Mayflower Vehicle Systems

Determination of Particulates &
Volatile Organic Compounds
Prototype Plant
Holbrook Lane, Coventry
CV6 4AW

26 August 2003

Prepared by: **CES Environmental Instruments Ltd**
Bretby Business Park
Ashby Road
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Report prepared by [redacted]

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Isokinetic Sampling Engineer AEATE 990019
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Report authorised by [redacted]

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ISO 9001 - Certificate No. 279

Contents

Executive Summary

Operator Company: - Mayflower Vehicles Systems

Address: - Holbrook Lane, Coventry, CV6 4AW

Monitoring Company: - CES Environmental Instruments Ltd

Address: - Bretby Business Park, Ashby Road, Stanhope, Bretby
Burton on Trent, DE15 0YZ

Analytical Company: - CES Environmental Instruments Ltd

Address: - Bretby Business Park, Ashby Road, Stanhope, Bretby
Burton on Trent, DE15 0YZ

Monitoring Objective
To monitor and quantify particulate emissions and volatile organic compounds to atmosphere from the Prototype Spray Booth Plant located at Mayflower Vehicle Systems, Holbrook Lane, Coventry

Test Team
D. Slack (Team Leader), R. Ward, C. Redman, S. Elton, M. Rogers

Deviations from Sampling Method
None

Results
Date of Sampling: 26 August 2003

Location	Pollutant	Test No.	Concentration Mg/Nm³	Mean Concentration mg/Nm³	Emission Rate kg/hr	Mean Emission Rate kg/hr
Prototype Plant	Particulate	1	1.2	0.6	0.013	0.007
Prototype Plant	Particulate	2	0.0		0.000	
Prototype Plant	Particulate	Blank	0.0	0.0		
Prototype Plant	Volatile Organic Compounds	1	5.0	5.0		

Results Correct to

Temperature		Pressure		Oxygen		Gas	
°C/K	0/273	mbar/kPa	1013/101.3	%		Wet/Dry	Wet

1. Introduction

Mayflower Vehicle Systems placed an order with CES Environmental Instruments Ltd, to monitor and quantify particulate emissions and volatile organic compounds to atmosphere from the Prototype Plant located at Mayflower Vehicle Systems, Holbrook Lane, Coventry. Test work was carried out 26 August 2003, and was undertaken by D. Slack (Team Leader), R. Ward, C. Redman, S. Elton, M. Rogers.

2. Plant and Conditions

The Prototype Spray Booth Plant is approximately 10m x 5m x 3m height, and is served by a dry filler system. Air is ducted into the booth and extracted out to atmosphere passing through a charcoal filter unit. Spraying activities are intermittent and are undertaken manually.

On the day spraying consisted of 2off MGF Front Bumper Assembles. The materials used consisted of Primer, Base Coat and Lacquer. All spraying activities were undertaken within a 45 minute period.

2.1 Materials Used

Prototype Particulates & VOC Monitoring 26/08/03		
Materials Used During Monitoring Exercise		
Manufacturer	**Description**	**Type/ identity number**
Dupont	High Solids Primer	1020 R - UN 1263
Dupont	High Solids Activator	1010 R - UN 1263 (686117)
RN	Silver Base Coat	
RN	Thinners	BCO20
Debeer	High Solids Clearcoat	MS 1-104
Debeer	High Solids Hardner	MS 47 - 55

Notes Parts Sprayed - 2 off MGF Bonnet Assembly
Spraying consisted of Two coats of primer laid on both components
First Base Coat Applied to both components
Second Base Coat Applied to both components
Lacquer coat applied to both components

3. Sampling Location

Sampling was undertaken in the vertical duct. The duct was measured to be 600mm x 600mm, giving a cross sectional area of 0.36m². There are two 4"BSP sample points. Samples were taken from 4 points on each axis, 8 in total. The sample location is compliant with BS EN 13284-1.

4. Test Programme

Two particulate emissions tests were carried out on each stack. Particulate emission measurements were made using the Erwin Sick "Gravimat SHC5" isokinetic dust sampling system. The method complies with the requirements of BS EN 13284-1 (Determination of low range mass concentration of dust). A detailed description of this method is given in Appendix 3.

Sampling equipment reference C005 – Gravimat SHC-5

Emissions of volatile organic compounds were extracted from the exit of the Prototype Plant and analysed using a FID Analyser. The Prototype Plant was monitored for a period of 60 minutes. Monitoring was undertaken in accordance with the requirements of US EPA Method 25A.

Sampling equipment reference C124 – FID Analyser

The instrument was calibrated at two reference points. Calibration gas was introduced via the probe.

Zero Reference = Ambient Air

Span Reference = 220ppm CH_4

Full sampling methods are given in Appendix 3.

5. Plant Emissions

No emission limits have yet been specified for the Prototype Spray Booth Plant.

All results are corrected to 0°C (273K) and 1013mbar (101.3 kPa)

6. Results

Date of Sampling: 26 August 2003

Location	Pollutant	Test No.	Concentration Mg/Nm³	Mean Concentration mg/Nm³	Emission Rate kg/hr	Mean Emission Rate kg/hr
Prototype Plant	Particulate	1	1.2	0.6	0.013	0.007
Prototype Plant	Particulate	2	0.0		0.000	
Prototype Plant	Particulate	Blank	0.0	0.0		
Prototype Plant	Volatile Organic Compounds	1	5.0	5.0		

Results Correct to

Temperature		Pressure		Oxygen		Gas	
°C/K	0/273	mbar/kPa	1013/101.3	%		Wet/Dry	Wet

7. Appendix 1
(Extraction Protocol)

Site : Mayflower Vehicles
Date : 26 August 2003
Plant : Prototype Plant
File Ref. 3208

Mean Particulate Results

Filter	mg/m³	kg/hr
80337	1.2	0.013
80335	0.0	0.000
Mean	**0.6**	**0.007**

Control Blank Filter

Filter	Volume (m³)
80337	0.510
80335	0.512
Mean	**0.511**

(Reference Conditions with no correction for Oxygen)

Filter 80134

Tare Weight 18.6011 mg
Gross Weight 18.6011 mg

Gain 0.0 mg

Measured Oxygen 0.0 %

Concentration 0.0 mg/Nm³

Results Correct to

Temperature		Pressure		Oxygen		Gas	
°C/K	0/273	mbar/kPa	1013/101.3	%		Wet/Dry	Wet

file : 3208PT1.SMP 26.08.03
10:01-10:23

plant : Prototype
measuring place: Mayflower Vehicles
engineer : CR/

remarks :
Normal operation
5
600mm x600mm

constants and parameters :

dyn.pressure	[mbar]	: 1008
normal density	[kg/m3]	: 1.3
water vapour	[%Vol]	: 4.00
cross section of the duct	[m2]	: 0.36

results

density	[kg/m3]	: 1.156
volume flow act.	[m3/h]	: 11876
volume flow norm wet	[m3/h]	: 10557
volume flow norm dry	[m3/h]	: 10135

file : 3208PT1.SMP dust probe : 80337 26.08.03
10:01-10:23

measured values and calculations

axis	depth	p_duct [mbar]	p_dyn [mbar]	T [°C]	v_duct [m/s]	angle [°]
1	1	2.6	0.68	31.6	10.7	-1.1
1	2	2.6	0.65	32.1	10.6	-0.1
1	3	2.5	0.64	32.6	10.5	0.3
1	4	2.5	0.63	33.3	10.5	-0.5
1	5	2.5	0.61	34.0	10.2	-0.0
1	6	2.5	0.61	34.7	10.3	-0.1
1	7	2.6	0.65	34.8	10.6	-0.6
1	8	2.6	0.64	34.8	10.5	-0.1
1	9	2.5	0.62	34.7	10.3	-0.6
1	10	2.6	0.65	34.4	10.6	0.2
2	1	2.5	0.56	31.5	9.8	0.0
2	2	2.3	0.42	32.2	8.5	0.4
2	3	2.3	0.36	32.9	7.9	-0.7
2	4	2.2	0.33	33.5	7.5	-0.5
2	5	2.2	0.33	33.8	7.5	-0.7
2	6	2.1	0.31	33.8	7.3	-0.1
2	7	2.2	0.30	33.4	7.2	0.2
2	8	2.3	0.33	33.0	7.6	-0.2
2	9	2.3	0.35	32.4	7.7	-0.1
2	10	2.4	0.34	31.7	7.6	-0.4
mean :		2.4		33.3	9.2	

dust concentration measurement **ERWIN SICK Optic Electronic**
protocol of isokinetic extraction measurement

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file : 3208PT1.SMP dust probe : 80337 26.08.03
10:01-10:23

plant : Prototype
measuring place: Mayflower Vehicles
engineer : CR/

remarks :
Normal operation
5
600mm x600mm

constants and parameters :

dyn.pressure	[mbar]	: 1008
normal density	[kg/m3]	: 1.3
water vapour	[%Vol]	: 4.00
cross section of the duct	[m2]	: 0.36
diameter of nozzle	[mm]	: 8.0
extraction/point	[h:m:s]	: 00:02:30
tare weight of probe	[mg]	: 17429.8
gross weight of probe	[mg]	: 17430.4

results

volume flow	[m3/h]	: 1.654
extracted vol. act.	[m3]	: 0.551
extracted vol. norm. hum.	[m3]	: 0.510
extracted vol. norm. dry	[m3]	: 0.490
volume flow act.	[m3/h]	: 11908.6
volume flow norm wet	[m3/h]	: 11018.4
volume flow norm dry	[m3/h]	: 10577.6
total extraction time	[h:m:s]	: 00:20:00
dust weight	[mg]	: 0.6
dust conc. act.	[mg/m3]	: 1.1
dust conc. norm. wet	[mg/m3]	: 1.2
dust conc. norm dry	[mg/m3]	: 1.2
particulate flow rate	[kg/h]	: 0.013
extinction	[mA]	: 0.00

file : 3208PT1.SMP dust probe : 80337 26.08.03
10:01-10:23

a	d	p_duct [mbar]	p_dyn [mbar]	T [°C]	v_duct [m/s]	p_orif [mbar]	p_prob [mbar]	I_cal [mA]	q [m3/h]	angle [°]
1	1	2.8	0.68	24.1	10.7	7.32	-42	0.00	1.91	1.5
1	2	2.7	0.65	22.6	10.4	6.92	-41	0.00	1.85	1.7
1	3	2.8	0.67	21.7	10.6	7.49	-43	0.00	1.92	0.3
1	4	2.8	0.66	21.1	10.5	7.33	-42	0.00	1.90	-2.0
2	1	2.6	0.47	20.6	8.8	4.87	-33	0.00	1.56	-0.3
2	2	2.5	0.38	20.3	7.9	3.96	-29	0.00	1.41	0.0
2	3	2.4	0.33	20.1	7.3	3.57	-27	0.00	1.34	2.5
2	4	2.4	0.33	20.0	7.4	3.61	-27	0.00	1.34	-2.3
mean :		2.6		21.3	9.2			0.00	1.65	

dust concentration measurement **ERWIN SICK Optic Electronic**
protocol of isokinetic extraction measurement

