

JAGUAR CARS LTD  
EMISSIONS REPORT  
JUNE 2005



**JUNE 2005**

**EMISSIONS MONITORING**

**BROWNS LANE**

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**Report Number P-RED05-039/EB/R1/Rev0**

PROJECT TEAM

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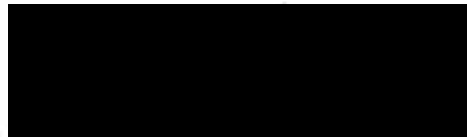
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MCerts Level 1 – MM 02 018

Report prepared by:

Elena Berek

Signature:



Date:

7<sup>th</sup> July 2005

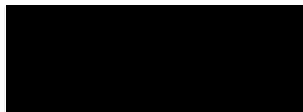
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7<sup>th</sup> July 2005

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## EXECUTIVE SUMMARY

The following document details the emissions to air monitoring survey undertaken by Philip Butler and Vicki Gavin of Redwing Environmental Ltd at Jaguar Cars Ltd, Browns Lane during June 2005.

All results pertain to the dates monitored only; these dates include the 8<sup>th</sup> to the 10<sup>th</sup> June 2005.

A summary of results is shown below:-

Emission point reference Stack N <sup>o</sup>	Total Particulate Matter range at reference conditions (mg/m <sup>3</sup> )	30 minute VOC Concentrations at reference conditions (mg/m <sup>3</sup> )	Isocyanate Concentrations at reference conditions (mg/m <sup>3</sup> )	Velocity corrected to reference conditions (m/s)	Volume flow corrected to reference conditions (m <sup>3</sup> /hr)
VMC 3 Polyester Auto Cell 1	0.46 to 0.91	755.8 (752.8)	<0.007	8.0	8939
VMC 3 Polyester Auto Cell 2	<0.3 to 0.41	751.4 (581.0)	<0.007	8.5	9496
VMC 3 Polyester Auto Cell 3	0.34 to 1.07	34.0 (33.5)	<0.007	6.5	7260
VMC 3 Manual Spray 1	<0.26 to 0.34	4.9 (4.4)	<0.007	8.1	13212
VMC 3 Manual Spray 2	<0.3	9.2 (8.1)	<0.007	7.8	12752
VMC 3 PU Auto	0.3	11.7 (11.6)	<0.007	10.3	14223
VMC 1 UV Spray	0.6 to 0.9	22.4 (19.1)	<0.007	5.1	4921

The figures in blue are the average concentrations obtained for the duration of the run

## 1.0 INTRODUCTION

The monitoring of the seven exhausts were monitored with respect to quotation Q-RED05-039/EB/v0 for the compliance check monitoring of emissions to air. The substances requested for monitoring at each emission point are listed below:

### Monitoring Programme

Substances to be monitored	Emission Point Identification						
	VMC 3 Auto Cell 1	VMC 3 Auto Cell 2	VMC 3 Auto Cell 3	VMC 3 Manual 1	VMC 3 Manual 2	VMC 3 PU Auto	VMC 1 UV Spray
Total Particulate Matter	✓	✓	✓	✓	✓	✓	✓
Volatile Organic Compounds	✓	✓	✓	✓	✓	✓	✓
Isocyanates	✓	✓	✓	✓	✓	✓	✓

**Special requirements** *Monitoring is only carried out during normal operations, no monitoring was carried out during scheduled or unscheduled breaks.*

- 1.1 The emission results will be compared to the results listed in the local authority permit.
- 1.2 The velocity and temperature profiles were within the required parameters of 9:1 (pascals) or 3:1 metres/second and  $\pm 1\%$  for temperature profile. This information indicates that the sample ports are in ideal positions to collect the samples under representative conditions.

## 1.3 Monitoring Results

Emission Point Reference	Substance to be Monitored	Emission Limit Value	Periodic Monitoring Result	Units	Reference Conditions 273 K, 101.3 kPa	Date of Sampling	Start and End Times	Monitoring Method Reference	Accreditation for use of Method	Operating Status
VMC 3 Polyester Auto Cell 1	Total Particulate Matter	50	0.46 to 0.91	mg/m <sup>3</sup>	273, 101.3kPa	09/06/05	0948-1020 1030-1102	ISO 9096	* UKAS accreditation applied for	Normal
	Volatile Organic Compounds	50	755.8	mg/m <sup>3</sup>			1001-1101	BS EN 13526		
	Isocyanates	0.1	<0.007	mg/m <sup>3</sup>			1000-1030	MDHS 25/3		
VMC 3 Polyester Auto Cell 2	Total Particulate Matter	50	<0.3 to 0.41	mg/m <sup>3</sup>	273, 101.3kPa	08/06/05	1303-1335 1343-1415	ISO 9096	* UKAS accreditation applied for	Normal
	Volatile Organic Compounds	50	751.4	mg/m <sup>3</sup>			1320-1420	BS EN 13526		
	Isocyanates	0.1	<0.007	mg/m <sup>3</sup>			1330-1400	MDHS 25/3		
VMC 3 Polyester Auto Cell 3	Total Particulate Matter	50	0.34 to 1.07	mg/m <sup>3</sup>	273, 101.3kPa	08/06/05	1428-1500 1508-1540	ISO 9096	* UKAS accreditation applied for	Normal
	Volatile Organic Compounds	50	34.0	mg/m <sup>3</sup>			1431-1531	BS EN 13526		
	Isocyanates	0.1	<0.007	mg/m <sup>3</sup>			1430-1500	MDHS 25/3		

Emission Point Reference	Substance to be Monitored	Emission Limit Value	Periodic Monitoring Result	Units	Reference Conditions 273 K, 101.3 kPa	Date of Sampling	Start and End Times	Monitoring Method Reference	Accreditation for use of Method	Operating Status
VMC 3 Manual Spray 1	Total Particulate Matter	50	<0.26 to 0.34	mg/m <sup>3</sup>	273, 101.3kPa	09/06/05	1228-1300 1308-1340	ISO 9096	• UKAS accreditation applied for	Normal
	Volatile Organic Compounds	50	4.9	mg/m <sup>3</sup>			1237-1337	BS EN 13526		
	Isocyanates	0.1	<0.007	mg/m <sup>3</sup>			1240-1310	MDHS 25/3		
VMC 3 Manual Spray 2	Total Particulate Matter	50	<0.3	mg/m <sup>3</sup>	273, 101.3kPa	09/06/05	1058-1130 1138-1210	ISO 9096	• UKAS accreditation applied for	Normal
	Volatile Organic Compounds	50	9.2	mg/m <sup>3</sup>			1111-1211	BS EN 13526		
	Isocyanates	0.1	<0.007	mg/m <sup>3</sup>			1115-1145	MDHS 25/3		
VMC 3 PU Auto	Total Particulate Matter	50	0.3	mg/m <sup>3</sup>	273, 101.3kPa	09/06/05	1300-1332 134801420	ISO 9096	• UKAS accreditation applied for	Normal
	Volatile Organic Compounds	50	11.7	mg/m <sup>3</sup>			1344-1444	BS EN 13526		
	Isocyanates	0.1	<0.007	mg/m <sup>3</sup>			1350-1420	MDHS 25/3		



Emission Point Reference	Substance to be Monitored	Emission Limit Value	Periodic Monitoring Result	Units	Reference Conditions 273 K, 101.3 kPa	Date of Sampling	Start and End Times	Monitoring Method Reference	Accreditation for use of Method	Operating Status
VMC 1 UV Spray	Total Particulate Matter	50	0.6 to 0.9	mg/m <sup>3</sup>	273, 101.3kPa	09/06/05	1142-1214 1219-1251	ISO 9096	* UKAS accreditation applied for	Normal
	Volatile Organic Compounds	50	22.4	mg/m <sup>3</sup>			1144-1244	BS EN 13526		
	Isocyanates	0.1	<0.007	mg/m <sup>3</sup>			1140-1210	MDHS 25/3		

\* Redwing Environmental Ltd are in the process of applying for UKAS accreditation, all site staff are certified to MCerts levels 1 and 2

## 2 Supporting Information (Held by Redwing Environmental Ltd)

### 2.1 General Information

#### 2.1.1 Redwing Environmental Ltd staff details

Philip Butler – MCerts Level 2 – TE1  
Registration number MM 02 016

Vicki Gavin – MCerts Level 1  
Registration number MM 02 018

### 2.2 Redwing Environmental Ltd method details

#### 2.2.1 Test Methods

#### 2.2.2 Particulate matter ISO 9096: 2003 (USEPA method 5 and method 17)

2.2.3 Total particulate matter was sampled using a CAE Method 5 isokinetic sampling system in accordance with USEPA method 5 - *Determination of particulate emissions from stationary sources* and USEPA method 17 - *Determination of particulate emissions from stationary sources (In-stack filtration method)*.

2.2.4 The CAE Method 5 sampling system monitors temperature, static pressure and velocities within the duct using an S-type pitot tube and K-type thermocouple. The sampling rate was continuously monitored and adjusted relative to the duct velocity to ensure isokinetic-sampling conditions were maintained throughout the monitoring period.

2.2.5 Exhaust gases were drawn under isokinetic conditions from the exhaust points using the Method 5 sampling probe, particulate matter was then collected on a pre-weighed glass fibre filter (or most suitable filter for process) contained within the filter cassette holder, and the total particulate matter determined gravimetrically.

2.2.6 It was also necessary to wash the probe and nozzle out with water and then acetone between sampling and the weight of the probe washing added to that collected on the sample filter. Analysis of an acetone/water blank was carried out and the result corrected accordingly.

2.2.7 The sample positions were calculated with respect to ISO9096:2003 – Stationary source emissions – Manual determination of mass concentration of particulate matter.

2.2.8 There were no deviations from the method; therefore the uncertainty for the monitoring procedure is reported to be:

Uncertainty:  $\pm 30\%$

## 2.3 Stack Velocity, Pressure and Temperature Measurements

2.3.1 The stack velocity, pressure and temperature were measured by full pitot traverses of the duct using the points provided. Measurements were taken at ten equally spaced points along each proposed sampling line, excluding the 5% of the effective flue diameter from the wall.

## 2.4 Volatile organic compounds (BS EN 13526: 2001)

2.4.1 Monitoring to determine VOC emission concentrations was in accordance with BS EN 13526: 2001.

2.4.2 Volatile organic compound concentrations were measured using a Signal 3030PM portable heated VOC analyser. The analyser works by burning the gas sample in a hydrogen flame. This ionises any organic compounds present and the current produced across an electric field is proportional to the number of carbon atoms.

2.4.3 The analyser and heated line were zeroed and calibrated with a test gas (80 ppm and 800ppm propane) prior to each sampling run. VOC sampling was undertaken over a period of at least 60 minutes to cover any process variation.

2.4.4 All data was logged onto a Grant Squirrel data logger set at 5 second logging intervals.

2.4.5 A list of response factors are available so that specific concentrations can be calculated for known solvents within the sample exhaust.

2.4.6 A heated line from the sample point to analyser was used to ensure that condensation did not occur leading to the loss of sample concentration.

## 2.5 Leak tests for extractive techniques

2.5.1 All extractive-sampling techniques were tested for leaks before sampling proceeded. Any leaks present were eliminated prior to sampling and will be reported.

2.5.2 Leak checks are carried out during the calibration procedure, as the concentration of the calibration gas is known it is easily noticed if air is entering the sample line and diluting the gas.

## 2.6 Isocyanates (MDHS 25/3)

2.6.1 There are several Isocyanates; these include TDI, MDI, HDI and IPDI. The isocyanate monitored was TDI (Toluene diisocyanate). All Isocyanates follow the same procedure for sampling and analysis.

2.6.2 Isocyanates can be sampled non-isokinetically following MDHS 25 or isokinetically following the draft US EPA Method 207-1.

2.6.3 The method used was the non-isokinetic method. A sample probe was placed inside the stack; the sample probe was then attached to two midget impingers. The first impinger contained 10mls of 1,2 methoxy-phenyl piperazine and the second impinger was empty.

- 2.6.4 The impingers were then attached to a calibrated sample pump; the pump was left to run for approximately 30 minutes. The pump was then recalibrated and the total volume of the sample gas calculated. In the event of the solution evaporating, the sample volume is made up to 10mls using dry toluene.
- 2.6.5 The samples were then stored in brown glass bottles and submitted for analysis. The samples will then be 'blown down' to dryness using air and made up to 1ml using the most suitable matrix (usually acetonitrile). The sample will then be ready for analysis by HPLC (High Pressure Liquid Chromatography).

