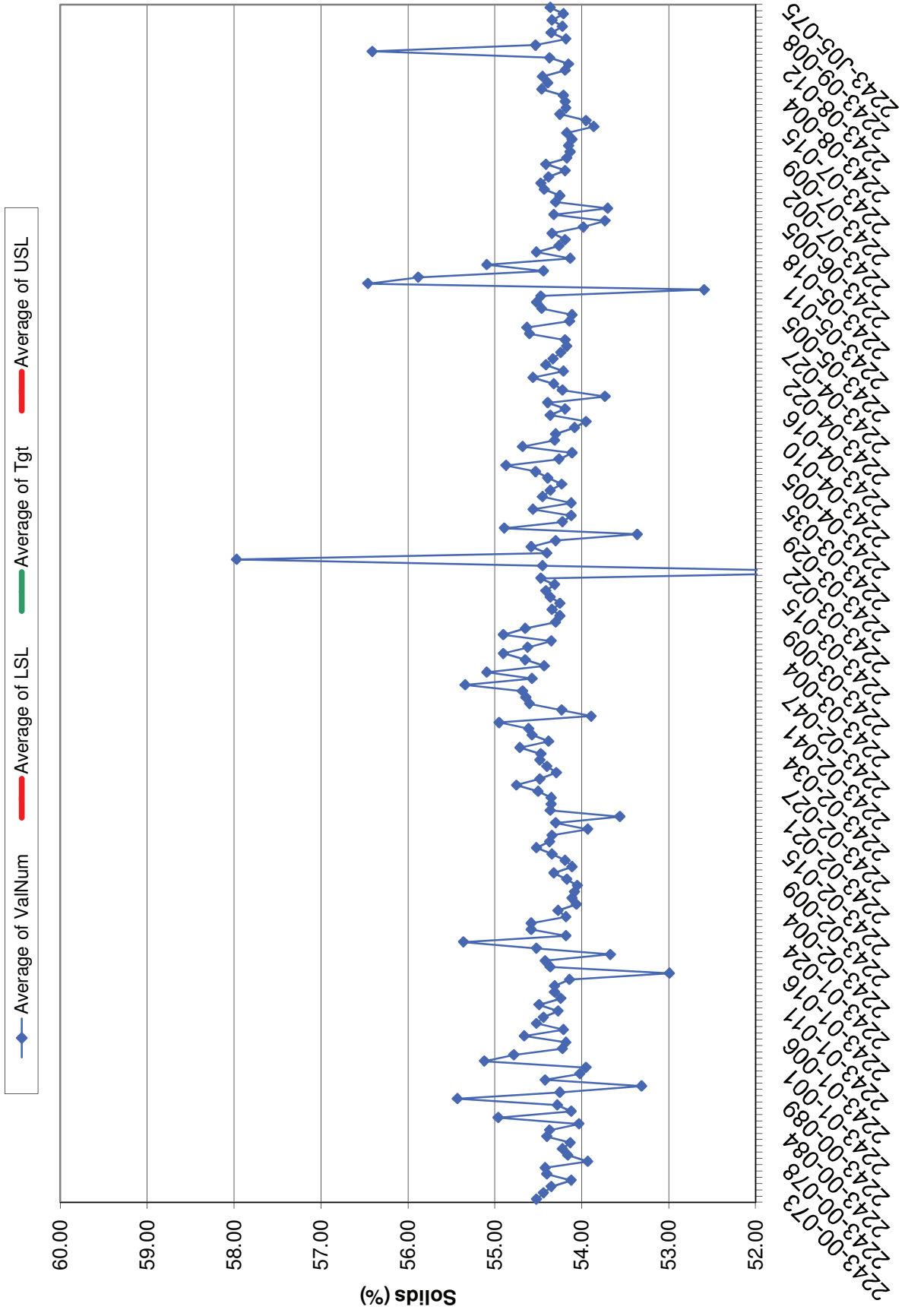


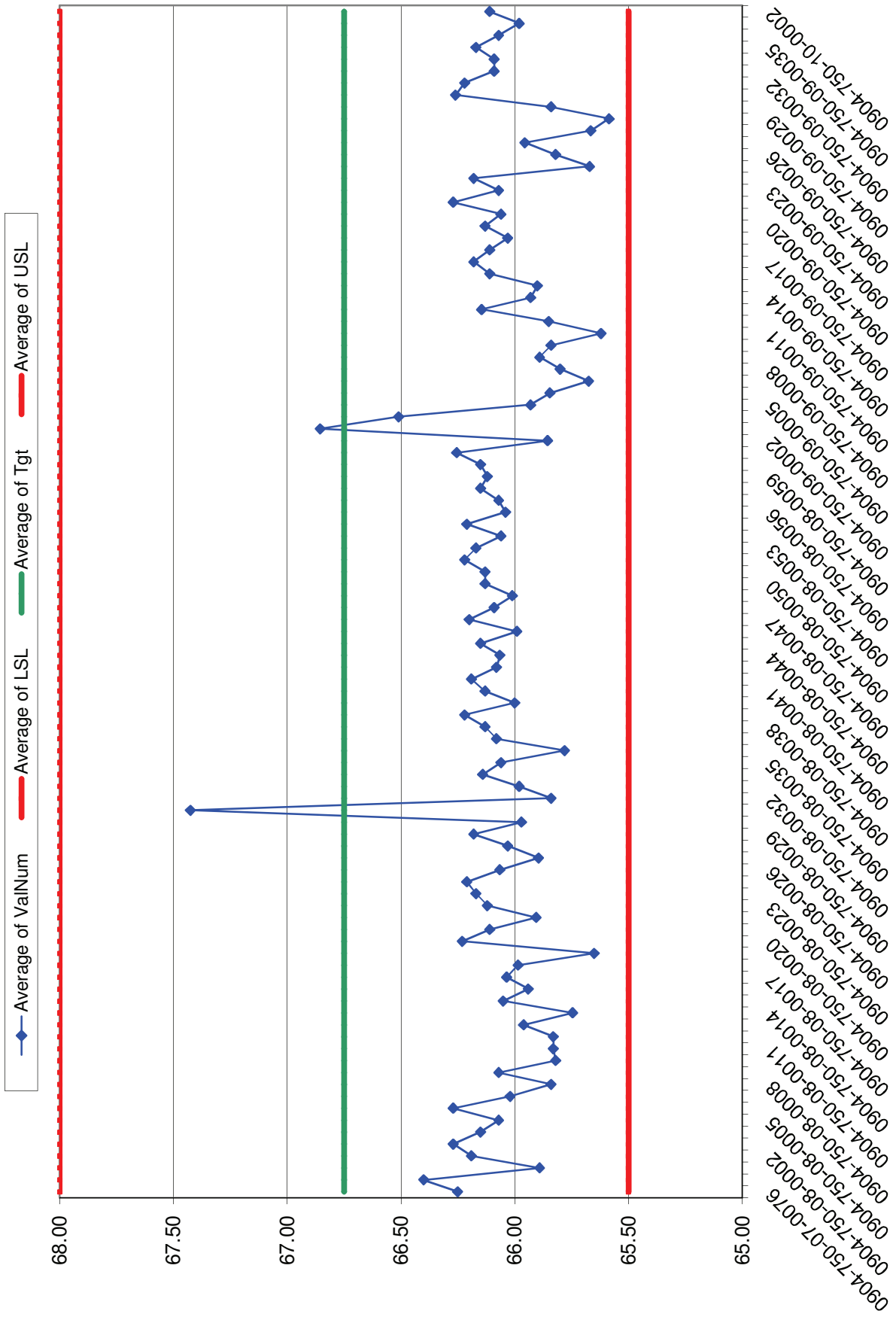
APPENDIX H

Supporting Documentation

Electrode Ink Target Variance



Slip Target Variance



Source Testing



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STATIONARY SOURCE SAMPLING REPORT

FOR

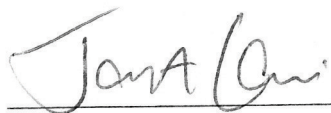
AVX CORPORATION

MYRTLE BEACH, SOUTH CAROLINA

***Adsorber Inlet
Adsorber Exhaust
Thermal Oxidizer Exhaust
VOC Sampling***

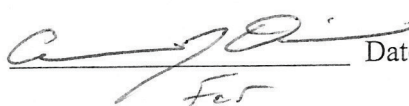
Integrity Project No. 09-005 Performed: February 26, 2009

Certified By:



Date

04/07/09



Date

4/7/09

James A. Lewis, QSTI
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1.0 INTRODUCTION

This test program was performed at the AVX Corporation facility in Myrtle Beach, South Carolina on the volatile organic compound (VOC) control system for the Passive Electronic Part Build Up Machines. This section of the report describes the test purpose and provides a brief outline of the test activities and the personnel involved in the test program.

1.1 Purpose

The AVX Corporation facility is covered by Title V Air Quality Permit No. TV-1340-0002; however, the testing was performed at the request of SC DHEC.

1.2 Outline of Test Program

Integrity Air Monitoring, Inc. (Integrity) performed stationary source sampling simultaneously at the Adsorber Common Inlet, the Adsorber Exhaust and the Thermal Oxidizer Exhaust on February 26, 2009. The sampling included three 1-hour sampling runs for VOC emissions using EPA Reference Method 25A at each location. In addition to the sampling performed for VOCs, Integrity also performed US EPA Reference Methods 1 through 4 to determine the location of the sampling points, the volumetric flow rate, the molecular weight of the stack gas and the moisture content, respectively.

Due to current economic conditions, AVX is not operating the build up process at maximum capacity. In order to simulate maximum VOC loading to the adsorber during emissions testing, simultaneous spiking was performed at three build up machines. AVX identified 2-butoxyethanol 70%, PGME 30 % (BCPM) as the majority VOC used in the build up process. A known quantity of BCPM was atomized and injected into each machine during each sampling run. O'Brien & Gere personnel assisted AVX with the spiking procedure.

Representatives of the South Carolina Department of Health and Environmental Control (SC DHEC) requested that AVX quantify the "as measured" loading rate of BCPM to the adsorber to verify the measured injection rate recorded during sampling. AVX provided Integrity with a sample of the BCPM used for spiking. Integrity utilized an organics laboratory to develop gaseous VOC standards from the BCPM that were subsequently analyzed by the same VOC analyzer used for sampling at the adsorber inlet. The analyzer responses were used to develop a response factor for BCPM relative to carbon. The response factor was then applied to the adsorber inlet sampling results to determine the "as measured" BCPM loading rates to the adsorber inlet.

2.0 RESULTS

This section presents the mean sampling results. Detailed sampling results for each sampling run and example calculations are presented in Appendix 1. Field data sheets and system bias and drift checks are presented in Appendix 2. Data acquisition system uncorrected values and values corrected for system bias are presented in Appendix 3.

2.1 Summary of Results

The following tables present the mean results from the sampling performed at the VOC control system serving the Build up Machines on February 26, 2009.

