Report of Environmental Monitoring carried out at: -

Burbidge & Son Ltd
Awson Street
Foleshill
Coventry CV6 6GJ

For the attention of Mr J Gwilliam

Examination, Assessment and Report by: -

Mike Thomas
6 Lakefield Avenue
Little Paxton
St Neots
PE19 6NZ

tel 01480 387749

Authenticating Signature [redacted]

Date: - February 2012

Contents

Introduction

This report relates to a visit to the premises of Burbidge & Son Ltd. at Awson Street in Coventry on 22nd February 2012 and subsequent dates to complete measurements. The purpose of this visit was to carry out emissions monitoring as part of compliance with The Pollution Prevention and Control (England and Wales) Regulations 2000. The process is authorised by City of Coventry, permit number PPC/045.

The emission points were monitored for particulate matter and Isocyanate as appropriate. Emission limits for particulates and Isocyanate are 50 $mg.m^{-3}$ and 0.1 $mg.m^{-3}$ respectively.

The process conditions at the time of monitoring were typical operating conditions unless noted.

Reference documents

The reference documents used for the emissions monitoring were

- PG6/33 Secretary of State's Guidance- Wood Coating Processes
- EN 13284-1:2001, tangential method for particulates
- CTM 036 for Isocyanates.

Sampling protocols

The following protocols were used in the emissions monitoring

- Stack sampling protocol- Measurement of airflow
- Stack sampling protocol- Measurement of particulate matter
- Stack sampling protocol- Measurement of Isocyanate

These protocols are included in this report in Appendix 1.

Equipment used

The following equipment was used in the emissions monitoring

- DPM TT570S micromanometer and pitot tube
- SKC Highlite high volume sampling pump and rotameter
- In-stack particulate filter head using 4mm nozzle unless specified
- SKC Aircheck sampler pump and rotameter

Information on the equipment and appropriate calibration details are included in this report in Appendix 2.

Location and identification of sampling points

The location and identification of the sampling points are shown diagrammatically in Appendix 3 of this report.

Deviations from standards

1. Due to the variable work patterns at the spraying positions and the need to run extended sampling times it was not always possible to sample the same coating process each time in each stack. This can potentially lead to a larger variation between measurements than might be expected.

2. The air flow in the stacks was generally turbulent and did not follow the normal velocity gradient across the diameter of the stack.

3. The occupancy of some spray positions was generally low with a small quantity of material being sprayed. It was therefore not always possible to take the requisite number of samples. In some instances specific spraying operations have been targeted to give an indication of potential worst case situations.

4. Sampling ports
   The sampling ports in the manual spray booths, in particular spray booth 4, have been sited closer to the extraction fans than normally recommended for representative sampling.

Results

A summary of results is given in the following table. The results in detail are given in Appendix 4.

It is difficult to estimate the accuracy of the results given the variability of the process and plant. Probable significant errors in the measurement of particulate matter are from air turbulence (10%) and low weight sample weighing (10%).

Stack Position	Particulate emissions	Isocyanate
	average mg/m^3	$mg.m^{-3}$
Spraybooth 1- left	2.9	
Spraybooth 1- right	2.7	0.0135
Spraybooth 2- left	0.6	
Spraybooth 2- right	1.6	0.0140
Spraybooth 4	1.3	
Stain Cab 1	1.2	
Lacquer Cab 2	0.4	

Conclusions and Discussion

The particulate emissions were lower than normal for the manual spray booths due to the nature of the work undertaken and to the effective maintenance programme. Typical emissions for the furniture industry are 0-10 $mg.m^{-3}$ for normal conditions and 10-15 $mg.m^{-3}$ for high use or poor filter condition. The emission limit is 50 $mg.m^{-3}$.

The occupancy of some spray booths was relatively low reflecting the workload for these positions. The particulate measurements were taken when these positions were in use.

Emissions of Isocyanate were below the 0.1 $mg.m^{-3}$ emission limit.

