



TOTAL AIR ANALYSIS, INC.

**EMISSIONS SOURCE
TEST REPORT**

**LIEBHERR 250 KW ENGINE
FRAUENFELD (SWITZERLAND)
Waste Water Treatment Plant**

Prepared For:

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Attn: Bill Morton

Test Dates: July 8, 2014
Report Date: August 11, 2014
Report Identification No: MF-141223

Prepared By:

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Carson, CA 90745

Performed by: _____

Russ P. Logan, President

TABLE OF CONTENTS

	<u>Page</u>
1.0 Summary of Results	1
2.0 Introduction	2
3.0 Process Description	2
3.1 <i>Equipment Description</i>	2
4.0 Test Description	2
4.1 <i>Test Requirements and Locations</i>	2
4.2 <i>Operating Parameters</i>	2
5.0 Sampling and Analytical Procedures	3
5.1 <i>EPA CTM-030 - Portable Gaseous Emissions Sampling</i>	3
5.2 <i>EPA Method 18 - Total Hydrocarbons Determination</i>	3
6.0 Test Results and Discussion	3
7.0 Quality Assurance/Quality Control	3

LIST OF APPENDICES

	<u>Page</u>
Appendix A - EPA Method CTM-030 – Emission Calculations and DAS Data.....	4
Appendix B - EPA Method 18.....	16
Appendix C - Operating Data.....	20
Appendix D - Quality Assurance/Quality Control.....	23

1.0 SUMMARY OF RESULTS

Facility: Frauenfeld, Switzerland WWTP
Source: Liebherr 250 KW GenSet
Date: 7/8/2014

Parameter/Condition Run No.	Units	Bio-Gas 1	Bio-Gas 2	Bio-Gas 3	Limits SCAQMD	Pass/Fail
NOx	ppmv	3.28	1.98	1.09	Rule 1110.2 11	Pass
NOx @ 15% O ₂	ppmv	0.93	0.56	0.31		
CO	ppmv	78.75	53.68	27.48	250	Pass
CO @ 15% O ₂	ppmv	22.36	15.25	7.80		
Total Hydrocarbons						
Methane	ppm	-	432	-	30	Pass
TOC, non-methane	ppm	-	2.00	-		
TOC @ 15% O ₂	ppm	-	0.57	-		
O ₂	%	0.00	0.00	0.00	-	-
CO ₂	%	11.70	11.70	11.70	-	-

2.0 Introduction

Total Air Analysis, Inc. was contracted to perform an emissions source test program on one (1) GenSet internal combustion engine (ICE) operated at the Frauenfeld Waste Water Treatment Plant in Switzerland. The purpose of the source test was to determine the emissions of Nitrogen Oxides (NO_x), Carbon Monoxide (CO), Carbon Dioxide (CO₂), and oxygen (O₂) in accordance with SCAQMD emission limits.

3.0 Process Description

Avesco AG operates a Liebherr 250 KW Internal Combustion Engine (ICE) firing on digester gas at the Frauenfeld Waste Water Treatment Plant in Switzerland. Triplicate twenty (20) minute sample runs were performed for NO_x, CO, CO₂ and O₂. A single sample was taken for total hydrocarbons using EPA Method 18.

3.1 *Equipment Description*

The ICE is a Liebherr Rich burn digester gas fired eight (8) cylinder four-stroke engine driving a 250 kW electrical generator. The exhaust is outfitted with Avesco AG's proprietary exhaust gas recirculation system and a non-selective catalytic converter.

4.0 Test Description

4.1 *Testing Requirements and Locations*

The source testing was conducted at the exhaust of the ICE after the catalytic converter. Table 1 summarizes the test methods used, sampling duration, and number of tests.

Table 1
Testing Location and Requirements

<i>Parameter</i>	<i>Test Methods</i>	<i>Test Locations</i>	<i>Test Duration per Run</i>	<i>Number of Tests</i>
NO _x , CO, O ₂ , CO ₂	EPA CTM-030	Exhaust	20 Minutes	Triplicate
Total Hydrocarbons	EPA Method 18	Exhaust	20 Minutes	Single

4.2 *Operating Parameters*

Operating parameters were documented during the source test using existing monitoring instruments. See Appendix C for a picture of the control panel taken during the test.

5.0 Sampling and Analytical Procedures

5.1 CTM-030 – Portable Gaseous Emissions Sampling

An ECOM J2KN portable instrument was used to determine post-cat exhaust emissions. NO_x, CO, CO₂ and O₂ were measured to determine emission levels during triplicate twenty (20) minute tests. This instrument was calibrated before and after this test. Results are found in Appendix A.

5.2 EPA Method 18 - Total Hydrocarbons Determination

The apparatus consists of a stainless steel probe connected by Teflon line to an airtight canister. Sample gas was drawn into the 1-liter canister. The sample was 20 minutes in duration.

Upon completion the sample was sealed and transported to SGS-RUK Laboratory in Germany. Sample was then injected into the GC for Methane and TOC analysis.

6.0 Test Results and Discussion

The emissions tests were conducted at the exhaust of the ICE GenSet. Triplicate 20-minute tests were conducted for NO_x, CO, CO₂ and O₂. Total Hydrocarbons were sampled using EPA Method 18 and analyzed by GC.

Results of the emissions tests are summarized in Section 1.0 (Summary of Results).

7.0 Quality Assurance and Quality Control

Total Air Analysis, Inc. applies stringent quality control and quality assurance procedures to ensure the validity of measurements for all projects. Our QA/QC procedures are documented in detailed quality assurance project plans similar to those used by the EPA, CARB, SCAQMD, and SDAPCD.

- ∞ Total Air Analysis QA/QC procedures follow guidelines in *Quality Assurance Handbook for Air Pollution Measurement Systems*, Volumes I through III. These procedures outline pretest preparation and calibrations of sampling equipment, post-test sample handling, and post-test calibrations.

