



Test Report



This test report is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to recognised national standards, and to units of measurement realised at the National Physical Laboratory or other recognised national standards laboratories. This test report may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

**PPC COMPLIANCE TESTING FOR PAXFORD COMPOSITES LIMITED
6TH MARCH 2014**

Permit Number: **B01/02**

Operator Name: **Paxford Composites Ltd**

Installation Name: **Paxford Composites**

Dates of Monitoring Visit: **6th March 2014**

Contract Reference: **B0102/PAXFORD/PAXFORD/MAR2014/SBs/PPC/Visit 1**

Client Contact: **Grahame Bloxham**

Client Organisation: **Paxford Composites Ltd**

Address: **2 - 4 Redwongs Way
Huntingdon
PE29 7HB**

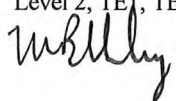
Monitoring Organisation: **National Physical Laboratory (NPL)**

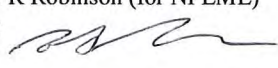
Address: **Hampton Road
Teddington
Middlesex
TW11 0LW**

Date of Report: **4th April 2014**

Report Author: **Matthew Ellison**

Reference: B0102/PAXFORD/PAXFORD/MAR2014/SBs/PPC/Visit 1

Report Approver: Kevin Blakley
MCERTS Registration: MM-03-317
Level & TEs Held: Level 2, TE1, TE2, TE3 & TE4
Signature: 

NPL Authorised Signatory
Name: Mr R Robinson (for NPLML)
Signature: 

NATIONAL PHYSICAL LABORATORY
Continuation Sheet

Contents Page

Part One: Executive Summary	Page
1.1 Monitoring Objectives	3
1.2.1 Particulate Monitoring Results	4
1.2.2 Isocyanates Monitoring Results	5
1.2.3 VOCs Monitoring Results	6
1.3 Operating Information	7
1.4 Monitoring Deviations	7
1.5 Conclusions	8
1.6 References	8
 Part Two: Supporting Information	
 APPENDIX 1	
2.1.1 Emissions Testing Personnel Details	10
2.1.2 Emissions Testing Procedures	10
2.1.3 Equipment Checklist Reference	11
2.1.4 Data Capture Location Reference	11
 APPENDIX 2	
2.2.1 Stack Diagram & Traverse Information	13
2.2.2 One Minute Averaged Gaseous Emissions Data	18
2.2.3 VOCs Emissions Graphical Data	21
2.2.4 Gas Calibration Log	24
2.2.5 Particulate Summary Sheets	27
2.2.6 Sample Sheets	30
2.2.7 Moisture Calculations	43
2.2.8 Uncertainty Calculations	48
2.2.9 Analytical Laboratory Details	53
2.2.10 Calculations Used in Reporting Results	54

1.1 Monitoring Objectives

NPL were awarded a contract by Paxford Composites Limited to carry out emissions compliance testing at their factory in Huntingdon. The scope of work includes carrying out monitoring on two spray paint booths.

Each spray paint booth was monitored for Particulates, Isocyanates and VOCs. Each test lasted for half an hour and was conducted during normal operation of the spray booths.

Results have been reported at standard conditions (273K and 101.3 kPa) on a wet gas basis. Testing was carried out on the 6th March 2014.

1.2.1 Particulate Monitoring Results

Client: Paxford Composites Ltd
Site: Paxford Composites

Emission Point		Spray Booth One		Spray Booth Two	
Test Designation		Run One	Blank	Run One	Blank
Emission Limit Value	mg/m ³ , Reference Conditions	50	-	50	-
Periodic Monitoring Result	Reference Conditions	4.6	1.5	2.7	0.7
Uncertainty (95% Confidence Level)	Reference Conditions	0.9	-	0.6	-
	Units	mg/m ³			
Reference Conditions		273K, 101.3 kPa on a wet gas basis			
Date	dd/mm/yyyy	06/03/2014		06/03/2014	
Sample Period	From hh:mm	14:15	-	11:15	-
	To hh:mm	14:45	-	11:45	-
Monitoring Method		BS EN 13284-1			
Accreditation		UKAS & MCERTS			
Process Status		Spray paint batch run			

1.2.2 Isocyanates (HDI) Monitoring Results

Client: Paxford Composites Ltd
Site: Paxford Composites

Emission Point		Spray Booth One		Spray Booth Two	
Test Designation		Run One	Blank	Run One	Blank
Emission Limit Value	mg/m ³ , Reference Conditions	0.1	-	0.1	-
Periodic Monitoring Result	Reference Conditions	0.007	<0.0001	0.009	<0.0001
Uncertainty (95% Confidence Level)	Reference Conditions	0.002	-	0.002	-
	Units	mg/m ³			
Reference Conditions		273K, 101.3 kPa on a wet gas basis			
Date	dd/mm/yyyy	06/03/2014		06/03/2014	
Sample Period	From hh:mm	14:55	-	12:10	-
	To hh:mm	15:25	-	12:40	-
Monitoring Method		US EPA CTM 36			
Accreditation		None			
Process Status		Spray paint batch run			