Appendix 1- Sampling Protocols

Stack Sampling Protocol- Measurement of airflow

1. Instrumentation
   The preferred instrument for measuring airflow in stacks is the pitot tube. This is a differential pressure probe designed to cause minimal turbulence when inserted into the airflow. The total pressure within the stack comprises of Velocity pressure, caused by the movement of the air, and Static pressure, exerted in all directions by compression or expansion of the air caused by the process e.g. extraction fan. The BS 1042 pitot tube has an ellipsoidal tip that is aligned into the direction of flow. The pitot tube has two separate tappings. The tip is affected by total pressure in the stack whereas the tappings perpendicular to the tip are affected by the static pressure only. The velocity pressure is the difference between the two.

   The pressures exerted on the pitot tube are measured by an electronic micromanometer. This provides the static and velocity pressures and the air velocity in the stack.

   The micromanometer can be set to display true velocity readings by automatically correcting for actual test point gas density using independently measured test temperature and barometric pressure.

2. Measuring site location
   Wherever possible the sampling port should be located in a region with sufficiently high and homogeneous air flow. As a guideline the minimum distances, in terms of stack diameters, from points of turbulence should be as follows; fan (3), junction (2) and bend (1). The location should be at least one diameter upstream of the next point of turbulence. In practice the greater the distances, the more reliable the airflow. In some cases these conditions cannot be met and measurements in these situations must be taken with some caution.

3. Measurements
   Measurements are taken at a series of points across the ducts. The positions of the points, along with alternative strategies, are given in the relevant particulate sampling standard. In situations where the airflow is not linear, preference is given to measuring air velocity at the points where sampling will occur.

Stack Sampling Protocol- Measurement of particulate matter

1. Air velocity in stack

   Measure the airflow in the stack using pitot tube, micromanometer, barometer and thermometer. The micromanometer can be set to display true velocity readings by automatically correcting for actual test point gas density using independently measured test temperature and barometric pressure.

2. Isokinetic sampling for particulate matter

   In isokinetic sampling the volume of flow into the sampling head is matched to the airflow velocity in the stack. This ensures an even flow of lighter particles into the head. If the sampling flow is set too low the light particles tend to be carried around the head by the airflow. If set too high, the light particles are pulled into the head from outside sampled volume of air. The required sampling rates can be determined by calculation or from standard tables.

3. Sampling

   Particulate sampling is taken over an approximate 60-240 minute period where the process allows, at points specified in EN 13284-1:2001, tangential method. The samples are collected onto a pre-weighed glass fibre filters. The filters are reweighed to determine the quantity of particulate matter collected. Dummy filters are used for internal calibration.

4. Presentation of results

   Particulate sampling is assessed by weight (gravimetrically). The weight is normally expressed in milligrams.

   The volume of air sampled is derived from the sampling flow rate and the sampling time. The volume is expressed in cubic metres. Measurements are taken without correction for water vapour content.

   The concentration of particulate matter is expressed as milligrams per cubic metre or $mg.m^{-3}$.

Stack Sampling Protocol- Measurement of Isocyanate

1. Measurements and Analysis
   The quantity of isocyanate in stack flue gases is measured by collecting a sample onto a 1-(2-pyridyl)piperazine (1,2-PP) impregnated filter. These are supplied by a UKAS accredited laboratory and the sample is subsequently analysed by the same laboratory.

2. Sampling
   A 6mm stainless steel probe is inserted into the stack and connected to a filter in a stainless steel sampling head. The sampling procedure is carried out in accordance with CTM 036. The sample is collected anisokinetically. The flue gasses are pumped through the filter for 20-30 minutes at a rate of 1000 ml/min.

3. Presentation of results
   The volume of air sampled is derived from the sampling flow rate and the sampling time. The volume is expressed in cubic metres.

   The flue gasses are analysed to give the weight of Isocyanate.

   The concentration of Isocyanate is expressed as milligrams per cubic metre or $mg.m^{-3}$.

