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**REPORT OF PERIODIC MONITORING OF EMISSIONS TO AIR TO COMPLY  
WITH  
HUNTINGDON DISTRICT COUNCIL PERMIT B04/94**

at

LINX PRINTING TECHNOLOGIES  
FLUIDS PLANT  
UNIT 4 EDISON ROAD  
ST IVES  
CAMBRIDGESHIRE  
PE27 3LF

**Report Written by:** Darren Bolton LFOH

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## EXECUTIVE SUMMARY

Emissions to atmosphere were assessed on 25 February 2019 at Linx Printing Technologies and in accordance with Huntingdon district council permit B04/94, to assess the levels of total Volatile Organic Compounds (VOC's) and total particulate being emitted from the Fluids Plant emission stack, Unit 4 Edison Road.

The monitoring was not completed to MCERTS/UKAS accreditation.

The results and information obtained during the visit indicated that all results were found to be below the permitted authorised limits.

### SURVEYED BY :



Darren Bolton LFOH  
Occupational Hygienist

### VERIFIED BY:



Matt Wadie  
General Manager

*Industrial Safety Solutions undertake site and process confidentiality relating to your business at all times. If you have any queries regarding this report contact Industrial Safety Solutions – Unit 26, Parkhall Business Village, Parkhall Road, Stoke on Trent, ST3 5XA.*

## **1. INTRODUCTION**

Stack emissions monitoring was completed at Linx Printing Technologies on 25 February 2019 by Mr Darren Bolton. The monitoring was carried out to assess emissions of total Volatile Organic Compounds (TVOC's) and total particulate matter being emitted into the atmosphere from the emissions stack at the Fluids Plant, Unit 4 Edison Road.

As agreed by the client this work falls outside the scope of UKAS & MCERTS.

## **2. DESCRIPTION OF PROCESS AND OBSERVATIONS**

The Fluids Plant at Edison Road provides the inks and flushing agents for the main manufacturing site at Linx House. IBC's containing solvent products are delivered to the Fluids Plant unit (MEK, acetone and TSDA). These bulk storage containers are positioned outside the Wet Room in a bunded area. The solutions are then piped through to the Wet Room.

The solutions are blended in mixing vessels that are closed for most of the time except when adding any dry components. The most common ink solution contains MEK at around 70 - 80%, with the remainder being a mix of acetone and TSDA which is a denatured ethanol.

On the Main Line empty bottles are loaded outside the Wet Room, conveyed into the Wet Room, automatically filled and capped then conveyed back out the Wet Room to be labelled and packed in the same area. A similar process occurs on the other side of the Wet Room at the 8090 Line; empty cartridges are conveyed into the Wet Room, solution is added and the cartridges are capped off before returning to the dry side to be automatically labelled and manually packed.

The Mini Line is a manual bottling and capping line entirely inside the Wet Room, for small batches solutions. All packaged solutions are stored in Unit 10 Warehouse.

Production schedules on the date of the survey were described as normal.

Local Exhaust Ventilation (LEV) is installed inside the Wet Room, with direct connections to mixing vessels and low-level extraction grills around the periphery of the room. This system extracts via a Helios bifurcated inline axial fan to a stack emission point at the side of the building. The fan is of variable speed and was run on the highest setting during the sampling period.

MCERTS were not requested and are not applicable to the work detailed in this report.

### 3. SAMPLING METHODS

<b>Process Type</b>	Fluids plant operations	<b>Process Duration</b>	8-hour sample period
<b>Substances to Be Monitored</b>	<b>Sampling Protocol/Method</b>	<b>Sampling Type</b>	<b>No of Samples</b>
Particulate matter	In house method	Ex, C, Iso	1 off 8-hour sample
Total VOC	In house method	Ex, Nc	8 off 1-hour runs
<b>Key</b>	Ex = extractive; Nc = non-continuous; C = continuous; Iso = isokinetic		
<b>Key Monitoring Notes</b>	None; <b>this work will not be completed to MCERTS/UKAS Standards</b>		
<b>Reference Conditions</b>	Normal wet room operations including mixing, auto bottling, manual bottling and changeovers		

#### **Volatile Organic Compound (VOC) Monitoring**

The sampling system comprises of a sampling head containing a SKC Sorbent sample tube (226-09), connected to a portable precision pump, capable of running continuously for 8 hours at the recommended flow rate. The pump flow rate is stable to within 5% and the total volume of air sampled by the pump over the recommended sampling period is within 10% of the calculated volume.