Source	Concentration, ppm as carbon dry	Loading/Emission Rate, lbs/hr as carbon	Control Efficiency, %
Adsorber Inlet	873.4	10.17	NA
Adsorber Exhaust	3.6	0.05	99.51†
Oxidizer Exhaust	1.7	0.0008	99.99‡
VOC Control System	NA	NA	99.50

† Adsorber control efficiency, % = $((\text{adsorber inlet lb/hr} - \text{adsorber exhaust lb/hr}) / \text{adsorber inlet lb/hr}) \times 100$

‡ Oxidizer control efficiency, % = $((\text{adsorber inlet lb/hr} - \text{adsorber exhaust lb/hr}) - \text{oxidizer exhaust, lb/hr}) / (\text{adsorber inlet lb/hr} - \text{adsorber exhaust lb/hr}) \times 100$

Run	Loading Rate As Carbon, Adjusted for Response Factor†	Spiking Rate, Gravimetric Determination
1	22.57	21.21
2	25.91	22.20
3	25.31	22.20
Average	24.59	21.87

† Calculations are provided in Appendix 1.

2.2 Discussion

The results of the sampling indicate that the VOC control system had an overall VOC control efficiency of 99.50%. Furthermore, the results of the adsorber inlet VOC sampling adjusted for the response factor confirm that the measured spiking rates were accurate and that AVX properly challenged the VOC control system under maximum process operation.

3.0 PROCESS DESCRIPTION

This section contains a brief description of the process and related control equipment.

The AVX Corporation facility located in Myrtle Beach, South Carolina produces electronic capacitors. There are two 'cells' each comprised of eight passive electronic parts build up machines which operate independently. Solvent VOC emissions from the ceramic slip material for the build up processes are captured at each machine and manifolded to a single common duct at each cell. The raw solvent constituents (2-butoxyethanol 70%, PGME 30%) are known as BC/PM or AVX Blend. BC/PM was injected directly into the fume hoods of three machines using six high pressure paint guns designed to atomize the solvent. A single paint pot was used to provide the solvent to all of the paint guns. The solvent pot weight was recorded at regular intervals during the testing as well as the beginning and end of each test run. This information was used to calculate the pounds per hour of solvent used on a mass-basis.

3.1 Air Pollution Control Equipment

Emissions from the cells were vented to an emissions control system consisting of a carbon concentrator manufactured by FluiSorb and a common attendant thermal oxidizer

3.2 Demonstration of Operating Rate

Process and control device operating parameters corresponding with the sampling were recorded once every 15 minutes by AVX Corporation personnel. The parameters recorded included adsorption unit ΔP , desorption temperature and thermal oxidizer combustion chamber temperature. This documentation is included in Appendix 5.

When the wet bulb temperature has stabilized, record both the wet bulb and dry bulb thermometer temperatures.

The flue gas moisture content (PMV) was then calculated using saturated vapor and moisture equations.

The moisture content at the thermal oxidizer exhaust ($>140^{\circ}\text{F}$) was performed using the following sampling system and procedures:

- A heated ($248^{\circ}\text{F} \pm 25^{\circ}\text{F}$) probe;
- A moisture condensing train consisting of four sequential impingers. Impingers one and two contained 100 ml each of deionized water followed by an empty impinger and a final impinger containing 200 grams of silica gel; and
- A Method 5 type metering system capable of maintaining a constant sampling rate.

At the end of the test run, the liquid in the first three impingers was measured to the nearest milliliter. The moisture collected by the silica gel was determined to the nearest 0.1 gram. These measurements were recorded on the Method 4 data form. The moisture content of the emission source was calculated according to the equations in Method 4, Section 12.

4.2.5 VOC Analyzer Procedures

Total gaseous organic(s) or total hydrocarbon(s) concentrations and emission rates were determined according to EPA Method 25A. Method 25A applies to the measurement of total gaseous organic concentration of vapors consisting primarily of alkanes, alkenes, and/or arenes (aromatic hydrocarbons). The concentration is expressed in terms of propane (or other appropriate calibration gas) or in terms of carbon.

Sampling for total gaseous organic(s) was performed using a VIG Industries Model 210 (dual channel) analyzer and one VIG Industries Model 20 analyzer. The principal components of each sampling systems were sequentially:

- A heated stainless steel sample probe;
- A heated system calibration assembly and filter;
- A heated sample line;
- An FIA analyzer;
- Calibration gases; and
- A data acquisition system that continuously logs 1-minute concentrations.

Prior to the test series, the heated sample lines were heated to 360°F and the hydrocarbon analyzers were heated above 200°C to prevent condensation. After temperatures were stabilized the hydrocarbon analyzers were ignited using a 40% hydrogen balance helium fuel and hydrocarbon free air. Calibration procedures commenced with the introduction of zero and high-level calibration gas into the sampling system. The necessary adjustments were made and the responses for low-level and mid-level gases were recorded. The predicted values for the calibration gases and the actual responses were recorded on the field data sheet and by the data acquisition system. High-level and zero gas concentrations were introduced into the measurement system and the response time was recorded on the field data sheet. Sampling was initiated immediately following instrument calibration. At the conclusion of the first hour, the zero and mid-level calibration gases were reintroduced and their respective responses recorded on the field data sheet. Integrity utilized a STEC 710-C gas divider according to Method 205 to create multi-level calibration gases from a single upscale standard. A certificate of calibration for the gas divider is provided in Appendix 5.

The zero and calibration drift checks were performed immediately following completion of the test run and at the conclusion of the test program. The data collected during the test program was archived on a data acquisition system and is attached to this test report as Appendix 3. The DAS used by Integrity Air Monitoring, Inc. for this project was an IBM computer with hard disk storage and a Superlogics data shuttle recorder.

4.2.6 Response Factor Development Procedures

The response factor was established using a product designated as *Blend AVX 70/30 (Blend)* manufactured by Brenntag Southeast, Inc. Three separate concentrations of the *Blend* were generated volumetrically using the following procedures:

- Three 12 liter glass canisters were evacuated using a vacuum pump;
- These canisters were heated and maintained at a constant temperature of ~150°F and allowed to thermally stabilize;
- Each canister was then injected with a known amount of the *Blend*, the product was allowed to vaporize and then the canister was pressurized to ~1400 mm mercury gauge pressure with zero air;
- A constant gas stream from the pressurized canisters was delivered to via a heated umbilical line to the VIG Model 20 Flame Ionization Analyzer where the response to the standard was measured as parts per million by volume (ppmv) propane.

The ppmv concentration of the *Blend* was calculated using the molecular weight and purity furnished by the vendor, canister temperature, pressure and the amount of the product injected into each canister. The three

concentrations of the product generated for this project were: low = 135 ppmv, medium = 269 ppmv and high = 402 ppmv. The calculation used to determine the concentrations was as follows:

$$\text{Concentration (ppmv)} = \frac{(\text{Mass of Blend AVX 70/30}) (24.056)}{(\text{Molecular Weight of Blend AVX 70/30}) (\text{Volume of gas in pressurized glass canister})}$$

The response factor Method 25A FIA instrumentation operational parameters, reference standard calculations and laboratory report and supporting documentation can be found in Appendix 1.

4.2.7 Sampling Ports and Points

The dimensions of the sampling locations and the location of the sampling ports and points are detailed in Figures 1, 2 and 3. The drawings provided are not to scale. For the VOC sampling at the Adsorber Exhaust, a stratification check was performed prior to sampling and the source was unstratified. All other VOC sampling was performed at single point near the center of each stack.

APPENDIX 1

SUMMARY OF RESULTS AND EXAMPLE CALCULATIONS

SUMMARY OF RESULTS
 EPA METHOD 25A
 Determination of Total Gaseous Organics
 AVX Corporation
 Myrtle Beach, SC
 Adsorber Inlet



Run Number		1	2	3	Avg
Date:		02/26/09	02/26/09	02/26/09	---
θ	Net Time of Test, minutes	60	60	60	---
T _s	Test Start Time	1350	1505	1615	---
T _e	Test End Time	1449	1604	1714	---
P _{bar}	Barometric Pressure, in. Hg	29.74	29.71	29.71	29.72
P _g	Static Pressure, in. Hg	-0.140	-0.140	-0.140	-0.140
P _s	Stack Pressure, Absolute, in. Hg	29.600	29.570	29.570	29.580
WB	Wet Bulb Temp., Deg. F †	66.1	66.3	66.5	66.3
DB	Dry Bulb Temp., Deg. F †	84.6	84.6	84.9	84.7
S _{vP}	Vapor Pressure of Water at Saturation, in. Hg	0.647	0.651	0.656	0.651
B _{WS}	Moisture Content of Gas Stream	0.015	0.015	0.015	0.015
P _{MV}	Percent Moisture in Stack	1.49	1.52	1.53	1.51
M _{FD}	Mole Fraction of Dry Gas	0.985	0.985	0.985	0.985
%O ₂	Percent Oxygen, Dry	21.0	21.0	21.0	21.0
%CO ₂	Percent Carbon Dioxide, Dry	0.0	0.0	0.0	0.0
%CO	Percent Carbon Monoxide, Dry	0.0	0.0	0.0	0.0
M _d	Mole. Wt. Stack Gas, Dry Basis, lb/lb mole	28.840	28.840	28.840	28.840
M _s	Mole. Wt. Stack Gas, Wet Basis, lb/lb mole	28.678	28.676	28.674	28.676
C _p	Pitot Tube Constant	0.84	0.84	0.84	0.84
Δ PS	Avg. Sqrt. Delta P, in. H ₂ O	0.598	0.615	0.607	0.607
T _s	Avg. Stack Temp., Deg. F	82.8	82.7	82.63	82.7
V _s	Avg. Stack Velocity, ft/sec	34.3	35.3	34.9	34.9
A	Area Stack, ft ²	3.14	3.14	3.14	3.14

SUMMARY OF RESULTS
 EPA METHOD 25A
 Determination of Total Gaseous Organics
 AVX Corporation
 Myrtle Beach, SC
 Adsorber Inlet



Run Number		1	2	3	Avg
Date:		02/26/09	02/26/09	02/26/09	---
Q_{SD}	Gas Volume Flow, Dry Std. Cond. CFM	6,136	6,307	6,228	6,224
Q_A	Actual Gas Volume Flow, CFM	6,473	6,661	6,577	6,570
Q_{SW}	Gas Volume Flow, Wet Std. Cond., CFM	6,229	6,404	6,325	6,320
Total Gaseous Organics As Carbon					
M_{WC}	Mole Weight of Carbon, g/mole	12.01	12.01	12.01	12.01
C_{meas}	Organic Concentration, ppm as propane (wet)	267.1	298.2	295.0	286.7
C_c	Organic Concentration, ppm as carbon (wet)	801.2	894.5	884.9	860.2
C_d	Organic Concentration, ppm as carbon (dry)	813.3	908.2	898.6	873.4
C_{ON}	Organic Concentration, mg/dscm as carbon	406.1	453.5	448.7	436.1
C_{AN}	Organic Concentration, gr/dscf as carbon	0.18	0.20	0.20	0.19
C_{AW}	Organic Loading Rate, lbs/hr as carbon	9.34	10.72	10.47	10.17
Total Gaseous Organics as BCPM					
M_{WC}	Mole Weight of BCPM, g/mole	109.76	109.76	109.76	109.76
Rf	BCPM Response Factor	1.26	1.26	1.26	1.26
C_d	Organic Concentration, ppm as propane (dry)	271.1	302.7	299.5	291.1
$C_{c \text{ as BCPM}}$	Organic Concentration, ppm as BCPM	215.2	240.3	237.7	231.1
C_{ON}	Organic Concentration, mg/dscm as BCPM	981.8	1096.4	1084.7	1054.3
C_{AN}	Organic Concentration, gr/dscf as BCPM	0.43	0.48	0.47	0.46
C_{AW}	Organic Loading Rate, lbs/hr as BCPM	22.57	25.91	25.31	24.59

