

**Report of Environmental Monitoring carried out at: -**

Burbidge & Son Ltd  
Awson Street  
Foleshill  
Coventry CV6 6GJ

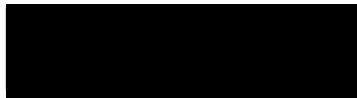
For the attention of Mr J Gwilliam

**Examination, Assessment and Report by: -**

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

tel 01480 387749

Authenticating Signature



**Date: -** February 2014

## **Contents**

Introduction

Reference documents

Sampling protocols

Equipment used

Location and identification of sampling points

Deviation from standards

Results

Conclusions

Appendix 1- sampling protocols

Appendix 2- equipment used

Appendix 3- location and identification of sampling points

Appendix 4- results

## **Introduction**

This report relates to a visit to the premises of Burbidge & Son Ltd. at Awson Street in Coventry on 4<sup>th</sup> February 2014 and subsequent dates to 11<sup>th</sup> March to complete measurements. The purpose of this visit was to carry out emissions monitoring as part of compliance with Pollution Prevention and Control Act 1999 and The Environmental Permitting (England & Wales) Regulations 2010 (as amended).

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<sup>-3</sup> and 0.1 mg.m<sup>-3</sup> 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 sampling ports in the manual spray booths, in particular spray booths 3& 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 average mg/m <sup>3</sup>	Isocyanate mg.m <sup>-3</sup>
Spraybooth 1- left	1.4	
Spraybooth 1- right	2.0	0.0028
Spraybooth 2- left	0.3	
Spraybooth 2- right	1.1	0.0033
Spraybooth 3	1.3	
Spraybooth 4	1.5	
Spraybooth 5	0.9	0.0029
Lacquer Cab 2	2.9	0.0448

### **Conclusions and Discussion**

The particulate emissions were lower than normal for the manual spray booths due to the effective maintenance programme. Typical emissions for the furniture industry are 0-10 mg.m<sup>-3</sup> for normal conditions and 10-15 mg.m<sup>-3</sup> for high use or poor filter condition. The emission limit is 50 mg.m<sup>-3</sup>.

Emissions of Isocyanate were below the 0.1 mg.m<sup>-3</sup> 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 tapings. The tip is affected by total pressure in the stack whereas the tapings 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  $\text{mg.m}^{-3}$ .

## **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  $\text{mg.m}^{-3}$ .

.



## **Appendix 2- Equipment Used**

# TT SERIES MICROMANOMETER



BACK LIGHT

SINGLE BATTERY

STORES 2500 READINGS

AIR DENSITY CORRECTION

AVERAGE VELOCITY/PRESSURE

Instrument shown actual size



For Measurement of Air Velocity and Pressure  
Positive Negative or Differential

# CERTIFICATE OF CALIBRATION

**Issued By** BSRIA Instrument Solutions  
**Date of Issue** 18 April 2013

Certificate Number  
STD53742MB

Page 1 of 4 Pages



Old Bracknell Lane West, Bracknell,  
Berkshire RG12 7AH United Kingdom  
T: +44 (0) 1344 459314 | F: +44 (0) 1344 465556  
E: info@bis.fm | W: www.bis.fm



Approved Signatory

**Customer :** Mike Thomas

**Date Received :** 11 April 2013

<b>Instrument -</b>	<b>System ID :</b>	79956
	<b>Description :</b>	Micromanometer
	<b>Manufacturer :</b>	D. P. Measurements
	<b>Model Number :</b>	TT570S
	<b>Serial Number :</b>	6012
	<b>Procedure Version :</b>	MA275V2

#### Environmental Conditions

Temperature : 20°C +/- 4°C  
Relative Humidity : <70% +/- %

Mains Voltage : 240V +/- 10V  
Mains Frequency : 50Hz +/- 1Hz

#### Comments

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

Results recorded as received. No adjustment performed.

#### Traceability Information

<i>Instrument description</i>	<i>Serial number</i>	<i>Certificate number</i>	<i>Cal. Date</i>	<i>Cal. Period</i>
FCO550 Pressure Calibrator	0010275	UK07311	07/01/2013	52

**Calibrated By :** M. Bray

**Date of Calibration :** 18 April 2013

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.  
Copyright of this certificate is owned by the issuing laboratory and may not be reproduced except with the prior written approval of the issuing laboratory.  
This certificate complies with the requirements of BS EN ISO 10012:2003.

