




Caring for the environment and creating safer workplaces

Report for the Periodic Monitoring of Emissions to Atmosphere

Wyndeham Heron

Operator:	Wyndeham Heron
Permit Number:	Unknown
Installation:	Printworks
Monitoring Dates:	16-18 August 2010
Site Address:	The Bentall Complex Colchester Road Maldon Essex

Report Number:	J 4506
Version:	1
Date of Report:	10 November 2010
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MCERTS Level:	Level 1 (TE1)

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Part 1: Executive Summary

1.1 Monitoring Objectives

Wyndeham Heron operate several printing process lines that have the potential to release controlled substances to atmosphere, and are subject to authorisation under the Environmental Permitting Regulations (EPR, 2007). Under the act, Local Authorities regulate the printing processes with guidance from the Sector Guidance Note SG6: Surface Treatment using Solvents.

In order for Wyndeham Heron to comply with its annual emission limits they have requested that Envirocare Technical Consultancy undertake a monitoring exercise on the Lithoman 2 press. The methodologies and results obtained form the basis of this report.

Emission Point Identification

Substances to Be Monitored	Lithoman 2
Carbon Monoxide	✓
Oxides of Nitrogen	✓
Sulphur Dioxide	✓
Total VOC's	✓

1.2 Monitoring Results

Emission Point Reference	Substance to be Monitored	Emission Limit Value	Periodic Monitoring Result	Uncertainty	Units	Reference Conditions	Date of Sampling	Start and End Times	Monitoring Method Reference	Accreditation for use of Method	Operating Status
Lithoman 2	Carbon Monoxide	100	79.1	6.3	mg/Nm ³	273K, 101.3kPa	05/11/10	11:23-12:12	BS EN 15058	MCERTS	Normal
	Oxides of Nitrogen (as NO ₂)	100	71.9	4.6	mg/Nm ³	273K, 101.3kPa	05/11/10	11:23-12:12	BS EN 14792	MCERTS	Normal
	Sulphur Dioxide	N/A	2.4	11.5	mg/Nm ³	273K, 101.3kPa	05/11/10	11:23-12:12	EA TGN M21	MCERTS	Normal
	Volatile Organic Compounds	20	0.8	0.8	mg/Nm ³	273K, 101.3kPa	05/11/10	11:23-12:12	BS EN 12619	MCERTS	Normal

1.3 Operating Information

Emission Point Reference	Date	Process Type	Process Duration	Fuel	Feedstock	Abatement	Load	Comparison of Operator CEMS and Periodic Monitoring Results			
								Substance	CEMS Results	Periodic Monitoring Results	Units
Lithoman 2	05/11/10	Drying Unit	Continuous except for paper and press changes	Natural Gas	Ink	MEGTEC Dual Dry DDTNV	Unknown	N/A	N/A	N/A	N/A

1.4 Monitoring Deviations

Emission Point Reference	Substance Deviations	Monitoring Deviations	Other Relevant Issues
Lithoman 2	None	None	Flow traverse only carried out through 1 port due to access issues.

Part 2: Supporting Information

2.1 Appendix 1: General Information

2.1.1 Monitoring organisation staff details

Mr C G Mann	MCERTS Level 2 (TE1, TE2, TE3, TE4)	MM 06 695
Mr M Ropka	MCERTS Level 2 (TE1, TE2, TE4)	MM 06 761

2.1.2 Monitoring organisation method details

2.1.2.1 Standard Reference Conditions

All pollutant concentrations measured have been expressed at standard reference conditions of 273K and 101.3 kPa. The temperatures and local barometric pressure levels are measured to correct the data, where necessary, to the reference conditions, and were measured as follows:

2.1.2.2 Temperature

A 1.5mm diameter Type K thermocouple coupled to a digital display (Tenma) was used to measure the ambient temperature on the day of monitoring.

2.1.2.3 Local Atmospheric Pressure

An aneroid barometer was used to measure this parameter at several times during the days of monitoring.

2.1.2.4 Combustion Gases

Combustion gases were monitored using a Horiba Combustion Gas Analyser (Model PG250) which monitors the gaseous emissions by appropriate systems for the gases in question. Oxygen is assessed by a Zirconium cell; Carbon Monoxide, CO by NDIR (pneumatic), Oxides of Nitrogen, NO_x, by chemiluminescence and Sulphur Dioxide, SO₂, by NDIR. It has an internal pump to draw a sample of the gas through the analyser at a rate of approximately 0.6litres per minute.

