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# 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
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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**<br>County Road 216<br>Palatka, Florida 32177<br>Attention: Joe E. Taylor<br>(386) 329-0027 Phone<br>(386) 328-0014 Facsimile<br>Email: JETAYLOR@GAPAC.com |
| Test Contractor: | **Cubix Corporation, SE Regional Office**<br>3709 SW 42nd Avenue, Suite 2<br>Gainesville, Florida 32608<br>Attention: Roger Osier, Project Foreman<br>(352) 378-0332 Phone<br>(352) 378-0354 Facsimile<br>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**<br>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.

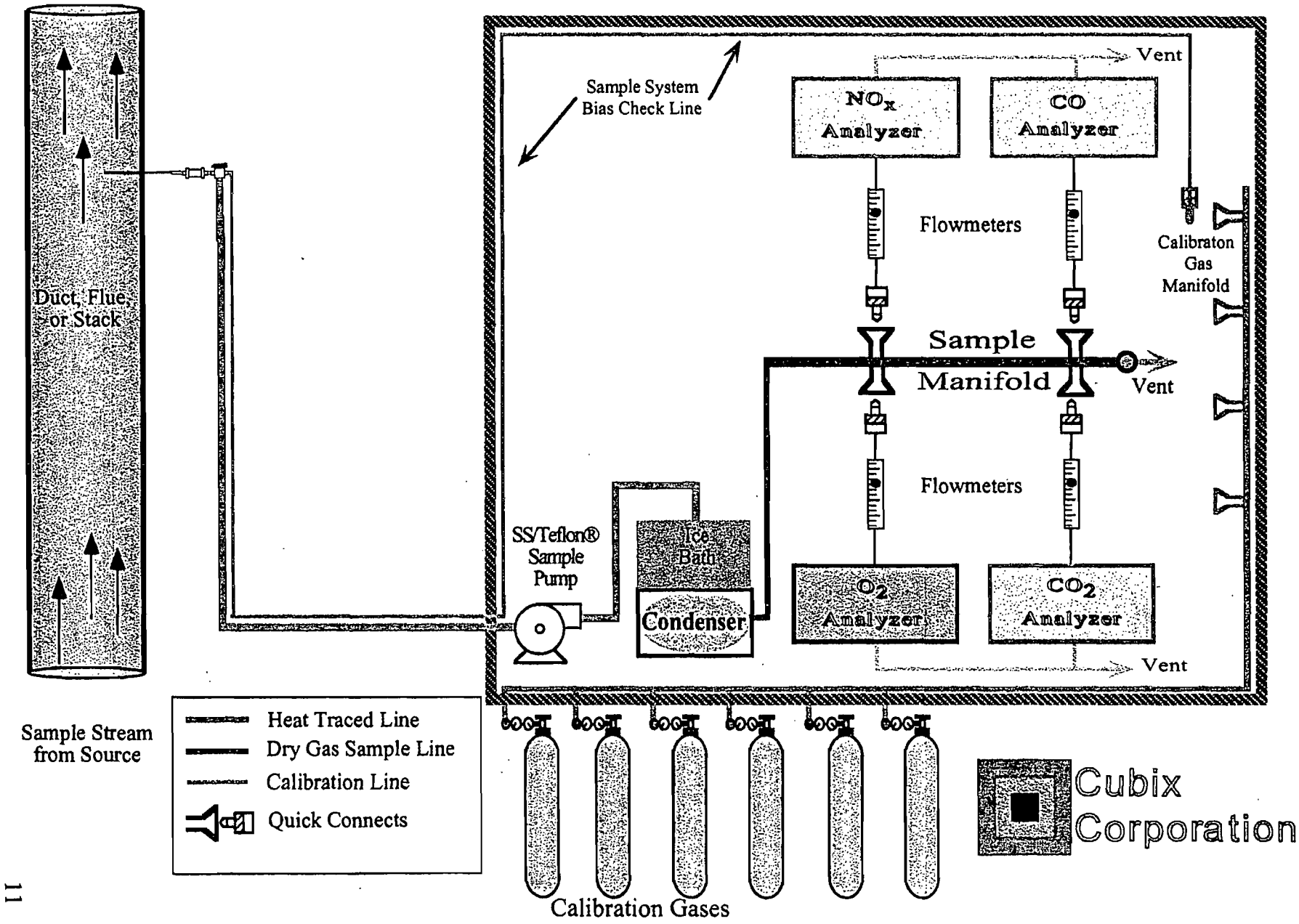
Emission calculations were conducted by a computer spreadsheet as shown in Table 2 of this report. Example calculations were performed manually using a hand-held calculator in order to verify the formulas used in the spreadsheet. Example calculations are in Appendix B of this report.