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file : 3208PT2.SMP dust probe : 80335 26.08.03
10:27-10:48

plant : Prototype
measuring place: Mayflower Vehicles
engineer : CR/

remarks :
Normal operation
5
600mm x600mm

constants and parameters :

dyn.pressure	[mbar]	: 1008
normal density	[kg/m3]	: 1.3
water vapour	[%Vol]	: 4.00
cross section of the duct	[m2]	: 0.36
diameter of nozzle	[mm]	: 8.0
extraction/point	[h:m:s]	: 00:02:30
tare weight of probe	[mg]	: 17489.2
gross weight of probe	[mg]	: 17489.2

results

volume flow	[m3/h]	: 1.652
extracted vol. act.	[m3]	: 0.551
extracted vol. norm. hum.	[m3]	: 0.512
extracted vol. norm. dry	[m3]	: 0.492
volume flow act.	[m3/h]	: 11912.7
volume flow norm wet	[m3/h]	: 11087.3
volume flow norm dry	[m3/h]	: 10643.9
total extraction time	[h:m:s]	: 00:20:00
dust weight	[mg]	: 0.0
dust conc. act.	[mg/m3]	: 0.0
dust conc. norm. wet	[mg/m3]	: 0.0
dust conc. norm dry	[mg/m3]	: 0.0
particulate flow rate	[kg/h]	: 0.000
extinction	[mA]	: 0.00

file : 3208PT2.SMP dust probe : 80335 26.08.03
10:27-10:48

a	d	p_duct [mbar]	p_dyn [mbar]	T [°C]	v_duct [m/s]	p_orif [mbar]	p_prob [mbar]	I_cal [mA]	q [m3/h]	angle [°]
1	1	2.8	0.68	19.6	10.6	7.09	-20	0.00	1.89	2.4
1	2	2.8	0.64	19.6	10.3	6.83	-20	0.00	1.85	-0.1
1	3	2.8	0.67	19.6	10.5	7.19	-20	0.00	1.90	-1.0
1	4	2.9	0.68	19.6	10.6	7.20	-20	0.00	1.90	0.7
2	1	2.6	0.48	19.6	8.9	4.83	-16	0.00	1.56	1.7
2	2	2.4	0.37	19.6	7.8	3.90	-13	0.00	1.41	-1.6
2	3	2.4	0.33	19.6	7.4	3.54	-12	0.00	1.34	1.2
2	4	2.5	0.34	19.5	7.5	3.67	-13	0.00	1.37	1.5
mean :		2.6		19.6	9.2			0.00	1.65	

8. Appendix 2
(Logged Values)

Site: Mayflower Vehicles
Date : 26 August 2003
Plant : Prototype Spray Booth
File Ref. 3208

Date	Time	Total VOC"s ppm	VOC's Expressed as Carbon mg/m³
26/08/2003	09:48:54	10.00	5.36
26/08/2003	09:50:54	16.88	9.04
26/08/2003	09:52:54	5.62	3.01
26/08/2003	09:54:54	5.62	3.01
26/08/2003	09:56:54	6.88	3.68
26/08/2003	09:58:54	11.88	6.36
26/08/2003	10:00:54	10.00	5.36
26/08/2003	10:02:54	0.62	0.33
26/08/2003	10:04:54	1.25	0.67
26/08/2003	10:06:54	1.88	1.00
26/08/2003	10:08:54	0.62	0.33
26/08/2003	10:10:54	5.62	3.01
26/08/2003	10:12:54	10.63	5.69
26/08/2003	10:14:54	6.88	3.68
26/08/2003	10:16:54	5.62	3.01
26/08/2003	10:18:54	5.62	3.01
26/08/2003	10:20:54	5.62	3.01
26/08/2003	10:22:54	5.62	3.01
26/08/2003	10:24:54	16.88	9.04
26/08/2003	10:26:54	38.13	20.42
26/08/2003	10:28:54	32.50	17.41
26/08/2003	10:30:54	25.00	13.39
26/08/2003	10:32:54	5.62	3.01
26/08/2003	10:34:54	10.63	5.69
26/08/2003	10:36:54	6.88	3.68
26/08/2003	10:38:54	5.62	3.01
26/08/2003	10:40:54	5.62	3.01
26/08/2003	10:42:54	5.62	3.01
26/08/2003	10:44:54	5.62	3.01
26/08/2003	10:46:54	6.88	3.68

	Total VOC's	VOC's Expressed as Carbon
	9.4 ppm	**5.0 mg/m³**

Oxygen Value %
Normalised Result Expressed as Carbon **5.0 mg/m³**

Results Correct to

Temperature		Pressure		Oxygen		Gas	
°C/K	0/273	mbar/kPa	1013/101.3	%		Wet/Dry	Dry

9. Appendix 3
(Sampling Methods)

Erwin Sick Sampling Train

Extractive dust measurements were made using the Erwin Sick "Gravimat SHC-5" isokinetic dust sampling system. The equipment uses a stainless steel probe which combines a sampling nozzle and filter, 3 pitot pressure inlets and a thermocouple. Real time velocity, turbidity and temperature measurements are provided for the control processor to modulate the pump speed and continuously ensure isokinetic conditions are maintained.

The Gravimat SHC-5 portable dust concentration measuring system operates on the gravimetric measuring principle as required by BS 3405 and BS 6069. The dust-laden gas is isokinetically extracted by a scavenging probe. A special filter retains the dust. The dust content is determined by differential weighing of the dust collectors together with the filters. This avoids the dust losses which are inevitable when the filters are removed. The dust concentration in mg/m^3 can then be calculated from the relationship between the dust weight and the volume of gas extracted.

The Gravimat SHC-5 gravimetric dust concentration measuring system comprises the following components:

* GS 5 filter head probe with accessories
* SHC-AE control unit
* Evaluation computer (laptop) with SMP5 measuring and evaluation software
* SHC-PS power supply unit
* SHC-TU transport unit, optional.

The SHC-AE control unit performs the isokinetic control that is necessary for precise measurements. It is connected to the multi-chamber hose and the thermocouple of the GS 5 probe as well as to the evaluation computer. All the measured data is automatically collected and recorded together with the extraction measurements time, relieving the operator of control and recording duties during the monitoring process. The operator is simply required to move the probe to the next measurement point at a signal from the control unit.

Before testing all recommended system checks and leak tests were carried out. The filters were assembled and then dried in an oven at 110°C, cooled in a desiccator and then weighed on a 0.1mg resolution balance. After testing the filters are weighed in an identical fashion.

Features:

* Considerably improved measuring accuracy through the newly developed GS 5 filter head probe.
* The probe can be used for both high (several g/m^3) and very low dust concentrations (less than 1 mg/m^3)
* Fully automatic detection and storage of all relevant measured values during extraction of the sample.
* Fully automatic isokinetic control precludes operator error and increases the accuracy of the measurement.
* Automatic logging of all measurements - only the weight of the dust collector and plant-specific comments have to be entered manually.

Volatile Organic Compounds

The Signal Mode 3030PM Portable Heated Hydrocarbon Analyser is based on the Flame Ionisation Detector (FID). The flame ionisation detector works by ionising the sample gas using combustion in a hydrogen flame. Ions produced in this process are collected at a polarized electrode outside the combustion zone. The polarizing voltage across the detector must be high enough to stop any recombination of the electrons and positive ions produced in the flame.

When the sample gas is composed of gases of different carbon number, the detector will respond to the number of carbon atoms present.

An important characteristic of the flame ionisation detector is the variation in detector response with changes in oxygen concentration in the sample gas. This effect is normally only found in the analysis of combustion gases. It requires a special fuel consisting of 40% hydrogen and 60% helium mix. To compensate for the lower concentration of hydrogen, an analyser using a hydrogen/helium mix requires a greater (x3) fuel flow. Each analyser is built to be used with a specific fuel option. A 100% hydrogen fuel is used for applications rich in oxygen.

In order to give a stable signal, the FID requires a supply of clean, hydrocarbon-free air. As an aid to portability, the analyser air is supplied from a built-in pump. As there is a possibility of the ambient air being contaminated with hydrocarbons, it is passed over an internal platinum catalyst on an alumina substrate at high temperature. Air passed through the catalytic air purifier is also used as zero gas during calibration.

10. Appendix 4
(Calibration Certificates)

Certificate of Calibration

Date of Issue: 4 April 2003

CES Environmental Instruments Ltd
Bretby Business Park, Ashby Road
Burton-on-Trent, Staffordshire, DE15 0YZ
Tel: 01283 216334 Fax: 01283 550939

Certificate No. CES0103

[redacted]

Certified By

Instrument Details

Instrument Type	Gravimat SHC-5
Instrument Make	Erwin Sick
Instrument Serial No.	94015142
Quality No.	C005
Calibration Date	27/03/03
Calibrated By Name	R..Allen

Ambient Conditions

Air Temperature (°C)	20.1	**
Barometric Pressure (mbar)	1002	
Relative Humidity (%)	40	**

Instruments used to undertake calibration

E Type Pitot	UKAS Certificate No. 00180	(Qu. No. C136)
Manometer Type FC012	UKAS Certificate No. 00350	(Qu. No. C082)
Manometer Type FC012	UKAS Certificate No. 00349	(Qu. No. C081)
Barometer Type 104	UKAS Certificate No. N1072047V	(Qu. No. C138)
Gallus Dry Gas Meter	UKAS Certificate No. N1054538F	(Qu. No. C125)
TM 2030 Thermometer	UKAS Certificate No. 89143	(Qu. No. C135)
K-Type Thermocouple	UKAS Certificate No. N1054537T	(Qu. No. C134)
RIS Supersal XT	Certificate No. IH50788	(Qu. No. C014) *

* Not UKAS traceable ** Indication only

Flow and Extraction

The reference pitot was placed in a wind tunnel located at Bretby Business Park. The Gravimat SHC-5 Sampling Probe under test was mounted within the same wind tunnel in close proximity to the reference pitot. The wind tunnel was operated to generate a differential pressure across each pitot, a direct comparison was made. The differential pressures measured were in the region of the calibration points of the reference pitot. Correction factors were applied to the reference pitot and compared to the differential pressure shown for the pitot under test. The extraction system of the unit was operated for a period of one minute.

Volume Flow

A calibrated dry gas meter was connected to the sampling nozzel ot the Gravimat SCH-5. A volume of air is pulled through the sampling system. The measured value shown on the calibrated dry gas meter is then compared to the indicated value on the Gravimat SCH-5 display.

Barometric Pressure

The barometric pressure was measured using a calibrated barometer. The indicated pressure was compared to the Gravimat SHC-5 display.

Temperature

The probe thermocouple was placed in a thermpcouple oven and heated. The temperature was measured using a calibrated thermocouple and temperature indicator. The resultant temperature was compared to the Gravimat SCH-5 display.

Current

A mA current source was injected into the Gravimat SCH-5 using a mA current generator. The injected current was compared to the Gravimat SCH-5 display.