The location, duration of sampling (1-hour x 8 samples) and flow rate (0.1 litre/min) are recorded. Following monitoring the 226-09 sorbent tube is capped and placed in a sealed inert container until analysis can be carried out. Analysis is by Gas Chromatography/Mass Spectrometry using specified procedures for the instrumentation.

Similar sampling systems were placed in associated LEV ducting within the Fluids Plant wet room to try and establish where the highest emissions were being produced.

#### **Particulate - Isokinetic Emission Sampling Procedure**

(Carried out using an inhouse method to the main procedural requirements of BS 3405, where practicable).

A transport velocity survey was taken along the one of the sampling lines of the stack. At each of four equally spaced intervals along the line (excluding the region within 5% of the effective stack diameter from the wall), the gas velocity was recorded. Stack velocity was measured using a pitot tube, coupled to an electronic manometer, both are calibrated annually by a UKAS accredited supplier. Temperature measurements were taken using a K-type thermocouple connected to an electronic thermometer, again both are calibrated annually by a UKAS accredited supplier.

velocity profile position	Internal stack diameter (m)	Duct Area (m <sup>2</sup> )	Duct Velocity		Duct Volume Flow (m <sup>3</sup> /hr)	Static Pressure (+ Pa)
			Measured (m/s)	Temperature (k)		
P1	Ø0.49	0.19	3.5	294	2,870	7
P2			4.5			
P3			4.2			
P4			4.7			
Average Duct Velocity 4.2						

#### 4. RESULTS

##### 4.1 Particulate Matter

Run No.	Sampling Time	Mass (mg)	Concentration (mg/m <sup>3</sup> )	Local Authority Limit (mg/m <sup>3</sup> )
1	09:04-17:04	0.04	0.03	20 8-hour mean

##### 4.2 VOC

Run No.	Sampling Time	Mass (mg)	Concentration (mg/m <sup>3</sup> )	Local Authority Limit (mg/m <sup>3</sup> )
1 (816)	09:02-10:02	0.18	40.6	150 8-hour mean
2 (823)	10:02-11:02	0.36	68.3	
3 (819)	11:02-12:02	0.44	78.9	
4 (824)	12:02-13:02	0.60	107.6	
5 (815)	13:02-14:02	0.37	63.3	
6 (820)	14:02-15:02	0.54	92.4	
7 (813)	15:02-16:02	0.55	94.1	
8 (821)	16:02-17:02	0.42	79.2	
Average			78.1	

Sampling Time	Average Concentration (mg/m <sup>3</sup> )	Mass Emission Rate*(kg/hr)
09:02-17:02	78.1	0.22

\*Based on volumetric flowrate of 0.8m<sup>3</sup>/sec

##### LEV static samplers within the ductwork

Sample No.	Position	Time	Concentration (mg/m <sup>3</sup> )
464	Inside duct, solvent vessel 3	09:05 to 13:05	>80
465	Inside duct, solvent vessel 4	10:20 to 14:20	>210
458	Inside duct, ink vessel 2	09:05 to 13:05	>170
459	Inside duct to low level grill close	09:05 to 13:05	>88
460	Entrance to duct to the bottling machine	09:05 to 13:05	40

> Indicates there was > 10% found on the back section of the tube, therefore level could be higher than stated.

## **5. CONCLUSIONS**

Particulate result was found to be very low at <1% the site's permitted limit.

Total VOC as carbon results indicated an average concentration at 52% of the sites permitted limit.