# TABLE 3
## ANALYTICAL INSTRUMENTATION

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

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

Comments: No permits required in area where we were working.

**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 | from: 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.

**Environmental Hazards**

| | | | |
|---|---|---|---|
| airborne particulate | Present | No Hazard | Comments: Difficult access to stack and sample ports. |
| 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 | |

**Chemical Hazards** (check hazards that are present at jobsite)

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

**Equipment Lifting & Fall Hazard**

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

## PRECAUTIONS TO BE IMPLEMENTED

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

**Protective Equipment**

| | | | |
|---|---|---|---|
| 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 |

**Protective Actions**

**Respiratory Safety Equip**

| | | | |
|---|---|---|---|
| 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 |

**Protective Clothing**

**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

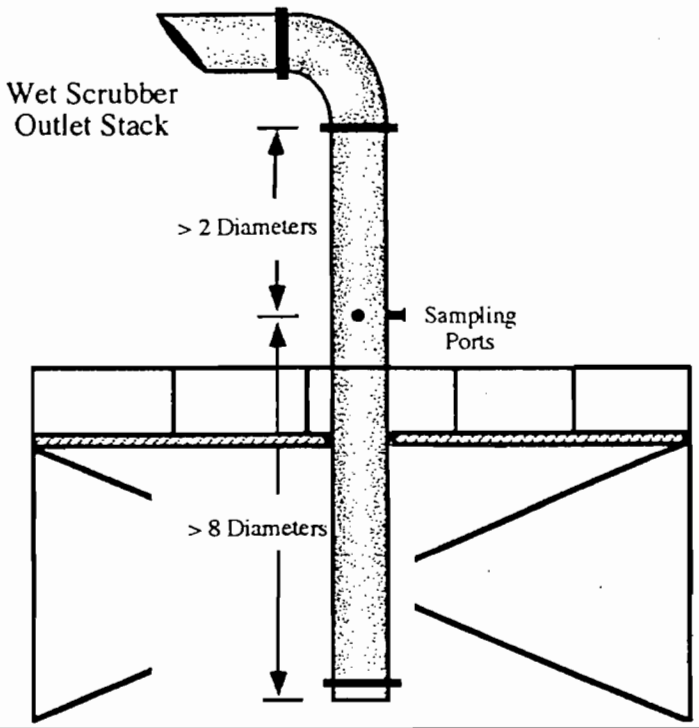
## (EPA Method 1, Velocity Measurement Traverse Points)

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

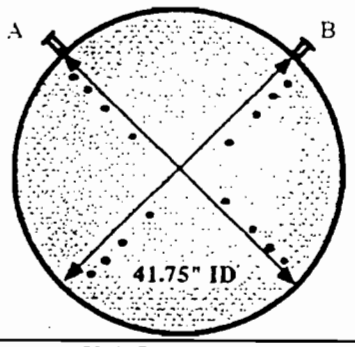
Port + Stack ID (in): 51.25
Port Extension (in): 9.50
Stack ID (in): 41.75
Stack Area (ft²): 9.507
Duct Diameters **upstream** from flow disturbance (A): > 2
Duct Diameters **downstream** from flow disturbance (B): >8
*Total Required Traverse Points*: 16
No. of Traverse Points per Diameter: 8