SUMMARY OF RESULTS
 EPA METHOD 25A
 Determination of Total Gaseous Organics
 AVX Corporation
 Myrtle Beach, SC
 Adsorber Exhaust



Run Number		1	2	3	Avg
Date:		02/26/09	02/26/09	02/26/09	---
θ	Net Time of Test, minutes	60	60	60	---
T _s	Test Start Time	1350	1505	1615	---
T _e	Test End Time	1449	1604	1714	---
P _{bar}	Barometric Pressure, in. Hg	29.74	29.71	29.71	29.72
P _g	Static Pressure, in. Hg	0.001	0.001	0.001	0.001
P _s	Stack Pressure, Absolute, in. Hg	29.741	29.711	29.711	29.721
WB	Wet Bulb Temp., Deg. F †	67.0	69.0	66.0	67.3
DB	Dry Bulb Temp., Deg. F †	90.0	91.0	91.0	90.7
S _{VP}	Vapor Pressure of Water at Saturation, in. Hg	0.667	0.715	0.645	0.676
B _{WS}	Moisture Content of Gas Stream	0.014	0.016	0.012	0.014
P _{MV}	Percent Moisture in Stack	1.38	1.58	1.23	1.40
M _{FD}	Mole Fraction of Dry Gas	0.986	0.984	0.988	0.986
%O ₂	Percent Oxygen, Dry	21.0	21.0	21.0	21.0
%CO ₂	Percent Carbon Dioxide, Dry	0.0	0.0	0.0	0.0
%CO	Percent Carbon Monoxide, Dry	0.0	0.0	0.0	0.0
M _d	Mole. Wt. Stack Gas, Dry Basis, lb/lb mole	28.840	28.840	28.840	28.840
M _s	Mole. Wt. Stack Gas, Wet Basis, lb/lb mole	28.690	28.669	28.706	28.688
C _p	Pitot Tube Constant	0.84	0.84	0.84	0.84
ΔPS	Avg. Sqrt. Delta P, in. H2O	0.321	0.335	0.323	0.327
T _s	Avg. Stack Temp., Deg. F	86.0	86.8	86.1	86.3
V _s	Avg. Stack Velocity, ft/sec	18.4	19.3	18.6	18.8
A	Area Stack, ft ²	6.25	6.25	6.25	6.25

SUMMARY OF RESULTS
 EPA METHOD 25A
 Determination of Total Gaseous Organics
 AVX Corporation
 Myrtle Beach, SC
 Adsorber Exhaust



Run Number		1	2	3	Avg
Date:		02/26/09	02/26/09	02/26/09	---
Q_{SD}	Gas Volume Flow, Dry Std. Cond. CFM	6,556	6,827	6,608	6,664
Q_A	Actual Gas Volume Flow, CFM	6,916	7,234	6,969	7,039
Q_{SW}	Gas Volume Flow, Wet Std. Cond., CFM	6,648	6,937	6,691	6,758
Total Gaseous Organics As Carbon					
M_{WC}	Mole Weight of Carbon, g/mole	12.01	12.01	12.01	12.01
C_{meas}	Organic Concentration, ppm as propane (wet)	1.1	1.2	1.3	1.2
C_c	Organic Concentration, ppm as carbon (wet)	3.2	3.5	4.0	3.6
C_d	Organic Concentration, ppm as carbon (dry)	3.2	3.6	4.1	3.6
C_{ON}	Organic Concentration, mg/dscm as carbon	1.6	1.8	2.0	1.8
C_{AN}	Organic Concentration, gr/dscf as carbon	0.0007	0.0008	0.0009	0.0008
C_{AW}	Organic Emission Rate, lbs/hr as carbon	0.039	0.046	0.050	0.045

SUMMARY OF RESULTS
 EPA METHOD 25A
 Determination of Total Gaseous Organics
 AVX Corporation
 Myrtle Beach, SC
 Thermal Oxidizer Exhaust



Run Number		1	2	3	Avg
Date:		02/26/09	02/26/09	02/26/09	---
Tstart	Test Start Time	1350	1505	1615	---
Tend	Test End Time	1449	1604	1714	---
θ	Net Time of Test, minutes	60	60	60	---
P_{bar}	Barometric Pressure, in. Hg	29.74	29.71	29.71	29.72
P_{g}	Static Pressure, in. Hg	-0.001	-0.001	-0.001	-0.001
P_{s}	Stack Pressure, Absolute, in. Hg	29.739	29.709	29.709	29.719
V_{M}	Actual Meter Volume Sampled, cu. ft.	21.686	22.593	22.625	22.301
ΔH	Avg. Delta H, in. H ₂ O	1.70	1.70	1.70	1.70
T_{M}	Avg. Gas Meter Temp., Deg. F	81.5	84.2	85.2	83.6
γ	Dry Gas Meter Correction Factor	0.975	0.975	0.975	0.975
V_{STD}	Volume Sampled at Stand. Cond., cu. ft.	20.579	21.312	21.304	21.065
V_{C}	Volume of Water Collected, ml	41.9	37.0	35.5	38.1
V_{WC}	Volume of Water Vapor at Std. Cond., SCF	1.97	1.74	1.67	1.80
B_{WS}	Moisture Content of Gas Stream	0.087	0.076	0.073	0.079
P_{MV}	Percent Moisture in Stack	8.7	7.6	7.3	7.9
M_{FD}	Mole Fraction of Dry Gas	0.913	0.924	0.927	0.921
%O ₂	Percent Oxygen, Dry	20.9	20.9	20.9	20.9
%CO ₂	Percent Carbon Dioxide, Dry	0.0	0.0	0.0	0.0
M_{d}	Mole. Wt. Stack Gas, Dry Basis, lb/lb mole	28.836	28.836	28.836	28.836
M_{s}	Mole. Wt. Stack Gas, Wet Basis, lb/lb mole	27.888	28.017	28.048	27.984
C_{p}	Pitot Tube Constant	0.84	0.84	0.84	0.84
ΔPS	Avg. Sqrt. Delta P, in. H ₂ O	0.134	0.136	0.137	0.136

SUMMARY OF RESULTS
 EPA METHOD 25A
 Determination of Total Gaseous Organics
 AVX Corporation
 Myrtle Beach, SC
 Thermal Oxidizer Exhaust



T _S	Avg. Stack Temp., Deg. F	1019.7	1027.6	1025.7	1024.3
V _S	Avg. Stack Velocity, ft/sec	12.9	13.1	13.1	13.0
A	Area Stack, ft ²	0.994	0.994	0.994	0.994
Q _{SD}	Gas Volume Flow, Dry Std. Cond. CFM	248	254	256	253
Q _A	Actual Gas Volume Flow, CFM	767	780	783	777
Q _{SW}	Gas Volume Flow, Wet Std. Cond., CFM	272	275	276	274
Total Gaseous Organics As Carbon					
M _{WC}	Mole Weight of Carbon, g/mole	12.01	12.01	12.01	12.01
C _{meas}	Organic Concentration, ppm as propane (wet)	0.6	0.6	0.2	0.5
C _c	Organic Concentration, ppm as carbon (wet)	1.9	1.9	0.7	1.5
C _d	Organic Concentration, ppm as carbon (dry)	2.1	2.1	0.8	1.7
C _{ON}	Organic Concentration, mg/dscm as carbon	1.1	1.0	0.4	0.8
C _{AN}	Organic Concentration, gr/dscf as carbon	0.0005	0.0005	0.0002	0.0004
C _{AW}	Organic Emission Rate, lbs/hr	0.0010	0.0010	0.0004	0.0008

APPENDIX 3

DATA ACQUISITION SYSTEM VALUES

AVX Corporation
 Myrtle Beach, SC
 Adsorber & Thermal Oxidizer
 VOC Raw Data
 02/26/09



Time	Adsorber Inlet ppm C3	Adsorber Outlet ppm C3	Thermal Oxidizer ppm C3	Time	Adsorber Inlet ppm C3	Adsorber Outlet ppm C3	Thermal Oxidizer ppm C3	Time	Adsorber Inlet ppm C3	Adsorber Outlet ppm C3
1350	264.70	1.06	0.46	1505	288.9	1.1	0.7	1615	300.2	1.24
1351	261.6	1.07	0.65	1506	287.7	1.1	0.7	1616	299.1	1.21
1352	262.5	1.06	0.6	1507	288.1	1.1	0.7	1617	298.9	1.28
1353	261.5	1.06	0.58	1508	287.7	1.1	0.8	1618	300	1.22
1354	259.5	1.05	0.56	1509	288.7	1.2	0.7	1619	299.5	1.26
1355	254.9	0.97	0.67	1510	292.2	1.2	0.9	1620	301.6	1.25
1356	254.9	0.97	0.54	1511	286.6	1.2	0.7	1621	301.1	1.29
1357	253.3	1.02	0.5	1512	286.6	1.2	0.9	1622	301.5	1.28
1358	255.3	1.0	0.5	1513	286.9	1.1	0.7	1623	299.5	1.26
1359	253.2	1.0	0.6	1514	284.2	1.1	0.8	1624	299.7	1.3
1400	252.5	1.0	0.6	1515	285.3	1.1	0.6	1625	301.6	1.27
1401	251.2	1.0	0.5	1516	286.5	1.1	0.8	1626	298.2	1.34
1402	251.8	1.0	0.5	1517	283.7	1.1	0.6	1627	300.1	1.31
1403	249.6	1.0	0.6	1518	283.4	1.1	0.9	1628	299.8	1.3
1404	249.2	1.0	0.6	1519	284.2	1.1	0.5	1629	298.6	1.31
1405	249.2	1.0	0.6	1520	282.0	1.1	0.9	1630	299.8	1.32
1406	249.7	1.0	0.6	1521	279.7	1.1	0.6	1631	300.3	1.33
1407	248.4	1.0	0.6	1522	279.5	1.1	0.7	1632	297.9	1.32
1408	248.6	1.0	0.5	1523	280.3	1.1	0.7	1633	297.5	1.34
1409	246.4	1.0	0.7	1524	277.7	1.1	0.7	1634	296.6	1.29
1410	246.4	1.0	0.6	1525	278.8	1.1	0.6	1635	296.7	1.35
1411	245.5	1.0	0.9	1526	280.2	1.1	0.5	1636	296.2	1.36
1412	244.7	1.0	0.6	1527	277.4	1.1	0.7	1637	296.8	1.32
1413	245.4	1.0	0.8	1528	278.8	1.1	0.6	1638	298.2	1.35
1414	246.0	1.0	0.8	1529	279.5	1.1	0.6	1639	297	1.36
1415	243.5	1.1	1.0	1530	277.2	1.1	0.6	1640	295.8	1.33
1416	243.6	1.1	0.8	1531	305.6	1.1	0.7	1641	295	1.3
1417	243.3	1.1	0.9	1532	315.0	1.2	0.5	1642	293	1.3
1418	242.4	1.1	0.8	1533	314.3	1.2	0.7	1643	293.9	1.33
1419	241.7	1.1	1.3	1534	312.8	1.2	0.6	1644	293.3	1.31
1420	242.3	1.1	1.1	1535	314.3	1.2	0.6	1645	294.1	1.31
1421	279.9	1.1	0.7	1536	315.7	1.2	0.6	1646	295.3	1.3
1422	278.6	1.1	0.9	1537	312.5	1.2	1.0	1647	296.5	1.37
1423	283.1	1.0	0.7	1538	313.4	1.3	0.5	1648	297.5	1.32
1424	284.4	1.1	1.1	1539	312.2	1.2	0.7	1649	295.6	1.32
1425	276.0	1.1	0.7	1540	311.2	1.2	0.4	1650	296.7	1.27
1426	277.2	1.1	0.7	1541	311.4	1.2	1.0	1651	297	1.32
1427	275.3	1.1	0.6	1542	311.5	1.2	0.5	1652	294.4	1.3
1428	275.5	1.1	0.7	1543	309.0	1.2	0.8	1653	296.1	1.3
1429	273.6	1.1	0.4	1544	309.6	1.2	0.4	1654	296.3	1.31
1430	273.5	1.1	0.6	1545	309.5	1.2	0.6	1655	293.3	1.37
1431	271.4	1.0	0.5	1546	311.9	1.3	0.5	1656	293.7	1.37
1432	272.7	1.1	0.6	1547	308.9	1.2	0.6	1657	293.1	1.35
1433	275.3	1.1	0.5	1548	310.8	1.3	0.5	1658	290.8	1.35
1434	275.0	1.1	0.5	1549	317.5	1.2	0.5	1659	290.5	1.38
1435	279.7	1.1	0.7	1550	307.8	1.2	0.5	1700	290.8	1.4
1436	280.9	1.1	0.6	1551	308.7	1.2	0.3	1701	291.7	1.36
1437	292.6	1.1	0.6	1552	307.5	1.2	0.5	1702	289.3	1.44
1438	296.1	1.1	0.6	1553	305.5	1.2	0.2	1703	290.2	1.4
1439	298.1	1.1	0.6	1554	307.7	1.2	0.5	1704	291	1.38
1440	297.4	1.1	0.6	1555	307.0	1.2	0.4	1705	290.1	1.41
1441	294.8	1.1	0.7	1556	306.2	1.2	0.4	1706	290.2	1.41
1442	293.0	1.1	0.7	1557	306.4	1.2	0.5	1707	289.7	1.39
1443	296.7	1.2	0.6	1558	305.1	1.2	0.5	1708	286.5	1.43
1444	295.5	1.2	0.5	1559	306.7	1.2	0.2	1709	286.5	1.42
1445	294.3	1.1	0.6	1600	304.4	1.2	0.9	1710	286.8	1.45
1446	294.7	1.1	0.6	1601	306.5	1.3	0.1	1711	287	1.46
1447	291.7	1.1	0.5	1602	304.5	1.3	3.5	1712	286.2	1.43
1448	291.6	1.1	0.4	1603	302.4	1.3	0.3	1713	285.9	1.47
1449	292.2	1.1	0.6	1604	303.8	1.3	0.4	1714	286.9	1.47
Average	267.1	1.1	0.6	Average	298.2	1.2	0.6	Average	295.0	1.3