When the instrument had warmed up (60 mins), each pollutant was zeroed by passing 100% N₂ directly to the analyser. The analyser was then calibrated for each target pollutant with an appropriate calibration gas. Nitrogen was then passed directly to analyser again to ensure no zero drift. Nitrogen was then passed through the whole sampling system to ensure there were no leaks in the system (an Oxygen reading of greater than 0.1% would indicate the presence of a leak). Each calibration gas was then passed down the entire system to ensure there is no loss or absorption of the target pollutants. The measured value must be within $\pm 2\%$ of the calibration gas value. At the end of the test nitrogen was passed down the entire system to check the zero values and then each calibration gas was passed down to the system to check for drift. If the post-test calibration value is within 2% of the calibration gas value no action is required. If the obtained value is between 2-5% of the calibration gas value the drift must be compensated for. If the drift is greater than 5% the test is invalid.

The analyser was connected to a portable laptop computer running custom EDA 2000 data logging software, which enables the future processing of results. Readings were logged at 15-second intervals during calibration and 30-second intervals during monitoring periods.

The conversion of the logged data in ppm to mg/m³ and correction to standard conditions (273K & 101.3 kPa) was subsequently carried out for each Table. The average, maximum, and minimum values over the whole monitoring period are displayed for each parameter.

The sample gases were drawn through a titanium probe, inserted into the stack and connected to a heated line (150°C) containing a heated PTFE filter. The heated line was, in turn, connected to a Testoterm Gas Preparation Unit, GPU (Model 339)/Signal 2020SM cooler which contained a Peltier Cooler to condition the gas by removing moisture from the sampled gas down to approximately 1%, to enable a dried gas stream to be presented to the analyser. A Tygon tube connected the output from the

GPU to the input connection of the Horiba analyser.

2.1.2.5 Total VOCs to BS EN 12619

All emissions were monitored for total VOC utilising a portable organic vapour analyser fitted with a flame ionisation detector (Signal 3030PM). Gases were fed into the analyser along a 15 metre heated line.

When the instrument had warmed up and stabilised, it was zeroed electronically by drawing sampled air over a catalyst to remove organic species, and (if required) adjusting the analyser to read 0.0 ppm. The “CAL” button on the analyser was then pressed to set the analyser to this value.

A certified span gas, traceable to National Standards, was then fed directly to the analyser through the SPAN port. If required the value displayed on the unit was adjusted to read the certified value. The “CAL” button was then pressed to set this value. The calibration gas was then sampled down the entire sampling system to ensure no leaks, absorption or loss of pollutant. It is required that the value obtained whilst sampling down the entire system is within $\pm 2\%$ of the value obtained when sampling directly to the analyser.

At the end of the sampling period calibration gas was sampled down the entire system again to ensure the analyser hadn't drifted.

The gaseous emissions were sampled directly from the stack, using the sampling hole in each duct, through a stainless steel probe and along the PTFE lined heated sample line to the instrument. An integral-heated PTFE filter in the input to the instrument removes any fine particulate matter material present in the sample gas.

Data was collected by custom-designed Sigems data logging software (V1.8 or V1.0) at approximately 30-second intervals directly onto a laptop computer.

In all cases, the VOC level was measured as parts per million (ppm) of propane. The data obtained were then converted to express the concentration as mg/Nm^3 , with respect to propane, and as carbon content.

2.1.3 Monitoring organisation equipment check list references

Equipment ID	Model Number	Purpose
Horiba 2	Horiba PG250	Multi component gas analyser
Sig 3	Signal 3030pm	Flame Ionisation Detector
GPU1	Testo 339	Heated line controller and peltier cooler

2.2 Appendix 2: Lithoman 2 Results and Discussions

2.2.1 Photograph of the sampling location and positions



2.2.2 Flow criteria measurements

Stack reference: **Lithoman 2** Date: **05/11/2010**
 Duct dimensions: **75.0 cm**
 Local barometric pressure: **1023 mbar**
 Ambient Temperature: **24 °C** Pitot Coefficient = 0.997
 Micromanometer Calibration (K; mbar) = 295 1013

Sample port (A)	Traverse point	Traverse position (D)	Distance (cm)	Velocity (m/s)		Temp (°C)
				Uncorr.	Corrd.	
Single	A1	0.05	3.8	7.1	10.1	330
	A2	0.15	11.3	7.4	10.5	330
	A3	0.25	18.8	7.6	10.8	330
	A4	0.35	26.3	8.2	11.6	330
	A5	0.45	33.8	8.0	11.3	330
	A6	0.55	41.3	8.1	11.5	330
	A7	0.65	48.8	7.6	10.8	330
	A8	0.75	56.3	7.4	10.5	330
	A9	0.85	63.8	7.3	10.4	330
	A10	0.95	71.3	5.9	8.4	330

