hTS

human Technology Systems **Environmental, Health and Safety Consultants**

Linx Printing Technologies plc

Ink Process Emissions Monitoring

Test date	16 October 2002
Report date	28 November 2002
Reported by	C G Brown

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1. INTRODUCTION

1.1 Project Background

1.1.1 Linx operates a speciality printing ink manufacturing and filling process at its St Ives site that is subject to the monitoring requirements set out in their Authorization by the Huntingdonshire District Council.

1.1.2 This project was commissioned to determine emissions to atmosphere from the single process vent in the Authorization.

1.2 Monitoring Summary

Monitoring took place at:-

Location	Targets
1. The combined process exhaust vent	• Total VOCs and • Total particulates

1.3 Principal Process and Monitoring Information

All of the site work took place on 16 October 2002 under normal operational conditions at the plant.

2. MONITORING EQUIPMENT AND PROCEDURES

2.1 Sampling Access

All monitoring took place from the existing vertical vent stack from sampling points in the duct where optimal flow conditions were expected. Samples were taken about 6m above ground level and approx. 2.5m below the efflux point.

2.2 Equipment, Methods and Sample Analysis

All samples were taken through equipment supplied by hTS Ltd placed in duct openings fabricated by the client.

A1. Total VOCs sample analysis

Equipment and Method

A sample of duct air was drawn continuously through a heated PTFE line into a Signal FID analyzer at ground level.

The FID was zero checked and spanned against a span gas of known concentration both before the site visit and immediately before live sampling on site.

The heated line and instrument were both allowed to reach temperature and stabilize over 45 minutes before the span and zero checks were performed.

The instrument was left to monitor over an 8 hour period from 09:30 to 17:30.

Analysis

Site analysis by portable FID.

2. MONITORING EQUIPMENT AND PROCEDURES

A2. Particulate sample analysis - BS3405:1983

Equipment and Method

An isokinetic sampling train was used to collect particulate onto 47mm GF/A filters. The sampling period was for a total of 66 minutes.

Sample Analysis

The pre-weighed sample filter was subsequently re-weighed to obtain the weight of particulate matter. (Under the same conditions of temperature and humidity.)

A4 Duct and efflux velocity

Equipment and Method

An S-pitot and an Airflow Developments electronic manometer were used to carry out pitot traverses to measure the airflow in the duct at the sampling point.

3. MONITORING RESULTS

3.1 The results obtained during this project follow on the next pages. The vent has been given a summary report page for each analyte/emission. Further information on generating the results is included in Appendices A and B.

3.1.1 Table 1a gives the results for the tests during normal operation of the plant at STP and no correction for Oxygen (as usually reported). Table 1b gives the Authorisation emission limits.

3.1.2 It is worth noting that the particulate result represents samples taken during periods when powder products were introduced into the mix. During other mixing and blending periods, once the powders are homogenized into the liquid, there should be no particulate emissions.

Table 1a Measured emissions to atmosphere – Ink process vent

Reference and target analysis	Measured duct volume airflow (m^3/hour)	Measured efflux velocity (m/s) (1)	Measured emission concentration (2) (mg/m^3)
hTS 1180 - Total particulates	8836	12.5	0.43
hTS 1141 - Total VOCs	8836	12.5	104 (3) & (4)

(1) Velocity result shown represents 85% of the measured duct velocity traverse.
(2) Results in this table reported at STP.
(3) Result for VOCs reported as total carbon.
(4) Result for VOCs reported is an 8-hour average.

Table 1b Authorisation emissions limits

Target emission	30 minute Emission Limit (mg/m^3)	8 hour Emission Limit (mg/m^3)	Emission Limit (mg/m^3)
Total particulates	n/a	n/a	20
Total VOCs	300	150	n/a

3. MONITORING RESULTS

3.1.3 The VOC results were obtained as carbon readings every 2 minutes throughout the 8-hour monitoring cycle. Figure 1 below shows the 30 minute averages throughout the period. The reported 8-hour average in Table 1a above is the average of the whole data range. The 30 minute averages are given in Table 2 below.

