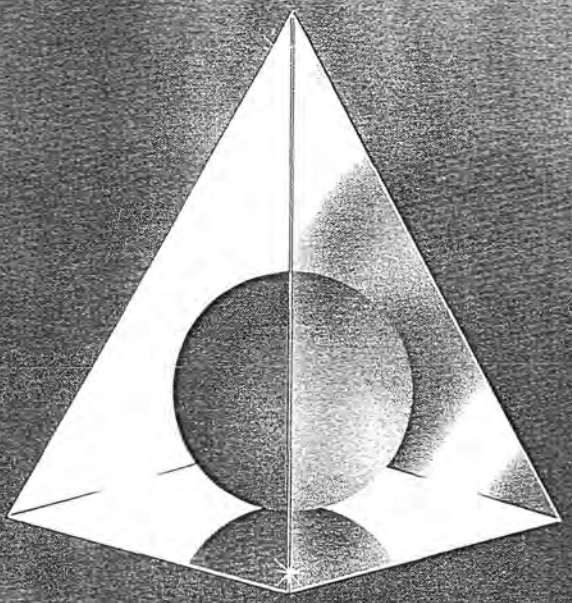


OEH
GROUP LTD

Understanding your environment

MEASUREMENT OF ENVIRONMENTAL EMISSIONS

FROM

INK MANUFACTURE OPERATIONS

at

LINX PRINTING TECHNOLOGIES PLC
BURREL ROAD
ST. IVES
CAMBRIDGESHIRE
PE27 3LA

REPORT NO:	OEH/STAK/31533/SL27	**CLIENT REF:**	Purchase Order No: 061404
DATE OF VISIT:	22 October 2003	**CONTACT ON SITE:**	Mr M Swindell
DATE OF REPORT:	05 November 2003	**DISK REFERENCE:**	N:\GenAdmin$\JG\AQ\Reports\ OEH31533.doc 05/11/2003 12:56

DATA PROTECTION ACT REGISTRATION NO: B0479 03 4

CONFIDENTIALITY UNDERTAKING

We undertake that we will not knowingly make use or disclose any confidential information or photographs relating to your business which may have come to our knowledge or attention as a result of our visit on site or otherwise as a result of the work carried out by us in connection with the preparation of this report. If you have any queries or comments regarding this report, please contact the Customer Services, OEH Group Limited Tel: 0121 359 5361.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Test Areas	Monitoring of the stack serving the Ink manufacture plant.
Date Of Test	22nd October 2003.
Test Conditions	Testing was performed while the plant was operating under normal conditions, over a period of 7 hours.
Compliance	Full compliance with the specified release limits was achieved on this occasion. Emissions of both particulate matter and Volatile Organic Compounds were below the authorised limits.

Surveyed and Reported By:

Jonathan Litterick *BSc (Hons)*
Environmental Scientist

Verified by:

Andy Barnes *BSc (Hons)*
Environmental Scientist

for and on behalf of OEH Group Limited

If you have any queries or comments regarding this report, please contact Customer Services, OEH Group Ltd. Tel: 0121 359 5361.

1 INTRODUCTION

1.1 Purpose of Survey

The aim of the survey described in this report was to verify compliance with the requirements of the process authorisation. The process monitored is covered by PG6/11(97) - Secretary of States Guidance – Manufacture of Printing Ink.

1.2 Terms of Reference

Linx Printing Technologies Limited, Burrel Road, St Ives, Cambridgeshire, PE27 3LA has commissioned OEH Group Limited to carry out the work described in this report. Monitoring was carried out on the 22nd October 2003 by Jonathan Litterick at the request of Mr Martin Swindell.

The work was carried out in accordance with OEH Proposal ref: AL-10285 dated 10th September 2003, and with the client's written instructions as set out in Purchase Order Number 061404.

OEH Group is accredited under ISO-9002 for the provision of health, safety and environmental consultancy services. The work described in this report was carried out in accord with our ISO-9000 Standard Operating Procedures and Level III: Consultancy Work Instructions. The field sampling and interpretations made in this report are not covered by the scope of OEH's accreditation under UKAS.

1.3 Plant conditions

Production schedules on the date of the survey were described as normal. Thus, the data reported herein must be considered typical and representative of the environmental levels experienced during normal daily workloads on this site.

2 METHODS

2.1 Stack Sampling

2.1.1 Stack Velocity & Temperature Measurements

Stack velocity was investigated using an ellipsoidal nosed pitot tube coupled to an electronic manometer. Temperature measurements were taken using a K-type thermocouple connected to an electronic thermometer.