Appendix A

EPA Method CTM-030 Emission Calibrations and DAS Data



FORM 3A: Periodic Monitoring Recordkeeping Form For Portable Analyzers
 SCAQMD RULE 1110.2 Emissions from Gaseous and Liquid-Fueled Engines

DATE: 7/8/2014 TIME (start/stop): 10:42 / 11:01 NAME: Total Air Analysis, Inc.

FACILITY NAME: ARA Frauenfeld, Switzerland ANALYZER (Make/Model): ECOM J2KN

Facility: Wastewater Treatment Plant Analyzer S/N: 2701 OCNX

Engine Name: Avesco 250 KW GenSet Date of Last Stability Check ¹: 8/2/2013

Permit to Operate: Date of Last Linearity Check ²: 8/2/2013

Application No.: 1. Stability check must be conducted within 12 months of test date
2. Linearity check must be conducted within 12 months of test date

"As Found" Test Results Date: 7/8/2014

Time Start: 10:42:10 AM Ambient Temperature (°F):

Time End: 11:01:25 AM Engine Hour Meter Reading:

Constituent	CO (ppm)	NO (ppm)	NO ₂ (ppm)	O ₂ (%)
Measured, C _{MEAS} *	76.95	2.53	0.78	0.00
Cal Adjusted, C _{CORR}	78.7	2.5	0.8	0.00

Calibration Results

Date of Pre-Test Calibration: 7/3/2014

Date of Post-Test Calibration: 7/11/2014

Constituent	CO (ppm)	NO (ppm)	NO ₂ (ppm)	O ₂ (%)
Pre-Test Zero	0	0	0	0
Post-Test Zero	0	0	0	0
Mean Zero, C _{CZ}	0	0	0	0
Span Gas, C _{CAL}	89.80	22.42	74.5	20.95
Pre-Test Span	87.5	22.8	75.0	21.00
Post-Test Span	88.0	22.5	74.8	21.00
Mean Span, C _{CM}	87.8	22.6	74.9	21.00
Drift, %	0.57	-1.10	-0.33	0.00

Example Calculation:
$$C_{ADJ} = (C_{MEAS} - C_{CZ}) \times \left(\frac{C_{CAL}}{C_{CM} - C_{CZ}} \right)$$

Constituent	CO (ppm)	NO (ppm)	Engine Operating Conditions:
C _{ADJ} @ 15% O ₂ , N	22.4	0.9	Normal Operating Conditions KW - 256
Compliance Limit	250.0	11.0	
Difference	227.6	10.1	

Drift Calculation is listed in Section 3.6, Periodic Monitoring Protocol

"As Left" Test Results (if applicable) Date:

Time Start: Ambient Temperature (°F):

Time End: Engine Hour Meter Reading:

Constituent	CO (ppm)	NO (ppm)	NO ₂ (ppm)	O ₂ (%)
Measured, C _{MEAS} *				
Cal Adjusted, C _{ADJ}				

Constituent	CO (ppm)	NO ₂ (ppm)	Engine Operating Conditions:
C _{ADJ} @ 15% O ₂ , N			
Compliance Limit			
Difference			

Describe any engine or control system maintenance or tuning conducted after the "As Found" Test to bring the engine into compliance (attach additional documentation as necessary):

* Attach printouts from the portable analyzer or the manual record of constituent concentrations during the test.

CERTIFICATION: Based on the calibrations and measurements performed in accordance with this protocol, I certify that the statements and information contained in this report are true, accurate, complete and representative of the emissions from this source.

Russ P. Logan
 Test Conducted By
 President
 Title

Signature
 7/8/2014
 Date



FORM 3A: Periodic Monitoring Recordkeeping Form For Portable Analyzers
 SCAQMD RULE 1110.2 Emissions from Gaseous and Liquid-Fueled Engines

DATE: 7/8/2014 TIME (start/stop): 11:04 / 11:24 NAME: Total Air Analysis, Inc.

FACILITY NAME: ARA Frauenfeld, Switzerland ANALYZER (Make/Model): ECOM J2KN

Facility ID Number: Wastewater Treatment Plant Analyzer S/N: 2701 OCNX

Engine Name: Avesco 250 KW GenSet Date of Last Stability Check¹: 8/2/2013

Permit to Operate: Date of Last Linearity Check²: 8/2/2013

Application No.:

1. Stability check must be conducted within 12 months of test date
 2. Linearity check must be conducted within 12 months of test date

"As Found" Test Results Date: 7/8/2014

Time Start: 11:04:55 AM Ambient Temperature (°F):

Time End: 11:24:25 AM Engine Hour Meter Reading:

Constituent	CO (ppm)	NO (ppm)	NO ₂ (ppm)	O ₂ (%)
Measured, C _{MEAS} *	52.46	2.00	0.00	0.00
Cal Adjusted, C _{CORR}	53.7	2.0	0.0	0.00

Example Calculation: $C_{ADJ} = (C_{MEAS} - C_{CZ}) \times \left(\frac{C_{CAL}}{C_{CM} - C_{CZ}} \right)$

Constituent	CO (ppm)	NO _x (ppm)	Engine Operating Conditions: Normal Operating Conditions 255 KW
C _{ADJ} @ 15% O ₂ , N	15.2	0.6	
Compliance Limit	250.0	11.0	
Difference	234.8	10.4	

Calibration Results

Date of Pre-Test Calibration: 7/3/2014

Date of Post-Test Calibration: 7/11/2014

Constituent	CO (ppm)	NO (ppm)	NO ₂ (ppm)	O ₂ (%)
Pre-Test Zero	0	0	0	0
Post-Test Zero	0	0	0	0
Mean Zero, C _{CZ}	0	0	0	0
Span Gas, C _{CAL}	89.80	22.42	74.5	20.95
Pre-Test Span	87.5	22.8	75.0	21.00
Post-Test Span	88.0	22.5	74.8	21.00
Mean Span, C _{CM}	87.8	22.6	74.9	21.00
Drift, %	0.57	-1.10	-0.33	0.00

Drift Calculation is listed in Section 3.6, Periodic Monitoring Protocol

"As Left" Test Results (if applicable) Date:

Time Start: Ambient Temperature (°F):

Time End: Engine Hour Meter Reading:

Constituent	CO (ppm)	NO (ppm)	NO ₂ (ppm)	O ₂ (%)
Measured, C _{MEAS} *				
Cal Adjusted, C _{ADJ}				
Constituent	CO (ppm)	NO _x (ppm)	Engine Operating Conditions:	
C _{ADJ} @ 15% O ₂ , N				
Compliance Limit				
Difference				

Describe any engine or control system maintenance or tuning conducted after the "As Found" Test to bring the engine into compliance (attach additional documentation as necessary):

* Attach printouts from the portable analyzer or the manual record of constituent concentrations during the test.

