Middlewood Environmental Limited

Middlewood Environmental Limited

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REPORT OF
PERIODIC MONITORING OF EMISSIONS TO AIR

DELTA GBN LTD

115 Lodgefield Road
Halesowen
West Midlands
B62 8AX

Part B Permit: PB/42

Customer Contact: Roger Hellend

Monitoring Dates: 25 to 27 November 2013

Middlewood Env Ref: E01159

Customer Ref: Verbal

Report Written By: William E. Green
MCERTS Registration No.: SIRA MP 02 012
Function: Director Middlewood Environmental Limited

Signed: W. Green

Date: 22 January 2014

CONTENTS

PART I: EXECUTIVE SUMMARY REPORT

PART II: SUPPORTING INFORMATION

A)	DEL 1	Shotblast
B)	DEL 2	Dip Spin
C)	DEL 4	Dip Spray Booth
D)	DEL 5	Dip Spray Oven
E)	DEL 6	Spray Booth
F)	DEL 7	Spray Booth Oven

Note: Results from any sampling or analysis activity that are designated with an asterisk do not comply with the minimum requirements of the relevant Standard.

PART I: EXECUTIVE SUMMARY REPORT

1.0 MONITORING OBJECTIVES

Sampling of emissions at Delta GBN Ltd was undertaken at the request of Mr Roger Hellend.

The aim of the monitoring campaign was to:

- Undertake annual compliance monitoring in accordance with the Quotation prepared on 20 July 2012.

The company is regulated as a Part B process. The available guidance note applicable to the process is:

PG 6/23 (11) Statutory Guidance for Coating of Metal and Plastic Processes

Tests were performed to quantify the levels of emissions from the following processes:

Stack Ref	Emission Source	Substances Monitored
DEL 1	Shotblast	Particulates
DEL 2	Dip Spin	Volatile Organic Compounds
DEL 4	Dip Spray Booth	Particulates, Volatile Organic Compounds
DEL 5	Dip Spray Oven	Volatile Organic Compounds
DEL 6	Spray Booth	Particulates, Volatile Organic Compounds
DEL 7	Spray Booth Oven	Volatile Organic Compounds

There were no special requirements applicable to the monitoring.

2.0 EXECUTIVE SUMMARY

Stack Ref	Emission Source	Test Date	Substances Monitored	Emission Concentration mg m^{-3}	Uncertainty mg m^{-3}	Mass Emission g hr^{-1}	In Stack Velocity m s^{-1}	Monitoring Method	Emission Limit Value mg m^{-3}
DEL 1	Shotblast	26-11-2013	Particulates	< 0.61	1.1	< 0.48	6.8	BS EN 13284-1:2002	50
DEL 2	Dip Spin	26-11-2013	Volatile Organic Compounds	67	4.1	560	18	BS EN 13526:2002	100
DEL 4	Dip Spray Booth	26-11-2013	Particulates*	< 0.65	0.80	<5.5	6.7	BS EN 13284-1:2002	50
		26-11-2013	Volatile Organic Compounds	44	3.2	390		BS EN 13526:2002	100
DEL 5	Dip Spray Oven	26-11-13	Volatile Organic Compounds	15	2.4	13	6.2	BS EN 13526:2002	100
DEL 6	Spray Booth	26 to 27-11-2013	Particulates*	2.0	0.53	4.6	8.4	BS EN 13284-1:2002	50
		27-11-2013	Volatile Organic Compounds	39	2.7	330		BS EN 13526:2002	100
DEL 7	Spray Booth Oven	27-11-2013	Volatile Organic Compounds	24	2.4	14	3.6	BS EN 13526:2002	100

Uncertainty figures quoted in the report represent the uncertainty at the 95% confidence level

* **Test results not in compliance with full requirements of Standard - see Section 5 for details**

3.0 MONITORING RESULTS

Stack Ref.: DEL 1 Shotblast

Particulates	Test 1	Test 2	Limit Value
Concentration:	<0.59 mg m^{-3}	<0.63 mg m^{-3}	< 50 mg m^{-3}
Mass release:	< 0.48 g hr^{-1}	<0.47 g hr^{-1}	-
Uncertainty:	±1.1 mg m^{-3}	±1.2 mg m^{-3}	-
Blank Value:	0.70 mg m^{-3}		< 10 % ELV
Isokinetic Rate:	101 %	101 %	95 % to 115 %
Reference Conditions:	273K and 101.3kPa, without correction for water vapour content		
Date:	26-11-2013	26-11-2013	-
Test Period:	11:01 to 11:31	11:40 to 12:10	-
Duration:	30 mins	30 mins	-
In Stack Velocity:	7.0 m s^{-1}	6.5 m s^{-1}	-
Efflux Velocity:	7.0 m s^{-1}	6.5 m s^{-1}	10 m s^{-1}
Volume Flow:	**As Measured**	**As Measured**	-
	0.23 m^3 s^{-1}	0.21 m^3 s^{-1}	-
	STP	**STP**	-
	0.22 m^3 s^{-1}	0.21 m^3 s^{-1}	-
Process Status:	Handblast operating throughout test		-
Visibility:	Not possible to observe		Free from persistent visible emission
Monitoring Method:	BS EN 13284-1:2002 Determination of low range mass concentrations of dust		

Stack Ref.: DEL 2 Dip Spin

Volatile Organic Compounds	Test 1	Emission Limit Value
Concentration:	67 mg m^{-3}	< 100 mg m^{-3}
Mass release: *	560 g hr^{-1}	-
Peak emission:	130 mg m^{-3}	-
Uncertainty:	±4.1 mg m^{-3}	-
Reference Conditions:	273K and 101.3kPa, without correction for water vapour content	
Date:	26-11-2013	-
Test Period:	09:44 to 10:43	-
Test Duration:	59 mins	-
In Stack Velocity:*	18 m s^{-1}	-
Efflux Velocity:*	18 m s^{-1}	15 m s^{-1}
Volume Flow:*	**As Measured**	-
	2.9 m^3 s^{-1}	-
	STP	-
	2.3 m^3 s^{-1}	-
Process Status:	Normal operation	-
Monitoring Method:	Based on BS EN 13526: 2002 Determination of the mass concentration of total gaseous organic carbon in flue gases from solvent using processes – continuous flame ionisation detector method	

* Test results not in full compliance with requirements of Standard - see Section 5 for details

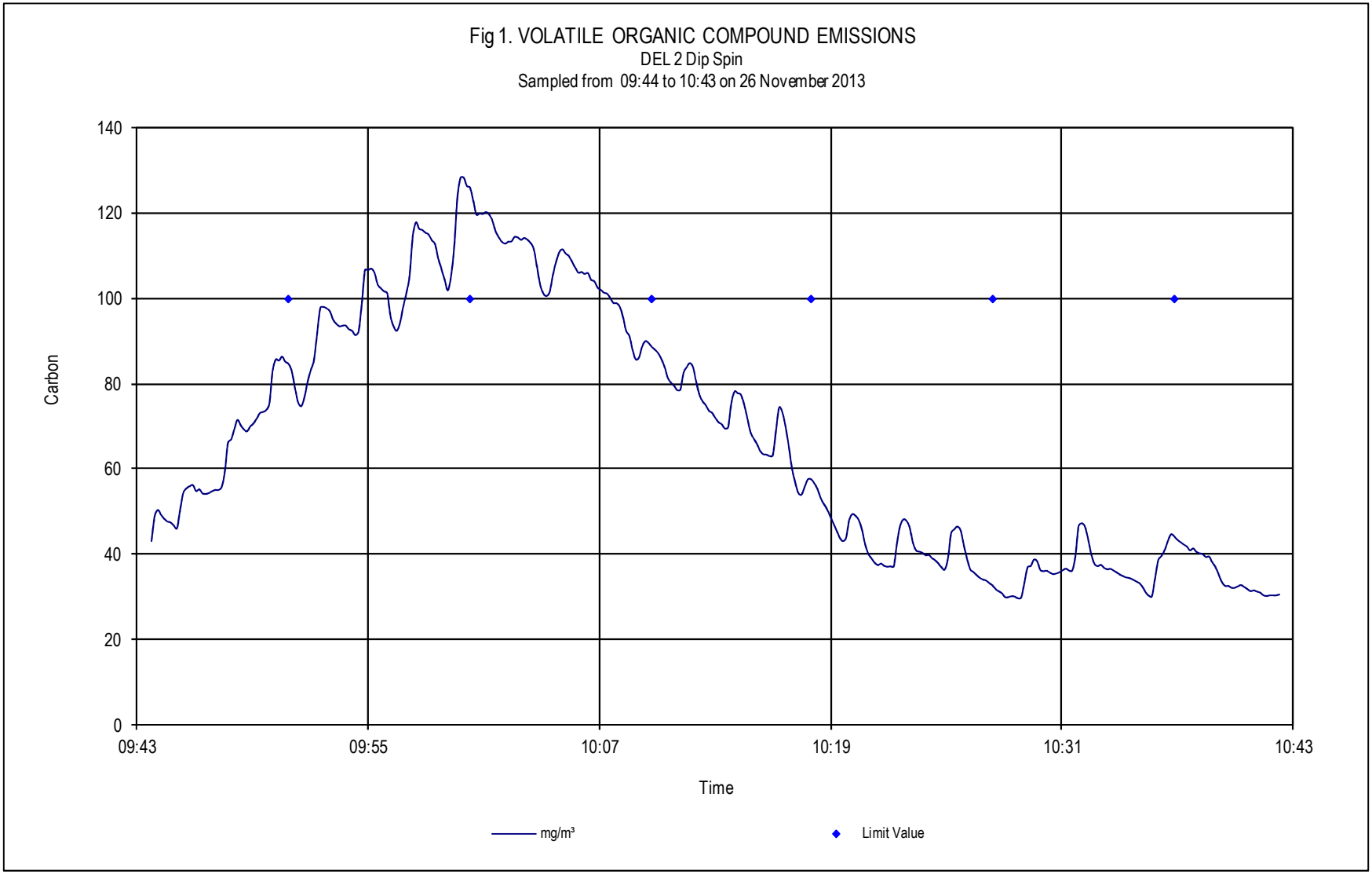


Fig 1. VOLATILE ORGANIC COMPOUND EMISSIONS
DEL 2 Dip Spin
Sampled from 09:44 to 10:43 on 26 November 2013
Carbon
140
120
100
80
60
40
20
0
09:43
09:55
10:07
10:19
10:31
10:43
Time
mg/m³
Limit Value