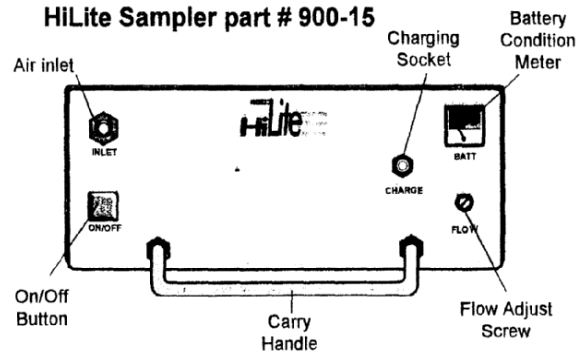
## FEATURES

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

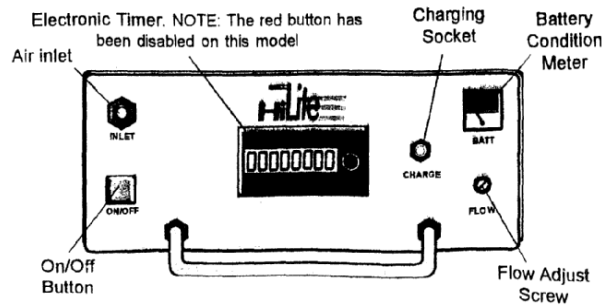
**ON/OFF SWITCH.** When pressed down to the ON position the pump will start to run, and the LCD (if fitted) activate showing eight ZEROS. If left running the timer will increase in one minute steps to a maximum of 99999999 minutes.

**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

HiLite

OPERATING INSTRUCTIONS

FEATURING

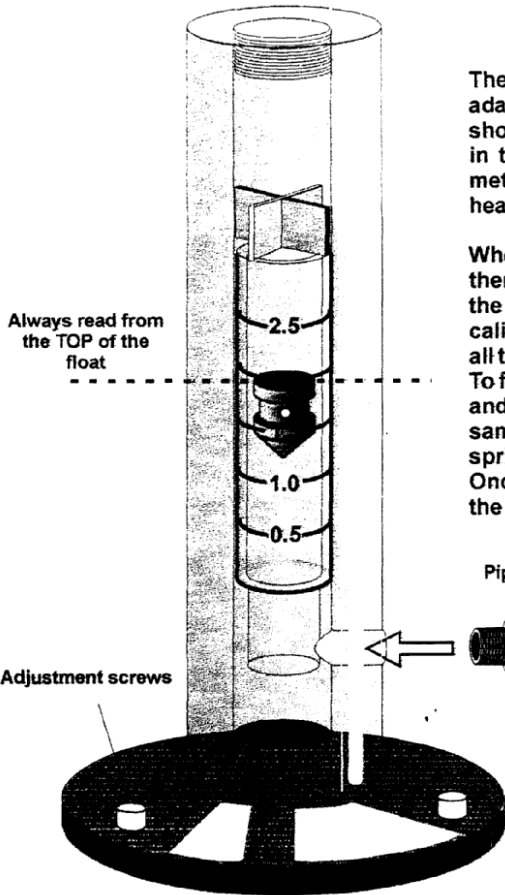
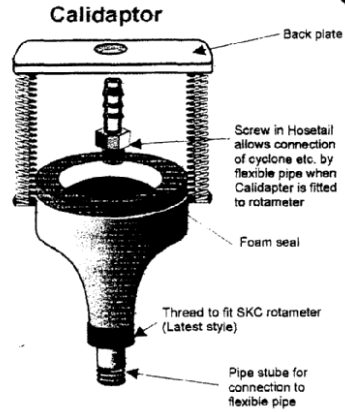
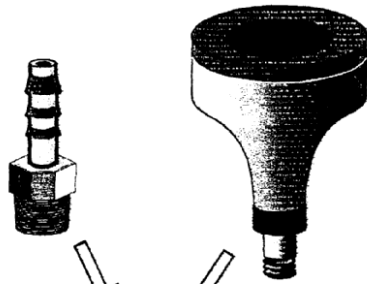
HILITE HIGH VOLUME SAMPLING PUMP

SPECIALISTS IN AIR SAMPLING



Unit 11 Sunrise Park, Higher Sharncliffe Road  
Mansfield Forum, Corse, DT11 2ST  
01258 48 01 88 01258 48 01 84

Published by SKC Ltd.