APPENDIX 5

FACILITY PRODUCTION DOCUMENTATION

Selection: MB2.ADS; MB2.ADS; MB2.ADS; MB2.STACK

Key	Name:Suffix	Trend Definitions Used
Point_1:	MB2.ADS3.BT	Point COV 5 Min
Point_2:	MB2.ADS3.DP	Point COV 1 Min
Point_3:	MB2.ADS3.MT	Point COV 5 Min
Point_4:	MB2.ADS3.TT	Point COV 5 Min
Point_5:	MB2.STACK	Trend COV (25.0000) 5 Min
Time Interval: 5 Minutes		
Date Range: 2/26/2009 00:00:00 - 2/26/2009 23:59:59		
Report Timings: All Hours		

<>Date	Time	Point_1	Point_2	Point_3	Point_4	Point_5
2/26/2009	13:35:00	482.31	3.07	434.62	97.65	1470.96
2/26/2009	13:40:00	482.31	3.05	430.38	96.59	1521.82
2/26/2009	13:45:00	481.25	3.09	425.09	96.59	1496.39
2/26/2009	13:50:00	480.19	3.10	422.97	96.59	1470.96
2/26/2009	13:55:00	487.60	3.13	420.85	96.59	1521.82
2/26/2009	14:00:00	498.20	3.12	421.91	97.65	1496.39
2/26/2009	14:05:00	496.08	3.12	425.09	97.65	1496.39
2/26/2009	14:10:00	487.60	3.17	430.38	98.71	1496.39
2/26/2009	14:15:00	487.60	3.12	432.50	99.77	1470.96
2/26/2009	14:20:00	482.31	3.15	435.68	99.77	1520.76
2/26/2009	14:25:00	482.31	3.17	436.74	99.77	1470.96
2/26/2009	14:30:00	487.60	3.16	435.68	101.89	1521.82
2/26/2009	14:35:00	489.72	3.21	434.62	102.95	1496.39
2/26/2009	14:40:00	486.55	3.16	433.56	102.95	1470.96
2/26/2009	14:45:00	482.31	3.22	432.50	104.01	1521.82
2/26/2009	14:50:00	481.25	3.22	430.38	105.07	1496.39
2/26/2009	14:55:00	485.49	3.21	430.38	106.13	1496.39
2/26/2009	15:00:00	482.31	3.21	427.20	108.25	1530.30
2/26/2009	15:05:00	479.13	3.20	427.20	108.25	1470.96
2/26/2009	15:10:00	482.31	3.24	426.15	109.31	1521.82
2/26/2009	15:15:00	487.60	3.23	425.09	110.37	1496.39
2/26/2009	15:20:00	365.75	3.23	424.03	110.37	1496.39
2/26/2009	15:25:00	286.27	3.25	421.91	111.43	1534.54
2/26/2009	15:30:00	286.27	3.23	420.85	111.43	1470.96
2/26/2009	15:35:00	280.97	3.26	420.85	111.43	1521.82
2/26/2009	15:40:00	275.67	3.23	420.85	111.43	1496.39
2/26/2009	15:45:00	259.78	3.21	421.91	111.43	1521.82
2/26/2009	15:50:00	265.08	3.25	422.97	113.55	1531.36
2/26/2009	15:55:00	265.08	3.22	422.97	113.55	1470.96
2/26/2009	16:00:00	265.08	3.21	424.03	113.55	1521.82
2/26/2009	16:05:00	259.78	3.21	425.09	134.74	1534.54
2/26/2009	16:10:00	250.24	3.22	422.97	177.13	1470.96
2/26/2009	16:15:00	271.44	3.23	418.73	211.04	1521.82

2/26/2009 16:20:00	266.14	3.26	414.49	237.53	1496.39
2/26/2009 16:25:00	269.32	3.24	412.37	256.60	1496.39
2/26/2009 16:30:00	274.62	3.26	411.31	267.20	1530.30
2/26/2009 16:35:00	258.72	3.24	409.19	272.50	1470.96
2/26/2009 16:40:00	269.32	3.24	408.13	272.50	1521.82
2/26/2009 16:45:00	253.42	3.24	408.13	273.56	1496.39
2/26/2009 16:50:00	264.02	3.26	408.13	273.56	1470.96
2/26/2009 16:55:00	269.32	3.26	410.25	272.50	1521.82
2/26/2009 17:00:00	264.02	3.27	410.25	272.50	1496.39
2/26/2009 17:05:00	264.02	3.26	412.37	270.38	1496.39
2/26/2009 17:10:00	258.72	3.25	414.49	268.26	1521.82
2/26/2009 17:15:00	257.66	3.28	419.79	265.08	1496.39
2/26/2009 17:20:00	258.72	3.29	419.79	261.90	1470.96
2/26/2009 17:25:00	258.72	3.24	418.73	259.78	1521.82
2/26/2009 17:30:00	253.42	3.26	415.55	258.72	1496.39
2/26/2009 17:35:00	253.42	3.27	409.19	260.84	1470.96
2/26/2009 17:40:00	255.54	3.27	403.89	261.90	1521.82
2/26/2009 17:45:00	255.54	3.26	398.59	264.02	1496.39
2/26/2009 17:50:00	255.54	3.28	388.00	261.90	1479.44

***** End of Report *****

Key Name:Suffix Trend Definitions Used
Point_1: MB2.CMAP.JHMAP.FITrend COV (100.0000) 1 Min
Time Inter: 5 Minutes
Date Rang: 2/26/2009 00:00:00 - 2/26/2009 23:59:59
Report Tim: All Hours

<>Date	Time	Point_1
2/26/2009	13:30:00	4978
2/26/2009	13:35:00	5007
2/26/2009	13:40:00	5012
2/26/2009	13:45:00	4847
2/26/2009	13:50:00	5022
2/26/2009	13:55:00	5007
2/26/2009	14:00:00	5011
2/26/2009	14:05:00	4784
2/26/2009	14:10:00	5017
2/26/2009	14:15:00	4971
2/26/2009	14:20:00	5042
2/26/2009	14:25:00	4967
2/26/2009	14:30:00	5004
2/26/2009	14:35:00	5002
2/26/2009	14:40:00	4990
2/26/2009	14:45:00	4777
2/26/2009	14:50:00	4974
2/26/2009	14:55:00	4790
2/26/2009	15:00:00	4988
2/26/2009	15:05:00	4978
2/26/2009	15:10:00	4973
2/26/2009	15:15:00	4965
2/26/2009	15:20:00	5005
2/26/2009	15:25:00	4985
2/26/2009	15:30:00	5000
2/26/2009	15:35:00	4772
2/26/2009	15:40:00	4979
2/26/2009	15:45:00	4974
2/26/2009	15:50:00	4970
2/26/2009	15:55:00	4808
2/26/2009	16:00:00	4980
2/26/2009	16:05:00	4970
2/26/2009	16:10:00	4971
2/26/2009	16:15:00	4997
2/26/2009	16:20:00	4781
2/26/2009	16:25:00	4781
2/26/2009	16:30:00	4959
2/26/2009	16:35:00	4923
2/26/2009	16:40:00	4961
2/26/2009	16:45:00	4978
2/26/2009	16:50:00	4776
2/26/2009	16:55:00	4982
2/26/2009	17:00:00	4774
2/26/2009	17:05:00	4996
2/26/2009	17:10:00	4781

2/26/2009	17:15:00	4960
2/26/2009	17:20:00	4972
2/26/2009	17:25:00	4984
2/26/2009	17:30:00	4955
2/26/2009	17:35:00	4776
2/26/2009	17:40:00	5009
2/26/2009	17:45:00	5007
2/26/2009	17:50:00	4982

***** End of Report *****

AVX
Application Rate

Binks Tank Wt. (lb)

Initial	Final	Time	Rate (lb/hr)	Actual Time
250.8	250	2:00:00		
	248.8	5:20:00		
	246.8	11:11:00		13:50 Start Run 1
	245.4	15:36:00		
	243.4	22:00:00		
	241.4	28:30:00		
	238.2	39:10:00		
	235.6	46:40:00		
	232.4	56:00:00		14:41
	229.6	63:30:00		
	227.2	70:00:00		14:55
			21.21	
221	218.8	6:15:00		
	216.6	12:30:00		15:05 Start Run 2
	213.4	21:45:00		
	210	30:40:00		
	206.2	40:30:00		
	200.8	54:30:00		
	198.8	60:00:00		16:05
			22.2	
195.4	193	6:20:00		16:15 Start Run 3
	190.2	13:50:00		
	187.4	21:18:00		
	184.2	30:00:00		
	180.6	39:40:00		
	177.4	48:30:00		
	173.2	60:00:00		17:15
			22.2	

1004226
regulator1



P.O. Box 559 • Huntersville, NC 28070-0559
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STATIONARY SOURCE SAMPLING REPORT

FOR

AVX CORPORATION

MYRTLE BEACH, SOUTH CAROLINA

*Burnout Oven Exhaust and Metals Exhaust
VOC Sampling*

Integrity Project No. 09-043 Performed: June 25, 2009

Certified By:

James A. Lewis Date 08/17/09

James A. Lewis, QSTI
Vice President
Integrity Air Monitoring, Inc.