CERTIFICATION: Based on the calibrations and measurements performed in accordance with this protocol, I certify that the statements and information contained in this report are true, accurate, complete and representative of the emissions from this source.

Russ P. Logan
 Test Conducted By
 President
 Title

Signature
 7/8/2014
 Date



FORM 3A: Periodic Monitoring Recordkeeping Form For Portable Analyzers
 SCAQMD RULE 1110.2 Emissions from Gaseous and Liquid-Fueled Engines

DATE: 7/8/2014 TIME (start/stop): 11:27 / 11:47 NAME: Total Air Analysis, Inc.

FACILITY NAME: ARA Frauenfeld, Switzerland ANALYZER (Make/Model): ECOM J2KN

Facility ID Number: Wastewater Treatment Plant Analyzer S/N: 2701 OCNX

Engine Name: Avesco 250 KW GenSet Date of Last Stability Check ¹: 8/2/2013

Permit to Operate: Date of Last Linearity Check ²: 8/2/2013

Application No.: *1. Stability check must be conducted within 12 months of test date*
2. Linearity check must be conducted within 12 months of test date

"As Found" Test Results Date: 7/8/2014

Time Start: 11:27:25 AM Ambient Temperature (°F):

Time End: 11:47:40 AM Engine Hour Meter Reading:

Constituent	CO (ppm)	NO (ppm)	NO ₂ (ppm)	O ₂ (%)
Measured, C _{MEAS} *	26.85	1.00	0.10	0.00
Cal Adjusted, C _{CORR}	27.5	1.0	0.1	0.00

Calibration Results

Date of Pre-Test Calibration: 7/3/2014

Date of Post-Test Calibration: 7/11/2014

Constituent	CO (ppm)	NO (ppm)	NO ₂ (ppm)	O ₂ (%)
Pre-Test Zero	0	0	0	0
Post-Test Zero	0	0	0	0
Mean Zero, C _{CZ}	0	0	0	0
Span Gas, C _{CAL}	89.80	22.42	74.5	20.95
Pre-Test Span	87.5	22.8	75.0	21.00
Post-Test Span	88.0	22.5	74.8	21.00
Mean Span, C _{CM}	87.8	22.6	74.9	21.00
Drift, %	0.57	-1.10	-0.33	0.00

Example Calculation: $C_{ADJ} = (C_{MEAS} - C_{CZ}) \times \left(\frac{C_{CAL}}{C_{CM} - C_{CZ}} \right)$

Constituent	CO (ppm)	NO _x (ppm)	Engine Operating Conditions: Normal Operating Conditions KW - 256
C _{ADJ} @ 15% O ₂ , N	7.8	0.3	
Compliance Limit	250.0	11.0	
Difference	242.2	10.7	

Drift Calculation is listed in Section 3.6, Periodic Monitoring Protocol

"As Left" Test Results (If applicable) Date:

Time Start: Ambient Temperature (°F):

Time End: Engine Hour Meter Reading:

Constituent	CO (ppm)	NO (ppm)	NO ₂ (ppm)	O ₂ (%)
Measured, C _{MEAS} *				
Cal Adjusted, C _{ADJ}				

Constituent	CO (ppm)	NO _x (ppm)	Engine Operating Conditions:
C _{ADJ} @ 15% O ₂ , N			
Compliance Limit			
Difference			

Describe any engine or control system maintenance or tuning conducted after the "As Found" Test to bring the engine into compliance (attach additional documentation as necessary):

* Attach printouts from the portable analyzer or the manual record of constituent concentrations during the test.

CERTIFICATION: Based on the calibrations and measurements performed in accordance with this protocol, I certify that the statements and information contained in this report are true, accurate, complete and representative of the emissions from this source.

Russ P. Logan
 Test Conducted By
 President
 Title

Signature
 7/8/2014
 Date

Total Air Analysis, Inc Data Acquisition System

Facility: ARA Frauenfeld, Switzerland
Date: 7/8/2014
Source: ICE GenSet, 250 KW Max
Run No.: 1

Date	Time	O2	CO	NO	NO2
7/8/2014	10:42:10	0	169	3	1
7/8/2014	10:42:25	0	203	3	0
7/8/2014	10:42:40	0	202	3	0
7/8/2014	10:42:55	0	173	3	1
7/8/2014	10:43:10	0	138	3	2
7/8/2014	10:43:25	0	113	3	1
7/8/2014	10:43:40	0	94	3	1
7/8/2014	10:43:55	0	69	4	4
7/8/2014	10:44:10	0	83	4	2
7/8/2014	10:44:25	0	78	4	2
7/8/2014	10:44:40	0	86	4	2
7/8/2014	10:44:55	0	108	3	2
7/8/2014	10:45:10	0	137	3	2
7/8/2014	10:45:25	0	108	3	2
7/8/2014	10:45:40	0	70	3	1
7/8/2014	10:45:55	0	61	5	1
7/8/2014	10:46:10	0	39	6	1
7/8/2014	10:46:25	0	47	6	1
7/8/2014	10:46:40	0	122	4	1
7/8/2014	10:46:55	0	148	3	1
7/8/2014	10:47:10	0	153	3	1
7/8/2014	10:47:25	0	172	2	1
7/8/2014	10:47:40	0	194	2	1
7/8/2014	10:47:55	0	187	2	1
7/8/2014	10:48:10	0	138	2	1
7/8/2014	10:48:25	0	101	2	1
7/8/2014	10:48:40	0	66	2	1
7/8/2014	10:48:55	0	32	3	1
7/8/2014	10:49:10	0	21	3	1
7/8/2014	10:49:25	0	52	3	1
7/8/2014	10:49:40	0	92	2	1
7/8/2014	10:49:55	0	109	2	1
7/8/2014	10:50:10	0	81	2	1
7/8/2014	10:50:25	0	61	2	1
7/8/2014	10:50:40	0	85	2	1
7/8/2014	10:50:55	0	102	2	1
7/8/2014	10:51:10	0	100	2	1
7/8/2014	10:51:25	0	81	2	1
7/8/2014	10:51:40	0	70	2	1
7/8/2014	10:51:55	0	64	2	1
7/8/2014	10:52:10	0	64	2	1
7/8/2014	10:52:25	0	73	2	1
7/8/2014	10:52:40	0	70	2	1
7/8/2014	10:52:55	0	58	2	1
7/8/2014	10:53:10	0	45	2	1
7/8/2014	10:53:25	0	37	2	1
7/8/2014	10:53:40	0	38	2	1
7/8/2014	10:53:55	0	29	2	1
7/8/2014	10:54:10	0	20	2	1