**Stack Diagram**

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




**Cross Section**

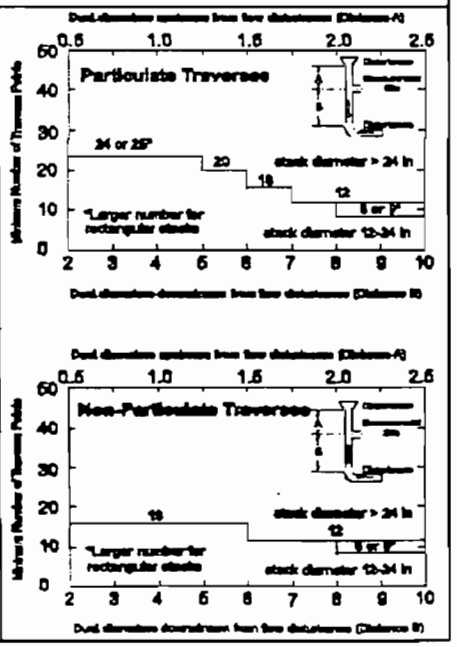



**Unit Information**

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: 10-23-02
Plant: G-P Pulpko 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 "$H_2O$ ($P_g$)
Ave. Stack Temp. 126.8 °F (Ts)

## Collection Data

| | | |
|---|---|---|
| Sample Box | 1 | |
| Leak Check ≤ 0.02 $ft^3$/min | | |
| Pre-Test Leak Check | 0.000 ft³/min<br>24.2 "Hg Vac. | |
| Post-Test Leak Check | 0.000 ft³/min<br>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.) | | |

## 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. |

## Impingment System

| Impinger | Contents | Initial Weight | Final Weight |
|---|---|---|---|
| 1 | Di $H_2O$ | 545.7 | 565.0 |
| 2 | Di $H_2O$ | 557.5 | 559.8 |
| 3 | Empty | 485.9 | 486.5 |
| 4 | Silica | 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 |

# MOISTURE & VELOCITY FIELD DATA SHEET

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

Dry Gas Meter ID: T-10 EQUIMETER
Dry Gas Meter Factor: 0.9869 (Kd)
Pitot Tube No/Type: #2110 7'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 $ft^3$/min | | |
| Pre-Test Leak Check | 0.000 $ft^3$/min<br>22.5 "Hg Vac. | |
| Post-Test Leak Check | 0.000 $ft^3$/min<br>23.0 "Hg Vac. | |
| | Initial | Final |
| Time | 11 33 | 12:14 |
| DGM Reading ($ft^3$ or L) | 703.905 | 726.224 |
| DGM Average Temp (°F) | 84 | 90 |
| Last Impinger Temp. (°F) | 67 | 68 |
| DGM Flow Rate | 40 | 40 |
| $O_2$ (% vol.) | | |
| $CO_2$ (% vol.) | | |

## Velocity System Leak Check

| Leak Check ≤ 0.1 "$H_2O$/min at a pressure ≥ 3.0 "$H_2O$ | | |
|---|---|---|
| Pre-Test Leak Check | ± 0.0<br>3.6 | = 0.0 "$H_2O$/min<br>4.6 "$H_2O$ Pres. |
| Post-Test Leak Check | ± 0.0<br>4.2 | = 0.0 "$H_2O$/min<br>4.1 "$H_2O$ Pres. |

## Impingment System

| Impinger | Contents | Initial Weight | Final Weight |
|---|---|---|---|
| 1 | DI $H_2O$ | 566.0 | 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 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
Plant: GP PLATTE PLANT
Source: Chlorine Plant Scrubber
Technicians: RPO, JTH
Atm. Pressure: 29.91 "Hg (Pb)
Test Run No.: RUN 3

