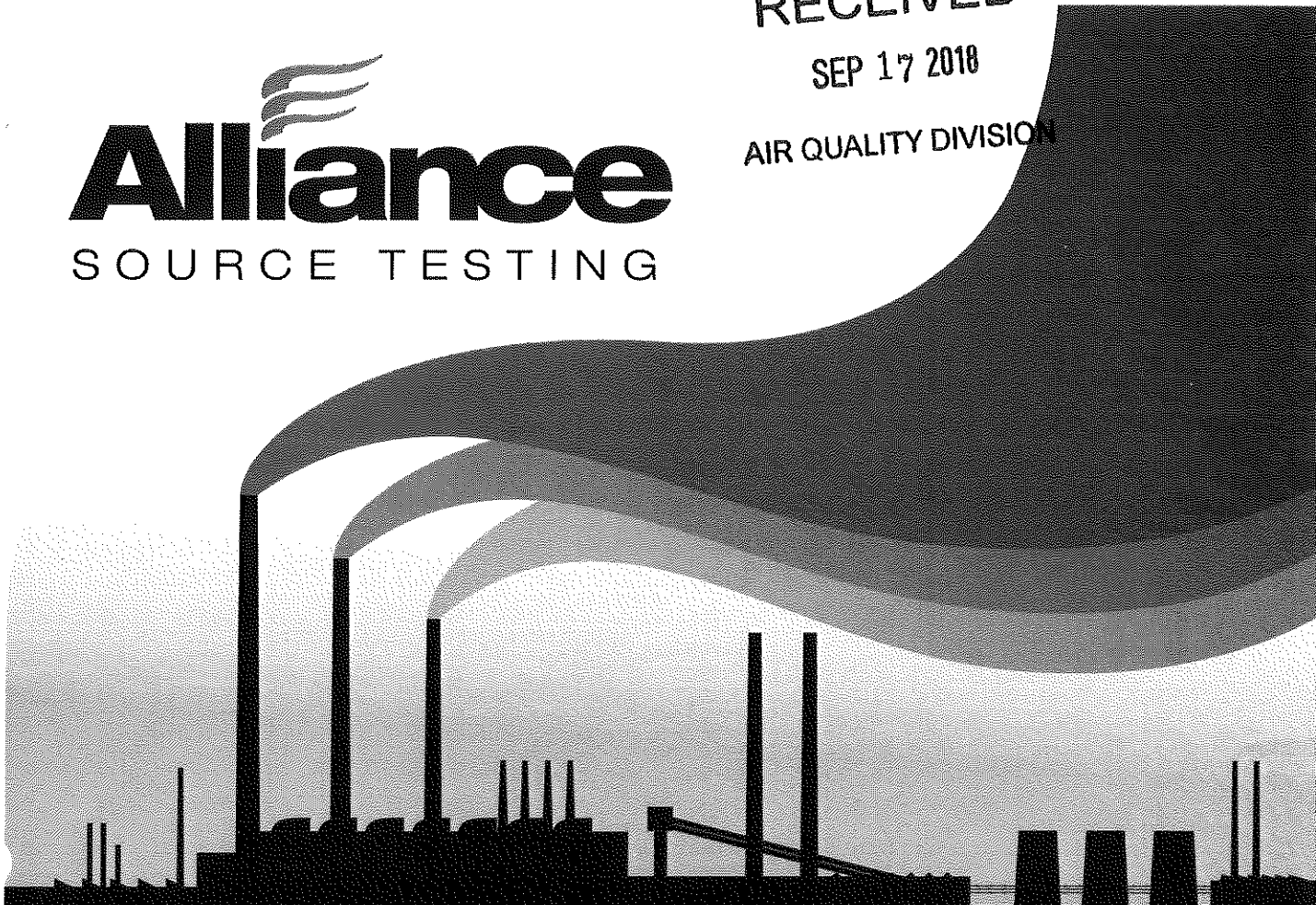




Alliance
SOURCE TESTING

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Source Test Report

Real Alloy Recycling, LLC
Coldwater South
267 N. Fillmore Road
Coldwater, MI 49036