1.2.3 VOCs Monitoring Results

Client: Paxford Composites Ltd
Site: Paxford Composites

Emission Point		Spray Booth One	Spray Booth Two
Test Designation		Run One	Run One
Emission Limit Value	mgC/m ³ , Reference Conditions	50	50
Periodic Monitoring Result	Reference Conditions	64.7	39.5
Uncertainty (95% Confidence Level)	Reference Conditions	7.9	6.9
	Units	mgC/m ³	
Reference Conditions		273K, 101.3 kPa on a wet gas basis	
Date	dd/mm/yyyy	06/03/2014	06/03/2014
Sample Period	From hh:mm	15:35	12:15
	To hh:mm	16:05	12:45
Monitoring Method		BS EN 12619:2013	
Accreditation		UKAS & MCERTS	
Process Status		Spray paint batch run	

1.3 Operating Information

Paxford Composites is located in Huntingdon and specialises in design and manufacturing of a wide range of components. The site also has spray painting facilities and can use a variety of different paints such as Epoxy, Polyurethane and Polyester.

The site has three spray paint booths each approximately the size of a garage, this allows large items to be transported inside. Air is pumped in from outside and can be heated if necessary to aid in the curing of the products. The paint filled air is then passed through a filter before being emitted to the atmosphere via a vent stack. Each batch run lasts approximately 20 to 30 minutes, depending upon how many layers of paint are required, and the size of the components. Only spray booths one and two were tested as spray booth three wasn't being used and is scheduled for decommissioning.

Continuous or Batch Process?	Batch Process
What part of the batch process was sampled? (If applicable)	The whole batch process was sampled
What fuel was used during monitoring? (If applicable)	None
What feedstock was used during monitoring? (If applicable)	None
What was the load during monitoring?	N/A
What abatement systems are present? Were they in operation?	A filter is installed in the vent system to reduce particulate emissions. This was in operation during the time of the monitoring
Periodic monitoring results and corresponding CEM values	There are no CEMS installed on the spray booths

1.4 Monitoring Deviations

Were all substances in the monitoring objectives monitored? If not why?	All substances set out in the objectives were monitored
Were all substances monitored in accordance to the relevant method? If not why?	Due to the duct area size of each spray booth, two sampling lines are required to monitor particulates to BS EN 13284:1. Whilst ports were provided, only one port on each spray booth could be accessed due to external obstructions and general accessibility.
Were there any other issues relevant to the monitoring results?	No

1.5 Conclusions

NPL carried out the emissions monitoring for particulates, isocyanates and VOCs on two paint spray booths on the 6th March 2014. No homogeneity tests have been carried out.

1.6 References

1. STA – Risk Assessment Guide: Industrial-emission monitoring – Version 12 - June 2012.
2. Environmental Agency - Manual Stack emission monitoring performance standard for Organisations – Version 7.2 - November 2011.
3. Environmental Agency – M1 Technical Guidance Note – Sampling requirements for stack emission monitoring – Version 6 –January 2010.
4. Environmental Agency – M2 Technical Guidance Note – Monitoring of stack emissions to air – Version 10 – October 2013.
5. Guidance on Assessing Measurement Uncertainty in Stack Emissions Monitoring, by Pullen J and Robinson R, Source Testing Association, Quality Guidance Note QGN1.

APPENDIX 1

2.1.1 Emissions Testing Personnel Details

Name	Role	MCERTS Number	Certification Level & Expiry Dates					
			Level 1	Level 2	TE1	TE2	TE3	TE4
Kevin Blakley	Team Leader	MM-03-317	Mar-2016	Mar-2016	Mar-2016	Mar-2016	Sep-2018	May-2014
Matthew Ellison	Team Leader	MM-05-682	Sep-2018	Sep-2018	Sep-2018	Sep-2018	Dec-2018	Sep-2018

2.1.2 Emissions Testing Procedures

Determinand	VOCs	Particulates	Isocyanates	Moisture	Stack Flow	Temperature
SRM Standard	BS EN 12619	BS EN 13284-1	US EPA CTM 36	BS EN 14790	BS EN 13284-1	BS EN 13284-1
Instrument	FID	APEX Method 5	APEX Method 5	APEX Method 5	Pitot	Type K Thermocouple
Instrument Serial No.	AS0234	AS0240	AS0240	AS0240	AS0261	N/A
Principle	FID	Gravimetric	HPLC	Gravimetric	Flow	Temperature
Operational Range	0 - 100 ppm	N/A	N/A	N/A	N/A	N/A
Certified Range	0 - 15 mg/m ³	N/A	N/A	N/A	N/A	N/A
Uncertainty	25%	15%	12%	20%	N/A	N/A
NPL Procedure	QPAS B 538	QPAS B 536	In House	QPAS B 536	QPAS B 536	QPAS B 536
UKAS Accreditation	YES	YES	NO	YES	YES	YES

Particulate and Isocyanate sampling was conducted using an APEX Method 5 and sampling train. A sample was extracted through a filter and then down a heated probe and sample line. The stack gas was then passed through a series of impingers to remove the moisture before passing through a dry gas meter (DGM) and out to atmosphere. The particulate filter had been weighed in a laboratory before and after testing in order to determine any weight gain. The isocyanate filter had been pre treated and sent to an analytical laboratory for analysis. The uncertainty quoted for the Isocyanate result is based upon the lab uncertainty.