Robert J. Blanton Date 08/17/09

J.A. Tony Blanton, QSTI
President
Integrity Air Monitoring, Inc.

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1.0 INTRODUCTION

This test program was performed at the AVX Corporation facility in Myrtle Beach, South Carolina on one Burnout Oven exhaust (Unit ID 12 – MB2 Kiln Room) and the Metals Department exhaust (Unit ID – 01 Metals Department). This section of the report describes the test purpose and provides a brief outline of the test activities and the personnel involved in the test program.

1.1 Purpose

The AVX Corporation facility is covered by Title V Air Quality Permit No. TV-1340-0002; however, the testing was performed at the request of SC DHEC.

1.2 Outline of Test Program

Integrity Air Monitoring, Inc. (Integrity) performed stationary source sampling at one Burnout Oven exhaust (during two separate operating scenarios) and at the Metals Department exhaust on June 25, 2009. The sampling included six 30-minute sampling runs at the Burnout Oven exhaust and three 30-minute sampling runs at the Metals Department exhaust for total hydrocarbon (THC) emissions as carbon using EPA Reference Method 25A. In addition to the sampling performed for THC, Integrity also performed US EPA Reference Methods 1 through 4 to determine the location of the sampling points, the volumetric flow rate, the molecular weight of the stack gas and the moisture content, respectively.

The original scope of the project included only three sampling runs at the burnout oven exhaust; however, SC DHEC representatives present to witness the testing requested three additional sampling runs at the burnout oven exhaust during a later phase of the burnout cycle (higher temperature).

1.3 Test Participants

The following table provides contact information for the test participants.

Table 1 – Test Participants			
Name	Title	Affiliation	Contact Info
J.A. "Tony" Blanton	President	Integrity Air Monitoring, Inc.	Telephone: (704) 398-1119 Facsimile: (704) 398-1113 tony@integrityair.net
James A. Lewis	Vice President	Integrity Air Monitoring, Inc.	Telephone: (704) 398-1119 Facsimile: (704) 398-1113 jim@integrityair.net
Boyd Holt	Safety & Environmental Manager	AVX Corporation	Telephone: (843) 946-0377 Facsimile: (843) 444-2833 bholt@avxus.com
Gary Yoder	President	Resolute Environmental, LLC	Telephone: (919) 701-0009 gyoder@nc.rr.com
Nathan T. Wagner	Environmental Health Manager	SC DHEC	Telephone: (803) 898-4054 Facsimile: (803) 898-4117 wagnert@dhec.gov
Mallory S. Sparks	Environmental Health Manager	SC DHEC	Telephone: (803) 898-4335 Facsimile: (803) 8984117- sparkmslj@dhec.sc.gov

2.0 RESULTS

This section presents the mean sampling results. Detailed sampling results for each sampling run and example calculations are presented in Appendix 1. Field data sheets and system bias and drift checks are presented in Appendix 2. Data acquisition system uncorrected values and values corrected for system bias are presented in Appendix 3.

2.1 Summary of Results

The following tables present the mean results from the sampling performed at the Burnout Oven exhaust and the Metals Department exhaust on June 25, 2009.

Source	Concentration, ppmvd as carbon	Loading/Emission Rate, lbs/hr as carbon
Burnout Oven Exhaust (Condition 1)	21.6	0.0010
Burnout Oven Exhaust (Condition 2)	381.2	0.014
Metals Exhaust	17.2	0.036

2.2 Discussion

The results of the test indicate that both electrode ink processing and burnout have low THC emissions. These test results will be used to develop emission factors used in future emission inventories and air permit applications for the AVX Myrtle Beach facility.

3.0 PROCESS DESCRIPTION

Total hydrocarbon emissions from both electrode ink processing and burnout are from the organic (carbon) materials terpeneol and ethyl cellulose. Both materials are part of the electrode ink mixture. Terpeneol is manufactured from terpentine with other uses in the manufacturing of fragrances, disinfectants, polishes, and household products. It is a heavy liquid with a flash point of 100°C (212°F) and is added to the ink for its solvent properties. Ethyl cellulose is a dry material added to the electrode ink for its binding properties potentially producing hydrocarbon emissions during the burnout process.

The Metals Department prepares conductive metal inks (electrode inks) and pastes (termination pastes) used with ceramic slip to manufacturer capacitors in the build-up process. The electrode ink is primarily made up of metals (nickel, copper, gold, etc.), dry binder (ethyl cellulose), and terpeneol. The mixture is added to milling tools where it may go through several passes depending on the desired particle size specification. Emissions are vented out a room exhaust.

The burnout ovens are located in the MB2 Kiln Room. Green chips enter the burnout ovens where they go through varying temperature profiles to remove the terpeneol and ethyl cellulose in the capacitor chips. The temperature profile and cycle time for this test ranged from room temperature to 500°F for 25 hours. This is the most common profile and cycle time used by AVX. Temperature profiles and cycle times can range from room temperature to 550°F for up to 32 hours. The temperature profiles are necessary to remove the binder and terpeneol while maintaining the structural integrity of the chips.

3.1 Air Pollution Control Equipment

Emissions from the burnout ovens and Metals Department are vented uncontrolled to the atmosphere.

3.2 Demonstration of Operating Rate

As communicated to SC DHEC during the development of the testing protocol, testing at the Metals Department could only measure emissions from the electrode ink processed the day of the test. The difference in electrode inks mixtures is primarily the type of metals used (nickel, copper, gold, platinum, etc.). The organic materials (terpeneol and ethyl cellulose) do not vary much between the mixtures. During this test, AVX prepared a nickel ink, which is the most common ink used in chip production at the facility. After the mixture is prepared, it goes through a series of passes in the department milling tools. The tested ink mixture contained 44% by weight terpeneol, 2.3% ethyl cellulose, 53.7% non-organic solids and went through three milling passes in the largest of 3 tools.

The burnout oven tested was GB 201. It contained 19 pans holding 1,010,960 Style 036 capacitor chips. As shown in the temperature profile in Figure 1, Test 1 was conducted from 8:30 to 9:38. During Test 1, The SC DHEC requested a second test at the oven's peak temperature, which was conducted from 15:00 to 16:08. The test results show a higher organic emission rate of 0.014 lb/hr at the Test 2 peak temperature. The oven was not completely charged and can hold up to 30 pans. Assuming a linear relationship, the oven charged with 30 pans would result in an organic emission rate of 0.022 lb/hr.

Production documentation corresponding with the sampling is included in Appendix 5.

Burnout Oven GB 201 Temperature Profile

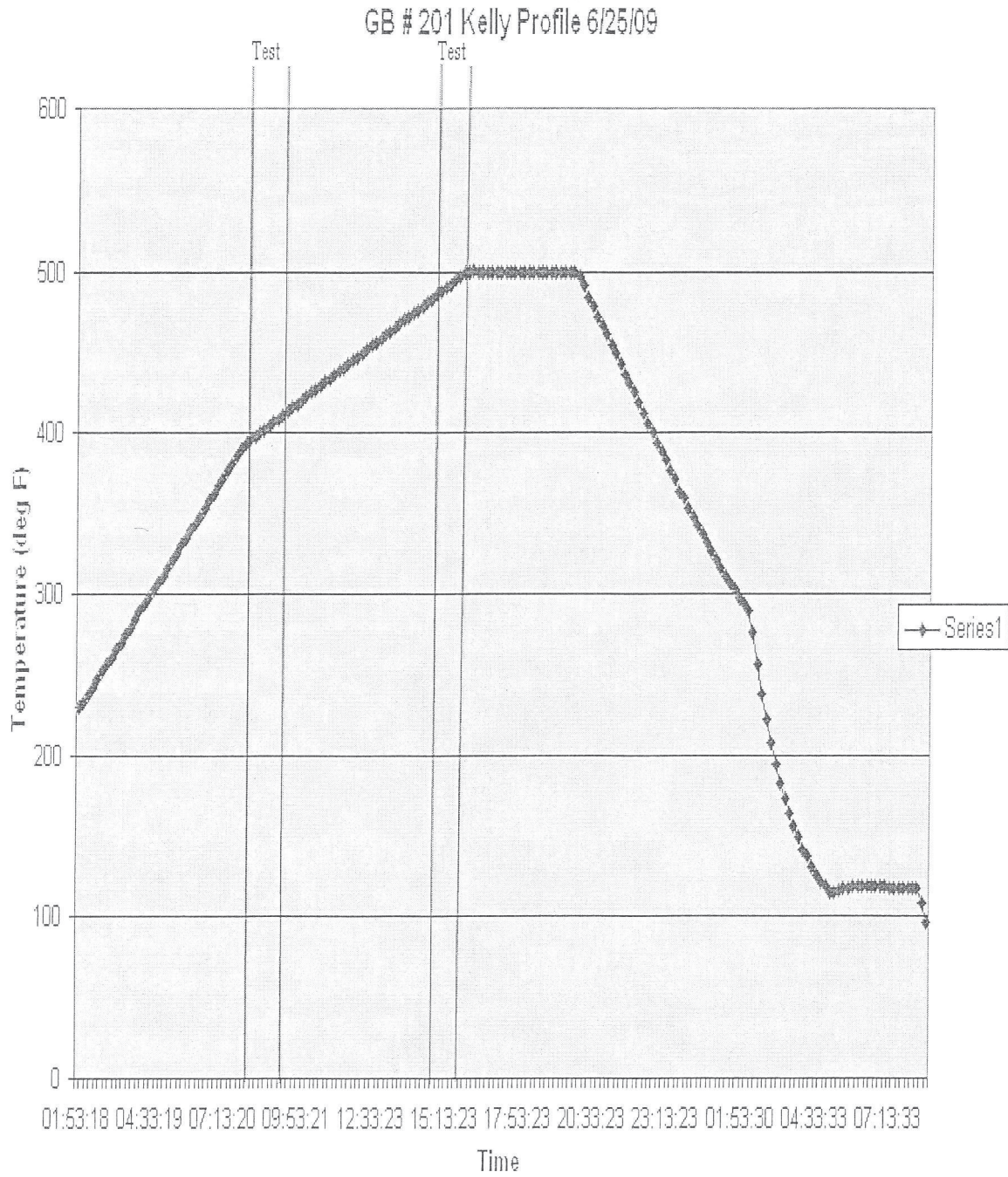


Figure 1

4.0 SAMPLING METHODS

This section describes the sampling strategy, sampling and analytical methods, and the quality assurance/quality control procedures implemented during this project.