Test Dates:
July 31, 2018 – August 2, 2018

AST Project No. 2018-0879

The
Alliance
Advantage



1.0 Introduction

Alliance Source Testing, LLC (AST) was retained by Real Alloy Recycling, LLC (RAR) to conduct compliance testing at the Coldwater, Michigan (South) facility. The facility is subject to provisions of 40 CFR 63, Subpart RRR and the Michigan Department of Environmental Quality Permit No. MI-PTI-N5957-2012e. Testing was conducted to determine the emission rates of particulate matter less than 10 microns (PM10) and hydrogen chloride (HCl) at the reverberatory furnace flue (SVIMREVFLUE-S2) stack, the emission rates of particulate matter (PM) and PM10 at the exhaust of the salt cake/hot dross handling baghouse (EUMIHOTDROSS), and the emission rates of NO_x and sulfur dioxide (SO₂) at the baghouse exhaust associated with two (2) rotary furnaces (FGIMROTFURN1/2).

1.1 Facility Description

RAR is a secondary aluminum production facility (SIC 3341) which produces molten aluminum and recycled scrap ingot (RSI) from the melting and recovery of aluminum from aluminum scrap and aluminum dross. The recovery of aluminum from aluminum scrap and aluminum dross and the subsequent production of aluminum ingot have been defined by the United States Environmental Protection Agency (EPA) as secondary aluminum production processes.

1.2 Source and Control System Descriptions

Reverberatory Furnace

The reverberatory furnace is used to melt aluminum scrap that has been processed by the existing drying system or directly charged toll or purchased scrap. The furnace is designed as a sidewall melter/holder unit to allow for continuous operation. The toll, purchased and preprocessed scrap is charged to the sidewall of the furnace along with solid flux material, Cl₂ gas and any alloying agents that are required for the production order. Once the materials are molten, the metal flows through a submerged opening to the hearth. Once properly alloyed, the furnace is tapped, and the molten aluminum is transferred to refractory lined crucibles for delivery or transferred to deox casting molds. Only clean charge materials are fed to the main hearth, and no reactive flux materials are used in this section of the furnace.

All emissions from the reverberatory furnace sidewall are captured and directed to a lime injected baghouse system for control of the regulated pollutants. Lime in the baghouse system reduces the concentrations of specific pollutants present in the exhaust gas. The baghouse then captures the reacted lime and other particulate matter from the melting process. Emissions from the reverberatory furnace flue exhaust directly to the atmosphere.

Rotary Furnaces

The rotary furnaces are used to process aluminum dross and scrap aluminum. Each furnace is designed to rotate on its axis, mixing and tumbling the charge while heating. The furnace then tilts forward to pour out the molten aluminum (tapping) and dump out the remaining slag or salt cake.

Included with the metal charge is the bulk addition of a salt flux material. The scrap or dross charge and salt flux is rotated in the furnace while a natural gas-oxygen burner directed into the open end of the furnace heats the mixture. When all of the aluminum in the batch has melted, the furnace is tilted forward, and the molten aluminum is poured into crucibles for transport, transferred to the reverberatory furnace or poured into sow molds to solidify. The remaining slag or salt cake is dumped out of the furnace by tilting and rotating into pans for cooling and ultimately disposal.

Emissions from these process units are captured by a hood and directed to a lime reagent injected baghouse system for control of the regulated pollutants. The emission control system injects the lime into the air stream prior to the inlet of the baghouse to reduce the concentration of specific pollutants present in the exhaust gases. The baghouse then captures the reacted material and other particulate matter from the melting process.

Salt Cake/Hot Dross

The salt cake cooling process uses a series of hoods and ducts to capture the emissions. To control process emissions, the exhausts from the various hoods are ducted to a baghouse system.

1.3 Project Team

Personnel involved in this project are identified in the following table.

**Table 1-1
Project Team**

RAR Personnel	Jeff Ferg Janine Caldwell
MDEQ Personnel	Jeremy Howe Rex Lane
AST Personnel	Kenji Kinoshita Tyler Branca Keith Rhodes Mark Godman

1.4 Site Specific Test Plan & Notification

Testing was conducted in accordance with the Site-Specific Test Plan (SSTP) submitted to MDEQ on June 1, 2018.

1.5 Test Program Notes

On August 1, 2018 during Run 1 for the FGIMROTFURN1/2, the SO₂ concentration exceeded the span of the analyzer. A higher concentration calibration gas was introduced to the analyzer after the run to verify linearity. The analyzer was recalibrated at a higher span for the remainder of the testing.