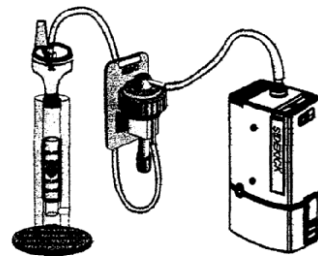


The SKC rotameter is supplied with an adapter and two pipe stub fittings which should be screwed into position as shown in the diagram opposite. This provides a method of connecting either a sampling head or flexible pipe to the rotameter.

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.

Pipe stub fitting



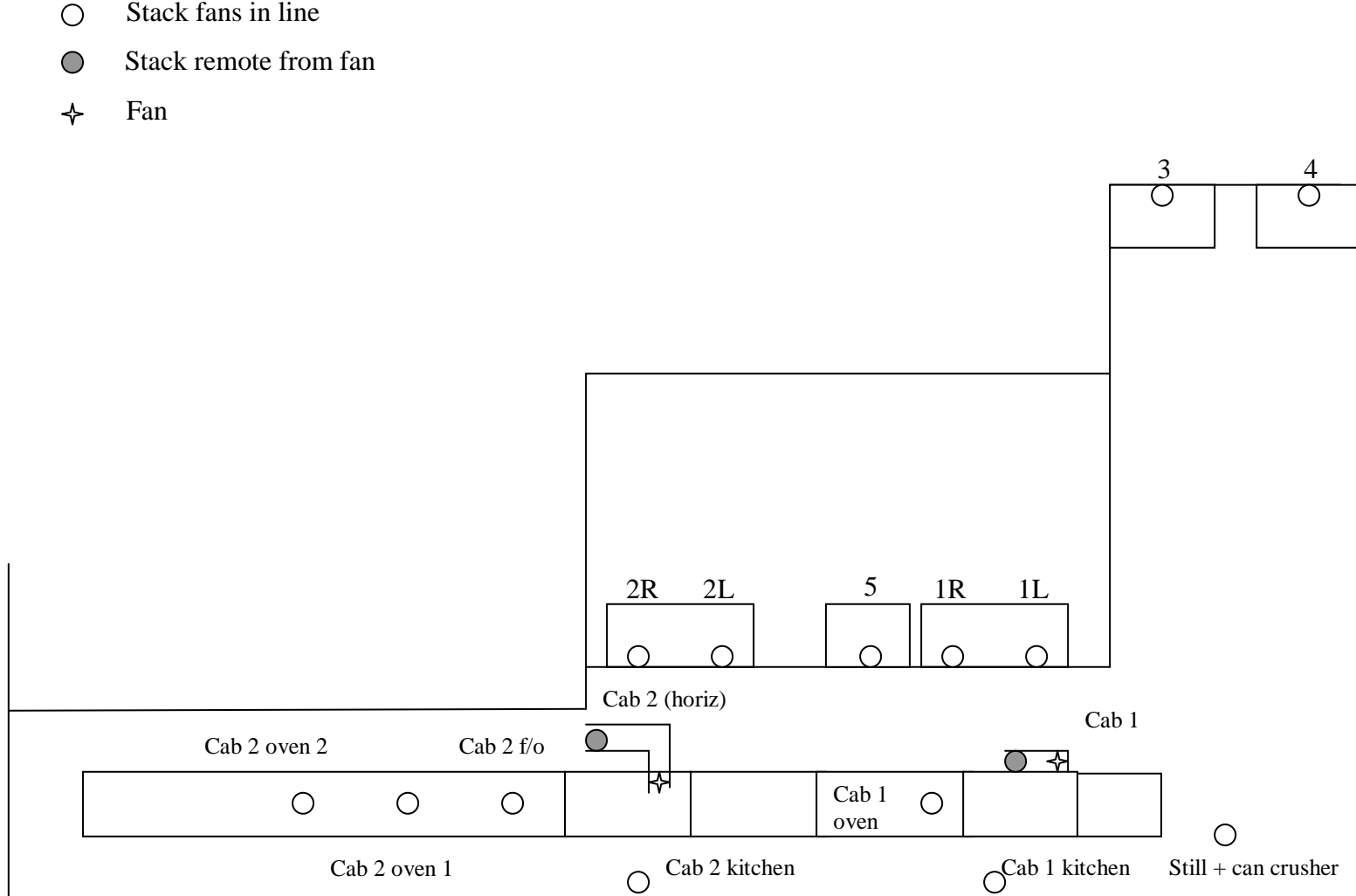
Set up showing cyclone being calibrated

**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



### **Appendix 3- Location and Identification of Sampling Points**

- Stack fans in line
- Stack remote from fan
- ✦ Fan



**Schematic of location and identification of sampling points**



## **Appendix 4- Results**

Particulate Matter Stack Monitoring

Stack Identification/Position	<b>Left stack</b>	Stack dimensions	700mm
Plant identification	<b>Spraybooth 1</b>	Process operation	Spraying polyurethane paint

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/m <sup>3</sup>	Comments
perpendicular port, 0.85D	12.9	9.8	106115	2.4	135	1323.0	1.8	
parallel port, 0.85D	9.1	6.9	106119	0.9	150	1035.0	0.9	

Particulate Matter Stack Monitoring

Stack Identification/Position	<b>Right stack</b>	Stack dimensions	700mm
Plant identification	<b>Spraybooth 1</b>	Process operation	Spraying polyurethane paint

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/m <sup>3</sup>	Comments
parallel port, 0.85D	13.5	10.2	106113	2.2	165	1683.0	1.3	
perpendicular port, 0.15D	8.0	6.0	106114	2.5	152	912.0	2.7	

Particulate Matter Stack Monitoring

Stack Identification/Position	<b>Left stack</b>	Stack dimensions	700mm
Plant identification	<b>Spraybooth 2</b>	Process operation	Drying area

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/m <sup>3</sup>	Comments
perpendicular port, 0.85D	9.8	7.4	102045	0.1	219	1620.6	0.0	overspray from right stack