Velocity readings (m/s)

Duct Mean m/s **10.6**
 Highest(a) 11.6 Lowest (b) 8.4

Temperature readings

Duct Mean °C **330**
 Duct Mean K 603
 Highest(a) 330.0 Lowest (b) 330.0

Volumetric flow rate

Duct dimensions 75.0 (cm)
 Duct area 0.442 (m²)
 Mean duct velocity 10.6 (m/s)
 Mean duct temperature 330 (°C)
 Ambient pressure 1023 (mbar)
 Vol. Flow rate at stack conditions **16829 (m³/hr)**
 Vol flow rate corrd. **7694.4 (Nm³/hr)**

2.2.3 Water vapour measurements

Not applicable.

2.2.4 Manual monitoring method - results – calculations

Not applicable.

2.2.5 Analysis results

Not applicable.

2.2.6 Instrumental gas analyser site calibration measurements

ANALYSER CALIBRATIONS

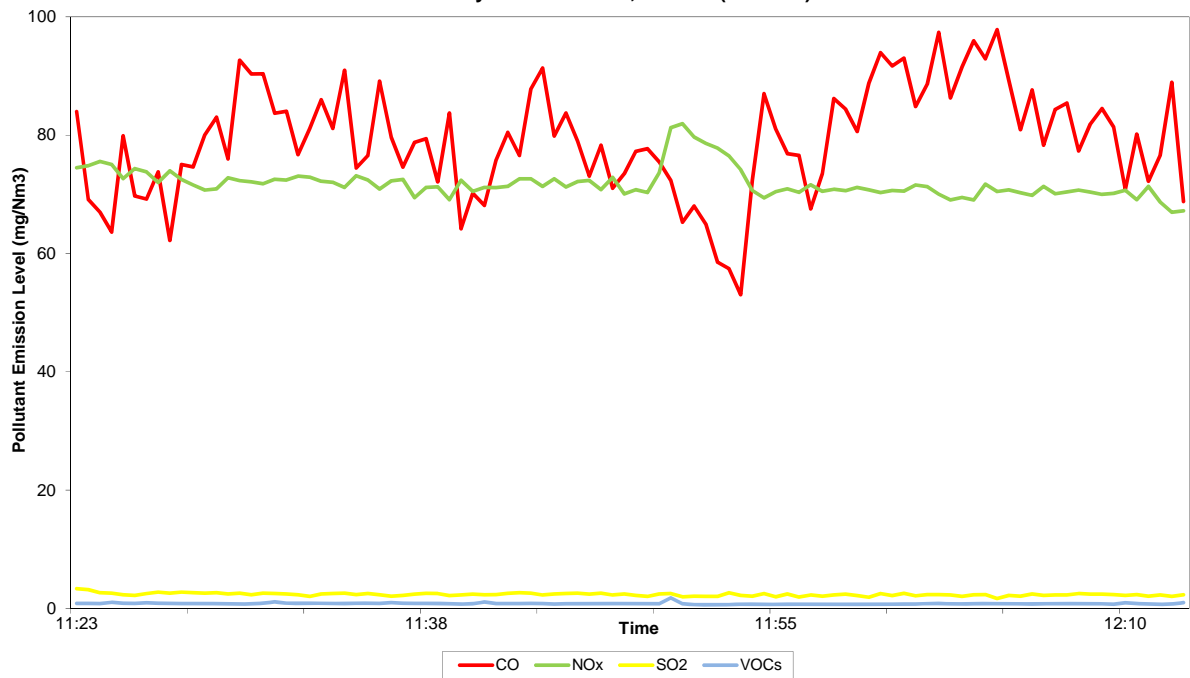
Combustion Gas and VOC Emissions from Lithoman 2 (05/11/10)

Data entered by: DF
 Horiba Analyser: 2
 Signal Analyser: 3

Type of Gas	CO		NO		SO2		VOCs	
Certified Calibration Values	80.0	ppm +/-2%	49.6	ppm +/-2%	200.3	ppm +/-2%	7.96	ppm +/-2%
Period								
Span PreCal direct to analyser	79.4	ppm	49.6	ppm	200.7	ppm	7.91	ppm
Zero PreCal through sample line	0.4	ppm	0.1	ppm	0.5	ppm	0.00	ppm
Span PreCal through sample line	78.8	ppm	48.5	ppm	198.1	ppm	8.03	ppm
Zero PostCal through sample line	0.8	ppm	0.1	ppm	-0.4	ppm	0.27	ppm
Span PostCal through sample line	78.6	ppm	48.9	ppm	196.5	ppm	8.27	ppm
Span Drift	0.3	%	-0.8	%	0.8	%		
Zero Drift	-0.6	%	-0.1	%	0.4	%		
Is data valid without adjustment	YES		YES		YES			
Does data require adjustment	NO		NO		NO			
Is data invalid	NO		NO		NO			