Per the request of RAR, NO_x data was collected at the reverberatory furnace flue stack (SVIMREVFLUE-S2) for process emission data collection purposes. NO_x testing was conducted in accordance with U.S. EPA Reference Test Method 7E. The methodology was part of the SSTP for testing on the rotary furnaces (FGIMROTFURN1/2) but was not specifically listed as a pollutant to be monitored on the reverberatory furnace flue.

2.0 Summary of Results

AST conducted compliance testing at the RAR facility in Coldwater (S), Michigan on July 31, 2018 – August 2, 2018. Testing consisted of determining the emission rates of PM10 and HCl at the reverberatory furnace flue (SVIMREVFLUE-S2) stack, the emission rates of PM and PM10 at the exhaust of the salt cake/hot dross handling baghouse (EUIMHOTDROSS), and the emission rates of NO_x and SO₂ at the baghouse exhaust associated with two (2) rotary furnaces (FGIMROTFURN1/2).

Tables 2-1 through 2-3 provide summaries of the emission testing results with comparisons to the applicable state permit limits. These tables also provide summaries of the process operating and control system data collected during testing. Any difference between the summary results listed in the following tables and the detailed results contained in appendices is due to rounding for presentation.

Table 2-1
Summary of Results – SVIMREVFLUE-S2

Emissions Data				
Run Number	Run 1	Run 2	Run 3	Average
Date	7/31/18	7/31/18	7/31/18	–
Filterable Particulate Matter Data				
Emission Factor, lb/ton	0.46	0.25	0.22	0.31
Emission Limit, lb/ton	--	--	--	0.854
Percent of Limit, %	--	--	--	36
Particulate Matter <10 Microns Data ¹				
Emission Factor, lb/ton	2.9	1.1	0.96	1.6
Emission Limit, lb/ton	--	--	--	1.114
Percent of Limit, %	--	--	--	> 100
Hydrogen Chloride Data				
Emission Factor, lb/ton	0.87	0.62	0.47	0.66
Emission Limit, lb/ton	--	--	--	1.648
Percent of Limit, %	--	--	--	40
Nitrogen Oxides Data				
Emission Rate, lb/hr	0.34	0.35	0.38	0.36
Emission Limit, lb/hr	--	--	--	0.171
Percent of Limit, %	--	--	--	>100
Emission Factor, lb/ton	0.082	0.072	0.081	0.078
Process Operating / Control System Data				
Run Number	Run 1	Run 2	Run 3	Average
Date	7/31/18	7/31/18	7/31/18	–
Feed Rate, lb/hr	8,210	9,817	9,404	9,143
Baghouse Inlet Temperature, °F	106	116	117	113
Flux Percentage, %	2.56	3.12	3.17	2.95
Lime Injection Rate, lb/hr	--	--	--	27

¹ PM10 data is the summation of filterable and condensable PM. All filterable PM is considered to be filterable PM10.

Table 2-2
Summary of Results – EUMHOTDROSS

Emissions Data				
Run Number	Run 1	Run 2	Run 3	Average
Date	8/1/18	8/1/18	8/2/18	–
Filterable Particulate Matter Data				
Emission Factor, lb/1000lbs Dry Grass	0.0030	0.0031	0.0018	0.0026
Emission Limit, lb/1000lbs Dry Grass	--	--	--	0.1
Percent of Limit, %	--	--	--	3
Particulate Matter <10 Microns Data ¹				
Emission Rate, lb/hr	0.74	0.68	0.46	0.63
Emission Limit, lb/hr	--	--	--	1.61
Percent of Limit, %	--	--	--	39
Process Operating / Control System Data				
Run Number	Run 1	Run 2	Run 3	Average
Date	8/1/18	8/1/18	8/2/18	–
Feed Rate, lb/hr	34,027	34,971	71,611	46,870

¹ PM10 data is the summation of filterable and condensable PM. All filterable PM is considered to be filterable PM10.

