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BUREAU OF AIR REGULATION

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

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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:

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.

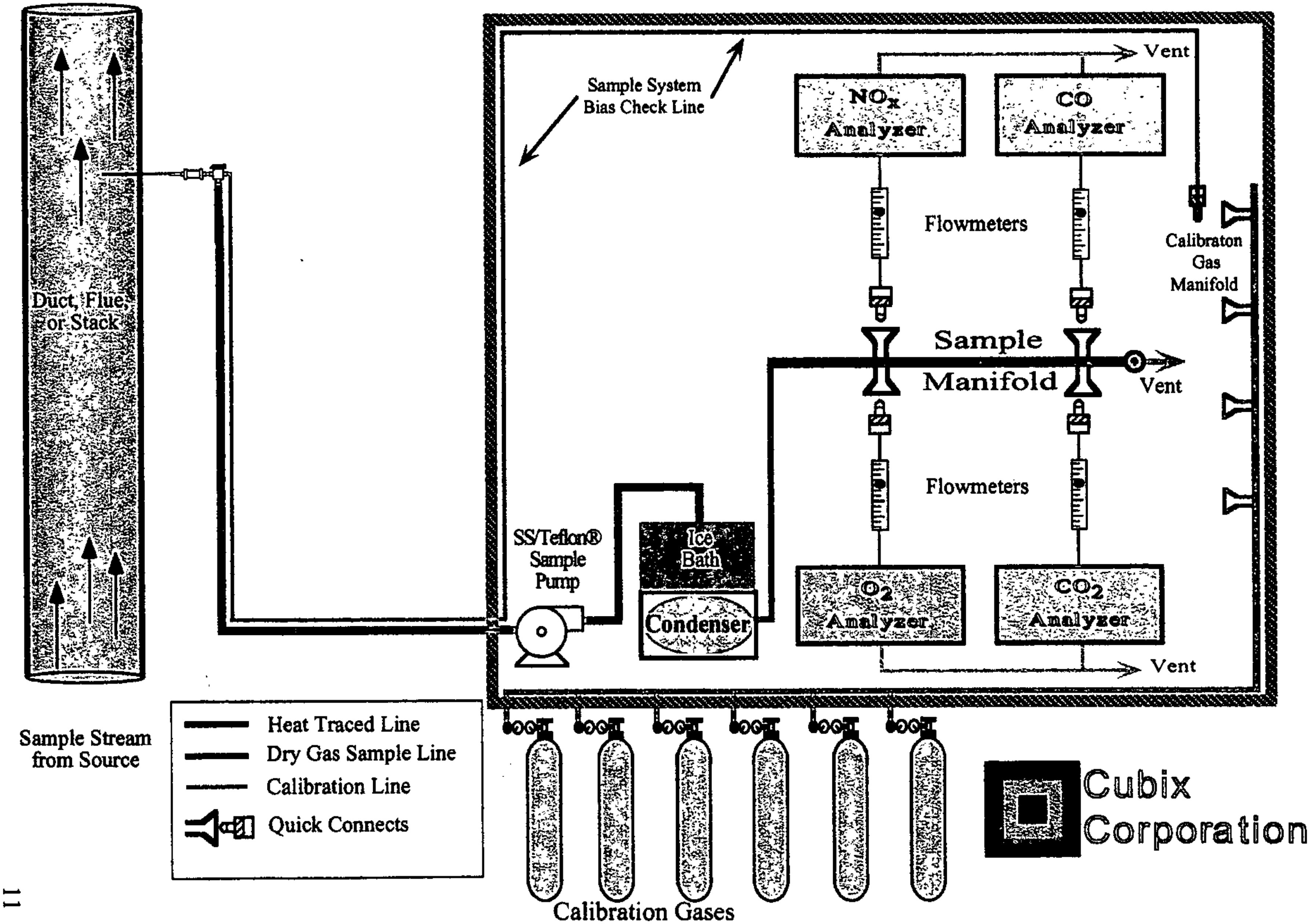
Emission calculations were conducted by a computer spreadsheet as shown in Table 2 of this report. Example calculations were performed manually using a hand-held calculator in order to verify the formulas used in the spreadsheet. Example calculations are in Appendix B of this report.

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, micro-processor 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

Description of Testing Activities:

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

Permits Required

		Comments
Hot Work	Check	No permits required in area where we were working.
Cold Work	Check	
Lock & Tag	Check	
Scaffolding	Check	
Crane/Lift	Check	
Line Break	Check	

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

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

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

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?

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.

JOB HAZARD IDENTIFIED

Hazardous Material (in plant area) (flammability, reactivity, health hazards)

List Hazmat?? ClO2.

PRECAUTIONS TO BE IMPLEMENTED

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

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.

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

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		

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

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

Inspections and Protective Actions

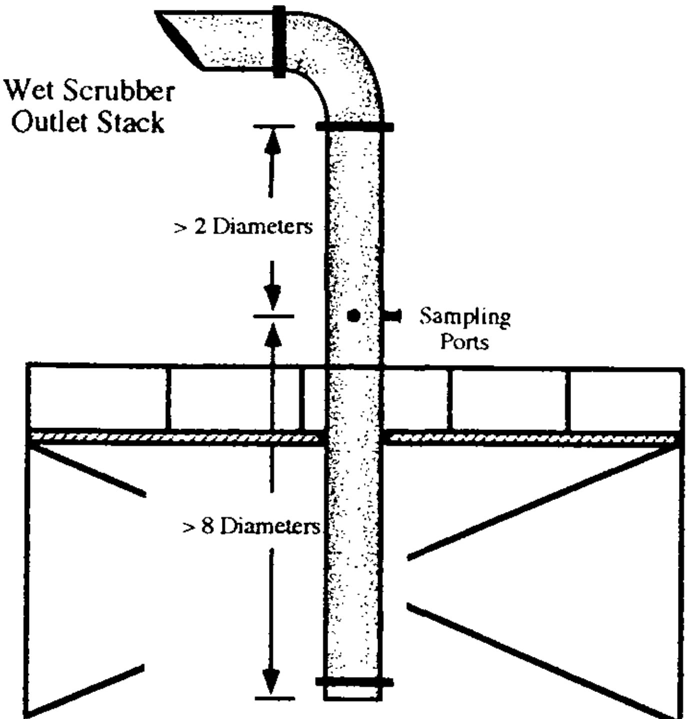
equipment secure	_ Check	clear lift zone	_ Check
operator certification	_ Check	rope inspection	_ Check
guy lines	_ Check	body harness	_ Check
radios/handsignals	_ Check	guard rails, toe plates	_ Check
housekeeping	_ Check	ladder tie-off	_ Check
lines secure	_ Check	monorails secure	_ Check
secure tools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

