EMISSIONS MONITORING SURVEY
(Main Stack – Ink Filling)

Prepared for:

Linx Printing Technologies
Burrell Road
St Ives
Cambridgeshire
PE27 3LA

Guidance Note	**: PG6/44**
Job Number	**: P883**
Report Number	**: R001**
Report Issue Date	**: 21st December 2010**
Survey Dates:	**: 7th December 2010**

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Report Issue:		**FINAL**	
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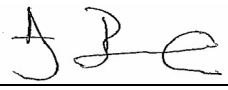
		Signature:	
Date:	20/12/10	***Date:***	21/12/10

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UKAS TESTING
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PART 1 - EXECUTIVE SUMMARY

1 Monitoring Objectives

Environmental Compliance Ltd (ECL) was commissioned by **Linx Printing Technologies** to undertake an emission monitoring survey at their **Location in St Ives, Cambs**. This report presents the findings of the study.

The monitoring at this installation was carried out in accordance with our quotation reference **PC/P883/Q001**, for compliance check monitoring of emissions to air. The substances requested for monitoring at each emissions point are listed below:

Substances to be monitored	Emission Point Identification
	Ink Filling – Main Stack
Particulates	● U
Total Organic Carbon (TOC)	● U

● Denotes the substances to be monitored.

U **Denotes UKAS accreditation is held for monitoring that substance, but does not mean that it has been claimed which will depend on whether the testing could be completed in accordance with the Standard Reference Method.**

Special Requirements: *"Normal Operations."*

1.1 Monitoring Results

Emission Point Reference	Substance to be Monitored	Emission Limit Value	Periodic Monitoring Result	Uncertainty %	Units	Reference Conditions 273 K, 101.3 kPa	Date of Sampling	Start and End Times	Monitoring Method Reference	Accreditation for use of Method	Tick if non-conforming test (see Sections 2 & 5)	Operating Status
Ink Filling – Main Stack	Particulates $	20	0.31	48	mg/m^3	& Wet Gas	07/12/10	08:20 – 10:21	BS EN 13284-1	UKAS / MCERTS		Normal
	Particulates $	20	0.26	56	mg/m^3	& Wet Gas	07/12/10	11:00 – 13:01	BS EN 13284-1	UKAS / MCERTS		
	TOCs as Carbon	150	220.25	7	mg/m^3	& Wet Gas	07/12/10	08:06 – 15:47	BS EN13526	UKAS / MCERTS		

Notes

Emission Limit Value	The emission limit value is that stated in the permit and will be expressed as a concentration or a mass emission.
Periodic Monitoring Result	The result given is expressed in the same terms and units as the emission limit value.
Uncertainty	The uncertainty associated with the quoted result is at the 95% confidence interval. The Uncertainty results **DO NOT** take into account the effect of the sample location limitations.
Reference Conditions	All results are expressed at 273 K and 101.3kPa. The oxygen and moisture corrections are stated.
Monitoring Method Reference	The method stated is in accordance with the Environment Agency Technical Guidance Note M2, or other method approved by the Environment Agency.
Accreditation for use of Method	**The details indicate the accreditation for the use of the complete monitoring method, e.g. MCERTs, UKAS. If use of the method is not accredited " NA" is stated.**
Operating Status	The details indicate the feedstock and the loading rate of the plant during monitoring.
$	Chemical Analysis on sample reagents was performed by an External Laboratory as detailed in Section 4
NU	UKAS Accreditation Held but UKAS Accreditation cannot be claimed for the test as sampling did not comply with the Standard Reference Method (SRM), see section 2 & 5
NA	**Method is NOT UKAS Accredited.**

1.2 Operating Information

Emission Point Reference	Process Type	Process Duration	Fuel	Feedstock	Abatement	Load	Comparison of Operator CEMS and Periodic Monitoring Results					
							Parameter	Date	Time	CEMS Results	Periodic Monitoring Results	Units
Main Stack	Batch	Various	n/a	n/a	None	Normal	…	…	…	n/a	…	…

Notes:

Process Type	State whether the process is a continuous or batch process.
Process Duration	If a batch process, state the duration, frequency and details of the portion of the batch sampled. If continuous state "NA"
Fuel	If applicable, state the fuel type If not applicable state "NA"
Feedstock	State the feedstock type
Abatement	State the type and whether operational during monitoring. If not applicable state "NA"
Load	State the normal load, throughput or rating of the plant
CEMS Data	Enter this data for each CEM installed if it is has been provided by operator otherwise state “NP” (NOT PROVIDED)

2 Monitoring Deviations

The objective of the survey was to measure the concentrations of pollutants from the processes / locations as detailed in Section 1. This survey meets the requirements of the site's **Applicable Process Guidance Note: PG6/44** where UKAS and MCERTS accreditation has and could be claimed for the testing in the monitoring results table.