Certificate of Calibration

Date of Issue: 4 April 2002

Certificate No. CES0103
Page 2 of 2

CES Environmental Instruments Ltd
Bretby Business Park, Ashby Road
Burton-on-Trent, Staffordshire, DE15 0YZ
Tel: 01283 216334 Fax: 01283 550939

[redacted]

Certified By

Instrument Details

Instrument Type	Gravimat SHC-5
Instrument Make	Erwin Sick
Instrument Serial No.	94015142
Quality No.	C005
Calibration Date	27/03/03

Ambient Conditions

Air Temperature (°C)	20.1	**
Barometric Pressure (mbar)	1002	
Relative Humidity (%)	40	**
Air Density @ 0°C (kg/m³)	1.277	
Corrected Air Density (kg/m³)	1.1765	

Calibration Details

Flow and Extraction

Applied Pressure (Pa)	Pitot Correction	Applied Pressure Corrected (Pa)	SHC5 p-dyn (Pa)	Pressure Factor	Calculated Velocity (m/s)	SHC5 Velocity (m/s)	Velocity Factor	Nozzel Diameter (mm)	Calculated Extraction (m³/hr)	SHC5 Extraction (m³/hr)	Extraction Factor
3.5	0.947	3.31	3.2	1.04	2.374	2.316	1.02	10.0	0.67	0.66	1.02
42.5	0.962	40.89	41.7	0.98	8.337	8.416	0.99	8.0	1.51	1.52	0.99
92.6	0.967	89.54	91.8	0.98	12.338	12.689	0.97	6.4	1.43	1.44	0.99
162.5	0.969	157.46	161.7	0.97	16.361	16.645	0.98	6.4	1.90	1.91	0.99
211.3	0.969	204.75	205.6	1.00	18.656	19.211	0.97	6.4	2.16	2.19	0.99

Volume Flow

Nominal Flow Rate	Actual Flow Rate	Actual Flow Rate	Orifice Constant
l/min	l/min	m³/hr	
15.00	15.000	0.9	15.45
20.00	20.000	1.2	15.70
25.00	24.950	1.497	15.92
30.00	29.917	1.795	15.91
		Instrument Orifice Constant(@1.5m³/hr) =	15.92

Barometric Pressure

Pressure	
Required Value (mbar)	Indicated Value (mbar)
1002.0	1002.0
1000.0	1000.0
999.0	998.0

Temperature

Temperature Input	
Required Value (°C)	Indicated Value (°C)
25.0	25.0
50.0	50.0
100.0	100.1
150.0	149.6
250.0	249.0
300.0	300.0

Current

Current Value	
Required Value (mA)	Indicated Value (mA)
0.0	0.0
5.0	5.0
10.0	10.0
15.0	15.0
20.0	20.0

Time

Time Period	Required Value	Within Limit
mins	mins	
3:00	2:59 → 3:01	Yes
5:00	4:59 → 5:01	Yes
10:00	9:59 → 10:01	Yes

TEST REPORT

1513

Customer: CES, Bretby Business Park, Ashby Road, Burton on Trent

Report No. 27402

Date analysed: 7 May 2003

CYLINDER NO	ANALYSIS % V/V	
	CH_4	Air
91112	0.0220	Balance
Accuracy of Analytical Method	±0.0005	

Method of Analysis: CH_4, - G.C. – F I D

Analyst: I. Thornewill

Customer Analytical Requirements CH_4	Authorised by: A Smith

Authorised by: [redacted]

A Smith
Gas Monitoring

Issue Date: 09 May 2003

End of Report

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Mayflower Vehicle Systems

Determination of Gaseous Species
Contrapol Incinerator
Holbrook Lane, Coventry
CV6 4AW

26 August 2003

Prepared by: **CES Environmental Instruments Ltd**
Bretby Business Park
Ashby Road
Stanhope Bretby
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DE15 0YZ

Telephone 01283 216334

Report prepared by [redacted]
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Isokinetic Sampling Engineer AEATE 990019
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ISO 9001 - Certificate No. 279

Contents

Executive Summary

Operator Company: - Mayflower Vehicles Systems

Address: - Holbrook Lane, Coventry, CV6 4AW

Monitoring Company: - CES Environmental Instruments Ltd

Address: - Bretby Business Park, Ashby Road, Stanhope, Bretby Burton on Trent, DE15 0YZ

Analytical Company: - CES Environmental Instruments Ltd

Address: - Bretby Business Park, Ashby Road, Stanhope, Bretby Burton on Trent, DE15 0YZ

Monitoring Objective

To monitor and quantify gaseous emissions and volatile organic compounds to atmosphere from the Contrapol Incinerator located at Mayflower Vehicle Systems, Holbrook Lane, Coventry

Test Team

D. Slack (Team Leader), R. Ward, C. Redman, S. Elton, M. Rogers

Deviations from Sampling Method

None

Results

Date of Sampling: 26 August 2003

Location	Pollutant	Test No.	Concentration mg/Nm³	Mean Concentration mg/Nm³	Emission Rate kg/hr	Mean Emission Rate kg/hr
Contrapol Incinerator	Carbon Monoxide	1	8.5	8.5		
Contrapol Incinerator	Oxides of Nitrogen	1	37.9	37.9		

Results Correct to

Temperature		Pressure		Oxygen		Gas	
°C/K	0/273	mbar/kPa	1013/101.3	%		Wet/Dry	Dry

1. Introduction

Mayflower Vehicle Systems placed an order with CES Environmental Instruments Ltd, to monitor and quantify gaseous emissions and volatile organic compounds to atmosphere from the Contrapol Incinerator located at Mayflower Vehicle Systems, Holbrook Lane, Coventry. Test work was carried out 26 August 2003, and was undertaken by D. Slack (Team Leader), R. Ward, C. Redman, S. Elton, M. Rogers.

2. Plant Details

Contrapol Incinerator is a gas fired unit installed at Mayflower Vehicle Systems, Holbrook Lane Coventry. The incinerator is utilised to dispose of relic ED paint. The incinerator output is estimated to be in the region of 2,000,000 kcal/hr. For the duration of the test the incinerator was operating under normal operating conditions, the normal cycle is one item being dipped every 8 minutes.

3. Sampling Location

Sample ports were located on the exit flue of the Contrapol Incinerator.

4. Test Programme

Emissions of gaseous species were monitored from the exit of the Contrapol Incinerator on 26 August 2003. The boiler was monitored for a period of 8 hours. Gaseous samples were taken at points indicated by Mayflower Vehicle Systems personnel. Gas samples were taken using a "Testoterm" combustion efficiency analyser and gas conditioning unit.

The gaseous constituents for which the flue gases were analysed.

Oxides of Nitrogen	(combined NO & NO_2)
Oxygen	(O_2)
Carbon Monoxide	(CO)

Sampling equipment reference C123 – Testoterm

5. Plant Emissions

All results are corrected to 0°C (273K) and 1013mbar (101.3 kPa)

6. Results

Date of Sampling: 26 August 2003

Location	Pollutant	Test No.	Concentration mg/Nm³	Mean Concentration mg/Nm³	Emission Rate kg/hr	Mean Emission Rate kg/hr
Contrapol Incinerator	Carbon Monoxide	1	8.5	8.5		
Contrapol Incinerator	Oxides of Nitrogen	1	37.9	37.9		

Results Correct to

Temperature		Pressure		Oxygen		Gas	
°C/K	0/273	mbar/kPa	1013/101.3	%		Wet/Dry	Dry

7. Appendix 1
(Logged Values)

Site : Mayflower Vehicles
Date : 26 August 2003
Plant : Contrapol Incinerator
File Ref. 3208

Date	Temp	Oxygen	Carbon	Carbon	Nitric	Nitrogen	Oxides of
14/08/2002			Monoxide	Monoxide	Oxide	Dioxide	Nitrogen (NO_2)
Time	°C	%	ppm	mg/m³	ppm	ppm	mg/m³
30 min avg	182.5	19.4	8	10	17	1	37
30 min avg	181.3	19.5	1	1	16	1	35
30 min avg	181.1	19.5	8	10	17	1	37
30 min avg	183.0	19.5	5	6	15	1	33
30 min avg	182.5	19.4	1	1	19	1	41
30 min avg	183.0	19.4	2	3	18	1	39
30 min avg	183.0	19.4	2	3	19	1	41
30 min avg	181.3	19.6	21	26	18	1	39
30 min avg	180.7	19.6	17	21	18	1	39
30 min avg	183.0	19.5	3	4	18	1	39
Max Test Result	**183.0**	**19.6**	**21.0**	**26.3**	**19.0**	**1.0**	**41.0**
Min Test Result	**180.7**	**19.4**	**1.0**	**1.3**	**15.0**	**1.0**	**32.8**
Mean Test Result	**182.1**	**19.5**	**6.8**	**8.5**	**17.5**	**1.0**	**37.9**

Results Correct to

Temperature		Pressure		Oxygen		Gas	
°C/K	0/273	mbar/kPa	1013/101.3	%		Wet/Dry	Dry

Site : Mayflower Vehicles
Date : 26 August 2003
Plant : Contrapol Incinerator
File Ref. 3208

Date	Temp	Oxygen	Carbon	Carbon	Nitric	Nitrogen	Oxides of
26/08/2003			Monoxide	Monoxide	Oxide	Dioxide	Nitrogen (NO2)
Time	°C	%	ppm	mg/m³	ppm	ppm	mg/m³
8:31:02	181.3	19.4	22	28	19	1	41
8:33:02	182.5	19.4	31	39	19	1	41
8:35:02	181.1	19.4	31	39	19	1	41
8:37:02	181.3	19.4	21	26	19	1	41
8:39:02	181.3	19.4	19	24	19	1	41
8:41:02	182.5	19.9	16	20	18	1	39
8:43:02	181.1	19.6	18	23	18	1	39
8:45:02	181.1	18.7	16	20	17	1	37
8:47:02	181.3	19.2	15	19	18	1	39
8:49:02	180.9	18.9	9	11	17	1	37
8:51:02	182.5	19.2	8	10	19	1	41
8:53:02	181.1	19.4	9	11	19	1	41
8:55:02	181.3	19.4	7	9	19	1	41
8:57:02	181.3	19.4	6	8	18	1	39
8:59:02	182.5	19.4	8	10	17	1	37
9:01:02	181.1	19.5	5	6	16	1	35
9:03:02	181.3	19.5	6	8	15	1	33
9:05:02	181.3	19.5	7	9	14	1	31
9:07:02	182.5	19.5	9	11	17	1	37
9:09:02	181.1	19.5	0	0	18	1	39
9:11:02	181.3	19.5	0	0	19	1	41
9:13:02	181.3	19.5	0	0	19	1	41
9:15:02	182.5	19.5	0	0	18	1	39
9:17:02	181.1	19.5	0	0	18	1	39
9:19:02	181.3	19.5	0	0	17	1	37
9:21:02	180.9	19.5	0	0	18	1	39
9:23:02	182.5	19.5	1	1	17	1	37
9:25:02	181.1	19.5	1	1	18	1	39
9:27:02	181.3	19.5	1	1	17	1	37
9:29:02	181.3	19.5	1	1	16	1	35
9:31:02	182.5	19.5	1	1	17	1	37
9:33:02	181.1	19.5	3	4	18	1	39
9:35:02	181.3	19.5	1	1	19	1	41
9:37:02	181.3	19.5	3	4	18	1	39
9:39:02	182.5	19.5	1	1	17	1	37
9:41:02	181.1	19.5	3	4	18	1	39
9:43:02	181.3	19.5	5	6	15	1	33
9:45:02	181.3	19.5	6	8	14	1	31
9:47:02	180.9	19.5	7	9	15	1	33
9:49:02	182.5	19.5	8	10	17	1	37
9:51:02	181.1	19.5	8	10	19	1	41
9:53:02	181.3	19.5	8	10	19	1	41
9:55:02	181.3	19.5	8	10	19	1	41
9:57:02	182.5	19.5	8	10	18	1	39
9:59:02	181.1	19.5	8	10	17	1	37
10:01:02	181.3	19.5	8	10	17	1	37
10:03:02	181.3	19.5	8	10	17	1	37
10:05:02	182.5	19.5	9	11	16	1	35
10:07:02	181.1	19.5	9	11	15	1	33
10:09:02	182.6	19.5	9	11	16	1	35
10:11:02	184.2	19.5	9	11	17	1	37
10:13:02	183.3	19.5	9	11	16	1	35
10:15:02	183.4	19.5	9	11	17	1	37
10:17:02	184.2	19.5	9	11	16	1	35
10:19:02	184.5	19.5	9	11	17	1	37
10:21:02	183.5	19.5	9	11	15	1	33
10:23:02	183.4	19.5	9	11	15	1	33
10:25:02	183.3	19.5	9	11	15	1	33
10:27:02	183.0	19.5	9	11	15	1	33
10:29:02	183.0	19.5	5	6	15	1	33
10:31:02	182.9	19.4	5	6	16	1	35
10:33:02	183.0	19.4	5	6	18	1	39
10:35:02	184.5	19.6	5	6	19	1	41
10:37:02	183.5	19.5	5	6	19	1	41
10:39:02	183.4	19.5	5	6	19	1	41
10:41:02	183.3	19.5	5	6	19	1	41
10:43:02	183.0	19.4	5	6	19	1	41
10:45:02	183.0	19.4	3	4	19	1	41