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

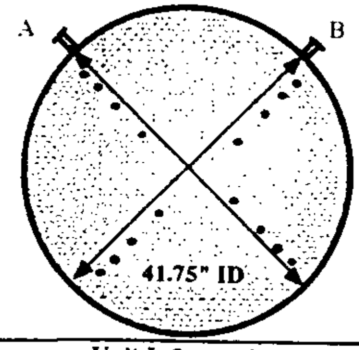
Date: October 27th, 2002
Client: Georgia-Pacific Corporation
Plant: G-P Palatka Operations
Source: Bleach Plant Scrubber
Technician(s): RPO, JTH

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)



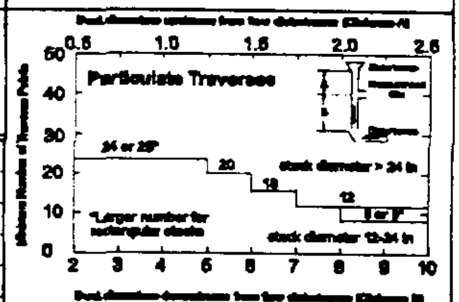
Cross Section

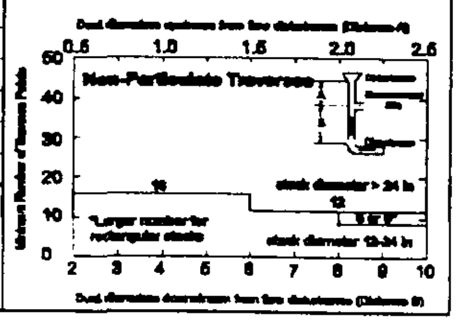


Unit Information

Bleach Plant Scrubber
Wet scrubber that uses an alkaline solution.

Traverse Point Number	Number of Traverse Points on a Diameter: 4	6	8	12	*Calculated Traverse Point	*Traverse Point with Port Extension
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*

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: 10-28-02
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'x3/8"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 ft^3/min		
Pre-Test Leak Check	0.000 ft^3/min	24.2 "Hg Vac.
Post-Test Leak Check	0.000 ft^3/min	25.0 "Hg Vac.
	Initial	Final
Time	9:42	10:27
DGM Reading (ft^3 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	DiH2O	545.7	565.0
2	DiH2O	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.

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 Ecolimeter
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: -.14 "H_2O (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.)		

Impingment System

Impinger	Contents	Initial Weight	Final Weight
1	Di H_2O	565.0	582.6
2	Di H_2O	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 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.

Velocity Traverse Data
with Stack Temperature and Cyclonic Flow Check

Point	ΔP ("H_2O)	°F	α	Point	ΔP ("H_2O)	°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	Dry Gas Meter ID:	T-10 Equimeter
Plant:	GP Palatka Plant	Dry Gas Meter Factor:	0.9869 (Kd)
Source:	Chlorine Plant Scrubber	Pitot Tube No/Type:	#2110 7'x3/8" OD SS S-type
Technicians:	RPO, JTH	Pitot Tube Factor:	0.84
Atm. Pressure:	29.91 "Hg (Pb)	Static Pressure:	+.1 -.18 "H_2O (Pg)
Test Run No.:	Run 3	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	Di H_2O	[illegible]	605.0
2	Di H_2O	561.7	565.6
3	MT	486.8	487.7
4	Si Gel	653.9	658.6
5			
6			
Totals		2285	2316.9

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	[illegible] 25	131	V	2-8	.23	131	V

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.

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

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

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

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

$\mathbf{B_{ws}}$ = moisture content by EPA Method 4

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

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

$\mathbf{B_{ws}}$ = **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)

= wt. of H_2O + wt. of CO_2 + wt. of O_2 + 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)

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

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

= 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)

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

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

Q_d = 7.698×10^5 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: [signature]
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: [signature]
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: [signature]
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: [signature]
FRED PIKULA

DATE: 7/23/2002

RATA CLASS

Dual-Analyzed Calibration Standard

Scott Specialty Gases

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	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/M200/71109	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	%

Second Triad Analysis: (blank)

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	%

Second Triad Analysis: (blank)

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.
5837 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

C. 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:	P164240
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

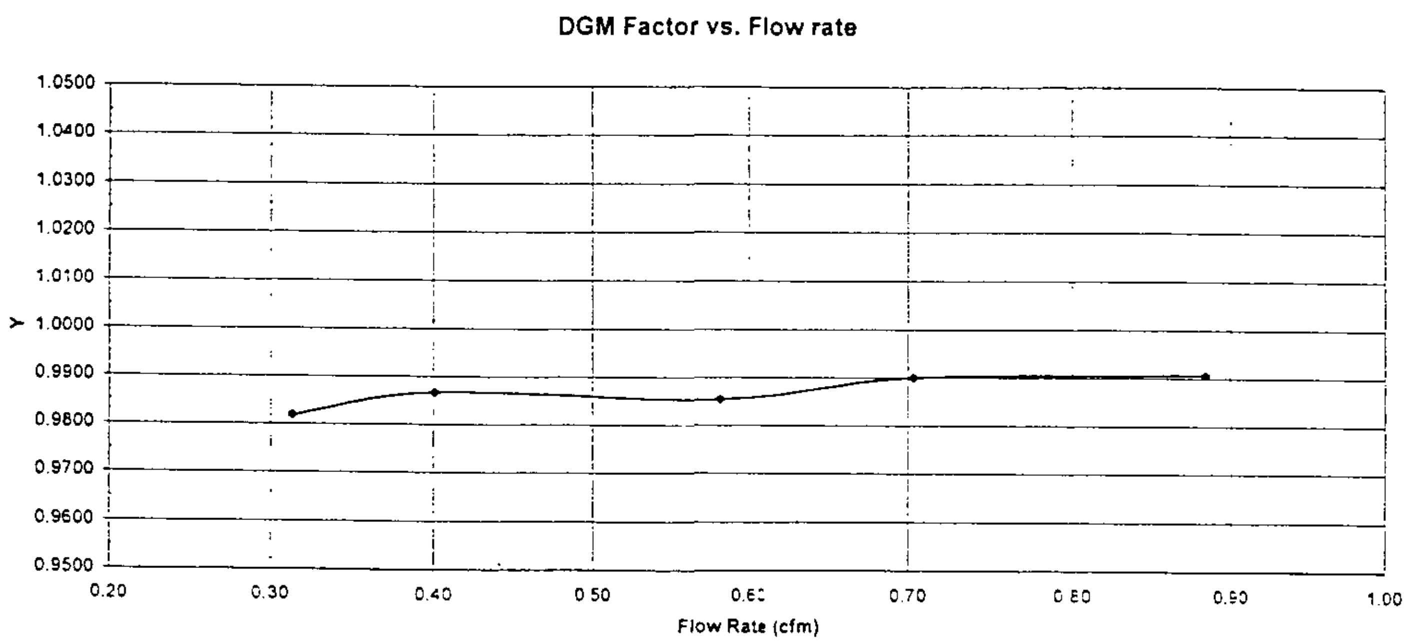
Dry Gas Meter (DGM Factor) Calibration Test Results

*** 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

Pitot Tube Calibration Sheet

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

Alignment Inspection

7 A

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:

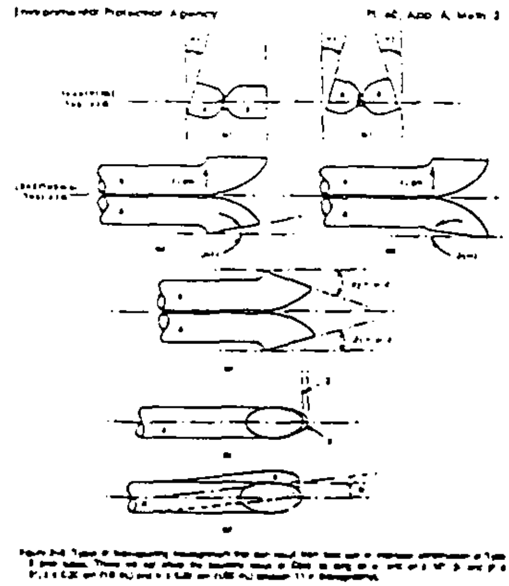
β_1 = 2 ° β_1 = 3 °

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

Pitot-tip end length alignment:

z = 0 (in or cm) [in circled]

Z must be ≤ 0.32 cm (1/8 in)



Pitot-tip centriod alignment with respect to transverse axis:

w = 0 (in or cm) [cm circled]

W must be ≤ 0.08 cm (1/32 in)

Pitot Tip Dimension Check

External tubing diameter:

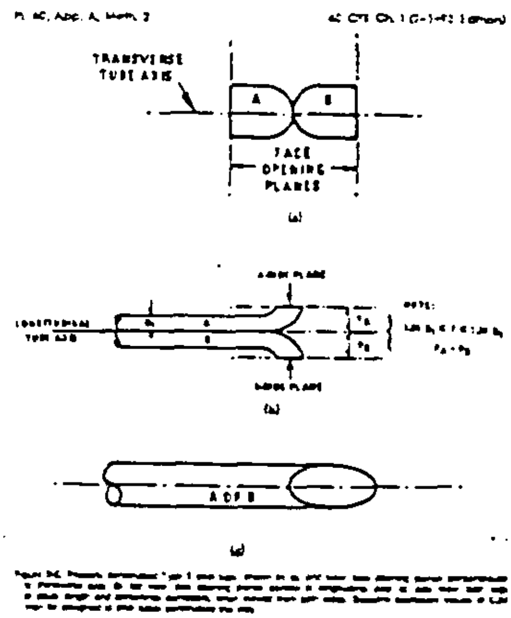
D_t = .375 (in or cm) [in circled]

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) [in circled]

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

START PRESSURE 30.06

FINAL PRESSURE 30.06

BAROMETRIC SCALE ERROR TEST

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

FRICTION TEST

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

CASE LEAK TEST @ 18,000 Ø

CASE LEAK TEST @ 1,200 Ø

HYSTERESIS TEST @ 50% 20

HYSTERESIS TEST @ 40% 15

AFTER EFFECT 15

SERIAL NUMBER J5924

INSPECTOR [signature]

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.

[signature] JAN 16 1995
AUTHORIZED SIGNATURE 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 C9102

NIST CALIBRATION CERTIFICATE

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

Instrument Tolerance

±3% full-scale

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

****** 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

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

NIST CALIBRATION CERTIFICATE

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

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.

2-1-02
DATE

RF
TESTED BY

mck
AUTHORIZED SIGNATURE

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
www.omega.com e-mail: info@omega.com

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**

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

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.

Georgia-Pacific

Palatka Pulp and Paper Operations
Consumer Products Division

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

December 13, 2002

Mr. Christopher L. Kirts
District Air Program Administrator
State of Florida
Department of Environmental Protection
7825 Baymeadows Way, Suite B200
Jacksonville, Florida 32256-7590

Re: Bleach Plant Compliance Test – October 2002
Georgia-Pacific Palatka Operations

Dear Mr. Kirts:

Continuous monitoring system (CMS) parameters, monitoring frequencies, averaging times and the rationale for selecting the CMS are required to be submitted for approval pursuant to 40 CFR 63.453 (n). This information has been updated from a previous submittal (letter dated October 25, 2002, Appendix A) reflecting recent compliance testing conducted in October 2002, which has been summarized and included in this correspondence for your review. (A copy of the test report is included as an attachment.)

The Bleach Plant scrubber collects and treats emissions from the No. 3 Bleach Plant as well as emissions from the R8/10 Chlorine Dioxide Generator. The pH of the gas scrubber effluent, the scrubber liquid influent flow rate, and the fan amps were continuously recorded during the testing. We have analyzed this information pursuant to 40 CFR 63.453 (n) as follows.

Although all runs demonstrated compliance with 40 CFR 63.445 (c) (2) by a considerable margin, four of the six runs were selected to develop operating parameter values providing the greatest operating flexibility while also demonstrating continuous compliance (see Table 1).

The average pH during these runs was 9.2 with a minimum during one run of 9.0 (see Figures 1 and 2 in Appendix B). We, therefore, propose for the Administrator's approval that we operate the scrubber effluent pH above a minimum of 9.0 as a rolling 3-hour average with a monitoring frequency of at least once every 15 minutes (see Table 2). We believe the monitoring frequency of once every 15 minutes to be appropriate because the standard deviation of the data was quite low. The average flow of the scrubber medium was 1257 gpm with a minimum of 1252 gpm. By the same rationale we propose for the Administrator's approval that we operate above a minimum flow of 1252 as a rolling 3-hour average with the same monitoring frequency described above.

Region 4 previously approved monitoring fan amperage of the bleaching system vent gas fan as an alternative monitoring parameter to 40 CFR 63.453 (c)(2) (letter dated December 22, 2000). The mill continuously monitors fan amperage and displays it as fan load on its Distributed Control System (DCS). Fan load during the time of the testing was calculated as follows (Equation 1).

$$\%Load = \frac{measured\ amps}{0.701 * full\ load\ amps} * 100 = \frac{measured\ amps}{0.701 * 25.7} * 100 = \frac{measured\ amps}{18.02} * 100$$

Please note 0.701 represents a conversion factor for ranging of the signal from the field instrumentation to the DCS.

Figure 3 reflects the fan load/amperage when the Bleach Plant goes down. Because the mill continues to run the fan the amperage goes up although the process is down. We have also taken all the belts off the fan motor to determine its "no load" amperage, 9.8 amps. Because of data variability we propose to operate the fan such that the amperage is below 19.3 and above 10.8 amps as a rolling 3-hour average. This will be converted to fan load for convenience of the operators. Note that this calculation has been simplified according to the following (Equation 2) and became effective on December 5, 2002 at 13:05.

$$\%Load = \frac{measured\ amps}{full\ load\ amps} * 100 = \frac{measured\ amps}{25.7} * 100$$

Again, we propose to monitor fan amperage/load at least once every 15 minutes. In all cases, pH, flow, and % Load data will be transferred to a plant wide information (PI) system for record keeping purposes.