### 3.0 Quality Assurance

- 3.1 Redwing Environmental Ltd will always endeavour to follow the methods specified in the Environment Agency Technical Guidance M2. The methods followed will be listed as our Technical Procedures and will be put forward for UKAS accreditation.
- 3.2 Redwing Environmental Ltd are accredited to ISO 9001: 2000.

### 4.0 Disclaimer

- 4.1 Redwing Environmental Ltd confirm that in preparing this report all reasonable skill and care has been exercised.
- 4.1.1 Unless specifically assigned or transferred within the terms of the agreement, Redwing Environmental Ltd asserts and retains all copyright, and other Intellectual Property Rights, in and over the report and its contents.

# APPENDIX 1

## Particulate and Velocity Certificates

Certificate - Total Particulate Matter (TPM) & Velocity

Stack Reference ID	VMC1 UV Spray					
	Jaguar Cars Ltd					
	RUN 1			RUN 2		
Filter Reference No	000589			000590		
Date	10-Jun-05			10-Jun-05		
Sample Period	11:42	to	12:14	12:19	to	12:51
Velocity (Nm/s)	5.06			5.06		
Volume (Nm <sup>3</sup> /hr)	4921			4921		
Average Stack Temp (°C)	17.00			17.00		
Permitted Temp Range (°C)	2.79	to	31.82	2.79	to	31.82
Lowest Pitot Reading (pascals)	10.78			10.78		
Highest Pitot Reading (pascals)	19.61			19.61		
Pitot Ratio (less than 9:1)	1.82	:	1	1.82	:	1
Delta H (mm H <sub>2</sub> O)	51.04			51.04		
K - Factor	9.90			9.90		
Moisture (%)	n/a			n/a		
Litres sampled	474			487		
Corrected volume sampled (m <sup>3</sup> )	0.421			0.431		
Particulate Concentration on Filter (mg/m <sup>3</sup> )	0.6			0.9		
Particulate Concentration in Wash (mg/m <sup>3</sup> )	<0.3			<0.3		
Total Particulate Concentration (mg/m <sup>3</sup> )	0.6			0.9		
Total Particulate Concentration corrected for moisture (mg/m <sup>3</sup> )	n/a			n/a		
Total Particulate Mass Emission (kg/hour)	0.003			0.004		

Certificate - Total Particulate Matter (TPM) & Velocity

Stack Reference ID		VMC 3 Polyester Auto Cell 2					
	Jaguar Cars Ltd						
	RUN 1			RUN 2			
Filter Reference No	000585			000586			
Date	08-Jun-05			08-Jun-05			
Sample Period	13:03	to	13:35	13:43	to	14:15	
Velocity (Nm/s)	8.46			8.46			
Volume (Nm <sup>3</sup> /hr)	8884			8884			
Average Stack Temp (°C)	18.00			18.00			
Permitted Temp Range (°C)	18.54	to	21.47	18.54	to	21.47	
Lowest Pitot Reading (pascals)	23.53			23.53			
Highest Pitot Reading (pascals)	89.22			89.22			
Pitot Ratio (less than 9:1)	3.79	:	1	3.79	:	1	
Delta H (mm H2O)	51.04			51.04			
K - Factor	3.10			3.10			
Moisture (%)	n/a			n/a			
Litres sampled	474			468			
Corrected volume sampled (m <sup>3</sup> )	0.418			0.413			
Particulate Concentration on Filter (mg/m <sup>3</sup> )	0.41			<0.3			
Particulate Concentration in Wash (mg/m <sup>3</sup> )	<0.3			<0.3			
Total Particulate Concentration (mg/m <sup>3</sup> )	0.41			<0.3			
Total Particulate Concentration corrected for moisture (mg/m <sup>3</sup> )	n/a			n/a			
Total Particulate Mass Emission (kg/hour)	0.004			<0.005			

Certificate - Total Particulate Matter (TPM) & Velocity

Stack Reference ID		VMC 3 Polyester Auto Cell 3					
	Jaguar Cars Ltd						
	RUN 1			RUN 2			
Filter Reference No	003120			000612			
Date	08-Jun-05			08-Jun-05			
Sample Period	14:28	to	15:00	15:08	to	15:40	
Velocity (Nm/s)	6.47			6.47			
Volume (Nm <sup>3</sup> /hr)	7333			7333			
Average Stack Temp (°C)	18.00			18.00			
Permitted Temp Range (°C)	16.55	to	19.46	16.55	to	19.46	
Lowest Pitot Reading (pascals)	17.65			17.65			
Highest Pitot Reading (pascals)	52.94			52.94			
Pitot Ratio (less than 9:1)	3.00	:	1	3.00	:	1	
Delta H (mm H <sub>2</sub> O)	51.04			51.04			
K - Factor	9.88			9.88			
Moisture (%)	n/a			n/a			
Litres sampled	638			637			
Corrected volume sampled (m <sup>3</sup> )	0.563			0.562			
Particulate Concentration on Filter (mg/m <sup>3</sup> )	1.07			0.34			
Particulate Concentration in Wash (mg/m <sup>3</sup> )	<0.2			<0.2			
Total Particulate Concentration (mg/m <sup>3</sup> )	1.07			0.34			
Total Particulate Concentration corrected for moisture (mg/m <sup>3</sup> )	n/a			n/a			
Total Particulate Mass Emission (kg/hour)	0.008			0.002			



Certificate - Total Particulate Matter (TPM) & Velocity

Stack Reference ID	VMC 3 PU Automatic Spray					
	Jaguar Cars Ltd					
	RUN 1			RUN 2		
Filter Reference No	000583			000588		
Date	09-Jun-05			09-Jun-05		
Sample Period	13:00	to	13:32	13:48	to	14:20
Velocity (Nm/s)	10.27			10.27		
Volume (Nm <sup>3</sup> /hr)	14335			14335		
Average Stack Temp (°C)	24.00			24.00		
Permitted Temp Range (°C)	22.52	to	25.49	22.52	to	25.49
Lowest Pitot Reading (pascals)	72.55			72.55		
Highest Pitot Reading (pascals)	93.14			93.14		
Pitot Ratio (less than 9:1)	1.28	:	1	1.28	:	1
Delta H (mm H2O)	51.04			51.04		
K - Factor	3.06			3.06		
Moisture (%)	n/a			n/a		
Litres sampled	563			589		
Corrected volume sampled (m <sup>3</sup> )	0.497			0.523		
Particulate Concentration on Filter (mg/m <sup>3</sup> )	0.3			0.3		
Particulate Concentration in Wash (mg/m <sup>3</sup> )	<0.2			<0.2		
Total Particulate Concentration (mg/m <sup>3</sup> )	0.3			0.3		
Total Particulate Concentration corrected for moisture (mg/m <sup>3</sup> )	n/a			n/a		
Total Particulate Mass Emission (kg/hour)	0.004			0.004		

Certificate - Total Particulate Matter (TPM) & Velocity

Stack Reference ID		VMC 3 Manual Booth 1					
	Jaguar Cars Ltd						
	RUN 1			RUN 2			
Filter Reference No	000591			003109			
Date	09-Jun-05			09-Jun-05			
Sample Period	12:28	to	13:00	13:08	to	13:40	
Velocity (Nm/s)	8.09			8.09			
Volume (Nm <sup>3</sup> /hr)	13411			13411			
Average Stack Temp (°C)	24.00			24.00			
Permitted Temp Range (°C)	22.52	to	25.49	22.52	to	25.49	
Lowest Pitot Reading (pascals)	43.14			43.14			
Highest Pitot Reading (pascals)	62.75			62.75			
Pitot Ratio (less than 9:1)	1.45	:	1	1.45	:	1	
Delta H (mm H <sub>2</sub> O)	51.04			51.04			
K - Factor	3.06			3.06			
Moisture (%)	n/a			n/a			
Litres sampled	438			441			
Corrected volume sampled (m <sup>3</sup> )	0.387			0.392			
Particulate Concentration on Filter (mg/m <sup>3</sup> )	0.34			<0.26			
Particulate Concentration in Wash (mg/m <sup>3</sup> )	<0.26			<0.26			
Total Particulate Concentration (mg/m <sup>3</sup> )	0.34			<0.26			
Total Particulate Concentration corrected for moisture (mg/m <sup>3</sup> )	n/a			n/a			
Total Particulate Mass Emission (kg/hour)	0.004			<0.007			

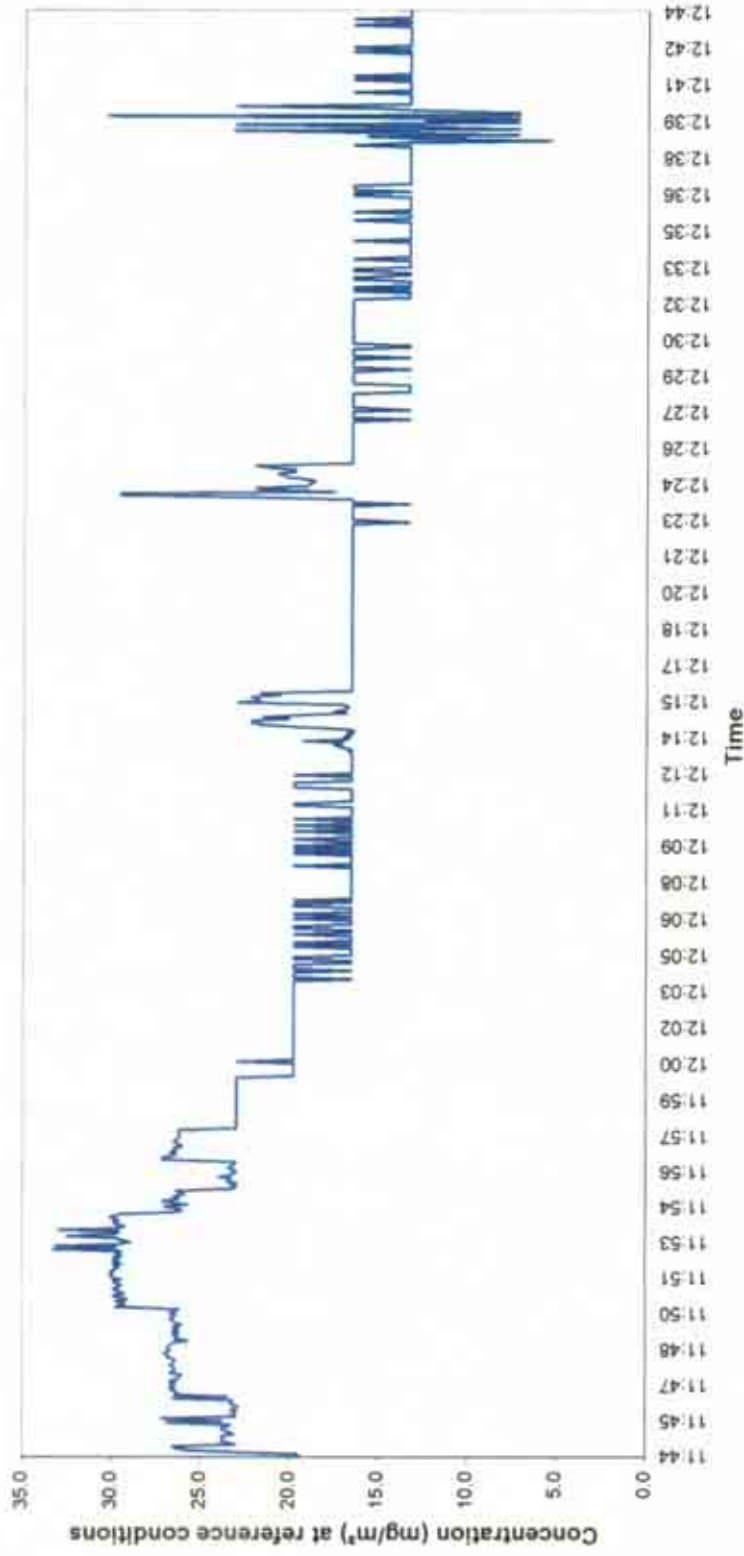
Certificate - Total Particulate Matter (TPM) & Velocity