10:47:02	182.9	19.4	3	4	18	1	39
10:49:02	183.0	19.4	3	4	18	1	39
10:51:02	182.3	19.4	3	4	18	1	39
10:53:02	182.5	19.4	2	3	18	1	39
10:55:02	181.3	19.4	1	1	19	1	41
10:57:02	181.3	19.4	1	1	18	1	39
10:59:02	182.5	19.4	1	1	19	1	41
11:01:02	181.1	19.4	2	3	18	1	39
11:03:02	181.3	19.4	1	1	19	1	41
11:05:02	181.3	19.4	1	1	18	1	39
11:07:02	182.5	19.4	2	3	19	1	41
11:09:02	181.1	19.4	1	1	18	1	39
11:11:02	182.6	19.4	1	1	19	1	41
11:13:02	184.2	19.4	2	3	18	1	39
11:15:02	182.5	19.4	2	3	19	1	41
11:17:02	182.8	19.4	2	3	18	1	39
11:19:02	183.0	19.4	2	3	19	1	41
11:21:02	183.3	19.4	2	3	18	1	39
11:23:02	183.1	19.4	2	3	19	1	41
11:25:02	182.4	19.4	2	3	18	1	39
11:27:02	183.0	19.4	2	3	19	1	41
11:29:02	183.0	19.4	2	3	18	1	39
11:31:02	182.3	19.4	2	3	19	1	41
11:33:02	182.5	19.4	2	3	18	1	39
11:35:02	182.8	19.4	2	3	19	1	41
11:37:02	183.0	19.4	2	3	18	1	39
11:39:02	183.5	19.4	2	3	19	1	41
11:41:02	183.4	19.4	2	3	17	1	37
11:43:02	183.3	19.4	2	3	16	1	35
11:45:02	183.0	19.4	2	3	17	1	37
11:47:02	183.0	19.4	2	3	17	1	37
11:49:02	182.9	19.4	2	3	17	1	37
11:51:02	183.0	19.4	2	3	18	1	39
11:53:02	182.3	19.4	2	3	18	1	39
11:55:02	182.5	19.4	2	3	19	1	41
11:57:02	182.8	19.4	2	3	18	1	39
11:59:02	183.0	19.4	2	3	19	1	41
12:01:02	183.3	19.4	3	4	18	1	39
12:03:02	183.1	19.4	3	4	19	1	41
12:05:02	182.4	19.4	3	4	18	1	39
12:07:02	183.0	19.4	3	4	19	1	41
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12:11:02	182.5	19.6	12	15	19	1	41
12:13:02	182.8	19.6	12	15	18	1	39
12:15:02	183.0	19.6	13	16	19	1	41
12:17:02	183.3	19.6	14	18	18	1	39
12:19:02	183.1	19.6	16	20	19	1	41
12:21:02	182.4	19.6	19	24	18	1	39
12:23:02	182.1	19.6	19	24	19	1	41
12:25:02	181.5	19.6	18	23	18	1	39
12:27:02	181.8	19.6	17	21	19	1	41
12:29:02	181.3	19.6	21	26	18	1	39
12:31:02	181.1	19.6	23	29	19	1	41
12:33:02	180.9	19.6	31	39	18	1	39
12:35:02	180.5	19.6	32	40	19	1	41
12:37:02	180.1	19.6	29	36	18	1	39
12:39:02	180.7	19.6	26	33	17	1	37
12:41:02	182.0	19.6	25	31	17	1	37
12:43:02	182.5	19.6	21	26	17	1	37
12:45:02	180.9	19.6	16	20	17	1	37
12:47:02	180.8	19.6	17	21	17	1	37
12:49:02	181.3	19.6	19	24	17	1	37
12:51:02	181.1	19.6	17	21	17	1	37
12:53:02	180.9	19.6	16	20	17	1	37
12:55:02	180.5	19.6	15	19	18	1	39
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13:03:02	182.5	19.6	14	18	18	1	39
13:05:02	180.9	19.7	12	15	18	1	39
13:07:02	180.8	19.7	13	16	18	1	39
13:09:02	181.7	19.7	14	18	18	1	39
13:11:02	182.4	19.7	13	16	19	1	41
13:13:02	181.7	19.7	15	19	19	1	41
13:15:02	180.7	19.7	14	18	19	1	41
13:17:02	180.9	19.7	14	18	19	1	41
13:19:02	181.4	19.4	12	15	19	1	41

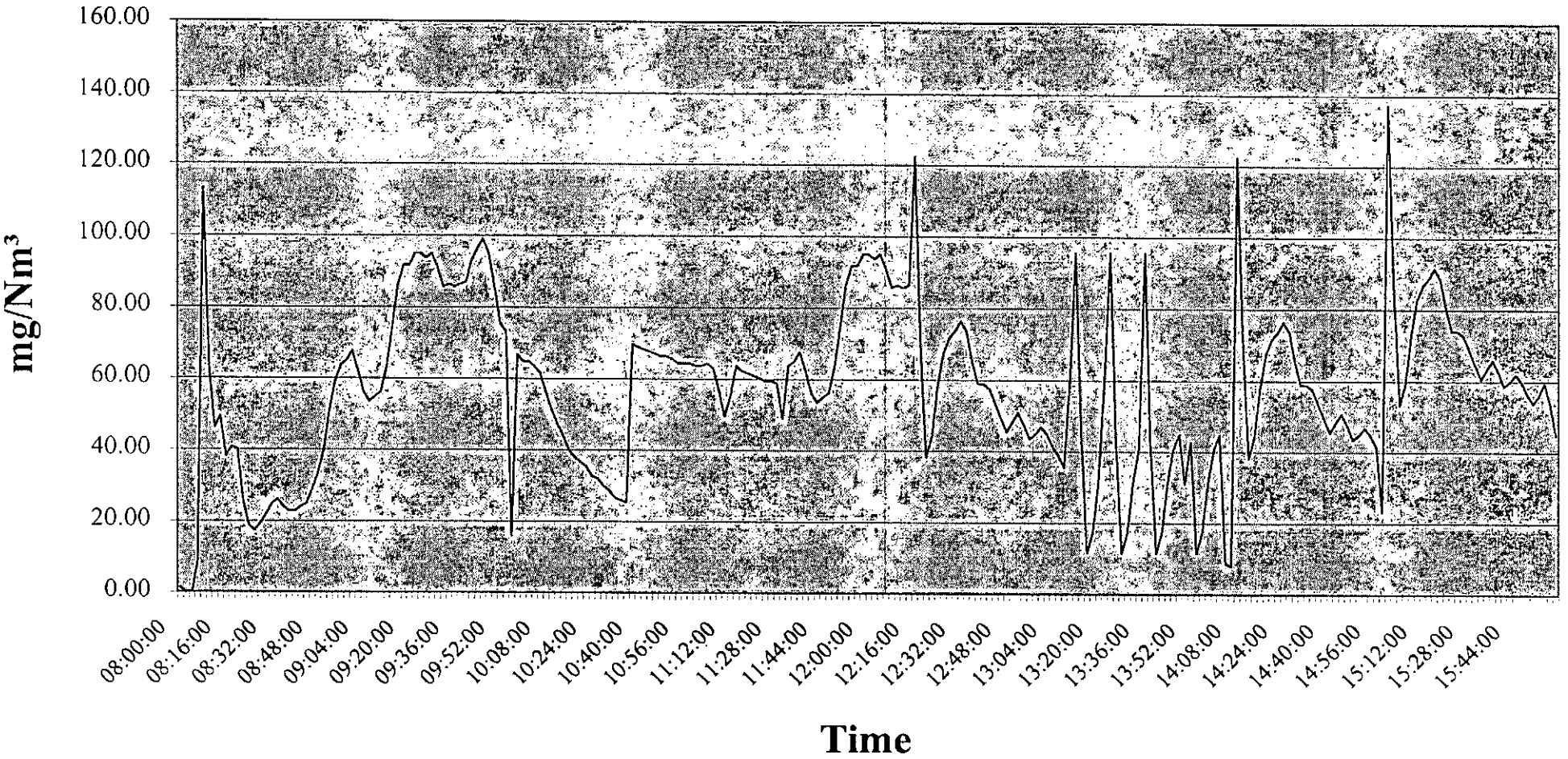
13:21:02	183.3	19.5	3	4	19	1	41
13:23:02	183.0	19.5	3	4	19	1	41
13:25:02	183.0	19.5	3	4	19	1	41
13:27:02	182.9	19.5	3	4	19	1	41
13:29:02	183.0	19.5	3	4	18	1	39

Max Test Result	**184.5**	**19.9**	**32.0**	**40.0**	**19.0**	**1.0**	**41.0**
Min Test Result	**180.1**	**18.7**	**0.0**	**0.0**	**14.0**	**1.0**	**30.8**
Mean Test Result	**182.1**	**19.5**	**8.2**	**10.2**	**17.8**	**1.0**	**38.6**

Results Correct to

Temperature		**Pressure**		**Oxygen**		**Gas**	
°C/K	0/273	**mbar/kPa**	1013/101.3	**%**	0.0	**Wet/Dry**	Dry

Incinerator



8. Appendix 2
(Sampling Methods)

Gaseous Species Determination

The Testo 33 combustion efficiency analyser is a portable self-contained measuring system for flue gas analysis. The analyser contains an integral pumping system, temperature sensor and electro-chemical cells. A gas preparation unit is used for sample gas conditioning.

Long term analysis of flue gases on heating plants generally leads to inaccurate measurement of NO_x and SO_2 due to the formation of condensate below the dew point temperature. Condensate forms in the tubes or filter and absorbs some NO_x and SO_2, hence the values measured are inaccurate. The gas preparation unit employed reduces this absorption to a minimum. The gas path and filters are maintained at a temperature of 150°C until the measuring gas in the gas cooler has been cooled down to the dew point of 3°C to 6°C via a Peitler element. The measuring medium already cleaned and dried, is then analysed in the combustion efficiency analyser.

TESTO 33

Temperature Measurement	
Temperature Range	-40 to + 1200 deg C
Maximum Tolerance	± 0.5 deg C (-40 to +100 deg C)
Draught	
Measuring Range	± 50 mBar
Resolution	0.01 mBar
Oxygen Measurement	
Measuring Range	0 - 21% vol. %
Maximum Tolerance	± 0.2 vol.% of m.v.
Carbon Dioxide Calculation	
Indication Range	0 - CO_2 maximum
Maximum Tolerance	± 0.2 vol. %
Carbon Monoxide Measurement	
Measuring Range	0 to 8000 ppm
Tolerance	± 20 ppm (up to 400 ppm) ± 5% of m.v. (up to 2000 ppm) ± 10% of m.v. (>2000 ppm)
NO Measurement	
Measuring Range	0 to 2000 ppm
Tolerance	± 20 ppm (up to 400 ppm) ±5% of m.v. (>400 ppm)
NO_2 Measurement	
Measuring Range	0 - 100 ppm
Tolerance	± 10 ppm
SO_2 Measurement	
Measuring Range	0 - 2000 ppm
Maximum Tolerance	± 20 ppm (up to 400 ppm) ± 5% of m.v. (>400 ppm)

9. Appendix 3
(Calibration Certificates)

EIM (NORTHERN) LTD
Unit No. 1
Adcroft Street
off Higher Hillgate
Stockport SK1 3HZ
Telephone 0161-476 3303
Fax 0161-476 4010
Email eim.northern@btclick.com
Website www.eimnorthern.co.uk

EIM NORTHERN LTD

CES ENVIRONMENTAL LTD
BRETBY BUSINESS PARK
STANHOPE BRETBY
STAFFS DE15 OYZ

CALIBRATION CERTIFICATE

CERTIFICATE NUMBER	021946	DATE	25-Nov-02
INSTRUMENT TYPE	0632 9733	YOUR REF.	2451
SERIAL NUMBER	203 4702 1002	OUR REF.	RR 8054

TEMPERATURE

Checked over the range: -40 deg C to 1200 deg C
Instrument Type: TME 2030. Serial No. 12078
Certificate No. 3949. Traceable to UKAS Lab 0078

CALIBRATION GASES

Supplied by AIR PRODUCTS.
Cert. No. 01131-98-AO-LDN-UKAS

CALIBRATION GAS TYPE	CO	NO	NO2	SO2	O2
Gas Values	150ppm	100ppm	78.8ppm	1001ppm	4.01%
Cylinder No.	3579	3524	2585	3553	173
INITIAL READINGS	144	100	67	962	3.9
Initial Cell Coefficient	0.0254	0.0805	-0.2509	0.0872	N A
CALIBRATED READINGS	149	100	80	1005	3.9
Final Cell Coefficient	0.0253	0.0805	-0.2295	0.0839	N A
Manufacturer's Tolerances	+/- 20ppm	+/- 5ppm	+/- 10ppm	+/- 5.0%	+/- 0.2%

COMMENTS: O2 Service switch replaced and calibration carried out.