We respectfully request written approval as required by 40 CFR 63.453 (n). If you have any questions about our rationale please do not hesitate to call me at (386) 329-0918.

Sincerely,

Theodore D. Kennedy
Vice President

tk

Enclosures

cc: Lee Page, EPA Region 4
William Jernigan, Atlanta
Scott Matchett, Atlanta
Cindy Barlow
Nickolai Selbach

Appendix A

Letter Dated October 25, 2002

Georgia-Pacific

Palatka Pulp and Paper Operations
Consumer Products Division

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

October 25, 2002

Mr. Mort Benjamin
Air Compliance Supervisor
Northeast District
Florida Department of Environmental Protection
7825 Baymeadows Way, Suite 200B
Jacksonville, FL 32256-7577

Re: Cluster Rule CMS Parameters (40 CFR 63.453(n))
Georgia-Pacific Palatka Operations
1070005

Dear Mr. Benjamin:

During a recent review of recordkeeping and reporting procedures we discovered that continuous monitoring system (CMS) parameters, monitoring frequencies, averaging times and the rationale for choosing the CMS were not submitted in a readable, concise format and summary to the Department pursuant to 40 CFR 63.453 (n).

The CMS listed in the attached tables were chosen because they indicate when there is a breach of the Closed Vent Collection System, a bypass of the Condensate Collection System, or they otherwise indicate operation outside of tested operating ranges on the condensate, low-volume-high-concentration (LVHC) and bleach plant treatment systems specifically identified in 40 CFR Subpart S. The tables show the equipment, the parameters that are monitored, the CMS tag numbers, the limits that have been evaluated and the thresholds or minimum averaging times.

Limit switches, pressure measurements, stream flows, temperatures, pH, fan load, pH and indications of valve positions are forms of CMS that are generally accepted industry-wide for monitoring for compliance.

The parameters designated as "Valve Position" or "Vent Valve Position" in the attached Tables indicate that a system is either being collected (valve "Closed") or bypassed (valve "Open") to show compliance with the requirement to collect gases from the named LVHC systems.

The incinerator temperature values were selected because data collected during the IPT of the two incinerators indicated that compliance with the treatment requirements of 63.443(d) were met at all times when the temperatures were above the chosen values. The averaging time was selected based on run times of the reference test methods. Similarly, the parameter values shown for the stripper parameters mandated under 63.453(g) were based on data gathered during the stripper characterization study.

Finally, the scrubber parameters are either mandated by the rule (see 63.453(c)) or approved as acceptable alternative monitoring. Parameter values were chosen based on data gathered during the scrubber IPTand subsequent performance tests, and when the parameters are within the designated ranges, we meet the bleach plant treatment requirements found in 63.445(c). Averaging times were selected based on normal compliance test times.

If you have any more questions concerning this issue, please do not hesitate to contact either Joe Taylor at 386-329-0027 or via e-mail at jetaylor@gapac.com or me at 386-329-0918.

Sincerely,

Theodore D. Kennedy

Theodore D. Kennedy
Vice-President
Palatka Operations

Bc: S. D. Matchett (GA030-43)
W. M. Jernigan (GA030-09)

MACT I CONTINUOUS MONITORING SYSTEMS

Area	Parameter/Equipment	Parameter Monitored	PI Tag Number	Range/Limit	Threshold/Averaging Time
Bleach Plant (scrubber)	Scrubbant Recirculation Flow	Flow	40fif31.pv	≥ 1229 gpm	3-hr average
	Scrubber Fan Load	Load	40iif33.pv	≥ 85%	Continuous
	Scrubbant Recirculation pH	PH	40aif32.pv	≥ 9.1	3-hr average
Thermal Oxidizer	Primary Incinerator Temperature	Temperature	13ncgincin:13ttm22a.pnt	≥ 1300° F	3-hr rolling average
	Backup Incinerator Temperature	Temperature	13ncgincin:13ttm22b.pnt	≥ 1300° F	
Steam Stripper	Steam Flow to Stripper	Steam Flow	13constrip:13fcc01.meas		3-hr rolling average
	Condensate Flow to Stripper	Condensate Flow	13constrip:13fcc19.meas	N/A	3-hr rolling average
	Condensate Temperature entering Column	Temperature	13constrip:13ttc30.pnt	≥ 160° F	3-hr rolling average
Condensate Collection	Pre-evaporator 1st and 2nd effect foul, Pre-evaporator hotwell condensate	Flow, gpm	13concollect:13ftk20.pnt	N/A	Daily average rolled into 15-day rolling average
	1st and 2nd effect contaminated condensate, as makeup	Flow, gpm	13concollect:13ftk03.pnt	N/A	Daily average rolled into 15-day rolling average
	Turpentine Decanter Underflow and Secondary Condenser condensate	Flow, gpm	13concollect:13ftk21.pnt	N/A	Daily average rolled into 15-day rolling average

MACT I CONTINUOUS MONITORING SYSTEMS

Area	Parameter/Equipment	Parameter Monitored	Loop Number	Range/Limit	Threshold/Averaging Time
Closed Vent System	#1 Blow Tank Safety Valve	Limit Switch	05VL1VNT	Open/Closed	minute
	#2 Blow Tank Safety Valve	Limit Switch	05VL2VNT	Open/Closed	minute
	#3 Blow Tank Safety Valve	Limit Switch	05VL3VNT	Open/Closed	minute
	Secondary Condenser Vent	Limit Switch	13D06	Open/Closed	minute
	Secondary Condenser Rupture Disc	Pressure Transmitter	13D07	14.5 psi	minute
	Secondary Condenser Rupture Disc	Pressure Transmitter	13D61	14.5 psi	minute
	Accumulator Safety Valve	Limit Switch	13A07	Open/Closed	minute
	Accumulator Safety Valve	Limit Switch	13A22	Open/Closed	minute
	Pre-evaporator Hotwell Loop Seal	Pressure Transmitter	13PTB23	14" water column	minute
	Pre-evaporator Hotwell Vent	Limit Switch	13D01	Open/Closed	minute
	Pre-evaporator Hotwell Rupture Disc	Pressure Switch	13D02	10 psi	minute
	Turpentine Condenser Vent	Limit Switch	13J01	Open/Closed	minute
	Turpentine Condenser Rupture Disc	Pressure Switch	13J02	10 psi	minute
	#1 Evaporator Hotwell Vent	Limit Switch	13J26	Open/Closed	minute