7/8/2014	10:54:25	0	16	2	1
7/8/2014	10:54:40	0	47	2	1
7/8/2014	10:54:55	0	52	2	1
7/8/2014	10:55:10	0	44	2	0
7/8/2014	10:55:25	0	48	2	0
7/8/2014	10:55:40	0	47	2	0
7/8/2014	10:55:55	0	42	2	0
7/8/2014	10:56:10	0	40	2	0
7/8/2014	10:56:25	0	35	2	0
7/8/2014	10:56:40	0	21	2	0
7/8/2014	10:56:55	0	11	3	0
7/8/2014	10:57:10	0	9	3	0
7/8/2014	10:57:25	0	28	3	0
7/8/2014	10:57:40	0	29	3	0
7/8/2014	10:57:55	0	68	2	0
7/8/2014	10:58:10	0	83	2	0
7/8/2014	10:58:25	0	89	2	0
7/8/2014	10:58:40	0	94	2	0
7/8/2014	10:58:55	0	92	1	0
7/8/2014	10:59:10	0	73	1	0
7/8/2014	10:59:25	0	62	2	0
7/8/2014	10:59:40	0	28	2	0
7/8/2014	10:59:55	0	14	2	0
7/8/2014	11:00:10	0	13	2	0
7/8/2014	11:00:25	0	7	3	0
7/8/2014	11:00:40	0	13	3	1
7/8/2014	11:00:55	0	36	2	0
7/8/2014	11:01:10	0	97	2	0
7/8/2014	11:01:25	0	121	2	0
Average		0.00	76.95	2.53	0.78
7/8/2014	11:01:40	18.2	126	1	0
7/8/2014	11:01:55	20.8	34	1	0 Ambient
7/8/2014	11:02:10	20.9	8	1	0 Air
7/8/2014	11:02:25	21	3	1	0
7/8/2014	11:02:40	21	2	1	0
7/8/2014	11:02:55	21	1	1	0
7/8/2014	11:03:10	21	1	1	0
7/8/2014	11:03:25	20.9	1	1	0
7/8/2014	11:03:40	21	0	1	0
7/8/2014	11:03:55	21	0	1	1
7/8/2014	11:04:10	0.8	0	1	2
7/8/2014	11:04:25	0.2	3	1	1
7/8/2014	11:04:40	0	6	1	1

Total Air Analysis, Inc Data Acquisition System

Facility: ARA Frauenfeld, Switzerland

Date: 7/8/2014

Source: ICE GenSet, 250 KW Max

Run No.: 2

Date	Time	O2	CO	NO	NO2
7/8/2014	11:04:55	0	33	1	0
7/8/2014	11:05:10	0	70	1	0
7/8/2014	11:05:25	0	71	1	0
7/8/2014	11:05:40	0	61	1	0
7/8/2014	11:05:55	0	46	1	0
7/8/2014	11:06:10	0	38	1	0
7/8/2014	11:06:25	0	28	1	0
7/8/2014	11:06:40	0	20	1	0
7/8/2014	11:06:55	0	16	1	0
7/8/2014	11:07:10	0	14	1	0
7/8/2014	11:07:25	0	12	1	0
7/8/2014	11:07:40	0	20	1	0
7/8/2014	11:07:55	0	31	1	0
7/8/2014	11:08:10	0	28	1	0
7/8/2014	11:08:25	0	23	1	0
7/8/2014	11:08:40	0	23	1	0
7/8/2014	11:08:55	0	13	1	0
7/8/2014	11:09:10	0	12	1	0
7/8/2014	11:09:25	0	13	1	0
7/8/2014	11:09:40	0	20	1	0
7/8/2014	11:09:55	0	38	1	0
7/8/2014	11:10:10	0	37	1	0
7/8/2014	11:10:25	0	30	1	0
7/8/2014	11:10:40	0	21	1	0
7/8/2014	11:10:55	0	18	1	0
7/8/2014	11:11:10	0	22	1	0
7/8/2014	11:11:25	0	21	1	0
7/8/2014	11:11:40	0	14	1	0
7/8/2014	11:11:55	0	14	1	0
7/8/2014	11:12:10	0	12	1	0
7/8/2014	11:12:25	0	11	1	0
7/8/2014	11:12:40	0	7	1	0
7/8/2014	11:12:55	0	8	1	0
7/8/2014	11:13:10	0	4	14	0
7/8/2014	11:13:25	0	1	30	0
7/8/2014	11:13:40	0	18	22	0
7/8/2014	11:13:55	0	53	10	0
7/8/2014	11:14:10	0	103	4	0
7/8/2014	11:14:25	0	139	3	0
7/8/2014	11:14:40	0	161	2	0
7/8/2014	11:14:55	0	179	2	0
7/8/2014	11:15:10	0	175	1	0
7/8/2014	11:15:25	0	172	1	0
7/8/2014	11:15:40	0	149	1	0
7/8/2014	11:15:55	0	138	1	0
7/8/2014	11:16:10	0	129	1	0
7/8/2014	11:16:25	0	120	1	0
7/8/2014	11:16:40	0	119	1	0
7/8/2014	11:16:55	0	126	1	0