There were no substance deviations from the original and agreed emissions monitoring schedule.

The particulate tests were carried out using an allowed deviation from BSEN 13284 & MID, due to the fact that no impingers were used and no moisture test was carried out. Based on EA / UKAS agreement, as the stack gases are essentially dry and the results are reported at wet gas conditions, UKAS / MCERTS can still been claimed for these tests.

There were no non-conforming tests.

Homogeneity tests have not been completed for pollutants at the following locations:

- **Main Stack - Not applicable to this location.**

PART 2 – SUPPORTING INFORMATION

3 SAMPLING STAFF DETAILS

Site Sampling Team

Names of Site Team	Dates on Site	MCERTS No.	LEVEL	Technical Endorsements
Paul Calland	07/12/10	MM 03 212	2	TE1, TE2, TE3, TE4

Report Reviewer

Name	MCERTS No.	LEVEL	Technical Endorsements
Andy Barnes	MM 03 235	2	TE1, TE2, TE3, TE4

Technical Endorsement Key:-

TE1 – **Isokinetic** Particulates, Temperature & Velocity Profiles, Oxygen.
TE2 – **Isokinetic** Extractive Pollutants:- Metals, Dioxin & Furans, PAHs, PCBs, HCL, HF.
TE3 – **Non-Isokinetic** Extractive Pollutants:- Speciated VOCs, HF, HCL, Cyanide.
TE4 – **Continuous Analysers** (Combustion Gases):- VOCs, CO, NOx, SO2.

4 SAMPLING PROTOCOLS / METHODOLOGIES

TOCs as Carbon

Testing was carried out using a Signal 3030PM FID and heated gas transport system with reference to the manufacturer's operation handbook, **BS EN 13526** and in-house technical procedure **ECL/TPD/032**. The analyser was calibrated pre and post the sample period using span gas and zero scrubbed air. Data was corrected by molecular weight to VOCs as total carbon.

Data was recorded as minute averages over each test period. The minute averaged data is presented in the Figures Section and the minute averaged data is detailed in the Tables Section**.**

Particulates

Testing was carried out using a Universal Stack Sampling system in accordance with **BS EN 13284-1 & MID** and In-house technical procedure **ECL/TPD/027.**

Isokinetic particulate sampling is achieved when the velocity of gas entering the sampling nozzle is exactly equal to the velocity of the approaching gas stream within the stack.

A measured volume of sample gas is withdrawn from the stack isokinetically through a sampling nozzle and through a pre-weighed filter positioned in an unheated housing inserted into the stack.

Particulate matter is collected on the filter. Following testing the front half of the filter housing, and the sample nozzle are rinsed to remove any particulate matter which, may have impacted on the surfaces during testing.

The filters and rinses are subsequently analysed to determine the amount of particulate matter captured.

RPS Laboratories (RPS) who are situated in Manchester carried out the analysis of the samples. **RPS** are UKAS accredited for all analysis conducted. In addition to the survey samples, a field blank is submitted as part of the technical procedure.

Pressure, Temperature and Velocity

Testing was carried out using a sampling system in accordance with **BS EN 13284-1 & MID** and In-house technical procedure **ECL/TPD/022.**

Temperature was recorded using a thermocouple and digital temperature reader.

Velocity and pressure was recorded using an “L” type pitot and digital manometer, data being recorded in mm H_2O.

5 SAMPLE POINT DESCRIPTION

The sample location that was monitored is detailed below:-

Main Stack

The sampling plane is in long straight vertical section of the emissions stack.

The diameter at the sample plane is 0.5m.

The flow characteristics meet the ***requirements*** of the standard.

2 x 2" ports are available and are located as per the requirements of BS EN 13284.

EQUIPMENT IDs
(Pre site checklist from SSP)