MACT I CONTINUOUS MONITORING SYSTEMS

Area	Parameter/Equipment	Parameter Monitored	Loop Number	Range/Limit	Threshold/Averaging Time
Closed Vent System	#1 Evaporator Hotwell Rupture Disc	Pressure Switch	13J27	10 psi	minute
	#2 Evaporator Hotwell Vent	Limit Switch	13J21	Open/Closed	minute
	#2 Evaporator Hotwell Rupture Disc	Pressure Switch	13J22	10 psi	minute
	#3 Evaporator Hotwell Vent	Limit Switch	13J16	Open/Closed	minute
	#3 Evaporator Hotwell Rupture Disc	Pressure Switch	13J17	10 psi	minute
	#3 Evaporator Hotwell Loop Seal	Pressure Transmitter	11PTJ12	14" water column	minute
	#4 Evaporator Hotwell Vent	Limit Switch	13J11	Open/Closed	minute
	#4 Evaporator Hotwell Rupture Disc	Pressure Switch	13J12	10 psi	minute
	#4 Evaporator Hotwell Rupture Disc	Pressure Switch	13J15	10 psi	minute
	#4 Evaporator Hotwell Loop Seal	Pressure Transmitter	68PTO46	14" water column	minute
	Stripper Feed Tank Water Seal	Water Seal	13K09	8 psi	minute
	Stripper Feed Tank Rupture Disc	Pressure Transmitter	13K15	14.5 psi	minute
	Stripper-off-gas to Oxidizer	Limit Switch	13L04	Open/Closed	minute
	Stripper-off-gas to Oxidizer Rupture Disc	Temperature Transmitter	13L14	160° F	minute

MACT I CONTINUOUS MONITORING SYSTEMS

Area	Parameter/Equipment	Parameter Monitored	Loop Number	Range/Limit	Threshold/Averaging Time
Closed Vent System	Stripper-off-gas to Boiler	Limit Switch	59D12	Open/Closed	
	Stripper-off-gas to Boiler Rupture Disc	Pressure Transmitter	59D35	14.5 psi	
	NCG Vent to Oxidizer	Limit Switch	13D70	Open/Closed	
	NCG to Oxidizer Rupture Disc	Pressure Transmitter	13D65	14.5 psi	
	NCG to Oxidizer Rupture Disc	Temperature Transmitter	13D68	160° F	
	Batch NCG to Boiler Rupture Disc	Pressure Transmitter	13D63	14.5 psi	
	NCG Vent to Boiler	Limit Switch	59D08	Open/Closed	
	NCG to Boiler Rupture Disc	Temperature Transmitter	59D06	160° F	

Appendix B

Miscellaneous Information

Table 1

	Run 1	Run 2	Run 3	Run 4
Start =	10/29/02 12:18	10/31/02 13:32	10/31/02 15:50	10/31/02 17:10
End =	10/29/02 13:23	10/31/02 14:43	10/31/02 16:56	10/31/02 18:16

	Do Stage					Eop Stage		D1 Stage	
	BAST/h			% Pine	% HW	% Pine	% HW	% Pine	% HW
	43FYB04.PV	Maximum	STDEV	43AYB04W.PV	Calculation	43AYD04W.PV	Calculation	43AYF04W.PV	Calculation
Run 1	50	52	0.6	100.0	0.0	100.0	0.0	100.0	0.0
Run 2	50	52	0.8	100.0	0.0	100.0	0.0	100.0	0.0
Run 3	50	52	0.6	100.0	0.0	100.0	0.0	100.0	0.0
Run 4	50	52	0.6	100.0	0.0	100.0	0.0	100.0	0.0

	BP Scrubber									R-10 Run Status	Test
	Flow (gpm)			pH			Fan Load (%)	Fan Load (amps)	Fan Delta P (in H2O)	ClO2 (STPD)	Cl2
	40FIF31.PV	Minimum	STDEV	40AIF32.PV	Minimum	STDEV	40IIF33.PV	40IIF33.PV	40PIF03.PV	37FYF14.PV	ppm
Run 1	1262	1261	0.6	9.1	9.0	0.05	83.9	15.1	20.9	0.00	0.233
Run 2	1253	1252	1.0	9.3	9.3	0.01	85.5	15.4	21.4	31.6	0.073
Run 3	1258	1257	0.8	9.3	9.3	0.00	85.4	15.4	21.4	37.3	0.020
Run 4	1262	1260	0.9	9.3	9.2	0.02	85.8	15.4	21.4	30.3	0.032
Average =		1257			9.2		85.1	15.3			

Table 2

Parameter		Test Condition	Proposed Operating Value	Monitoring Frequency	Averaging Time
No. 3 Bleach Plant					
pH, Minimum		9.0	9.0	5 min	3-hr., rolling
Scrubber flow, Minimum	(gpm)	1252	1252	5 min	3-hr., rolling
Fan load Minimum	(amps)	15.11[a]	10.8[c]	5 min	3-hr., rolling
Fan load Maximum	(amps)	15.45[b]	19.3[d]	5 min	3-hr., rolling
Fan "No Load"	(amps)	9.8			

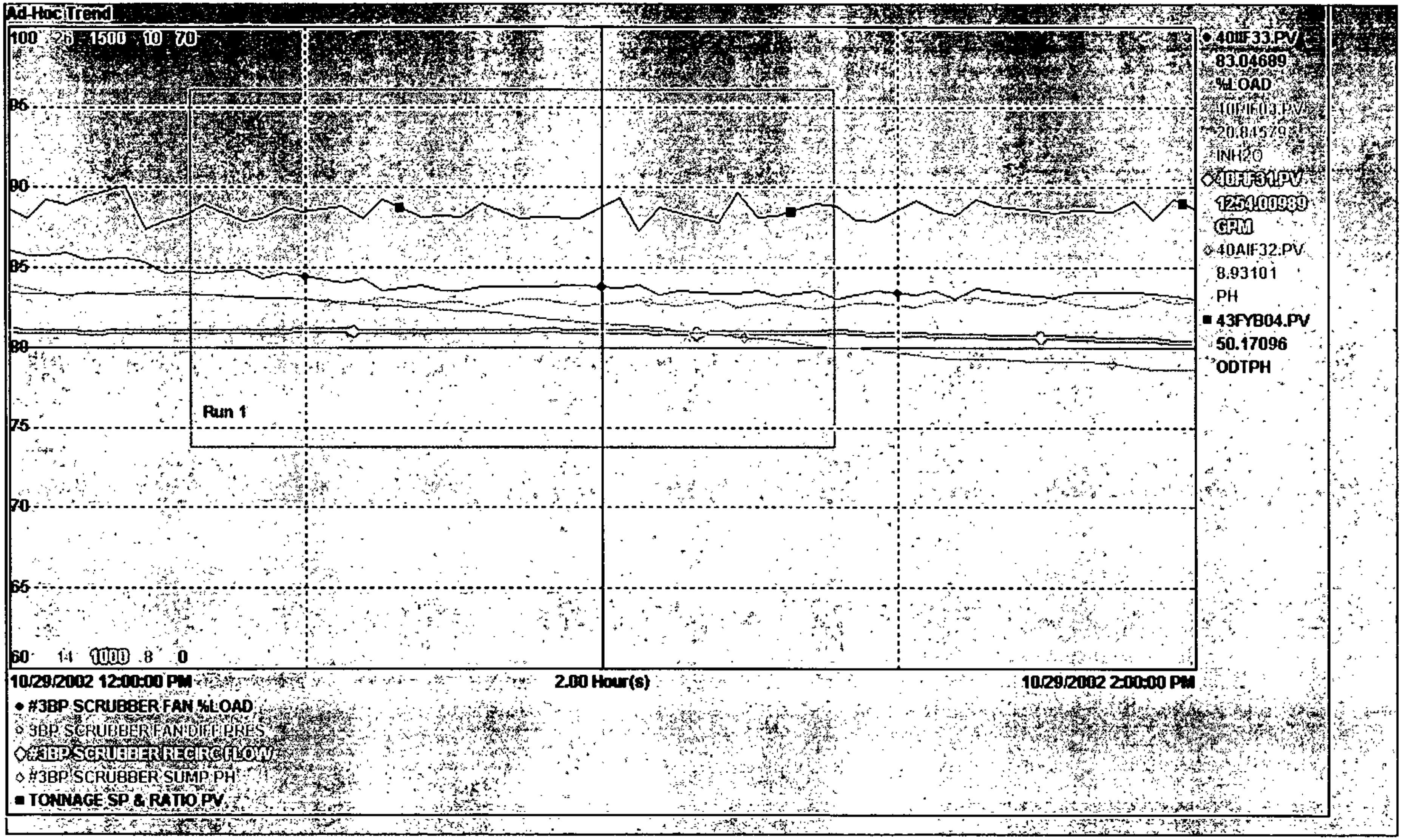
[a] Equivalent to 83.9% Load, using Equation 1