7/8/2014	11:17:10	0	121	1	0
7/8/2014	11:17:25	0	104	1	0
7/8/2014	11:17:40	0	86	1	0
7/8/2014	11:17:55	0	88	1	0
7/8/2014	11:18:10	0	79	1	0
7/8/2014	11:18:25	0	68	1	0
7/8/2014	11:18:40	0	64	1	0
7/8/2014	11:18:55	0	64	1	0
7/8/2014	11:19:10	0	66	1	0
7/8/2014	11:19:25	0	59	1	0
7/8/2014	11:19:40	0	50	1	0
7/8/2014	11:19:55	0	47	1	0
7/8/2014	11:20:10	0	46	1	0
7/8/2014	11:20:25	0	44	1	0
7/8/2014	11:20:40	0	44	1	0
7/8/2014	11:20:55	0	47	1	0
7/8/2014	11:21:10	0	60	1	0
7/8/2014	11:21:25	0	40	1	0
7/8/2014	11:21:40	0	34	1	0
7/8/2014	11:21:55	0	29	1	0
7/8/2014	11:22:10	0	26	1	0
7/8/2014	11:22:25	0	19	1	0
7/8/2014	11:22:40	0	39	1	0
7/8/2014	11:22:55	0	44	1	0
7/8/2014	11:23:10	0	33	1	0
7/8/2014	11:23:25	0	26	1	0
7/8/2014	11:23:40	0	22	1	0
7/8/2014	11:23:55	0	22	1	0
7/8/2014	11:24:10	0	21	1	0
7/8/2014	11:24:25	0	21	1	0
	Average	0.00	52.46	2.00	0.00
7/8/2014	11:24:40	19.5	19	1	0
7/8/2014	11:24:55	20.8	8	1	0
7/8/2014	11:25:10	21	3	1	0
7/8/2014	11:25:25	21	2	1	0
7/8/2014	11:25:40	21	3	1	0
7/8/2014	11:25:55	21	3	1	0
7/8/2014	11:26:10	21	2	1	0
7/8/2014	11:26:25	21	1	1	0
7/8/2014	11:26:40	21	1	1	0
7/8/2014	11:26:55	0.3	25	1	2
7/8/2014	11:27:10	0.1	48	1	1

Total Air Analysis, Inc Data Acquisition System

Facility: ARA Frauenfeld, Switzerland
Date: 7/8/2014
Source: ICE GenSet, 250 KW Max
Run No.: 3

Date	Time	O2	CO	NO	NO2
7/8/2014	11:27:25	0	50	1	0
7/8/2014	11:27:40	0	44	1	0
7/8/2014	11:27:55	0	41	1	0
7/8/2014	11:28:10	0	29	1	0
7/8/2014	11:28:25	0	27	1	0
7/8/2014	11:28:40	0	22	1	0
7/8/2014	11:28:55	0	22	1	0
7/8/2014	11:29:10	0	21	1	0
7/8/2014	11:29:25	0	19	1	0
7/8/2014	11:29:40	0	19	1	0
7/8/2014	11:29:55	0	18	1	0
7/8/2014	11:30:10	0	55	1	0
7/8/2014	11:30:25	0	31	1	0
7/8/2014	11:30:40	0	48	1	0
7/8/2014	11:30:55	0	43	1	0
7/8/2014	11:31:10	0	16	1	0
7/8/2014	11:31:25	0	14	1	0
7/8/2014	11:31:40	0	27	1	0
7/8/2014	11:31:55	0	24	1	0
7/8/2014	11:32:10	0	15	1	0
7/8/2014	11:32:25	0	8	1	0
7/8/2014	11:32:40	0	47	1	0
7/8/2014	11:32:55	0	90	1	8
7/8/2014	11:33:10	0	102	1	0
7/8/2014	11:33:25	0	81	1	0
7/8/2014	11:33:40	0	54	1	0
7/8/2014	11:33:55	0	44	1	0
7/8/2014	11:34:10	0	30	1	0
7/8/2014	11:34:25	0	24	1	0
7/8/2014	11:34:40	0	24	1	0
7/8/2014	11:34:55	0	25	1	0
7/8/2014	11:35:10	0	18	1	0
7/8/2014	11:35:25	0	18	1	0
7/8/2014	11:35:40	0	17	1	0
7/8/2014	11:35:55	0	17	1	0
7/8/2014	11:36:10	0	14	1	0
7/8/2014	11:36:25	0	14	1	0
7/8/2014	11:36:40	0	10	1	0
7/8/2014	11:36:55	0	30	1	0
7/8/2014	11:37:10	0	61	1	0
7/8/2014	11:37:25	0	15	1	0
7/8/2014	11:37:40	0	15	1	0
7/8/2014	11:37:55	0	25	1	0
7/8/2014	11:38:10	0	22	1	0
7/8/2014	11:38:25	0	17	1	0

