908) 252-9300 • (800) 932-0624 • Fax: (908) 252-0811
Shipped From: 80 Industrial Drive • Alpha, NJ 08865

CERTIFICATE OF ANALYSIS

EPA PROTOCOL MIXTURE

PROCEDURE # : G1

CUSTOMER: Cubix Corporation
SGI ORDER # : 0023960
ITEM# : 2
P.O.# : 2002420

CYLINDER # : CC-60135
CYLINDER PRES: 2000 PSIG
CGA OUTLET: 590

CERTIFICATION DATE: 7/19/2002
EXPIRATION DATE: 7/11/2005

CERTIFICATION HISTORY

COMPONENT	DATE OF ASSAY	MEAN CONCENTRATION	CERTIFIED CONCENTRATION	ANALYTICAL ACCURACY
Carbon Monoxide	7/11/2002 7/19/2002	441.6 ppm 439.9 ppm	441 ppm	+/- 1%
Methane	7/11/2002	445 ppm	445 ppm	+/- 1%

BALANCE Air

PREVIOUS CERTIFICATION DATES: None

REFERENCE STANDARDS

COMPONENT	SRM/NTRM#	CYLINDER#	CONCENTRATION
Carbon Monoxide	NTRM-81681	CC-55779	994 ppm
Methane	GMIS-1	CC55777	993.6 ppm

INSTRUMENTATION

COMPONENT	MAKE/MODEL	SERIAL #	DETECTOR	CALIBRATION DATE(S)
Carbon Monoxide	Horiba VIA-510	570423011	NDIR	7/19/2002
Methane	H. Packard 6890	US00001434	GC - FID	6/24/2002

THIS STANDARD IS NIST TRACEABLE. IT WAS CERTIFIED ACCORDING TO THE EPA PROTOCOL PROCEDURES.
DO NOT USE THIS STANDARD IF THE CYLINDER PRESSURE IS LESS THAN 150 PSIG.

ANALYST: ______________
FRED PIKULA

DATE: 7/19/2002

SPECTRA GASES INC.
3434 Route 22 West • Branchburg, NJ 08876 USA Tel.: (908) 252-9300 • (800) 932-0624 • Fax: (908) 252-0811
Shipped From: 80 Industrial Drive • Alpha, NJ 08865

CERTIFICATE OF ANALYSIS

EPA PROTOCOL MIXTURE

PROCEDURE # : G1

CUSTOMER: Cubix Corporation
SGI ORDER # : 0000840
ITEM# : 4
P.O.# : G-1334

CYLINDER # : CC126532
CYLINDER PRES: 2000 PSIG
CGA OUTLET: 590

CERTIFICATION DATE: 1/31/2001
EXPIRATION DATE: 1/30/2004

CERTIFICATION HISTORY

COMPONENT	DATE OF ASSAY	MEAN CONCENTRATION	CERTIFIED CONCENTRATION	ANALYTICAL ACCURACY
Carbon Monoxide	1/23/2001 1/31/2001	885.2 ppm 884.4 ppm	885 ppm	+/- 1%
Methane	1/30/2001	919 ppm	919 ppm	+/- 1%

BALANCE Air

PREVIOUS CERTIFICATION DATES: None

REFERENCE STANDARDS

COMPONENT	SRM/NTRM#	CYLINDER#	CONCENTRATION
Carbon Monoxide	NTRM-81681	CC55721	994 ppm
Methane	GMIS-1	CC55777	994.1 ppm

INSTRUMENTATION

COMPONENT	MAKE/MODEL	SERIAL #	DETECTOR	CALIBRATION DATE(S)
Carbon Monoxide	Horiba VIA-510	570423011	NDIR	1/19/2001
Methane	H. Packard 6890	US00001434	GC - FID	1/30/2001

THIS STANDARD IS NIST TRACEABLE. IT WAS CERTIFIED ACCORDING TO THE EPA PROTOCOL PROCEDURES.
DO NOT USE THIS STANDARD IF THE CYLINDER PRESSURE IS LESS THAN 150 PSIG.

ANALYST: ____________
FRED PIKULA

DATE: 1/31/2001

SPECTRA GASES INC.

3434 Route 22 West • Branchburg, NJ 08876 USA Tel.: (908) 252-9300 • (800) 932-0624 • Fax (908) 252-0811
Shipped From: 80 Industrial Drive • Alpha, NJ 08865

CERTIFICATE OF ANALYSIS

EPA PROTOCOL MIXTURE

PROCEDURE # : G1

CUSTOMER: Cubix Corporation
SGI ORDER # : 0021285
ITEM# : 1
P.O.# : 2002275 T10LENO

CYLINDER # : CC-133482
CYLINDER PRES: 2000 PSIG
CGA OUTLET: 590

Begin use 7/24/02

CERTIFICATION DATE: 5/24/2002
EXPIRATION DATE: 5/24/2005

CERTIFICATION HISTORY

COMPONENT	DATE OF ASSAY	MEAN CONCENTRATION	CERTIFIED CONCENTRATION	ANALYTICAL ACCURACY
Carbon Dioxide	5/24/2002	4.48 %	4.48 %	+/- 1%
Oxygen	5/24/2002	20.9 %	20.9 %	+/- 1%

BALANCE Nitrogen

PREVIOUS CERTIFICATION DATES: None

REFERENCE STANDARDS

COMPONENT	SRM/NTRM#	CYLINDER#	CONCENTRATION
Carbon Dioxide	GMIS-1	CC-90832	9.98 %
Oxygen	NTRM-1	CC-83909	22.8 %

INSTRUMENTATION

COMPONENT	MAKE/MODEL	SERIAL #	DETECTOR	CALIBRATION DATE(S)
Carbon Dioxide	Horiba VIA-510	571417045	NDIR	5/24/2002
Oxygen	Horiba MPA-510	570694081	PM	5/20/2002

THIS STANDARD IS NIST TRACEABLE. IT WAS CERTIFIED ACCORDING TO THE EPA PROTOCOL PROCEDURES.
DO NOT USE THIS STANDARD IF THE CYLINDER PRESSURE IS LESS THAN 150 PSIG.