PRE SITE EQUIPMENT CHECKLIST/ EQUIPMENT USED

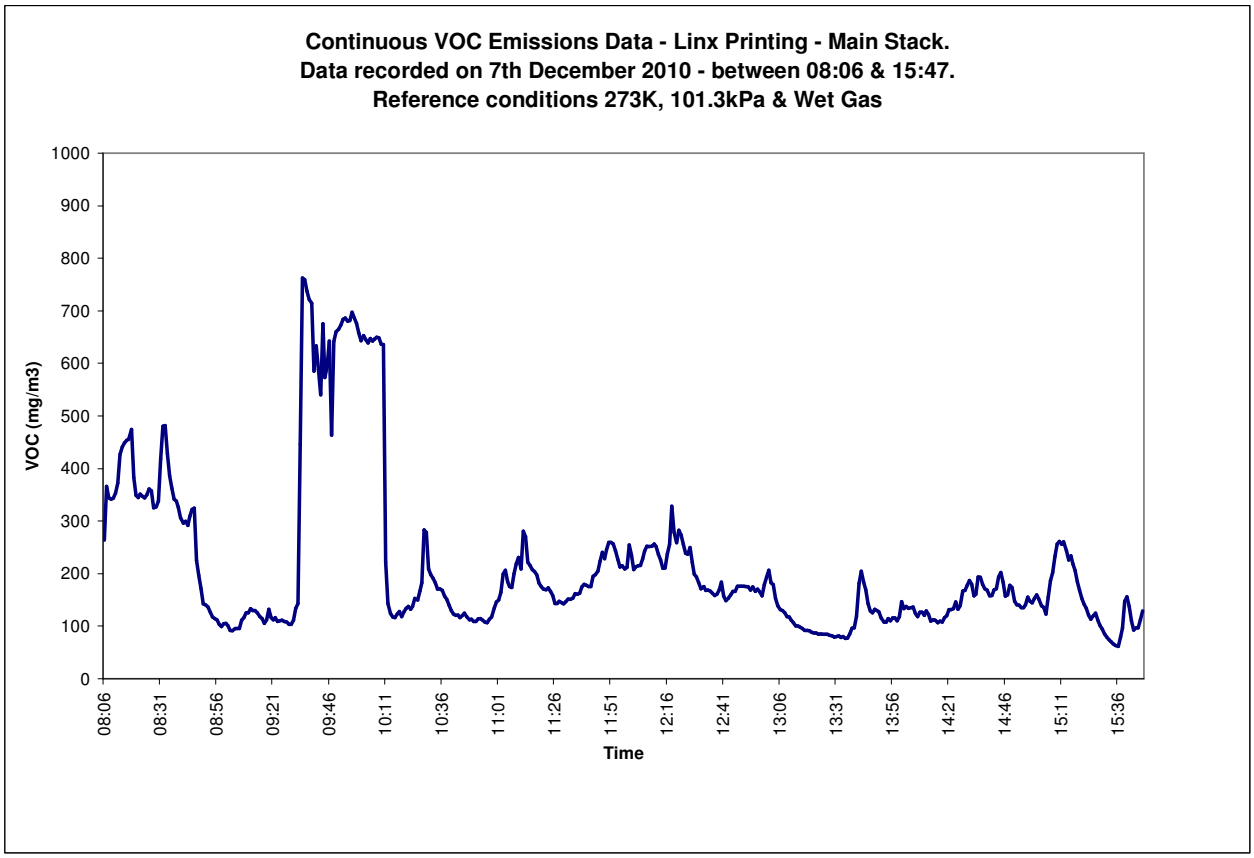
(Completed before departure to site and when on site in full)

Equipment	Equip. Type	ID No:	ID No:	ID No:	ID No:	ID No:	ID No:	ID No:	ID No:
MST console/pump	E001	U006							
MST Nozzle set									
MST "S" Type Pitot									
MST Probe									
MST Hot Box									
MST Impinger Arm									
Barometer		204							
Site Balance									
Site Check weights									
Horiba	E002								
Heated Probe									
Chiller									
Sonimix									
Heated Line									
FID	E003	304							
Heated Line		212							
Testo	E004								
FTIR	E005								
Heated Probe									
Heated Line									
Stackmite	E006								
"L" Type Pitot		489							
Digital Manometer		421							
Stack Thermocouple		468							
Thermocouple Reader		358							
Nozzle Set		522							
Workhorse Pumps	E007								
Low Flow Pumps									

Quantity of Ice Required / Used for Survey	ZERO	Bags (2kg bags)

FIGURES

Figure 1


Continuous VOC Emissions Data - Linx Printing - Main Stack.
Data recorded on 7th December 2010 - between 08:06 & 15:47.
Reference conditions 273K, 101.3kPa & Wet Gas
VOC (mg/m3)
1000
900
800
700
600
500
400
300
200
100
0
08:06
08:31
08:56
09:21
09:46
10:11
10:36
11:01
11:26
11:51
12:16
12:41
13:06
13:31
13:56
14:21
14:46
15:11
15:36
Time

TABLES

Table 1 - VOC

Data Recorded from Main Stack

Sample Period: 08:06 – 15:47 on the 7th December 2010

Volumetric Flowrate (Reference Conditions) = 0.824 **m^3/sec ***

	Minimum	Maximum	Average	Emission Rate
	mg/m^3	**mg/m^3**	**mg/m^3**	**Kg/hr**
VOCs (as carbon)	**76.74**	**761.99**	**220.25**	**0.653**

Data expressed at (273K, 101.3 kPa & Wet Gas)