7/8/2014	11:38:40	0	28	1	0
7/8/2014	11:38:55	0	21	1	0
7/8/2014	11:39:10	0	23	1	0
7/8/2014	11:39:25	0	20	1	0
7/8/2014	11:39:40	0	21	1	0
7/8/2014	11:39:55	0	20	1	0
7/8/2014	11:40:10	0	17	1	0
7/8/2014	11:40:25	0	11	1	0
7/8/2014	11:40:40	0	8	1	0
7/8/2014	11:40:55	0	6	1	0
7/8/2014	11:41:10	0	6	1	0
7/8/2014	11:41:25	0	16	1	0
7/8/2014	11:41:40	0	23	1	0
7/8/2014	11:41:55	0	19	1	0
7/8/2014	11:42:10	0	10	1	0
7/8/2014	11:42:25	0	8	1	0
7/8/2014	11:42:40	0	8	1	0
7/8/2014	11:42:55	0	9	1	0
7/8/2014	11:43:10	0	11	1	0
7/8/2014	11:43:25	0	7	1	0
7/8/2014	11:43:40	0	6	1	0
7/8/2014	11:43:55	0	13	1	0
7/8/2014	11:44:10	0	17	1	0
7/8/2014	11:44:25	0	16	1	0
7/8/2014	11:44:40	0	10	1	0
7/8/2014	11:44:55	0	18	1	0
7/8/2014	11:45:10	0	32	1	0
7/8/2014	11:45:25	0	71	1	0
7/8/2014	11:45:40	0	74	1	0
7/8/2014	11:45:55	0	63	1	0
7/8/2014	11:46:10	0	54	1	0
7/8/2014	11:46:25	0	38	1	0
7/8/2014	11:46:40	0	24	1	0
7/8/2014	11:46:55	0	14	1	0
7/8/2014	11:47:10	0	10	1	0
7/8/2014	11:47:25	0	17	1	0
7/8/2014	11:47:40	0	26	1	0
	Average	0.00	26.85	1.00	0.10
7/8/2014	11:47:55	19.8	20	1	0
7/8/2014	11:48:10	20.9	6	1	0 Ambient
7/8/2014	11:48:25	21	1	1	0 Air
7/8/2014	11:48:40	21	0	1	0
7/8/2014	11:48:55	21	0	1	0
7/8/2014	11:49:10	21	0	1	0
7/8/2014	11:49:25	21	0	1	0
7/8/2014	11:49:40	21	0	1	0
7/8/2014	11:49:55	21	0	1	0
7/8/2014	11:50:10	21	0	1	0
7/8/2014	11:50:25	21	0	1	0
7/8/2014	11:50:40	21	0	1	0
7/8/2014	11:50:55	21	0	1	0
7/8/2014	11:51:10	21	0	1	0



FORM 2: Calibration Recordkeeping For Portable Analyzers

Pre-Test Calibration

DATE: 7/3/2014 TIME (start/stop): 14:00 / 14:50 NAME: Total Air Analysis, Inc.

MONITOR: ECOM J2KN

Gas Constituent	Cylinder	Expiration Date	Cylinder Conc.	Reading 1*	Reading 2*	Reading 3*	Reading 4*	Response Time ** (seconds)
NOx	CC203680	3/20/2016	22.42	22	23	23	23	39
CO	CC158749	1/13/2022	89.80	88	87	87	88	45
NO ₂	ALFS108858	2/15/2015	74.5	75	75	75	75	42
O ₂	-	-	20.95	21.0	21.0	21.0	21.0	33

** If the reading is re-calibrated, then put an "R" next to it in the box
 ** The NO and CO response times are the time required to respond to 95% of a step change in the analyzer response to the span gases. For NO₂, it is the time required to respond to 90% of a step change.



FORM 2 : Calibration Recordkeeping For Portable Analyzers

Post-Test Calibration

DATE: 7/11/2014 TIME (start/stop): 10:30 / 11:15 NAME: Total Air Analysis, Inc.

MONITOR: ECOM J2KN

Gas Constituent	Cylinder	Expiration Date	Cylinder Conc.	Reading 1*	Reading 2*	Reading 3*	Reading 4*	Response Time ** (seconds)
NOX	CC203680	3/20/2016	22.42	23	23	22	22	37
CO	CC158749	1/13/2022	89.80	88	88	88	88	45
NO ₂	ALFS108858	2/15/2015	74.5	75	75	74	75	40
O ₂	-	-	20.95	21.0	21.0	21.0	21.0	31

*If the reading is re-calibrated, then put an "R" next to it in the box
 ** The NO and CO response times are the time required to respond to 95% of a step change in the analyzer response to the span gases. For NO₂, it is the time required to respond to 90

Appendix B
EPA Method 18
Total Hydrocarbons Determination

ARA Frauenfeld

exhaust gas

Sample description

Gas type

-
Further information

SGS-RUK GmbH · Im Paesch 1a · 54340 Longuich · Germany

SGS-RUK GmbH
Im Paesch 1a, 54340 Longuich, Germany
phone +49 (0)6502-9339-0 (fax -29)
mail: thomas.haeusler@sgs.com
www.umweltueberwachung.de
www.sgs.com

Avesco AG
Hasenmattstrasse 2
4901 Langenthal
Schweiz

metal gas container
filling level (%): -
state of sample: no objection
remarks: -

Results actual sample

Results former samples

SGS-RUK sample no.	140805757			
Sampling date /Sampled by	21.07.2014 / customer			
Order no. / Date	22.07.2014			

		ppm	mg/m ³	Results former samples	
Methane	ppm	432			
Methane	mg/m ³	309			
TOC (methane-free)	mg/m ³	< 1			
TOC	mg/m ³	232			

n. d. = not determined, n. a. = not applicable

Methods of analyses

The values in the column "100% CH₄" refer to 100 % Methane.
The values below "Results former samples" refer to the original gas.

Methane (CH ₄)	according to DIN 51872-04 A (GC-FID)
Hydrocarbons	according to VDI 3865 Bl. 4 (GC-FID)

Longuich, 01.08.2014

i. V. Dr. Thomas Häusler
(Laboratory Director)

i. A. Eva Friedrich
(Environmental Services - Laboratory)

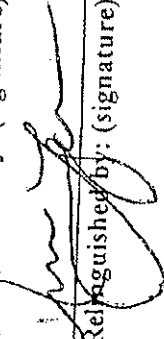
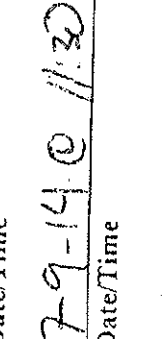
Die Prüfergebnisse beziehen sich auf die untersuchten Proben. Die Veröffentlichung und Vervielfältigung unserer Prüfberichte und Gutachten zu Werbezwecken sowie auszugsweise Verwendung in sonstigen Fällen bedürfen unserer schriftlichen Genehmigung. Alle Dienstleistungen werden auf Grundlage der anwendbaren Allgemeinen Geschäftsbedingungen der SGS, die auf Anfrage zur Verfügung gestellt werden, erbracht.