Stack Ref.: DEL 4 Dip Spray Booth

Particulates	Test 1	Test 2	Limit Value
Concentration:*	<0.39 mg m^{-3}	0.92 mg m^{-3}	< 50 mg m^{-3}
Mass release:*	<3.3 g hr^{-1}	8.0 g hr^{-1}	-
Uncertainty:	± 0.88 mg m^{-3}	± 0.71 mg m^{-3}	-
Blank Value:	0.49 mg m^{-3}		< 10 % ELV
Isokinetic Rate:	102 %	100 %	95 % to 115 %
Reference Conditions:	273K and 101.3kPa, without correction for water vapour content		
Date:	26-11-2013	26 to 27-11-2013	-
Test Period:	16:48 to 17:18	17:25 to 17:28 08:55 to 09:17	-
Duration:	30 mins	30 mins	-
In Stack Velocity:	6.4 m s^{-1}	6.7 m s^{-1}	-
Efflux Velocity:	6.4 m s^{-1}	6.7 m s^{-1}	10 m s^{-1}
Volume Flow:	**As Measured**	**As Measured**	-
	2.5 m^3 s^{-1}	2.6 m^3 s^{-1}	-
	STP	**STP**	-
	2.4 m^3 s^{-1}	2.4 m^3 s^{-1}	-
Process Status:	Dip Spray Booth working normally		-
Visibility:	Not possible to observe		Free from persistent visible emission
Monitoring Method:	BS EN 13284-1:2002 Determination of low range mass concentrations of dust		

* Test results not in full compliance with requirements of Standard - see Section 5 for details

Stack Ref.: DEL 4 Dip Spray Booth

Volatile Organic Compounds	Test 1	Emission Limit Value
Concentration: *	44 mg m^{-3}	< 100 mg m^{-3}
Mass release: *	390 g hr^{-1}	-
Peak emission: *	72 mg m^{-3}	-
Uncertainty:	± 3.2 mg m^{-3}	-
Reference Conditions:	273K and 101.3kPa, without correction for water vapour content	
Date:	26-11-2013	-
Test Period:	12:22 to 13:27	-
Test Duration:	65 mins	-
In Stack Velocity:	6.7 m s^{-1}	-
Efflux Velocity:	6.7 m s^{-1}	10 m s^{-1}
Volume Flow:	**As Measured**	-
	2.6 m^3 s^{-1}	-
	STP	-
	2.4 m^3 s^{-1}	-
Process Status:	Normal operation	-
Monitoring Method:	Based on BS EN 13526: 2002 Determination of the mass concentration of total gaseous organic carbon in flue gases from solvent using processes – continuous flame ionisation detector method	

* Test results not in full compliance with requirements of Standard - see Section 5 for details

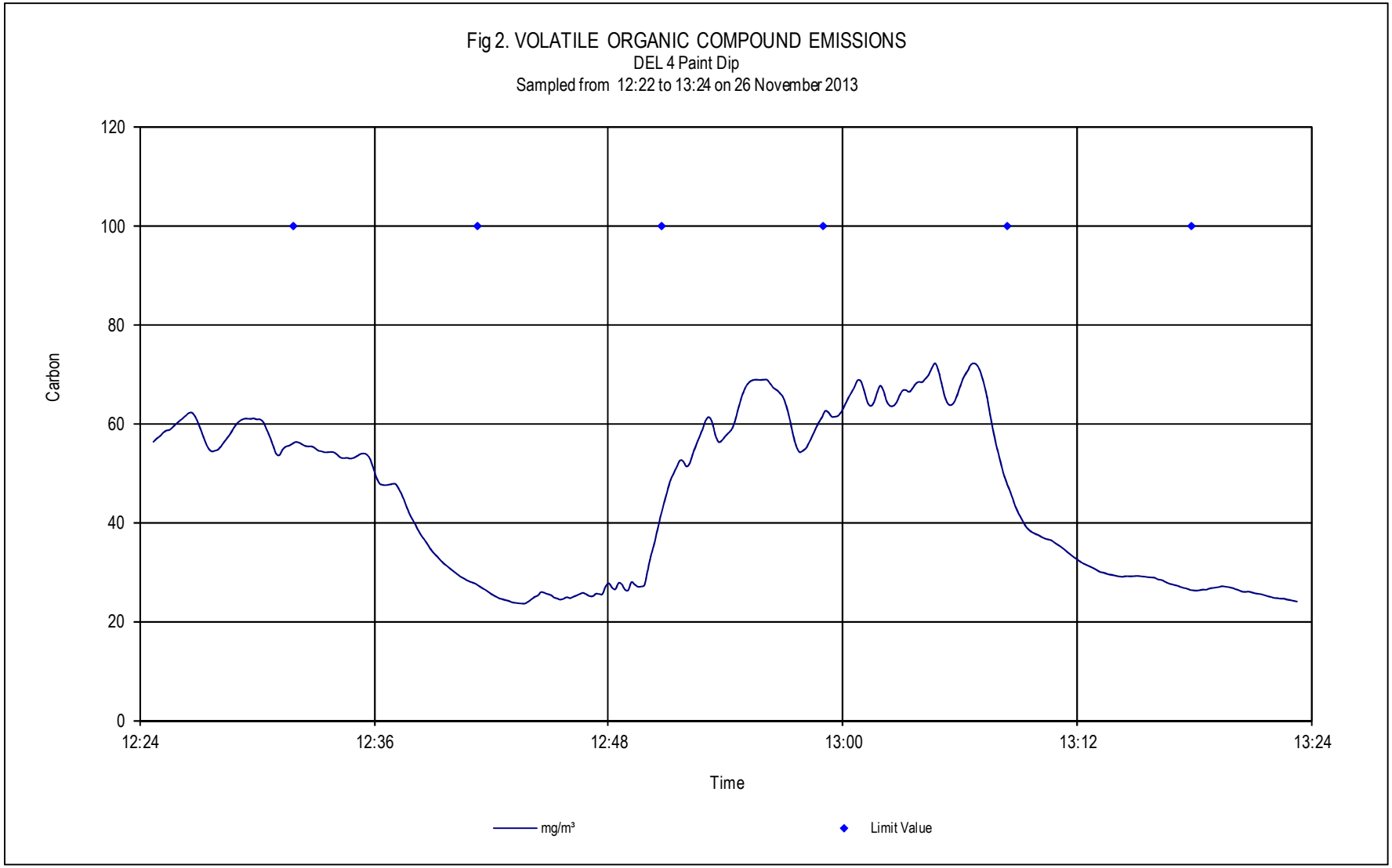
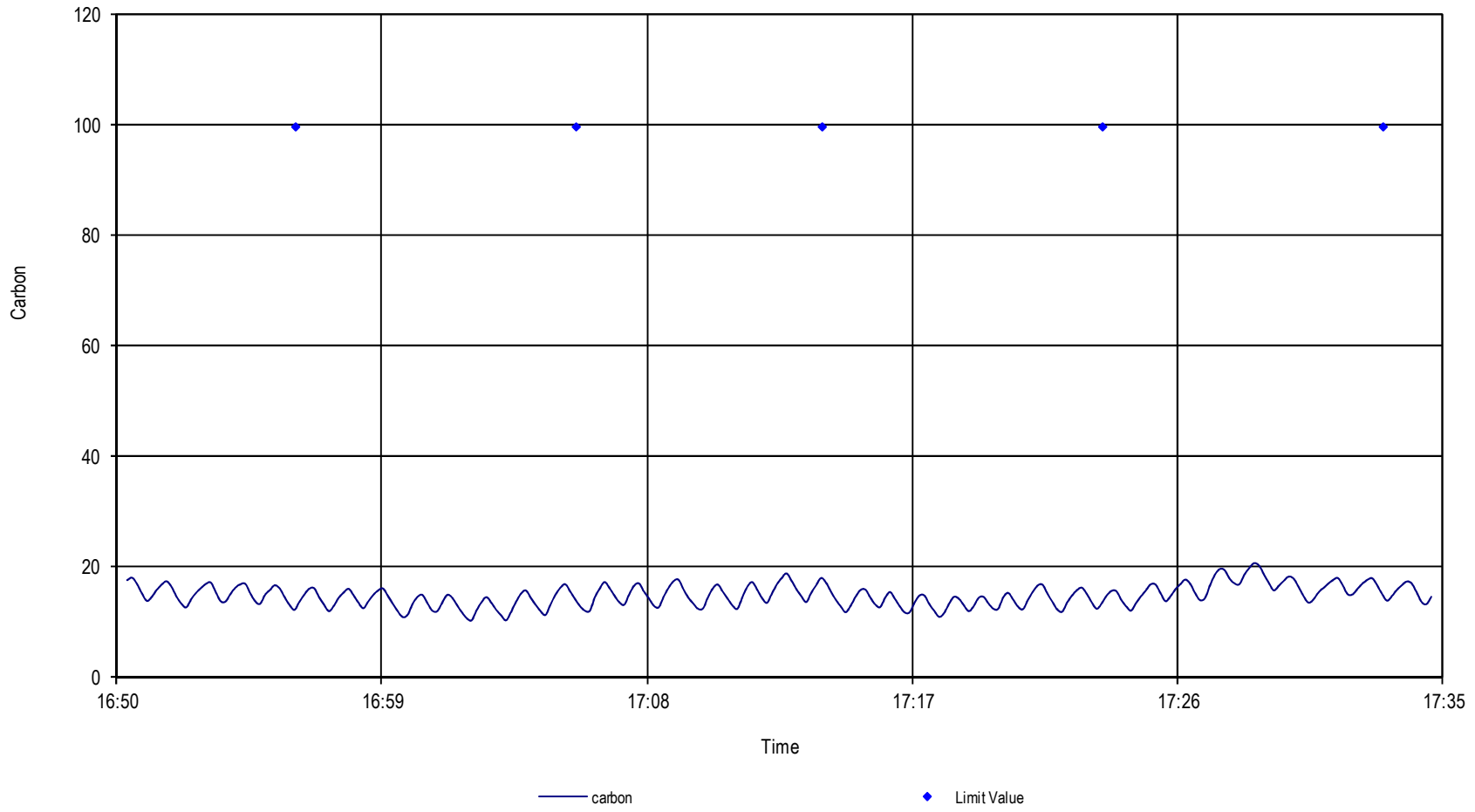