[b] Equivalent to 85.8% Load, using Equation 1

[c] Equivalent to 41.9% Load using Equation 2

[d] Equivalent to75% Load using Equation 2

Figure 1



Ad-Hoc Trend
100 26 1500 10 70
95
90
85
80
75
70
65
60 14 1000 8 0
Run 1
40IIF33.PV
83.04689
%LOAD
40PIF03.PV
20.84579
INH2O
40FIF31.PV
1254.00989
GPM
40AIF32.PV
8.93101
PH
43FYB04.PV
50.17096
ODTPH
10/29/2002 12:00:00 PM
2.00 Hour(s)
10/29/2002 2:00:00 PM
#3BP SCRUBBER FAN %LOAD
3BP SCRUBBER FAN DIFF PRES
#3BP SCRUBBER RECIRC FLOW
#3BP SCRUBBER SUMP PH
TONNAGE SP & RATIO PV

Figure 2

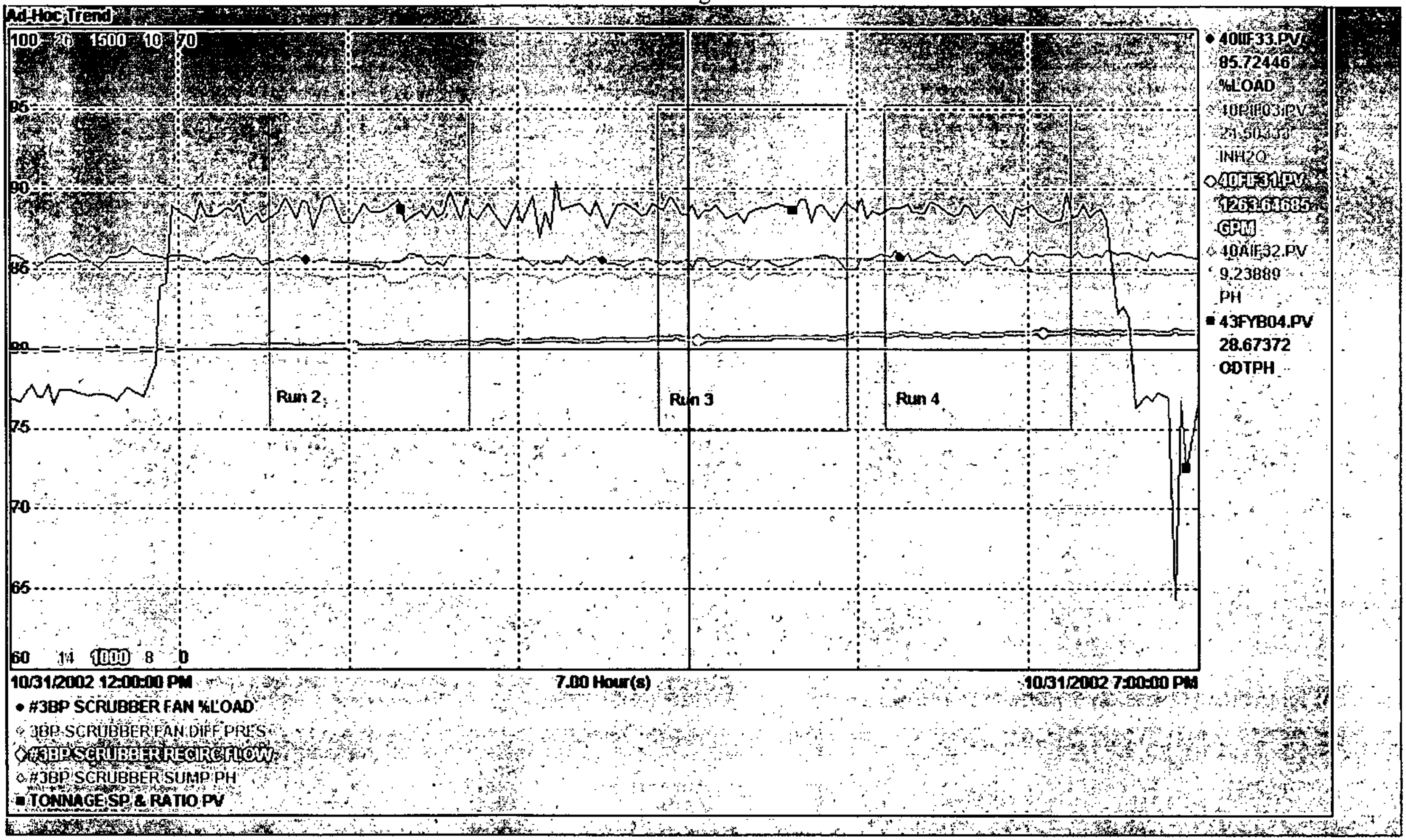
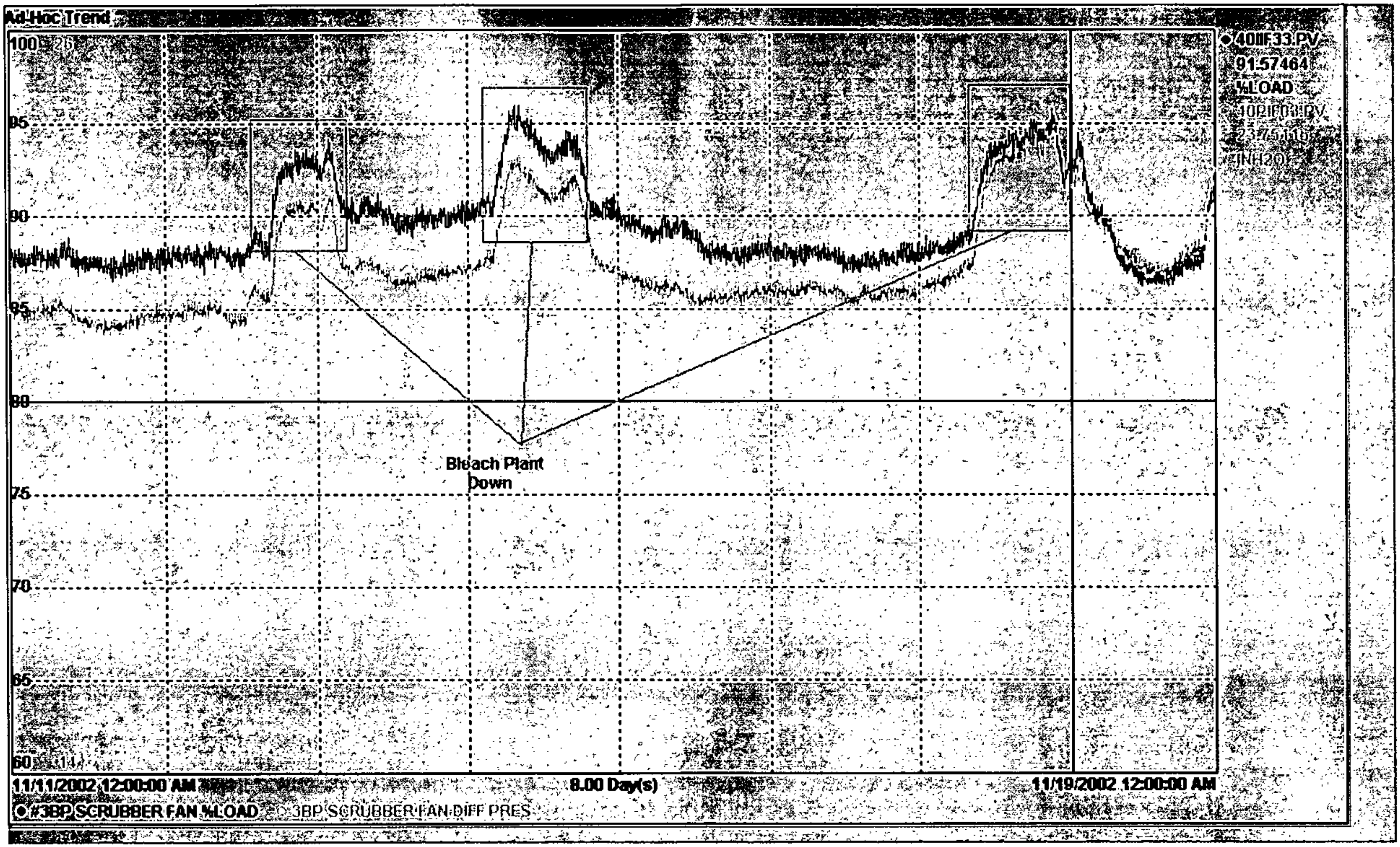