parallel port, 0.85D	6.0	10.2	102057	0.9	172	1754.4	0.5	overspray from right stack, 6mm nozzle

Particulate Matter Stack Monitoring

Stack Identification/Position	<b>Right stack</b>	Stack dimensions	700mm
Plant identification	<b>Spraybooth 2</b>	Process operation	Spraying polyurethane paint

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/m <sup>3</sup>	Comments
perpendicular port, 0.15D	9.5	7.2	102055	1.6	182	1310.4	1.2	
parallel port, 0.15D	9.0	6.8	102056	1.5	215	1462.0	1.0	

Particulate Matter Stack Monitoring

Stack Identification/Position	<b>Right stack</b>	Stack dimensions	700mm
Plant identification	<b>Spraybooth 3</b>	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/m <sup>3</sup>	Comments
perpendicular port, 0.15D	8.4	6.4	107229	1.5	175	1120.0	1.3	
parallel port, 0.85D	15.6	11.7	106120	2.7	178	2082.6	1.3	

Particulate Matter Stack Monitoring

Stack Identification/Position	<b>Stack</b>	Stack dimensions	700mm
Plant identification	<b>Spraybooth 4</b>	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/m <sup>3</sup>	Comments
perpendicular port, 0.85D	9.0	6.8	107233	1.0	165	1122.0	0.8	
parallel port, 0.15D	14.0	10.6	106121	3.6	155	1643.0	2.2	

Particulate Matter Stack Monitoring

Stack Identification/Position	<b>Stack</b>	Stack dimensions	650mm
Plant identification	<b>Spraybooth 5</b>	Process operation	Spraying polyurethane paint

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/m <sup>3</sup>	Comments
perpendicular port, 0.15D	6.9	5.2	106112	0.5	135	702.0	0.8	
parallel port, 0.15D	5.3	9.0	106118	1.3	150	1350.0	0.9	6mm nozzle



Particulate Matter Stack Monitoring

Stack Identification/Position	<b>Stack</b>	Stack dimensions	550mm
Plant identification	<b>Spray Cab 2</b>	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/m <sup>3</sup>	Comments
right port, 0.85D	16.1	12.1	107226	10.0	165	1996.5	5.0	
left port, 0.85D	17.7	13.2	106116	1.5	160	2112.0	0.7	