Fig 2. VOLATILE ORGANIC COMPOUND EMISSIONS
DEL 4 Paint Dip
Sampled from 12:22 to 13:24 on 26 November 2013
Carbon
120
100
80
60
40
20
0
12:24
12:36
12:48
13:00
13:12
13:24
Time
mg/m³
Limit Value

Stack Ref.: DEL 5 Dip Spray Oven

Volatile Organic Compounds	Test 1	Emission Limit Value
Concentration:	15 mg m^{-3}	< 100 mg m^{-3}
Mass release:	13 g hr^{-1}	-
Peak emission:	21 mg m^{-3}	-
Uncertainty:	±2.4 mg m^{-3}	-
Reference Conditions:	273K and 101.3kPa, without correction for water vapour content	
Date:	26-11-2013	-
Test Period:	16:51 to 117:35	-
Test Duration:	44 mins	-
In Stack Velocity:	6.2 m s^{-1}	-
Efflux Velocity:	6.2 m s^{-1}	m s^{-1}
Volume Flow:	**As Measured**	-
	0.44 m^3 s^{-1}	-
	STP	-
	0.24 m^3 s^{-1}	-
Process Status:	Normal operation	-
Monitoring Method:	Based on BS EN 13526: 2002 Determination of the mass concentration of total gaseous organic carbon in flue gases from solvent using processes – continuous flame ionisation detector method	

Fig 3. VOLATILE ORGANIC COMPOUND EMISSIONS
DEL 5 Paint Dip Oven
Sampled from 16:51 to 17:35 on 26 November 2013



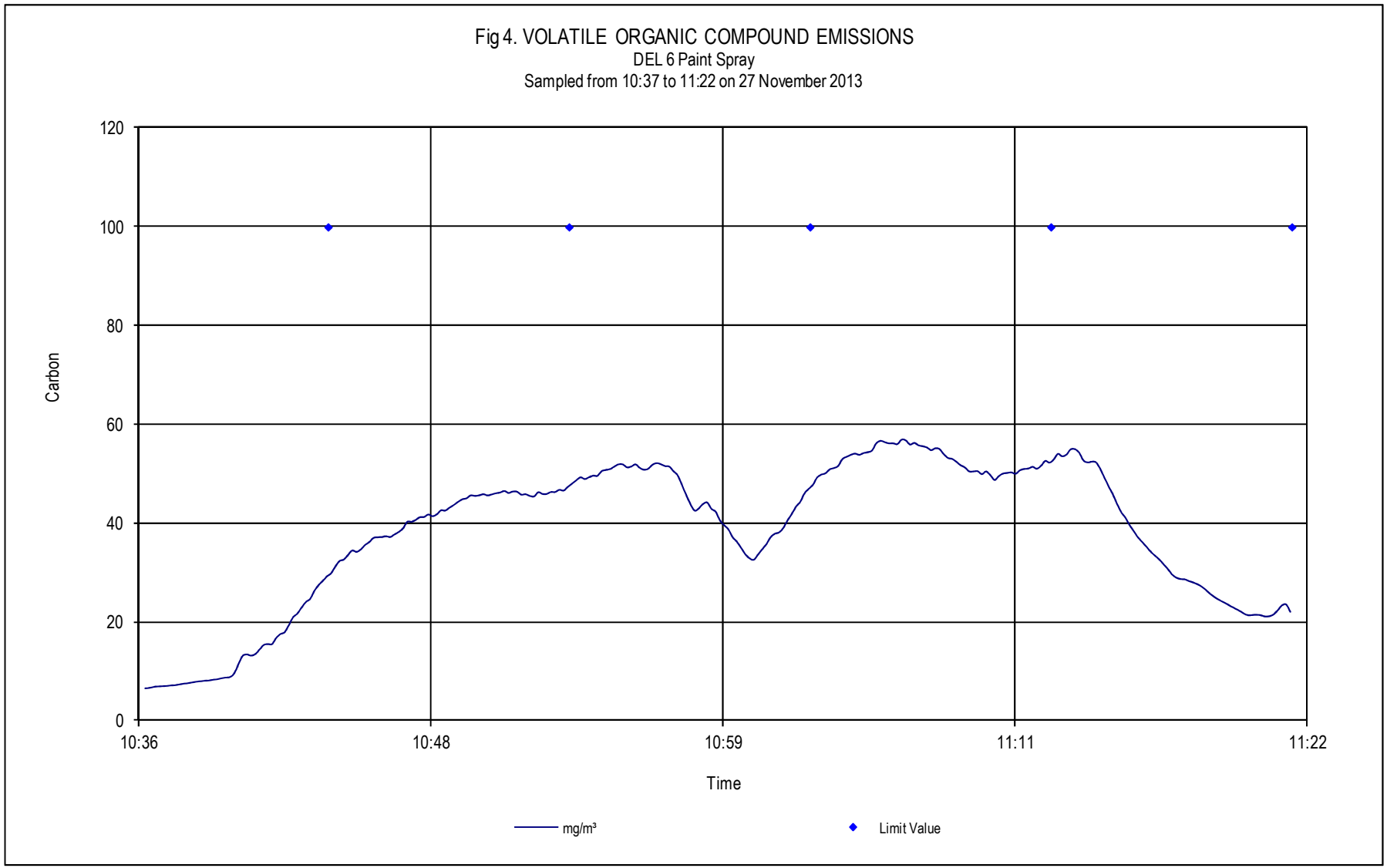
Stack Ref.: DEL 6 Spray Booth

Particulates	Test 1	Test 2	Limit Value
Concentration:*	1.1 mg m^{-3}	2.8 mg m^{-3}	< 50 mg m^{-3}
Mass release:*	10 g hr^{-1}	26 g hr^{-1}	-
Uncertainty:	± 0.55 mg m^{-3}	± 0.51 mg m^{-3}	-
Blank Value:	0.27 mg m^{-3}		< 10 % ELV
Isokinetic Rate:	101 %	102 %	95 % to 115 %
Reference Conditions:	273K and 101.3kPa, without correction for water vapour content		
Date:	27-11-2013	27-11-2013	-
Test Period:	10:38 to 11:08	11:21 to 11:51	-
Duration:	30 mins	30 mins	-
In Stack Velocity:	8.4 m s^{-1}	9.1 m s^{-1}	-
Efflux Velocity:	8.4 m s^{-1}	9.1 m s^{-1}	11 m s^{-1}
Volume Flow:	**As Measured**	**As Measured**	-
	2.5 m^3 s^{-1}	2.7 m^3 s^{-1}	-
	STP	**STP**	-
	2.3 m^3 s^{-1}	2.5 m^3 s^{-1}	-
Process Status:	Dip Spray Booth working normally		-
Visibility:	Not possible to observe		Free from persistent visible emission
Monitoring Method:	BS EN 13284-1:2002 Determination of low range mass concentrations of dust		

* Test results not in full compliance with requirements of Standard - see Section 5 for details

Stack Ref.: DEL 6 Spray Booth

Volatile Organic Compounds	Test 1	Emission Limit Value
Concentration: *	39 mg m^{-3}	< 100 mg m^{-3}
Mass release: *	330 g hr^{-1}	-
Peak emission: *	57 mg m^{-3}	-
Uncertainty:	± 2.7 mg m^{-3}	-
Reference Conditions:	273K and 101.3kPa, without correction for water vapour content	
Date:	27-11-2013	-
Test Period:	10:37 to 11:22	-
Test Duration:	45 mins	-
In Stack Velocity:	8.4 m s^{-1}	-
Efflux Velocity:	8.4 m s^{-1}	11 m s^{-1}
Volume Flow:	**As Measured**	-
	2.5 m^3 s^{-1}	-
	STP	-
	2.4 m^3 s^{-1}	-
Process Status:	Normal operation	-
Monitoring Method:	Based on BS EN 13526: 2002 Determination of the mass concentration of total gaseous organic carbon in flue gases from solvent using processes – continuous flame ionisation detector method	