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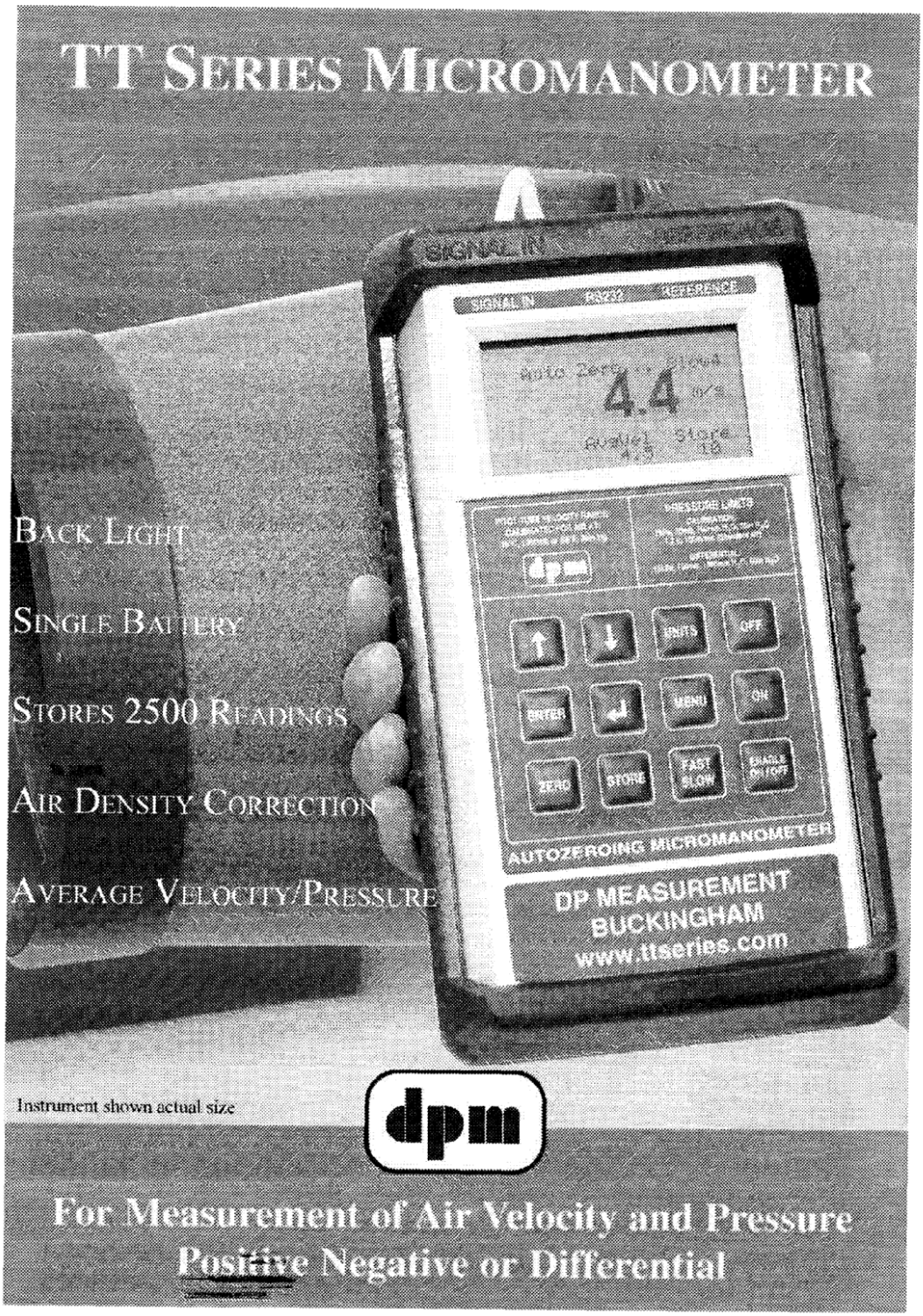
Appendix 2- Equipment Used

TT Series Micromanometer



- Back Light
- Single Battery
- Stores 2500 Readings
- Air Density Correction
- Average Velocity/Pressure

Instrument shown actual size

dpm

For Measurement of Air Velocity and Pressure
Positive Negative or Differential

CERTIFICATE OF CALIBRATION

Issued By BSRIA Instrument Solutions

Date of Issue 21 January 2011

Certificate Number
STD34579

Hire Calibration Sales
BSRIA
Instrument Solutions

BSRIA Instrument Solutions
Old Bracknell Lane West, Bracknell, Berkshire RG12 7AH UK
Tel: +44 (0) 1344 459314 Fax: +44 (0) 1344 465556
e mail: info@bis.fm website: www.bis.fm