ANALYST: ____________________
FRED PIKULA

DATE: 5/24/2002

SPECTRA GASES INC.
3434 Route 22 West • Branchburg, NJ 08876 USA Tel.: (908) 252-9300 • (800) 932-0624 • Fax: (908) 252-0811
Shipped From: 80 Industrial Drive • Alpha, NJ 08865

CERTIFICATE OF ANALYSIS

EPA PROTOCOL MIXTURE

PROCEDURE # : G1

CUSTOMER: Cubix Corporation
SGI ORDER # : 0023960
ITEM# : 1
P.O.# : 2002420

CYLINDER # : CC-127463
CYLINDER PRES: 2000 PSIG
CGA OUTLET: 590

CERTIFICATION DATE: 7/23/2002
EXPIRATION DATE: 7/23/2005

CERTIFICATION HISTORY

COMPONENT	DATE OF ASSAY	MEAN CONCENTRATION	CERTIFIED CONCENTRATION	ANALYTICAL ACCURACY
Carbon Dioxide	7/23/2002	7 99 %	7 99 %	+/- 1%
Oxygen	7/23/2002	11.94 %	11.94 %	+/- 1%

BALANCE Nitrogen

PREVIOUS CERTIFICATION DATES: None

REFERENCE STANDARDS

COMPONENT	SRM/NTRM#	CYLINDER#	CONCENTRATION
Carbon Dioxide	GMIS-1	CC-90832	9.98 %
Oxygen	NTRM-1	CC-83909	22 8 %

INSTRUMENTATION

COMPONENT	MAKE/MODEL	SERIAL #	DETECTOR	CALIBRATION DATE(S)
Carbon Dioxide	Horiba VIA-510	571417045	NDIR	6/25/2002
Oxygen	Horiba MPA-510	570694081	PM	7/23/2002

THIS STANDARD IS NIST TRACEABLE. IT WAS CERTIFIED ACCORDING TO THE EPA PROTOCOL PROCEDURES.
DO NOT USE THIS STANDARD IF THE CYLINDER PRESSURE IS LESS THAN 150 PSIG.

ANALYST: ____________________
FRED PIKULA

DATE: 7/23/2002

Scott Specialty Gases

RATA CLASS

Dual-Analyzed Calibration Standard

9810 BAY AREA BLVD,PASADENA,TX 77507 Phone: 281-474-5800 Fax: 281-474-5857

CERTIFICATE OF ACCURACY: Interference Free™ Multi-Component EPA Protocol Gas

Assay Laboratory

SCOTT SPECIALTY GASES
9810 BAY AREA BLVD
PASADENA,TX 77507

P.O. No.: G-1291
Project No.: 04-85228-002

Customer

CUBIX CORPORATION

4536 NW 20TH DRIVE
GAINESVILLE FL 32605

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure #G1; September, 1997.

Cylinder Number: ALM009152 Certification Date: 4/03/00 Exp. Date: 4/03/2003

Cylinder Pressure***: 1883 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)	ANALYTICAL ACCURACY**	TRACEABILITY
CARBON DIOXIDE	12.62 %	+/- 1%	Direct NIST and NMi
OXYGEN	4.53 %	+/- 1%	Direct NIST and NMi
NITROGEN	BALANCE		

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocal procedure G1, September 1997.

* Product certified as +/- 1% analytical accuracy is directly traceable to NIST or NMI standards

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM [illegible]	1/01/03	ALM042032	13.96 %	CO2/N2
NTRM 2658	12/19/01	ALM031738	9.680 %	OXYGEN

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
FTIR System/8220A/AAB9400260	03/28/00	Scott Enhanced FTIR
MTI-A/M200/171109	03/21/00	GAS CHROMATOGRAPHY

ANALYZER READINGS

(Z = Zero Gas R = Reference Gas T = Test Gas r = Correlation Coefficient)

First Triad Analysis — Second Triad Analysis — Calibration Curve

CARBON DIOXIDE

Date:04/03/00	Response Unit:%	
Z1 = 0.0220	R1 = 13.956	T1 = 12.629
R2 = 13.966	Z2 = 0.0178	T2 = 12.617
Z3 = 0.0276	T3 = 12.620	R3 = 13.959
Avg. Concentration:	12.62	%

Concentration = A + Bx + Cx2 + Dx3 + Ex4	
r = 0.999990	
Constants:	A = 0.000000
B = 1.000000	C = 0.000000
D = 0.000000	E = 0.000000

OXYGEN

Date:04/06/00	Response Unit:AREA	
Z1 = 114.00	R1 = 35455.	T1 = 16619.
R2 = 35183.	Z2 = 141.00	T2 = 16552.
Z3 = 118.00	T3 = 16573.	R3 = 35179.
Avg. Concentration:	4.530	%

Concentration = A + Bx + Cx2 + Dx3 + Ex4	
r = 0.999999418	
Constants:	A = -0.03442397
B = 0.000275952	C =
D =	E =

APPROVED BY:

John Hunnicutt

Air Products and Chemicals, Inc.
5637 W. Fifth Street
Jacksonville, FL 32254
Telephone (904) 786-2663
FAX (904) 693-9128

AIR PRODUCTS

30 March, 1995

Cubix Corporation
2106 NW 67th Place
Suite 7
Gainesville, FL 32653

CERTIFICATE OF CONFORMANCE

This document certifies that the product listed below is supplied via Air Products and Chemicals, Inc. and complies with the current minimum purity specifications of Air Products and Chemicals, Inc., Specialty Gas Department.