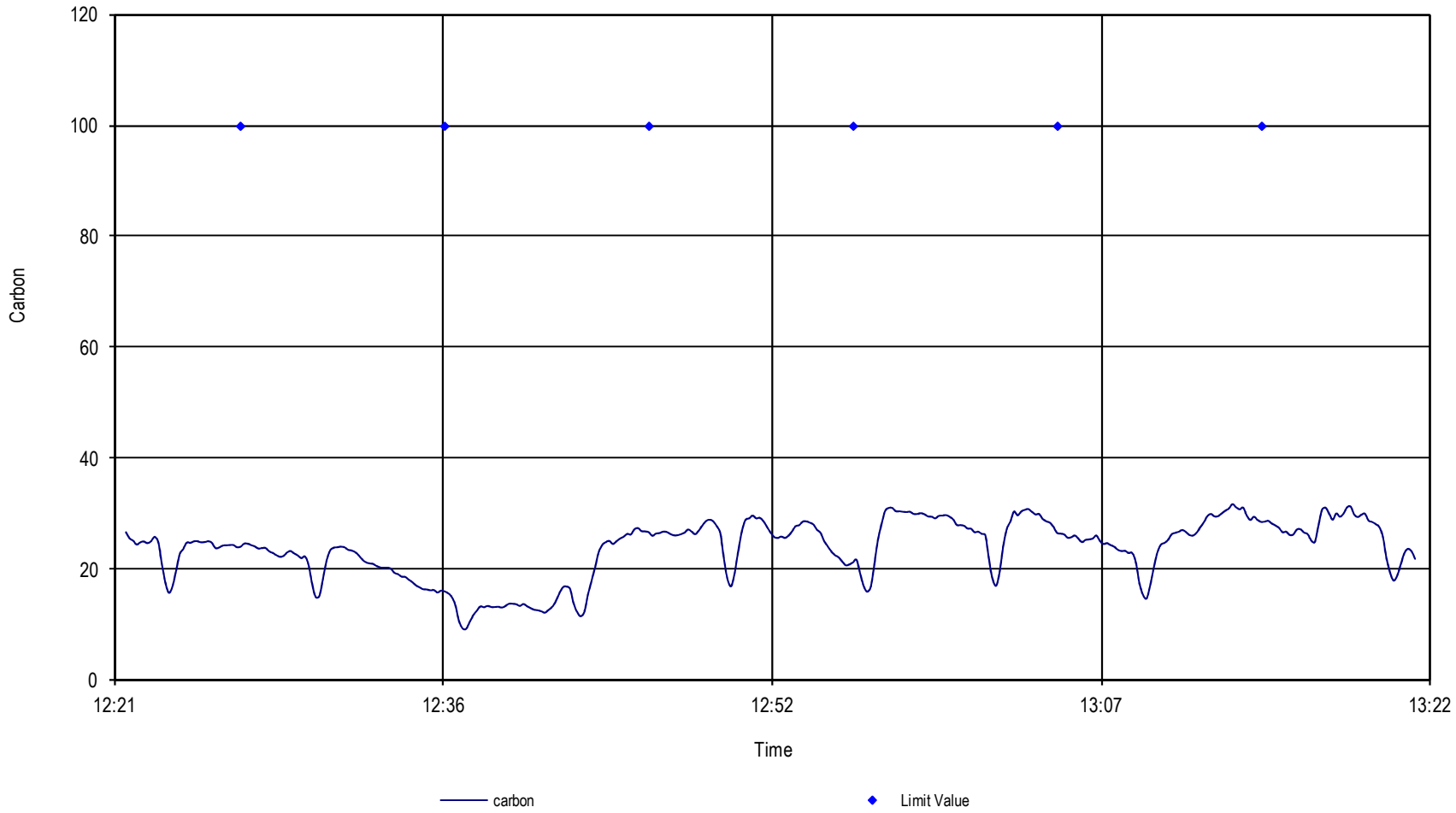


Report Ref.: E0159/2013/Visit No.1
Report Version No.: 1

Stack Ref.: DEL 7 Spray Booth Oven

Volatile Organic Compounds	Test 1	Emission Limit Value
Concentration:	24 mg m^{-3}	< 100 mg m^{-3}
Mass release:	14 g hr^{-1}	-
Peak emission:	32 mg m^{-3}	-
Uncertainty:	±2.4 mg m^{-3}	-
Reference Conditions:	273K and 101.3kPa, without correction for water vapour content	
Date:	27-11-2013	-
Test Period:	12:22 to 13:22	-
Test Duration:	60 mins	-
In Stack Velocity:*	3.6 m s^{-1}	-
Efflux Velocity:*	3.6 m s^{-1}	10 m s^{-1}
Volume Flow:*	**As Measured**	-
	0.25 m^3 s^{-1}	-
	STP	-
	0.16 m^3 s^{-1}	-
Process Status:	Normal operation	-
Monitoring Method:	Based on BS EN 13526: 2002 Determination of the mass concentration of total gaseous organic carbon in flue gases from solvent using processes – continuous flame ionisation detector method	

Fig 5. VOLATILE ORGANIC COMPOUND EMISSIONS
DEL 7 Paint Spray Oven
Sampled from 12:221 to 13:22 on 27 November 2013



4.0 OPERATING INFORMATION

Stack Ref.	Process	Process Type	Process Duration (Batch processes only)	Fuel	Feedstock	Abatement Type & operational status if abnormal	Operating Conditions	Load
DEL 1	Shotblast	Batch	10 – 30 mins	-	Metal parts, abrasive grit	Bag Filter	Handblast only	Normal
DEL 2	Dip Spin	Semi-continuous	-	Natural Gas	Delta Protekt	None	Coating small metal parts. Oven set-point 260 °C	Normal
DEL 4	Dip Spray Booth	Batch	-	-	Delta Tone 9000 Silber	Water Curtain	Coating M18 Bolts, 6 per rack.	Normal
DEL 5	Dip Spray Oven	Batch	-	Natural Gas	Delta Tone 9000 Silber	None	Drying M18 bolts, 6 per rack. Oven set-point 230 °C.	Normal
DEL 6	Spray Booth	Batch	10 – 90 minutes	-	Delta Tone 9000 Silber	Water Curtain	Spraying metal plates	Normal
DEL 7	Spray Booth Oven	Batch	10 – 90 minutes	Natural Gas	Delta Tone 9000 Silber	None	Baking metal plates. Oven set-point 230 °C.	Normal

5.0 MONITORING DEVIATIONS

Parameters not monitored in accordance with Environment Agency TGN M2:

Stack Ref.	Parameter	Reason
DEL 2	Velocity	In stack velocity profile does not comply with requirements of BS EN 13284-1: Air flow angle of 20 to axis of stack is greater than the maximum of 15° allowed by the Standard.
	Volume flow Mass Emission	Cyclonic flow prevents accurate measurement of true gas flow rate.
DEL 4	Particulates	Due to difficulties in accessing both sample ports, tests were undertaken across a single traverse. In order to improve the accuracy of the test, the number of sample points across the traverse was increased from two to four. As a result the uncertainty associated with the test result may be greater than that reported.
DEL 6	Particulates	Due to difficulties in accessing both sample ports, tests were undertaken at a single point in the centre of the stack. As a result the uncertainty associated with the test result may be greater than that reported.

Note: Emission concentrations within a duct are unaffected by cyclonic flow.

The deviation from "standard" conditions means that the uncertainty of the flow measurements is increased and not easily quantifiable, therefore any mass emissions calculated will also have a greater uncertainty attached.

Mass emission rates are included for additional information and are not a condition of the relevant Guidance Note or Permit.

PART II:

SUPPORTING INFORMATION

APPENDIX I

General Information

A) Monitoring Organisation Staff Details

The following Middlewood Environmental staff were involved in the monitoring work reported:

Name	MCERTS Registration	Personnel Competency					Function
			TE1	TE2	TE3	TE4	
William E Green	SIRA MM 02 012	L2	✓	✓	✓	✓	Director – Middlewood Environmental Limited

B) Monitoring Organisation Method Details

The following methods were used for the monitoring work reported:

Substance	Standard Method
Temperature & pressure	BS EN 13284-1:2002
Moisture	
Particulates	
Total Volatile Organic Compounds (20 - 500 mg m^{-3})	BS EN 13526:2002

C) Monitoring Equipment and Quality Assurance

Velocity Measurements

Oil gauge manometer coupled with S-type pitot static tube. Digital manometer coupled with L-type pitot static tube.

Manometers calibrated to UKAS traceable standards.

Temperature

Digital Thermometer with type K thermocouple wire probe.

Thermometer and thermocouple calibrated to UKAS traceable standards.

Particulates

CAE USEPA Method 5 sampler and in-stack filter.

Dry gas meter calibrated to UKAS traceable standards.

Volatile Organic Compounds (VOCs)

Sick - Bernath Atomic Heated FID - portable heated hydrocarbon analyser with filter and heated line.

Before and after use the analyser is zero and span calibrated. Filtered ambient air is used as the initial internal zero gas. Hydrocarbon free Nitrogen and certified Propane as the span gases are used to calibrate through the instrument. Zero and span gases are then introduced down the sample line for further calibration checks and to detect leaks.

Sick - Bernath Atomic Heated FID is MCERTS certified.

Down line span gas calibrated to UKAS traceable standards.

Sampling

In all cases, sampling equipment is chosen and configured to suit the particular duct conditions, and includes attention to duct size, temperature, moisture, emission composition, loading rate, and the nature of the process. MCERTS accredited and UKAS calibrated equipment is used wherever possible.

Data Collection and Calculations

Monitoring Method	Site Recording	Data Analysis	Data Quality Check
Instrumental - VOC	Procedure specific data sheets	Method specific spreadsheet	Analysis by Level 2 consultant
Manual - Particulates	Procedure specific data sheets	Method specific spreadsheet	Analysis by Level 2 consultant

The specific equipment used is referenced on the sampling sheets. Details of historical use of the equipment are kept in the Monitoring Equipment register.

APPENDIX II

Emission Point Description, Calculations and Supporting Data

A) Emission Point Ref DEL 1

Emission Source Shotblast

Substances monitored: Particulates.