BSRIA Quality Approved
[redacted]
M.J. Trotter

Approved Signatory

Customer : Mike Thomas
1A Astwick Road, Stotfield
Hitchin Hertfordshire

Date Received : 16 January 2011

Instrument -

System ID :	66484
Description :	Micromanometer
Manufacturer :	D. P. Measurements
Model Number :	TT570S
Serial Number :	6012
Procedure Version :	MA275V2

Environmental Conditions

Temperature :	20°C +/- 4°C	Mains Voltage :	240V +/- 10V
Relative Humidity :	<70% +/- %	Mains Frequency :	50Hz +/- 1Hz

Comments

Instrument calibrated with "Fast" averaging and Auto zero enabled.

Results recorded as received. No adjustment performed.

Traceability Information

Instrument description	*Serial number*	*Certificate number*	*Cal. Date*	*Cal. Period*
FCO550 Pressure Calibrator	0010275	UK04109	05/10/2010	26

[redacted]

Calibrated By : J. Weston **Date of Calibration :** 21 January 2011

This certificate provides traceability of measurement to recognised National Standards, and to the units of measurement realised at the National Physical Laboratory or other recognised National Standards laboratories.

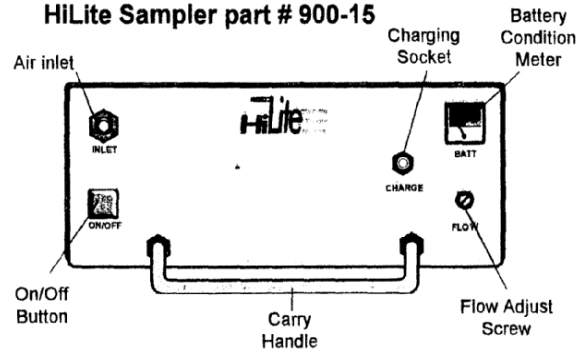
This certificate complies with the requirements of BS EN ISO 10012:2003.

FEATURES

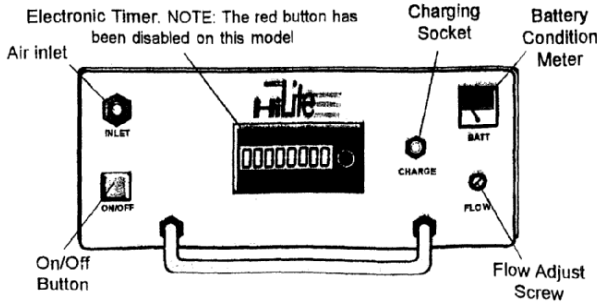
Where are the controls located? All the controls of the HiLite series are located on the front panel.

ON/OFF SWITCH. When pressed down to the ON position the pump will start to run, and the LCD (if fitted) activate showing eight ZEROS. If left running the timer will increase in one minute steps to a maximum of 99999999 minutes.
TIMER (if fitted). The red button on the timer is disabled on the HiLite pump and has no effect when pressed. Once the pump has been started the timer will record the run time in minutes. At the end of the sample the pump is stopped and the timer will freeze displaying the total run time. When the pump is next restarted the timer will zero and commence recording the run time once again.

HiLite Sampler part # 900-15



HiLite Sampler with Timer part # 900-15T



FLOW ADJUST. Below the level of the hole marked FLOW is a small screw. To adjust the flow use a small screwdriver, making sure the screwdriver end is located in the slot. To increase the flow turn clockwise. The span of this screw is around 5 turns. **DO NOT FORCE** the flow adjust screw, and flow range by this adjuster is approximately 3-12 l/min.to free air.
BATTERY CHARGE METER. The meter gives an indication of the battery capacity available. If the meter is in the RED area the pump should be recharged before use.
INLET. Connect the sampling device to this pipe stub using flexible tubing of 6mm diameter.
FUSE. An internal fuse is fitted which can only be accessed by removal of the case top. Please refer to page 4 for instructions on how to remove case top. The fuse is rated at 2 Amp anti surge and **must** be replaced with an equivalent. Replacement of the fuse with a higher or lower value can cause damage to your pump.
CHARGING. The charger for the HiLite will automatically switch to a trickle charge after the battery has reached full charge. This prevents overheating of the battery and increases its life.