Product	Hydrogen
Product Code	3602
Product	Oxygen
Product Code	1602
Shipper Number	854-C-78428
Product	Compressed Air
Product Code	9197
Product	Nitrogen
Product Code	2602
Shipper Number	854-C-78440

E Edward Henderson
Authorized Signature

Dry Gas Meter Calibration

WORKING METER

Date: 4/12/02
Prev. Calib. Date: rebuilt
Location: Cubix Austin Lab
Technician: Bradley Rayhons
Meter Serial No: 2962152
Cubix DGM ID T-10
Prev. Calib Factor (Y): 1 0000

REFERENCE METER

Calibration Date: 4/11/02
Location: Cubix Austin Lab
Technician: Steve Oleyar
Meter Serial No: F164240
Cubix DGM ID American
Calib. Factor (Y): 1 0022

REFERENCE METER

Calibration Run #	Time (min)	Start Temp (deg F)	Stop Temp (deg F)	Vol (initial) (cu ft)	Vol (final) (cu ft)	Vol. Total (cu ft)	Meter Rate (cu-ft /min)	Corr. Vol @ EPA STP (cu ft)
1	20	74	73.7	18.936	25 078	6.155	0 3078	5.998
2	18	74	74.5	26.261	33 362	7.117	0 3954	6.928
3	10	74	73 4	12.401	18.122	5.734	0 5734	5.589
4	11	74	74.6	35.001	42.645	7.661	0 6965	7.453
5	11	75	75 1	44 308	53.922	9.635	0 8759	9 367

WORKING METER

Calibration Run #	Time (min)	Start Temp (deg F)	Stop Temp (deg F)	Vol (initial) (cu ft)	Vol (final) (cu ft)	Vol. Total (cu ft)	Meter Rate (cu-ft /min)	Corr. Vol @ EPA STP (cu ft)	Calculated DGM Factor (Y)
1	20	75	73.7	19.158	25.436	6.278	0.314	6 108	0.9819
2	18	75	73.9	26 635	33.854	7.219	0.401	7.023	0.9866
3	10	73	74 6	12 465	18.285	5.820	0.582	5 672	0.9854
4	11	74	75 8	35.525	43.266	7.741	0.704	7 529	0.9900
5	11	76	73.9	44.957	54.684	9.727	0.884	9 455	0.9906

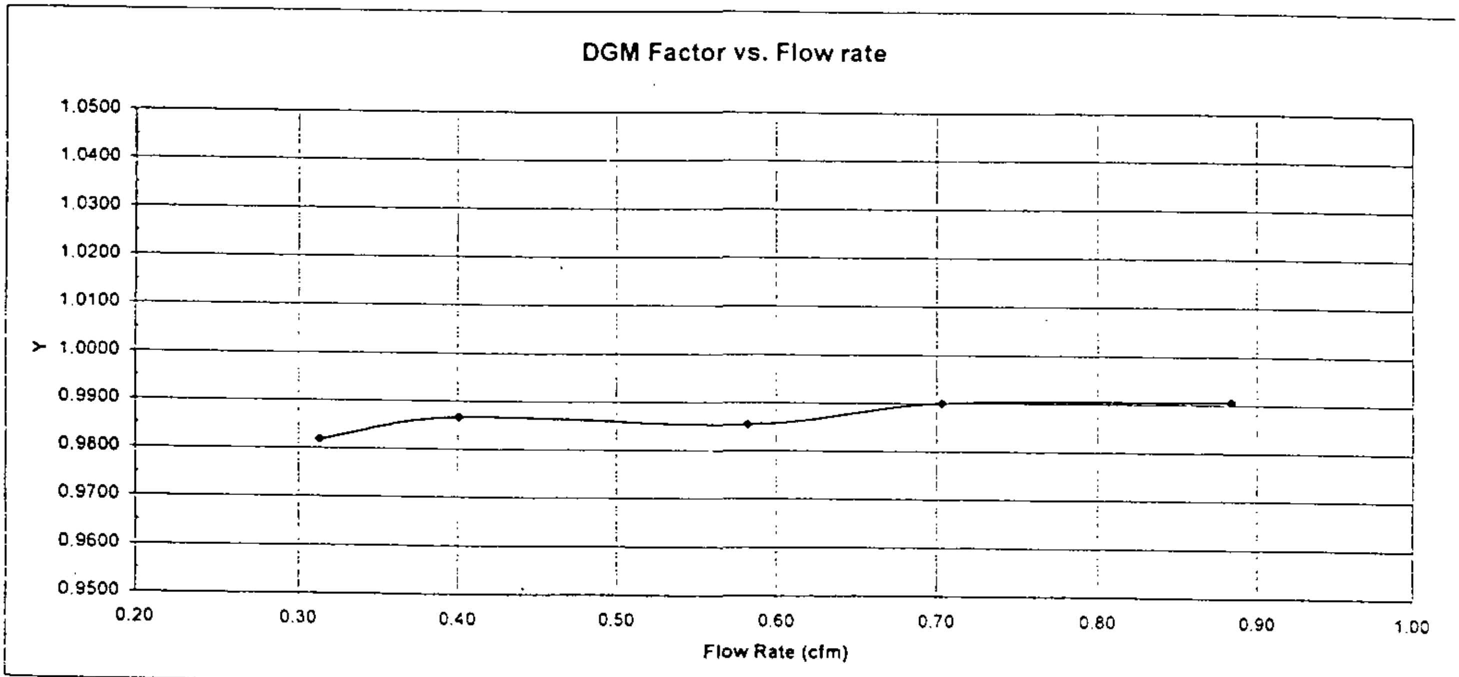
Dry Gas Meter (DGM Factor) Calibration Test Results

*** Average Y: 0.9869**

Ave. Y w/in 5% of previous value: *YES*
Ave. Y between 0.95 and 1.05: *PASS*
Ind. Y values +/- 0.02 from Ave.: *PASS*

Criteria:

* Y- ratio of the reading of the reference meter to the working DGM. Acceptable tolerance of individual values from the average is +/- 0.02, with a value between 0.95 and 1.05.



signature

Cubix Corporation

Pitot Tube Calibration Sheet

S-Type Tip Inspection (Method 2, Section 4)

7 ft

Alignment Inspection

Transverse tube axis pitot-tip angle:

α_1 = 4 ° α_2 = 3 °

Each α must be less than 10° from perpendicular to the transverse tube axis

Longitudinal tube axis pitot-tip angle:

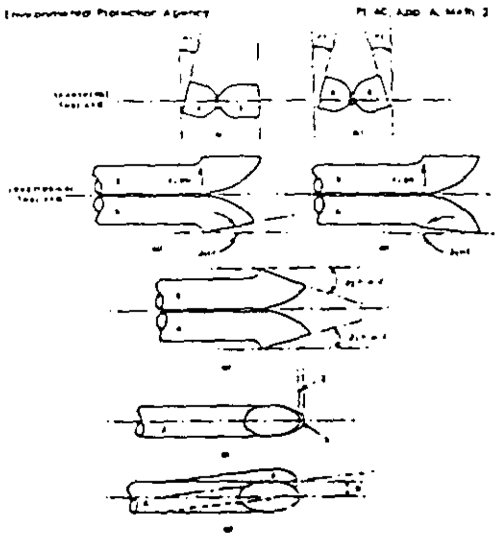
β_1 = 2 ° β_1 = 3 °

Each β must be less than 5° from parrallel to the longitudinal tube axis

Pitot-tip end length alignment:

z = 0 ([✓ in] or cm)