Arrestment: Bag Filter

Emission Point Description:		BS EN 15259 & EA TGN M1 Compliant
Duct dimensions:	0.21 m diameter	✓
Location of sampling plane:	In vertical outlet stack	✓
Access to sampling position:	Footed ladder to place sampler in stack	✗
Adequacy of work area:	< 5 m^2	✗
Availability of required utilities:	Power available in foundry building – 240v	✓
Access to sample points	Full access available	✓
Type of sampling port:	4" BSP	✓
Number of sample lines:	One	✓
Arrangement of sample lines:	N/A	✓
Orientation of sample lines:	Horizontal	✓
Gas Flow Parameters	Flow: angle <15°, > 5Pa, Ratio <3:1, no –ve flow	✓
Temperature and moisture:	Ambient	✓
Velocity profile:	30 Pa	✓
Homogeneity test	N/A	-

PLEASE"SAVE AS"INTO BLANK DIRECTORY BEFORE USING

VELOCITY CALCULATION

Site:	Delta GBN		Location:	Shotblast		Plant Ref:	DEL1	Process:	Shotblast			Date:	26/11/2013
	Units												
Stack diameter(Ds):	m	0.21			Emission Point Dia:	0.21							
Stack dimensions(L,W):	m	0.000	0.000		Emission Point L, W:	0.00	0.00						
Stack area(As):	m^2	0.033			Emission Point Area:	0.033							
Reference temp(Tr):	K	273			Efflux Vel:	7							
Reference Pressure (Pr):	Pa	101300											
Barometric Pressure (Pb):	mb	1016	101600	Pa									
Static Pressure (Ps):	"H_2O	0.28	69	Pa									
	mmH_2O	6.23											
Pitot coefficient(Cp):		0.816	Note: Use 1 if raw data corrected										

TEST ONE:

				Stack				Vol Flow		Vol Flow	Vol Flow	V(m/s) Point	
Pitot cm H_2O	Pitot ("H_2O)	Pa	Temp, °C	DGM in	DGM out	V(m/s)	m^3/s	V(m/s)	m^3/s	m^3/min	Stack	STP
0.5	0.20	32.7	9	8	8	7.0	0.231	6.8	0.223	13	7.2	7.0
0.5	0.20	32.7	9	8	8						7.2	7.0
0.5	0.19	30.7	11	9	8					803	7.0	6.8
0.5	0.19	30.7	11	9	8		Vol Flow		Vol Flow		7.0	6.8
0.5	0.18	30.0	11	11	8		cfm		cfm		6.9	6.7
0.4	0.17	27.4	11	12	9						6.6	6.4
							489		473			
		Mean	31	10.3	8.8							
		Std	1.8	0.9								
		Pa	Temp, °C		DGM							

TEST TWO:

Barometric Pressure (Pb):	mb	1016	101600 Pa
Static Pressure (Ps):	"H_2O	0.28	69 Pa
	mmH_2O	6.23	Pa
Pitot coefficient(Cp):		0.816	

								Vol Flow		Vol Flow	Vol Flow	V(m/s) Point	
Pitot cm H_2O	Pitot ("H_2O)	Pa	Temp, °C	DGM in	DGM out	V(m/s)	m^3/s	V(m/s)	m^3/s	m^3/min	Stack	STP
0.43	0.17	28.1	11	12	9	6.5	0.214	6.3	0.206	12	6.7	6.5
0.39	0.15	25.5	11	13	10						6.4	6.2
0.39	0.15	25.5	11	13	10						6.4	6.2
0.40	0.16	26.1	12	14	11		Vol Flow		Vol Flow		6.5	6.2
0.40	0.16	26.1	12	15	11		cfm		cfm		6.5	6.2
0.41	0.16	26.8	12	15	12						6.6	6.3
							454		437			
		Mean	26	11.5	12.1							
		Std	4.4	1.3								
		Pa	Temp, °C		DGM							

EFFLUX VELOCITY CALCULATIONS

Performed in accordance with HMIP Technical Guidance Note D1

Stack area (As)		0.03	
Efflux velocity		7.0	m/s
Discharge gas temperature		284.5	°K
Vol discharge rate of gases		0.23	m^3s^1
Ambient temperature(K)		283	°K
Heat release.	Q=	0.00	*MW*
Momentum.	M=	2	m^4s^{-1}
Minimum Efflux Velocity.	V=	10	ms^{-1}

13284 PARTICULATE CALCULATION

Site:	Delta GBN		Location:	Shotblast		Plant Ref:	DEL1	Process:	Shotblast				Date:	26/11/2013			
Standard 9096 or 13284:		13284															
Filter ID:		9589		9591		9590											
Filter Size 37, 47, 110 or 4:		47		47		47											
Sample Ref:		DEL 1-1		DEL 1-2		DEL 1-B											
Filter weights:																	
						Blank											
Tare Test One:		0.15192	*Tare Test Two:*	0.15060		0.15069											
Gross Test One:		0.15210	*Gross Test Two:*	0.15061		0.15069											
mass collected:		0.00017		0.00000		0.00000											
Wash Out Weights:																	
						Blank											
Tare Test One:		48.33231	*Tare Test Two:*	48.05960		49.18198											
Gross Test One:		48.33248	*Gross Test Two:*	48.05958		49.18241											
mass collected:		0.00017		-0.00002		0.00043											
Control Weights:		**Test 1**		**Test 2**		**Blank**											
Mass Change:	***Filter:***	-0.0000140		-0.0000140		-0.0000140											
Mass Change:	***Beaker:***	0.00013		0.00013		0.00013											
Duct O2(Od):	%																
Ref O2(Or):	%																
Particulates collected, (Mass):	mg		0.23		-0.13			Mass Emission with or without blank correction									
Concentration at STP dry(Cm):	mg/m^3		0.49	0.09	-0.30			With = Y Without = N:			n						
Concentration at STP wet(Cw):	mg/m^3		0.49	0.1	-0.30										0.6	0.63	
Concentration at ref O2(C-O2):	mg/m^3		0.49		-0.30				0.5		-0.3						
Minus Blank:	mg		-0.09		-0.45				Mass Emission						Detection Limit		
	mg/m^3		-0.19	-0.61	-1.02				Test One		Test Two				Mass Emission		
	mg/m^3		-0.19	-0.60	-1.01										Test One	Test Two	
	mg/m^3		-0.19		-1.02				0.11		-0.06		mg/s		0.13	0.13	
						% of limit Value											
Test Blank	mg		0.31		0.31				0.39		-0.22		g/hr		0.48	0.47	
	mg/m^3		0.68	0.70	0.72	3.4%	3.6%										
	mg/m^3		0.67	0.70	0.72	3.4%	3.6%		3.10		-1.77		g/8 hr day		3.81	3.75	
	mg/m^3		0.68		0.72	3.4%	3.6%										
									0.02		-0.01		kg/5 day week		0.02	0.02	
Emission Limit:	mg/m^3	20															
									0.75		-0.43		kg/48 week year		0.91	0.90	
Test Detection limit:																	
Particulates collected, (Mass):	mg		0.28		0.28												
Concentration at STP dry(Cm):	mg/m^3		0.60		0.63												
Concentration at STP wet(Cw):	mg/m^3		0.59	0.61	0.63												
Concentration at ref O2(C-O2):	mg/m^3		0.60		0.63												
Number of traverses:		1		1													
Theoretical Number of Traverses:		1		1													
Theoretical Points / Traverse		1		1													
Acuual Points / Traverse		1		1													
Calculated Uncertainty:	+/-	1.10	mg/m^3	1.17													

B) Emission Point Ref DEL 2

Emission Source Dip Spin

Substances monitored: Volatile Organic Compounds.

Arrestment: None

Emission Point Description:		BS EN 15259 & EA TGN M1 Compliant
Duct dimensions:	0.45 m diameter	✓
Location of sampling plane:	In vertical outlet stack	✓
Access to sampling position:	Footed ladder to place sampler in stack	✗
Adequacy of work area:	< 5 m^2	✗
Availability of required utilities:	Power available in foundry building – 240v	✓
Access to sample points	Full access available	✓
Type of sampling port:	15 mm hole	✗
Number of sample lines:	One	✓
Arrangement of sample lines:	N/A	✓
Orientation of sample lines:	Horizontal	✓
Gas Flow Parameters	Flow: angle >15°, > 5Pa, Ratio <3:1, no –ve flow	✗
Temperature and moisture:	66 °C, ~ 2%	✓
Velocity profile:	117 - 216 Pa	✓
Homogeneity test	N/A	-

Site:	Delta GBN		**Plant:**	DEL 2 Dip Spin			**Date:**	26/11/2013		
		Units					Units			
Stack diameter(Ds):		m	0.450			Port Length: (Pl)	mm	85		
Stack dimensions(L,W):		m								
Stack area(As):		m2	0.159							
Reference temp(Tr):		K	273							
Reference Pressure (Pr):		Pa	101300							
	TEST ONE:									
Barometric Pressure (Pb):		mb	1018	101800	Pa					
Static Pressure (Ps):		"H2O	0.04	10	Pa					
		mmH2O		0	Pa					
Pitot coefficient(Cp):			0.990	Note: Use 1 if raw data corrected						
									STP	
	Pitot Point (mm)	Pitot mm H_20	Pitot (Pa)	Pa	Anemometer	Stack Stack Temp,	V(m/s)	Vol Flow	V(m/s)	Vol Flow
	151		220	215.6	0.0	66	18.1	2.87	14.6	2.33
	469		220	215.6		66				
			120	117.6		66				
			150	147.0		66		Vol Flow cfm		Vol Flow cfm
								30986		4928
				174.0	0.0	66.0				
				42.9	0.0	0.0				
				Pa	Flow	Stack Temp, ℃				

Final calculations:

Mean ppm	42	Std dev ppm	18.3		Mass Emission				
Mean mgm	67	Std dev mgm	29.4		Required Mass Emision Rate:		g/hr		mg/s
									g/hr
Max ppm	80	Max mgm	128						kg/d
									t/y
Peak Time	10:00:16				562	g/hr	Carbon		
Start Time:	09:43:56								
Finish Time:	10:42:56								

