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: -

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Authenticating Signature [redacted]

Date: - December 2003

Contents

Introduction

This report relates to a visit to the premises of Burbidge & Son Ltd. at Awson Street in Coventry on 2nd December 2003 and subsequent dates to complete measurements. The purpose of this visit was to carry out emissions monitoring as part of compliance with the Environmental Protection Act PG6/33(97) Secretary of State's Guidance- Wood Coating Processes. The process is authorised by City of Coventry authorisation number 045.

The emission points were monitored for volatile organic compounds (VOC) and for particulate matter as appropriate.

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
- MDHS 70- General methods for sampling airborne gasses and vapours
- EN 13284-1:2001, tangential method

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 Volatile Organic Compounds

These protocols are included in this report in Appendix 1.

Equipment used

The following equipment was used in the emissions monitoring

- DP-CALC micromanometer and pitot tube
- SKC Highlite high volume sampling pump and rotameter
- SKC universal constant flow pump and dry-flo flowmeter
- In-stack particulate filter head using 4mm nozzle unless specified

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 above the 30 minutes minimum for particulates stated in PG6/33, it was not always possible to sample the same coating process each time in each stack. This has therefore led 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. In order to minimise error in the measurement of particulate emissions additional air velocity measurements were taken where necessary at the 0.15D and 0.85D particulate sampling points and used to determine the isokinetic sampling rate.

3. The occupancy of some spray booths 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 booths 3 and 4, have been sited closer to the extraction fans than the guidance position.

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	VOC emissions
	average mg/m^3	mg/m^3
Spraybooth 1- left	0.3	2.4
Spraybooth 1- right	0.1	13.2
Spraybooth 5	0.8	17.9
Spraybooth 2- left	2.1	9.0
Spraybooth 2- right	0.5	3.5
Spraybooth 3	0.6	4.4
Spraybooth 4	1.9	18.3
Stain Cab 1	2.6	875.0
Stain flash-off	n/a	231.5
Lacquer Cab 2	1.9	216.7
Lacquer flash-off	n/a	79.7
Oven 1	n/a	10.7
Oven 2	n/a	8.1
Stain kitchen	n/a	135.5
Lacquer kitchen	n/a	72.5
Still + can crusher	n/a	1.8

2nd Dec '03

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 stain and lacquer cabs are specified to achieve the 3 mg/m^3 particulate limit set in the German environmental legislation (TA- Luft).

The occupancy of the spray booths 2, 3 and 4 was relatively low reflecting the reduced workload for these positions. The particulate measurements were taken when these positions were in use and the VOC measurements taken when solvent based coatings were in use.

The VOC measurements from the automatic spray line were targeted at periods when solvent based materials were in use and as such represent greater emissions than would be expected when water based materials were in use. The VOC emissions from cab 1 were recorded when applying a patina coating unusually high in fast drying solvents. Under more normal process conditions the VOC emissions would be expected to be similar to the 107 mg/m^3 recorded in 2002.

The VOC emissions are typical for the industry and represent the different coatings and different occupancy of the spraying positions.

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 gas 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 and do not comply with the standard.

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 EN 13284-1:2001. 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 velocity 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 a 120-210 minute period at points specified in EN 13284-1:2001, tangential method. The samples are collected onto a pre-weighed glass fibre filters in an assembly inside the stack. 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 Volatile Organic Compounds

1. Measurements and Analysis
   The quantity of VOC's in a stack is measured by collecting a sample on a charcoal adsorption tube. This sample is subsequently analysed by a combination of Gas Chromatography and Mass Spectroscopy and the weight of VOC's calculated as total carbon.

2. Sampling
   A 6mm stainless steel probe is inserted into the stack and connected to the charcoal adsorption tube. The flue gasses are pumped through the adsorption tube for 20-50 minutes at a rate of 100-200 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 VOC's in terms of total carbon.