The manometer and thermometer are subject to regular calibration by a UKAS accredited test house using NPL traceable standards.

2.1.2 Particulates

Periodic extractive sampling for particulates was conducted using a Stackmite 9096 sampling train. Triplicate samples were taken. Within the limitations of the stack and field conditions; the sampling protocol was in accordance with the main procedural requirements of BS3405:1983. The sampling train was set up and checked for leaks before commencement of the survey and between each sample. The Stackmite unit is calibrated annually and is traceable to NPL standards. Calibration dated 31st March 2003.

2.1.3 Volatile Organic Compounds (VOC)

Continuous extractive sampling for VOCs was conducted using a Research Engineers Flame Ionisation Detector (FID). The unit was calibrated onsite prior to the start of monitoring and between each test period, using standard span gas methane at 100 & 1000 ppm, traceable to an NPL standard. The calibration gases are re-certified every two years in accordance with the manufacturer's requirements. The Flame Ionisation Detectors are returned to the manufacturers annually for calibration and testing.

Continuous extractive sampling was backed up by periodic extractive sampling for VOCs using calibrated sampling pumps connected to charcoal adsorption tubes. The method is based on, and intends to satisfy the main procedural requirements of MDHS-72, and provides a correction factor for the instrumental results. The tubes are used to speciate the total VOC, so that the individual contributions from various compounds can be quantified.

2.2 Analysis

2.2.1 Techniques & Detection Limits

Analyte	Analysis Technique	Detection Limit	Analytical Precision, %	Method Reference
TPM	Gravimetric	20 µg	1	LSOP 202
Continuous VOC	Flame Ionisation Detector	0.2 $mg.m^{-3}$ as carbon	5	EPA 25
Periodic VOC	Gas Chromatography	2 µg as carbon	5	Variation on LSOP 402

2.2.2 Accreditation

Service Category	ISO-9002	UKAS[1]
Consultancy – Field sampling and interpretation	Yes	No
Analysis		
- Dusts (air filter samples); Lab Method LSOP 202, based on MDHS14 (latest issue)	Yes	Yes
- Solvents (B, T, X 111-T, TCE, PERC); Lab Method LSOP402, based on Various NIOSH	Yes	Yes
- Solvents (all other species); Based on Various NIOSH	Yes	No
[1]UKAS lab number 1821		
Stack sampling team is a member of the Source Testing Association		

3 PRESENTATION OF RESULTS

The following table gives summary details of the mean emission concentrations measured.

Sampling Position	Mean Particulate Emission ($mg.m^{-3}$)	Mean VOC Emission ($mgC.m^{-3}$)
Ink Manufacture	0.4	16.7

Results reported at Standard Conditions of 273K and 101.3kPa, no correction for water vapour content.

Detailed results are included in the Appendices of this report as follows:

Appendix I lists in tabular form further details of the particulate and volumetric flow data for each position, including additional data from the pitot traverses.

VOC Profiling Data is presented in graphical form in Appendix II.

4 DISCUSSION

The process monitored is covered by PG6/11(97) - Secretary of States Guidance – Manufacture of Printing Ink. This document states the following applicable limits:

Parameter	Emissions Limit
Volatile Organic Compounds (expressed as total carbon excluding particulate matter):	
i) for emissions from fixed and Change Pan processes where the mass emission of volatile organic compounds from an individual source exceeds 1kg in any 8 hour period	150 $mg.m^{-3}$
ii) for emissions from pan washing processes	50 $mg.m^{-3}$
iii) for emissions from the manufacture of exempted inks.	no limit
Particulate Matter	20 $mg.m^{-3}$

4.1 TPM

Particulate monitoring was undertaken at times when powder was been added to the mixing vessel, which would give the maximum particulate discharge from the process.

The levels of particulate matter monitored averaged 0.4$mg.m^{-3}$, with a maximum figure of 0.6 $mg.m^{-3}$. These figures are well below the 20 $mg.m^{-3}$ emissions limit and are broadly similar to the levels encountered on the previous visit.

4.2 VOC

VOC emissions monitoring was carried out continuously for 7 hours.

The average VOC level was measured at 16.7 $mg.m^{-3}$ this is well below the 150 $mg.m^{-3}$ emissions limit and are significantly lower than to the average level encountered on the previous visit.

There was only one peak which exceeded the limit and this lasted for less than 3 minutes at around 11:30 a.m.