Figure 1 Chart showing each 30 minute average VOC emission concentration

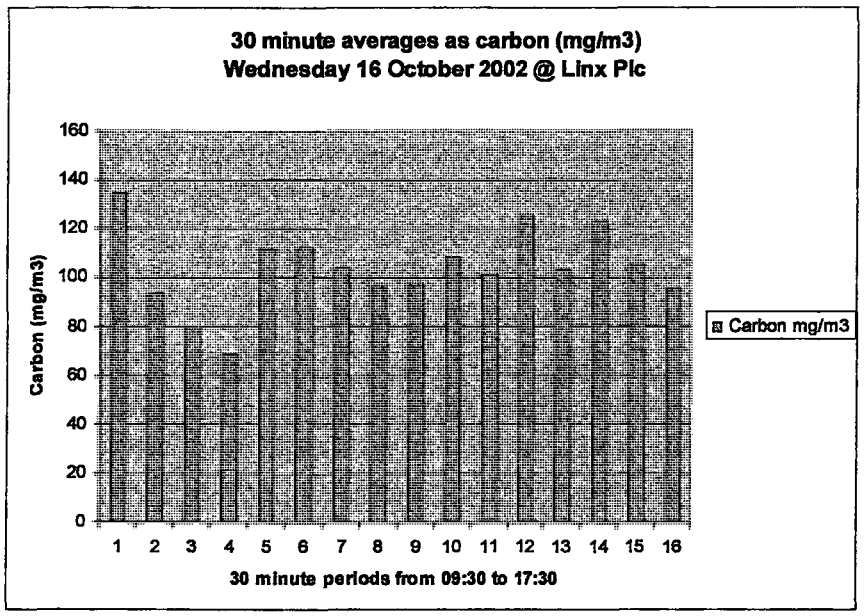
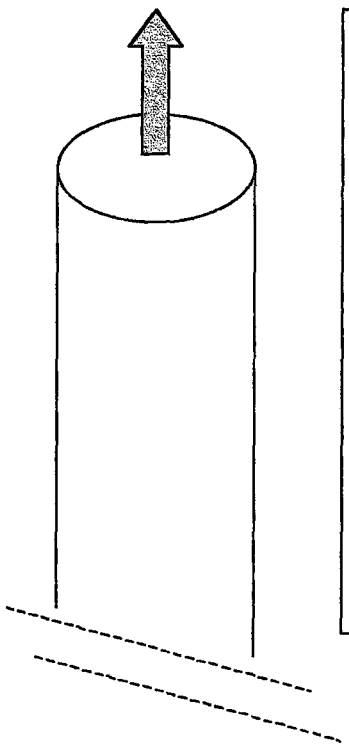


Table 1 30 minute average VOC emissions

Carbon emission concentrations for sequential 30-minute averages over the 8-hour test (mg/m^3)							
1	2	3	4	5	6	7	8
134	93	79	68	112	112	104	96
9	10	11	12	13	14	15	16
97	108	101	125	103	123	106	95

Result for VOCs reported as total carbon.