CALIBRATION ENGINEER [redacted]

QUALITY CONTROL [redacted]

Mayflower Vehicle Systems

Determination of Particulates
Sealer Coat (ED) Plant
Holbrook Lane, Coventry
CV6 4AW

26 August 2003

Prepared by: **CES Environmental Instruments Ltd**
Bretby Business Park
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Telephone 01283 216334

Report prepared by [redacted]
.....
D.J. Slack
Isokinetic Sampling Engineer AEATE 990019
MCERTS Reg No. MM 02 100

Report authorised by [redacted]
...
R.M. Allen
Isokinetic Sampling Engineer AEATE 990018
MCERTS Reg No. MM 02 009

ISO 9001 - Certificate No. 279

Contents

Executive Summary

Operator Company: - Mayflower Vehicles Systems

Address: - Holbrook Lane, Coventry, CV6 4AW

Monitoring Company: - CES Environmental Instruments Ltd

Address: - Bretby Business Park, Ashby Road, Stanhope, Bretby
Burton on Trent, DE15 0YZ

Analytical Company: - CES Environmental Instruments Ltd

Address: - Bretby Business Park, Ashby Road, Stanhope, Bretby
Burton on Trent, DE15 0YZ

Monitoring Objective
To monitor and quantify particulate emissions to atmosphere from the Sealer Coat (ED) Plant located at Mayflower Vehicle Systems, Holbrook Lane, Coventry

Test Team
D. Slack (Team Leader), R. Ward, C. Redman, S. Elton, M. Rogers

Deviations from Sampling Method
None

Results
Date of Sampling: 26 August 2003

Location	Pollutant	Test No.	Concentration mg/Nm³	Mean Concentration mg/Nm³	Emission Rate kg/hr	Mean Emission Rate kg/hr
Sealer Coat (ED) Plant	Particulate	1	2.4	2.1	0.122	0.104
Sealer Coat (ED) Plant	Particulate	2	1.7		0.086	
Sealer Coat (ED) Plant	Particulate	Blank	0.0	0.0		

Results Correct to

Temperature		Pressure		Oxygen		Gas	
°C/K	0/273	mbar/kPa	1013/101.3	%		Wet/Dry	Wet

1. Introduction

Mayflower Vehicle Systems placed an order with CES Environmental Instruments Ltd, to monitor and quantify particulate emissions to atmosphere from the Sealer Coat (ED) Plant located at Mayflower Vehicle Systems, Holbrook Lane, Coventry. Test work was carried out 26 August 2003, and was undertaken by D. Slack (Team Leader), R. Ward, C. Redman, S. Elton, M. Rogers.

2. Plant Details

2.1 Sealer Coat Plant

The Seal Coat Plant is a wetback filter system with a single fan and stack. This is used for compliant coatings only.

3. Materials Used

Sealercoat Particulates Monitoring 26/08/03			
Materials Used During Monitoring Exercise			
Manufacturer	**Parts Sprayed**	**Description**	**Type/ Identity number**
Hemmelwrath	Taxis & Parts	Hydro-Primer Surfacer 3902	Mid Grey 31.03902.0
Hemmelwrath	Bumpers	Hydro- Fulignund 3608 6	Mayflower Grey Res SA6 GL HRG
Notes			
Parts Sprayed	15 Off Taxis & Sets of Parts	16 Off Bumpers	
Spraying commenced at	7.00 Shift finished at 4.30	30 minute lunch break between 12.30 to 1.0	

Electro Dip Particulates & VOC Monitoring 26/08/03												
Materials Used During Monitoring Exercise												
Manufacturer				**Parts Dipped**				**Description**			**Type/ Identity nu**	
PPG				As per log sheet				Powercron 648			ED 5	
Time	Product	Time	Product	Time	Product	Time	Product	Time	Product	Time	Product	Time
7.11	Agco/Roofs	9.21	Roof & Agco	11.31	Roof + VO3	13.41	Inglemex Floor	15.51	Empty	18.01		
7.20	Agco/Roofs	9.30	Agco	11.40	Taxi & Parts	13.50	Roof + MGF	15.59	Empty	18.09		
7.29	Agco	9.38	Taxi & Parts	11.48	Roof + Agco	13.58	Leyland Door + rad assy	16.06	Empty	18.18		
7.37	Roof	9.47	Roof	11.57	Taxi & Parts	14.07	Taxis & Parts	16.17	Agco	18.27		
7.46	Agco	9.56	Roof	12.05	Roof + Agco	14.16	Roofs + Agco	16.25	Roof + MGF	18.35		
7.54	Roof	10.04	Roofs	12.14	Agco	14.24	Taxis & Parts	16.34	Agco	18.44		
8.03	Taxi & Parts	10.13	Agco	12.23	Taxi & Parts	14.33	Empty	16.43	Roof + V03	18.53		
8.12	Taxi & Parts	10.22	NWA	12.32	Roof	14.42	Empty	16.51		19.01		
8.20	Roofs	10.30	Agco	12.40	Roof	14.50	Empty	17.00				
8.29	Landrover sides	10.39	Roof	12.49	Roofs	14.59	Empty	17.09				
8.38	Taxi & Parts	10.48	Taxi & Parts	12.58	Agco	15.07	Ultra	17.17				
8.46	Agco/Roofs	10.56	Inglemex Floor	12.05	Roofs	15.15	Taxi + Parts	17.26				
8.55	Taxi & Parts	11.05	Roof	13.15	Agco	15.25	Roof + LAP	17.35				
9.04	Roof	11.14	Landrover sides	13.24	Roof + Agco	15.33	Agco	17.43				
9.12	Taxi & Parts	11.22	Taxi & Parts	13.32	Taxi & Parts	15.42	Empty	17.52				

4. Sampling Location

4.1 Sealer Coat

Sampling was undertaken in the vertical duct, the duct was measured to be 1400mm x 1100mm giving a cross sectional area of 1.54m^2. There are two 4"BSP sockets. Samples were taken from 4 points on each axis, 8 in total.

The sample location does not comply with BS EN 13284-1 for the following reasons:

1. The sample plane does not comply with the minimum requirement in length upstream and downstream.

5. Test Programme

Two particulate emissions tests were carried out on each stack. Particulate emission measurements were made using the Erwin Sick "Gravimat SHC5" isokinetic dust sampling system. The method complies with the requirements of BS EN 13284-1 (Determination of low range mass concentration of dust). A detailed description of this method is given in Appendix 2.

Sampling equipment reference C120 – Gravimat SHC-5

6. Plant Emissions

All results are corrected to 0°C (273K) and 1013mbar (101.3 kPa)

7. Results

Date of Sampling: 26 August 2003

Location	Pollutant	Test No.	Concentration mg/Nm^3	Mean Concentration mg/Nm^3	Emission Rate kg/hr	Mean Emission Rate kg/hr
Sealer Coat (ED) Plant	Particulate	1	2.4	2.1	0.122	0.104
Sealer Coat (ED) Plant	Particulate	2	1.7		0.086	
Sealer Coat (ED) Plant	Particulate	Blank	0.0	0.0		

Results Correct to

Temperature		Pressure		Oxygen		Gas	
°C/K	0/273	mbar/kPa	1013/101.3	%		Wet/Dry	Wet

8. Appendix 1
(Extraction Protocol)

Site : Mayflower Vehicles
Date : 26 August 2003
Plant : Sealer Coat
File Ref. 3208

Mean Particulate Results

Filter	mg/m³	kg/hr
64335	2.4	0.122
64326	1.7	0.086
Mean	2.1	0.104

Control Blank Filter

Filter	Volume (m³)
64335	0.696
64326	0.686
Mean	0.691

(Reference Conditions with no correction for Oxygen)

Filter 64131

Tare Weight	18.7449 mg
Gross Weight	18.7449 mg
Gain	0.0 mg
Measured Oxygen	0.0 %
Concentration	0.0 mg/Nm³

Results Correct to

Temperature		Pressure		Oxygen		Gas	
°C/K	0/273	mbar/kPa	1013/101.3	%		Wet/Dry	Wet

file : 3208SCT1.SMP 26.08.03
11:55-12:37

plant : Sealercoat
measuring place: Mayflower Vehicals
engineer : CR/DS

remarks :
Normal Operation
Dim = 1400mm x 1100mm

constants and parameters :

dyn.pressure	[mbar]	: 1012
normal density	[kg/m3]	: 1.3
water vapour	[%Vol]	: 15.0
cross section of the duct	[m2]	: 1.54

results

density	[kg/m3]	: 1.222
volume flow act.	[m3/h]	: 49333
volume flow norm wet	[m3/h]	: 46379
volume flow norm dry	[m3/h]	: 39422

file : 3208SCT1.SMP dust probe : 64335 26.08.03
11:55-12:37

measured values and calculations

axis	depth	p_duct [mbar]	p_dyn [mbar]	T [°C]	v_duct [m/s]	angle [°]
1	1	0.0	0.38	17.1	7.6	-3.0
1	2	0.0	0.25	17.1	6.3	-1.3
1	3	0.0	0.40	17.1	8.0	-1.6
1	4	0.0	0.38	17.1	7.9	-0.5
1	5	0.0	0.36	17.1	7.6	-0.6
1	6	0.0	0.38	17.0	7.8	-0.9
1	7	0.0	0.41	17.0	8.0	-0.4
1	8	0.3	0.47	17.0	8.7	1.0
1	9	0.0	0.47	17.1	8.8	-0.6
1	10	0.0	0.46	17.1	8.6	-1.1
2	1	0.5	0.57	17.2	9.6	0.3
2	2	0.4	0.54	17.2	9.3	0.3
2	3	0.4	0.57	17.2	9.6	-0.1
2	4	0.5	0.59	17.2	9.7	-0.8
2	5	0.4	0.57	17.2	9.6	0.3
2	6	0.6	0.62	17.2	10.1	0.4
2	7	0.6	0.64	17.2	10.2	-1.0
2	8	0.6	0.63	17.3	10.2	-1.0
2	9	0.6	0.61	17.2	10.0	-0.2
2	10	0.6	0.65	17.1	10.3	0.0
mean :		0.3		17.1	8.9	

file : 3208SCT1.SMP dust probe : 64335 26.08.03
11:55-12:37

plant : Sealercoat
measuring place: Mayflower Vehicals
engineer : CR/DS

remarks :
Normal Operation
Dim = 1400mm x 1100mm

constants and parameters :

dyn.pressure	[mbar]	: 1012
normal density	[kg/m3]	: 1.3
water vapour	[%Vol]	: 15.0
cross section of the duct	[m2]	: 1.54
diameter of nozzle	[mm]	: 6.4
extraction/point	[h:m:s]	: 00:05:00
tare weight of probe	[mg]	: 17392.1
gross weight of probe	[mg]	: 17393.8