5 CONCLUSIONS

Both VOC and particulate emissions were well below the current authorised limits.

6 APPENDICES

Appendix I: Detailed Particulate Results Tables

Appendix II: VOC Profiling Data

APPENDIX I

DETAILED PARTICULATE RESULTS TABLES

Plant Type	**Ink Manufacture**	Stack Area (m²)	0.196
Job Number	**OEH 31533**	Ambient Temp (°C)	4
Client Name	**Linx Printing**	Stack Diameter (cm)	50
Date	**22/10/2003**	Pitot Factor	1.00
		Pitot Factor (sqrt)	1.00
		Stack Pressure (Pa)	25
		Ambient Pressure (kPa)	101.3
		Nozzle Size (mm)	4.00

PITOT SURVEY

Traverse Point	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
Distance From Near Wall (D)	0.065	0.150	0.250	0.350	0.450	0.550	0.650	0.750	0.850	0.935
Pitot Reading (Pa)	*130*	*133*	*147*	*150*	*160*	*166*	*161*	*141*	*121*	*120*
Temperature (°C)	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*
Duct Velocity (m/s)	14.6	14.7	15.5	15.7	16.2	16.5	16.2	15.2	14.1	14.0
Traverse Point	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
Distance From Near Wall (D)	0.065	0.150	0.250	0.350	0.450	0.550	0.650	0.750	0.850	0.935
Pitot Reading (Pa)	*145*	*151*	*148*	*159*	*168*	*171*	*164*	*151*	*140*	*100*
Temperature (°C)	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*
Duct Velocity (m/s)	15.4	15.7	15.5	16.1	16.6	16.7	16.4	15.7	15.1	12.8

Absolute Mean Duct Velocity (m/s) **15.4**
Absolute Flow Rate (m³/hr) **10908**
Normalised Flow Rate (Nm³/hr) **10343**

Sampling Run 1 **Time: 9:52 - 10:53**

Sampling Point	A2	A9	B2	B9	Initial Meter Reading (l)	681050
Sampling Rate (l/min)	*11.3*	*10.8*	*12.1*	*11.6*	Final Meter Reading (l)	681725
Sampling Duration (mins)	*15*	*15*	*15*	*15*	Volume Sampled (l)	675
Filter N°	*7895*	*7895*	*7895*	*7895*	Isokineticity Error (%)	-1.6
Volume Sampled (m³)	Meter	0.675	Expected	0.686	*(Maximum Allowed Error = 10%)*	

Corrected Volume = 0.67 Nm³ (at NTP)

Sampling Run 2 **Time: 11:11 - 12:13**

Sampling Point	A2	A9	B2	B9	Initial Meter Reading (l)	681739
Sampling Rate (l/min)	*11.3*	*10.8*	*12.1*	*11.6*	Final Meter Reading (l)	682430
Sampling Duration (mins)	*15*	*15*	*15*	*15*	Volume Sampled (l)	691
Filter N°	*7892*	*7892*	*7892*	*7892*	Isokineticity Error (%)	0.7
Volume Sampled (m³)	Meter	0.691	Expected	0.686	*(Maximum Allowed Error = 10%)*	

Corrected Volume = 0.68 Nm³ (at NTP)

Sampling Run 3 **Time: 13:34 - 14:34**

Sampling Point	A2	A9	B2	B9	Initial Meter Reading (l)	682453
Sampling Rate (l/min)	*11.3*	*10.8*	*12.1*	*11.6*	Final Meter Reading (l)	683149
Sampling Duration (mins)	*15*	*15*	*15*	*15*	Volume Sampled (l)	696
Filter N°	*7919*	*7919*	*7919*	*7919*	Isokineticity Error (%)	1.5
Volume Sampled (m³)	Meter	0.696	Expected	0.686	*(Maximum Allowed Error = 10%)*	

Corrected Volume = 0.69 Nm³ (at NTP)