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

## Collection Data

| | | |
|---|---|---|
| Sample Box | 1 | |
| Leak Check ≤ 0.02 $ft^3$/min | | |
| Pre-Test Leak Check | 0.000 $ft^3$/min<br>25.0 "Hg Vac. | |
| Post-Test Leak Check | 0.000 $ft^3$/min<br>25.5 "Hg Vac. | |
| | Initial | Final |
| Time | 13:24 | 14:05 |
| DGM Reading ($ft^3$ 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 $H_2O$ | 584.6 | 605.0 |
| 2 | Di $H_2O$ | 561.7 | 565.6 |
| 3 | MT | 486.8 | 487.7 |
| 4 | SiGel | 653.9 | 658.6 |
| 5 | | | |
| 6 | | | |
| Totals | | 2285 | 2316.9 |

## Velocity System Leak Check

| Leak Check ≤ 0.1 "$H_2O$/min at a pressure ≥ 3.0 "$H_2O$ | + | − | |
|---|---|---|---|
| Pre-Test Leak Check | 0.0 | 0.0 | "$H_2O$/min<br>4.6 "$H_2O$ Pres. |
| Post-Test Leak Check | 0.0 | 0.0 | "$H_2O$/min<br>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 | .18 | 129 | | 2-1 | .19 | 130 | |
| 1-2 | .19 | 129 | | 2-2 | .22 | 130 | |
| 1-3 | .22 | 131 | | 2-3 | .23 | 131 | |
| 1-4 | .22 | 131 | | 2-4 | .25 | 132 | |
| 1-5 | .23 | 131 | | 2-5 | .21 | 131 | |
| 1-6 | .23 | 132 | | 2-6 | .22 | 131 | |
| 1-7 | .25 | 131 | | 2-7 | .21 | 131 | |
| 1-8 | ~~.23~~ .25 | 131 | ↓ | 2-8 | .23 | 131 | ↓ |

# 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

$= K_2 \times M_{WC}$

$= (0.04715 \times 26.9)$

$= 1.2683\ ft^3$

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

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

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

$$= 25.964\ ft^3$$

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

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

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

$B_{ws}$ = **0.04657**

= **4.66 % moisture**

## Stack Gas Molecular Weight

*Refers to Test Run # 1*

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

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

= 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

$\Delta P$ = pressure difference in stack as measured (in. $H_2O$)

$\sqrt{\Delta P_{av}}$ = average of square root of $\Delta P$'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 = $85.49 \frac{ft}{sec}\left(\frac{(lb/lb-mole)(in.Hg)}{(°R)(in.H_2O)}\right)^{\frac{1}{2}}$

$T_{std}$ = 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)

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

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

**$Q_d$ = $7.698 \times 10^5$ 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

$Q_d$ = $7.698 \times 10^5$ 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<br>2/6/02 | 252.8 ppm<br>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<br>7/19/2002 | 441.6 ppm<br>439.9 ppm | 441 ppm | +/- 1% |
| Methane | 7/11/2002 | 445 ppm | 445 ppm | +/- 1% |
| | | | | |
| | | | | |

**BALANCE** Air

PREVIOUS CERTIFICATION DATES: None

REFERENCE STANDARDS

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

INSTRUMENTATION

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

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

ANALYST: _____
FRED PIKULA

DATE: 7/19/2002

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

## CERTIFICATE OF ANALYSIS

## EPA PROTOCOL MIXTURE

PROCEDURE # : G1

| | | | |
|---|---|---|---|
| CUSTOMER: | Cubix Corporation | CYLINDER # : | CC126532 |
| SGI ORDER # : | 0000840 | CYLINDER PRES: | 2000 PSIG |
| ITEM# : | 4 | CGA OUTLET: | 590 |
| P.O.# : | G-1334 | | |

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<br>1/31/2001 | 885.2 ppm<br>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: _____ DATE: 1/31/2001
FRED PIKULA