Emissions data – Summary for the vent for total VOCs

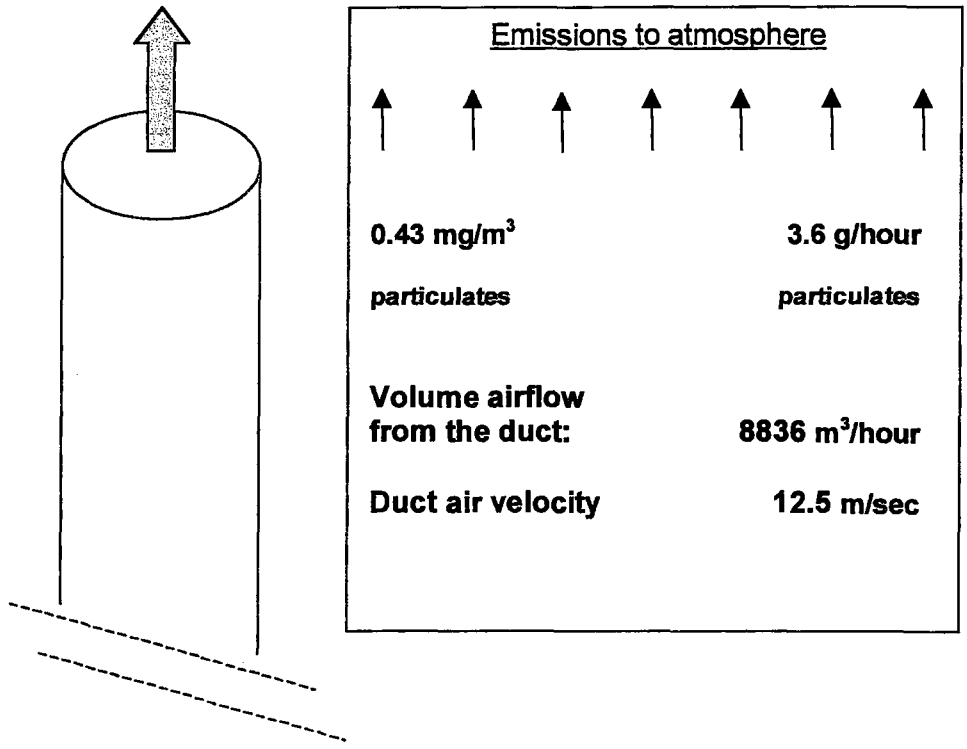


Emissions to atmosphere

104 mg/m^3	919 g/hour
VOCs	VOCs
Volume airflow from the duct:	8836 m^3/hour
Duct air velocity	12.5 m/sec

Refer to Appendix 1 for site data and details of the emission calculations.

Emissions data – Summary for the vent for particulates



Refer to Appendix 1 for site data and details of the emission calculations.

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human Technology Systems Ltd | Emissions monitoring data for Linx Printing Technologies plc | Location Ink line emission vent

Data of test 16 Oct 2002 | hTS Project 3801

Results summary

Emission concentration of	**Total particulates**	0.43 mgm^{-3} at 273K, 101.3kPa and an oxygen reference of 20.9%
Mass emission rate		3.57 ghr^{-1} at duct (or stack) conditions

Duct or stack temperature	16 °Celcius	
Average duct or stack air velocity	12.5 ms^{-1} at the stack temperature above	
Duct or stack dimensions	500 mm diameter	OR
	0 mm width	
	0 mm depth	
Duration of sample	64 minutes	

Other site sample data	Sample port A		Sample port A		Sample port B		Sample port B	
Point on traverse	2		8		2		8	
hTS Filter Sample Ref:	hTS 1180		hTS 1180		hTS 1180		hTS 1180	
	Data	Units	Data	Units	Data	Units	Data	Units
Sample points								
Sample volumes	0.268	m^3	0.156	m^3	0.159	m^3	0.143	m^3
Sample durations	24	minutes	13	minutes	13	minutes	14	minutes
Filter used weight	93.700	milligrammes	0.000	milligrammes	0.000	milligrammes	0.000	milligrammes
Filter clean weight	93.400	milligrammes	0.000	milligrammes	0.000	milligrammes	0.000	milligrammes
Point Sample weights	0.300	milligrammes	0.000	milligrammes	0.000	milligrammes	0.000	milligrammes

Aggregate of the GF/A	hTS 1180	hTS 1180	hTS 1180	hTS 1180

Total sample weight	0.300	milligrammes
Basic data		
Meter temperature	15	°Celcius
Duct (or stack) temperature	16	°Celcius
Ambient pressure	1012	mbar
Duct (or stack) diameter	500	millimetres
Duct (or stack) width	0	millimetres
Duct (or stack) depth	0	millimetres
Duct (or stack) oxygen level	20.9	%
Total sample volume	0.743	m^3 at meter temperature and pressure
	0.704	m^3 at 273K
	0.705	m^3 at 273K and 101.3kPa
	0.705	m^3 at 273K, 101.3kPa and the oxygen reference of 20.9%