Stack Reference ID	VMC 3 Manual Booth 2					
	Jaguar Cars Ltd					
	RUN 1			RUN 2		
Filter Reference No	003114			003115		
Date	09-Jun-05			09-Jun-05		
Sample Period	10:58	to	11:30	11:38	to	12:10
Velocity (Nm/s)	7.81			7.81		
Volume (Nm <sup>3</sup> /hr)	12862			12862		
Average Stack Temp (°C)	24.00			24.00		
Permitted Temp Range (°C)	22.52	to	25.49	22.52	to	25.49
Lowest Pitot Reading (pascals)	32.35			32.35		
Highest Pitot Reading (pascals)	56.86			56.86		
Pitot Ratio (less than 9:1)	1.76	:	1	1.76	:	1
Delta H (mm H2O)	51.04			51.04		
K - Factor	3.06			3.06		
Moisture (%)	n/a			n/a		
Litres sampled	446			431		
Corrected volume sampled (m <sup>3</sup> )	0.394			0.383		
Particulate Concentration on Filter (mg/m <sup>3</sup> )	<0.3			<0.3		
Particulate Concentration in Wash (mg/m <sup>3</sup> )	<0.3			<0.3		
Total Particulate Concentration (mg/m <sup>3</sup> )	<0.3			<0.3		
Total Particulate Concentration corrected for moisture (mg/m <sup>3</sup> )	n/a			n/a		
Total Particulate Mass Emission (kg/hour)	<0.007			<0.007		

## APPENDIX 2

### Volatile Organic Compound Charts

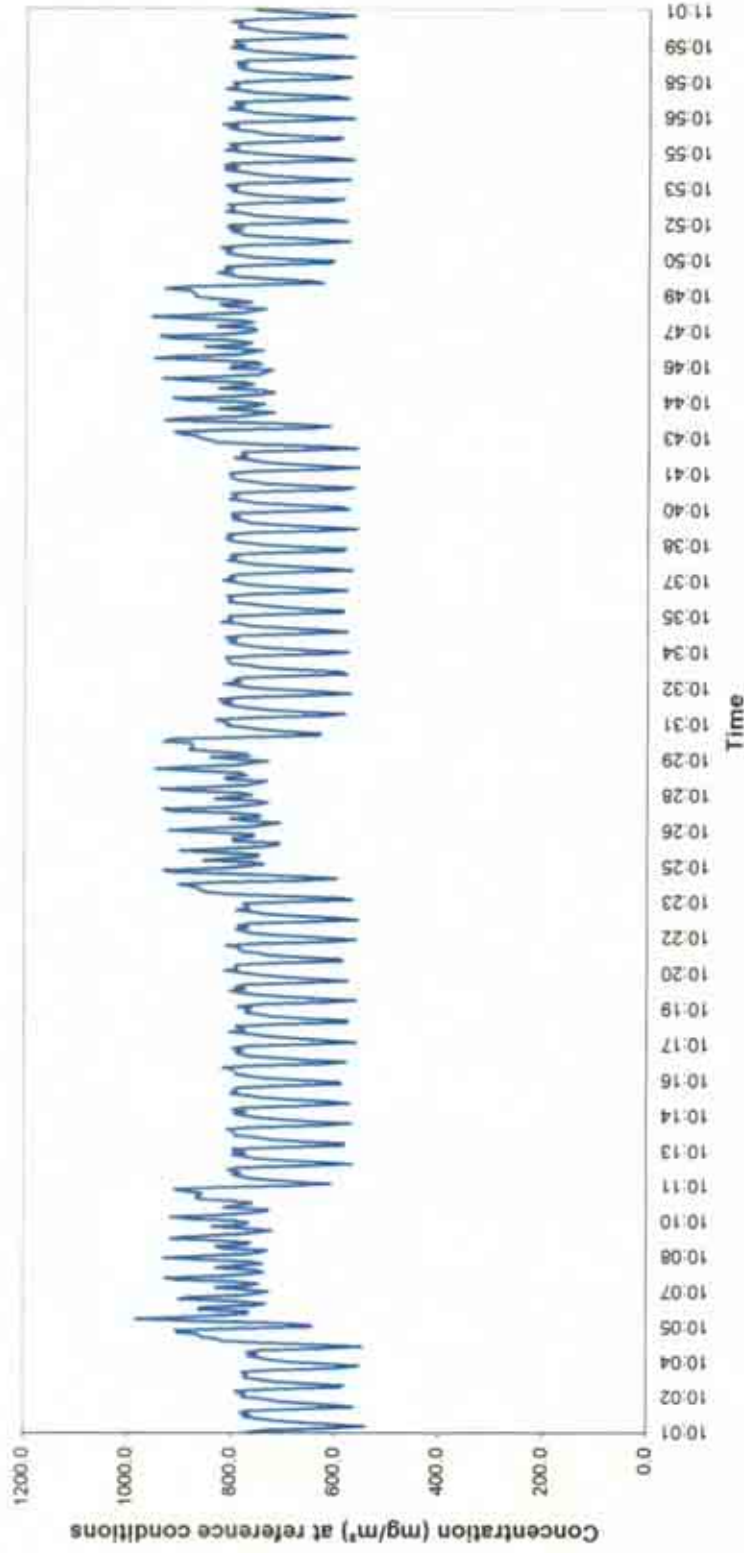
VMC 1 UV Spray Cell - VOC Monitoring (10/06/05)



Average Run Time		Volatile Organic Compound (ppm)		Volatile Organic Compound (mg/m³)	
		Mean	Max	Mean	Max
11:44	to	13.93	20.70	22.39	33.27
12:14	to	9.83	18.90	15.80	30.38
			3.40		5.46

VMC 1 UV Spray Booth - VOC Monitoring					
Date	Time	VOC mg/m <sup>3</sup>	Date	Time	VOC mg/m <sup>3</sup>
10-Jun-05	11:44:06	19.61	10-Jun-05	12:33:06	16.55
10-Jun-05	11:45:06	23.30	10-Jun-05	12:34:06	13.34
10-Jun-05	11:46:06	22.98	10-Jun-05	12:35:06	13.34
10-Jun-05	11:47:06	26.68	10-Jun-05	12:36:06	13.34
10-Jun-05	11:48:06	26.36	10-Jun-05	12:37:06	13.34
10-Jun-05	11:49:06	26.20	10-Jun-05	12:38:06	13.34
10-Jun-05	11:50:06	26.68	10-Jun-05	12:39:06	14.30
10-Jun-05	11:51:06	29.89	10-Jun-05	12:40:06	15.11
10-Jun-05	11:52:06	29.89	10-Jun-05	12:41:06	13.34
10-Jun-05	11:53:06	28.93	10-Jun-05	12:42:06	13.34
10-Jun-05	11:54:06	29.89	10-Jun-05	12:43:06	13.34
10-Jun-05	11:55:06	25.88	10-Jun-05	12:44:06	13.34
10-Jun-05	11:56:06	22.98			
10-Jun-05	11:57:06	26.52			
10-Jun-05	11:58:06	22.98			
10-Jun-05	11:59:06	22.98			
10-Jun-05	12:00:06	19.77			
10-Jun-05	12:01:06	19.77			
10-Jun-05	12:02:06	19.77			
10-Jun-05	12:03:06	19.77			
10-Jun-05	12:04:06	16.55			
10-Jun-05	12:05:06	16.55			
10-Jun-05	12:06:06	16.55			
10-Jun-05	12:07:06	19.77			
10-Jun-05	12:08:06	16.55			
10-Jun-05	12:09:06	16.55			
10-Jun-05	12:10:06	16.55			
10-Jun-05	12:11:06	16.55			
10-Jun-05	12:12:06	19.77			
10-Jun-05	12:13:06	16.55			
10-Jun-05	12:14:06	17.04			
10-Jun-05	12:15:06	16.88			
10-Jun-05	12:16:06	16.55			
10-Jun-05	12:17:06	16.55			
10-Jun-05	12:18:06	16.55			
10-Jun-05	12:19:06	16.55			
10-Jun-05	12:20:06	16.55			
10-Jun-05	12:21:06	16.55			
10-Jun-05	12:22:06	16.55			
10-Jun-05	12:23:06	16.55			
10-Jun-05	12:24:06	29.57			
10-Jun-05	12:25:06	19.77			
10-Jun-05	12:26:06	16.55			
10-Jun-05	12:27:06	16.55			
10-Jun-05	12:28:06	16.55			
10-Jun-05	12:29:06	16.55			
10-Jun-05	12:30:06	16.55			
10-Jun-05	12:31:06	16.55			
10-Jun-05	12:32:06	16.55			
			Average		19.10

VMC 3 Polyester Automatic Cell 1 - VOC Monitoring (09/06/05)

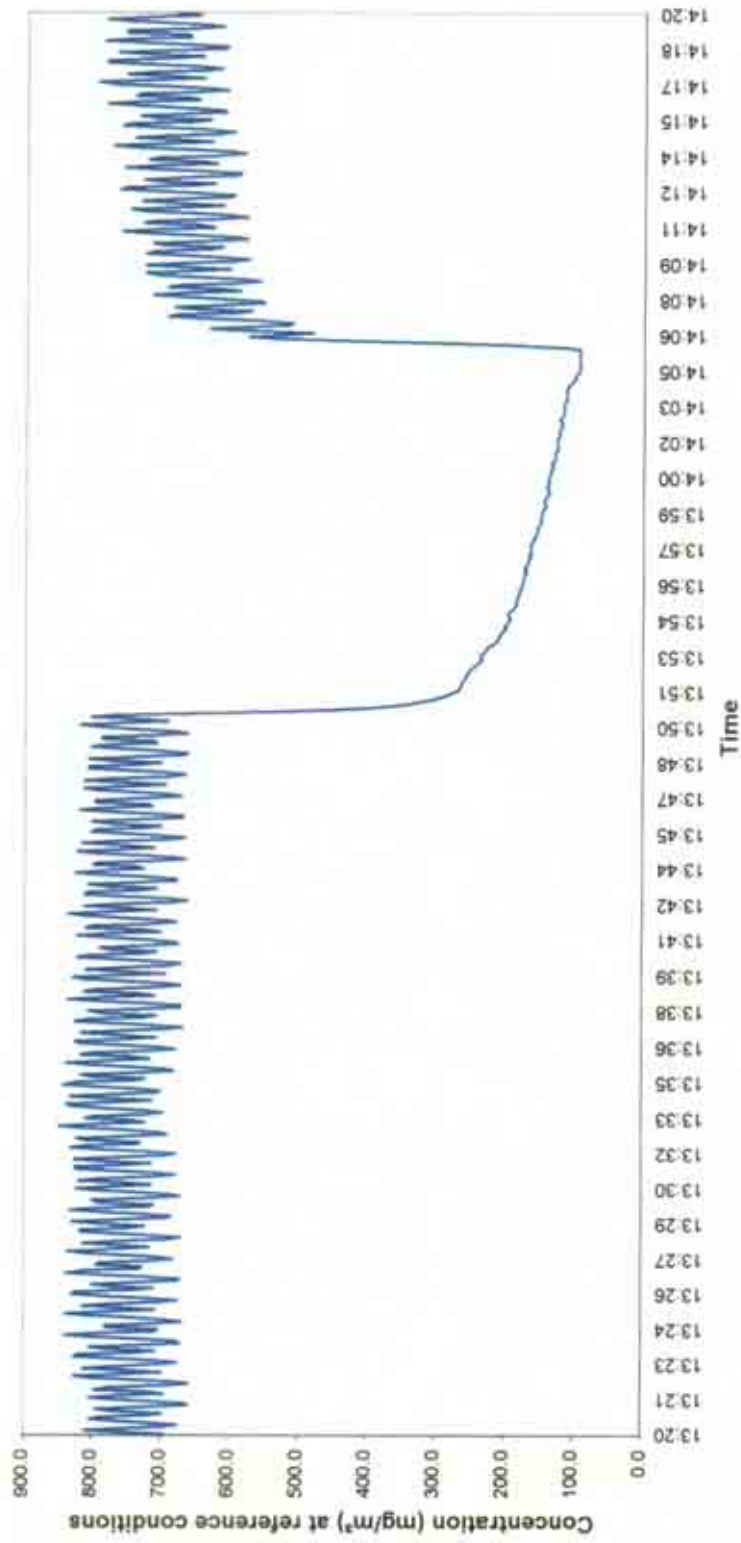


Average Run Time		Volatile Organic Compound (ppm)		Volatile Organic Compound (mg/m³)	
		Mean	Max	Mean	Min
10:01	to	470.25	612.00	755.77	540.00
10:31	to	466.70	596.00	750.06	556.07