**SPECTRA GASES INC.**

3434 Route 22 West • Branchburg, NJ 08876 USA Tel.: (908) 252-9300 • (800) 932-0624 • Fax (908) 252-0611
Shipped From: 80 Industrial Drive • Alpha, NJ 08865

## CERTIFICATE OF ANALYSIS

## EPA PROTOCOL MIXTURE

PROCEDURE # : G1

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

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

Begin use 7/24/02

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

CERTIFICATION HISTORY

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

**BALANCE** Nitrogen

**PREVIOUS CERTIFICATION DATES:** None

REFERENCE STANDARDS

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

INSTRUMENTATION

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

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

ANALYST: _____
FRED PIKULA

DATE: 5/24/2002

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

## CERTIFICATE OF ANALYSIS

## EPA PROTOCOL MIXTURE
PROCEDURE # : G1

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

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

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

CERTIFICATION HISTORY

| COMPONENT | DATE OF ASSAY | MEAN CONCENTRATION | CERTIFIED CONCENTRATION | ANALYTICAL ACCURACY |
|---|---|---|---|---|
| Carbon Dioxide | 7/23/2002 | 7.99 % | 7.99 % | +/- 1% |
| Oxygen | 7/23/2002 | 11.94 % | 11.94 % | +/- 1% |
| | | | | |
| | | | | |

**BALANCE** Nitrogen

**PREVIOUS CERTIFICATION DATES:** None

REFERENCE STANDARDS

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

INSTRUMENTATION

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

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

ANALYST: _____
FRED PIKULA

DATE: 7/23/2002

# Scott Specialty Gases

**RATA CLASS**

*Dual-Analyzed Calibration Standard*

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

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

**Assay Laboratory**

SCOTT SPECIALTY GASES
9810 BAY AREA BLVD
PASADENA,TX 77507

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

**Customer**

CUBIX CORPORATION

4536 NW 20TH DRIVE
GAINESVILLE FL 32605

ORDER ON-LINE • WWW.SCOTTGAS.COM

### 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/M200/171109 | 03/21/00 | GAS CHROMATOGRAPHY |

### ANALYZER READINGS

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

First Triad Analysis | Second Triad Analysis | Calibration Curve

**CARBON DIOXIDE**

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

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

**OXYGEN**

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

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

APPROVED BY:

John Hunnicutt

Air Products and Chemicals, Inc.
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 |

E Edward Henderson
Authorized Signature

# Dry Gas Meter Calibration

**WORKING METER**

| | |
|---|---|
| Date: | 4/12/02 |
| Prev. Calib. Date: | rebuilt |
| Location: | Cubix Austin Lab |
| Technician: | Bradley Rayhons |
| Meter Serial No: | 2962152 |
| Cubix DGM ID | T-10 |
| Prev. Calib Factor (Y): | 1.0000 |

**REFERENCE METER**

| | |
|---|---|
| Calibration Date: | 4/11/02 |
| Location: | Cubix Austin Lab |
| Technician: | Steve Oleyar |
| Meter Serial No: | 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 |