SKC

SKC Lite

OPERATING INSTRUCTIONS

FEATURING

HILITE HIGH VOLUME SAMPLING PUMP

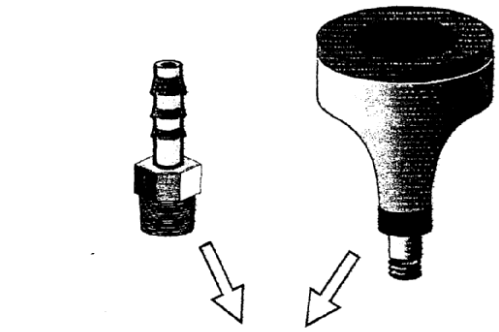
SPECIALISTS IN AIR SAMPLING

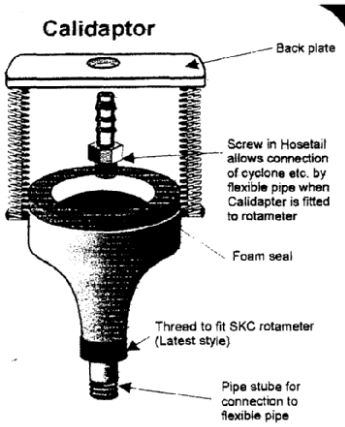
SKC®

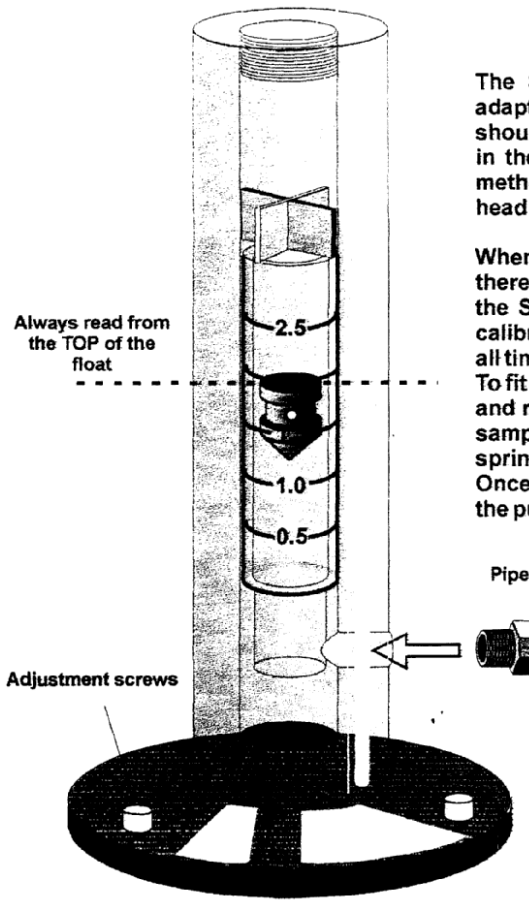
Unit 11 Sunrise Park, Higher Shaftesbury Road
Blandford Forum Dorset DT11 8ST
01258 48 01 88 01258 48 01 84

Published by SKC Ltd.

CE

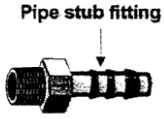


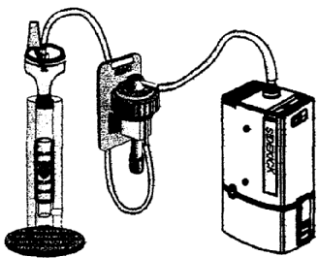




The SKC rotameter is supplied with an adapter and two pipe stub fittings which should be screwed into position as shown in the diagram opposite. This provides a method of connecting either a sampling head or flexible pipe to the rotameter.

When using an I.O.M. head or similar, where there is no facility to connect a flexible pipe the SKC CALIDAPTOR allows hands free calibration and ensures a good air seal at all times.
To fit simply remove the pipe stub (if fitted) and replace it with the CALIDAPTOR. The sample head is now clipped between the spring loaded back plate and the foam seal. Once in place both hands are left free to set the pump flow rate.