Date and time of VOC data point	As carbon mg/m3
"10/16/02""09:31:06"17.74	179
"10/16/02""09:33:06"20.46	214
"10/16/02""09:35:06"20.46	214
"10/16/02""09:37:06"20.46	214
"10/16/02""09:39:06"20.46	214
"10/16/02""09:41:06"17.80	180
"10/16/02""09:43:06"13.10	118
"10/16/02""09:45:06"12.22	107
"10/16/02""09:47:06"10.80	89
"10/16/02""09:49:06"11.24	94
"10/16/02""09:51:06"10.08	79
"10/16/02""09:53:06" 9.98	78
"10/16/02""09:55:06"10.04	79
"10/16/02""09:57:06" 9.98	78
"10/16/02""09:59:06"10.06	79
"10/16/02""10:01:06"11.06	92
"10/16/02""10:03:06"10.88	90
"10/16/02""10:05:06"10.64	86
"10/16/02""10:07:06"10.70	87
"10/16/02""10:09:06"10.72	87
"10/16/02""10:11:06"10.72	87
"10/16/02""10:13:06"10.78	88
"10/16/02""10:15:06"10.72	87
"10/16/02""10:17:06"11.34	96
"10/16/02""10:19:06"12.24	107
"10/16/02""10:21:06"12.32	108
"10/16/02""10:23:06"12.64	112
"10/16/02""10:25:06"11.46	97
"10/16/02""10:27:06"11.18	93
"10/16/02""10:29:06"10.10	79
"10/16/02""10:31:06" 9.60	73
"10/16/02""10:33:06" 9.36	70
"10/16/02""10:35:06" 9.02	65
"10/16/02""10:37:06" 9.18	67
"10/16/02""10:39:06"10.88	90
"10/16/02""10:41:06"10.76	88
"10/16/02""10:43:06"10.50	85
"10/16/02""10:45:06"10.58	86
"10/16/02""10:47:06"11.06	92
"10/16/02""10:49:06"10.22	81
"10/16/02""10:51:06"10.26	81
"10/16/02""10:53:06" 9.94	77
"10/16/02""10:55:06" 9.78	75
"10/16/02""10:57:06" 9.88	77
"10/16/02""10:59:06"10.02	78

Date and time of VOC data point	As carbon mg/m3
"10/16/02""11:01:06"10.18	80
"10/16/02""11:03:06" 9.66	74
"10/16/02""11:05:06" 9.64	73
"10/16/02""11:07:06" 9.40	70
"10/16/02""11:09:06" 9.68	74
"10/16/02""11:11:06" 9.82	76
"10/16/02""11:13:06" 9.66	74
"10/16/02""11:15:06" 9.36	70
"10/16/02""11:17:06" 9.22	68
"10/16/02""11:19:06" 9.16	67
"10/16/02""11:21:06" 9.00	65
"10/16/02""11:23:06" 8.78	62
"10/16/02""11:25:06" 8.64	60
"10/16/02""11:27:06" 8.30	56
"10/16/02""11:29:06" 8.14	54
"10/16/02""11:31:06" 7.96	52
"10/16/02""11:33:06" 7.92	51
"10/16/02""11:35:06" 7.78	49
"10/16/02""11:37:06" 7.68	48
"10/16/02""11:39:06" 7.74	49
"10/16/02""11:41:06" 7.90	51
"10/16/02""11:43:06"10.42	84
"10/16/02""11:45:06"17.80	180
"10/16/02""11:47:06"17.54	176
"10/16/02""11:49:06"17.50	176
"10/16/02""11:51:06"16.92	168
"10/16/02""11:53:06"16.00	156
"10/16/02""11:55:06"15.60	151
"10/16/02""11:57:06"15.22	146
"10/16/02""11:59:06"14.74	140
"10/16/02""12:01:06"15.42	149
"10/16/02""12:03:06"13.72	127
"10/16/02""12:05:06" 9.50	72
"10/16/02""12:07:06"14.70	139
"10/16/02""12:09:06"14.90	142
"10/16/02""12:11:06"14.18	132
"10/16/02""12:13:06"13.66	126
"10/16/02""12:15:06"12.98	117
"10/16/02""12:17:06"12.66	113
"10/16/02""12:19:06"11.96	104
"10/16/02""12:21:06"11.74	101
"10/16/02""12:23:06"11.56	98
"10/16/02""12:25:06"10.86	89
"10/16/02""12:27:06"10.60	86
"10/16/02""12:29:06"10.52	85
"10/16/02""12:31:06"11.02	91
"10/16/02""12:33:06" 9.86	76