Table 2-3
Summary of Results – FGIMROTFURN1/2

Emissions Data				
Run Number	Run 1	Run 2	Run 3	Average
Date	8/1/18	8/1/18	8/2/18	–
Nitrogen Oxides Data				
Emission Factor, lb/ton	0.32	0.50	0.30	0.37
Emission Limit, lb/ton	--	--	--	0.754
Percent of Limit, %	--	--	--	49
Sulfur Dioxide Data				
Emission Factor, lb/ton *	0.99	0.14	0.00	0.38
Emission Limit, lb/ton	--	--	--	0.439
Percent of Limit, %	--	--	--	86
Process Operating / Control System Data				
Run Number	Run 1	Run 2	Run 3	Average
Date	8/1/18	8/1/18	8/2/18	–
RF No. 1 Feed Rate, lb/hr	12,720	12,804	13,650	13,058
RF No. 2 Feed Rate, lb/hr	13,121	12,407	14,009	13,179
RF No. 1 Flux Percentage, %	4.8	6.7	8.8	6.8
RF No. 2 Flux Percentage, %	3.8	10.8	10.1	8.2
Baghouse Inlet Temperature, °F	174	174	148	165
Baghouse Lime Injection Rate, lb/hr	178	176	176	177

* After post run bias calculations were applied to the SO₂ concentration for Run 3, the corrected value was negative and therefore, reported as zero.

3.0 Testing Methodology

The emission testing program was conducted in accordance with the test methods listed in Table 3-1. Method descriptions are provided below while quality assurance/quality control data is provided in Appendix D.

**Table 3-1
Source Testing Methodology**

Parameter	U.S. EPA Reference Test Methods	Notes/Remarks
Volumetric Flow Rate	1 & 2	Full Velocity Traverses
Oxygen / Carbon Dioxide	3A	Instrumental Analysis
Moisture Content	4	Volumetric / Gravimetric Analysis
Particulate Matter	5 / 202	Isokinetic Sampling
Sulfur Dioxide	6C	Instrumental Analysis
Nitrogen Oxides	7E	Instrumental Analysis
Hydrogen Chloride	26	Constant Rate Sampling
Gas Dilution System Certification	205	--

3.1 U.S. EPA Reference Test Methods 1 and 2 – Sampling/Traverse Points and Volumetric Flow Rate

The sampling location and number of traverse (sampling) points were selected in accordance with U.S. EPA Reference Test Method 1. To determine the minimum number of traverse points, the upstream and downstream distances were equated into equivalent diameters and compared to Figure 1-1 (for isokinetic sampling) and/or Figure 1-2 (measuring velocity alone) in U.S. EPA Reference Test Method 1.

Full velocity traverses were conducted in accordance with U.S. EPA Reference Test Method 2 to determine the average stack gas velocity pressure, static pressure and temperature. The velocity and static pressure measurement system consisted of a pitot tube and inclined manometer. The stack gas temperature was measured with a K-type thermocouple and pyrometer.

The EUIMHOTDROSS O₂ and CO₂ concentration were assumed to be ambient for molecular weight and volumetric flow rate calculations.

3.2 U.S. EPA Reference Test Method 3A – Oxygen/Carbon Dioxide

The oxygen (O₂) and carbon dioxide (CO₂) testing was conducted in accordance with U.S. EPA Reference Test Method 3A. Data was collected online and reported in one-minute averages. The sampling system consisted of a stainless-steel probe, Teflon sample line(s), gas conditioning system and the identified gas analyzer. The gas conditioning system was a non-contact condenser used to remove moisture from the stack gas. If an unheated Teflon sample line was used, then a portable non-contact condenser was placed in the system directly after the probe. Otherwise, a heated Teflon sample line was used. The quality control measures are described in Section 3.9.

3.3 U.S. EPA Reference Test Method 4 – Moisture Content

The stack gas moisture content was determined in accordance with U.S. EPA Reference Test Method 4. The gas conditioning train consisted of a series of chilled impingers. Prior to testing, each impinger was filled with a known quantity of water or silica gel. Post testing, the quantities of water and silica gel were measured to determine the amount of moisture condensed during the test run. Alternatively, each impinger was analyzed gravimetrically before and after each test run on the same balance to determine the amount of moisture condensed.

3.4 U.S. EPA Reference Test Methods 5 and 202 – Total Particulate Matter

The total particulate matter (filterable and condensable PM) testing was conducted in accordance with U.S. EPA Reference Test Methods 5 and 202. The complete sampling system consisted of a glass nozzle, glass-lined probe, pre-weighed quartz filter, coil condenser, un-weighed Teflon filter, gas conditioning train, pump and calibrated dry gas meter. The gas conditioning train consisted of a coiled condenser and four (4) chilled impingers. The first, and second impingers were initially empty, the third contained 100 mL of de-ionized water and the last impinger contained 200-300 grams of silica gel. The un-weighed 90 mm Teflon filter was placed between the second and third impingers. The probe liner heating system was maintained at a temperature of $248 \pm 25^\circ\text{F}$, and the impinger temperature was maintained at 68°F or less throughout testing. The temperature of the Teflon filter was maintained greater than 65°F but less than or equal to 85°F .