Set up showing cyclone being calibrated

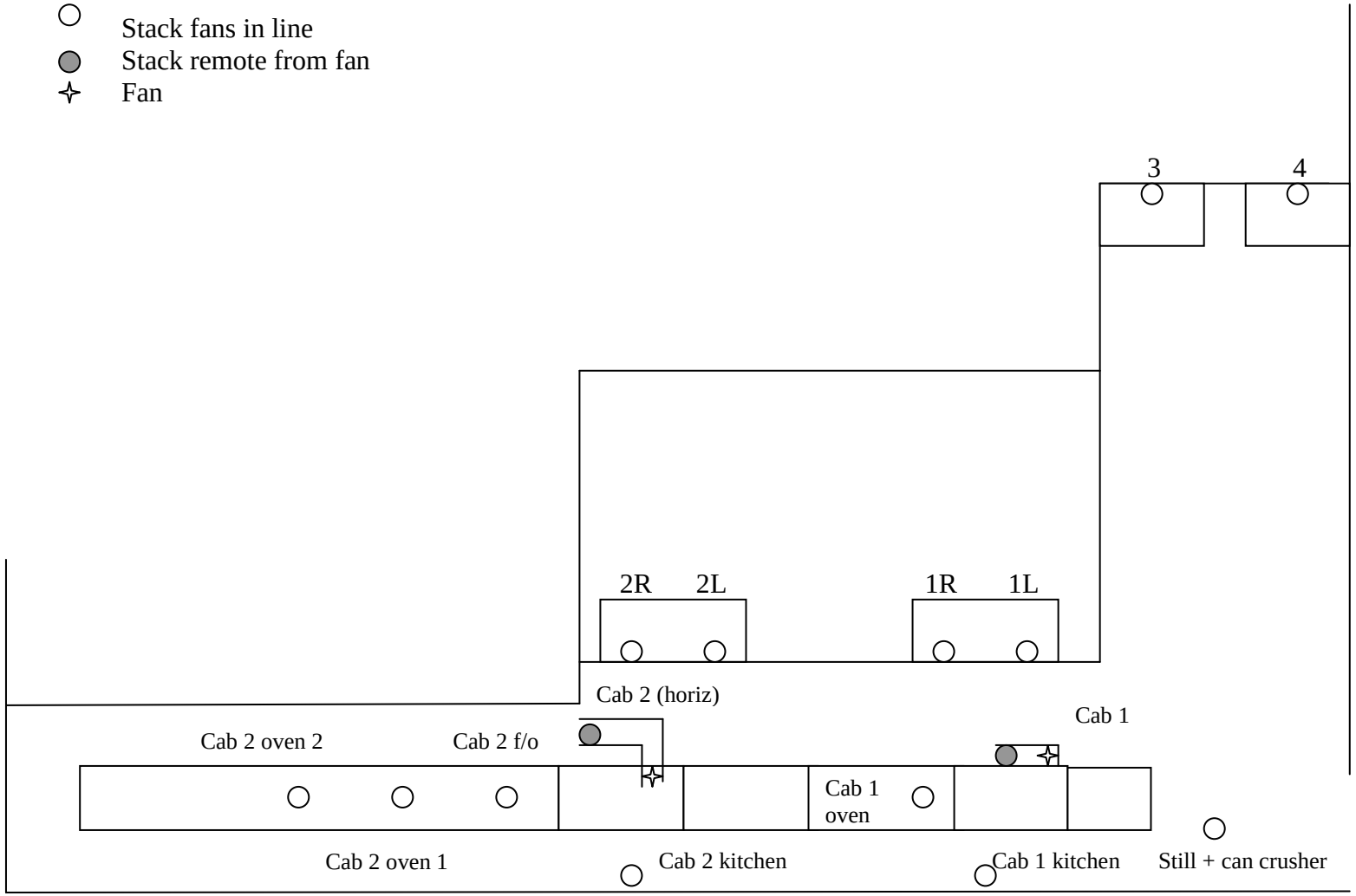
Universal Pumps

PCXR8

1000 to 5000 ml/min
(5 to 500 ml/min Low Flow Applications)
Unexcelled Personal or Area Air Sampling Pump
Programmable Start and Stop Times