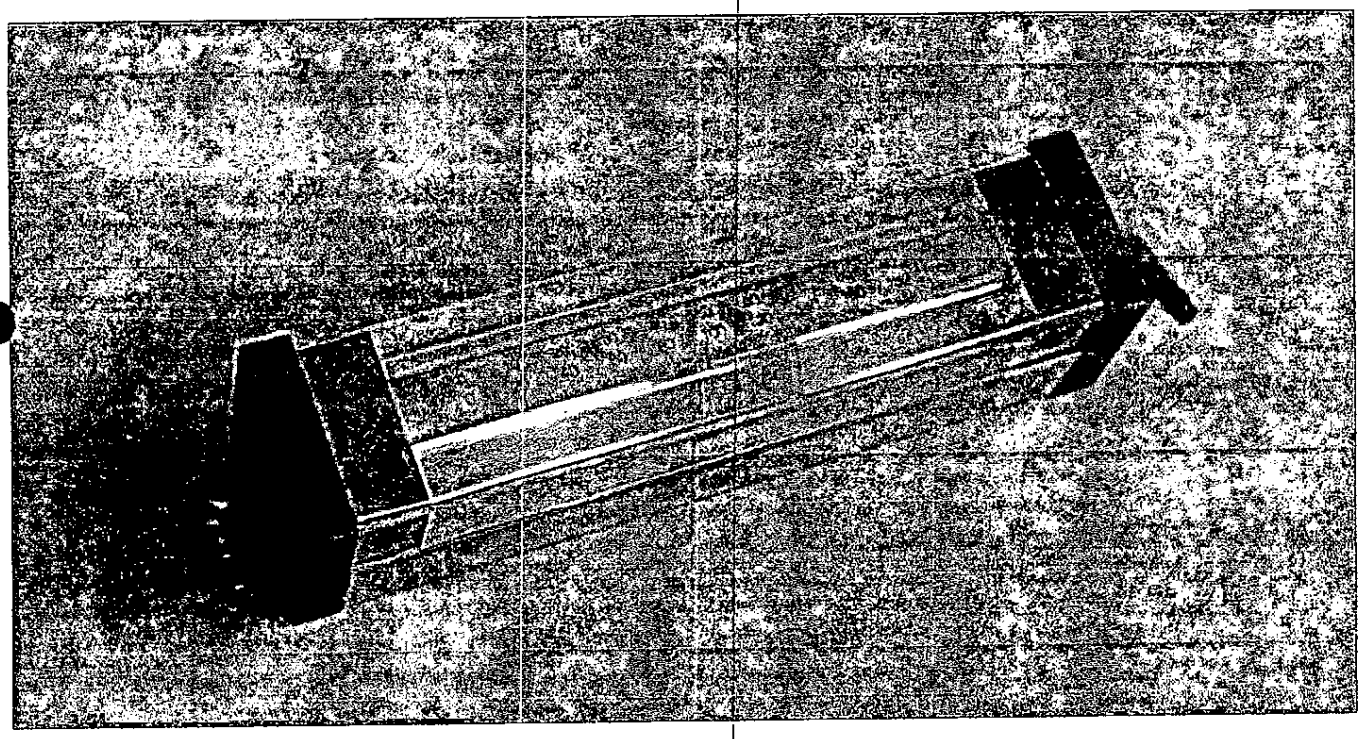
   The concentration of volatile organic compounds is expressed as milligrams carbon per cubic metre or $mg.m^{-3}$.

Appendix 2- Equipment Used

J.S. HOLDINGS

DRY-FLO FLOWMETER MODEL 100A

OPERATING INSTRUCTIONS



Description of Operation

A hollow glass cylinder and near frictionless diaphragm form the measurement element. As gas is introduced or evacuated from one end of the cylinder, the diaphragm is displaced by an equal volume. The flow rate (using an external timer) or volume sampled is read off from a graduated scale.

Construction

The tube and diaphragm of the measuring element are constructed from borosilicate glass with plastic sealing caps. A steel channel with aluminium connector blocks secures the glass tube. The top of the instrument is protected by a transparent dust cover.