VMC 3 Polyester Automatic Cell 1 - VOC Monitoring					
Date	Time	VOC mg/m <sup>3</sup>	Date	Time	VOC mg/m <sup>3</sup>
09-Jun-05	10:01:07	765.00	09-Jun-05	10:50:07	803.57
09-Jun-05	10:02:07	665.36	09-Jun-05	10:51:07	826.07
09-Jun-05	10:03:07	581.79	09-Jun-05	10:52:07	694.29
09-Jun-05	10:04:07	687.86	09-Jun-05	10:53:07	588.21
09-Jun-05	10:05:07	826.07	09-Jun-05	10:54:07	729.64
09-Jun-05	10:06:07	806.79	09-Jun-05	10:55:07	784.29
09-Jun-05	10:07:07	726.43	09-Jun-05	10:56:07	810.00
09-Jun-05	10:08:07	829.29	09-Jun-05	10:57:07	793.93
09-Jun-05	10:09:07	771.43	09-Jun-05	10:58:07	745.71
09-Jun-05	10:10:07	790.71	09-Jun-05	10:59:07	568.93
09-Jun-05	10:11:07	867.86	09-Jun-05	11:00:07	678.21
09-Jun-05	10:12:07	797.14	09-Jun-05	11:01:07	758.57
09-Jun-05	10:13:07	793.93			
09-Jun-05	10:14:07	748.93			
09-Jun-05	10:15:07	572.14			
09-Jun-05	10:16:07	665.36			
09-Jun-05	10:17:07	765.00			
09-Jun-05	10:18:07	803.57			
09-Jun-05	10:19:07	761.79			
09-Jun-05	10:20:07	774.64			
09-Jun-05	10:21:07	585.00			
09-Jun-05	10:22:07	636.43			
09-Jun-05	10:23:07	736.07			
09-Jun-05	10:24:07	861.43			
09-Jun-05	10:25:07	774.64			
09-Jun-05	10:26:07	707.14			
09-Jun-05	10:27:07	803.57			
09-Jun-05	10:28:07	761.79			
09-Jun-05	10:29:07	861.43			
09-Jun-05	10:30:07	874.29			
09-Jun-05	10:31:07	806.79			
09-Jun-05	10:32:07	826.07			
09-Jun-05	10:33:07	691.07			
09-Jun-05	10:34:07	575.36			
09-Jun-05	10:35:07	700.71			
09-Jun-05	10:36:07	768.21			
09-Jun-05	10:37:07	819.64			
09-Jun-05	10:38:07	803.57			
09-Jun-05	10:39:07	765.00			
09-Jun-05	10:40:07	575.36			
09-Jun-05	10:41:07	658.93			
09-Jun-05	10:42:07	745.71			
09-Jun-05	10:43:07	864.64			
09-Jun-05	10:44:07	755.36			
09-Jun-05	10:45:07	742.50			
09-Jun-05	10:46:07	803.57			
09-Jun-05	10:47:07	765.00			
09-Jun-05	10:48:07	887.14			
09-Jun-05	10:49:07	874.29			
			Average		752.84



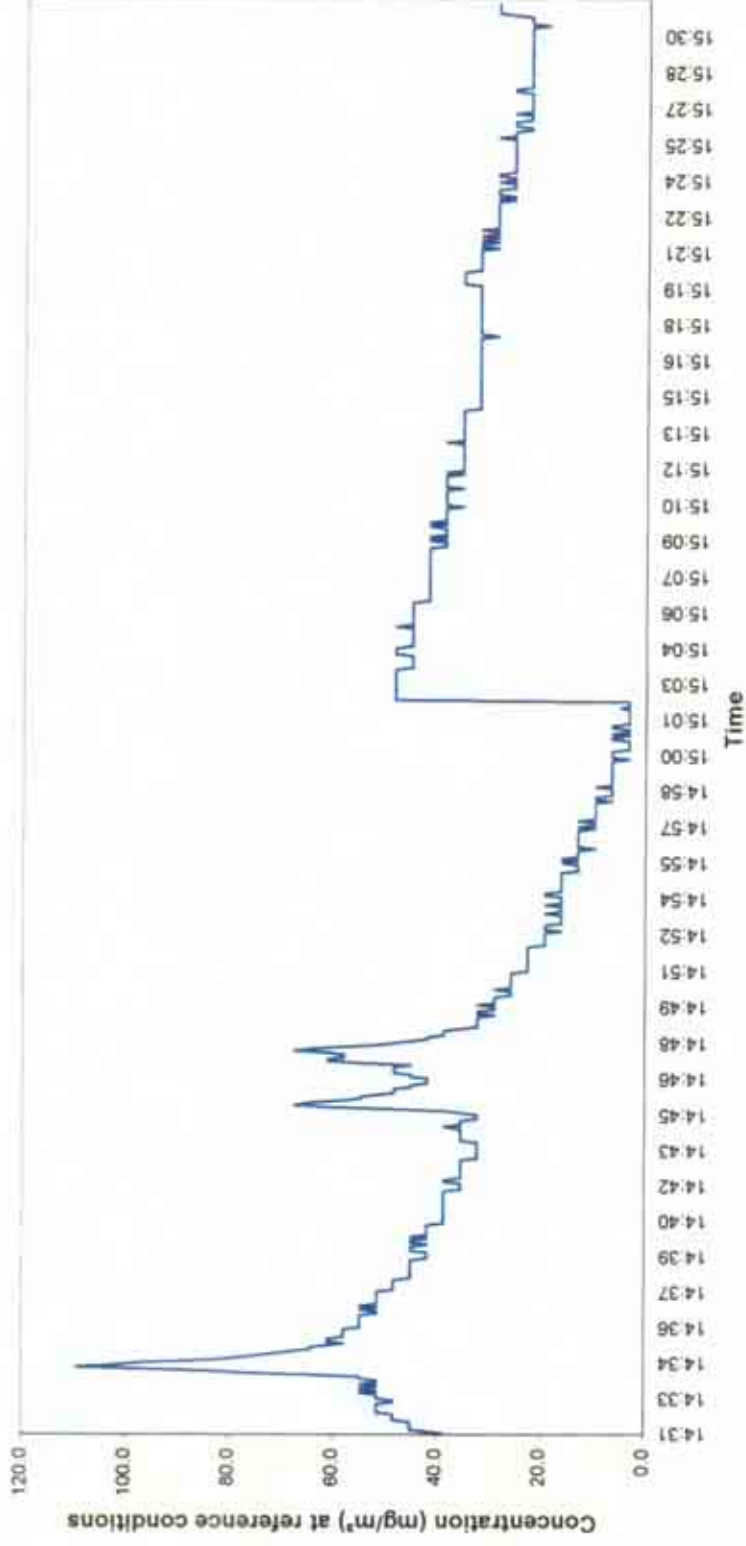
VMC 3 Polyester Automatic Cell 2 - VOC Monitoring (08/06/05)



Average Run Time		Volatile Organic Compound (ppm)		Volatile Organic Compound (mg/m³)				
		Mean	Max	Mean	Min			
13:20	to	13:50	467.55	528.00	410.00	751.42	848.57	658.93
13:50	to	14:20	255.81	510.00	58.00	411.13	819.64	93.21

VMC 3 Polyester Automatic Cell 2 - VOC Monitoring					
Date	Time	VOC mg/m <sup>3</sup>	Date	Time	VOC mg/m <sup>3</sup>
08-Jun-05	13:20:29	694.29	08-Jun-05	14:09:29	703.93
08-Jun-05	13:21:29	774.64	08-Jun-05	14:10:29	713.57
08-Jun-05	13:22:29	777.86	08-Jun-05	14:11:29	626.79
08-Jun-05	13:23:29	697.50	08-Jun-05	14:12:29	671.79
08-Jun-05	13:24:29	678.21	08-Jun-05	14:13:29	729.64
08-Jun-05	13:25:29	748.93	08-Jun-05	14:14:29	623.57
08-Jun-05	13:26:29	829.29	08-Jun-05	14:15:29	597.86
08-Jun-05	13:27:29	810.00	08-Jun-05	14:16:29	671.79
08-Jun-05	13:28:29	716.79	08-Jun-05	14:17:29	768.21
08-Jun-05	13:29:29	793.93	08-Jun-05	14:18:29	784.29
08-Jun-05	13:30:29	800.36	08-Jun-05	14:19:29	662.14
08-Jun-05	13:31:29	710.36	08-Jun-05	14:20:29	681.43
08-Jun-05	13:32:29	678.21			
08-Jun-05	13:33:29	752.14		Average	580.98
08-Jun-05	13:34:29	829.29			
08-Jun-05	13:35:29	822.86			
08-Jun-05	13:36:29	716.79			
08-Jun-05	13:37:29	771.43			
08-Jun-05	13:38:29	806.79			
08-Jun-05	13:39:29	710.36			
08-Jun-05	13:40:29	671.79			
08-Jun-05	13:41:29	732.86			
08-Jun-05	13:42:29	810.00			
08-Jun-05	13:43:29	806.79			
08-Jun-05	13:44:29	726.43			
08-Jun-05	13:45:29	761.79			
08-Jun-05	13:46:29	803.57			
08-Jun-05	13:47:29	716.79			
08-Jun-05	13:48:29	665.36			
08-Jun-05	13:49:29	707.14			
08-Jun-05	13:50:29	790.71			
08-Jun-05	13:51:29	340.71			
08-Jun-05	13:52:29	260.36			
08-Jun-05	13:53:29	234.64			
08-Jun-05	13:54:29	205.71			
08-Jun-05	13:55:29	189.64			
08-Jun-05	13:56:29	176.79			
08-Jun-05	13:57:29	167.14			
08-Jun-05	13:58:29	157.50			
08-Jun-05	13:59:29	147.86			
08-Jun-05	14:00:29	138.21			
08-Jun-05	14:01:29	131.79			
08-Jun-05	14:02:29	125.36			
08-Jun-05	14:03:29	122.14			
08-Jun-05	14:04:29	112.50			
08-Jun-05	14:05:29	93.21			
08-Jun-05	14:06:29	115.71			
08-Jun-05	14:07:29	511.07			
08-Jun-05	14:08:29	610.71			