ATEX-approved models available

Appendix 3- Location and Identification of Sampling Points



Schematic of location and identification of sampling points

Appendix 4- Results

Particulate Matter Stack Monitoring

Stack Identification/Position	**Left stack**	Stack dimensions	700mm
Plant identification	**Spraybooth 1**	Process operation	Spraying mixed materials

Sample Point	Air Velocity	Isokinetic flow rate	Filter Number	Particulate Weight	Total Time	Total Volume	Particulate Concentration	Comments
	m/s	l/min		milligrams	minutes	litres	mg/m3	
perpendicular port, 0.85D	10.4	7.8	382	8.8	225	1755.0	5.0	
parallel port, 0.15D	11.7	8.6	277	1.4	209	1797.4	0.8	

Stack Identification/Position	**Right stack**	Stack dimensions	700mm
Plant identification	**Spraybooth 1**	Process operation	Spraying mixed materials

Sample Point	Air Velocity	Isokinetic flow rate	Filter Number	Particulate Weight	Total Time	Total Volume	Particulate Concentration	Comments
	m/s	l/min		milligrams	minutes	litres	mg/m3	
parallel port, 0.85D	12.5	9.4	83	4.4	210	1974.0	2.2	
perpendicular port, 0.15D	9.3	7.0	323	2.7	120	840.0	3.2	

Stack Identification/Position	**Left stack**	Stack dimensions	700mm
Plant identification	**Spraybooth 2**	Process operation	Spraying mixed materials

Sample Point	Air Velocity m/s	Isokinetic flow rate l/min	Filter Number	Particulate Weight milligrams	Total Time minutes	Total Volume litres	Particulate Concentration mg/m3	Comments
parallel port, 0.85D	11.6	8.6	148	0.8	155	1333.0	0.6	overspray from right stack

Stack Identification/Position	**Right stack**	Stack dimensions	700mm
Plant identification	**Spraybooth 2**	Process operation	Spraying mixed materials

Sample Point	Air Velocity	Isokinetic flow rate	Filter Number	Particulate Weight	Total Time	Total Volume	Particulate Concentration	Comments
	m/s	l/min		milligrams	minutes	litres	mg/m3	
perpendicular port, 0.15D	8.7	6.6	421	1.7	234	1544.4	1.1	
parallel port, 0.85D	10.0	7.5	447	2.8	188	1410.0	2.0	

Stack Identification/Position	**Stack**	Stack dimensions	700mm
Plant identification	**Spraybooth 4**	Process operation	Spraying mixed materials

Sample Point	Air Velocity m/s	Isokinetic flow rate l/min	Filter Number	Particulate Weight milligrams	Total Time minutes	Total Volume litres	Particulate Concentration mg/m3	Comments
perpendicular port, 0.15D	5.3	9.0	209	0.5	152	1368.0	0.4	6mm nozzle
parallel port, 0.15D	14.5	10.9	433	4.6	196	2136.4	2.2	

Stack Identification/Position	**Stack**	Stack dimensions	650mm
Plant identification	**Spray Cab 1**	Process operation	Spraying mixed materials

Sample	Air	Isokinetic	Filter	Particulate	Total	Total	Particulate	Comments
Point	Velocity	flow rate	Number	Weight	Time	Volume	Concentration	
	m/s	l/min		milligrams	minutes	litres	mg/m3	
top port, 0.15D	10.0	7.5	325	0.7	75	562.5	1.2	stain, occasional process

Stack Identification/Position	**Stack**	Stack dimensions	550mm
Plant identification	**Spray Cab 2**	Process operation	Spraying mixed materials

Sample Point	Air Velocity m/s	Isokinetic flow rate l/min	Filter Number	Particulate Weight milligrams	Total Time minutes	Total Volume litres	Particulate Concentration mg/m3	Comments
right port, 0.85D	15.9	12.0	340	0.5	80	960.0	0.5	
left port, 0.85D	16.7	12.5	353	1.0	247	3087.5	0.3	