VOC analysis was conducted using a SICK Bernath FID (Flame Ionisation Detector). A sample of stack gas was drawn through a heated filter and heated line before passing into the analyser.

NATIONAL PHYSICAL LABORATORY
Continuation Sheet

The FID analyser zero and span settings were checked before and after each test run using zero grade nitrogen (ex BOC), a suitable gas mixture (BOC beta gas standard), traceable to national reference standards and a gas dilution system. The certified accuracies of the gas standards are listed below: -

SB1

Component	Sample Location	Cylinder ID	Certified Amount	Instrument Range	Certified Uncertainty
Propane	SB1	138227	53 ppm	0 - 100 ppm	1%

SB2

Component	Sample Location	Cylinder ID	Certified Amount	Instrument Range	Certified Uncertainty
Propane	SB2	138227	53 ppm	0 - 100 ppm	1%

These measurement uncertainties are expressed at a 95% level of confidence.

A leak test was conducted before testing to confirm hydraulic integrity of the gaseous sampling system. This was conducted by sending nitrogen down the entire sample line and ensuring a zero reading was obtained.

The electrical volt/millivolt outputs from the FID analyser was collected by a squirrel data logger and downloaded to digital media at the end of the day. Under the program used during the tests, the software records and stores individual readings every 2 seconds. From this data, the logger can perform a series of calculations to output 1 minute averaged measurement on a mass/volume basis. After each 1 minute average has been established the data buffer is reset and the process repeats.

2.1.3 Equipment Checklist Reference

See workfile PX06MAR14/Equipment Checklist

2.1.4 Data Capture Location Reference

All data collected is transferred onto digital media at the end of the day, and then stored on the NPL internal servers upon arrival back at base. The location reference for this is below:

P:\Stack Emissions Team\Paxford Composites\PX06MAR14\7. Monitoring Record Sheets

APPENDIX 2

2.2.1 - Stack Diagram & Traverse Information

NATIONAL PHYSICAL LABORATORY
Continuation Sheet

Test no	SB1 Velocity		Site: Paxford Composites	Stack Description: SB1	
Date	6-3-14		Time of Survey:	14:00	
Swirl Test Conducted	OK		SITE TEAM:	KCB & MRE	
Stack Pres (with +/- above barometric if unknown enter zero)	0	mmH ₂ O	COMMENTS: Temperature & Velocity Traverse		
Pitot Type and Tube ID	AS0261		Diagram of Sample Location: 		
Conditions	Value	Units			
Stack pressure	756.25	mmHg			
Ref oxygen Value	21	%			
Moisture Content	0.3	%			
CO	0	ppm			
CO ₂	0	%			
N ₂	79.05	%			
O ₂	20.95	%			
dry molecular wt	28.84				
stack molecular wt	28.81				
area of stack	0.47	m ²			
Pbar	1008	mbar			
Pbar	756	mmHg			
pitot tube coeft	0.83				
Reference Temp	273	K	Is the gas flow angle <15° to the duct axis?	Yes	✓
Reference Pressure	760	mmHg	Is there any local negative flow?	No	✓
PITOT LEAK CHECK (Yes/No)	YES		Is the flow rate high enough to be measured?	Yes	✓
			Ratio of flows less than 3:1 (or 9:1 for pressure readings)?	Yes	✓

SAMPLING LINE: A							
Traverse Point	Distance into duct (m)	Δp mm H ₂ O	Δp Pa	Stack Temp T _s °C	Velocity @ stack gas T&P on wet gas basis m/s	Angle of Swirl °	$\sqrt{\Delta p}$
1	A10	16.8	164.7	21	13.8	<15	4.1
2	A9	16.6	162.7	21	13.7	<15	4.1
3	A8	14.0	137.2	21	12.6	<15	3.7
4	A7	12.8	125.5	21	12.1	<15	3.6
5	A6	12.0	117.6	21	11.7	<15	3.5
6	A5	6.2	60.8	21	8.4	<15	2.5
7	A4	4.8	47.1	21	7.4	<15	2.2
8	A3	3.8	37.3	21	6.6	<15	1.9
9	A2	3.0	29.4	21	5.8	<15	1.7
10	A1	3.0	29.4	21	5.8	<15	1.7
Average values		9.3	22.8	21.0	9.8	<15	2.9