Z must be ≤ 0.32 cm (1/8 in)



Pitot-tip centriod alignment with respect to transverse axis:

w = 0 (in or [✓ cm])

W must be ≤ 0.08 cm (1/32 in)

Pitot Tip Dimension Check

External tubing diameter:

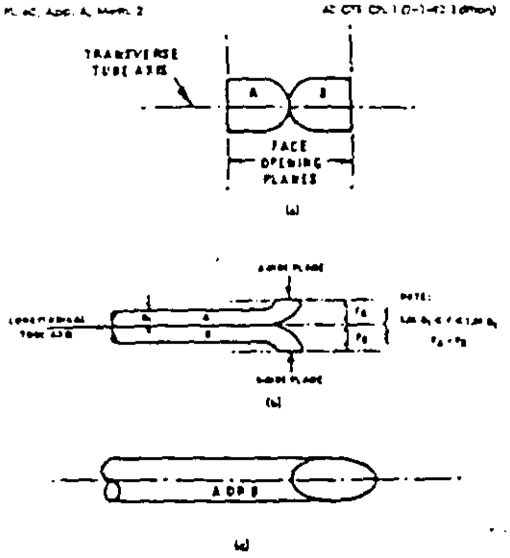
D_t = .375 ([✓ in] or cm)

D_t must be between 0.48 and 0.95 cm (3/16 and 3/8 in)

Base to opening plane distance:

$P_A = P_B$ = .475 ([✓ in] or cm)

P_A and P_B must be between 1.05 D_t and 1.50 D_t



Pitot Tube Coefficient

C_p = 0.84 Pitot Tube: 2110 Date and Initials: 8-7-02 JH

Calibration by Cubix Corporation - Austin, Texas - Gainesville, Florida

ALTIMETER TEST RECORD

This unit was tested and inspected IAW FAR Part 43, Appendix E, and is approved for return to service.

DATE: 3-8-02

WORK ORDER #: 3501

SCALE ERROR

-1000	-15
0	0
+ 500	0
+1000	+10
+1500	0
+2000	+10
+3000	+5
+4000	0
+6000	-5
+8000	+5
+10,000	+15
+12,000	+20
+14,000	+20
+16,000	+15
+18,000	0
+20,000	-10
+22,000	
+25,000	
+30,000	
+35,000	
+40,000	
+45,000	
+50,000	

START PRESSURE 30.06

FINAL PRESSURE 30.06

BAROMETRIC SCALE ERROR TEST

28.10	0	30.50	+5
28.50	-5	30.90	0
29.00	0	30.99	0
29.50	0		
29.92	0		

FRICTION TEST

1000	30	20,000	50
2000	30	25,000	
3000	30	30,000	
5000	30	35,000	
10,000	40	40,000	
15,000	45	50,000	

CASE LEAK TEST @ 18,000 0

CASE LEAK TEST @ 1,200 0

HYSTERESIS TEST @ 50% 20

HYSTERESIS TEST @ 40% 15

AFTER EFFECT 15

SERIAL NUMBER J5924

INSPECTOR

TRAILER 10
ALTIMETER/BAROMETER CALIBRATION SHEET

BFG/C 9001

BFGoodrich
Aerospace

Component Overhaul & Repair

817 Dessau Road
Austin, Texas 78753
512-251-3441
FAX 512-990-1271

FAA Repair Station No. UZ2R232L

CASTLEBERRY AERCOR

Serviceable Part Tag

COMPONENT Altimeter
PART NO. 5934P-1A.83
SERIAL NO. J5924
MFG United Instr. WORK ORDER # V7071

☒ Overhaul ☐ Repair ☐ Bench Check & Test ☐ Other

The Aircraft Appliance identified above was overhauled, repaired, or bench tested (as per block marked) and inspected, in accordance with current Federal Aviation Administration Regulations, and is approved for return to service. Details of this component are on file at this repair station.

AUTHORIZED SIGNATURE

JAN 16 1995
DATE

ALTIMETER SCALE ERROR					
PART NO. 5934P1A83			SERIAL NO. J5924		
ALTIMETER PRESSURE					
TEST PT (FT)	INDICATOR READINGS AT + 25 °C	TEST PT (FT)	INDICATOR READINGS AT + 25 °C	TEST PT (FT)	INDICATOR READINGS AT + 25 °C
-1000	+5	8,000	+5	30,000	
0 0	0	10,000	+10	35,000	
500	0	12,000	+15	40,000	
1000	0	14,000	+15	45,000	
1500	0	16,000	+5	50,000	
2000	0	18,000	0	55,000	
3000	-5	20,000	-5	60,000	
4000	-10	22,000		70,000	
6000	-10	25,000		80,000	

BFG/C91C2

NIST CALIBRATION CERTIFICATE

Page 2 of 2

Catalog Number : 17005-00 **Certificate Reference Number** 3924899

Instrument Tolerance

±3% full-scale

	Equipment "As Found"				Equipment "As Left"		
	Test Points	Reading	Deviation	O.O.T	Test Points	Reading	Deviation
Measured in:				☐			
	32.00	32.0	0.0000	☐	32.00	32.0	0.0000
°F				☐			
	110.00	110.0	0.0000	☐	110.00	110.0	0.0000
Measured in:				☐			
	32.00	32.0	0.0000	☐	32.00	32.0	0.0000
°F				☐			
	110.00	110.0	0.0000	☐	110.00	110.0	0.0000
Measured in:				☐			
				☐			
				☐			
				☐			
Measured in:				☐			
				☐			
				☐			
				☐			
Measured in:				☐			
				☐			
				☐			
				☐			

**** Note **** Check mark under the O.O.T column indicates the equipment is Out Of Tolerance.

This certificate was performed under the climate controlled lab conditons of: 22 °C 50 %RH 29.5 "Hg