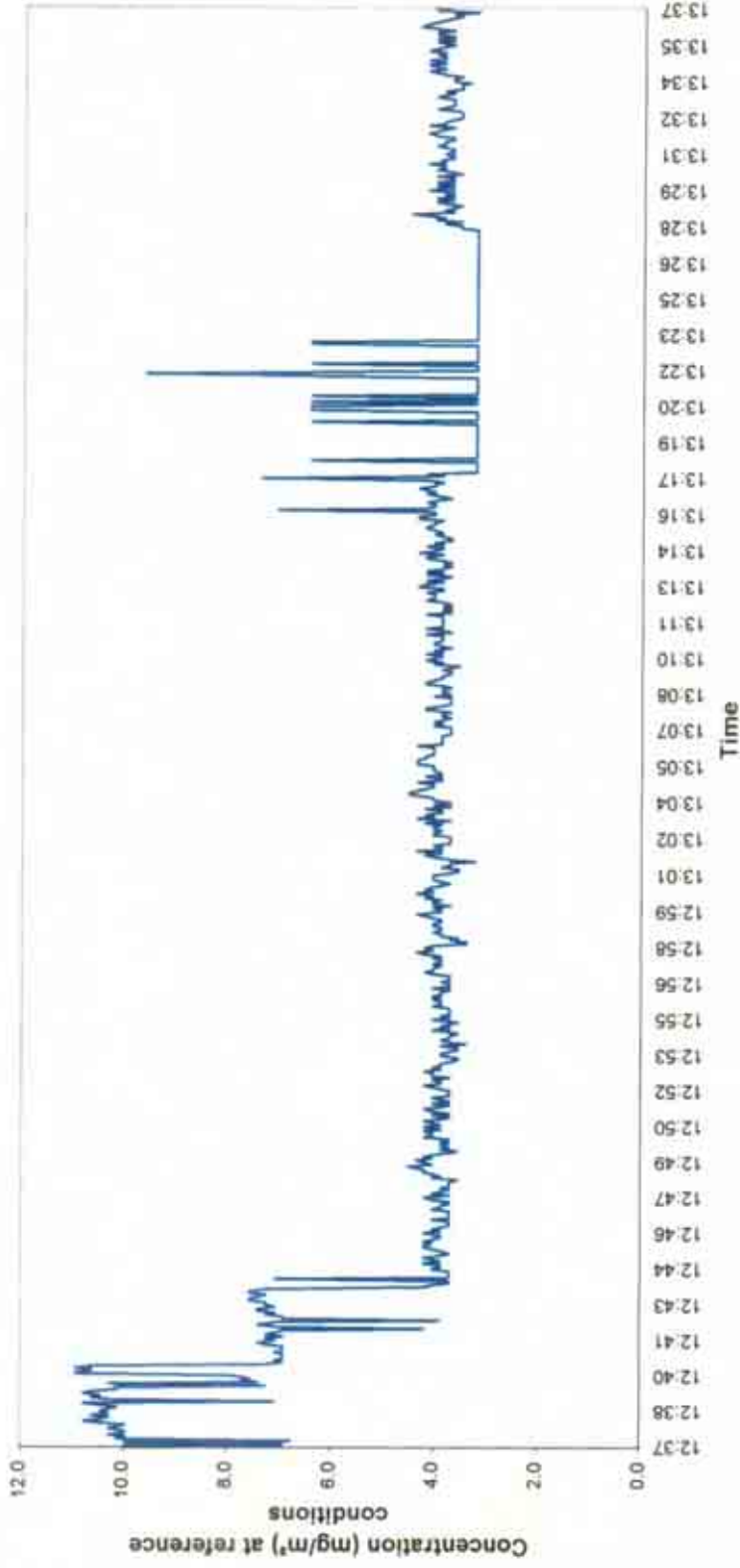
VMC 3 Polyester Automatic Cell 3 - VOC Monitoring (08/06/05)



Average Run Time		Volatile Organic Compound (ppm)		Volatile Organic Compound (mg/m³)	
		Mean	Max	Mean	Min
14:31	to	21.18	68.00	34.04	3.21
15:01	to	20.40	30.00	32.79	3.21

VMC 3 Polyester Automatic Cell 3 - VOC Monitoring					
Date	Time	VOC mg/m <sup>3</sup>	Date	Time	VOC mg/m <sup>3</sup>
08-Jun-05	14:31:48	38.57	08-Jun-05	15:20:48	32.14
08-Jun-05	14:32:48	51.43	08-Jun-05	15:21:48	32.14
08-Jun-05	14:33:48	51.43	08-Jun-05	15:22:48	28.93
08-Jun-05	14:34:48	96.43	08-Jun-05	15:23:48	28.93
08-Jun-05	14:35:48	61.07	08-Jun-05	15:24:48	25.71
08-Jun-05	14:36:48	54.64	08-Jun-05	15:25:48	25.71
08-Jun-05	14:37:48	51.43	08-Jun-05	15:26:48	22.50
08-Jun-05	14:38:48	45.00	08-Jun-05	15:27:48	22.50
08-Jun-05	14:39:48	41.79	08-Jun-05	15:28:48	22.50
08-Jun-05	14:40:48	38.57	08-Jun-05	15:29:48	22.50
08-Jun-05	14:41:48	38.57	08-Jun-05	15:30:48	22.50
08-Jun-05	14:42:48	35.36	00-Jan-00	00:00:00	0.00
08-Jun-05	14:43:48	32.14			
08-Jun-05	14:44:48	38.57			
08-Jun-05	14:45:48	64.29			
08-Jun-05	14:46:48	41.79			
08-Jun-05	14:47:48	57.86			
08-Jun-05	14:48:48	38.57			
08-Jun-05	14:49:48	28.93			
08-Jun-05	14:50:48	25.71			
08-Jun-05	14:51:48	22.50			
08-Jun-05	14:52:48	19.29			
08-Jun-05	14:53:48	16.07			
08-Jun-05	14:54:48	16.07			
08-Jun-05	14:55:48	16.07			
08-Jun-05	14:56:48	12.86			
08-Jun-05	14:57:48	9.64			
08-Jun-05	14:58:48	6.43			
08-Jun-05	14:59:48	6.43			
08-Jun-05	15:00:48	3.21			
08-Jun-05	15:01:48	3.21			
08-Jun-05	15:02:48	48.21			
08-Jun-05	15:03:48	48.21			
08-Jun-05	15:04:48	48.21			
08-Jun-05	15:05:48	45.00			
08-Jun-05	15:06:48	41.79			
08-Jun-05	15:07:48	41.79			
08-Jun-05	15:08:48	41.79			
08-Jun-05	15:09:48	38.57			
08-Jun-05	15:10:48	38.57			
08-Jun-05	15:11:48	38.57			
08-Jun-05	15:12:48	35.36			
08-Jun-05	15:13:48	35.36			
08-Jun-05	15:14:48	32.14			
08-Jun-05	15:15:48	32.14			
08-Jun-05	15:16:48	32.14			
08-Jun-05	15:17:48	28.93			
08-Jun-05	15:18:48	32.14			
08-Jun-05	15:19:48	32.14			
			Average		33.46

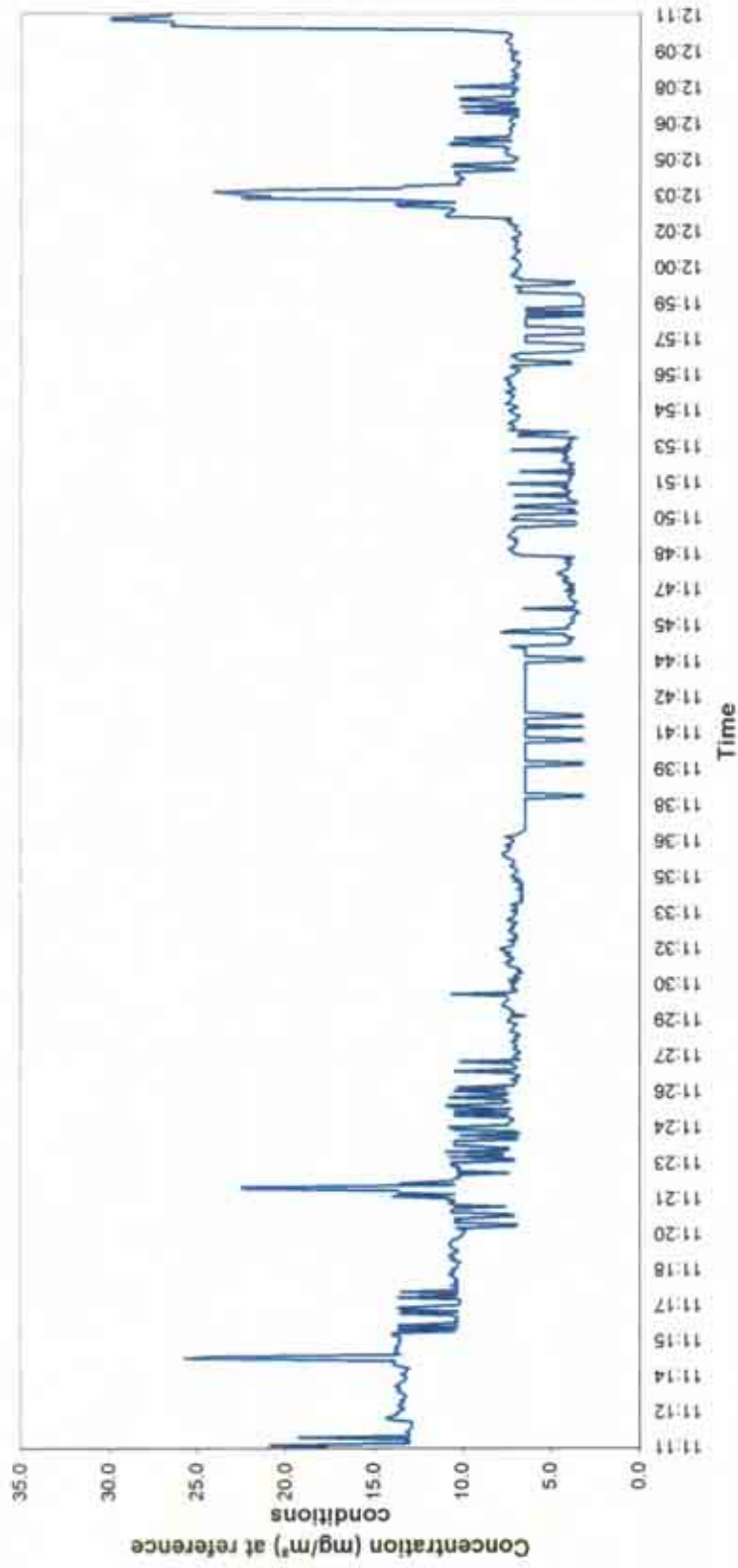
VMC 3 Manual Spray Booth 1 - VOC Monitoring (09/06/05)



Average Run Time		Volatile Organic Compound (ppm)		Volatile Organic Compound (mg/m³)	
		Mean	Max	Mean	Min
12:37	to	3.07	6.80	4.93	3.21
13:07	to	2.37	6.00	3.81	3.21

VMC 3 Manual Spray Booth 1 - VOC Monitoring					
Date	Time	VOC mg/m <sup>3</sup>	Date	Time	VOC mg/m <sup>3</sup>
09-Jun-05	12:37:17	9.96	09-Jun-05	13:26:17	3.21
09-Jun-05	12:38:17	10.45	09-Jun-05	13:27:17	3.21
09-Jun-05	12:39:17	10.29	09-Jun-05	13:28:17	3.54
09-Jun-05	12:40:17	7.88	09-Jun-05	13:29:17	4.02
09-Jun-05	12:41:17	7.07	09-Jun-05	13:30:17	3.70
09-Jun-05	12:42:17	4.18	09-Jun-05	13:31:17	3.86
09-Jun-05	12:43:17	7.23	09-Jun-05	13:32:17	3.86
09-Jun-05	12:44:17	3.70	09-Jun-05	13:33:17	3.70
09-Jun-05	12:45:17	4.18	09-Jun-05	13:34:17	3.70
09-Jun-05	12:46:17	4.18	09-Jun-05	13:35:17	3.86
09-Jun-05	12:47:17	4.02	09-Jun-05	13:36:17	4.02
09-Jun-05	12:48:17	3.70	09-Jun-05	13:37:17	4.02
09-Jun-05	12:49:17	4.18			
09-Jun-05	12:50:17	3.70		Average	4.37
09-Jun-05	12:51:17	4.02			
09-Jun-05	12:52:17	3.70			
09-Jun-05	12:53:17	4.02			
09-Jun-05	12:54:17	3.38			
09-Jun-05	12:55:17	4.02			
09-Jun-05	12:56:17	4.02			
09-Jun-05	12:57:17	4.18			
09-Jun-05	12:58:17	4.18			
09-Jun-05	12:59:17	4.02			
09-Jun-05	13:00:17	3.86			
09-Jun-05	13:01:17	4.02			
09-Jun-05	13:02:17	4.34			
09-Jun-05	13:03:17	4.02			
09-Jun-05	13:04:17	3.70			
09-Jun-05	13:05:17	3.86			
09-Jun-05	13:06:17	4.02			
09-Jun-05	13:07:17	3.70			
09-Jun-05	13:08:17	3.86			
09-Jun-05	13:09:17	4.18			
09-Jun-05	13:10:17	4.02			
09-Jun-05	13:11:17	4.18			
09-Jun-05	13:12:17	3.86			
09-Jun-05	13:13:17	4.34			
09-Jun-05	13:14:17	3.70			
09-Jun-05	13:15:17	3.70			
09-Jun-05	13:16:17	4.02			
09-Jun-05	13:17:17	4.18			
09-Jun-05	13:18:17	3.21			
09-Jun-05	13:19:17	3.21			
09-Jun-05	13:20:17	3.21			
09-Jun-05	13:21:17	3.21			
09-Jun-05	13:22:17	3.21			
09-Jun-05	13:23:17	3.21			
09-Jun-05	13:24:17	3.21			
09-Jun-05	13:25:17	3.21			