Duct / Stack Flow Characteristics: SB1		
Test No:	SB1 Velocity	
	Average	Units
Stack Velocity at stack gas T & P and a wet gas basis	9.8	ms ⁻¹
Stack flow @ STP, O ₂ (ref) and on a dry gas basis	N/A	m ³ s ⁻¹
Stack flow @ stack gas T & P and on a wet gas basis	4.6	m ³ s ⁻¹
Stack flow @ stack gas T & P and on a dry gas basis	4.6	m ³ s ⁻¹
Stack flow @ STP and on a wet gas basis	4.3	m ³ s ⁻¹
Stack flow @ STP, O ₂ (ref) and on a wet gas basis	N/A	m ³ s ⁻¹

Test no	SB2 Velocity		Site:	Paxford Composites	Stack Description:	SB2															
Date	6-3-14		Time of Survey:	11:00																	
Swirl Test Conducted	OK		SITE TEAM:	KCB & MRE																	
Stack Pres (with +/- above barometric if unknown enter zero)	0	mmH ₂ O	COMMENTS: Temperature & Velocity Traverse																		
Pitot Type and Tube ID	AS0466		Diagram of Sample Location: 																		
Conditions	Value	Units																			
Stack pressure	756.25	mmHg																			
Ref oxygen Value	21	%																			
Moisture Content	0.6	%																			
CO	0	ppm																			
CO ₂	0	%																			
N ₂	79.05	%																			
O ₂	20.95	%																			
dry molecular wt	28.84																				
stack molecular wt	28.77																				
area of stack	0.64	m ²																			
Pbar	1008	mbar																			
Pbar	756	mmHg																			
PITOT LEAK CHECK (Yes/No)	YES						<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 70%;">Flow Criteria Measurements</th> <th style="width: 10%;"></th> <th style="width: 20%;">Fulfilled?</th> </tr> <tr> <td>Is the gas flow angle <15° to the duct axis?</td> <td>Yes</td> <td>✓</td> </tr> <tr> <td>Is there any local negative flow?</td> <td>No</td> <td>✓</td> </tr> <tr> <td>Is the flow rate high enough to be measured?</td> <td>Yes</td> <td>✓</td> </tr> <tr> <td>Ratio of flows less than 3:1 (or 9:1 for pressure readings)?</td> <td>Yes</td> <td>✓</td> </tr> </table>				Flow Criteria Measurements		Fulfilled?	Is the gas flow angle <15° to the duct axis?	Yes	✓	Is there any local negative flow?	No	✓	Is the flow rate high enough to be measured?	Yes
Flow Criteria Measurements		Fulfilled?																			
Is the gas flow angle <15° to the duct axis?	Yes	✓																			
Is there any local negative flow?	No	✓																			
Is the flow rate high enough to be measured?	Yes	✓																			
Ratio of flows less than 3:1 (or 9:1 for pressure readings)?	Yes	✓																			

SAMPLING LINE: A							
Traverse Point	Distance into duct (m)	Δp mm H ₂ O	Δp Pa	Stack Temp T _s °C	Velocity @ stack gas T&P on wet gas basis m/s	Angle of Swirl °	$\sqrt{\Delta p}$
1	A10	56.0	549.0	22	25.3	<15	7.5
2	A9	50.0	490.2	22	23.9	<15	7.1
3	A8	48.0	470.5	22	23.4	<15	6.9
4	A7	32.0	313.7	22	19.1	<15	5.7
5	A6	25.0	245.1	22	16.9	<15	5.0
6	A5	25.0	245.1	22	16.9	<15	5.0
7	A4	18.8	184.3	22	14.7	<15	4.3
8	A3	14.6	143.1	22	12.9	<15	3.8
9	A2	8.8	86.3	22	10.0	<15	3.0
10	A1	6.4	62.7	22	8.5	<15	2.5
Average values		28.5	69.7	22.0	17.2	<15	5.1

Duct / Stack Flow Characteristics: SB2		
Test No: SB2 Velocity		
	Average	Units
Stack Velocity at stack gas T & P and a wet gas basis	17.2	ms ⁻¹
Stack flow @ STP, O ₂ (ref) and on a dry gas basis	N/A	m ³ s ⁻¹
Stack flow @ stack gas T & P and on a wet gas basis	11.0	m ³ s ⁻¹
Stack flow @ stack gas T & P and on a dry gas basis	10.9	m ³ s ⁻¹
Stack flow @ STP and on a wet gas basis	10.1	m ³ s ⁻¹
Stack flow @ STP, O ₂ (ref) and on a wet gas basis	N/A	m ³ s ⁻¹

2.2.2 - One Minute Averaged Gaseous Emissions Data

Paxford Composites - Spray Booth One
273K, 101.3 kPa, on a Wet Gas Basis
6th March 2014