Table 2 – Particulate Matter

Data Recorded from Main Stack - Ink Filling

Emission Parameter	Units	TPM 1	TPM 2	Blank
Stack Diameter	**metres**	0.50		…
Area of Sample Plane	**m^2**	0.196		…
Stack Temperature	**°C**	10	10	…
Gas Velocity (as Measured)	**m/sec**	4.36	4.36	…
Gas Velocity (Reference Conditions)	**m/sec***	4.20	4.20	…
Volumetric Flowrate (as Measured)	**m^3/sec**	0.86	0.86	…
Volumetric Flowrate (Reference Conditions)	**m^3/sec***	0.824	0.824	…
Sample Date	**…**	07/12/2010	07/12/2010	…
Sample Period	**…**	08:20 - 10:21	11:00 - 13:01	…
Sample Volume (reference Conditions)	**m^3***	2.040	2.050	2.045
Isokinetic Sampling Rate	**%**	105.15	105.67	…
Sample Reference (ECL ID)	**ECL/10/**	6070 & 6071	6072 & 6073	6074 & 6075
Mass of Particulate Matter Collected	**mg**	0.63	0.54	0.54
Concentration of Particulate Matter	**mg/m^3***	**0.31**	**0.26**	0.26
Emission Rate of Particulate Matter	**g/hr**	0.92	0.78	...
Expanded Uncertainty (% Relative)	**%**	48	56	...
Emission Limit Value (ELV)	**mg/m^3***	20	20	…
Blank Concentration as Percentage of ELV	**%**	…	…	1.32

***Reference Conditions (273K, 101.3kPa, Wet Gas)**

VELOCITY TRAVERSE PROFILE

Environmental Compliance Limited	Traverse Data Profoma	Date of Measurement	07/12/2010	

Company	Linx Printing	Stack Diameter (mm)	500	Pitot tube coefficient	1.00
Site	St Ives	Port Length (mm)		Pitot Id	489
Location	Ink Filling	Duct Length (mm) A		Stack Thermocouple ID	468
Stack	Main Stack	Duct width (mm) B		Stack Temp Reader ID	358
Job No	P883	Barometric Pressure. (mb)	1012	Manometer ID	421
Operators	PC	Static Pressure. (mm H_20)	2	Barometer ID	204

	Distance to Point (mm)	Port	Temp. (°C)	(ΔP) (mm H_20)	Swirl Test ^{o} from ref. 0	Port	Temp. (°C)	(ΔP) (mm H_20)	Swirl Test ^{o} from ref. 0
	33	A	6.0	0.8	<15	B	6.0	0.8	<15
	75	A	6.0	1.2	<15	B	6.0	1.2	<15
	125	A	6.0	1.4	<15	B	6.0	1.4	<15
	175	A	6.0	1.6	<15	B	6.0	1.6	<15
	225	A	6.0	2.0	<15	B	6.0	2.0	<15
	275	A	6.0	2.0	<15	B	6.0	2.0	<15
	325	A	6.0	1.6	<15	B	6.0	1.6	<15
	375	A	6.0	1.4	<15	B	6.0	1.4	<15
	425	A	6.0	1.2	<15	B	6.0	1.2	<15
	468	A	6.0	0.8	<15	B	6.0	0.8	<15
Total			60				60		
Max			6	2			6	2	
Min			6	0.8			6	0.8	
Average			6.00	1.40			6.00	1.40	

Average temp (K)=((average temp port A+average temp port B)/2)+273	279.00

Suitability of Sampling Position	Actual Stack Conditons
Permitted highest:lowest flow pressure ratio =9:1	2.5:1
Permitted deviation of flow from axis=15°	<15
X-sectional area for stacks= πr^2	0.20 m^2
X-sectional area for ducts = L x B	m^2
Suitabilty of Position for Sampling	OK

Diagram/ Description of Cross Section of Stack/Duct

Compliance With Positional Requirements?

Height of sample ports from Platform	1.0m
Number of sample ports	2
Width of platform (port back to handrail)	>1 m

Nearest downstream disturbance	All	OK
Nearest upstream disturbance	All	OK
Disturbances are classed as bends, fans or diameter variations		

FIELD SAMPLING & CALIBRATION DATA

Environmental Compliance Limited	PARTICULATE DATA SAMPLING PROFORMA	Date of Measurement	07/12/2010

ECL/TPD/	27	Time taken to change Ports?	1	Start Time	08:20	End Time	10:21
				Test Duration	120 mins		