Applications

The DRY-FLO calibrator can be used for the calibration of either:

gas flow-rate (using an external timer)
sample volumes up to a maximum volume of 100 ml

Typical applications include calibration of:

low flow air sampling pumps
hand pumps for indicator tubes
(e.g. Draeger, Gastec)

WARNING:

THE CALIBRATOR IS NOT COMPATIBLE WITH LIQUIDS

JS Holdings
Unit 6 Leyden Road
Stevenage
Hertfordshire
SG1 2BW
T: 01438 316994
F: 01438 316995

Certificate of Calibration

This Dry Flo Flowmeter, model 100A, serial number 0156 has been calibrated against an adjustable precision gas tight syringe, of nominal volume 100ml, which has been calibrated by filling with distilled water and determining the weight of water delivered in accordance with the general principles contained in British Standard Specification 6696:1986 and BS 6018:1991 or BS 7532:1991 as appropriate. At least ten determinations were made at each volume and the mean value was used to compute the measured volume. The weights used in the determination were a stainless steel reference set numbered ST1/831310, which have a certificate issued by the National Physical Laboratory, reference number 08C021/9506, and a stainless steel reference set numbered ST1/852298-860416, which have a certificate, issued by the National Physical Laboratory reference number 08C021/9402.

The measurement results are given in the table below, where each value given in the second column represents the average of three readings of the measured delivered volume of air at 20°C represented by the nominal value identified in the first column. The Uncertainty of Measurement is ± 0.2ml.

Nominal Value (ml)	Measured Volume (ml)	Accuracy %
20 (From 0 to 20)	19.00	98.00
40 (From 0 to 40)	38.50	96.25
60 (From 0 to 60)	58.50	97.50
80 (From 0 to 80)	78.60	98.25
100 (From 0 to 100)	98.00	98.00

Certificate number 0140

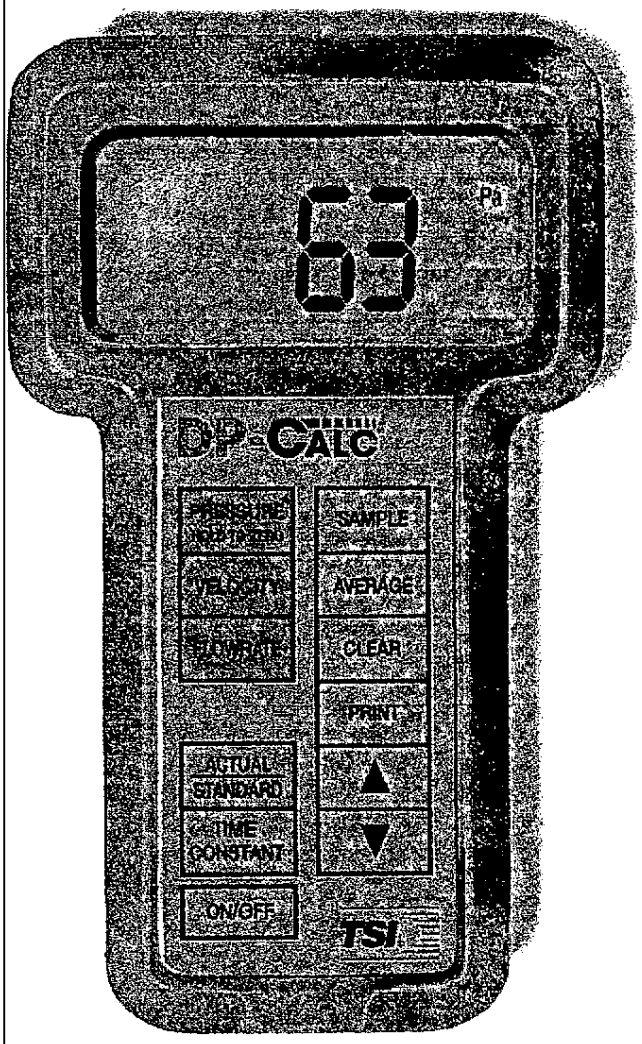
The uncertainties are for a confidence probability of not less than 95%

Model 8704

The advanced Model 8704 DP-CALC has all of the features of the Model 8702 and more. The Model 8704 allows storing of up to 500 data points, calculates volumetric flowrate along with velocity, converts between actual and standard velocity, and calculates statistics such as average, minimum, maximum and count. The saved data can then be recalled or downloaded to a computer for further analysis. Volumetric flowrate calculations also include a K factor. The included software allows downloading of the data into a spreadsheet. These features save you time in taking measurements and reporting results.