Laboratory: _____



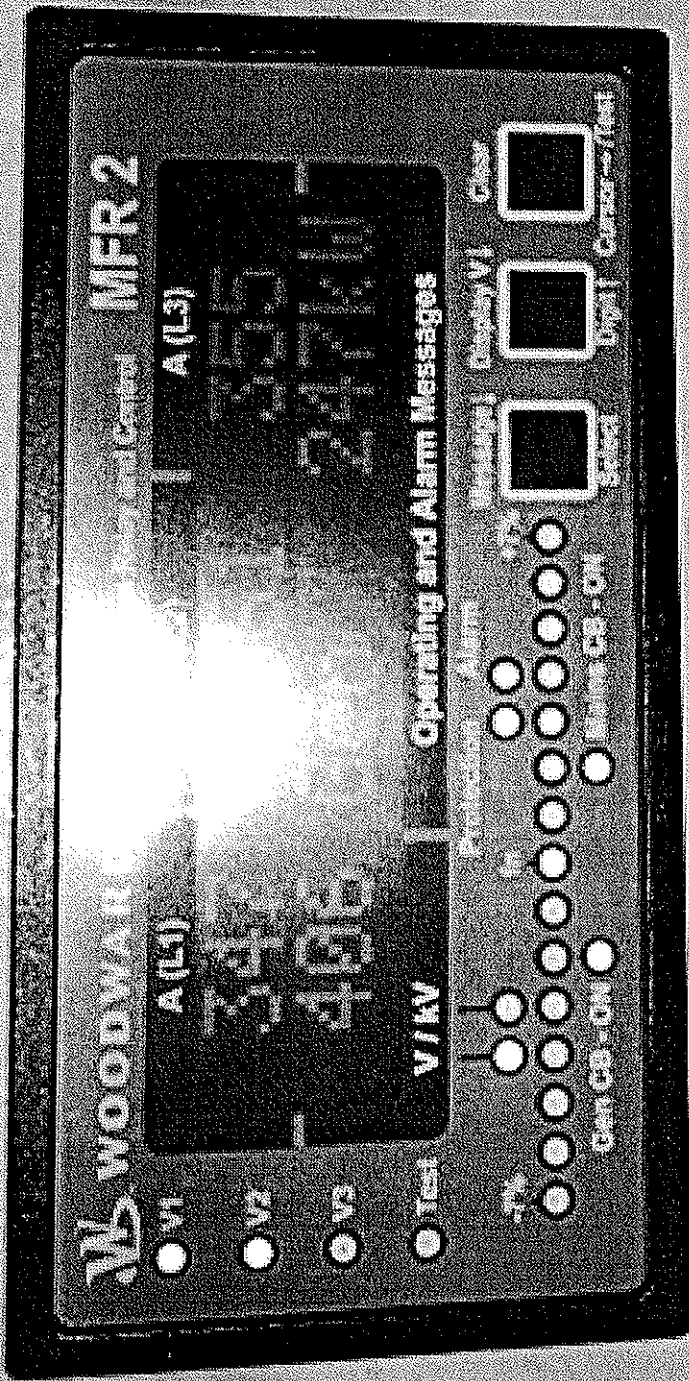
1210 East 223 rd Street, # 314 Carson, CA 90745 (310) 518 5133 Fax: (310) 518 5107