results

volume flow	[m3/h]	: 1.112
extracted vol. act.	[m3]	: 0.741
extracted vol. norm. hum.	[m3]	: 0.696
extracted vol. norm. dry	[m3]	: 0.591
volume flow act.	[m3/h]	: 53255.0
volume flow norm wet	[m3/h]	: 50003.3
volume flow norm dry	[m3/h]	: 42502.8
total extraction time	[h:m:s]	: 00:40:00
dust weight	[mg]	: 1.7
dust conc. act.	[mg/m3]	: 2.3
dust conc. norm. wet	[mg/m3]	: 2.4
dust conc. norm dry	[mg/m3]	: 2.9
particulate flow rate	[kg/h]	: 0.122
extinction	[mA]	: 0.00

file : 3208SCT1.SMP dust probe : 64335 26.08.03
11:55-12:37

a	d	p_duct [mbar]	p_dyn [mbar]	T [°C]	v_duct [m/s]	p_orif [mbar]	p_prob [mbar]	I_cal [mA]	q [m3/h]	angle [°]
1	1	0.0	0.47	16.8	8.8	2.89	-99	0.00	1.00	0.6
1	2	0.0	0.38	16.8	7.8	2.34	-86	0.00	0.91	1.1
1	3	0.0	0.50	16.7	9.0	3.16	-105	0.00	1.05	0.4
1	4	0.0	0.50	16.8	9.0	3.16	-105	0.00	1.04	-0.3
2	1	0.5	0.65	17.3	10.3	4.14	-121	0.00	1.19	0.2
2	2	0.6	0.65	17.0	10.3	4.21	-122	0.00	1.19	0.1
2	3	0.6	0.68	19.0	10.6	4.43	-126	0.00	1.23	-0.2
2	4	0.7	0.74	19.8	11.0	4.89	-135	0.00	1.28	-0.1
mean :		0.3		17.5	9.6			0.00	1.11	

dust concentration measurement **ERWIN SICK Optic Electronic**
protocol of isokinetic extraction measurement

---

file : 3208SCT2.SMP dust probe : 64326 26.08.03
12:48-13:29

plant : Sealercoat
measuring place: Mayflower Vehicals
engineer : CR/DS

remarks :
Normal Operation
Dim = 1400mm x 1100mm

constants and parameters :

dyn.pressure	[mbar]	: 1012
normal density	[kg/m3]	: 1.3
water vapour	[%Vol]	: 15.0
cross section of the duct	[m2]	: 1.54
diameter of nozzle	[mm]	: 6.4
extraction/point	[h:m:s]	: 00:05:00
tare weight of probe	[mg]	: 17012.2
gross weight of probe	[mg]	: 17013.4

results

volume flow	[m3/h]	: 1.095
extracted vol. act.	[m3]	: 0.730
extracted vol. norm. hum.	[m3]	: 0.686
extracted vol. norm. dry	[m3]	: 0.583
volume flow act.	[m3/h]	: 52299.0
volume flow norm wet	[m3/h]	: 49151.4
volume flow norm dry	[m3/h]	: 41778.7
total extraction time	[h:m:s]	: 00:40:00
dust weight	[mg]	: 1.2
dust conc. act.	[mg/m3]	: 1.6
dust conc. norm. wet	[mg/m3]	: 1.7
dust conc. norm dry	[mg/m3]	: 2.1
particulate flow rate	[kg/h]	: 0.086
extinction	[mA]	: 0.00

file : 3208SCT2.SMP dust probe : 64326 26.08.03
12:48-13:29

a	d	p_duct [mbar]	p_dyn [mbar]	T [°C]	v_duct [m/s]	p_orif [mbar]	p_prob [mbar]	I_cal [mA]	q [m3/h]	angle [°]
1	1	0.0	0.45	17.1	8.6	2.82	-96	0.00	0.99	0.9
1	2	0.0	0.38	17.2	7.9	2.41	-89	0.00	0.92	0.6
1	3	0.3	0.48	17.3	8.9	3.03	-101	0.00	1.03	-0.9
1	4	0.5	0.54	17.2	9.3	3.46	-108	0.00	1.09	0.3
2	1	0.5	0.57	17.2	9.6	3.60	-111	0.00	1.11	-0.2
2	2	0.5	0.58	17.0	9.8	3.75	-114	0.00	1.13	-1.0
2	3	0.6	0.67	17.3	10.5	4.30	-126	0.00	1.21	0.4
2	4	0.7	0.73	17.7	10.9	4.86	-136	0.00	1.27	-0.5
mean :		0.4		17.3	9.4			0.00	1.09	

9. Appendix 2
(Sampling Methods)

Erwin Sick Sampling Train

Extractive dust measurements were made using the Erwin Sick "Gravimat SHC-5" isokinetic dust sampling system. The equipment uses a stainless steel probe which combines a sampling nozzle and filter, 3 pitot pressure inlets and a thermocouple. Real time velocity, turbidity and temperature measurements are provided for the control processor to modulate the pump speed and continuously ensure isokinetic conditions are maintained.

The Gravimat SHC-5 portable dust concentration measuring system operates on the gravimetric measuring principle as required by BS 3405 and BS 6069. The dust-laden gas is isokinetically extracted by a scavenging probe. A special filter retains the dust. The dust content is determined by differential weighing of the dust collectors together with the filters. This avoids the dust losses which are inevitable when the filters are removed. The dust concentration in mg/m^3 can then be calculated from the relationship between the dust weight and the volume of gas extracted.

The Gravimat SHC-5 gravimetric dust concentration measuring system comprises the following components:

* GS 5 filter head probe with accessories
* SHC-AE control unit
* Evaluation computer (laptop) with SMP5 measuring and evaluation software
* SHC-PS power supply unit
* SHC-TU transport unit, optional.

The SHC-AE control unit performs the isokinetic control that is necessary for precise measurements. It is connected to the multi-chamber hose and the thermocouple of the GS 5 probe as well as to the evaluation computer. All the measured data is automatically collected and recorded together with the extraction measurements time, relieving the operator of control and recording duties during the monitoring process. The operator is simply required to move the probe to the next measurement point at a signal from the control unit.

Before testing all recommended system checks and leak tests were carried out. The filters were assembled and then dried in an oven at 110°C, cooled in a desiccator and then weighed on a 0.1mg resolution balance. After testing the filters are weighed in an identical fashion.

Features:

* Considerably improved measuring accuracy through the newly developed GS 5 filter head probe.
* The probe can be used for both high (several g/m^3) and very low dust concentrations (less than 1 mg/m^3)
* Fully automatic detection and storage of all relevant measured values during extraction of the sample.
* Fully automatic isokinetic control precludes operator error and increases the accuracy of the measurement.
* Automatic logging of all measurements - only the weight of the dust collector and plant-specific comments have to be entered manually.

10. Appendix 3
(Calibration Certificates)

Certificate of Calibration

Date of Issue: 4 April 2003

CES Environmental Instruments Ltd
Bretby Business Park, Ashby Road
Burton-on-Trent, Staffordshire, DE15 0YZ
Tel: 01283 216334 Fax: 01283 550939

[redacted] 102
of 2

Certified By

Instrument Details

Instrument Type	Gravimat SHC-5
Instrument Make	Erwin Sick
Instrument Serial No.	93055129
Quality No.	C120
Calibration Date	27/03/03
Calibrated By Name	R. Allen

Ambient Conditions

Air Temperature (°C)	22	**
Barometric Pressure (mbar)	1002	
Relative Humidity (%)	42	**

Instruments used to undertake calibration

E Type Pitot	UKAS Certificate No. 00180	(Qu. No. C136)
Manometer Type FC012	UKAS Certificate No. 00350	(Qu. No. C082)
Manometer Type FC012	UKAS Certificate No. 00349	(Qu. No. C081)
Barometer Type 104	UKAS Certificate No. N1072047V	(Qu. No. C138)
Gallus Dry Gas Meter	UKAS Certificate No. N1054538F	(Qu. No. C125)
TM 2030 Thermometer	UKAS Certificate No. 89143	(Qu. No. C135)
K-Type Thermocouple	UKAS Certificate No. N1054537T	(Qu. No. C134)
RIS Supersat XT	Certificate No. IH50788	(Qu. No. C014) *

* Not UKAS traceable ** Indication only

Flow and Extraction

The reference pitot was placed in a wind tunnel located at Bretby Business Park. The Gravimat SHC-5 Sampling Probe under test was mounted within the same wind tunnel in close proximity to the reference pitot. The wind tunnel was operated to generate a differential pressure across each pitot, a direct comparison was made. The differential pressures measured were in the region of the calibration points of the reference pitot. Correction factors were applied to the reference pitot and compared to the differential pressure shown for the pitot under test. The extraction system of the unit was operated for a period of one minute.

Volume Flow

A calibrated dry gas meter was connected to the sampling nozzel ot the Gravimat SCH-5. A volume of air is pulled through the sampling system. The measured value shown on the calibrated dry gas meter is then compared to the indicated value on the Gravimat SCH-5 display.

Barometric Pressure

The barometric pressure was measured using a calibrated barometer. The indicated pressure was compared to the Gravimat SHC-5 display.

Temperature

The probe thermocouple was placed in a thermpcouple oven and heated. The temperature was measured using a calibrated thermocouple and temperature indicator. The resultant temperature was compared to the Gravimat SCH-5 display.

Current

A mA current source was injected into the Gravimat SCH-5 using a mA current generator. The injected current was compared to the Gravimat SCH-5 display.

Certificate of Calibration

Date of Issue: 4 April 2002

CES Environmental Instruments Ltd
Bretby Business Park, Ashby Road
Burton-on-Trent, Staffordshire, DE15 0YZ
Tel: 01283 216334 Fax: 01283 550939

[redacted]
Certified By

Instrument Details

Instrument Type	Gravimat SHC-5
Instrument Make	Erwin Sick
Instrument Serial No.	93055129
Quality No.	C120
Calibration Date	27/03/03

Ambient Conditions

Air Temperature (°C)	22	**
Barometric Pressure (mbar)	1002	
Relative Humidity (%)	42	**
Air Density @ 0°C (kg/m³)	1.277	
Corrected Air Density (kg/m³)	1.1689	

Calibration Details

Flow and Extraction

Applied Pressure (Pa)	Pitot Correction	Applied Pressure Corrected (Pa)	SHC5 p-dyn (Pa)	Pressure Factor	Calculated Velocity (m/s)	SHC5 Velocity (m/s)	Velocity Factor	Nozzel Diameter (mm)	Calculated Extraction (m³/hr)	SHC5 Extraction (m³/hr)	Extraction Factor
3.4	0.947	3.22	3.2	1.01	2.347	2.309	1.02	10.0	0.66	0.67	0.99
42.3	0.962	40.69	41.3	0.99	8.344	8.415	0.99	8.0	1.51	1.53	0.99
93.1	0.967	90.03	92.2	0.98	12.411	12.566	0.99	6.4	1.44	1.45	0.99
164.2	0.969	159.11	161.4	0.99	16.499	16.547	1.00	6.4	1.91	1.94	0.99
214.3	0.969	207.66	206.4	1.01	18.849	19.132	0.99	6.4	2.18	2.21	0.99

Volume Flow

Nominal Flow Rate l/min	Actual Flow Rate l/min	Actual Flow Rate m³/hr	Orifice Constant
15.00	14.967	0.898	13.33
20.00	20.367	1.222	13.54
25.00	25.133	1.508	13.26
30.00	29.933	1.796	13.32
		Instrument Orifice Constant(@1.5m³/hr) =	13.26

Barometric Pressure

Pressure	
Required Value (mbar)	Indicated Value (mbar)
1002.0	1002.0
1000.0	1000.0
999.0	999.0

Temperature

Temperature Input	
Required Value (°C)	Indicated Value (°C)
25.0	25.0
50.0	49.9
100.0	99.8
150.0	149.8
250.0	250.0
300.0	300.1

Current

Current Value	
Required Value (mA)	Indicated Value (mA)
0.0	0.0
5.0	5.0
10.0	10.0
15.0	15.0
20.0	19.9

Time

Time Period mins	Required Value mins	Within Limit
3:00	2:59 → 3:01	Yes
5:00	4:59 → 5:01	Yes
10:00	9:59 → 10:01	Yes

CES Environmental Instruments Ltd
Bretby Business Park, Ashby Road, Bretby
Burton-on-Trent, Staffordshire, DE15 0YZ
Tel: 01283 216334 Fax: 01283 550939
www.cesei.co.uk

SITE SPECIFIC PROTOCOL

Site name, address and operator contact

Peter Redhead	Telephone No.:	02476 584100
Mayflower Vehicle Systems	Fax No.:	02476 688209
Holbrook Lane		
Coventry		
CV6 4AW		

Planned date of the measurement campaign

TBD

Names of sampling team members, their competency and specific responsibility

D. Slack	MCERTS Level 2
R. Allen	MCERTS Level 2
R. Ward	MCERTS Level 2
C. Redman	MCERTS Level 1

Description of the site

Vehicle Manufacture and Spray Finish Spraying Company

Identify of the installations to be measured

1. Prototype Spraybooth
2. Sealant Coat Spraybooth
3. Contrapol Incinerator

PLANT
1. Prototype Spraybooth

Type of Process

Prototype Spraybooth
Paint Spray Operation

Operational / feed details, e.g. continuous, batch process

Batch Process (small spray operations typical 10-15 minutes, not used everyday)

Duration of any batch processes

Can be as small as 2-3 minutes, up to 20 minutes.