Std Method:	BS EN 13526:2002		**ELV**	100						
	Calibration Data						**Drift**			
	Start	Finish								
Zero	0.1	0.2		Measured	0.16	mgm	Allowable	5	OK	
Span	72.95	72		Measured	1.53	mgm	Allowable	5	OK	
Uncertainty	± 5 mg/m³	or ± 10 %			0.84					
Uncertainty	± 4.1	or ± 6	%							

C) Emission Point Ref DEL 4

Emission Source Dip Spray Booth

Substances monitored: Volatile Organic Compounds, Particulates

Arrestment: Water Curtain

Emission Point Description:		BS EN 15259 & EA TGN M1 Compliant
Duct dimensions:	0.70 m diameter	✓
Location of sampling plane:	In vertical outlet stack	✓
Access to sampling position:	Man basket to place probe, top of booth to index	✗
Adequacy of work area:	< 5 m^2	✗
Availability of required utilities:	Power available in foundry building – 240v	✓
Access to sample points	Full access available	✓
Type of sampling port:	2 x 4" BSP	✗
Number of sample lines:	Two – only one accessible	✓
Arrangement of sample lines:	N/A	✗
Orientation of sample lines:	Horizontal	✗
Gas Flow Parameters	Flow: angle <15°, > 5Pa, Ratio <3:1, no –ve flow	✓
Temperature and moisture:	Ambient	✓
Velocity profile:	20 to 30 Pa	✓
Homogeneity test	N/A	-

VELOCITY CALCULATION

Site:	Delta GBN		Location:	Paint Shop		Plant Ref:	DEL 4	Process:	Dip Spray			Date: 26/11/2013	
	Units												
Stack diameter(Ds):	m	0.70			Emission Point Dia:	0.70							
Stack dimensions(L,W):	m	0.000	0.000		Emission Point L, W:	0.00	0.00						
Stack area(As):	m^2	0.385			Emission Point Area:	0.385							
Reference temp(Tr):	K	273			Efflux Vel:	6							
Reference Pressure (Pr):	Pa	101300											
Barometric Pressure (Pb):	mb	1015	101500	Pa									
Static Pressure (Ps):	$"H_2O$	0.39	98	Pa									
	mmH_2O	8.90		Pa									
Pitot coefficient(Cp):		0.827	Note: Use 1 if raw data corrected										
TEST ONE:										STP			
				Stack					Vol Flow		Vol Flow	Vol Flow	V(m/s) Point
	Pitot cm H_2O	Pitot ($"H_2O$)	Pa	Temp, °C	DGM in	DGM out	V(m/s)	m^3/s	V(m/s)	m^3/s	m^3/min	Stack	STP
	0.3	0.12	20.1	15	22	22	6.4	2.466	6.1	2.355	141	5.7	5.4
	0.3	0.12	20.1	15	22	22						5.7	5.4
	0.4	0.16	26.8	15	23	23					8478	6.6	6.3
	0.4	0.16	26.8	14	24	22		Vol Flow		Vol Flow		6.6	6.3
	0.4	0.16	27.5	13	25	23		cfm		cfm		6.7	6.4
	0.4	0.17	28.2	12	26	23						6.7	6.5
	0.4	0.17	28.2	13	27	23		5226		4990		6.7	6.4
	0.4	0.16	26.8	13	27	23						6.6	6.3
		Mean	26	13.8		23.6							
		Std	3.2	1.1									
			Pa	Temp, °C		DGM							
TEST TWO:													
Barometric Pressure (Pb):	mb	1013	101300	Pa									
Static Pressure (Ps):	$"H_2O$	0.39	98	Pa									
	mmH_2O	8.90		Pa									
Pitot coefficient(Cp):		0.827											
										STP			
								Vol Flow		Vol Flow	Vol Flow	V(m/s) Point	
	Pitot cm H_2O	Pitot ($"H_2O$)	Pa	Temp, °C	DGM in	DGM out	V(m/s)	m^3/s	V(m/s)	m^3/s	m^3/min	Stack	STP
	0.42	0.17	28.2	13	25	24	6.7	2.563	6.3	2.426	146	6.7	6.4
	0.44	0.17	29.5	13	27	25						6.9	6.6
	0.42	0.17	28.2	16	24	24						6.8	6.4
	0.42	0.17	28.2	16	24	24		Vol Flow		Vol Flow		6.8	6.4
	0.38	0.15	25.5	17	24	24		cfm		cfm		6.4	6.1
	0.40	0.16	26.8	17	25	24						6.6	6.2
	0.38	0.15	25.5	17	26	25		5430		5141		6.4	6.1
	0.40	0.16	26.8	16	27	25						6.6	6.2
		Mean	27	15.6		24.8							
		Std	2.2	2.4									
			Pa	Temp, °C		DGM							

EFFLUX VELOCITY CALCULATIONS

Performed in accordance with HMIP Technical Guidance Note D1

Stack area (As)		0.38	
Efflux velocity		6.7	m/s
Discharge gas temperature		288.6	°K
Vol discharge rate of gases		2.56	m^3s^1
Ambient temperature(K)		283	°K
Heat release.	Q=	0.02	*MW*
Momentum.	M=	17	m^4s^{-1}
Minimum Efflux Velocity.	V=	10	ms^{-1}

13284 PARTICULATE CALCULATION

Site:	Delta GBN	Location:	Paint Shop	Plant Ref: DEL 4	Process: Dip Spray	Date: 26/11/2013

Standard 9096 or 13284:	13284				
Filter ID:	9583		9584		9585
Filter Size 37, 47, 110 or 4:	47		47		47
Sample Ref:	DEL 4-1		DEL 4-2		DEL 4-B
Filter weights:					
					Blank
Tare Test One:	0.15091	*Tare Test Two:*	0.15158		0.15066
Gross Test One:	0.15102	*Gross Test Two:*	0.15193		0.15064
mass collected:	0.00011		0.00035		-0.00002
Wash Out Weights:					
					Blank
Tare Test One:	47.53885	*Tare Test Two:*	46.82788		76.14561
Gross Test One:	47.53908	*Gross Test Two:*	46.82831		76.14610
mass collected:	0.00023		0.00043		0.00049
Control Weights:	**Test 1**		**Test 2**		**Blank**
Mass Change: ***Filter:***	-0.0000140		-0.0000140		-0.0000140
Mass Change: ***Beaker:***	0.00013		0.00013		0.00013
Duct O2(Od): %					
Ref O2(Or): %					

Particulates collected, (Mass):	mg	0.23		0.66			
Concentration at STP dry(Cm):	mg/m^3	0.32	0.62	0.93			
Concentration at STP wet(Cw):	mg/m^3	0.32	0.62	0.92			
Concentration at ref O2(C-O2):	mg/m^3	0.32		0.93			
Minus Blank:	mg	-0.13		0.31			
	mg/m^3	-0.18	0.13	0.43			
	mg/m^3	-0.18	0.12	0.43			
	mg/m^3	-0.18		0.43			
					% of limit Value		
Test Blank	mg	0.35		0.35			
	mg/m^3	0.50	0.50	0.50	2.5%	2.5%	
	mg/m^3	0.50	0.49	0.49	2.5%	2.4%	
	mg/m^3	0.50		0.50	2.5%	2.5%	
Emission Limit	mg/m^3	20					

Mass Emission with or without blank correction
With = Y Without = N: n

			0.4	0.38
0.3	0.9			
			Detection Limit	
Mass Emission			Mass Emission	
Test One	Test Two		Test One	Test Two
0.75	2.2	mg/s	0.91	0.93
2.7	8.0	g/hr	3.29	3.35
21	64	g/8 hr day	26.3	26.8
0.11	0.32	kg/5 day week	0.13	0.13
5.2	15	kg/48 week year	6.32	6.42

Test Detection limit:

Particulates collected, (Mass):	mg	0.28	0.28
Concentration at STP dry(Cm):	mg/m^3	0.39	0.39
Concentration at STP wet(Cw):	mg/m^3	0.39	0.38
Concentration at ref O2(C-O2):	mg/m^3	0.39	0.39

Number of traverses:		1		1
Theoretical Number of Traverses:		2		2
Theoretical Points / Traverse		2		2
Acuual Points / Traverse		1		1
Calculated Uncertainty:	+/-	0.88	mg/m^3	0.71

Site:	Delta GBN		**Plant:**	DEL 4 Paint Dip			**Date:**	26/11/2013		
		Units					Units			
Stack diameter(Ds):		m	0.700			Port Length: (Pl)	mm	85		
Stack dimensions(L,W):		m								
Stack area(As):		m2	0.385							
Reference temp(Tr):		K	273							
Reference Pressure (Pr):		Pa	101300							
TEST ONE:										
Barometric Pressure (Pb):		mb	1018	101800	Pa					
Static Pressure (Ps):		"H2O	0.39	97	Pa					
		mmH2O		0	Pa					
Pitot coefficient(Cp):			0.827	Note: Use 1 if raw data corrected						
									STP	
	Pitot Point (mm)	Pitot mm H_20	Pitot (Pa)	Pa	Anemometer	Stack Stack Temp,	V(m/s)	Vol Flow	V(m/s)	Vol Flow
	151	0.17	41	28.2	0.0	13	6.7	2.56	6.3	2.44
	469	0.17	43	29.5		13				
		0.17	41	28.2		16				
		0.17	41	28.2		16		Vol Flow		Vol Flow
		0.15	37	25.5		17		cfm		cfm
		0.16	39	26.8		17				
		0.15	37	25.5		17		13425		5167
		0.16	39	26.8		16				
				27.3	0.0	15.6				
				1.3	0.0	1.6				
						Stack				
				Pa	Flow	Temp, ℃				

Final calculations:

Mean ppm	28		Std dev ppm	10.2		Mass Emission				
Mean mgm	44		Std dev mgm	16.3		Required Mass Emision Rate:		g/hr		mg/s
										g/hr
Max ppm	45		Max mgm	72						kg/d
										t/y
Peak Time	13:05:16						389	g/hr	Carbon	
Start Time:	12:22:36									
Finish Time:	13:27:06									
Std Method:	BS EN 13526:2002		**ELV**	100						

	Calibration Data				**Drift**					
	Start		Finish							
Zero	0.2		0.008		Measured	0.31	mgm	Allowable	5	OK
Span	72.9		72.3		Measured	0.96	mgm	Allowable	5	OK
Uncertainty	±	5 mg/m³	or	± 10 %		0.64				
Uncertainty	±	3.2	or	± 7	%					

D) Emission Point Ref DEL 5

Emission Source Dip Spray Oven

Substances monitored: Volatile Organic Compounds.