2.2.7 Instrumental gas analyser results

**Combustion Gas and VOC Emissions from Lithoman 2
 Wyndeham Heron, Maldon (05/11/10)**



Gaseous Analysis using Horiba PG 250 & Signal 3030PM Analysers

Wyndeham Heron, Maldon

Combustion Gas and VOC Emissions from Lithoman 2 (05/11/10)

	Carbon Monoxide CO (ppm)	Oxides of Nitrogen NOx (ppm)	Sulphur Dioxide SO2 (ppm)	VOCs (ppm)	Conversion from ppm to mg/Nm³			
					CO (mg/Nm³)	NOx (as NO ₂) (mg/Nm³)	SO2 (mg/Nm³)	VOCs (mg/Nm³)
Average	63.3	35.0	0.8	0.5	79.1	71.9	2.4	0.8
Maximum	78.2	39.9	1.2	1.1	97.8	81.9	3.4	1.8
Minimum	42.4	32.6	0.6	0.4	53.0	67.0	1.7	0.7

2.2.8 Uncertainty calculations

UNCERTAINTY OF CARBON MONOXIDE BY HORIBA 2

Reading =

63.3

 ppm
 Span Gas Certified Value =

80

 ppm +/-2%

Parameter	Uncertainty criteria	U	U ²
Repeatability	1% of value	0.6330	0.4007
Zero Drift/Lower limit of detection	0.5 ppm	0.5000	0.2500
Span Drift	2% of value	1.2660	1.6028
Linearity	0.48% of value	0.3038	0.0923
Setting Gas Divider	0.25% of value	0.1583	0.0250
Interference	2.9% of value	1.8357	3.3698
Span Gas	1% of span gas	0.8000	0.6400

Sum U ²	6.38
Total U	2.53 ppm
95% confidence	5.05 ppm
or	6.32 mg/Nm³

UNCERTAINTY OF OXIDES OF NITROGEN BY HORIBA 2

Reading =

35

 ppm
 Span Gas Certified Value =

49.6

 ppm

Parameter	Uncertainty criteria	U	U ²
Repeatability	1% of value	0.3500	0.1225
Zero Drift/Lower limit of detection	0.3ppm	0.3000	0.0900
Span Drift	1.9% of value	0.6650	0.4422
Linearity	1.14% of value	0.3990	0.1592
Setting Gas Divider	0.25% of value	0.0875	0.0077
Interference	1.2% of value	0.4200	0.1764
Span Gas	1% of span gas	0.4960	0.2460

Sum U ²	1.24
Total U	1.12 ppm
95% confidence	2.23 ppm
or	4.58 mg/Nm³

UNCERTAINTY OF SULPHUR DIOXIDE BY HORIBA 2

Reading =

0.8

 ppm
 Span Gas Certified Value =

200.3

 ppm

Parameter	Uncertainty criteria	U	U ²
Repeatability	1% of value	0.0080	0.0001
Zero Drift/Lower limit of detection	0.1ppm	0.1000	0.0100
Span Drift	1.9% of value	0.0152	0.0002
Linearity	1.82% of value	0.0146	0.0002
Setting Gas Divider	0.25% of value	0.0020	0.0000
Interference	1.2% of value	0.0096	0.0001
Span Gas	1% of span gas	2.0030	4.0120

Sum U ²	4.02
Total U	2.01 ppm
95% confidence	4.01 ppm
or	11.45 mg/Nm³

UNCERTAINTY OF VOC BY SIGNAL3

Reading =

0.5

 ppm as C₃H₈
 Span Gas=

7.96

 ppm+/-2%

Parameter	Uncertainty criteria	U	U ²
Repeatability	1% of value	0.0050	0.0000
Zero Drift/ Detection threshold	0.2ppm	0.2000	0.0400
Noise	0.1 ppm	0.1000	0.0100
Linearity	0.6% of value	0.0030	0.0000
Setting Gas Divider	0.25% of value	0.0013	0.0000
Temperature Drift	1% of value	0.0050	0.0000
Span Gas	1% of Value	0.0796	0.0063

Sum U ²	0.056
Total U	0.237 ppm
95% confidence	0.475 ppm as C ₃ H ₈

or

0.76

 mg/Nm³ as carbon