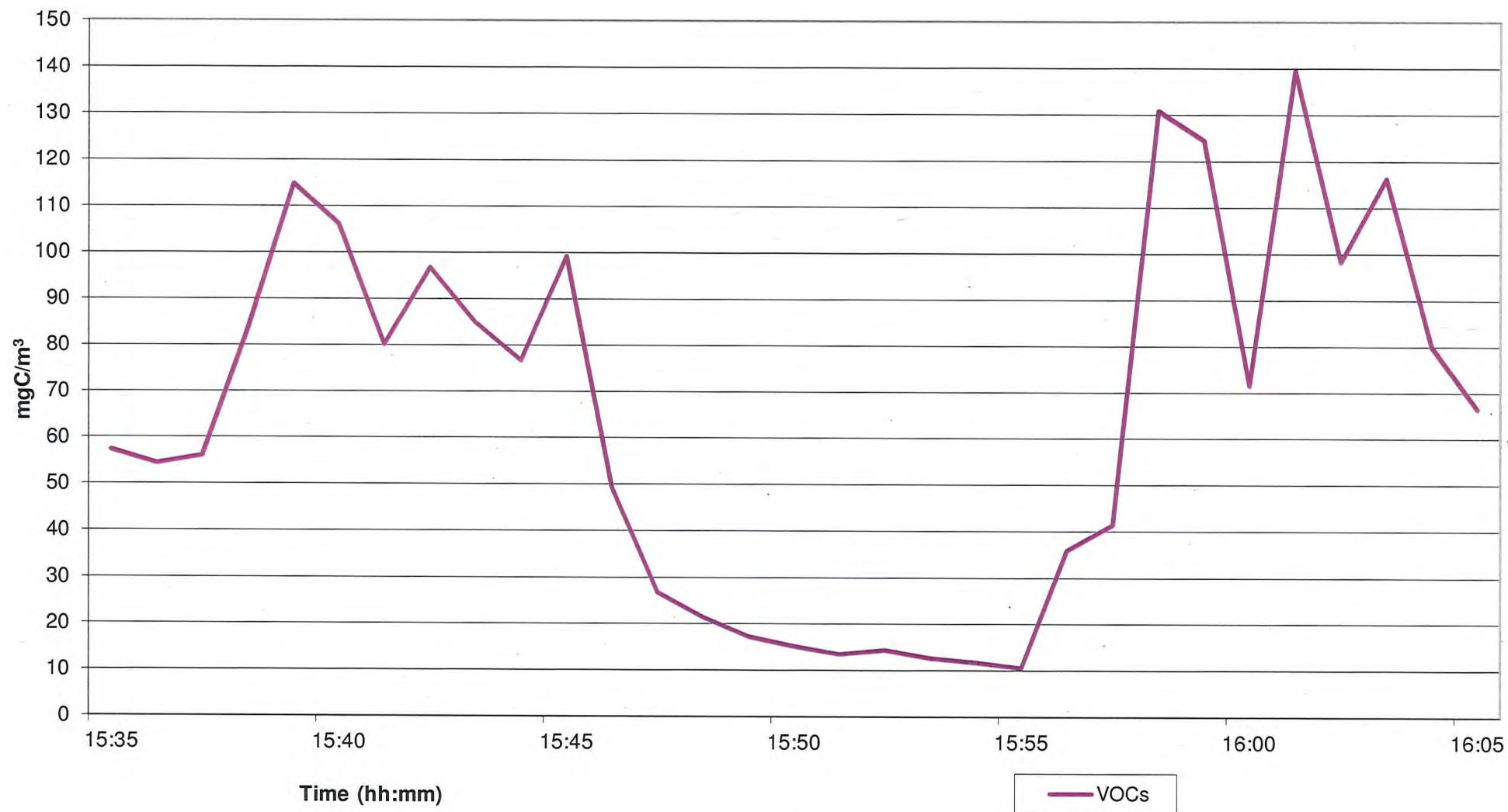
Time	VOCs (mgC/m ³)
15:35	57.3
15:36	54.3
15:37	56.0
15:38	83.5
15:39	115
15:40	106
15:41	80.1
15:42	96.7
15:43	84.8
15:44	76.7
15:45	99.2
15:46	49.2
15:47	26.8
15:48	21.4
15:49	17.2
15:50	15.2
15:51	13.5
15:52	14.4
15:53	12.6
15:54	11.7
15:55	10.5
15:56	35.9
15:57	41.4
15:58	131
15:59	124
16:00	71.5
16:01	139
16:02	98.2
16:03	116
16:04	79.9
16:05	66.4
Maximum	139
Minimum	10.5
Average	64.7

Paxford Composites - Spray Booth Two
273K, 101.3 kPa, on a Wet Gas Basis
6th March 2014