VMC 3 Manual Spray Booth 2 - VOC Monitoring (09/06/05)

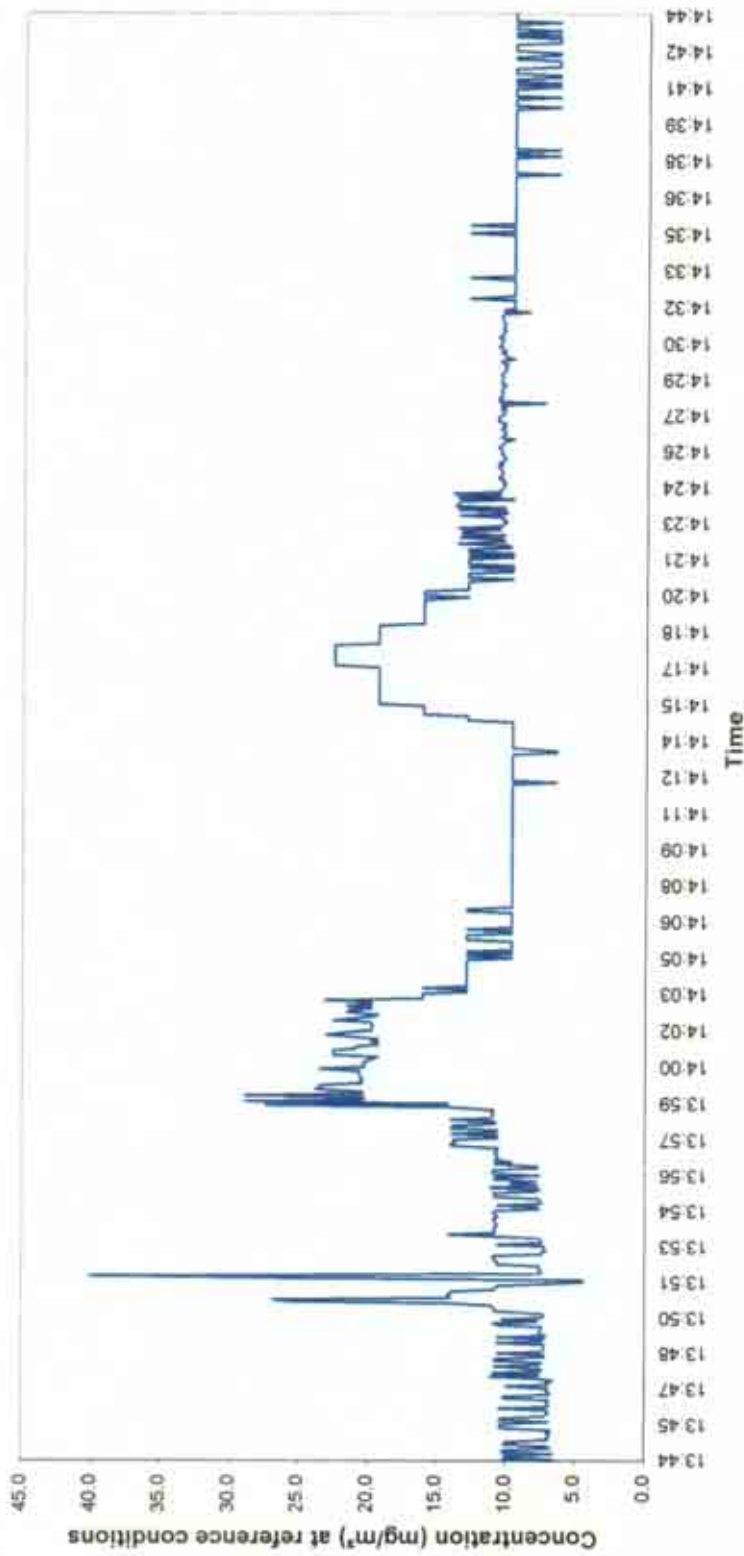


Average Run Time		Volatile Organic Compound (ppm)		Volatile Organic Compound (mg/m³)	
		Mean	Max	Mean	Max
11:11	to	11.41	16.00	9.19	25.71
11:41	to	12.11	18.60	7.00	29.89
			2.00		3.21
			2.00		3.21

VMC 3 Manual Spray Booth 2 - VOC Monitoring					
Date	Time	VOC mg/m <sup>3</sup>	Date	Time	VOC mg/m <sup>3</sup>
09-Jun-05	11:11:28	17.68	09-Jun-05	12:00:28	6.75
09-Jun-05	11:12:28	12.86	09-Jun-05	12:01:28	7.07
09-Jun-05	11:13:28	13.50	09-Jun-05	12:02:28	7.07
09-Jun-05	11:14:28	13.18	09-Jun-05	12:03:28	13.66
09-Jun-05	11:15:28	13.82	09-Jun-05	12:04:28	10.29
09-Jun-05	11:16:28	13.66	09-Jun-05	12:05:28	6.91
09-Jun-05	11:17:28	10.29	09-Jun-05	12:06:28	7.39
09-Jun-05	11:18:28	10.45	09-Jun-05	12:07:28	6.91
09-Jun-05	11:19:28	10.45	09-Jun-05	12:08:28	10.45
09-Jun-05	11:20:28	9.96	09-Jun-05	12:09:28	6.75
09-Jun-05	11:21:28	10.61	09-Jun-05	12:10:28	7.39
09-Jun-05	11:22:28	22.50	09-Jun-05	12:11:28	26.52
09-Jun-05	11:23:28	10.61			
09-Jun-05	11:24:28	6.91		Average	8.10
09-Jun-05	11:25:28	10.45			
09-Jun-05	11:26:28	10.45			
09-Jun-05	11:27:28	6.91			
09-Jun-05	11:28:28	7.07			
09-Jun-05	11:29:28	7.39			
09-Jun-05	11:30:28	7.55			
09-Jun-05	11:31:28	6.59			
09-Jun-05	11:32:28	7.88			
09-Jun-05	11:33:28	7.07			
09-Jun-05	11:34:28	6.59			
09-Jun-05	11:35:28	7.23			
09-Jun-05	11:36:28	7.71			
09-Jun-05	11:37:28	6.43			
09-Jun-05	11:38:28	6.43			
09-Jun-05	11:39:28	6.43			
09-Jun-05	11:40:28	6.43			
09-Jun-05	11:41:28	6.43			
09-Jun-05	11:42:28	6.43			
09-Jun-05	11:43:28	6.43			
09-Jun-05	11:44:28	3.21			
09-Jun-05	11:45:28	4.18			
09-Jun-05	11:46:28	3.38			
09-Jun-05	11:47:28	3.70			
09-Jun-05	11:48:28	3.86			
09-Jun-05	11:49:28	7.07			
09-Jun-05	11:50:28	7.07			
09-Jun-05	11:51:28	4.02			
09-Jun-05	11:52:28	3.70			
09-Jun-05	11:53:28	4.18			
09-Jun-05	11:54:28	7.23			
09-Jun-05	11:55:28	7.23			
09-Jun-05	11:56:28	7.07			
09-Jun-05	11:57:28	3.21			
09-Jun-05	11:58:28	6.43			
09-Jun-05	11:59:28	3.21			



VMC 3 PU Automatic Spray - VOC (09/06/05)



Average Run Time		Volatile Organic Compound (ppm)		Volatile Organic Compound (mg/m³)	
		Mean	Max	Mean	Min
13:44	to	14:14	24.90	11.70	40.02
14:14	to	14:44	14.00	11.55	22.50
			2.70		4.34
			4.00		6.43

VMC 3 PU Automatic Spray - VOC					
Date	Time	VOC mg/m <sup>3</sup>	Date	Time	VOC mg/m <sup>3</sup>
09-Jun-05	13:44:06	6.59	09-Jun-05	14:33:06	9.64
09-Jun-05	13:45:06	6.91	09-Jun-05	14:34:06	9.64
09-Jun-05	13:46:06	6.91	09-Jun-05	14:35:06	12.86
09-Jun-05	13:47:06	6.91	09-Jun-05	14:36:06	9.64
09-Jun-05	13:48:06	7.55	09-Jun-05	14:37:06	9.64
09-Jun-05	13:49:06	7.39	09-Jun-05	14:38:06	9.64
09-Jun-05	13:50:06	7.39	09-Jun-05	14:39:06	9.64
09-Jun-05	13:51:06	14.14	09-Jun-05	14:40:06	9.64
09-Jun-05	13:52:06	7.55	09-Jun-05	14:41:06	6.43
09-Jun-05	13:53:06	7.23	09-Jun-05	14:42:06	6.43
09-Jun-05	13:54:06	10.77	09-Jun-05	14:43:06	6.43
09-Jun-05	13:55:06	7.55	09-Jun-05	14:44:06	9.64
09-Jun-05	13:56:06	7.55			
09-Jun-05	13:57:06	10.77	Average		11.63
09-Jun-05	13:58:06	13.98			
09-Jun-05	13:59:06	14.14			
09-Jun-05	14:00:06	20.41			
09-Jun-05	14:01:06	22.50			
09-Jun-05	14:02:06	19.77			
09-Jun-05	14:03:06	21.54			
09-Jun-05	14:04:06	12.86			
09-Jun-05	14:05:06	9.64			
09-Jun-05	14:06:06	9.64			
09-Jun-05	14:07:06	12.86			
09-Jun-05	14:08:06	9.64			
09-Jun-05	14:09:06	9.64			
09-Jun-05	14:10:06	9.64			
09-Jun-05	14:11:06	9.64			
09-Jun-05	14:12:06	9.64			
09-Jun-05	14:13:06	9.64			
09-Jun-05	14:14:06	9.64			
09-Jun-05	14:15:06	12.86			
09-Jun-05	14:16:06	19.29			
09-Jun-05	14:17:06	19.29			
09-Jun-05	14:18:06	19.29			
09-Jun-05	14:19:06	16.07			
09-Jun-05	14:20:06	16.07			
09-Jun-05	14:21:06	9.64			
09-Jun-05	14:22:06	9.80			
09-Jun-05	14:23:06	10.29			
09-Jun-05	14:24:06	9.64			
09-Jun-05	14:25:06	10.45			
09-Jun-05	14:26:06	10.45			
09-Jun-05	14:27:06	10.29			
09-Jun-05	14:28:06	7.39			
09-Jun-05	14:29:06	10.45			
09-Jun-05	14:30:06	10.29			
09-Jun-05	14:31:06	10.29			
09-Jun-05	14:32:06	9.64			