Following the completion of each test run, the sampling train was leak checked at a vacuum pressure greater than or equal to the highest vacuum pressure observed during the run. Condensate was collected in the first dry impinger, therefore the front-half of the sample train (the nozzle, probe, and heated pre-weighed filter) was removed in order to purge the back-half of the sample train (coil condenser, first and second impingers and CPM filter). A glass bubbler was inserted into the first impinger. If needed, de-ionized ultra-filtered (DIUF) water was added to the first impinger to raise the water level above the bubbler, then the coil condenser was replaced. Zero nitrogen was connected to the condenser, and a 60-minute purge at 14 liters per minute was conducted. After the completion of the nitrogen purge the impinger contents were measured for moisture gain.

The pre-weighed quartz filter was carefully removed and placed in container 1. The probe, nozzle and front half of the filter holder were rinsed three (3) times with acetone to remove any adhering particulate matter and these rinses were recovered in container 2. All containers were sealed, labeled and liquid levels marked for transport to the identified laboratory for filterable particulate matter analysis.

The contents of impingers 1 and 2 were recovered in container CPM Cont. #1. The back half of the filterable PM filter holder, the coil condenser, impingers 1 and 2 and all connecting glassware were rinsed with DIUF water and then rinsed with acetone, followed by hexane. The water rinses were added to container CPM Cont. #1 while the solvent rinses were recovered in container CPM Cont. #2. The Teflon filter was removed from the filter holder and placed in container CPM Cont. #3. The front half of the condensable PM filter holder was rinsed with DIUF water and then with acetone, followed by hexane. The water rinse was added to container CPM Cont. #1 while the solvent rinses were added to container CPM Cont. #2. All containers were sealed, labeled and liquid levels marked for transport to the identified laboratory for condensable particulate matter analysis.

3.5 U.S. EPA Reference Test Method 6C – Sulfur Dioxide

The sulfur dioxide (SO_2) testing was conducted in accordance with U.S. EPA Reference Test Method 6C. Data was collected online and reported in one-minute averages. The sampling system consisted of a heated stainless-steel

probe, Teflon sample line(s), gas conditioning system and the identified analyzer. The gas conditioning system was a non-contact condenser used to remove moisture from the source gas. If an unheated Teflon sample line was used, then a portable non-contact condenser was placed in the system directly after the probe. Otherwise, a heated Teflon sample line was used. The quality control measures are described in Section 3.9.

3.6 U.S. EPA Reference Test Method 7E – Nitrogen Oxides

The nitrogen oxides (NO_x) testing was conducted in accordance with U.S. EPA Reference Test Method 7E. Data was collected online and reported in one-minute averages. The sampling system consisted of a stainless-steel probe, Teflon sample line(s), gas conditioning system and the identified gas analyzer. The gas conditioning system was a non-contact condenser used to remove moisture from the stack gas. If an unheated Teflon sample line was used, then a portable non-contact condenser was placed in the system directly after the probe. Otherwise, a heated Teflon sample line was used. The quality control measures are described in Section 3.9.

3.7 U.S. EPA Reference Test Method 26 – Hydrogen Chloride

The hydrogen chloride testing was conducted in accordance with U.S. EPA Reference Test Method 26. The complete sampling system consisted of a glass nozzle, heated glass-lined probe, heated Teflon filter, gas conditioning train, pump and calibrated dry gas meter. The gas conditioning train consisted of four (4) chilled impingers. The first and second impingers contained 100 mL of 0.1 N H₂SO₄, the third was initially empty and the fourth contained 200-300 grams of silica gel. The probe liner and filter heating systems were maintained at 248-273°F, and the impinger temperature was maintained at 20°C (68°F) or less throughout the testing.

Following the completion of each test run, the sampling train was leak checked at a vacuum pressure greater than or equal to the highest vacuum pressure observed during the run and the contents of the impingers were measured for moisture gain. The absorbing solution (0.1 N H₂SO₄) from the first and second impingers was placed into sample container 3. The back-half of the filter holder, first, second and third impingers and all glassware leading to the outlet of the third impinger were rinsed with de-ionized (DI) water. These rinses were also placed in container 3. All containers were sealed, labeled and liquid levels marked for transport to the identified laboratory for analysis.