Arrestment: None

Emission Point Description:		BS EN 15259 & EA TGN M1 Compliant
Duct dimensions:	0.30 m diameter	✓
Location of sampling plane:	In sub-vertical outlet stack	✓
Access to sampling position:	Top of oven – boarded out	✗
Adequacy of work area:	< 5 m^2	✗
Availability of required utilities:	Power available in foundry building – 240v	✓
Access to sample points	Full access available	✓
Type of sampling port:	25mm hole	✗
Number of sample lines:	One	✓
Arrangement of sample lines:	N/A	✓
Orientation of sample lines:	Horizontal	✓
Gas Flow Parameters	Flow: angle <15°, > 5Pa, Ratio <3:1, no –ve flow	✓
Temperature and moisture:	~ 225 °C, ~ 2%	✓
Velocity profile:	12 to 16 Pa	✓
Homogeneity test	N/A	-

Site:	Delta GBN		**Plant:**	DEL 5 Paint Dip Oven			**Date:**	26/11/2013		
		Units					Units			
Stack diameter(Ds):		m	0.300			Port Length: (Pl)	mm			
Stack dimensions(L,W):		m								
Stack area(As):		m2	0.071							
Reference temp(Tr):		K	273							
Reference Pressure (Pr):		Pa	101300							
TEST ONE:										
Barometric Pressure (Pb):		mb	1018	101800	Pa					
Static Pressure (Ps):		"H2O	0.12	30	Pa					
		mmH2O		0	Pa					
Pitot coefficient(Cp):			0.990	Note: Use 1 if raw data corrected						
									STP	
	Pitot Point (mm)	Pitot mm H_20	Pitot (Pa)	Pa	Anemometer	Stack Stack Temp,	V(m/s)	Vol Flow	V(m/s)	Vol Flow
	151	0.06	16	15.6	0.0	225	6.2	0.44	3.4	0.24
	469	0.05	12	11.7		225				
		0.05	12	11.7		225				
		0.06	16	15.6		225		Vol Flow		Vol Flow
								cfm		cfm
								7207		509
				13.7	0.0	225.0				
				2.0	0.0	0.0				
						Stack				
				Pa	Flow	Temp, ℃				

Final calculations:

Mean ppm	9.2			Std dev ppm	1.2		Mass Emission			
Mean mgm	15			Std dev mgm	2.0		Required Mass Emision Rate:		g/hr	mg/s
										g/hr
Max ppm	13			Max mgm	21					kg/d
										t/y
Peak Time	17:29:06						13	g/hr	Carbon	
Start Time:	16:50:56									
Finish Time:	14:46:16									
Std Method:	BS EN 13526:2002			**ELV**	100					

	Calibration Data					**Drift**				
	Start		Finish							
Zero	0.2		0.008		Measured	0.31	mgm	Allowable	5	OK
Span	72.9		72.3		Measured	0.96	mgm	Allowable	5	OK
Uncertainty	± 3 mg/m³		or ± 20 %			0.64				
Uncertainty	± 2.4		or ± 16	%						

E) Emission Point Ref DEL 6
Emission Source Spray Booth
Substances monitored: Volatile Organic Compounds. Particulates
Arrestment: Water Curtain

Emission Point Description:		BS EN 15259 & EA TGN M1 Compliant
Duct dimensions:	0.61 m diameter	✓
Location of sampling plane:	In vertical outlet stack	✓
Access to sampling position:	Man basket to place sample probe	✗
Adequacy of work area:	< 5 m^2	✗
Availability of required utilities:	Power available in foundry building – 240v	✓
Access to sample points	Full access available	✓
Type of sampling port:	10 mm hole, 2 x 4" BSP	✓
Number of sample lines:	One	✓
Arrangement of sample lines:	N/A	✓
Orientation of sample lines:	Horizontal	✓
Gas Flow Parameters	Flow: angle <15°, > 5Pa, Ratio <3:1, no –ve flow	✓
Temperature and moisture:	Ambient	✓
Velocity profile:	40 - 52 Pa	✓
Homogeneity test	N/A	-

VELOCITY CALCULATION

Site:	Delta GBN		Location:	Paint Shop		Plant Ref:	DEL 6	Process:	Spray Booth			Date:	27/11/2013
	Units												
Stack diameter(Ds):	m	0.61			Emission Point Dia:	0.61							
Stack dimensions(L,W):	m	0.000	0.000		Emission Point L, W:	0.00	0.00						
Stack area(As):	m^2	0.292			Emission Point Area:	0.292							
Reference temp(Tr):	K	273			Efflux Vel:	8							
Reference Pressure (Pr):	Pa	101300											
Barometric Pressure (Pb):	mb	1012	101200	Pa									
Static Pressure (Ps):	"H_2O	0.05	12	Pa									
	mmH_2O	1.07											
Pitot coefficient(Cp):		0.816	Note: Use 1 if raw data corrected										
TEST ONE:									STP				
				Stack				Vol Flow		Vol Flow	Vol Flow	V(m/s) Point	
	Pitot cm H_2O	Pitot ("H_2O)	Pa	Temp, °C	DGM in	DGM out	V(m/s)	m^3/s	V(m/s)	m^3/s	m^3/min	Stack	STP
	0.65	0.26	42.4	14	25	25	8.4	2.466	8.0	2.347	141	8.3	7.9
	0.65	0.26	42.4	14	24	25						8.3	7.9
	0.67	0.26	43.8	14	25	25					8448	8.4	8.0
	0.67	0.26	43.8	14	25	25		Vol Flow		Vol Flow		8.4	8.0
	0.70	0.28	45.7	13	27	25		cfm		cfm		8.6	8.2
	0.72	0.28	47.0	13	28	26						8.7	8.3
								5226		4973			
		Mean	44	13.7		25.4							
		Std	1.7	0.5									
			Pa	Temp, °C		DGM							
TEST TWO:													
Barometric Pressure (Pb):	mb	1012	101200	Pa									
Static Pressure (Ps):	"H_2O	0.05	12	Pa									
	mmH_2O	1.07		Pa									
Pitot coefficient(Cp):		0.816											
									STP				
								Vol Flow		Vol Flow	Vol Flow	V(m/s) Point	
	Pitot cm H_2O	Pitot ("H_2O)	Pa	Temp, °C	DGM in	DGM out	V(m/s)	m^3/s	V(m/s)	m^3/s	m^3/min	Stack	STP
	0.78	0.31	50.9	14	25	25	9.1	2.673	8.7	2.545	153	9.1	8.6
	0.79	0.31	51.6	14	27	26						9.1	8.7
	0.80	0.31	52.2	13	28	26						9.2	8.7
	0.80	0.31	52.2	13	28	25		Vol Flow		Vol Flow		9.2	8.7
	0.80	0.31	52.2	14	28	26		cfm		cfm		9.2	8.7
	0.80	0.31	52.2	13	30	27						9.2	8.7
								5664		5392			
		Mean	52	13.5		26.8							
		Std	7.7	0.5									
			Pa	Temp, °C		DGM							

EFFLUX VELOCITY CALCULATIONS

Performed in accordance with HMIP Technical Guidance Note D1

Stack area (As)		0.29	
Efflux velocity		9.1	m/s
Discharge gas temperature		286.7	°K
Vol discharge rate of gases		2.67	m^3s^1
Ambient temperature(K)		283	°K
Heat release.	Q=	0.01	*MW*
Momentum.	M=	24	m^4s^{-1}
Minimum Efflux Velocity.	V=	11	ms^{-1}

13284 PARTICULATE CALCULATION

Site:	Delta GBN		Location:	Paint Shop		Plant Ref:	DEL 6
Standard 9096 or 13284:		13284					
Filter ID:		9416		9417		9418	
Filter Size 37, 47, 110 or 4:		47		47		47	
Sample Ref:		DEL 6-1		DEL 6-2		DEL 6-B	
Filter weights:							
						Blank	
Tare Test One:		0.15052	*Tare Test Two:*	0.15010		0.15003	
Gross Test One:		0.15148	*Gross Test Two:*	0.15228		0.15000	
mass collected:		0.00096		0.00218		-0.00004	
Wash Out Weights:							
						Blank	
Tare Test One:		56.69831	*Tare Test Two:*	48.33238		49.18217	
Gross Test One:		56.69852	*Gross Test Two:*	48.33318		49.18258	
mass collected:		0.00021		0.00080		0.00041	
Control Weights:		**Test 1**		**Test 2**		**Blank**	
Mass Change:	***Filter:***	-0.0000140		-0.0000140		-0.0000140	
Mass Change:	***Beaker:***	0.00013		0.00013		0.00013	
Duct O2(Od):	%						
Ref O2(Or):	%						
Particulates collected, (Mass):	mg		1.06		2.86		
Concentration at STP dry(Cm):	mg/m^3		1.15	2.00	2.85		
Concentration at STP wet(Cw):	mg/m^3		1.14	2.0	2.81		
Concentration at ref O2(C-O2):	mg/m^3		1.15		2.85		
Minus Blank:	mg		0.80		2.60		
	mg/m^3		0.87	1.73	2.59		
	mg/m^3		0.86	1.71	2.56		
	mg/m^3		0.87		2.59		
						% of limit Value	
Test Blank	mg		0.26		0.26		
	mg/m^3		0.28	0.27	0.26	1.4%	1.3%
	mg/m^3		0.28	0.27	0.25	1.4%	1.3%
	mg/m^3		0.28		0.26	1.4%	1.3%
Emission Limit:	mg/m^3	20					
Test Detection limit:							
Particulates collected, (Mass):	mg		0.28		0.28		
Concentration at STP dry(Cm):	mg/m^3		0.30		0.28		
Concentration at STP wet(Cw):	mg/m^3		0.30		0.27		
Concentration at ref O2(C-O2):	mg/m^3		0.30		0.28		
Number of traverses:		1		1			
Theoretical Number of Traverses:		2		2			
Theoretical Points / Traverse		2		2			
Acuual Points / Traverse		1		1			
Calculated Uncertainty:	+/-	0.55	mg/m^3	0.51			