Sample	Stack Identification	Total NCO	Pump Rate	Pump Time	Air Volume	Emission	Comments
		microgram	ml/min	min	litre	mg/m3	
Bur S1	2R	0.28	1000	20	20.00	0.0140	
Bur S2	1R	0.27	1000	20	20.00	0.0135	

Air Flow Measurement

duct identification	diameter mm	air velocity m/s										average velocity m/s	measured air volume m3/hr	static pressure pascals
		1	2	3	4	5	6	7	8	9	10			
spraybooth 1 left stack, perpendicular port	700	15.1	12	10.2	11.2	11.2	9.6	9.4	10.4	13	12.2	11.62	16,091	0
spraybooth 1 left stack, parallel port	700	13	12	11.7	10.5	11.2	11	10	12.7	13.1	12.8			
spraybooth 1 right stack, perpendicular port	700	10.8	8.7	9.3	11	11.5	10.2	10.8	11	10.8	10.2	11.50	15,925	-5
spraybooth 1 right stack, parallel port	700	12.9	16.2	15.5	12.6	11.2	10.9	11	12.5	11.7	11.1			
spraybooth 2 left stack, perpendicular port	700	0	3.6	7.3	8.3	9.6	11.5	11.8	11.3	10.3	9.1	10.17	14,083	30
spraybooth 2 left stack, parallel port	700	8.9	13.9	14.5	15.1	14.1	11.4	10.2	11.6	10.9	9.9			
spraybooth 2 right stack, perpendicular port	700	7.4	7.9	8.7	7.9	8	8.4	8.2	7.9	7.4	7.9	10.74	14,879	20 to -20
spraybooth 2 right stack, parallel port	700	11.5	15.3	16.2	16.5	15.2	12.5	9.8	10	12.9	15.2			

Air Flow Measurement

duct identification	diameter mm	air velocity m/s										average velocity m/s	measured air volume m3/hr	static pressure pascals
		1	2	3	4	5	6	7	8	9	10			
spraybooth 3 perpendicular port	700	not in use												
spraybooth 3 parallel port	700													
spraybooth 4 perpendicular port	700	7.8	7	5.3	5.3	6.8	9.5	8.6	8.3	7.9	9.8	10.80	14,955	-20
spraybooth 4 parallel port	700	18.3	17.8	14.5	12.3	11.4	14.5	14.9	13.3	11.5	11.1			
spray cab 1 top port	650	12.1	10.2	10.0	9.8	9.6	9.7	8.9	8.5	8.1	6.5	9.60	11,462	-15
spray cab 1 side port	650	8.2	8.0	8.8	8.2	9.2	10.7	11.6	11.7	11.5	10.6			
spray cab 2 right port	550	19.3	19.5	19.2	17.1	17.6	17.2	16.7	15.9	15.0	14.2	17.15	14,664	-30
spray cab 2 left port	550	16.5	17.4	17.3	17.7	18.1	18.3	17.8	16.7	16.3	15.3			

Air Flow Measurement

duct identification	diameter mm	air velocity m/s										average velocity m/s	measured air volume m3/hr	static pressure pascals
		1	2	3	4	5	6	7	8	9	10			
spray cab 2 flash-off right port	350	6.9	7.2	7.9	8.2	8.7	9.1					8.2	2,837	-5
spray cab 2 flash-off left port	350	6.9	7.9	8.0	8.5	9.1	9.9							
spray cab 2 oven 1 right port	250	8.9	9.8	10.4	12.1	13.7	11.6					11.3	1,991	-10
spray cab 2 oven 1 left port	250	10.3	12.3	12.5	11.6	11.1	10.9							
spray cab 2 oven 2 right port	250	11.3	11.6	12.7	13.1	14.1	12.9					13.1	2,318	-15
spray cab 2 oven 2 left port	250	11.8	12.3	13.3	14.7	15.9	13.7							
cab 1 kitchen	250	6.6	8.4	9.2	9.1	8.6	7.9					8.3	1,467	-50
cab 2 kitchen	250	8.6	9.1	9.8	9.7	9.6	9.4					9.4	1,655	-60
still + can crusher	250	7.4	7.5	7.6	6.0	6.6	6.3					6.9	1,219	-70