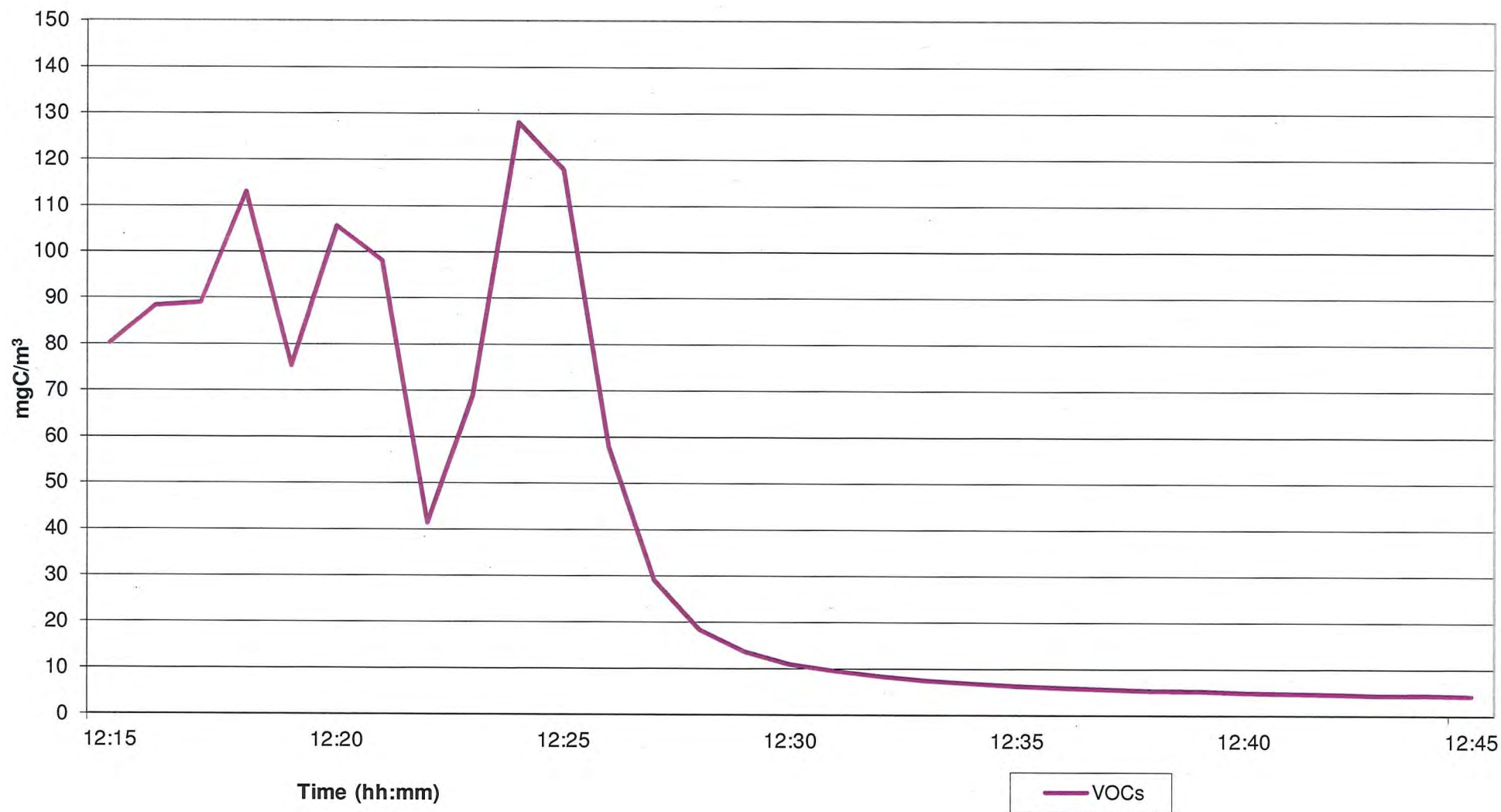
Time	VOCs (mgC/m ³)
12:15	80.2
12:16	88.3
12:17	88.9
12:18	113
12:19	75.3
12:20	106
12:21	98.1
12:22	41.3
12:23	68.9
12:24	128
12:25	118
12:26	57.8
12:27	29.0
12:28	18.4
12:29	13.7
12:30	10.9
12:31	9.5
12:32	8.4
12:33	7.5
12:34	6.9
12:35	6.3
12:36	6.0
12:37	5.7
12:38	5.4
12:39	5.3
12:40	4.9
12:41	4.8
12:42	4.6
12:43	4.4
12:44	4.5
12:45	4.2
Maximum	128
Minimum	4.2
Average	39.5

2.2.3 - VOCs Emissions Graphical Data

2.2.3 - VOCs Emissions Graphical Data for Spray Booth One - 6th March 2014
(273.15K, 101.325kPa, on a Wet Gas basis) using the NPL Conventional Analysis Package



2.2.3 - VOCs Emissions Graphical Data for Spray Booth Two - 6th March 2014
(273.15K, 101.325kPa, on a Wet Gas basis) using the NPL Conventional Analysis Package