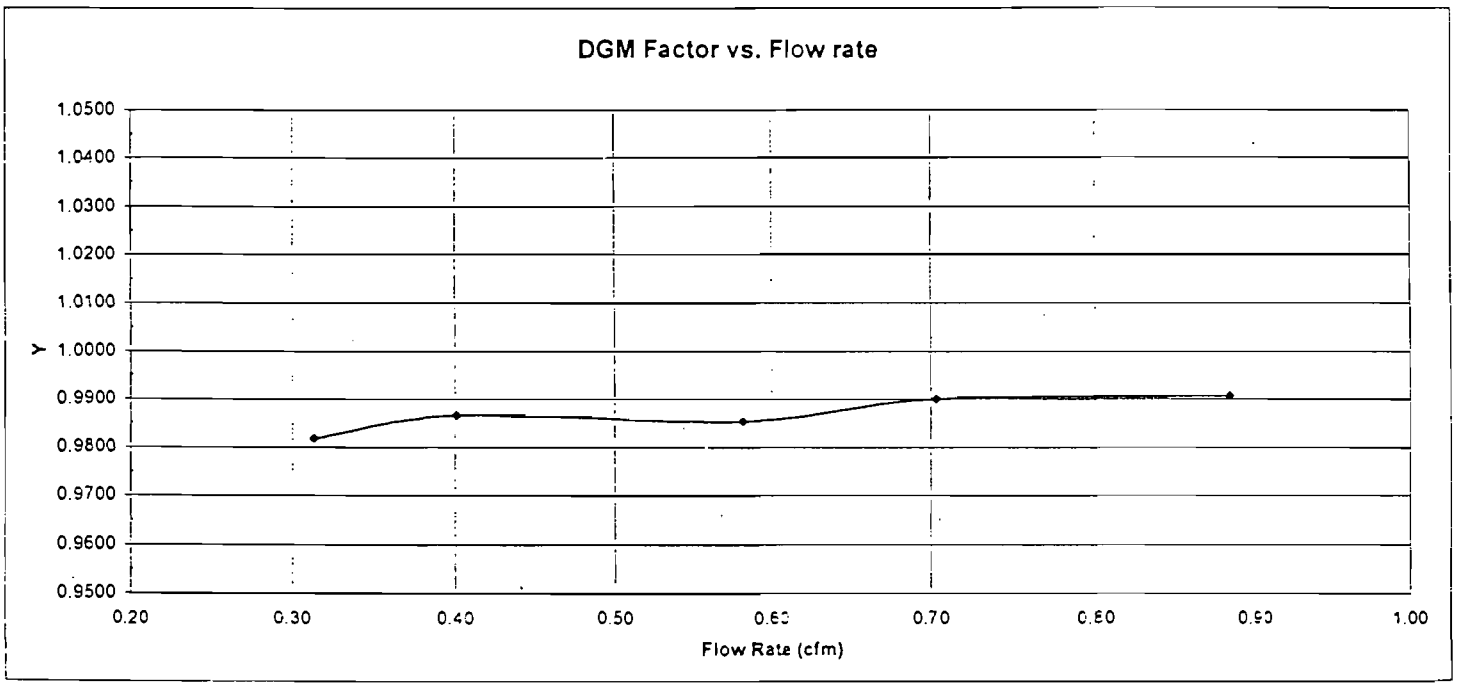
**Dry Gas Meter (DGM Factor) Calibration Test Results**

* 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)

7 ft

## Alignment Inspection

Transverse tube axis pitot-tip angle:

$\alpha_1$ = 4 ° $\alpha_2$ = 3 °

Each $\alpha$ must be less than 10° from perpendicular to the transverse tube axis

Longitudinal tube axis pitot-tip angle:

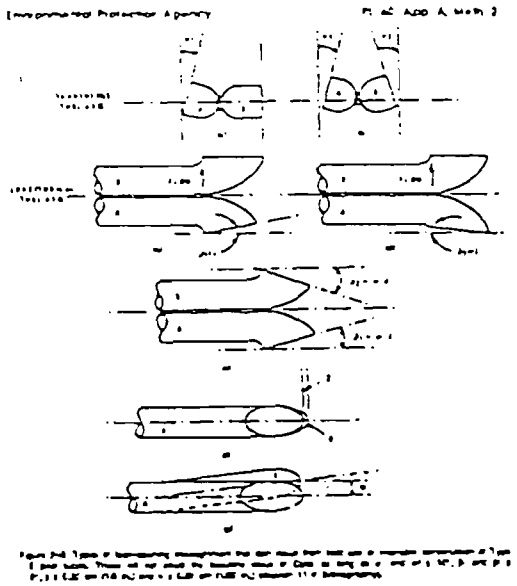
$\beta_1$ = 2 ° $\beta_1$ = 3 °

Each $\beta$ must be less than 5° from parrallel to the longitudinal tube axis

Pitot-tip end length alignment:

z = 0 (in or cm)