The VOC Mass emission rate was calculated at 0.22 kg/hr.

Direct connection duct legs to the vessels indicated concentrations between 80 – 210 mg/m<sup>3</sup>.

One of the low level grill extraction ducts indicated a concentration at 88 mg/m<sup>3</sup>.

The entrance to the bottling duct indicated a concentration at 40 mg/m<sup>3</sup>.

## **APPENDIX I CALCULATIONS**



**Particulate Calculations**

Location: Fluids Plant  
 Date of Sample: 25/02/19  
 Test No: 1  
 Filter No: GFA 3803

Absolute temperature at meter ( $T_m$ ) 294 K

Absolute temperature in duct ( $T_d$ ) 294 K

Total pressure in duct ( $P_d$ ) barometric + static ( $P_d$ ) 101.3 kPa

Total pressure at meter ( $P_m$ ) 101.3 kPa

Temperature/Pressure correction factor =  $\frac{P_d \times T_m}{P_m \times T_d}$  (CF) 1.0

Total volume sampled at meter ( $V_m$ ) 1.350 m<sup>3</sup>

Quantity of air at nozzle  
 =  $\frac{V_m}{CF}$  ( $Q_n$ ) 1.350 m<sup>3</sup>

Particulate weighed on filter ( $W$ ) 0.04 mg

Particulate concentration (nominal) =  $W/Q_n$  0.03 mg/m<sup>3</sup>

Correction to STP =  $\frac{W \times T_d \times 101.3}{Q_n \times 273 \times P_d}$  **0.032** mg/m<sup>3</sup>

**Process at time of sampling**

Normal spraying of  
 wooden components

**Total VOC Emission Calculations****Location:** Fluids Plant Stack**Date of Sample:** 25/02/19 Test 1

Absolute temperature in duct (Td)	294	K
Total pressure in duct = barometric + static (Pd)	101.3	kPa
Flow rate for VOC sampling (f)	100	ml/min
Total period of sampling (t) = T1-T0	60	mins
Total quantity of air sampled = f x t (Q voc)	0.0048	m <sup>3</sup>
Weight of VOC collected expressed as Carbon (Wc)	0.18	mg
Concentration VOC = $\frac{Wc}{Q \text{ voc}}$	37.5	mg/m <sup>3</sup>
Correction to STP = $\frac{Wc \times Td \times 101.3}{Q \text{ voc} \times 273 \times Pd}$	40.60	mg/m <sup>3</sup>

Process at time of sampling

Main line intermittently running  
 Cartridge line running  
 Re-filling solvent vessel 3  
 Ink vessel 2 running

Substances in use at Time of Sampling

Primarily MEK  
 Acetone  
 Ethanol

**Total VOC Emission Calculations****Location:** Fluids Plant Stack**Date of Sample:** 25/02/19 Test 2

Absolute temperature in duct (Td)	294	K
Total pressure in duct = barometric + static (Pd)	101.3	kPa
Flow rate for VOC sampling (f)	100	ml/min
Total period of sampling (t) = T1-T0	60	mins
Total quantity of air sampled = f x t (Q voc)	0.0057	m <sup>3</sup>
Weight of VOC collected expressed as Carbon (Wc)	0.36	mg
Concentration VOC = $\frac{Wc}{Q \text{ voc}}$	63.2	mg/m <sup>3</sup>
Correction to STP = $\frac{Wc \times Td \times 101.3}{Q \text{ voc} \times 273 \times Pd}$	68.28	mg/m <sup>3</sup>

Process at time of sampling

Main line running

Cartridge line running

All 3 solvent vessels running

15-minute break

Substances in use at Time of Sampling

Primarily MEK

Acetone

Ethanol

**Total VOC Emission Calculations****Location:** Fluids Plant Stack**Date of Sample:** 25/02/19 Test 3

Absolute temperature in duct (Td)	294	K
Total pressure in duct = barometric + static (Pd)	101.3	kPa
Flow rate for VOC sampling (f)	100	ml/min
Total period of sampling (t) = T1-T0	60	mins
Total quantity of air sampled = f x t (Q voc)	0.006	m <sup>3</sup>
Weight of VOC collected expressed as Carbon (Wc)	0.44	mg
Concentration VOC = $\frac{Wc}{Q \text{ voc}}$	73.3	mg/m <sup>3</sup>
Correction to STP = $\frac{Wc \times Td \times 101.3}{Q \text{ voc} \times 273 \times Pd}$	78.94	mg/m <sup>3</sup>