Process:	Spray Booth				Date:	27/11/2013
Mass Emission with or without blank correction						
With = Y Without = N:			n			
					0.3	0.27
		1.1	2.8			

Mass Emission Test One	Mass Emission Test Two		Detection Limit Mass Emission Test One	Detection Limit Mass Emission Test Two
2.7	7.20	mg/s	0.70	0.69
10	25.8	g/hr	2.52	2.49
77	210	g/8 hr day	20.13	19.95
0.38	1.03	kg/5 day week	0.10	0.10
18	49.5	kg/48 week year	4.83	4.79

Site:	Delta GBN		**Plant:**	DEL 6 Paint Spray			**Date:**	27/11/2013		
		Units					Units			
Stack diameter(Ds):		m	0.610			Port Length: (Pl)	mm	85		
Stack dimensions(L,W):		m								
Stack area(As):		m2	0.292							
Reference temp(Tr):		K	273							
Reference Pressure (Pr):		Pa	101300							
TEST ONE:										
Barometric Pressure (Pb):		mb	1012	101200	Pa					
Static Pressure (Ps):		"H2O	0.39	97	Pa					
		mmH2O		0	Pa					
Pitot coefficient(Cp):			0.816	Note: Use 1 if raw data corrected						
									STP	
	Pitot Point (mm)	Pitot cm H_20	Pitot (Pa)	Pa	Anemometer	Stack Stack Temp,	V(m/s)	Vol Flow	V(m/s)	Vol Flow
	151	0.65	64	42.4	0.0	14	8.4	2.47	8.0	2.35
	469	0.65	64	42.4		14				
		0.67	66	43.7		14				
		0.67	66	43.7		14		Vol Flow		Vol Flow
		0.70	69	45.7		13		cfm		cfm
		0.72	71	47.0		13				
		0.65	64	42.4		14		17027		4976
		0.65	64	42.4		14				
		0.67	66	43.7		13				
		0.67	66	43.7		13				
		0.7	69	45.7		14				
		0.72	71	47.0		13				
				44.2	0.0	13.6				
				1.7	0.0	0.5				
						Stack				
				Pa	Flow	Temp, ℃				

Final calculations:

Mean ppm	24		Std dev ppm	8.8		Mass Emission				
Mean mgm	39		Std dev mgm	14.2		Required Mass Emision Rate:		g/hr		mg/s
										g/hr
Max ppm	35.3		Max mgm	56.750						kg/d
										t/y
Peak Time	11:06:35						328	g/hr	Carbon	
Start Time:	10:37:05									
Finish Time:	11:21:55									
Std Method:	BS EN 13526:2002		**ELV**	100						

	Calibration Data				**Drift**					
	Start		Finish							
Zero	0.008		0.008		Measured	0.00	mgm	Allowable	5	OK
Span	72.95		72.6		Measured	0.56	mgm	Allowable	5	OK
Uncertainty	± 5 mg/m³		or ± 10 %			0.28				
Uncertainty	± 2.7		or ± 7	%						

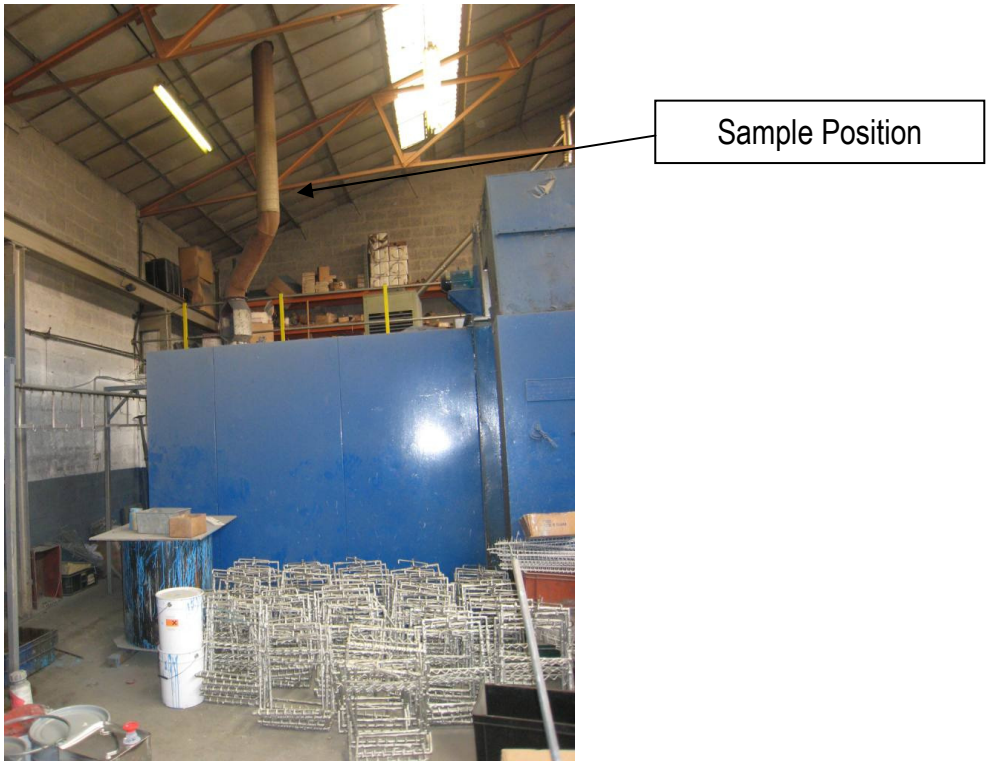
F) Emission Point Ref DEL 7

Emission Source Spray Booth Oven

Substances monitored: Volatile Organic Compounds.

Arrestment: None

Emission Point Description:		BS EN 15259 & EA TGN M1 Compliant
Duct dimensions:	0.25 m diameter	✓
Location of sampling plane:	In sub-vertical outlet stack	✓
Access to sampling position:	Footed ladder to place sampler in stack	✗
Adequacy of work area:	< 5 m^2	✗
Availability of required utilities:	Power available in foundry building – 240v	✓
Access to sample points	Full access available	✓
Type of sampling port:	25 mm hole	✗
Number of sample lines:	One	✓
Arrangement of sample lines:	N/A	✓
Orientation of sample lines:	Horizontal	✓
Gas Flow Parameters	Flow: angle <15°, < 5Pa, Ratio <3:1, no –ve flow	✗
Temperature and moisture:	~ 160 °C, ~ 2%	✓
Velocity profile:	5 – 7 Pa	✗
Homogeneity test	N/A	-



Site:	Delta GBN		**Plant:**	DEL 7 Spray Dip Oven			**Date:**	27/11/2013		
		Units					Units			
Stack diameter(Ds):		m	0.300			Port Length: (Pl)	mm			
Stack dimensions(L,W):		m								
Stack area(As):		m2	0.071							
Reference temp(Tr):		K	273							
Reference Pressure (Pr):		Pa	101300							
	TEST ONE:									
Barometric Pressure (Pb):		mb	1018	101800	Pa					
Static Pressure (Ps):		"H2O	0.07	16	Pa					
		mmH2O		0	Pa					
Pitot coefficient(Cp):			0.990	Note: Use 1 if raw data corrected						
									STP	
	Pitot Point (mm)	Pitot mm H_20	Pitot (Pa)	Pa	Anemometer	Stack Stack Temp,	V(m/s)	Vol Flow	V(m/s)	Vol Flow
		0.06	5	4.9	0.0	160	3.6	0.25	2.3	0.16
		0.05	5	4.9		160				
		0.05	7	6.9		160				
		0.06	7	6.9		160		Vol Flow		Vol Flow
			4	3.9				cfm		cfm
			5	4.9						
								4841		342
				5.4	0.0	160.0				
				1.1	0.0	0.0				
						Stack				
				Pa	Flow	Temp, ℃				

Final calculations:

Mean ppm	14.8			Std dev ppm	3.3		Mass Emission			
Mean mgm	24			Std dev mgm	5.3		Required Mass Emision Rate:		g/hr	mg/s
										g/hr
Max ppm	20			Max mgm	32					kg/d
										t/y
Peak Time	13:13:37						14	g/hr	Carbon	
Start Time:	12:22:07									
Finish Time:	13:22:07									
Std Method:	BS EN 13526:2002			**ELV**	100					

	Calibration Data						**Drift**			
	Start		Finish							
Zero	0.07		0		Measured	0.11	mgm	Allowable	5	OK
Span	72.9		72.4		Measured	0.80	mgm	Allowable	5	OK
Uncertainty	± 5 mg/m³		or ± 10 %			0.46				
Uncertainty	± 2.4		or ± 10	%						