Additional Comments:
n/a

*This certificate shall not be reproduced except in full and requires written approval from InnoCal. * Results data shown relates only to above listed item(s) **

INNOCAL™
INNOVATIVE CALIBRATION SOLUTIONS
625 East Bunker Court, Vernon Hills, Illinois, 60061
Domestic 866-InnoCal - Fax 847-247-2984

NIST CALIBRATION CERTIFICATE

Page 1 of 2

Catalog Number : 17005-00 **Certificate Reference Number** 3924899

Unit Under Test 1 : 03312-20 **Unit Under Test 2:** n/a
Serial Number 1 : 57778 **Serial Number 2:** n/a

Certificate Completed for: Cubix Corp
3709 SW 42nd Ave
Gainsville FL 32608

InnoCal certifies that the calibration of the listed units, used procedure number MWI-17005-00with equipment traceable to the National Institute of Standards and Technology (NIST), and the test was performed in accordance with ANSI/NCSL Z540-1,ISO Guide 25.

Best measurement uncertainty: k=2, ±0.08°C

Listed uncertainties represent the best measurement uncertainty expressed at 95% confidence level. Actual uncertainties available upon request.

Purchase Order Number: 2002615 **Secondary ID #:** n/a
Equipment Conditon : USED

Calibration Standards Used

Manufacturer	Function Performed	Model Number	Serial Number	Due Date
Hart Scientific	Platinum Resistance Probe	5680	1074	04/14/03
Ertco/Hart	Temperature Indicator	850	85307	04/14/03

Lab Technician: 321

Date Completed: 10/17/02 **Issue Date:** 10/17/02 **Received Date** 9/18/02

*This certificate shall not be reproduced except in full and requires written approval from InnoCal. * Results .data shown relates only to above listed item(s) **

OMEGA
ENGINEERING, INC.

One Omega Drive, Box 4047, Stamford, CT 06907
(203) 359-1660 – http://www.omega.com – e-mail: info@omega.com

CERTIFICATE OF CALIBRATION

Model HH-25KF **Serial Number** T-233418

Omega Engineering, Inc., certifies that the above listed instrument has been calibrated using standards whose accuracy is traceable to the U.S. National Institute of Standards and Technology, and meets or exceeds its published specifications. Calibration traceability of the above listed instrument is in full compliance with ANSI/Z540-1-1994 standards and requirements.

DATE 2-1-02

TESTED BY RF

AUTHORIZED SIGNATURE mck

Placed in service: August 14, 2002
Recalibration Date: February 1, 2003
Location: Trailer 10

OMEGA
ENGINEERING, INC.
An OMEGA Technologies Company

Certificate Of Calibration

CUBIX

Cust. P.O. #:	G1342	Report #:	102915471
Test Item:	ASTM-1C-CC	Test Date:	22-FEB-01
Serial #:	99293	Recal Date:	Per System Application

Omega Engineering, Inc. certifies that the above instrumentation has been calibrated and tested to **meet or exceed** the published specifications. This calibration and testing was performed using instrumentation and standards that are traceable to the United States National Institute of Standards and Technology. Calibration on this product was performed by an approved Supplier/ Lab of Omega Engineering, Inc. and is in compliance with **MIL-STD-45662A.**

Test Conditions: Temperature 22 C Relative Humidity 35%

NIST Traceable Test Numbers: 213426,264615-01

Temperature	Thermometer Reading	Correction
	We certify that subject thermometer conforms to specifications and tolerances stated in A.S.T.M. Designate E-1, Table 1, No. 1C, Scale Error + or - 0.5 C Max.	

Metrology Inspector 27-FEB-01

OMEGA Engineering, Inc., One Omega Drive, Box 4047, Stamford, CT 06907 Telephone (203) 359-1660 • FAX: (203) 359-7811

APPENDIX F:
LOGGED DATA RECORDS
1-MINUTE AVERAGES

Georgia-Pacific Palatka Operations, Bleach Plant Scrubber, Logged Data Records

Run Number	Date	Time	CO (ppmv)	O2 (% vol)	CO2 (% vol)	AVE CO (ppmv)	AVE O2 (% vol)	AVE CO2 (% vol)
START Run 1	10/28/02	9:34:18	843.3	20.60	0.88	843.3	20.60	0.88
Run 1	10/28/02	9:35:18	850.0	20.58	0.94	846.6	20.60	0.91
Run 1	10/28/02	9:36:18	841.2	20.60	0.94	844.8	20.60	0.92
Run 1	10/28/02	9:37:18	910.5	20.60	0.96	861.2	20.60	0.93
Run 1	10/28/02	9:38:18	853.2	20.60	0.96	859.6	20.60	0.94
Run 1	10/28/02	9:39:18	895.1	20.60	0.94	865.5	20.60	0.95
Run 1	10/28/02	9:40:18	910.5	20.60	1.00	871.9	20.60	0.95
Run 1	10/28/02	9:41:18	856.6	20.58	0.96	870.0	20.60	0.95
Run 1	10/28/02	9:42:18	909.4	20.58	0.94	874.4	20.60	0.95
Run 1	10/28/02	9:43:18	851.1	20.58	0.94	872.0	20.59	0.94
Run 1	10/28/02	9:44:18	833.5	20.58	0.90	868.5	20.59	0.94
Run 1	10/28/02	9:45:18	908.3	20.58	0.92	871.9	20.59	0.94
Run 1	10/28/02	9:46:18	868.7	20.55	0.98	871.6	20.59	0.94
Run 1	10/28/02	9:47:18	930.3	20.53	1.00	875.8	20.59	0.94
Run 1	10/28/02	9:48:17	869.8	20.53	1.02	875.4	20.58	0.94
Run 1	10/28/02	9:49:16	919.3	20.55	1.04	878.1	20.58	0.95
Run 1	10/28/02	9:50:18	953.4	20.55	1.06	882.6	20.58	0.96
Run 1	10/28/02	9:51:17	892.9	20.55	1.04	883.1	20.58	0.96
Run 1	10/28/02	9:52:18	944.6	20.55	1.04	886.4	20.57	0.96
Run 1	10/28/02	9:53:17	928.1	20.58	1.06	888.4	20.57	0.97
Run 1	10/28/02	9:54:17	961.1	20.53	1.08	891.9	20.57	0.97
Run 1	10/28/02	9:55:17	963.3	20.53	1.12	895.2	20.57	0.98
Run 1	10/28/02	9:56:18	985.5	20.53	1.12	899.1	20.57	0.99
Run 1	10/28/02	9:57:18	961.1	20.55	1.14	901.7	20.57	0.99
Run 1	10/28/02	9:58:18	1000.7	20.58	1.12	905.6	20.57	1.00
Run 1	10/28/02	9:59:18	999.6	20.55	1.16	909.2	20.57	1.00
Run 1	10/28/02	10:00:18	1015.4	20.58	1.08	913.2	20.57	1.01
Run 1	10/28/02	10:01:18	997.4	20.55	1.08	916.2	20.57	1.01
Run 1	10/28/02	10:02:18	964.4	20.55	1.04	917.8	20.57	1.01
Run 1	10/28/02	10:03:18	1000.7	20.55	1.06	920.6	20.57	1.01
Run 1	10/28/02	10:04:18	975.4	20.53	1.10	922.4	20.56	1.02
Run 1	10/28/02	10:05:18	995.8	20.53	1.08	924.7	20.56	1.02
Run 1	10/28/02	10:06:18	954.5	20.53	1.06	925.6	20.56	1.02