Date and time of VOC data point	As carbon mg/m3
"10/16/02""12:35:06"10.02	78
"10/16/02""12:37:06"10.32	82
"10/16/02""12:39:06"14.60	138
"10/16/02""12:41:06"14.02	130
"10/16/02""12:43:06"12.72	113
"10/16/02""12:45:06"13.56	124
"10/16/02""12:47:06"12.24	107
"10/16/02""12:49:06"11.74	101
"10/16/02""12:51:06"11.38	96
"10/16/02""12:53:06"12.92	116
"10/16/02""12:55:06"14.16	132
"10/16/02""12:57:06"11.02	91
"10/16/02""12:59:06" 9.86	76
"10/16/02""13:01:06"10.30	82
"10/16/02""13:03:06" 9.80	75
"10/16/02""13:05:06" 9.68	74
"10/16/02""13:07:06" 9.62	73
"10/16/02""13:09:06"11.62	99
"10/16/02""13:11:06"15.16	145
"10/16/02""13:13:06"14.38	135
"10/16/02""13:15:06"11.66	100
"10/16/02""13:17:06"11.00	91
"10/16/02""13:19:06"11.24	94
"10/16/02""13:21:06"11.52	98
"10/16/02""13:23:06"11.80	102
"10/16/02""13:25:06"11.56	98
"10/16/02""13:27:06"10.92	90
"10/16/02""13:29:06"10.78	88
"10/16/02""13:31:06" 9.80	75
"10/16/02""13:33:06"10.14	80
"10/16/02""13:35:06" 9.12	67
"10/16/02""13:37:06" 8.52	59
"10/16/02""13:39:06" 7.88	50
"10/16/02""13:41:06" 8.02	52
"10/16/02""13:43:06"11.92	103
"10/16/02""13:45:06"14.74	140
"10/16/02""13:47:06"11.50	98
"10/16/02""13:49:06"14.56	137
"10/16/02""13:51:06"13.78	127
"10/16/02""13:53:06"13.82	128
"10/16/02""13:55:06"13.12	119
"10/16/02""13:57:06"12.76	114
"10/16/02""13:59:06"12.22	107
"10/16/02""14:01:06"12.96	117
"10/16/02""14:03:06"12.66	113
"10/16/02""14:05:06"11.90	103
"10/16/02""14:07:06"12.10	105