Non-continuous processes, the part of the process when sampling will take place

Sampling will be undertaken during normal spraying and baking activities.

Unusual occurrences that may occur in the process

None known

Process details that need to be collected over the monitoring period

1. Components being sprayed
2. Paints and solvents being used

Emission limit values

1.	Particulates	50 mg/m^3
2.	VOC's	50 mg/m^3 expressed as carbon

Substances to be monitored at each installation

1.	Particulates	Spraying operation
2.	Volatile Organic Compounds	Spraying / Baking

Reference conditions for reporting concentrations

0°C (273K) and 1013mbar (101.3kPa)

Measurement method for each substance

1.	Particulates	BS EN 13284-4
2.	Volatile Organic Compounds	US EPA Method 25A

Organisation's technical procedure reference covering implementation of the above method

CES Environmental Instruments Ltd Work Instruction

Overall uncertainty of the technical procedure

1.	Particulates	BS EN 13284-4	± 30%
2.	Volatile Organic Compounds	US EPA Method 25A	± 10%

Modifications to the technical procedure, with justifications and any resulting changes to the uncertainties

None

Equipment used for each substance monitored

1.	Particulates	Erwin Sick Gravimat
2.	Volatile Organic Compounds	Signal Flame Ionisation Detector

Sampling duration and number of samples for each measurement, including blanks

1.	Particulates	20 minutes	samples TBD
2.	Volatile Organic Compounds	20 minutes	samples TBD 2 min ave's

For manual methods, the proposed sample flowrate and volume and the minimum sampling times

1. Particulates 4 points per axis, eight in total, 2.5 minutes per point

For instrumental methods, the proposed span-gas concentration

2. Volatile Organic Compounds 0-350 ppm

Measurement concentration range and lower detection limit

2. Volatile Organic Compounds 0.1ppm from method

Description of the location of the sampling plane for release point

Vertical rectangular duct, sampling plane accessed by office window

Each sampling plane, a description of the type of sampling port

2 x 4" BSP sockets

Each sampling plane, a summary of the number, arrangement and orientation of sample line(s), and the number of sampling points per line

1.	Particulates	2 x sample planes	4 points per axis
2.	Volatile Organic Compounds	centre point sample	

Each sampling plane, a summary of compliance with CEN Standards

	Yes	No
Does the sample plane comply upstream	*	
Does the sample plane comply downstream	*	
Are the appropriate sample ports fitted	*	
Does the velocity air temperature profile comply	*	

For manual methods requiring a separate chemical analysis stage

1. **details of the analytical method**

Not Required

2. **the laboratory carrying out the analysis**

Not Required

3. **chain-of-custody details**

Not Required

4. **allowable time for transit to the laboratory**

Not Required

5. **storage conditions**

Not Required

6. **archiving requirements**

Not Required

Procedure for recording monitoring data

On site loggers and manual back-up (reference to work instruction)

Method to be followed for correction of results to standard conditions

Technical Guidance Document M2

Report format

Word Processed / Hard Copy

Person who will be writing the report

David Slack

Person who will be checking the report

Robert Allen

Procedure for checking data quality

Software Verification

Date the results report is due to be issued

Within 14 days of testing

Reference number and date of the on-site health and safety risk assessment carried out

TBC EI/3208

Reference number of the use of hazardous chemicals risk assessments for each measurement method

Not Required

Site-specific safety requirements, e.g. local safety induction course, intrinsically safe site

Site Induction

Other relevant health and safety requirements

No additional

PLANT
2. Sealant Coat Spraybooth

Type of Process

Sealant Coat(Electrocoat) Spraybooth for the spraying of Automotive components
Wet back and dry fitter spraybooth

Operational / feed details, e.g. continuous, batch process

Process Dictated by amount of Automotive components to be sprayed

Duration of any batch processes

Not Applicable

Non-continuous processes, the part of the process when sampling will take place

Sampling will be undertaken during normal spraying activities

Unusual occurrences that may occur in the process

None known

Process details that need to be collected over the monitoring period

1. Components being sprayed and spray time
2. Paints and Solvents being used

Emission limit values

1. Particulates 50 mg/m^3

Substances to be monitored at each installation

1. Particulates

Reference conditions for reporting concentrations

0°C (273K) and 1013mbar (101.3kPa)

Measurement method for each substance

1. Particulates BS EN 13284-4

Organisation's technical procedure reference covering implementation of the above method

CES Environmental Instruments Ltd Work Instruction

Overall uncertainty of the technical procedure

1.	Particulates	BS EN 13284-4	±30%

Modifications to the technical procedure, with justifications and any resulting changes to the uncertainties

None

Equipment used for each substance monitored

1.	Particulates	Erwin Sick Gravimat

Sampling duration and number of samples for each measurement, including blanks

1.	Particulates	40 minutes	2 samples + 1 blank

For manual methods, the proposed sample flowrate and volume and the minimum sampling times

1.	Particulates	4 points per axis, eight in total, 5 minutes per point

For instrumental methods, the proposed span-gas concentration

Not Required

Measurement concentration range and lower detection limit

Not Required

Description of the location of the sampling plane for release point

Guarded ladder to permanent sample platform

Each sampling plane, a description of the type of sampling port

2 x 4" BSP sockets

Each sampling plane, a summary of the number, arrangement and orientation of sample line(s), and the number of sampling points per line

1. Particulates 2 x sample plane 4 points per axis

Each sampling plane, a summary of compliance with CEN Standards

	Yes	No
Does the sample plane comply upstream		*
Does the sample plane comply downstream		*
Are the appropriate sample ports fitted	*	
Does the velocity air temperature profile comply	*	

For manual methods requiring a separate chemical analysis stage

1. **details of the analytical method**

Not Required

2. **the laboratory carrying out the analysis**

Not Required

3. **chain-of-custody details**

Not Required

4. **allowable time for transit to the laboratory**

Not Required

5. **storage conditions**

Not Required

6. **archiving requirements**

Not Required

Procedure for recording monitoring data

On site loggers and manual back-up (reference to work instruction)

Method to be followed for correction of results to standard conditions

Technical Guidance Document M2

Report format

Word Processed / Hard Copy

Person who will be writing the report

David Slack

Person who will be checking the report

Robert Allen

Procedure for checking data quality

Software Verification

Date the results report is due to be issued

Within 14 days of testing

Reference number and date of the on-site health and safety risk assessment carried out

TBC EI/3208

Reference number of the use of hazardous chemicals risk assessments for each measurement method

Not Required

Site-specific safety requirements, e.g. local safety induction course, intrinsically safe site

Site Induction

Other relevant health and safety requirements

No additional

PLANT
3. Contrapol Incinerator

Type of Process

Contrapol Incinerator
Incinerator processes the extracted air from the spraying process. It is then fed to the incinerator to burn any volatile away.

Operational / feed details, e.g. continuous, batch process

Process Dictated by production rates

Duration of any batch processes

Not Applicable

Non-continuous processes, the part of the process when sampling will take place

Sampling will be undertaken during normal spraying activities

Unusual occurrences that may occur in the process

None known

Process details that need to be collected over the monitoring period

1. Components being sprayed and spray time
2. Paints and Solvents being used

Emission limit values

1.	Oxides of Nitrogen	100 mg/m^3
2.	Carbon Monoxide	100 mg/m^3

Substances to be monitored at each installation

1. Oxides of Nitrogen
2. Carbon Monoxide

Reference conditions for reporting concentrations

0°C (273K) and 1013mbar (101.3kPa)

Measurement method for each substance

1.	Oxides of Nitrogen	BS ISO 10849
2.	Carbon Monoxide	BS ISO 12039

Organisation's technical procedure reference covering implementation of the above method

CES Environmental Instruments Ltd Work Instruction

Overall uncertainty of the technical procedure

1.	Oxides of Nitrogen	BS ISO 10849	±10%
2.	Carbon Monoxide	BS ISO 12039	±10%

Modifications to the technical procedure, with justifications and any resulting changes to the uncertainties

None

Equipment used for each substance monitored

1.	Oxides of Nitrogen	Testoterm 33 + Gas Preparation
2.	Carbon Monoxide	Testoterm 33 + Gas Preparation

Sampling duration and number of samples for each measurement, including blanks

1.	Oxides of Nitrogen	5 hours	1 sample
2.	Carbon Monoxide	5 hours	1 sample

For manual methods, the proposed sample flowrate and volume and the minimum sampling times

Not Required

For instrumental methods, the proposed span-gas concentration

1.	Oxides of Nitrogen	0-50ppm / 0-350ppm / 0-1000ppm
2.	Carbon Monoxide	0-250ppm / 0-500ppm / 0-1000ppm

Measurement concentration range and lower detection limit

1.	Oxides of Nitrogen	±20ppm LDL 1ppm
2.	Carbon Monoxide	±20ppm LDL ±5%

Description of the location of the sampling plane for release point

Via guarded ladder to sample platform – 15ft high

Each sampling plane, a description of the type of sampling port

2 x 4" BSP Sockets

Each sampling plane, a summary of the number, arrangement and orientation of sample line(s), and the number of sampling points per line

Centre Point Sample

Each sampling plane, a summary of compliance with CEN Standards

	Yes	No
Does the sample plane comply upstream	*	
Does the sample plane comply downstream	*	
Are the appropriate sample ports fitted	*	
Does the velocity air temperature profile comply	*	

For manual methods requiring a separate chemical analysis stage

7. details of the analytical method

Not Required

8. the laboratory carrying out the analysis

Not Required

9. chain-of-custody details

Not Required

10. allowable time for transit to the laboratory

Not Required

11. storage conditions

Not Required

12. archiving requirements

Not Required

Procedure for recording monitoring data

On site loggers and manual back-up (reference to work instruction)

Method to be followed for correction of results to standard conditions

Technical Guidance Document M2

Report format

Word Processed / Hard Copy

Person who will be writing the report

David Slack

Person who will be checking the report

Robert Allen

Procedure for checking data quality

Software Verification

Date the results report is due to be issued

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TBC EI/3208

Reference number of the use of hazardous chemicals risk assessments for each measurement method

Not Required

Site-specific safety requirements, e.g. local safety induction course, intrinsically safe site

Site Induction

Other relevant health and safety requirements

No additional

For and on behalf of Mayflower Vehicle Systems.