Process at time of sampling

Main line running

Cartridge line running

Ink vessel 2 &amp; Solvent vessel 3 running

Substances in use at Time of Sampling

Primarily MEK

Acetone

Ethanol

**Total VOC Emission Calculations****Location:** Fluids Plant Stack**Date of Sample:** 25/02/19 Test 4

Absolute temperature in duct (Td)	294	K
Total pressure in duct = barometric + static (Pd)	101.3	kPa
Flow rate for VOC sampling (f)	100	ml/min
Total period of sampling (t) = T1-T0	60	mins
Total quantity of air sampled = f x t (Q voc)	0.006	m <sup>3</sup>
Weight of VOC collected expressed as Carbon (Wc)	0.60	mg
Concentration VOC = $\frac{Wc}{Q \text{ voc}}$	100	mg/m <sup>3</sup>
Correction to STP = $\frac{Wc \times Td \times 101.3}{Q \text{ voc} \times 273 \times Pd}$	107.64	mg/m <sup>3</sup>

Process at time of sampling

Main line running  
 Cartridge line running  
 All 3 solvent vessels running  
 Some manual bottling

Substances in use at Time of Sampling

Primarily MEK  
 Acetone  
 Ethanol

**Total VOC Emission Calculations****Location:** Fluids Plant Stack**Date of Sample:** 25/02/19 Test 5

Absolute temperature in duct (Td)	294	K
Total pressure in duct = barometric + static (Pd)	101.3	kPa
Flow rate for VOC sampling (f)	100	ml/min
Total period of sampling (t) = T1-T0	60	mins
Total quantity of air sampled = f x t (Q voc)	0.0063	m <sup>3</sup>
Weight of VOC collected expressed as Carbon (Wc)	0.37	mg
Concentration VOC = $\frac{Wc}{Q \text{ voc}}$	58.7	mg/m <sup>3</sup>
Correction to STP = $\frac{Wc \times Td \times 101.3}{Q \text{ voc} \times 273 \times Pd}$	63.32	mg/m <sup>3</sup>

Process at time of sampling

Main line running  
 Cartridge line running  
 Solvent vessel 3 & 4 running  
 Some manual bottling  
 30 minute lunch break

Substances in use at Time of Sampling

Primarily MEK  
 Acetone  
 Ethanol

**Total VOC Emission Calculations****Location:** Fluids Plant Stack**Date of Sample:** 25/02/19 Test 6

Absolute temperature in duct (Td)	294	K
Total pressure in duct = barometric + static (Pd)	101.3	kPa
Flow rate for VOC sampling (f)	100	ml/min
Total period of sampling (t) = T1-T0	60	mins
Total quantity of air sampled = f x t (Q voc)	0.0063	m <sup>3</sup>
Weight of VOC collected expressed as Carbon (Wc)	0.54	mg
Concentration VOC = $\frac{Wc}{Q \text{ voc}}$	85.7	mg/m <sup>3</sup>
Correction to STP = $\frac{Wc \times Td \times 101.3}{Q \text{ voc} \times 273 \times Pd}$	92.42	mg/m <sup>3</sup>