Client	Linx Printing	Stack Profile	Circular	Console id	U006	Barometer id	204
Site	St Ives	Stack Area (m^2)	0.20	Pump id	U006	Nozzle Id	522
Location	Ink Filling	Barometric Pressure (mb)	1012	Probe id	n/a	Nozzle size	9.04
Stack ID	Main Stack	Static Pres. (mm H^20)	2	DGM Yd	1.003	Filter Id	65940
Test No.	TPM 1	Pitot coefficient	1	ΔH@	42.62	Pitot ID	489
Job No	P883	Probe Heater Setting (°C)	n/a	Impinger Id	n/a	Hot Box ID	n/a
ECL Site Staff	PC	Hot Box Setting (°C)	n/a	Balance Id	n/a		

	Sample	Leak 1	Leak 2	Leak 3	Leak 4	Leak 5	Total
Start Volume	1523315.0						
Final Volume	1525345.0						
Total Volume	2030.0	0.0	0.0	0.0	0.0	0.0	2030.0

Original K Factor Settings	
Meter Temp.	10
Stack Temp	10
%Moisture	0.00

Leak Check	First	Second	Third	Fourth	Fifth
Rate l/min	<0.2	<0.2			
Vaccum "Hg	15	15			
Time of Check	08:19	10:22			

Measured O_2 (Atmospheric)	20.90	K factor	25
Measured Carbon Dioxide %		Reference Oxygen Percentage	
Measured Carbon Monoxide ppm			

Traverse Point	A2	A2	A2	A2	A2	A2	A9	A9	Total
Time/Point (mins)	0 - 5	5 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	
ΔΠ (mm H20)	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
K factor	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	
ΔH (Orifice)	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Meter (Tm in)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Meter (Tm out)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stack Temp (Ts)	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Impinger T Outlet	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Vaccum (" Hg)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00

Traverse Point	A9	A9	A9	A9	B2	B2	B2	B2	Total
Time/Point(mins)	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	
ΔΠ (mm H20)	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
K factor	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	
ΔH (Orifice)	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Meter (Tm in)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Meter (Tm out)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stack Temp (Ts)	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Impinger T Outlet	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Vaccum (" Hg)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00

Traverse Point	B2	B2	B9	B9	B9	B9	B9	B9	Total
Time/Point(mins)	80 - 85	85 - 90	90 - 95	95 - 100	100 - 105	105 - 110	110 - 115	115 - 120	
ΔΠ (mm H20)	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
K factor	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	
ΔH (Orifice)	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Meter (Tm in)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Meter (Tm out)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stack Temp (Ts)	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Impinger T Outlet	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Vaccum (" Hg)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00

Impinger 1	n/a
SOL/	dry stack
Start Weight (g)	0
End Weight (g)	0.1
Total weight (g)	0.1
Impinger 2	wet gas
SOL/	reporting
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Impinger3	Empty
SOL/	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Impinger 4	Silica
SOL/	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Impinger 5	
SOL/	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Impinger 6	
SOL/	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Impinger 7	
SOL/	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Impinger 8	
SOL/	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Total (g)	0.10

Additional Moisture Weighings	
Item Name	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Item Name	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Item Name	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Item Name	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Item Name	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Item Name	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Item Name	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Item Name	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Item Name	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Item Name	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0

	PARTICULATE DATA SAMPLING PROFORMA	Date of Measurement	07/12/2010

ECL/TP	27	Time taken to change Ports?	1	Start Time	11:00	End Time	13:01
				Test Duration	120 mins		

Client	Linx Printing	Stack Profile	Circular	Console id	U006	Barometer id	204
Site	St Ives	Stack Area (m^2)	0.20	Pump id	U006	Nozzle Id	522
Location	Ink Filling	Barometric Pressure (mb)	1012	Probe id	n/a	Nozzle size	9.04
Stack ID	Main Stack	Static Pres. (mm H^20)	2	DGM Yd	1.003	Filter Id	65967
Test No.	TPM 2	Pitot coefficient	1	ΔH@	42.62	Pitot ID	489
Job No	P883	Probe Heater Setting (^oC)	n/a	Impinger Id	n/a	Hot Box ID	n/a
ECL Site Staff	PC	Hot Box Setting (^oC)	n/a	Balance Id	n/a		

	Sample	Leak 1	Leak 2	Leak 3	Leak 4	Leak 5	Total
Start Volume	1525400.0						
Final Volume	1527440.0						
Total Volume	2040.0	0.0	0.0	0.0	0.0	0.0	2040.0

Original K Factor Settings	
Meter Temp.	10
Stack Temp	10
%Moisture	0.00

Leak Check	First	Second	Third	Fourth	Fifth
Rate l/min	<0.2	<0.2			
Vaccum "Hg	15	10			
Time of Check	10:59	13:02			

Measured O_2 (Atmospheric)	20.90	K factor	25
Measured Carbon Dioxide %		Reference Oxygen Percentage	0
Measured Carbon Monoxide ppm			