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Linx, St Ives

Date and time of VOC data point	As carbon mg/m3
"10/16/02""14:09:06"12.58	112
"10/16/02""14:11:06"12.00	104
"10/16/02""14:13:06"13.30	121
"10/16/02""14:15:06"12.52	111
"10/16/02""14:17:06"11.40	96
"10/16/02""14:19:06"14.24	133
"10/16/02""14:21:06"11.48	97
"10/16/02""14:23:06"12.00	104
"10/16/02""14:25:06"12.38	109
"10/16/02""14:27:06"11.72	100
"10/16/02""14:29:06"11.36	96
"10/16/02""14:31:06"10.38	83
"10/16/02""14:33:06" 9.52	72
"10/16/02""14:35:06"10.84	89
"10/16/02""14:37:06"15.60	151
"10/16/02""14:39:06"11.74	101
"10/16/02""14:41:06"10.46	84
"10/16/02""14:43:06"10.70	87
"10/16/02""14:45:06"10.68	87
"10/16/02""14:47:06"12.26	108
"10/16/02""14:49:06"13.18	119
"10/16/02""14:51:06"15.48	149
"10/16/02""14:53:06"10.52	85
"10/16/02""14:55:06"13.18	119
"10/16/02""14:57:06"10.60	86
"10/16/02""14:59:06"11.16	93
"10/16/02""15:01:06"11.34	96
"10/16/02""15:03:06"12.78	114
"10/16/02""15:05:06"16.60	164
"10/16/02""15:07:06"12.82	115
"10/16/02""15:09:06"12.08	105
"10/16/02""15:11:06"13.78	127
"10/16/02""15:13:06"15.08	144
"10/16/02""15:15:06"16.54	163
"10/16/02""15:17:06"16.30	160
"10/16/02""15:19:06"16.22	159
"10/16/02""15:21:06"13.92	129
"10/16/02""15:23:06"11.98	104
"10/16/02""15:25:06"10.78	88
"10/16/02""15:27:06"11.02	91
"10/16/02""15:29:06"13.24	120
"10/16/02""15:31:06"12.86	115
"10/16/02""15:33:06"13.50	124
"10/16/02""15:35:06"13.14	119
"10/16/02""15:37:06"13.24	120
"10/16/02""15:39:06"12.82	115
"10/16/02""15:41:06"12.18	106

Date and time of VOC data point	As carbon mg/m3
"10/16/02""15:43:06"12.70	113
"10/16/02""15:45:06"11.52	98
"10/16/02""15:47:06"12.24	107
"10/16/02""15:49:06"11.26	94
"10/16/02""15:51:06" 9.60	73
"10/16/02""15:53:06"10.22	81
"10/16/02""15:55:06"10.62	86
"10/16/02""15:57:06"11.38	96
"10/16/02""15:59:06"11.26	94
"10/16/02""16:01:06"11.66	100
"10/16/02""16:03:06"11.56	98
"10/16/02""16:05:06"12.38	109
"10/16/02""16:07:06"12.08	105
"10/16/02""16:09:06"15.04	144
"10/16/02""16:11:06"15.28	147
"10/16/02""16:13:06"14.80	141
"10/16/02""16:15:06"13.70	126
"10/16/02""16:17:06"11.92	103
"10/16/02""16:19:06"14.74	140
"10/16/02""16:21:06"11.98	104
"10/16/02""16:23:06"15.60	151
"10/16/02""16:25:06"14.34	135
"10/16/02""16:27:06"13.50	124
"10/16/02""16:29:06"13.30	121
"10/16/02""16:31:06"13.12	119
"10/16/02""16:33:06"13.62	125
"10/16/02""16:35:06"14.68	139
"10/16/02""16:37:06"15.52	150
"10/16/02""16:39:06"14.80	141
"10/16/02""16:41:06"13.48	123
"10/16/02""16:43:06"11.98	104
"10/16/02""16:45:06"14.38	135
"10/16/02""16:47:06"13.00	117
"10/16/02""16:49:06"11.08	92
"10/16/02""16:51:06" 9.42	71
"10/16/02""16:53:06" 8.48	58
"10/16/02""16:55:06" 8.84	63
"10/16/02""16:57:06" 9.02	65
"10/16/02""16:59:06"10.30	82
"10/16/02""17:01:06"14.44	136
"10/16/02""17:03:06"14.50	137
"10/16/02""17:05:06"10.66	87
"10/16/02""17:07:06"16.84	167
"10/16/02""17:09:06"16.26	160
"10/16/02""17:11:06" 9.18	67
"10/16/02""17:13:06" 8.14	54
"10/16/02""17:15:06" 7.84	50

Date and time of VOC data point	As carbon mg/m3
"10/16/02""17:17:06" 8.54	59
"10/16/02""17:19:06" 7.84	50
"10/16/02""17:21:06" 8.22	55
"10/16/02""17:23:06" 8.38	57
"10/16/02""17:25:06" 8.36	57
"10/16/02""17:27:06"13.38	129
"10/16/02""17:29:06"16.48	162
"10/16/02""17:31:06"10.34	83