Ad-Hoc Trend
100 20 1500 10 70
95
90
85
80
75
70
65
60 14 1000 8 0
Run 2
Run 3
Run 4
40IIF33.PV
85.72446
%LOAD
10PIIF03.PV
21.50333
INH2O
40FIF31.PV
1263.64685
GPM
40AIF32.PV
9.23889
PH
43FYB04.PV
28.67372
ODTPH
10/31/2002 12:00:00 PM
7.00 Hour(s)
10/31/2002 7:00:00 PM
#3BP SCRUBBER FAN %LOAD
3BP SCRUBBER FAN DIFF PRES
#3BP SCRUBBER RECIRC FLOW
#3BP SCRUBBER SUMP PH
TONNAGE SP & RATIO PV

Figure 3



Ad Hoc Trend
100
95
90
85
80
75
70
65
60
Bleach Plant Down
40IIF33.PV
91.57464
%LOAD
11/11/2002 12:00:00 AM
8.00 Day(s)
11/19/2002 12:00:00 AM
#3BP SCRUBBER FAN %LOAD
3BP SCRUBBER FAN DIFF PRES

Appendix C

Raw Data
(5-minute averages)

pH Run 1		pH Run 2		pH Run 3		pH Run 4	
29-Oct-02 12:18:00	9.2	31-Oct-02 13:32:00	9.3	31-Oct-02 15:50:00	9.3	31-Oct-02 17:10:00	9.3
29-Oct-02 12:23:00	9.2	31-Oct-02 13:37:00	9.3	31-Oct-02 15:55:00	9.3	31-Oct-02 17:15:00	9.3
29-Oct-02 12:28:00	9.1	31-Oct-02 13:42:00	9.3	31-Oct-02 16:00:00	9.3	31-Oct-02 17:20:00	9.3
29-Oct-02 12:33:00	9.1	31-Oct-02 13:47:00	9.3	31-Oct-02 16:05:00	9.3	31-Oct-02 17:25:00	9.3
29-Oct-02 12:38:00	9.1	31-Oct-02 13:52:00	9.3	31-Oct-02 16:10:00	9.3	31-Oct-02 17:30:00	9.3
29-Oct-02 12:43:00	9.1	31-Oct-02 13:57:00	9.3	31-Oct-02 16:15:00	9.3	31-Oct-02 17:35:00	9.3
29-Oct-02 12:48:00	9.1	31-Oct-02 14:02:00	9.3	31-Oct-02 16:20:00	9.3	31-Oct-02 17:40:00	9.3
29-Oct-02 12:53:00	9.1	31-Oct-02 14:07:00	9.3	31-Oct-02 16:25:00	9.3	31-Oct-02 17:45:00	9.3
29-Oct-02 12:58:00	9.1	31-Oct-02 14:12:00	9.3	31-Oct-02 16:30:00	9.3	31-Oct-02 17:50:00	9.3
29-Oct-02 13:03:00	9.1	31-Oct-02 14:17:00	9.3	31-Oct-02 16:35:00	9.3	31-Oct-02 17:55:00	9.2
29-Oct-02 13:08:00	9.0	31-Oct-02 14:22:00	9.3	31-Oct-02 16:40:00	9.3	31-Oct-02 18:00:00	9.2
29-Oct-02 13:13:00	9.0	31-Oct-02 14:27:00	9.3	31-Oct-02 16:45:00	9.3	31-Oct-02 18:05:00	9.2
29-Oct-02 13:18:00	9.0	31-Oct-02 14:32:00	9.3	31-Oct-02 16:50:00	9.3	31-Oct-02 18:10:00	9.2
		31-Oct-02 14:37:00	9.3				