Traverse Point	A2	A2	A2	A2	A2	A2	A9	A9	Total
Time/Point (mins)	0 - 5	5 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	
ΔΠ (mm H20)	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
K factor	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	
ΔH (Orifice)	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Meter (Tm in)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Meter (Tm out)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stack Temp (Ts)	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Impinger T Outlet	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Vaccum (" Hg)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00

Traverse Point	A9	A9	A9	A9	B2	B2	B2	B2	Total
Time/Point(mins)	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	
ΔΠ (mm H20)	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
K factor	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	
ΔH (Orifice)	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Meter (Tm in)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Meter (Tm out)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stack Temp (Ts)	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Impinger T Outlet	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Vaccum (" Hg)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00

Traverse Point	B2	B2	B9	B9	B9	B9	B9	B9	Total
Time/Point(mins)	80 - 85	85 - 90	90 - 95	95 - 100	100 - 105	105 - 110	110 - 115	115 - 120	
ΔΠ (mm H20)	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
K factor	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	
ΔH (Orifice)	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Meter (Tm in)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Meter (Tm out)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stack Temp (Ts)	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Impinger T Outlet	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Vaccum (" Hg)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00

Impinger 1	n/a
SOL/	dry stack
Start Weight (g)	0
End Weight (g)	0.1
Total weight (g)	0.1
Impinger 2	wet gas
SOL/	reporting
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Impinger3	Empty
SOL/	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Impinger 4	Silica
SOL/	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Impinger 5	
SOL/	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Impinger 6	
SOL/	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Impinger 7	
SOL/	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Impinger 8	
SOL/	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Total (g)	0.10

Additional Moisture Weighings	
Item Name	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Item Name	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Item Name	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Item Name	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Item Name	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Item Name	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Item Name	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Item Name	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Item Name	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Item Name	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0

FID CALIBRATION DATA

Formula ref			TOC ppm		
	Analyser Range		400		
	Repeatability at Zero		4		
A	Span Gas Concentration Applied		50.04		
B	Zero Gas Concentration Applied		0		
	Direct Cal	Zero	6.25	07:10 - 07:15	
		Span	56.38	07:15 - 07:20	
		Zero	6.25	07:22 - 07:27	
	Difference (Zero)		0		
	<2×Repeatability @ Zero?		YES		
C	Pre Test	Zero	6.25	07:28 - 07:33	
D		Span	56.25	07:33 - 07:38	
	Difference (Zero)		0		
Drift	<2×Repeatability @ Zero?		YES		If Red CONTACT QM
Correction	Difference (Span)		0.125		
	<2% Relative		YES		If Red CONTACT QM
F	Post Test	Zero	7.50	15:50 - 15:55	
G		Span	55.00	15:55 - 16:00	
	Difference (Zero)		1.250		
	<2% of Span Value		NO		If Red apply Drift
	Difference (Span)		1.250		
	<2% of Span Value		NO		If Red apply Drift
	Drift <5%?		YES		If Red CONTACT QM

Note* TOC is logged in mA NOT ppm - Zero Offset is likely

LABORATORY ANALYSIS RESULTS

RPS Laboratories

UKAS TESTING 0605

Test Certificate

Date 17/12/2010

Client	Environmental Compliance Ltd Unit G1 Main Avenue Treforest Industrial Estate Pontypridd CF37 5YL	**Order No.**	P7949
		Certificate No.	WK10-6895
		Issue No.	1
Contact	Andy Barnes	**Date Received**	13/12/2010
Description	3 filters & 3 solutions for TPM	**Technique**	Gravimetric

Parameter	Analysis Method	Accreditation	Method LOD	Uncertainty
Total particulate matter	D9	UKAS	0.1 mg	-
Total particulate matter	D9	UKAS	0.5 mg	-

Sample No.	**630254**	**ECL/10/6070**		**Method**
Total particulate matter		0.13 mg		D9(U)
Sample No.	**630255**	**ECL/10/6071**		**Method**
Total particulate matter		<0.5 mg		D9(U)
Sample No.	**630256**	**ECL/10/6072**		**Method**
Total particulate matter		<0.04 mg		D9(U)
Sample No.	**630257**	**ECL/10/6073**		**Method**
Total particulate matter		<0.5 mg		D9(U)
Sample No.	**630258**	**ECL/10/6074**		**Method**
Total particulate matter		0.04 mg		D9(U)
Sample No.	**630259**	**ECL/10/6075**		**Method**
Total particulate matter		<0.5 mg		D9(U)

Page 1 of 2

RPS Laboratories Ltd. Unit 12. Waters Edge Business Park. Modwen Road. Salford. M5 3EZ
Tel: (0161) 872 2443 Fax: (0161) 877 3959

UKAS TESTING
0605

Date 17/12/2010

Test Certificate

Client	Environmental Compliance Ltd	Certificate No.	WK10-6895
		Issue No.	1

Tested By	Carl Hayes	Date	17/12/2010
Approved By		Date	17/12/2010

Joanne Dewhurst
Laboratory Manager

For and on authority of RPS Laboratories Ltd.
RPS Laboratories terms and conditions apply - a copy is available on request.