Georgia-Pacific Palatka Operations, Bleach Plant Scrubber, Logged Data Records

Run Number	Date	Time	CO (ppmv)	O2 (% vol)	CO2 (% vol)	AVE CO (ppmv)	AVE O2 (% vol)	AVE CO2 (% vol)
Run 1	10/28/02	10:07:18	987.5	20.53	1.06	927.4	20.56	1.02
Run 1	10/28/02	10:08:18	930.3	20.50	1.06	927.5	20.56	1.02
Run 1	10/28/02	10:09:18	987.5	20.53	1.02	929.1	20.56	1.02
Run 1	10/28/02	10:10:18	949.0	20.50	1.08	929.7	20.56	1.02
Run 1	10/28/02	10:11:18	1000.7	20.50	1.08	931.5	20.56	1.02
Run 1	10/28/02	10:12:18	1015.0	20.48	1.10	933.7	20.55	1.03
Run 1	10/28/02	10:13:17	1021.3	20.45	1.10	935.9	20.55	1.03
Run 1	10/28/02	10:14:17	1003.2	20.45	1.16	937.5	20.55	1.03
Run 1	10/28/02	10:15:17	1000.7	20.45	1.16	939.0	20.55	1.03
Run 1	10/28/02	10:16:17	1003.0	20.45	1.18	940.5	20.55	1.04
Run 1	10/28/02	10:17:17	1005.7	20.45	1.22	942.0	20.54	1.04
Run 1	10/28/02	10:18:17	1015.7	20.45	1.18	943.6	20.54	1.04
Run 1	10/28/02	10:19:17	1008.7	20.45	1.18	945.0	20.54	1.05
Run 1	10/28/02	10:20:17	1002.7	20.48	1.18	946.3	20.54	1.05
Run 1	10/28/02	10:21:17	947.9	20.45	1.10	946.3	20.54	1.05
Run 1	10/28/02	10:22:17	990.7	20.40	1.16	947.2	20.53	1.05
Run 1	10/28/02	10:23:17	990.1	20.43	1.18	948.1	20.53	1.05
Run 1	10/28/02	10:24:17	1000.3	20.50	1.16	949.1	20.53	1.06
Run 1	10/28/02	10:25:17	1024.1	20.53	1.10	950.5	20.53	1.06
Run 1	10/28/02	10:26:17	1035.3	20.50	1.16	952.1	20.53	1.06
Run 1	10/28/02	10:27:17	1007.3	20.50	1.16	953.1	20.53	1.06
Run 1	10/28/02	10:28:17	1002.0	20.50	1.18	954.0	20.53	1.06
Run 1	10/28/02	10:29:17	1012.8	20.50	1.22	955.1	20.53	1.06
Run 1	10/28/02	10:30:17	998.6	20.50	1.24	955.8	20.53	1.07
Run 1	10/28/02	10:31:17	987.5	20.48	1.28	956.4	20.53	1.07
Run 1	10/28/02	10:32:17	999.6	20.45	1.26	957.1	20.53	1.07
Run 1	10/28/02	10:33:17	1000.7	20.43	1.28	957.8	20.52	1.08
END Run 1	10/28/02	10:34:17	1012.4	20.43	1.32	**958.7**	**20.52**	**1.08**