2.2.4 - Gas Calibration Log

NATIONAL PHYSICAL LABORATORY
Continuation Sheet

GAS CALIBRATION MEASUREMENTS

Client:	Paxford Composites	Date:	06/03/2014	Horiba ID:	N/A
Site:	Huntingdon	Job Number:	PX06MAR13	FID ID:	AS0234
Stack ID:	SB1	Mobile Lab ID:	Transit	Sonimix ID:	N/A
Reference oxygen %	21	Nitrogen cylinder ID:	Zero Grade	Initial N ₂ pressure bar	120

GAS CALIBRATION LOG - DIRECT CALIBRATION

		SO ₂	CO	NOx	O ₂	CO ₂	VOCs
Gas Cylinder ID:							138227
Initial Reg. Pressure bar							90
Cylinder Concentration:							53.0 ppm C ₃ H ₈
Span Value:							53.0 ppm C ₃ H ₈
Analyser Range:0 -							100 ppm C ₃ H ₈
Check Zero	Time						14:18
	Reading						-0.21 ppm C ₃ H ₈
	Initial Gain						4
Adjust Zero	Time						14:19
	Reading						0 ppm C ₃ H ₈
	Final Gain						4.53
Check Span	Time						14:23
	Reading						55.3 ppm C ₃ H ₈
	Initial Gain						1.32
Adjust Span	Time						14:24
	Reading						53.0 ppm C ₃ H ₈
	Final Gain						1.34
Check Zero	Time						14:26
	Reading						0.1 ppm C ₃ H ₈

GAS CALIBRATION LOG - SYSTEM CAL (Including heated line and chiller unit)

		SO ₂	CO	NOx	O ₂	CO ₂	VOCs
Span Value:							53.0 ppm C ₃ H ₈
Check Zero	Time						14:28
	Reading						0.1 ppm C ₃ H ₈
	Pass/fail						PASS
Check Span	Time						14:30
	Reading						53.0 ppm C ₃ H ₈
	Response Time/s						40
Pass/fail							PASS

GAS CALIBRATION LOG - POST CAL (Including heated line and chiller unit)

		SO ₂	CO	NOx	O ₂	CO ₂	VOCs
Span Value:							53.0 ppm C ₃ H ₈
Check Zero	Time						15:13
	Reading						0.3 ppm C ₃ H ₈
Check Span	Time						15:15
	Reading						53.1 ppm C ₃ H ₈
	Reg Pressure						70
Check Zero	Time						15:17
	Reading						0.1 ppm C ₃ H ₈
	Reg Pressure (n ₂)						100
Zero Drift check @2x repeatability zero							0.1 ppm C ₃ H ₈
Acceptance							Accept
Zero Drift (%)							0.6
Span Drift (%)							0.2
Acceptance zero							Accept
Acceptance span							Accept

CALIBRATION TO BE CARRIED OUT BY OR UNDER THE SUPERVISION OF MCERTS QUALIFIED PERSONNEL WITH LEVEL TWO AND TE4

Name:	Kevin Blakley
MCERTS ID:	MM-03-317

Personnel Present:	KCB/MRE
--------------------	---------

NATIONAL PHYSICAL LABORATORY
Continuation Sheet

GAS CALIBRATION MEASUREMENTS

Client:	Paxford Composites	Date:	06/03/2014	Horiba ID:	N/A
Site:	Huntingdon	Job Number:	PX06MAR13	FID ID:	AS0234
Stack ID:	SB2	Mobile Lab ID:	Transit	Sonimix ID:	N/A
Reference oxygen %	21	Nitrogen cylinder ID:	Zero Grade	Initial N ₂ pressure bar	120

GAS CALIBRATION LOG - DIRECT CALIBRATION

		SO ₂	CO	NOx	O ₂	CO ₂	VOCs
Gas Cylinder ID:							138227
Initial Reg. Pressure bar							90
Cylinder Concentration:							53.0 ppm C ₃ H ₈
Span Value:							53.0 ppm C ₃ H ₈
Analyser Range:0 -							100 ppm C ₃ H ₈
Check Zero	Time						11:18
	Reading						0.46 ppm C ₃ H ₈
	Initial Gain						4.7
Adjust Zero	Time						11:20
	Reading						0 ppm C ₃ H ₈
	Final Gain						4
Check Span	Time						11:25
	Reading						74.6 ppm C ₃ H ₈
	Initial Gain						2.24
Adjust Span	Time						11:27
	Reading						53.0 ppm C ₃ H ₈
	Final Gain						1.32
Check Zero	Time						11:29
	Reading						0.0 ppm C ₃ H ₈

GAS CALIBRATION LOG - SYSTEM CAL (Including heated line and chiller unit)