Z must be ≤ 0.32 cm (1/8 in)



Pitot-tip centriod alignment with respect to transverse axis:

w = 0 (in or cm)

W must be ≤ 0.08 cm (1/32 in)

## Pitot Tip Dimension Check

External tubing diameter:

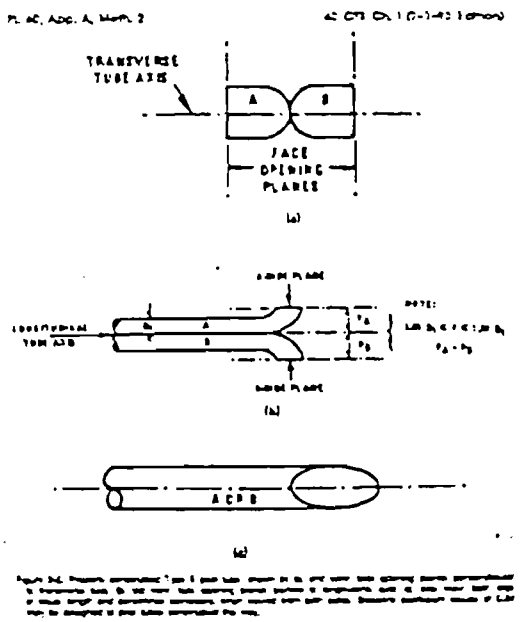
$D_t$ = .375 (in or cm)

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

Base to opening plane distance:

$P_A = P_B$ = .475 (in or cm)

$P_A$ and $P_B$ must be between 1.05 $D_t$ and 1.50 $D_t$




## Pitot Tube Coefficient

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

# 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 | |
| +25,000 | |
| +30,000 | |
| +35,000 | |
| +40,000 | |
| +45,000 | |
| +50,000 | |

START PRESSURE 30.06

FINAL PRESSURE 30.06

BAROMETRIC SCALE ERROR TEST

| | | | |
|---|---|---|---|
| 28.10 | 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 | |
| 3000 | 30 | 30.000 | |
| 5000 | 30 | 35.000 | |
| 10.000 | 40 | 40.000 | |
| 15.000 | 45 | 50,000 | |

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 15924

INSPECTOR [signature]

# TRAILER 10
## ALTIMETER/BAROMETER CALIBRATION SHEET

BFG/C 9001

**BFGoodrich**
Aerospace

Component Overhaul & Repair

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

FAA Repair Station No. UZ2R232L

CASTLEBERRY AERCOR

# Serviceable Part Tag

COMPONENT Altimeter
PART NO. 5934P-1A.83
SERIAL NO. J5924
MFG United Fastc. WORK ORDER # V7076

☒ Overhaul ☐ Repair ☐ Bench Check & Test ☐ Other _____

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

AUTHORIZED SIGNATURE

JAN 16 1995
DATE

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

BFG C91C2

**Best Available Copy**

# 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 |
|---|---|---|---|---|
| Measured in: °F | 32.00 | 32.0 | 0.0000 | ☐ |
| | 110.00 | 110.0 | 0.0000 | ☐ |
| Measured in: °F | 32.00 | 32.0 | 0.0000 | ☐ |
| | 110.00 | 110.0 | 0.0000 | ☐ |
| Measured in: | | | | ☐ |
| | | | | ☐ |
| Measured in: | | | | ☐ |
| | | | | ☐ |
| Measured in: | | | | ☐ |
| | | | | ☐ |

### Equipment "As Left"

| Test Points | Reading | Deviation |
|---|---|---|
| 32.00 | 32.0 | 0.0000 |
| 110.00 | 110.0 | 0.0000 |
| 32.00 | 32.0 | 0.0000 |
| 110.00 | 110.0 | 0.0000 |

****** 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-17005-00 with 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. | |
| | | |

Richard G Patterson
**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** |