4.1 Sampling Strategy

The sampling and analytical procedures used during this test program were those established by the US EPA and SC DHEC. A Site-Specific Test Plan (SSTP) was submitted to the SC DHEC detailing the sampling procedures and process parameters to be followed during this test program.

4.2 Sampling and Analytical Procedures

The following table provides the US EPA reference methods used in this sampling program.

Reference Method	Parameter
1	Location of Sampling Points
2	Volumetric Flow Rate
3	Molecular Weight
4	Moisture Content
25A	THC

A sampling and analysis synopsis for each of these methods is discussed briefly in the following subsections. These test methods are available in the Code of Federal Regulations Volume 40, Part 60 or by request from Integrity.

4.2.1 Sampling Ports, Traverse Points and Cyclonic Flow Determination

The sampling locations were prepared according to the criteria in Method 1. The duct diameters upstream and downstream from the sampling ports were measured and documented prior to sampling. The number of traverse points was chosen with respect to sampling port location. The amount of cyclonic flow was determined according to the criteria detailed in Method 1.

4.2.2 Stack Gas Velocity and Volumetric Flow Rate Determination

Method 2 is used to determine the average gas velocity in a stack using the average temperature and average velocity head. The temperature is measured with a calibrated thermocouple and the velocity determined with a Type S (Stausscheibe) pitot tube. This method is further used to calculate to volumetric flow rate.

Measurements of velocity head and temperature at the sampling location were performed at the traverse points specified by Method 1. An inclined oil manometer or calibrated magnehelic gauge was used to measure the differential pressure.

The apparatus was set-up according to manufacturer and reference method recommendations. Pre-test and post-test leak checks were conducted for each sampling run. The atmospheric and static pressure of the stack was also determined for each set of velocity head readings. The volumetric flow rate calculations used were those specified in Method 2.

4.2.3 Dry Molecular Weight Determination

Method 3 is applicable for determining carbon dioxide and oxygen concentrations and dry molecular weight of a sample from a gas stream of a fossil-fuel combustion process. This method may also be applicable to other processes where it has been determined that compounds other than carbon dioxide, oxygen, carbon monoxide, and nitrogen are not present in concentrations sufficient to affect the results.

Since the sources were emitting essentially air, a dry molecular weight of 29.0 was used according to Method 2, Section 8.6.

4.2.4 Moisture Determination

Method 4 was used to determine the stack gas moisture content. The moisture content is used to correct the concentration or mass emission rate to a dry basis. Moisture determinations for this sampling project were determined using one of two methods described below dependant on the sample stream temperature. Sources above 140 degrees F require the use of a Method 4 sample train.

The flue gas moisture content at the Metals Department exhaust (< 140 °) was determined using wet bulb/dry bulb thermometers and partial pressure, vapor and saturated vapor pressure equations. This technique is described in Method 4 and is summarized below:

- Moisten the wet bulb thermometer wick with deionized water;
- Insert both thermometers into the flue gas stream and monitor the wet bulb temperature;

When the wet bulb temperature has stabilized, record both the wet bulb and dry bulb thermometer temperatures.

The flue gas moisture content (PMV) was then calculated using saturated vapor and moisture equations.

The moisture content at the burnout oven exhaust (>140 °F) was performed using the following sampling system and procedures:

- A heated (248°F ±25°F) probe;
- A moisture condensing train consisting of four sequential impingers. Impingers one and two contained 100 ml each of deionized water followed by an empty impinger and a final impinger containing 200 grams of silica gel; and
- A Method 5 type metering system capable of maintaining a constant sampling rate.

At the end of the test run, the liquid in the first three impingers was measured to the nearest milliliter. The moisture collected by the silica gel was determined to the nearest 0.1 gram. These measurements were recorded on the Method 4 data form. The moisture content of the emission source was calculated according to the equations in Method 4, Section 12. At the direction of SC DHEC, since the process is steady state, only one moisture sample was conducted and the moisture result was used for all runs.

4.2.5 THC Analyzer Procedures

Total gaseous organics or total hydrocarbons concentrations and emission rates were determined according to EPA Method 25A. Method 25A applies to the measurement of total gaseous organic concentration of vapors consisting primarily of alkanes, alkenes, and/or arenes (aromatic hydrocarbons). The concentration is expressed in terms of propane (or other appropriate calibration gas) or in terms of carbon.

Sampling for total gaseous organics was performed using a VIG Industries Model 20 analyzer. The principal components of each sampling systems were sequentially:

- A heated stainless steel sample probe;
- A heated system calibration assembly and filter;
- A heated sample line;
- An FIA analyzer;
- Calibration gases; and
- A data acquisition system that continuously logs 1-minute concentrations.

Prior to the test series, the heated sample lines were heated to 360°F and the hydrocarbon analyzer was heated above 200°C to prevent condensation. After temperatures were stabilized the hydrocarbon analyzer was ignited using a 40% hydrogen balance helium fuel and hydrocarbon free air. Calibration procedures commenced with the introduction of zero and high-level calibration gas into the sampling system. The necessary adjustments were made and the responses for low-level and mid-level gases were recorded. The predicted values for the calibration gases and the actual responses were recorded on the field data sheet and by the data acquisition system. High-level and zero gas concentrations were introduced into the measurement system and the response time was recorded on the field data sheet. Sampling was initiated immediately following instrument calibration. At the conclusion of the first hour, the zero and mid-level calibration gases were reintroduced and their respective responses recorded on the field data sheet. Integrity utilized a STEC 710-C gas divider according to Method 205 to create multi-level calibration gases from a single upscale standard. A certificate of calibration for the gas divider is provided in Appendix 5.

The zero and calibration drift checks were performed immediately following completion of the test run and at the conclusion of the test program. The data collected during the test program was archived on a data acquisition system and is attached to this test report as Appendix 3. The DAS used by Integrity Air Monitoring, Inc. for this project was an IBM computer with hard disk storage and a Superlogics data shuttle recorder.

4.2.6 Sampling Ports and Points

The dimensions of the sampling locations and the location of the sampling ports and points are detailed in Figures 2 and 3. The drawings provided are not to scale. The THC sampling was performed at single point near the center of each stack.