3.8 U.S. EPA Reference Test Method 205 – Gas Dilution System Certification

A calibration gas dilution system field check was conducted in accordance with U.S. EPA Reference Method 205. Multiple dilution rates and total gas flow rates were utilized to force the dilution system to perform two dilutions on each mass flow controller. The diluted calibration gases were sent directly to the analyzer, and the analyzer response recorded in an electronic field data sheet. The analyzer response agreed within 2% of the actual diluted gas concentration. A second Protocol 1 calibration gas, with a cylinder concentration within 10% of one of the gas divider settings described above, was introduced directly to the analyzer, and the analyzer response recorded in an electronic field data sheet. The cylinder concentration and the analyzer response agreed within 2%. These steps were repeated three (3) times. Copies of the Method 205 data can be found in the Quality Assurance/Quality Control Appendix.

3.9 Quality Assurance/Quality Control – U.S. EPA Reference Test Methods 3A, 6C and 7E

Cylinder calibration gases used met EPA Protocol 1 (+/- 2%) standards. Copies of all calibration gas certificates can be found in the Quality Assurance/Quality Control Appendix.

Low Level gas was introduced directly to the analyzer. After adjusting the analyzer to the Low-Level gas concentration and once the analyzer reading was stable, the analyzer value was recorded. This process was repeated

for the High-Level gas. For the Calibration Error Test, Low, Mid, and High-Level calibration gases were sequentially introduced directly to the analyzer. All values were within 2.0 percent of the Calibration Span or 0.5 ppmv absolute difference.

High or Mid-Level gas (whichever was closer to the stack gas concentration) was introduced at the probe and the time required for the analyzer reading to reach 95 percent or 0.5 ppm (whichever was less restrictive) of the gas concentration was recorded. The analyzer reading was observed until it reached a stable value, and this value was recorded. Next, Low Level gas was introduced at the probe and the time required for the analyzer reading to decrease to a value within 5.0 percent or 0.5 ppm (whichever was less restrictive) was recorded. If the Low-Level gas was zero gas, the response was 0.5 ppm or 5.0 percent of the upscale gas concentration (whichever was less restrictive). The analyzer reading was observed until it reached a stable value and this value was recorded. The measurement system response time and initial system bias were determined from these data. The System Bias was within 5.0 percent of the Calibration Span or 0.5 ppmv absolute difference

High or Mid-Level gas (whichever was closer to the stack gas concentration) was introduced at the probe. After the analyzer response was stable, the value was recorded. Next, Low Level gas was introduced at the probe, and the analyzer value recorded once it reached a stable response. The System Bias was within 5.0 percent of the Calibration Span or 0.5 ppmv absolute difference or the data was invalidated, and the Calibration Error Test and System Bias were repeated.

Drift between pre- and post-run System Bias was within 3% of the Calibration Span or 0.5 ppmv absolute difference. If the drift exceeded 3% or 0.5 ppmv, the Calibration Error Test and System Bias were repeated.

To determine the number of sampling points, a gas stratification check was conducted prior to initiating testing. The pollutant concentrations were measured at three points (16.7, 50.0 and 83.3 percent of the measurement line). Each traverse point was sampled for a minimum of twice the system response time.

If the pollutant concentration at each traverse point did not differ more than 5% or 0.5 ppm (whichever was less restrictive) of the average pollutant concentration, then single point sampling was conducted during the test runs. Copies of stratification check data can be found in the Quality Assurance/Quality Control Appendix.

An NO₂ – NO converter check was performed on the analyzer at the completion of testing. An approximately 50 ppm nitrogen dioxide cylinder gas was introduced directly to the NO_x analyzer and the instrument response was recorded in an electronic data sheet. The instrument response was within +/- 10 percent of the cylinder concentration.

A Data Acquisition System with battery backup was used to record the instrument response in one (1) minute averages. The data was continuously stored as a *.CSV file in Excel format on the hard drive of a computer. At the completion of testing, the data was also saved to the AST server. All data was reviewed by the Field Team Leader before leaving the facility. Once arriving at AST's office, all written and electronic data was relinquished to the report coordinator and then a final review was performed by the Project Manager.