		SO ₂	CO	NOx	O ₂	CO ₂	VOCs
Span Value:							53.0 ppm C ₃ H ₈
Check Zero	Time						11:30
	Reading						0.0 ppm C ₃ H ₈
	Pass/fail						PASS
Check Span	Time						11:32
	Reading						53.7 ppm C ₃ H ₈
	Response Time/s						30
Pass/fail							PASS

GAS CALIBRATION LOG - POST CAL (Including heated line and chiller unit)

		SO ₂	CO	NOx	O ₂	CO ₂	VOCs
Span Value:							53.0 ppm C ₃ H ₈
Check Zero	Time						12:47
	Reading						-1.9 ppm C ₃ H ₈
Check Span	Time						12:50
	Reading						51.2 ppm C ₃ H ₈
	Reg Pressure						75
Check Zero	Time						12:52
	Reading						-1.5 ppm C ₃ H ₈
	Reg Pressure (n ₂)						100
Zero Drift check @2x repeatability zero							0.0 ppm C ₃ H ₈
Acceptance							Accept
Zero Drift (%)							3.6
Span Drift (%)							3.4
Acceptance zero							Correct for drift
Acceptance span							Correct for drift

CALIBRATION TO BE CARRIED OUT BY OR UNDER THE SUPERVISION OF MCERTS QUALIFIED PERSONNEL WITH LEVEL TWO AND TE4

Name:	Matthew Ellison
MCERTS ID:	MM-05-682

Personnel Present:	KCB/MRE
--------------------	---------

2.2.5 - Particulate Summary Sheets

NATIONAL PHYSICAL LABORATORY
Continuation Sheet

Field	Units	Blank	TEST 1
Date	dd/mm/yyyy	06/03/2014	06/03/2014
Test No.		Blank	SB1 Particulates Test 1
Filter No.		13TF185	13TF184
Stack Description		SB1	SB1
Start Time	hh:mm	-	14:15
End Time	hh:mm	-	14:45
Total Time	min	-	30
Stack Temp.	C	-	21
Gas Meter Temp	C	-	21
Gas Meter Pressure	kPa	-	100.8
Filter	mg	0.1	1.4
Washings	mg	0.8	1.0
TOTAL Mass Collected	mg	0.8	2.4
Test H2O	% Vol	-	0.3
Stack Temp	°C	-	21.0
Stack Pressure	kPa	-	100.8
Nozzle Diameter	mm	-	5.74
Duct Area	m ²	-	0.47
Isokinicity	%	-	100
Stack Velocity	Stack T & P, uncorrected, ms ⁻¹	-	12.23
Gas Vol. Sampled	Dry Gas Basis, Ambient T and P	-	0.55
Gas Vol. Sampled	Wet Gas Basis, Standard T and P	-	0.53
Particulate Concentration	Wet Gas Basis, Standard T and P, mg Nm ⁻³	1.5	4.6
Expanded Uncertainty	+/-mg Nm ⁻³ , 95% Conf. k=2	-	0.9
Emission Limit Value (ELV)	Dry Gas Basis, Standard T and P, mg Nm ⁻³	50	50
Percentage of Emission Limit Value (ELV) for Test	Wet Gas Basis, Standard T and P, %	3	9
Mass Emission	Wet Gas Basis, Standard T and P, g s ⁻¹	-	0.06

NATIONAL PHYSICAL LABORATORY
Continuation Sheet

Field	Units	Blank	TEST 1
Date	dd/mm/yyyy	06/03/2014	06/03/2014
Test No.		Blank	SB2 Particulates Test 1
Filter No.		13TF182	13TF183
Stack Description		SB2	SB2
Start Time	hh:mm	-	11:15
End Time	hh:mm	-	11:45
Total Time	min	-	30
Stack Temp.	C	-	23
Gas Meter Temp	C	-	19
Gas Meter Pressure	kPa	-	100.8
Filter	mg	0.1	0.6
Washings	mg	0.5	1.6
TOTAL Mass Collected	mg	0.6	2.2
Test H2O	% Vol	-	0.6
Stack Temp	°C	-	22.5
Stack Pressure	kPa	-	100.8
Nozzle Diameter	mm	-	5.74
Duct Area	m ²	-	0.64
Isokinicity	%	-	99
Stack Velocity	Stack T & P, uncorrected, ms ⁻¹	-	18.89
Gas Vol. Sampled	Dry Gas Basis, Ambient T and P	-	0.83
Gas Vol. Sampled	Wet Gas Basis, Standard T and P	-	0.80
Particulate Concentration	Wet Gas Basis, Standard T and P, mg Nm ⁻³	0.7	2.7
Expanded Uncertainty	+/-mg Nm ⁻³ , 95% Conf. k=2	-	0.6
Emission Limit Value (ELV)	Wet Gas Basis, Standard T and P, mg Nm ⁻³	50	50
Percentage of Emission Limit Value (ELV) for Test	Wet Gas Basis, Standard T and P, %	1	5
Mass Emission	Wet Gas Basis, Standard T and P, g s ⁻¹	-	0.1