Name:..... Signature.....

Position:.....

Date:.....

For and on behalf of Regulatory Authority.

Name:..... Signature.....

Position:.....

Date:.....

For and on behalf of CES Environmental Instruments Ltd.

Name:..... Signature.....

Position:.....

Date:.....

CES Environmental Instruments Ltd
Bretby Business Park, Ashby Road, Bretby
Burton-on-Trent, Staffordshire, DE15 0YZ
Tel: 01283 216334 Fax: 01283 550939
www.cesei.co.uk

SITE SPECIFIC PROTOCOL

Site name, address and operator contact

Peter Redhead
Mayflower Vehicle Systems
Holbrook Lane
Coventry
CV6 4AW

Telephone No.: 02476 584100
Fax No.: 02476 688209

Planned date of the measurement campaign

TBD

Names of sampling team members, their competency and specific responsibility

D. Slack	MCERTS Level 2
R. Allen	MCERTS Level 2
R. Ward	MCERTS Level 2
C. Redman	MCERTS Level 1

Description of the site

Vehicle Manufacture and Spray Finish Spraying Company

Identify of the installations to be measured

1. Prototype Spraybooth
2. Sealant Coat Spraybooth
3. Contrapol Incinerator

PLANT
1. Prototype Spraybooth

Type of Process

Prototype Spraybooth
Paint Spray Operation

Operational / feed details, e.g. continuous, batch process

Batch Process (small spray operations typical 10-15 minutes, not used everyday)

Duration of any batch processes

Can be as small as 2-3 minutes, up to 20 minutes.

Non-continuous processes, the part of the process when sampling will take place

Sampling will be undertaken during normal spraying activities.

Unusual occurrences that may occur in the process

None known

Process details that need to be collected over the monitoring period

1. Components being sprayed
2. Paints and solvents being used

Emission limit values

1. Particulates 50 mg/m^3
2. VOC's 50 mg/m^3 expressed as carbon

Substances to be monitored at each installation

1. Particulates
2. Volatile Organic Compounds

Reference conditions for reporting concentrations

0°C (273K) and 1013mbar (101.3kPa)

Measurement method for each substance

1.	Particulates	BS: 6069 Section 4.3
2.	Volatile Organic Compounds	US EPA Method 25A

Organisation's technical procedure reference covering implementation of the above method

CES Environmental Instruments Ltd Work Instruction

Overall uncertainty of the technical procedure

1.	Particulates	BS:6069	± 10%
2.	Volatile Organic Compounds	US EPA Method 25A	± 10%

Modifications to the technical procedure, with justifications and any resulting changes to the uncertainties

Dust collected will not meet 100mg required for BS:6069.

Equipment used for each substance monitored

1.	Particulates	Erwin Sick Gravimat
2.	Volatile Organic Compounds	Signal Flame Ionisation Detector

Sampling duration and number of samples for each measurement, including blanks

1.	Particulates	20 minutes	samples TBD
2.	Volatile Organic Compounds	20 minutes	samples TBD 2 min ave's

For manual methods, the proposed sample flowrate and volume and the minimum sampling times

1. Particulates 4 points per axis, eight in total, 2.5 minutes per point

For instrumental methods, the proposed span-gas concentration

2. Volatile Organic Compounds 0-350 ppm

Measurement concentration range and lower detection limit

2. Volatile Organic Compounds 0.1ppm from method

Description of the location of the sampling plane for release point

Vertical rectangular duct, sampling plane accessed by office window

Each sampling plane, a description of the type of sampling port

2 x 4" BSP sockets

Each sampling plane, a summary of the number, arrangement and orientation of sample line(s), and the number of sampling points per line

1.	Particulates	2 x sample planes	4 points per axis
2.	Volatile Organic Compounds	centre point sample	

Each sampling plane, a summary of compliance with CEN Standards - 6069 being used?

	Yes	No
Does the sample plane comply upstream	*	
Does the sample plane comply downstream	*	
Are the appropriate sample ports fitted	*	
Does the velocity air temperature profile comply	*	

For manual methods requiring a separate chemical analysis stage

1. details of the analytical method

Not Required

2. the laboratory carrying out the analysis

Not Required

3. chain-of-custody details

Not Required

4. allowable time for transit to the laboratory

Not Required

5. storage conditions

Not Required

6. archiving requirements

Not Required

Procedure for recording monitoring data

On site loggers and manual back-up (reference to work instruction)

Method to be followed for correction of results to standard conditions

Technical Guidance Document M2

Report format

Word Processed / Hard Copy

Person who will be writing the report

David Slack

Person who will be checking the report

Robert Allen

Procedure for checking data quality

Software Verification

Date the results report is due to be issued

Within 14 days of testing

Reference number and date of the on-site health and safety risk assessment carried out

TBC EI/3208

Reference number of the use of hazardous chemicals risk assessments for each measurement method

Not Required

Site-specific safety requirements, e.g. local safety induction course, intrinsically safe site

Site Induction

Other relevant health and safety requirements

No additional

PLANT
2. Sealant Coat Spraybooth

Type of Process

Sealant Coat(Electrocoat) Spraybooth for the spraying of Automotive components
Wet back and dry fitter spraybooth

Operational / feed details, e.g. continuous, batch process

Process Dictated by amount of Automotive components to be sprayed

Duration of any batch processes

Not Applicable

Non-continuous processes, the part of the process when sampling will take place

Sampling will be undertaken during normal spraying activities

Unusual occurrences that may occur in the process

None known

Process details that need to be collected over the monitoring period

1. Components being sprayed and spray time
2. Paints and Solvents being used

Emission limit values

1.	Particulates	50 mg/m^3

Substances to be monitored at each installation

1. Particulates

Reference conditions for reporting concentrations

0°C (273K) and 1013mbar (101.3kPa)

Measurement method for each substance

1.	Particulates	BS: 6069 Section 4.3

Organisation's technical procedure reference covering implementation of the above method

CES Environmental Instruments Ltd Work Instruction

Overall uncertainty of the technical procedure

1. Particulates BS: 6069 ±10%

Modifications to the technical procedure, with justifications and any resulting changes to the uncertainties

Dust collected will not meet 100mg required for BS:6069

Equipment used for each substance monitored

1. Particulates Erwin Sick Gravimat

Sampling duration and number of samples for each measurement, including blanks

1. Particulates 40 minutes 2 samples + 1 blank

For manual methods, the proposed sample flowrate and volume and the minimum sampling times

1. Particulates 4 points per axis, eight in total, 5 minutes per point

For instrumental methods, the proposed span-gas concentration

Not Required

Measurement concentration range and lower detection limit

Not Required

Description of the location of the sampling plane for release point

Guarded ladder to permanent sample platform

Each sampling plane, a description of the type of sampling port

2 x 4" BSP sockets

Each sampling plane, a summary of the number, arrangement and orientation of sample line(s), and the number of sampling points per line

1. Particulates 2 x sample plane 4 points per axis

Each sampling plane, a summary of compliance with CEN Standards

	Yes	No
Does the sample plane comply upstream		*
Does the sample plane comply downstream		*
Are the appropriate sample ports fitted	*	
Does the velocity air temperature profile comply	*	

For manual methods requiring a separate chemical analysis stage

1. **details of the analytical method**

Not Required

2. **the laboratory carrying out the analysis**

Not Required

3. **chain-of-custody details**

Not Required

4. **allowable time for transit to the laboratory**

Not Required

5. **storage conditions**

Not Required

6. **archiving requirements**

Not Required

Procedure for recording monitoring data

On site loggers and manual back-up (reference to work instruction)

Method to be followed for correction of results to standard conditions

Technical Guidance Document M2

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TBC EI/3208

Reference number of the use of hazardous chemicals risk assessments for each measurement method

Not Required

Site-specific safety requirements, e.g. local safety induction course, intrinsically safe site

Site Induction

Other relevant health and safety requirements

No additional

PLANT
3. Contrapol Incinerator

Type of Process

Contrapol Incinerator
Incinerator processes the extracted air from the spraying process. It is then fed to the incinerator to burn any volatile away.

Operational / feed details, e.g. continuous, batch process

Process Dictated by production rates

Duration of any batch processes

Not Applicable

Non-continuous processes, the part of the process when sampling will take place

Sampling will be undertaken during normal spraying activities

Unusual occurrences that may occur in the process

None known

Process details that need to be collected over the monitoring period

1. Components being sprayed and spray time
2. Paints and Solvents being used

Emission limit values

1.	Oxides of Nitrogen	100 mg/m^3
2.	Carbon Monoxide	100 mg/m^3

Substances to be monitored at each installation

1. Oxides of Nitrogen
2. Carbon Monoxide

Reference conditions for reporting concentrations

0°C (273K) and 1013mbar (101.3kPa)

Measurement method for each substance

1.	Oxides of Nitrogen	BS ISO 10849
2.	Carbon Monoxide	BS ISO 12039

Organisation's technical procedure reference covering implementation of the above method

CES Environmental Instruments Ltd Work Instruction

Overall uncertainty of the technical procedure

1.	Oxides of Nitrogen	BS ISO 10849	±10%
2.	Carbon Monoxide	BS ISO 12039	±10%

Modifications to the technical procedure, with justifications and any resulting changes to the uncertainties

None

Equipment used for each substance monitored

1.	Oxides of Nitrogen	Testoterm 33 + Gas Preparation
2.	Carbon Monoxide	Testoterm 33 + Gas Preparation

Sampling duration and number of samples for each measurement, including blanks

1.	Oxides of Nitrogen	2 hours	1 sample
2.	Carbon Monoxide	2 hours	1 sample

PG 6/23 30 min. mean ?

For manual methods, the proposed sample flowrate and volume and the minimum sampling times

Not Required

For instrumental methods, the proposed span-gas concentration

1.	Oxides of Nitrogen	0-50ppm / 0-350ppm / 0-1000ppm
2.	Carbon Monoxide	0-250ppm / 0-500ppm / 0-1000ppm

Measurement concentration range and lower detection limit

1.	Oxides of Nitrogen	±20ppm LDL 1ppm
2.	Carbon Monoxide	±20ppm LDL ±5%

Description of the location of the sampling plane for release point

Via guarded ladder to sample platform – 15ft high

Each sampling plane, a description of the type of sampling port

2 x 4" BSP Sockets

Each sampling plane, a summary of the number, arrangement and orientation of sample line(s), and the number of sampling points per line

Centre Point Sample

Each sampling plane, a summary of compliance with CEN Standards

	Yes	No
Does the sample plane comply upstream	*	
Does the sample plane comply downstream	*	
Are the appropriate sample ports fitted	*	
Does the velocity air temperature profile comply	*	

For manual methods requiring a separate chemical analysis stage

7. details of the analytical method

Not Required

8. the laboratory carrying out the analysis

Not Required

9. chain-of-custody details

Not Required

10. allowable time for transit to the laboratory

Not Required

11. storage conditions

Not Required

12. archiving requirements

Not Required

Procedure for recording monitoring data

On site loggers and manual back-up (reference to work instruction)

Method to be followed for correction of results to standard conditions

Technical Guidance Document M2

Report format

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Person who will be writing the report

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Person who will be checking the report

Robert Allen

Procedure for checking data quality

Software Verification

Date the results report is due to be issued

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Reference number and date of the on-site health and safety risk assessment carried out

TBC EI/3208

Reference number of the use of hazardous chemicals risk assessments for each measurement method

Not Required

Site-specific safety requirements, e.g. local safety induction course, intrinsically safe site

Site Induction

Other relevant health and safety requirements

No additional

For and on behalf of Mayflower Vehicle Systems.

Name:..... Signature.....

Position:.....

Date:.....

For and on behalf of Regulatory Authority.

Name:..... Signature.....

Position:.....

Date:.....

For and on behalf of CES Environmental Instruments Ltd.

Name:..... Signature.....

Position:.....

Date:.....