## APPENDIX 3

### Velocity raw information

# Raw Data: PARTICULATE EMISSIONS & VELOCITY PROFILE

Client	Jaguar Cars Ltd				
Site Address	Castle Bromwich				
Job Number	P-RED05-039/EB/R1/Rev0				
Date	10/06/2005	Port Depth (cm)	4		
Operator(s)	Vicki Gavin & Philip Butler				
Isokinetic Sampling Information					
Stack Reference	VMC1 UV Spray	Isokinetic Sampling Method			ISO 9096
Number of Stacks	1	Samples per Axis			2
Configuration (Round / Rectangular)	Rectangular	Stack Area (m2)			0.270
Dimensions Port Side (mtrs)	0.52	1	13.00		
Dimensions other (mtrs)	0.52	2	39.00		
Number of Sample Ports	2	3	n/a		
Number of Samples per Axis / Port	2	4	n/a		
Nozzle Diameter (mm)	8.0			1 Axis	2 Axis
Nozzle Area (mm²)	50.272	Average Isokinetic Flow Rate (ltrs/min)		14.81	15.68
Duct Survey					
Pitot Coefficient	1.00	Pitot Calibration Date		30/01/06	
Position No.	Distance (cms)	Axis 1 (cm H2O)	Temperature (C)	Axis 2 (cm H2O)	Temperature (C)
1	6.5	0.2	17.4	0.17	17.2
2	13.0	0.16	17.3	0.18	17.3
3	19.5	0.15	17.4	0.15	17.3
4	26.0	0.14	17.4	0.16	17.2
5	32.5	0.11	17.4	0.14	17.2
6	39.0	0.12	17.3	0.15	17.3
7	45.5	0.11	17.4	0.16	17.2
				Atmos. Pressure (mbars)	
				1020	
				Static Pressure (cm H2O)	
				-0.07	
				1 Axis	
				2 Axis	
				Average Velocity Flow (m/s)	
				5.06	
				Average Volume Flow (Nm³/s)	
				1.37	
				Volume (m³/s)	
				1.33	
				1.41	
				Velocity of flow (m/s)	
				4.91	
				5.20	
Averages		0.14	17.4	0.16	17.2
				Reduced Exit Velocity (m/s)	
				n/a	
				n/a	
Mean Flue Gas Temp (ln K) $T_p = ((\text{Mean } T_1 + \text{Mean } T_2)/2) - 273$ =				290.31	
Permitted Range of gas temperature readings (C) = $(0.85T_p - 273)$ to $(1.05T_p - 273)$ =				2.78 to 31.82	
Highest Pitot Static Reading (either sampling line) (cm H2O) =				0.2	
Lowest Pitot Static Reading (either sampling line) (cm H2O) =				0.1	
Ratio Highest/Lowest (Max permitted = 9:1)				1.82 : 1	
On site Checklist				Instrument Serial No:	
Manometer Leak Check	ok			Manometer	RED 0095
Range of Gas Temps	ok			Temp Indicator	RED 0096
Leak Check (l/min)	<0.1			Thermocouple	93100443
Leak Check 2% Vol (l/min)	0.30			Pitot Tube	RED 0136
Swirl Test (<15°)	ok				

dH= 51.04  
K Factor = 9.90

Raw Data: VELOCITY PROFILE

Client	Jaguar Cars Ltd				
Site Address	Browns Lane, Coventry				
Job Number	P-RED05-039/EB/R1/Rev0				
Date	08/06/2005	Port Depth (cm)			
Operator(s)	Vicki Gavin & Philip Butler				
<b>Isokinetic Sampling Information</b>					
Stack Reference	VMC 3 Polyester Auto Cell 2	Isokinetic Sampling Method			ISO 9096
Number of Stacks	1	Samples per Axis			2
Configuration (Round / Rectangular)	1 Round	Stack Area (m2)			0.312
Dimensions (mtrs)	0.63	Isokinetic Sample Points (cms)			
Outlet Diameter (If applicable) (mtrs/sec)		1	9.20	5	N/A
Number of Sample Ports	2	2	53.80	6	N/A
Number of Samples per Axis / Port	2	3	N/A	7	N/A
Nozzle Diameter (mm)	6.0	4	N/A	8	N/A
Nozzle Area (mm <sup>2</sup> )	28.278	Average Isokinetic Flow Rate (ltrs/min)		1 Axis	2 Axis
				13.43	15.28
<b>Duct Survey</b>					
Pitot Coefficient	0.84	Pitot Calibration Date		31/10/05	
Position No.	Distance (cms)	Axis 1 (cm H2O)	Temperature (C)	Axis 2 (cm H2O)	Temperature (C)
1	4.1	0.31	20.0	0.24	20.0
2	9.5	0.29	20.0	0.69	20.0
3	15.8	0.45	20.0	0.91	20.0
4	22.1	0.55	20.0	0.74	20.0
5	28.4	0.66	20.0	0.76	20.0
6	34.7	0.68	20.0	0.68	20.0
7	41.0	0.64	20.0	0.61	20.0
8	47.3	0.58	20.0	0.58	20.0
9	53.6	0.51	20.0	0.73	20.0
10	59.9	0.49	20.0	0.74	20.0
Averages		0.52	20.0	0.67	20.0
				Atmos. Pressure (mbars)	
				1020	
				Static Pressure (cm H2O)	
				-0.29	
				1 Axis	
				2 Axis	
				Average Velocity Flow (m/s)	
				8.46	
				Average Volume Flow (Nm <sup>3</sup> /s)	
				2.64	
				Volume (m <sup>3</sup> /s)	
				2.47	
				2.81	
				Velocity of flow (m/s)	
				7.92	
				9.01	
				Reduced Exit Velocity (m/s)	
				N/A	
				N/A	
Mean Flue Gas Temp (In K) $T_p = ((\text{Mean } T_1 + \text{Mean } T_2)/2 + 273) =$					
293.00					
Permitted Range of gas temperature readings (C) = $(0.895T_p - 273)$ to $(1.005T_p - 273) =$					
18.54 to 21.47					
Highest Pitot Static Reading (either sampling line) (cm H2O) =					
0.8					
Lowest Pitot Static Reading (either sampling line) (cm H2O) =					
0.2					
Ratio Highest/Lowest (Max permitted = 8:1)					
3.78 : 1					
<b>On site Checklist</b>					
Manometer Leak Check	ok	Instrument		Serial No:	
Range of Gas Temps	ok	Manometer	RED 0095		
Leak Check (l/min)	<0.10	Temp Indicator	RED 0096		
Leak Check 2% Vol (l/min)	0.27	Thermocouple	83100443		
Swirl Test (<15°)	ok	Pitot Tube	RED 0138		

dHe = 51.04  
K Factor = 3.10

**Raw Data: VELOCITY PROFILE**

Client		Jaguar Cars Ltd					
Site Address		Browns Lane, Coventry					
Job Number		P-RED05-039/EB/R1/Rev0					
Date		08/06/2005		Port Depth (cm)			
Operator(s)		Vicki Gavin & Philip Butler					
<b>Isokinetic Sampling Information</b>							
Stack Reference		VMC 3 Polyester Auto Cell 3		Isokinetic Sampling Method		ISO 9096	
Number of Stacks		1		Samples per Axis		2	
Configuration (Round / Rectangular)		Round		Stack Area (m2)		0.312	
Dimensions (mtrs)		0.63		Isokinetic Sample Points (cms)			
Outlet Diameter (if applicable) (mtrs/sec)				1	9.20	5	N/A
Number of Sample Ports		2		2	53.80	6	N/A
Number of Samples per Axis / Port		2		3	N/A	7	N/A
Nozzle Diameter (mm)		8.0		4	N/A	8	N/A
Nozzle Area (mm <sup>2</sup> )		50.272		Average Isokinetic Flow Rate (ltrs/mln)		19.71	19.32
<b>Duct Survey</b>							
Pitot Coefficient		0.84		Pitot Calibration Date		31/10/05	
Position No.		Distance (cms)		Axis 1 (cm H2O)		Temperature (C)	
				Axis 2 (cm H2O)		Temperature (C)	
						Atmos. Pressure (mbars)	
1		4.1		0.21		18.0	
2		9.5		0.39		18.0	
3		15.8		0.4		18.0	
4		22.1		0.27		18.0	
5		28.4		0.35		18.0	
6		34.7		0.29		18.0	
7		41.0		0.33		18.0	
8		47.3		0.4		18.0	
9		53.6		0.48		18.0	
10		59.9		0.42		18.0	
Averages				0.35		18.0	
				0.34		18.0	
						1020	
						Static Pressure (cm H2O)	
						-0.19	
						1 Axis 2 Axis	
						Average Velocity Flow (m/s)	
						6.47	
						Average Volume Flow (Nm <sup>3</sup> /s)	
						2.02	
						Volume (m <sup>3</sup> /s)	
						2.04 2.00	
						Velocity of flow (m/s)	
						6.53 6.40	
						Reduced Exit Velocity (m/s)	
						N/A N/A	
Mean Flue Gas Temp (ln K) $T_p = ((\text{Mean } T_1 + \text{Mean } T_2)/2 + 273) =$ 291.00							
Permitted Range of gas temperature readings (C) = $(0.995T_p - 273)$ to $(1.005T_p - 273) =$ 18.65 to 18.46							
Highest Pitot Static Reading (either sampling line) (cm H2O) = 0.5							
Lowest Pitot Static Reading (either sampling line) (cm H2O) = 0.2							
Ratio Highest/Lowest (Max permitted = 9:1) 3.00 : 1							
<b>On site Checklist</b>							
Manometer Leak Check		ok		Instrument		Serial No:	
Range of Gas Temps		ok		Manometer		RED 0095	
Leak Check (l/min)		<0.10		Temp Indicator		RED 0096	
Leak Check 2% Vol (l/min)		0.38		Thermocouple		83100443	
Swirl Test (<15°)		ok		Pitot Tube		RED 0136	

$dH = 51.04$   
**K Factor = 9.88**

# Raw Data: VELOCITY PROFILE

Client	Jaguar Cars Ltd					
Site Address	Browns Lane, Coventry					
Job Number	P-RED05-039/EB/R1/Rev0					
Date	09/06/2005	Port Depth (cm)				
Operator(s)	Vicki Gavin & Philip Butler					
<b>Isokinetic Sampling Information</b>						
Stack Reference	VMC 3 PU Automatic Spray	Isokinetic Sampling Method				ISO 9096
Number of Stacks	1	Samples per Axis				2
Configuration (Round / Rectangular)	Round	Stack Area (m <sup>2</sup> )				0.385
Dimensions (mtrs)	0.70	Isokinetic Sample Points (cms)				
Outlet Diameter (if applicable) (mtrs/sec)		1	10.22	5	N/A	
Number of Sample Ports	2	2	59.78	6	N/A	
Number of Samples per Axis / Port	2	3	N/A	7	N/A	
Nozzle Diameter (mm)	6.0	4	N/A	8	N/A	
Nozzle Area (mm <sup>2</sup> )	28.278	Average Isokinetic Flow Rate (ltrs/min)		17.56	17.28	
<b>Duct Survey</b>						
Pitot Coefficient	0.84	Pitot Calibration Date		31/10/05		Atmos. Pressure (mbars)
Position No.	Distance (cms)	Axis 1 (cm H <sub>2</sub> O)	Temperature (C)	Axis 2 (cm H <sub>2</sub> O)	Temperature (C)	1025
1	4.6	0.88	24.0	0.94	24.0	Static Pressure (cm H <sub>2</sub> O)
2	10.5	0.9	24.0	0.95	24.0	0.16
3	17.5	0.93	24.0	0.88	24.0	1 Axis
4	24.5	0.91	24.0	0.83	24.0	2 Axis
5	31.5	0.88	24.0	0.85	24.0	Average Velocity Flow (m/s)
6	38.5	0.82	24.0	0.83	24.0	10.27
7	45.5	0.84	24.0	0.74	24.0	Average Volume Flow (Nm <sup>3</sup> /s)
8	52.5	0.87	24.0	0.79	24.0	3.95
9	59.5	0.81	24.0	0.8	24.0	Volume (m <sup>3</sup> /s)
10	66.5	0.86	24.0	0.82	24.0	3.98
Averages		0.87	24.0	0.84	24.0	3.92
						Velocity of flow (m/s)
						10.35
						10.19
						Reduced Exit Velocity (m/s)
						N/A
						N/A
Mean Flue Gas Temp (In K) $T_p = ((\text{Mean } T_1 + \text{Mean } T_2)/2) + 273$ =						297.00
Permitted Range of gas temperature readings (C) = $(0.995T_p - 273)$ to $(1.005T_p - 273)$ =						22.52 to 25.48
Highest Pitot Static Reading (either sampling line) (cm H <sub>2</sub> O) =						1.0
Lowest Pitot Static Reading (either sampling line) (cm H <sub>2</sub> O) =						0.7
Ratio Highest/Lowest (Max permitted = 8:1)						1.28 : 1
<b>On site Checklist</b>						
Manometer Leak Check	ok	Instrument		Serial No:		
Range of Gas Temps	ok	Manometer		RED 0095		
Leak Check (l/min)	<0.10	Temp Indicator		RED 0096		
Leak Check 2% Vol (l/min)	0.35	Thermocouple		83100443		
Swirl Test (<15°)	ok	Pitot Tube		RED 0136		