Method Symbols
(U) Analysis is UKAS Accredited
(N) Analysis is not UKAS Accredited

Concentration values (mg/m3 and ppm) are provided to assist with interpretation only, they are not covered by the scope of UKAS accreditation

Analysis carried out on samples 'as received'

RPS Laboratories Ltd. Unit 12. Waters Edge Business Park. Modwen Road. Salford. M5 3EZ
Tel: (0161) 872 2443 Fax: (0161) 877 3959

UNCERTAINTY CALCULATIONS

Site: St Ives
Location: Main Stack

$$u_{mass} = \sqrt{\sum (u_{filter})^2 + (u_{solution})^2}$$

Determinand	Filter mg	Solution mg	Recovered Mass mg	RPS Method Uncert (%) K=2 Filter mg	RPS Method Uncert (%) K=2 Solution mg	Standard Uncertainty Filter mg	Standard Uncertainty Solution mg	Combined Uncertainty mg
			TPM 1					
Particulates	0.13	0.50	0.63	0.14	0.27	0.0700	0.14	0.15
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...
			TPM 2					
Particulates	0.0400	0.50	0.54	0.14	0.27	0.0700	0.14	0.15
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...

	TPM 1	TPM 2			Standard Uncertainty @ 95%		
Sampled Volume (V_m)	2.03	2.04	m^3	uV_m	0.001	m^3	
Meter Correction Factor (Yd)	1.00	1.00	...		...	...	
Meter Temperature (T_m)	273.00	273.00	k	uT_m	1.5	k	
Average Differential Pressure (ΔH)	30.00	30.00	mmH_2O	$u\Delta H$	0.25	mmH_2O	
Barometric Pressure (ρ_b)	759.06	759.06	mmHg	up_b	3.8	mmHg	
$\Delta H + \rho s$ (ρ_m)	101.49	101.49	kPa		...	...	
Oxygen content ($O_{2,m}$)	20.90	20.90	% by volume	$uO_{2,m} = \sigma/\sqrt{n}$	0.00	0.00	% by volume
Moisture Content (H_2O)	0.00610	0.00607	% by volume	uH_2O	0.0747	0.0744	% by volume

Note: In the following calculations, the sensitivity coefficient (C) is estimated using: $C_i = \frac{\partial f}{\partial x_i}$

For each factor, uncertainty is then calculated by $C_i u_i$ where C is the sensitivity coefficient, u is the standard uncertainty and i is the index identifying th contributing factor e.g. i =uV_m, uT_m etc.

Where results are required at wet conditions, the following correction factor is used to convert the data from the dry gas meter:

TPM 1:

$$f_{s,wet} = \frac{100}{(100 - H_2O)} = \quad 1.00$$

TPM 2:

$$f_{s,wet} = \frac{100}{(100 - H_2O)} = \quad 1.00$$

Uncertainty in correction factor to STP due to measured ΔH uncertainty component ($u\Delta H$), measured stack pressure uncertainty component (up_s) & measured temperature of dry gas uncertainty component ($uT_{m\ Dry}$)

TPM 1:

$$f_s = \frac{273}{760} \times \frac{P_b + \frac{\Delta H}{13.6}}{T_m} \times Y_d = \quad 1.005$$

	Maximum	Minimum	Sensitivity	ufstp
$u\Delta H$	1.00	1.00	0.0000970	0.0000243
up_b	1.01	1.00	0.00132	0.00495
uT_m	1.01	1.00	0.00368	0.00552
H_2O	1.01	1.00	0.0100	0.000751

$$\frac{uf_s}{f_s} = \sqrt{\left(\frac{\sqrt{(u\Delta H)^2 + (uP_s)^2}}{(P_m/101.3)}\right)^2 + \left(\frac{uT_m}{(T_m/273.15)}\right)^2 + \left(\frac{uH_2O}{100/(100 - H_2O)}\right)^2} = \quad 0.00748$$

TPM 2:

$$f_s = \frac{273}{760} \times \frac{P_b + \frac{\Delta H}{13.6}}{T_m} \times Y_d = \quad 1.005$$