FILTER WEIGHTS

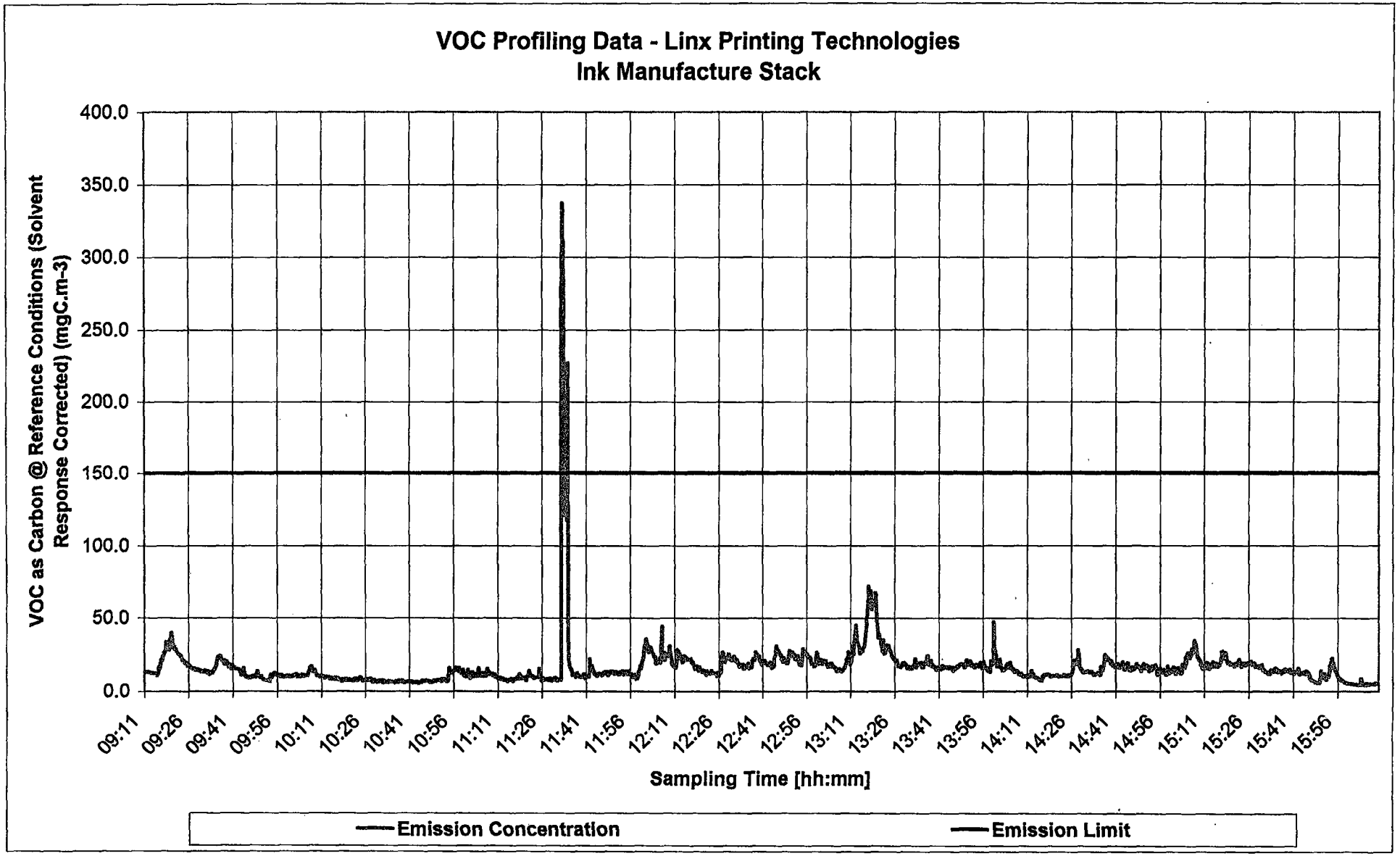
Test Number	Filter N°	Pre-Weight (mg)	Post-Weight (mg)	Acetone Rinse (m	Gain (mg)
1	7895	55.29	55.71	0.00	0.42
2	7892	55.83	56.10	0.00	0.27
3	7919	56.50	56.57	0.00	0.07

TEST RESULTS

	Test 1	Test 2	Test 3	Mean
Particulate Concentration(mg/Nm³)	**0.6**	**0.4**	**0.1**	**0.4**
Mass Emission (g/hr)	**6.5**	**4.1**	**1.1**	**3.9**

APPENDIX II

VOC PROFILING DATA


VOC Profiling Data - Linx Printing Technologies
Ink Manufacture Stack
VOC as Carbon @ Reference Conditions (Solvent Response Corrected) (mgC.m-3)
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
09:11
09:26
09:41
09:56
10:11
10:26
10:41
10:56
11:11
11:26
11:41
11:56
12:11
12:26
12:41
12:56
13:11
13:26
13:41
13:56
14:11
14:26
14:41
14:56
15:11
15:26
15:41
15:56
Sampling Time [hh:mm]
Emission Concentration
Emission Limit