Process at time of sampling

Main line running

Cartridge line running

Solvent vessel 3 &amp; 4 running

Some manual bottling

Substances in use at Time of Sampling

Primarily MEK

Acetone

Ethanol

**Total VOC Emission Calculations****Location:** Fluids Plant Stack**Date of Sample:** 25/02/19 Test 7

Absolute temperature in duct (Td)	294	K
Total pressure in duct = barometric + static (Pd)	101.3	kPa
Flow rate for VOC sampling (f)	100	ml/min
Total period of sampling (t) = T1-T0	60	mins
Total quantity of air sampled = f x t (Q voc)	0.0063	m <sup>3</sup>
Weight of VOC collected expressed as Carbon (Wc)	0.55	mg
Concentration VOC = $\frac{Wc}{Q \text{ voc}}$	87.3	mg/m <sup>3</sup>
Correction to STP = $\frac{Wc \times Td \times 101.3}{Q \text{ voc} \times 273 \times Pd}$	94.13	mg/m <sup>3</sup>

Process at time of sampling

Main line running  
 Cartridge line running  
 Solvent vessel 3 & 4 running  
 Some manual bottling  
 15 minute break

Substances in use at Time of Sampling

Primarily MEK  
 Acetone  
 Ethanol



**Total VOC Emission Calculations****Location:** Fluids Plant Stack**Date of Sample:** 25/02/19 Test 8

Absolute temperature in duct (Td)	294	K
Total pressure in duct = barometric + static (Pd)	101.3	kPa
Flow rate for VOC sampling (f)	100	ml/min
Total period of sampling (t) = T1-T0	60	mins
Total quantity of air sampled = f x t (Q voc)	0.0057	m <sup>3</sup>
Weight of VOC collected expressed as Carbon (Wc)	0.42	mg
Concentration VOC = $\frac{Wc}{Q \text{ voc}}$	73.7	mg/m <sup>3</sup>
Correction to STP = $\frac{Wc \times Td \times 101.3}{Q \text{ voc} \times 273 \times Pd}$	79.17	mg/m <sup>3</sup>

Process at time of sampling

Main line running

Cartridge line running

Solvent vessel 3 running

Some manual bottling

Substances in use at Time of Sampling

Primarily MEK

Acetone

Ethanol

## **APPENDIX II**

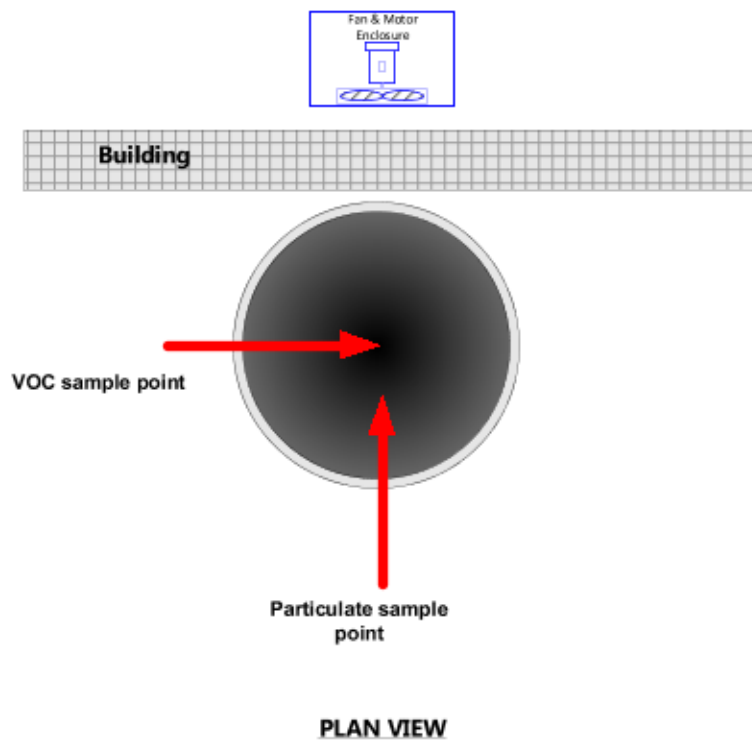
### **DIAGRAMS AND PHOTOGRAPHS**



Fluids Plant – Stack



Fluids Plant – Axial inline fan



### **APPENDIX III LABORATORY REPORTS**



CONCEPT LIFE SCIENCES

ANALYTICAL & DEVELOPMENT SERVICES

Concept Life Sciences is a trading name of  
Concept Life Sciences Analytical & Development  
Services Limited registered in England and  
Wales (No 2514788)