$dH = 51.04$   
 K Factor = 3.06

**Raw Data: VELOCITY PROFILE**

Client	Jaguar Cars Ltd					
Site Address	Browns Lane, Coventry					
Job Number	P-RED05-039/EB/R1/Rev0					
Date	09/06/2005	Port Depth (cm)				
Operator(s)	Vicki Gavin & Philip Butler					
<b>Isokinetic Sampling Information</b>						
Stack Reference	VMC 3 Manual Booth 1	Isokinetic Sampling Method			ISO 9096	
Number of Stacks	1	Samples per Axis			4	
Configuration (Round / Rectangular)	Round	Stack Area (m2)			0.454	
Dimensions (mtrs)	0.76	Isokinetic Sample Points (cms)				
Outlet Diameter (if applicable) (mtrs/sec)		1	5.09	5	N/A	
Number of Sample Ports	2	2	19.00	6	N/A	
Number of Samples per Axis / Port	4	3	57.00	7	N/A	
Nozzle Diameter (mm)	6.0	4	70.91	8	N/A	
Nozzle Area (mm <sup>2</sup> )	28.278	Average Isokinetic Flow Rate (ltrs/min)		1 Axis	2 Axis	
				13.93	13.52	
<b>Duct Survey</b>						
Pitot Coefficient	0.84	Pitot Calibration Date		31/10/05		Atmos. Pressure (mbars)
Position No.	Distance (cms)	Axis 1 (cm H2O)	Temperature (C)	Axis 2 (cm H2O)	Temperature (C)	1025
1	4.9	0.46	24.0	0.5	24.0	Static Pressure (cm H2O)
2	11.4	0.45	24.0	0.44	24.0	0.14
3	19.0	0.58	24.0	0.55	24.0	1 Axis
4	26.6	0.64	24.0	0.58	24.0	2 Axis
5	34.2	0.64	24.0	0.56	24.0	Average Velocity Flow (m/s)
6	41.8	0.58	24.0	0.47	24.0	8.09
7	49.4	0.59	24.0	0.49	24.0	Average Volume Flow (Nm <sup>3</sup> /s)
8	57.0	0.5	24.0	0.5	24.0	3.67
9	64.6	0.53	24.0	0.49	24.0	Volume (m <sup>3</sup> /s)
10	72.2	0.51	24.0	0.58	24.0	3.73
Averages		0.55	24.0	0.52	24.0	3.61
						Velocity of flow (m/s)
						8.21
						7.97
						Reduced Exit Velocity (m/s)
						N/A
						N/A
Mean Flue Gas Temp (ln K) $T_p = ((\text{Mean } T_1 + \text{Mean } T_2)/2 + 273) =$				287.00		
Permitted Range of gas temperature readings (C) = $(0.995T_p - 273)$ to $(1.005T_p - 273) =$				22.52 to 25.49		
Highest Pitot Static Reading (either sampling line) (cm H2O) =				0.6		
Lowest Pitot Static Reading (either sampling line) (cm H2O) =				0.4		
Ratio Highest/Lowest (Max permitted = 9:1)				1.45 : 1		
<b>On site Checklist</b>						
Manometer Leak Check	ok	Instrument		Serial No:		
Range of Gas Temps	ok	Manometer	RED 0095			
Leak Check (l/min)	<0.10	Temp Indicator	RED 0096			
Leak Check 2% Vol (l/min)	0.28	Thermocouple	93100443			
Swirl Test (<15°)	ok	Pitot Tube	RED 0136			

$dH = 51.04$   
 K Factor = 3.06



Raw Data: VELOCITY PROFILE

Client		Jaguar Cars Ltd					
Site Address		Browns Lane, Coventry					
Job Number		P-RED05-039/EB/R1/Rev0					
Date		09/06/2005			Port Depth (cm)		
Operator(s)		Vicki Gavin & Phillip Butler					
<b>Isokinetic Sampling Information</b>							
Stack Reference		VMC 3 Manual Booth 2		Isokinetic Sampling Method			ISO 9096
Number of Stacks		1		Samples per Axis			4
Configuration (Round / Rectangular)		Round		Stack Area (m2)			0.454
Dimensions (mtrs)		0.76		Isokinetic Sample Points (cms)			
Outlet Diameter (if applicable) (mtrs/sec)				1	5.09	5	N/A
Number of Sample Ports		2		2	19.00	6	N/A
Number of Samples per Axis / Port		4		3	57.00	7	N/A
Nozzle Diameter (mm)		6.0		4	70.91	8	N/A
Nozzle Area (mm²)		28.278		Average Isokinetic Flow Rate (ltrs/min)		1 Axis	2 Axis
						13.36	13.13
<b>Duct Survey</b>							
Pitot Coefficient		0.84		Pitot Calibration Date		31/10/05	
Position No.		Distance (cms)		Axis 1 (cm H2O)		Temperature (C)	
1		4.9		0.53		24.0	
2		11.4		0.55		24.0	
3		19.0		0.58		24.0	
4		26.6		0.57		24.0	
5		34.2		0.51		24.0	
6		41.8		0.53		24.0	
7		49.4		0.46		24.0	
8		57.0		0.44		24.0	
9		64.6		0.42		24.0	
10		72.2		0.45		24.0	
Averages				0.50		24.0	
						Reduced Exit Velocity (m/s)	
						N/A	
						N/A	
Mean Flue Gas Temp (ln K) $T_p = ((\text{Mean } T_1 + \text{Mean } T_2)/2 + 273) =$				287.00			
Permitted Range of gas temperature readings (C) = $(0.895T_p - 273)$ to $(1.005T_p - 273) =$				22.52 to 25.48			
Highest Pitot Static Reading (either sampling line) (cm H2O) =				0.6			
Lowest Pitot Static Reading (either sampling line) (cm H2O) =				0.3			
Ratio Highest/Lowest (Max permitted = 8:1)				1.76 : 1			
<b>On site Checklist</b>							
Manometer Leak Check		ok		Instrument		Serial No:	
Range of Gas Temps		ok		Manometer		RED 0095	
Leak Check (l/min)		<0.10		Temp Indicator		RED 0096	
Leak Check 2% Vol (l/min)		0.27		Thermocouple		83100443	
Swirl Test (<15°)		ok		Pitot Tube		RED 0136	

$dH = 51.04$   
 K Factor = 3.06

# APPENDIX 4

## Isocyanate Results

# CERTIFICATE OF SAMPLING AND ANALYSIS RESULTS

<b>Client</b>	Jaguar Cars Ltd
<b>Site Address</b>	Browns Lane, Coventry
<b>Job Number</b>	P-RED05-039/EBR/1/Rev0
<b>Date</b>	8th and 9th June 2005
<b>Operator(s)</b>	Philip Buder & Vicki Gavin

Pump Reference	Sample ID	Location / Process / Operator	Pump Flow (mls/min)			Sample Duration (mins)			Total Volume (l)	Mass of Analyte (ug)	Concentration (mg/m <sup>3</sup> )
			Initial	Final	Average	Start	Finish	Total			
Yellow - 44	039/31	VMC 3 POLYESTER AUTOMATIC SPRAY CELL 1 8th June 2005	Initial	1000.00		Start	10:00		30	<0.2	<0.007
			Final	1000.00		Finish	10:30				
			Average	1000.00		Total	30				
Yellow - 44	039/30	VMC 3 POLYESTER AUTOMATIC SPRAY CELL 2 8th June 2005	Initial	1000.00		Start	13:30		30	<0.2	<0.007
			Final	1000.00		Finish	14:00				
			Average	1000.00		Total	30				
Yellow - 44	039/29	VMC 3 POLYESTER AUTOMATIC SPRAY CELL 3 8th June 2005	Initial	1000.00		Start	14:30		30	<0.2	<0.007
			Final	1000.00		Finish	15:00				
			Average	1000.00		Total	30				
Yellow - 48	039/34	P U AUTOMATIC SPRAY CELL 8th June 2005	Initial	1000.00		Start	11:50		30	<0.2	<0.007
			Final	1000.00		Finish	12:20				
			Average	1000.00		Total	30				
Yellow - 48	039/33	VMC 3 MANUAL SPRAY 1 8th June 2005	Initial	1000.00		Start	12:40		30	<0.2	<0.007
			Final	1000.00		Finish	13:10				
			Average	1000.00		Total	30				



**CERTIFICATE OF SAMPLING AND ANALYSIS RESULTS**

<b>Client</b>	Jaguar Cars Ltd
<b>Site Address</b>	Browns Lane, Coventry
<b>Job Number</b>	P-RED05-038/EBR1/Rev0
<b>Date</b>	9th & 10th June 2005
<b>Operator(s)</b>	Phillip Butler & Vicki Gavin

Pump Reference	Sample ID	Location / Process / Operator	Pump Flow (litres/min)			Sample Duration (mins)			Total Volume (l)	Mass of Analyte (ug)	Concentration (mg/Nm3)
			Initial	Final	Average	Start	Finish	Total			
Yellow - 47	039/32	VMC 3 MANUAL SPRAY 2 9th June 2005	Initial	1000.00		Start	11:15	30	<0.2	<0.007	
			Final	1000.00		Finish	11:45				
			Average	1000.00		Total	30				
Yellow - 47	039/35	VMC 1 - UV SPRAY FACILITY 10th June 2005	Initial	1000.00		Start	11:40	30	<0.2	<0.007	
			Final	1000.00		Finish	12:10				
			Average	1000.00		Total	30				
			Initial			Start					
			Final			Finish					
			Average			Total					
			Initial			Start					
			Final			Finish					
			Average			Total					
			Initial			Start					
			Final			Finish					
			Average			Total					

# APPENDIX 5

## Calibration Certificates



AGL Airtesting Ltd  
 Horizon House  
 London Rd Ind. Est.  
 Baldock, Herts  
 SG7 6NG  
 Tel: 01462 896818 Fax: 01462 896870  
 E-mail: support@aglairtesting.co.uk

**METER BOX CALIBRATION SHEET (USING CRITICAL ORIFICES)**

METER BOX No.	2036
ORIGINAL $Y_D$	
$\Delta H @$	51.04
LEAK CHECKED	Yes
MAXIMUM VACUUM (inches/Hg)	26
DATE	23/12/2004
CALIBRATED BY	Jim Ryan
CERTIFICATE NUMBER	111178

0.2463    0.4353    0.701    X 0.831

RUN NUMBER	1	2	3
ORIFICE COEFFICIENT	0.2247	0.3659	0.5836
INITIAL VOLUME (litres)	6613.0	6725.0	6919.1
FINAL VOLUME (litres)	6711.81	6886.1	7162.5
VOLUME DRAWN (litres)	98.81	161.1	243.45
BAROMETRIC PRESSURE (m/bar)	999.9	999.9	999.9
PRESSURE (mm/Hg)	750.17	750.17	750.17
TIME (min)	10	10	10
<b>DRY GAS METER TEMP</b>			
INITIAL INLET TEMPERATURE (°C)	23	23	24
INITIAL OUTLET TEMPERATURE (°C)	22	22	22
FINAL INLET TEMPERATURE (°C)	23	24	26
FINAL OUTLET TEMPERATURE (°C)	22	22	23
AVERAGE DGM TEMPERATURE (°C)	22.5	22.75	23.75
AMBIENT TEMP (°C)	22	22	22
$\Delta H$ mm/H <sub>2</sub> O	11	29	64

VOLUME METERED STANDARD	96.88	158.10	238.9229
ORIFICE VOLUME STANDARD	98.14	159.81	246.16
$Y_D$ OF RUN	1.0130	1.0108	1.0303

AVERAGE $Y_D$	1.0180555	
MIN $Y_D$	1.0108476	
MAX $Y_D$	1.030298	
RUN DIFFERENCE (%)	1.9	(MUST BE LESS THAN 2%)
DEVIATION FROM ORIGINAL CALIBRATION (%)	#DIV/0!	(MUST BE LESS THAN 5%)

## Certificate of Analysis

**Customer**

\*Redwing Environmental  
 Springfield Farm  
 Ansley  
 Nuneaton  
 Warwickshire  
  
 CV10 0QU

**Certificate Number**      0035346

Order Number	PO-RED04-020	Date	27/05/04
Our Reference Number	0043317	Cylinder Number	P2851ZMZ0595
Cylinder Description	7.0 SGM CYL BS3 RPV	Cylinder Pressure	3000 PSI
Analysis Method	Gravimetric	Instrument Numbers	B/02
Procedure Numbers	Gravimetric		

Traceable To      National Standards      UN Number      1956

We certify that the cylinder contains the following gas mixture

COMPONENT	NOMINAL CONCENTRATION	ACTUAL CONCENTRATION	ACCURACY %
Propane Nitrogen	800.000 ppm BALANCE	803.800 ppm BALANCE	1.00

Date 28/5

Signed: \_\_\_\_\_  
 Chemist