Flow Run 1		Flow Run 2		Flow Run 3		Flow Run 4	
29-Oct-02 12:18:00	1263	31-Oct-02 13:32:00	1253	31-Oct-02 15:50:00	1258	31-Oct-02 17:10:00	1261
29-Oct-02 12:23:00	1262	31-Oct-02 13:37:00	1253	31-Oct-02 15:55:00	1258	31-Oct-02 17:15:00	1261
29-Oct-02 12:28:00	1263	31-Oct-02 13:42:00	1252	31-Oct-02 16:00:00	1257	31-Oct-02 17:20:00	1261
29-Oct-02 12:33:00	1263	31-Oct-02 13:47:00	1252	31-Oct-02 16:05:00	1257	31-Oct-02 17:25:00	1261
29-Oct-02 12:38:00	1263	31-Oct-02 13:52:00	1253	31-Oct-02 16:10:00	1258	31-Oct-02 17:30:00	1261
29-Oct-02 12:43:00	1262	31-Oct-02 13:57:00	1252	31-Oct-02 16:15:00	1258	31-Oct-02 17:35:00	1261
29-Oct-02 12:48:00	1263	31-Oct-02 14:02:00	1252	31-Oct-02 16:20:00	1258	31-Oct-02 17:40:00	1261
29-Oct-02 12:53:00	1263	31-Oct-02 14:07:00	1252	31-Oct-02 16:25:00	1259	31-Oct-02 17:45:00	1262
29-Oct-02 12:58:00	1262	31-Oct-02 14:12:00	1252	31-Oct-02 16:30:00	1259	31-Oct-02 17:50:00	1262
29-Oct-02 13:03:00	1262	31-Oct-02 14:17:00	1253	31-Oct-02 16:35:00	1260	31-Oct-02 17:55:00	1262
29-Oct-02 13:08:00	1261	31-Oct-02 14:22:00	1254	31-Oct-02 16:40:00	1259	31-Oct-02 18:00:00	1263
29-Oct-02 13:13:00	1262	31-Oct-02 14:27:00	1254	31-Oct-02 16:45:00	1259	31-Oct-02 18:05:00	1263
29-Oct-02 13:18:00	1261	31-Oct-02 14:32:00	1254	31-Oct-02 16:50:00	1259	31-Oct-02 18:10:00	1263
		31-Oct-02 14:37:00	1255				

Fan Load (Amps) Run 1		Fan Load (Amps) Run 2		Fan Load (Amps) Run 3		Fan Load (Amps) Run 4	
29-Oct-02 12:18:00	15.26	31-Oct-02 13:32:00	15.40	31-Oct-02 15:50:00	15.37	31-Oct-02 17:10:00	15.47
29-Oct-02 12:23:00	15.23	31-Oct-02 13:37:00	15.44	31-Oct-02 15:55:00	15.39	31-Oct-02 17:15:00	15.44
29-Oct-02 12:28:00	15.20	31-Oct-02 13:42:00	15.43	31-Oct-02 16:00:00	15.39	31-Oct-02 17:20:00	15.45
29-Oct-02 12:33:00	15.14	31-Oct-02 13:47:00	15.41	31-Oct-02 16:05:00	15.38	31-Oct-02 17:25:00	15.48
29-Oct-02 12:38:00	15.09	31-Oct-02 13:52:00	15.40	31-Oct-02 16:10:00	15.38	31-Oct-02 17:30:00	15.45
29-Oct-02 12:43:00	15.07	31-Oct-02 13:57:00	15.38	31-Oct-02 16:15:00	15.38	31-Oct-02 17:35:00	15.39
29-Oct-02 12:48:00	15.10	31-Oct-02 14:02:00	15.36	31-Oct-02 16:20:00	15.36	31-Oct-02 17:40:00	15.46
29-Oct-02 12:53:00	15.11	31-Oct-02 14:07:00	15.34	31-Oct-02 16:25:00	15.40	31-Oct-02 17:45:00	15.45
29-Oct-02 12:58:00	15.10	31-Oct-02 14:12:00	15.38	31-Oct-02 16:30:00	15.35	31-Oct-02 17:50:00	15.44
29-Oct-02 13:03:00	15.05	31-Oct-02 14:17:00	15.43	31-Oct-02 16:35:00	15.39	31-Oct-02 17:55:00	15.38
29-Oct-02 13:08:00	15.03	31-Oct-02 14:22:00	15.47	31-Oct-02 16:40:00	15.43	31-Oct-02 18:00:00	15.47
29-Oct-02 13:13:00	15.03	31-Oct-02 14:27:00	15.38	31-Oct-02 16:45:00	15.45	31-Oct-02 18:05:00	15.48
29-Oct-02 13:18:00	15.03	31-Oct-02 14:32:00	15.40	31-Oct-02 16:50:00	15.42	31-Oct-02 18:10:00	15.47
		31-Oct-02 14:37:00	15.45				

Fan Load (%) Run 1		Fan Load (%) Run 2		Fan Load (%) Run 3		Fan Load (%) Run 4	
29-Oct-02 12:18:00	84.7	31-Oct-02 13:32:00	85.5	31-Oct-02 15:50:00	85.3	31-Oct-02 17:10:00	85.9
29-Oct-02 12:23:00	84.6	31-Oct-02 13:37:00	85.7	31-Oct-02 15:55:00	85.4	31-Oct-02 17:15:00	85.7
29-Oct-02 12:28:00	84.4	31-Oct-02 13:42:00	85.6	31-Oct-02 16:00:00	85.4	31-Oct-02 17:20:00	85.8
29-Oct-02 12:33:00	84.0	31-Oct-02 13:47:00	85.5	31-Oct-02 16:05:00	85.4	31-Oct-02 17:25:00	85.9
29-Oct-02 12:38:00	83.8	31-Oct-02 13:52:00	85.5	31-Oct-02 16:10:00	85.4	31-Oct-02 17:30:00	85.8
29-Oct-02 12:43:00	83.6	31-Oct-02 13:57:00	85.4	31-Oct-02 16:15:00	85.4	31-Oct-02 17:35:00	85.4
29-Oct-02 12:48:00	83.8	31-Oct-02 14:02:00	85.3	31-Oct-02 16:20:00	85.2	31-Oct-02 17:40:00	85.8
29-Oct-02 12:53:00	83.9	31-Oct-02 14:07:00	85.1	31-Oct-02 16:25:00	85.5	31-Oct-02 17:45:00	85.8
29-Oct-02 12:58:00	83.8	31-Oct-02 14:12:00	85.4	31-Oct-02 16:30:00	85.2	31-Oct-02 17:50:00	85.7
29-Oct-02 13:03:00	83.6	31-Oct-02 14:17:00	85.6	31-Oct-02 16:35:00	85.4	31-Oct-02 17:55:00	85.4
29-Oct-02 13:08:00	83.4	31-Oct-02 14:22:00	85.9	31-Oct-02 16:40:00	85.6	31-Oct-02 18:00:00	85.9
29-Oct-02 13:13:00	83.4	31-Oct-02 14:27:00	85.4	31-Oct-02 16:45:00	85.8	31-Oct-02 18:05:00	85.9
29-Oct-02 13:18:00	83.4	31-Oct-02 14:32:00	85.5	31-Oct-02 16:50:00	85.6	31-Oct-02 18:10:00	85.9
		31-Oct-02 14:37:00	85.7				

Attachment