Georgia-Pacific Palatka Operations, Bleach Plant Scrubber, Logged Data Records

Run Number	Date	Time	CO (ppmv)	O2 (% vol)	CO2 (% vol)	AVE CO (ppmv)	AVE O2 (% vol)	AVE CO2 (% vol)
START Run 2	10/28/02	11:27:40	1012.8	20.43	1.32	1012.8	20.43	1.32
Run 2	10/28/02	11:28:40	1000.8	20.45	1.28	1034.6	20.44	1.31
Run 2	10/28/02	11:29:39	1043.0	20.45	1.32	1020.5	20.43	1.32
Run 2	10/28/02	11:30:39	1022.8	20.43	1.32	1020.2	20.44	1.31
Run 2	10/28/02	11:31:39	1047.0	20.43	1.34	1027.8	20.43	1.32
Run 2	10/28/02	11:32:39	1105.0	20.45	1.30	1034.8	20.43	1.32
Run 2	10/28/02	11:33:39	1049.0	20.48	1.30	1041.2	20.43	1.32
Run 2	10/28/02	11:34:39	788.8	20.30	1.22	1040.1	20.44	1.29
Run 2	10/28/02	11:35:39	1063.0	20.40	1.28	1030.5	20.43	1.29
Run 2	10/28/02	11:36:39	1022.8	20.43	1.26	1033.0	20.43	1.29
Run 2	10/28/02	11:37:39	1071.0	20.43	1.28	1034.2	20.43	1.29
Run 2	10/28/02	11:38:39	1089.0	20.45	1.32	1036.9	20.43	1.29
Run 2	10/28/02	11:39:39	1041.0	20.45	1.30	1042.5	20.43	1.29
Run 2	10/28/02	11:40:39	1107.0	20.48	1.30	1044.7	20.43	1.29
Run 2	10/28/02	11:41:39	1051.0	20.43	1.32	1045.3	20.43	1.29
Run 2	10/28/02	11:42:39	1057.0	20.45	1.30	1047.6	20.43	1.29
Run 2	10/28/02	11:43:39	1087.0	20.43	1.30	1048.9	20.43	1.29
Run 2	10/28/02	11:44:39	1092.8	20.45	1.30	1050.3	20.43	1.29
Run 2	10/28/02	11:45:39	1069.0	20.43	1.28	1053.1	20.43	1.29
Run 2	10/28/02	11:46:39	1083.0	20.40	1.32	1053.8	20.43	1.29
Run 2	10/28/02	11:47:39	1081.0	20.40	1.30	1055.6	20.43	1.29
Run 2	10/28/02	11:48:39	1083.0	20.43	1.28	1057.1	20.43	1.29
Run 2	10/28/02	11:49:39	1047.0	20.53	0.78	1057.6	20.43	1.29
Run 2	10/28/02	11:50:39	1061.0	20.40	1.26	1052.9	20.43	1.28
Run 2	10/28/02	11:51:39	1123.0	20.40	1.32	1054.3	20.43	1.28
Run 2	10/28/02	11:52:39	1081.0	20.43	1.24	1057.3	20.43	1.28
Run 2	10/28/02	11:53:39	1127.0	20.43	1.24	1058.8	20.43	1.28
Run 2	10/28/02	11:54:39	1061.0	20.43	1.26	1059.3	20.43	1.28
Run 2	10/28/02	11:55:39	1076.8	20.45	1.22	1060.3	20.43	1.28
Run 2	10/28/02	11:56:39	1127.0	20.40	1.30	1061.0	20.43	1.28
Run 2	10/28/02	11:57:39	1097.0	20.43	1.28	1063.2	20.43	1.28
Run 2	10/28/02	11:58:39	1127.0	20.43	1.28	1064.7	20.43	1.28
Run 2	10/28/02	11:59:39	1081.0	20.43	1.30	1065.7	20.43	1.28

Georgia-Pacific Palatka Operations, Bleach Plant Scrubber, Logged Data Records

Run Number	Date	Time	CO (ppmv)	O2 (% vol)	CO2 (% vol)	AVE CO (ppmv)	AVE O2 (% vol)	AVE CO2 (% vol)
Run 2	10/28/02	12:00:39	1095.0	20.45	1.30	1066.8	20.43	1.28
Run 2	10/28/02	12:01:39	1079.0	20.43	1.26	1067.1	20.43	1.28
Run 2	10/28/02	12:02:39	1093.0	20.45	1.28	1067.8	20.43	1.28
Run 2	10/28/02	12:03:39	1087.0	20.45	1.30	1067.8	20.43	1.28
Run 2	10/28/02	12:04:39	1101.0	20.40	1.28	1069.0	20.43	1.28
Run 2	10/28/02	12:05:39	1149.0	20.43	1.30	1070.3	20.43	1.28
Run 2	10/28/02	12:06:39	1145.0	20.38	1.28	1072.7	20.43	1.28
Run 2	10/28/02	12:07:39	1209.0	20.38	1.32	1075.0	20.43	1.28
Run 2	10/28/02	12:08:39	1171.0	20.40	1.32	1077.7	20.43	1.28
Run 2	10/28/02	12:09:39	1187.0	20.40	1.32	1079.9	20.43	1.28
Run 2	10/28/02	12:10:39	1109.0	20.43	1.28	1081.8	20.43	1.28
Run 2	10/28/02	12:11:39	1131.0	20.43	1.22	1082.9	20.43	1.28
Run 2	10/28/02	12:12:39	1125.0	20.70	1.20	1083.4	20.43	1.28
Run 2	10/28/02	12:13:39	1099.0	20.48	1.16	1083.3	20.43	1.28
Run 2	10/28/02	12:14:39	1125.0	20.45	1.20	1083.4	20.43	1.28
Run 2	10/28/02	12:15:39	1091.0	20.48	1.18	1084.1	20.43	1.28
Run 2	10/28/02	12:16:39	1135.0	20.48	1.20	1084.5	20.43	1.27
Run 2	10/28/02	12:17:39	1083.0	20.48	1.18	1085.0	20.43	1.27
Run 2	10/28/02	12:18:39	1127.0	20.45	1.18	1085.8	20.43	1.27
Run 2	10/28/02	12:19:38	1113.0	20.45	1.20	1086.0	20.43	1.27
Run 2	10/28/02	12:20:38	1079.0	20.45	1.20	1086.5	20.43	1.27
Run 2	10/28/02	12:21:38	1145.0	20.45	1.20	1087.0	20.43	1.27
Run 2	10/28/02	12:22:38	1153.0	20.45	1.20	1087.6	20.43	1.27
Run 2	10/28/02	12:23:38	1091.0	20.43	1.22	1088.5	20.43	1.26
Run 2	10/28/02	12:24:38	1113.0	20.45	1.16	1089.4	20.43	1.26
Run 2	10/28/02	12:25:38	1173.0	20.45	1.20	1089.7	20.43	1.26
Run 2	10/28/02	12:26:38	1127.0	20.45	1.20	1090.3	20.43	1.26
END Run 2	10/28/02	12:27:38	1137.0	20.40	1.26	**1091.3**	**20.43**	**1.26**