# Concept Life Sciences

## Certificate of Analysis

Hadfield House  
Hadfield Street  
Crombrook  
Manchester  
M16 9FE  
Tel : 0161 874 2400  
Fax : 0161 874 2404

**Report Number:** 805941-1

**Date of Report:** 07-Mar-2019

**Customer:** Industrial Safety Solutions  
MH2 Building  
Unit 26A  
Suite 1  
Parkhall Business Village  
Parkhall Road  
Longton  
Stoke on Trent  
ST3 5XA

**Customer Contact:** . Reports

**Customer Job Reference:** 19-1713

**Date Job Received at Concept:** 28-Feb-2019

**Date Analysis Started:** 01-Mar-2019

**Date Analysis Completed:** 07-Mar-2019

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.

This report should not be reproduced except in full without the written approval of the laboratory

Tests covered by this certificate were conducted in accordance with Concept Life Sciences SOPs

All results have been reviewed in accordance with Section 25 of the Concept Life Sciences, Analytical Services Quality Manual

Report checked  
and authorised by :  
Lauren Clarke  
Customer Service Advisor

Issued by :  
Lauren Clarke  
Customer Service Advisor

Concept Reference: 805941					
Customer Reference: 19-1713					
Tube (Charcoal 226-09)      Analysed as Tube (Charcoal 226-09)					
Total VOC as C					
Concept Reference		805941 006	805941 007	805941 008	805941 009
Customer Sample Reference		816	823	819	824
Test Sample		AR	AR	AR	AR
Volume l		4.8	5.7	6	6.3
Determinand	Method	LOD	Units	Symbol	
Total VOC as C	GC/MS	1	µg	N	180
	Calc	Calc	mg/m3	N	38

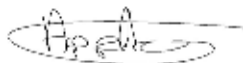
Concept Reference: 805941			
Customer Reference: 19-1713			
Tube (Charcoal 226-09)      Analysed as Tube (Charcoal 226-09)			
Total VOC as C			
Concept Reference		805941 011	805941 012
Customer Sample Reference		820	813
Test Sample		AR	AR
Volume l		6.3	6.3
Determinand	Method	LOD	Units
Total VOC as C	GC/MS	1	µg
	Calc	Calc	mg/m3

Concept Reference: 805941					
Customer Reference: 19-1713					
Tube (Charcoal)      Analysed as Tube (Charcoal 226-01)					
Total VOC as C					
Concept Reference		805941 001	805941 002	805941 003	805941 004
Customer Sample Reference		465	460	459	464
Test Sample		AR	AR	AR	AR
Volume l		19.2	19.2	20.4	43.2
Determinand	Method	LOD	Units	Symbol	
Total VOC as C	GC/MS	1	µg	N	4000 <sup>(37)</sup>
	Calc	Calc	mg/m3	N	210

## Index to symbols used in 805941-1

Value	Description
AR	As Received
37	There was >10% found on the back section of the tube
N	Analysis is not UKAS accredited
C	Calculation

TECHNICAL SERVICES	
REPORT NUMBER	AS3039
CLIENT	Darren Bolton
ORGANISATION	Industrial Safety Solutions
ORDER NO	19-1713
DATE SAMPLES RECEIVED	28-Feb-19
DATE OF REPORT	01-Mar-19
ANALYST(S)	SA
NO. OF SAMPLES	1
BATCH DESCRIPTION	GFA filters for total inhalable dustt
DETAILS OF ANALYSIS	MDHS 14/4 (Gravimetric analysis)
Comments:	



Sample Number	Type of Sample	Client's Reference	AIR VOLUME (litres)	TOTAL INHALABLE DUST (mg)	TOTAL INHALABLE DUST (mg/m3)
3037/01	GFA	3813	1350	0.04	0.05

END OF REPORT