	Maximum	Minimum	Sensitivity	ufstp
$u\Delta H$	1.00	1.00	0.0000970	0.0000243
up_b	1.01	1.00	0.00132	0.00495
uT_m	1.01	1.00	0.00368	0.00552
H_2O	1.01	1.00	0.0100	0.000747

$$\frac{uf_s}{f_s} = \sqrt{\left(\frac{\sqrt{(u\Delta H)^2 + (uP_s)^2}}{(P_m/101.3)}\right)^2 + \left(\frac{uT_m}{(T_m/273.15)}\right)^2 + \left(\frac{uH_2O}{100/(100 - H_2O)}\right)^2} = \quad 0.00748$$

Uncertainty in volume @ STP due to volume correction factor uncertainty component (uV_{std}) & volume uncertainty component (uV_m)

TPM 1:

$$V_{std} = V_{measured} \times f_s = \quad 2.040$$

	Maximum m^3	Minimum m^3	Sensitivity	Standard Uncertainty (m^3)
Effect of uV_{std}	2.05	2.02	2.03	0.0152
Effect of uV_m	2.04	2.04	1.00	0.00100

Combined Standard Uncertainty

$$\frac{uV_{std}}{V_{std}} = \sqrt{\left(\frac{uV_{std}}{f_s}\right)^2 + \left(\frac{uV_m}{V_m}\right)^2} = \quad 0.0309$$

TPM 2:

$$V_{std} = V_{measured} \times f_s = \quad 2.050$$

	Maximum m^3	Minimum m^3	Sensitivity	Standard Uncertainty (m^3)
Effect of uV_{std}	2.06	2.03	2.04	0.0153
Effect of uV_m	2.05	2.05	1.00	0.00100

Combined Standard Uncertainty

$$\frac{uV_{std}}{V_{std}} = \sqrt{\left(\frac{uV_{std}}{f_s}\right)^2 + \left(\frac{uV_m}{V_m}\right)^2} = \quad 0.0312$$

Uncertainty of correction factor to reference oxygen due to measured oxygen uncertainty component (uf_{O2})

TPM 1:

$$f_{o_2} = \frac{20.9\% - O_{2,\,ref}}{20.9\% - O_{2,\,measured}} = \quad 1.00$$

	Maximum	Minimum	Sensitivity	Standard Uncertainty
uf_{o_2}	...	...	...	...

TPM 2:

$$f_{o_2} = \frac{20.9\% - O_{2,\,ref}}{20.9\% - O_{2,\,measured}} = \quad 1.00$$

	Maximum	Minimum	Sensitivity	Standard Uncertainty
uf_{o_2}	...	...	...	...

Uncertainty in final measurement @ reference conditions due to mass uncertainty component (uM)

Determinand	TPM 1:				TPM 2:			
	Maximum mg/Nm^3	Minimum mg/Nm^3	Sensitivity	uM mg/Nm^3	Maximum mg/Nm^3	Minimum mg/Nm^3	Sensitivity	uM mg/Nm^3
Particulates	0.38	0.23	0.49	0.0746	0.34	0.19	0.49	0.0742
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...

Uncertainty in final measurement @ reference conditions due to uncertainty component arising from leak and/or loss (assumed 2% max) in the sample system (uL)

Determinand	TPM 1:	TPM 2:
	uL mg/Nm^3	uL mg/Nm^3
Particulates	0.00357	0.00304
...	...	...
...	...	...
...	...	...

Uncertainty in final measurement @ reference conditions due to oxygen correction uncertainty component (uf_{Oxy})

Determinand	TPM 1:				TPM 2:			
	Maximum mg/Nm^3	Minimum mg/Nm^3	Sensitivity	uf_{Oxy} mg/Nm^3	Maximum mg/Nm^3	Minimum mg/Nm^3	Sensitivity	uf_{Oxy} mg/Nm^3
Particulates	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...

No uncertainty component due to oxygen correction.

Uncertainty in final measurement @ Reference Conditions due to uVstp

Determinand	TPM 1:				TPM 2:			
	Maximum mg/Nm^3	Minimum mg/Nm^3	Sensitivity	uVstp mg/Nm^3	Maximum mg/Nm^3	Minimum mg/Nm^3	Sensitivity	uVstp mg/Nm^3
Particulates	0.31	0.30	0.15	0.00467	0.27	0.26	0.13	0.00401
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...

Combined Uncertainty

$$u_{combined} = \sqrt{\sum (u_M)^2 + (u_L)^2 + (uf_{Oxy})^2 + (uV_{stp})^2}$$

Determinand	TPM 1:				TPM 2:			
	Combined Uncertainty mg/Nm^3	Expanded Uncertainty mg/Nm^3	Measured Concentration mg/Nm^3	Percent of Measured Concentration	Combined Uncertainty mg/Nm^3	Expanded Uncertainty mg/Nm^3	Measured Concentration mg/Nm^3	Percent of Measured Concentration
Particulates	0.0748	0.15	0.31	48.43	0.0744	0.15	0.26	56.45
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...