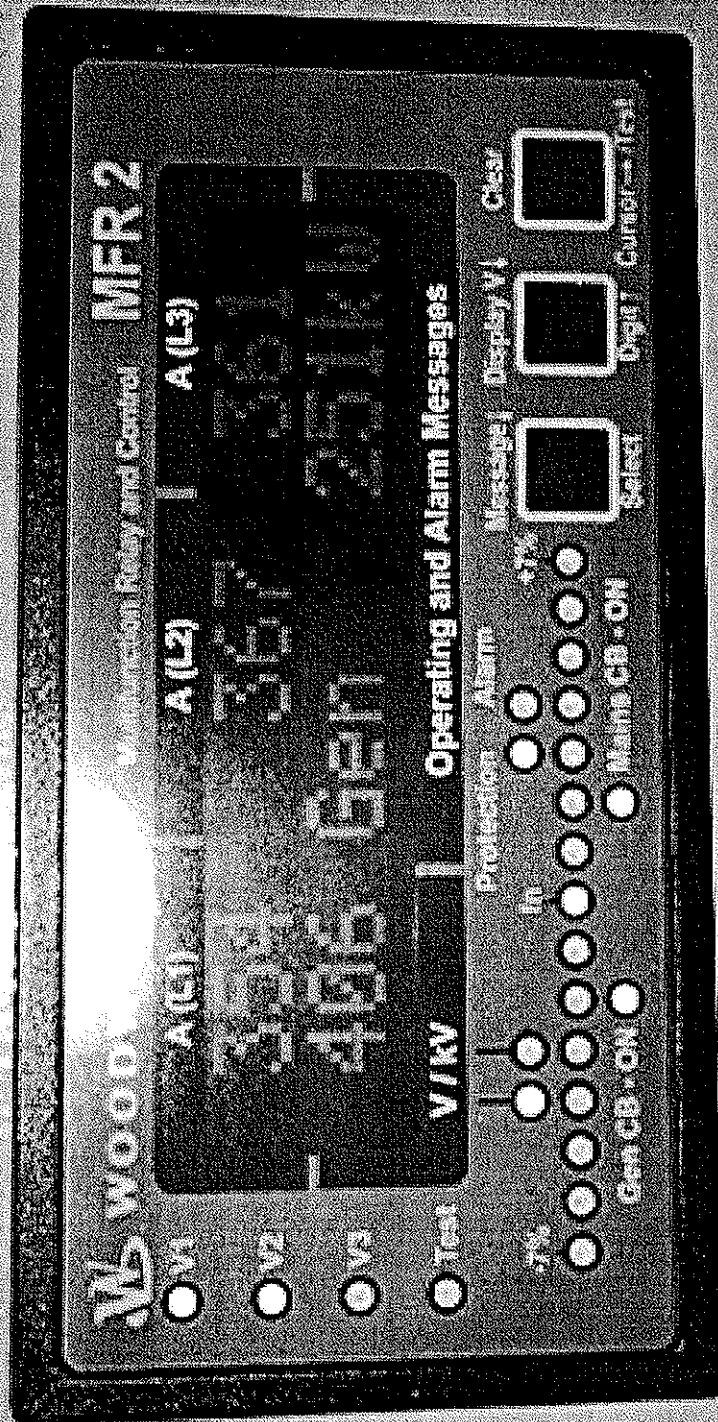
CHAIN OF CUSTODY

Client: <u>Avesco</u>		Project No.: <u>ME-141223</u>		Analysis		Turnaround Time: <input type="checkbox"/> Same Day <input type="checkbox"/> 24 Hours <input type="checkbox"/> 48 Hours <input checked="" type="checkbox"/> Normal			
Contact Person: <u>Thomas R. Roth</u>		Project Name: <u>Frankenfeld</u>							
tel: _____		Project Manager: <u>Thomas Roth</u>		TOC - Methane		Remarks <u>Relubricate ICE</u>			
fax: _____		P.O. Number: _____							
Total Air ID #	Client Sample ID	Summa Canister #	Date				Type of Sample	Lab ID Number	
	<u>FF-TOC #1</u>	<u>369</u>	<u>7-8-14</u>				<u>GAS</u>	<u>✓</u>	
Relinquished by: (signature) 		Date/Time		Received by: (signature)		Date/time			
Relinquished by: (signature) 		<u>7-9-14 @ 11:30</u>		Received by: (signature)		Date/time			

Appendix C

Operating Outputs





Appendix D

Quality Assurance/Quality Control

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E02NI99E15AC1S8	Reference Number: 48-124363593-2
Cylinder Number: CC203680	Cylinder Volume: 144.3 CF
Laboratory: ASG - Los Angeles - CA	Cylinder Pressure: 2015 PSIG
PGVP Number: B32013	Valve Outlet: 660
Gas Code: NO	Certification Date: Mar 20, 2013

Expiration Date: Mar 20, 2016

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

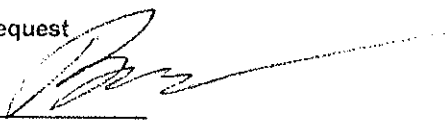
ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	23.00 PPM	22.42 PPM	G1	+/- 1.4% NIST Traceable	03/13/2013, 03/20/2013
NITRIC OXIDE	23.00 PPM	22.34 PPM	G1	+/- 1.4% NIST Traceable	03/13/2013, 03/20/2013
NITROGEN	Balance				

CALIBRATION STANDARDS						
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date	
NTRM	12061650	CC344943	20.23 PPM NITRIC OXIDE/NITROGEN	+/- 1.5%	Apr 15, 2015	
NTRM	12061650	CC344943-NOX	20.28 PPM NOx/NITROGEN	+/- 1.5%	Apr 15, 2015	

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Thermo 42-iLS 1115848421 NO	Chemiluminescence	Mar 14, 2013
Thermo 42-iLS 1115848421 NOx	Chemiluminescence	Mar 14, 2013

Triad Data Available Upon Request

Notes:



Approved for Release

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E02NI99E15AC672	Reference Number: 48-124413173-2
Cylinder Number: CC158749	Cylinder Volume: 144.3 CF
Laboratory: ASG - Los Angeles - CA	Cylinder Pressure: 2015 PSIG
PGVP Number: B32014	Valve Outlet: 350
Gas Code: CO,BALN	Certification Date: Jan 13, 2014

Expiration Date: Jan 13, 2022

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

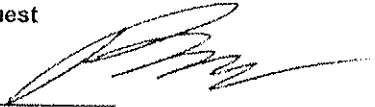
ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON MONOXIDE	90.00 PPM	89.80 PPM	G1	+/- 0.9% NIST Traceable	01/13/2014
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	12062258	CC366865	97.56 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	May 25, 2018

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AMP0900118 CO	FTIR	Dec 18, 2013

Triad Data Available Upon Request

Notes:



Approved for Release

CERTIFICATE OF ANALYSIS

Customer Name: Total Air Analysis, Inc.
Stock/Analyzer Tag #: A030-106780PN
Customer Reference: Verbal
MESA Reference: 111293
Date of Certification: February 15, 2013
Recommended Shelf Life: 2 Years

Cylinder Number: ALFS108858
Product Class: ±2% NIST Traceable
Cylinder Contents: 140 CF @ 2000 PSI
Cylinder CGA: A030-HP-660/SS
Analysis Method: Process Analyzers
Preparation Method: Gravimetric

Component	Requested Concentration (2)	Reported Concentration (2,3)
Nitrogen Dioxide	80 ppm	74.5 ppm
Nitrogen	Balance	Balance

Authorized Signature: _____



- (1) The fill pressure shown on the COA is as originally quoted. The fill pressure measured by the customer may differ from the fill pressure originally quoted due to temperature effects, compressibility of the individual components when blended together in the cylinder, gauge accuracy or reduction in content volume before shipping as a result of samples withdrawn for laboratory QC necessary to ensure product quality.
- (2) Unless otherwise stated, concentrations are given in molar units.
- (3) Vapor pressure mixes are blended at a sufficiently low pressure so as to eliminate phase separation under most low temperature conditions encountered during transport or storage. However, it is generally recommended that cylinders containing vapor pressure restricted mixes be placed on the floor in a horizontal position and rolled back and forth to improve homogeneity of the gas phase mixture before being put into service.

Analytical Gas Standards are prepared and analyzed using combinations of NIST traceable weights, SRM's provided by NIST, or internal gas standards that have been verified for accuracy using procedures published by the US-EPA. Pure gases are analyzed and certified for purity using minor component Analytical Gas Standards prepared according to the methods specified above. Balances are calibrated to NIST test weights covered by NIST test number 822/278982-10, S/N 33071. Reference Certification #'s: 1072/U, 901V, 833/V, and 3280/E. Calibration methods are in conformance with MIL-STD 45662A.

MESA Specialty Gases & Equipment

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On-line Catalog at www.mesagas.com