### Isocyanate Emissions

Sample	Stack Identification	Total NCO	Pump Rate	Pump Time	Air Volume	Emission	Comments
		microgram	ml/min	min	litre	mg/m3	

Bur 1	2R	0.07	1000	21	21.00	0.0033	
Bur 2	5	0.07	1000	24	24.00	0.0029	
Bur 3	1R	0.07	1000	25	25.00	0.0028	
Bur 4	pen 2	0.94	1000	21	21.00	0.0448	

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	13.8	8.6	7.6	10.7	8.7	9.3	11.7	12.9	13.5	9.4	10.72	14,845	-55
spraybooth 1 left stack, parallel port	700	14.5	12.4	10.4	9	9.2	10.3	9.5	9.1	11.3	12.4			
spraybooth 1 right stack, perpendicular port	700	7.7	9.3	8	8	8.5	11.6	11.2	9.1	8.6	3.7	10.92	15,129	-70
spraybooth 1 right stack, parallel port	700	14.3	16.6	14.6	12.2	11	11.1	11.3	13.5	14.5	13.6			
spraybooth 2 left stack, perpendicular port	700	7.8	8.2	7.6	8.1	8.4	8.9	9.5	9.8	9	6.2	8.26	11,443	-55
spraybooth 2 left stack, parallel port	700	7	9.6	12.3	10.5	8.5	9.3	9.2	6	5.2	4.1			
spraybooth 2 right stack, perpendicular port	700	11.3	9.3	9.5	9.8	9	7.4	7.8	11.2	10.9	11.5	8.40	11,630	0
spraybooth 2 right stack, parallel port	700	6.9	12.6	9	7.2	8.4	9.2	8.3	5.4	3.2	0			

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	3.8	5.9	8.4	10.5	11.2	10.6	10.4	10.3	8.9	5.3			-15
spraybooth 3 parallel port	700	16.9	17.4	17.3	14.5	13.6	10.5	11.9	15.6	17.3	14.3			
spraybooth 4 perpendicular port	700	0	4.8	7.2	9.7	11.1	11.2	9.3	9	7.6	5.6	11.50	15,932	-15
spraybooth 4 parallel port	700	18.9	18.4	14	11.8	11.6	13.6	15.2	15.9	16.5	18.6			
spraybooth 5 perpendicular port	700	7.6	6.8	6.9	7.1	6.6	6.7	7.1	8.1	8.2	8.0	7.37		-45
spraybooth 5 parallel port	700	7.1	5.3	5.3	6.5	7.5	7.9	8.6	8.5	8.9	8.6			
spray cab 1 top port	650	12.6	11.4	11.7	10.9	9.7	9.5	9.1	8.9	8.6	8.2	9.88	11,802	-20
spray cab 1 side port	650	8.3	8.7	8.9	9.4	9.9	10.2	10.4	10.5	10.6	10.1			
spray cab 2 right port	550	19.1	19.3	19.3	19.6	19.5	19.5	17.8	16.1	15.3	15.4	18.08	15,459	-35
spray cab 2 left port	550	18.5	18.6	18.8	18.5	18.2	18.3	18.2	17.7	17.6	16.2			

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			
spray cab 2 flash-off right port	350	8	8.7	8.8	9	8.8	9.4					8.6	2,973	-5
spray cab 2 flash-off left port	350	7.1	7.8	8.2	8.3	8.9	10.0							
spray cab 2 oven 1 right port	250	9	9.7	9.8	10.7	12.4	11.5					10.9	1,933	-5
spray cab 2 oven 1 left port	250	10.2	12.5	12.8	11.3	10.9	10.5							
spray cab 2 oven 2 right port	250	11.0	11.8	12.9	13.0	13.9	12.8					13.2	2,325	-5
spray cab 2 oven 2 left port	250	12.5	12.7	13.1	13.6	15.5	15.1							
cab 1 kitchen	250	6.7	8.1	8.5	8.7	8.3	6.6					7.8	1,381	-60
cab 2 kitchen	250	7.4	8.8	9.6	9.4	8.9	5.2					8.2	1,452	-70
still + can crusher	250	8.2	8.1	7.7	7.3	6.9	6.0					7.4	1,302	-80