Georgia-Pacific Palatka Operations, Bleach Plant Scrubber, Logged Data Records

Run Number	Date	Time	CO (ppmv)	O2 (% vol)	CO2 (% vol)	AVE CO (ppmv)	AVE O2 (% vol)	AVE CO2 (% vol)
START Run 3	10/28/02	13:17:45	1009.0	20.40	1.04	1009.0	20.40	1.04
Run 3	10/28/02	13:18:45	1023.0	20.45	1.06	1004.8	20.42	1.06
Run 3	10/28/02	13:19:45	969.0	20.45	1.04	999.4	20.44	1.04
Run 3	10/28/02	13:20:45	991.0	20.45	1.00	996.6	20.43	1.04
Run 3	10/28/02	13:21:45	983.0	20.45	0.98	992.1	20.44	1.03
Run 3	10/28/02	13:22:45	979.0	20.43	1.02	991.8	20.44	1.02
Run 3	10/28/02	13:23:45	991.0	20.43	1.02	988.9	20.44	1.02
Run 3	10/28/02	13:24:45	957.0	20.43	1.02	987.7	20.44	1.02
Run 3	10/28/02	13:25:45	1007.0	20.43	1.06	986.4	20.43	1.02
Run 3	10/28/02	13:26:45	923.0	20.28	1.04	985.4	20.42	1.02
Run 3	10/28/02	13:27:45	1015.0	20.33	1.04	985.1	20.41	1.03
Run 3	10/28/02	13:28:45	1025.0	20.33	1.14	986.6	20.40	1.03
Run 3	10/28/02	13:29:45	1039.0	20.38	1.12	992.9	20.40	1.04
Run 3	10/28/02	13:30:45	1089.0	20.38	1.12	997.1	20.40	1.05
Run 3	10/28/02	13:31:45	1055.0	20.38	1.14	1002.2	20.39	1.06
Run 3	10/28/02	13:32:45	1093.0	20.38	1.12	1007.8	20.39	1.06
Run 3	10/28/02	13:33:45	1065.0	20.35	1.14	1010.7	20.39	1.07
Run 3	10/28/02	13:34:44	1015.0	20.35	1.10	1014.0	20.39	1.07
Run 3	10/28/02	13:35:44	1083.0	20.35	1.14	1015.7	20.38	1.07
Run 3	10/28/02	13:36:44	1007.0	20.35	1.14	1017.6	20.38	1.07
Run 3	10/28/02	13:37:44	1013.0	20.38	1.08	1018.3	20.38	1.08
Run 3	10/28/02	13:38:44	1025.0	20.35	1.14	1017.1	20.38	1.08
Run 3	10/28/02	13:39:44	1005.0	20.35	1.12	1017.4	20.38	1.08
Run 3	10/28/02	13:40:44	1037.0	20.33	1.12	1016.7	20.38	1.08
Run 3	10/28/02	13:41:44	993.0	20.33	1.14	1016.6	20.38	1.09
Run 3	10/28/02	13:42:44	999.0	20.33	1.12	1016.1	20.37	1.09
Run 3	10/28/02	13:43:44	947.0	20.43	1.14	1013.9	20.37	1.09
Run 3	10/28/02	13:44:44	937.0	20.38	1.12	1011.8	20.38	1.09
Run 3	10/28/02	13:45:44	935.0	20.40	1.10	1008.9	20.38	1.09
Run 3	10/28/02	13:46:44	911.0	20.40	1.08	1006.3	20.38	1.09
Run 3	10/28/02	13:47:44	959.0	20.40	1.12	1003.6	20.38	1.09
Run 3	10/28/02	13:48:44	945.0	20.40	1.14	1001.9	20.38	1.09
Run 3	10/28/02	13:49:44	971.0	20.40	1.10	1000.9	20.38	1.09

Georgia-Pacific Palatka Operations, Bleach Plant Scrubber, Logged Data Records

Run Number	Date	Time	CO (ppmv)	O2 (% vol)	CO2 (% vol)	AVE CO (ppmv)	AVE O2 (% vol)	AVE CO2 (% vol)
Run 3	10/28/02	13:50:44	961.0	20.38	1.16	999.0	20.38	1.10
Run 3	10/28/02	13:51:44	929.0	20.35	1.08	998.1	20.38	1.10
Run 3	10/28/02	13:52:44	973.0	20.35	1.08	996.5	20.38	1.10
Run 3	10/28/02	13:53:44	909.0	20.38	1.12	994.6	20.38	1.10
Run 3	10/28/02	13:54:44	945.0	20.33	1.06	993.4	20.38	1.09
Run 3	10/28/02	13:55:44	933.0	20.33	1.08	991.5	20.38	1.09
Run 3	10/28/02	13:56:44	690.8	20.35	0.98	988.5	20.38	1.09
Run 3	10/28/02	13:57:44	927.0	20.33	1.04	984.3	20.37	1.09
Run 3	10/28/02	13:58:44	873.0	20.35	1.00	982.1	20.37	1.09
Run 3	10/28/02	13:59:44	891.0	20.38	1.02	980.0	20.37	1.08
Run 3	10/28/02	14:00:44	915.0	20.38	1.06	977.9	20.37	1.08
Run 3	10/28/02	14:01:44	861.0	20.38	1.04	976.3	20.37	1.08
Run 3	10/28/02	14:02:44	921.0	20.40	1.06	974.2	20.37	1.08
Run 3	10/28/02	14:03:44	855.0	20.38	1.06	972.2	20.37	1.08
Run 3	10/28/02	14:04:44	893.0	20.38	1.02	970.4	20.37	1.08
Run 3	10/28/02	14:05:44	849.0	20.38	1.04	967.8	20.37	1.08
Run 3	10/28/02	14:06:44	889.0	20.40	1.04	966.3	20.37	1.08
Run 3	10/28/02	14:07:44	917.0	20.40	1.04	964.7	20.37	1.08
Run 3	10/28/02	14:08:44	879.0	20.40	1.06	963.3	20.37	1.08
Run 3	10/28/02	14:09:44	903.0	20.38	1.04	962.1	20.37	1.08
Run 3	10/28/02	14:10:44	863.0	20.38	1.08	960.2	20.38	1.08
Run 3	10/28/02	14:11:44	855.0	20.38	1.02	958.7	20.38	1.08
Run 3	10/28/02	14:12:44	917.0	20.38	1.06	957.2	20.38	1.07
Run 3	10/28/02	14:13:44	879.0	20.38	1.06	956.0	20.38	1.07
Run 3	10/28/02	14:14:44	845.0	20.40	0.96	954.6	20.38	1.07
Run 3	10/28/02	14:15:44	883.0	20.38	0.98	952.6	20.38	1.07
Run 3	10/28/02	14:16:44	825.0	20.38	0.96	951.0	20.38	1.07
END Run 3	10/28/02	14:17:44	849.0	20.38	0.90	**949.3**	**20.38**	**1.07**