Burnout Oven Exhaust

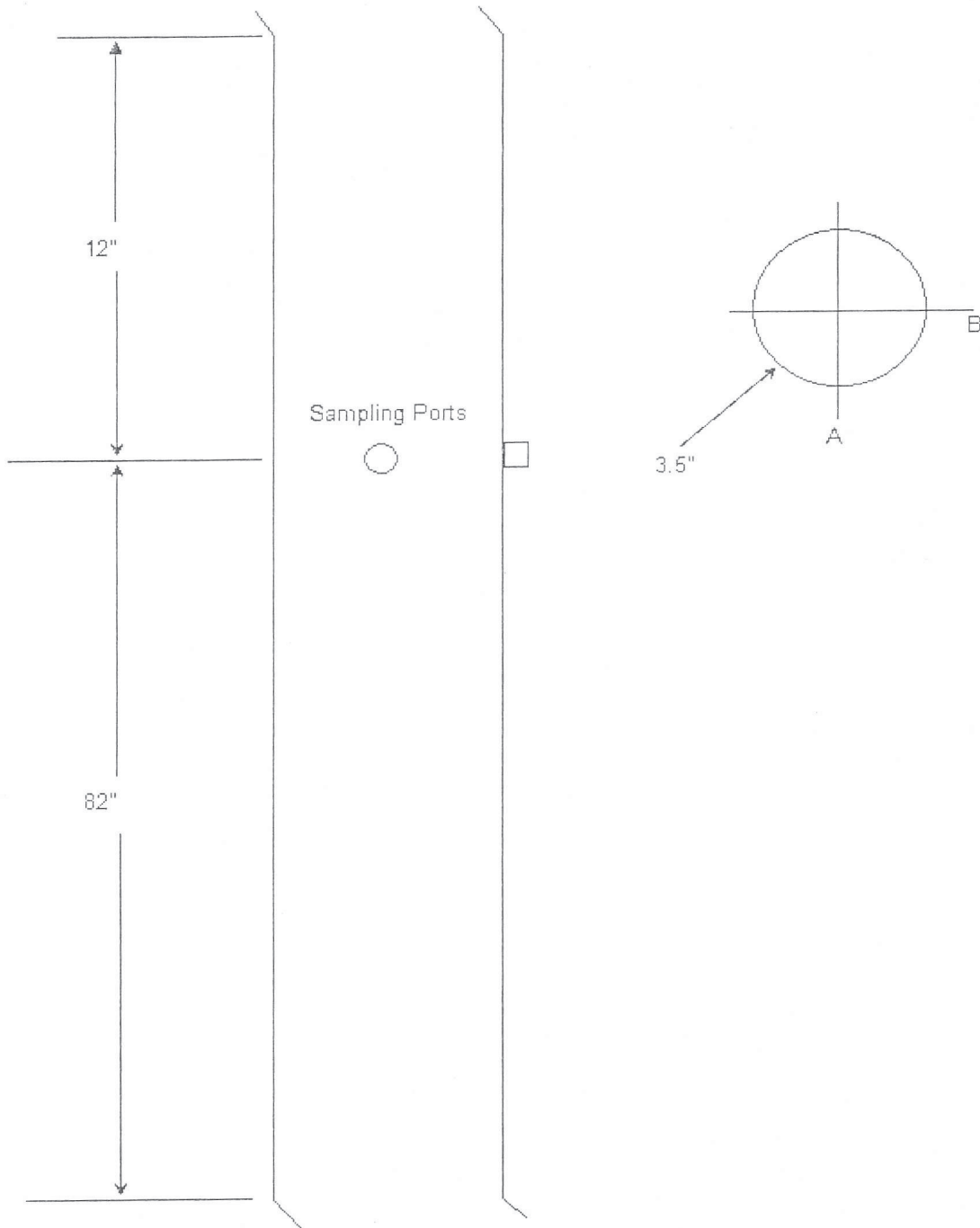


Figure 2

Location of Sampling Ports

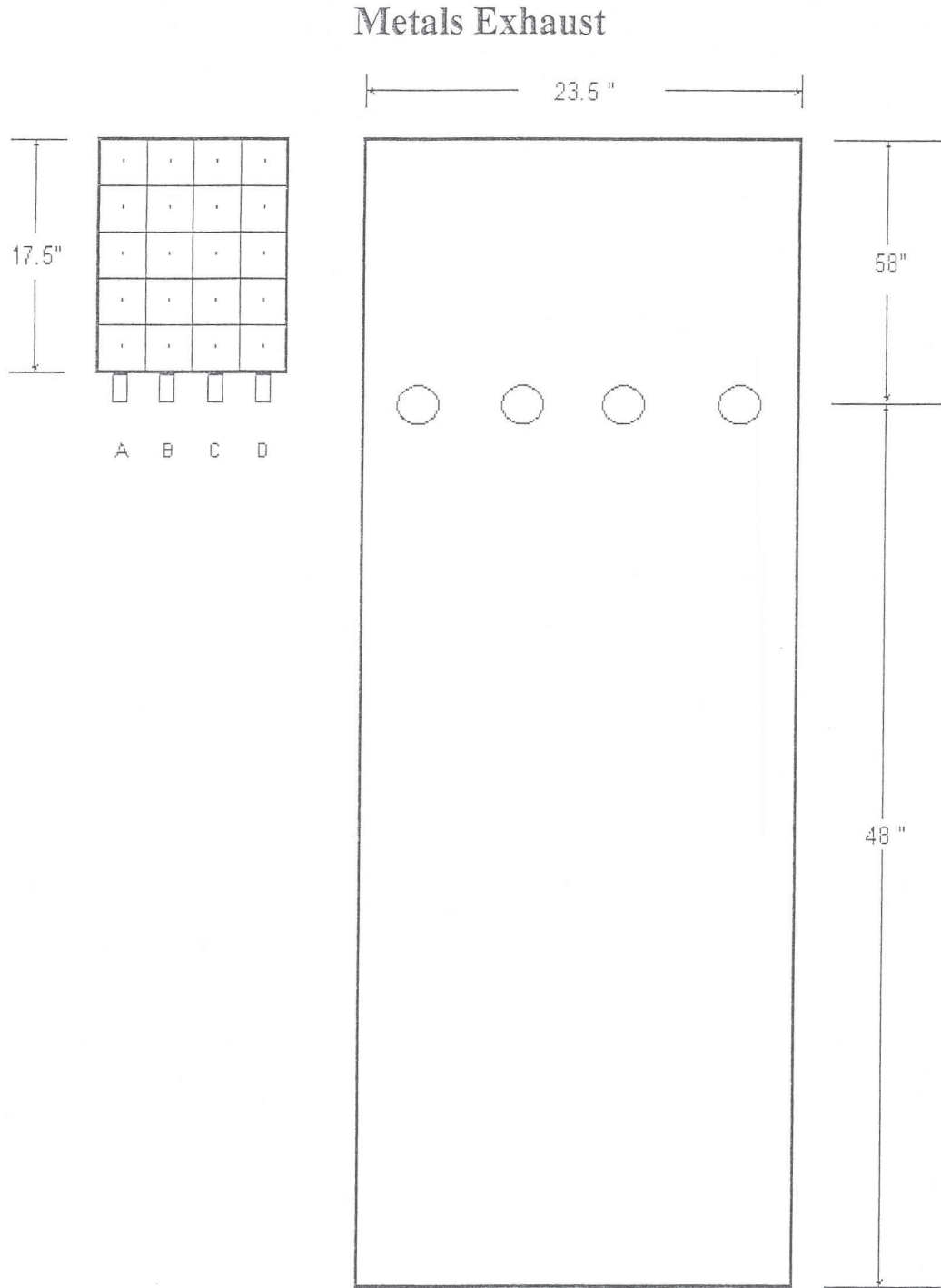


Figure 3

Location of Sampling Ports

4.3 Quality Assurance and Quality Control

Integrity Air has established quality assurance and quality control (QA/QC) guidelines to ensure the highest quality sampling and analytical data from source tests.

Data quality objectives were maintained throughout this project. The following table provides the QA activities followed during this sampling project and the results.

Parameter	Criteria	Within Limits?
Sampling Train Leak Check	< 0.02 cfm	yes
Pitot Tube Leak Check	< 0.1 in. H ₂ O in 15 sec.	yes
Console Calibration	γ +/- 0.02	yes
Thermocouples	+/- 2% of ref. temp.	yes
25A Analyzer Calibration	+/- 5% of gas	yes
25A Drift Check	+/- 3% of span	yes

Quality control procedures for the gaseous pollutant sampling has included the use of EPA Protocol I calibration gases. Protocol gas certificates of analysis are included in Appendix 4. US EPA Approved Alternate Method ALT-009 was used for the console post-test calibration and can be found in Appendix 1. The pre-test and post-test thermocouple system calibrations were performed using the procedures found in US EPA Approved Alternate Method ALT-011 and can be found in Appendix 4.

Field data and final laboratory results were independently audited and reviewed for verification of data. The Emission Test Report is audited for completeness and reasonableness of data. The report requires the signature of the project manager and Vice President or President before release to the client. Data and final reports are archived in a secured area for a minimum period of three years.

Integrity's field and laboratory test equipment has been maintained and calibrated in accordance with quality assurance procedures established by the US EPA in the Quality Assurance Handbook for Air Pollution Measurement Systems: Volume III. Equipment calibrations including pre-test and post-test calibration data are presented in Appendix 4.

Adsorber/Desorber and Thermal Oxidizer

MONITORING PLAN FOR REECO FLUISORB SYSTEM

This plan is prepared to comply with Section II.C. of Construction Permit number 1340-0002-CK issued August 11, 1998, for the Chip Manufacturing Automated Process (CMAP) machines at AVX Corporation in Myrtle Beach, South Carolina. The monitoring and recordkeeping requirements in this plan include the monitoring parameters, calibration, and inspection schedules.

Listed below are a description of the control device, AVX's proposed alternative monitoring method, and monitoring procedures and inspection schedule.

CONTROL DEVICE DESCRIPTION

AVX uses a Reeco FluiSorb system (a combination of an adsorber, desorber, and thermal oxidizer) to reduce the emissions of volatile organic compounds (VOC) into the atmosphere. The device controls emissions from the CMAP machines in the NMF. The air first passes through the adsorption vessel. The high surface area of the carbonaceous media removes the majority of the VOC, leaving a cleaned exhaust gas. Organics collected on the porous media are removed via steam in the desorption unit, creating a concentrated VOC air stream. This air stream is then sent to a thermal oxidizer. Because the first stage of adsorption significantly decreases the flowrate needing treatment by the thermal oxidizer, the size of the thermal oxidizer is greatly reduced. Upon entering the thermal oxidizer, the air stream is combusted with auxiliary fuel, such as natural gas, to convert VOC into carbon dioxide and water vapor.

A copy of the FluiSorb vendor brochure is included with this Monitoring Plan.

ALTERNATIVE MONITORING METHOD

Construction Permit number 1340-0002-CK lists monitoring parameters for the adsorber/desorber unit and for the thermal oxidizer. The permit also includes clauses for alternative monitoring methods, as follows:

Any alternative method for monitoring scrubber performance must be approved by the Bureau and shall be incorporated into a Monitoring Plan...

Any alternative method for monitoring afterburner performance must be approved by the Bureau and may be incorporated into a Monitoring Plan...

Although the specific condition refers to a scrubber (a scrubber is not a part of the CMAP control equipment), a more appropriate monitoring condition is proposed for the adsorber/desorber unit. This monitoring condition involves a monitoring of pressure drop across the adsorber inlet/outlet and a monitoring of the desorber temperature.

MONITORING PROCEDURES

To ensure the control device is operating properly and efficiently, AVX will follow the monitoring and recordkeeping procedures below.

Adsorber/Desorber Unit

The pressure drop across the adsorber inlet/outlet and the desorber temperature will be monitored. Measuring the pressure drop across the adsorber is an excellent means of determining whether the unit is operating correctly. Any pressure drop increases above the desired range would indicate the unit is not operating at peak efficiency. The pressure drop will be recorded continuously on a data logger while the adsorber/desorber unit is operating.

Monitoring the desorber temperature ensures that the maximum amount of VOC is desorbed from the carbon media; significant decreases in desorber temperature would result in a decrease in the amount of organics removed from the carbonaceous material. Temperature measurements will be recorded continuously on a data logger while the adsorber/desorber unit is operating.

Pressure drop and temperature readings will be relayed from the data logger to a display. Records containing these readings will be maintained in a form suitable for inspection for five (5) years from the date the information is recorded.

Thermal Oxidizer

To monitor the destruction of VOC at the thermal oxidizer, the combustion temperature will be recorded on a data logger. Because the unit relies on combustion at a specific range of temperatures, monitoring this parameter ensures the control of VOC. A thermocouple located near the combustion chamber will measure the temperature and relay this information to a display. Temperature measurements will be recorded when the oxidizer is treating exhaust from the adsorption/desorption unit. When the adsorption/desorption unit is not operating, the thermal oxidizer is shut down, and the combustion temperature is not recorded. Records containing the temperature readings will be maintained in a form suitable for inspection for five (5) years from the date the information is recorded.

Table 1 summarizes the monitoring methods AVX will employ to ensure compliance with Construction Permit number 1340-0002-CK.

TABLE 1. MONITORING PLAN SUMMARY.

Unit	Monitoring Method	Range	Duration	Frequency	Recordkeeping	Record Kept in Form Suitable for Inspection
Adsorption Unit	Pressure drop	2" w.c. - 5" w.c.	Continuous	Continuous	Electronic records	5 years
Desorption Unit	Thermocouple at heat source	400°F – 500°F	Continuous	Continuous	Electronic records	5 years
Thermal Oxidizer	Thermocouple at combustion chamber	1400°F- 1800°F	Continuous	When adsorption/desorption unit is operating	Electronic records	5 years

INSPECTION AND MALFUNCTION SCHEDULE

The adsorber/desorber system and the thermal oxidizer will be inspected quarterly. Preventive maintenance will be completed quarterly, per vendor specifications. If the monitoring parameters reveal a departure from the proposed ranges, then the unit in question (i.e., the adsorber/desorber or the oxidizer) will be inspected. If the parameters continue to show consecutive readings outside the ranges for more than a 24-hour period following the initial observation, then the unit will be shut down, the problem corrected, and startup will resume once the unit can be operated within the acceptable ranges. In instances where a shutdown of the unit results in a significant production interruption, AVX will request prior approval from the DHEC to continue to operate the CMAP machines.

FluiSorb™

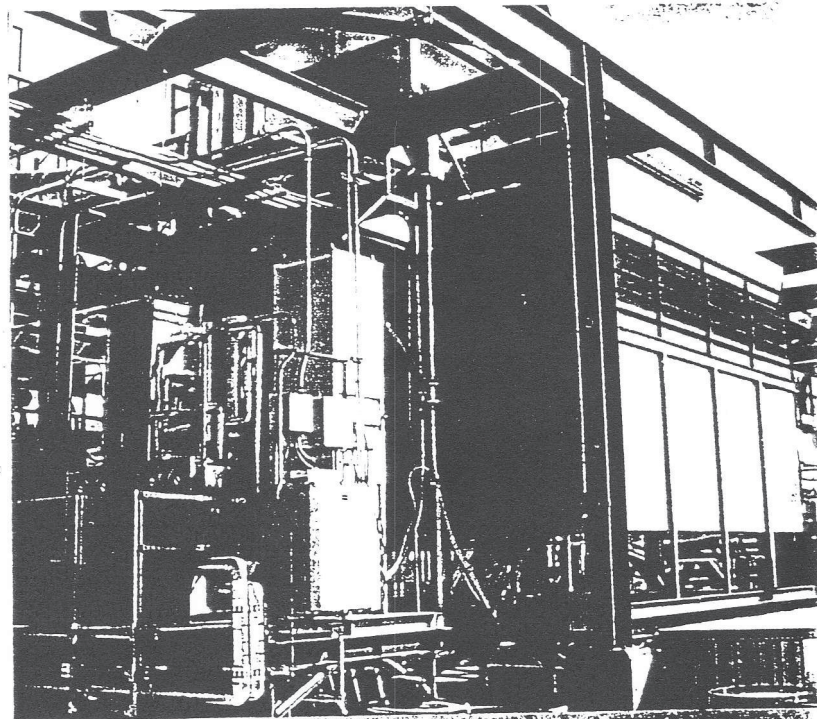
Fluidized Bed Concentrator

Superior Concentration
of VOCs and Air Toxics

Concentrations of 1000:1
or Greater

Exceptionally Low
Operating Costs

Destruction/Recovery
Rates of 95%–99%



REECO

A Research-Cottrell Company

FluiSorb™

When You Need To Really Concentrate On VOCs.

With the ability to achieve VOC concentration ratios of 1000:1 to as high as 10,000:1, REECO's FluiSorb™ fluidized bed adsorber/desorber concentrator offers the highest turndown ratio of any VOC concentrator available. No other system even comes close. (Gas volume reduction ratios in other concentrators are normally in the range of just 10:1.)

The FluiSorb system's high turndown ratios translate into even more important numbers for you: exceptionally low capital and operating costs.

Using a synthetic beaded carbonaceous adsorbent media, FluiSorb treats industrial process exhaust streams containing volatile organic compounds and toxic air emissions. This proven system takes high volume gas streams with low concentrations of VOCs and increases VOC concentration before destruction through oxidation or solvent recovery.

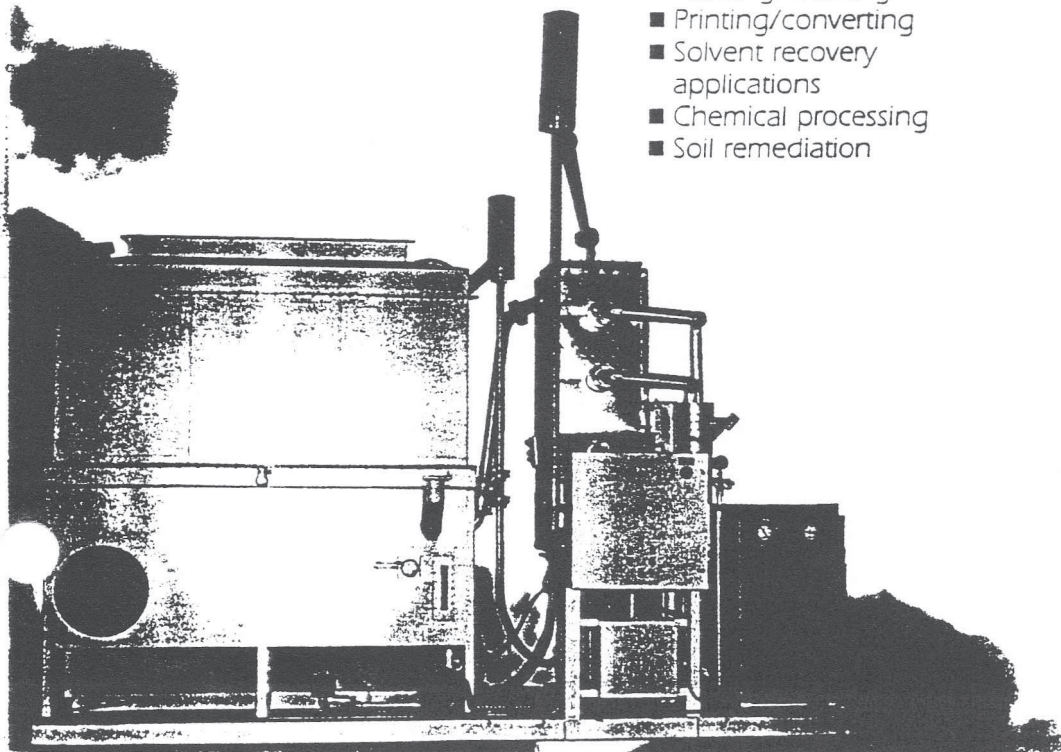
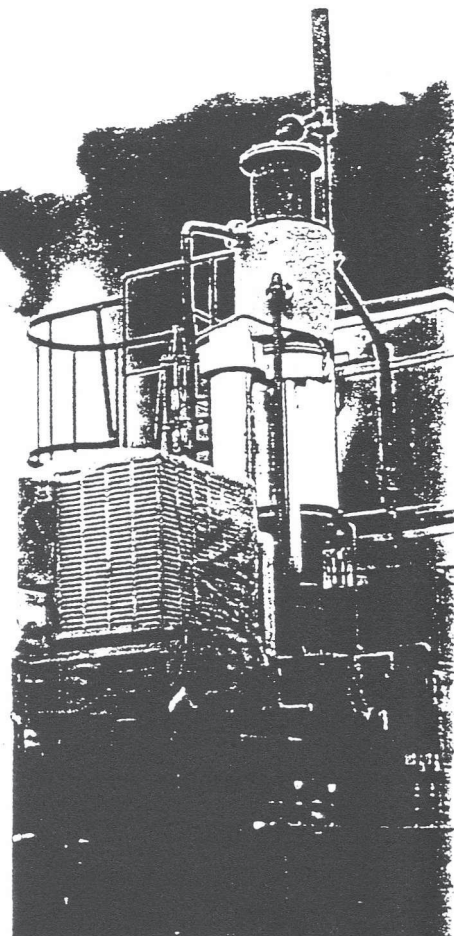
Hundreds of systems are operating throughout the world in such applications as:

- Semiconductor manufacturing
- Painting/finishing
- Printing/converting
- Solvent recovery applications
- Chemical processing
- Soil remediation

High Concentrations. Low Costs.

With the FluiSorb's ability to highly concentrate VOC-laden streams, "Back-End" systems such as afterburners and thermal oxidizers for destruction, and cooler/condensers for solvent recovery, are smaller and less costly than those required by other concentrator systems. The result is higher performance and lower capital and operating costs.

FluiSorb systems can handle exhaust streams ranging from 200 cfm to over 500,000 cfm. Destruction or recovery efficiencies of 95% to 99% are readily achievable, providing proven regulatory compliance and effective product recovery performance.





Semiconductor Manufacturing

FluiSorb systems are operating in semiconductor manufacturing facilities throughout the world, and with up-time reliability critical for the "around-the-clock" operations typical in this industry, FluiSorb is the technology of choice. In addition to high turndown ratios for better solvent recovery and reuse, the fluid bed technology virtually eliminates pressure swings, keeping sensitive process conditions unaffected by its operation. FluiSorb also is unaffected by HMDS, which can cause problems in alternative technologies.

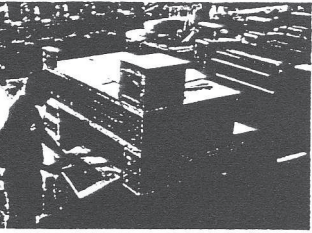


Painting/Finishing

Painting and surface finishing operations in the automotive, aerospace, auto parts, shipbuilding, and furniture manufacturing industries require a low-cost solution to their air pollution control and product recovery requirements. With its proven ability to handle HVLC gas streams, FluiSorb is ideally suited to these applications. Depending on the level of particulate present, REECO can supply a pre-filter to handle organic or inorganic particulate upstream of the FluiSorb system.

Demonstrated Experience

In A Wide Range of Industries



FluiSorb is a proven technology in applications where high-volume, low-concentration (HVLC) process streams benefit from concentration for destruction through thermal oxidation or recovery via a cooler/condenser component. Hundreds of systems are operating in a wide range of industries.



Printing/Converting

Characterized by higher VOC levels than those found in many other processes, industries such as coating, laminating, and printing can benefit from FluiSorb's high volume reduction ratios. FluiSorb can concentrate these gas streams to stay under the 25% Lower Explosive Limit (LEL) required for economical operation with an oxidizer. Solvent recovery of a more concentrated stream through a cooler/condenser stage can be effective if the solvents can be recycled back into the process.

industry. FluiSorb is flexible enough to handle both continuous or batch processing. With its extremely high VOC reduction ratios, the FluiSorb system can offset capital and operating costs by recovering valuable solvents.



Soil Remediation/ Groundwater Air Stripping

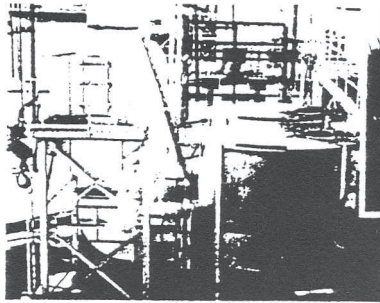
Process flexibility is a necessity in soil remediation and groundwater air stripping applications, which typically encounter low concentrations of a wide variety of air toxics, including halogenated VOCs. High humidity conditions are also typical, and the hydrophobic nature of the FluiSorb carbon adsorption media, allows it to operate in high humidity situations. FluiSorb has the flexibility to adapt to wide swings in process conditions.

Chemical Processing

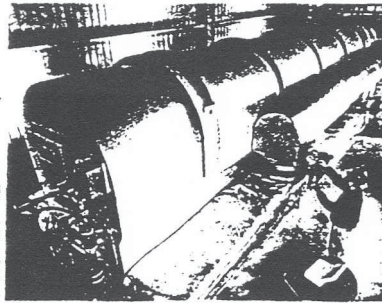
FluiSorb has proved to be an exceptional technology for the wide ranging process conditions found in the chemical processing

REECO

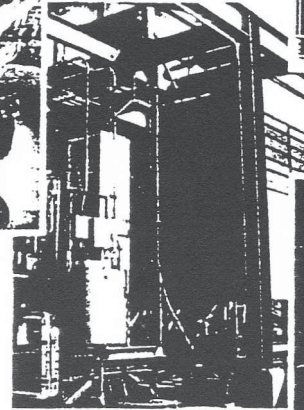
Over Two Decades of Leadership in VOC and Air Toxics Control



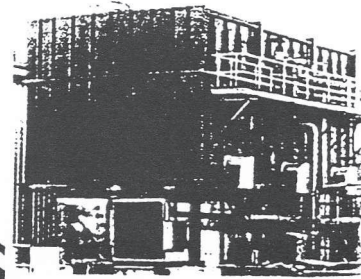
*Rotary Bed Protector™
(Particulate Control)*



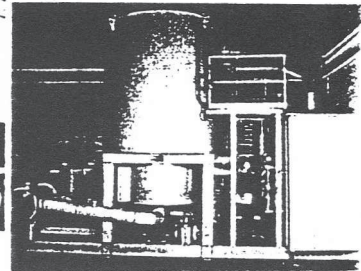
UNITHERM™



FluiSorb™ Concentrator



RE-THERM™



RE-THERM™

REECO was the first to develop regenerative thermal oxidizers for air pollution control. After nearly a quarter century, we continue to be the industry pacesetter, offering concentrator systems and regenerative, recuperative, and catalytic oxidizers to suit specific industry applications, process conditions, and budget considerations for air pollution control and product recovery.

More than 250 highly-efficient RE-THERM systems have been installed in industries such as:

- Semiconductor manufacturing
- Printing/converting
- Spray painting
- Metal decorating
- Wood products
- Chemical processing
- Soil and water remediation
- Coating
- Laminating
- Coil coating
- Food/pharmaceutical manufacturing
- Odor control applications

Our full range of capabilities include: applications engineering, engineering studies, full system design/installation, process

modifications, construction/construction management, start-up services, inspections, service & maintenance, parts, and training.

REECO benefits from its partnering agreement with Environmental C&C, Inc. (EC&C). FluiSorb was developed by EC&C as an improvement over existing technologies in solvent recovery. EC&C has been involved with environmental testing and the development of air pollution control systems for more than 15 years. The company has developed novel VOC control and solvent recovery systems as well as innovative VOC concentrator technologies.



REECO

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Environmental C&C, inc.

Solvent Recovery & VOC Abatement Systems