Features	8702	8704
Differential Pressure	●	●
Static Pressure	●	●
Velocity	●	●
Volumetric Flowrate		●
Calculates min/max		●
Variable Time Constant	●	●
Density Correction		●
Calculate Average	●	●
K Factor		●
Data Logging		●
Data Reporting Software*		●
Printer Output	●	●
NIST** Calibration Certificate	●	●

*Requires use of a spreadsheet software package
**U.S. National Institute of Standards and Technology



Model 8704

Backed by TSI Expertise

TSI Incorporated has more than 30 years experience in air flow measurement technology. It's this type of experience and innovation that provides you with accurate and reliable instruments. Along with TSI's expertise, each instrument is backed by a two year limited warranty and the industry's best service policy. Not only is service performed quickly, but calibrations are NIST traceable and a free certificate of calibration is included.

TSI®

Models 8702 and 8704 DP-CALC Micromanometers Specifications

Pressure:
Range: 1245 to 3735 Pa (-9.3 to 28.0 mm Hg, -5 to +15 in. H_2O)
Accuracy: ±1% of reading ±1 Pa (±0.01 mm Hg, ±0.005 in. H_2O)
Resolution: 1 Pa, 0.01 mmHg (0.001 in. H_2O)

Velocity:
Range[1]: 1.25 m/s to 78.5 m/s (250 ft/min - 15,500 ft/min)
Accuracy[2]: ±1.5% at 10 m/s (2,000 ft/min)

Instrument Temperature Range:
Operating range: 0 to 70°C (32 to 158°F)
Storage range: -40 to 85°C (-40 to 185°F)

Averaging Capability: (Model 8702 only)
Range: Up to 255 values each of pressure and velocity

Flow Rate: (Model 8704 only)
Displayed range[3]: to 9,999,000 ft³/min, m³/h, l/s
K Factor range: 0.01 to 2
Flow factor range: 0.01 to 999.9

Storage Capability: (Model 8704 only)
Range: Up to 500 values

Time Constant:
Values: 1, 5, 10, 15, or 20 seconds

Power Requirements:
Batteries: Four AA-size Alkaline or NiCd rechargeable
Approx. battery life: 24 hours (Alkaline), 7 hours (NiCd)
AC adapter (optional): 7 VDC nominal, 300 mA

Physical:
External dimensions: 100 mm x 168 mm x 36 mm (3.9 in. x 6.6 in. x 1.5 in.)
Weight (with batteries): 0.35 kg (0.76 lb.)
Display: 4-digit LCD, 15 mm (0.6 in.) digit height

Printer Interface:
Type: Serial
Baud rate: 1200

Recommended Maintenance Schedule:
Factory calibration: Annually

8702 DP-CALC includes the following accessories:
1 - carrying case
4 - size AA batteries
1 - NIST certificate of calibration
1 - operation and service manual

8704 DP-CALC includes the following accessories:
1 - carrying case
1 - static tube
4 - size AA batteries
1 - NIST certificate of calibration
1 - operation and service manual
1 - downloading software disk
2.44 m of tubing

1 Pressure velocity measurements are not recommended below 5.08 m/s and are best suited to velocities over 10.16 m/s.
2 Accuracy is a function of converting pressure to velocity. Conversion accuracy improves when actual pressure values increase.
3 Actual range is a function of maximum velocity, pressure, duct size, K factor and density correction.

Specifications are subject to change without notice.

TSI.

TSI Incorporated
Environmental Measurements and Controls Division
500 Cardigan Road
Shoreview, MN 55126 USA
Telephone: 001 612 490 2807
Fax: 001 612 490 2874

Printed in U.S.A.

Bristol Industrial & Research Associates LTD.
P.O. Box No. 2
Portishead, Bristol BS20 9JB
England

Certificate of Calibration

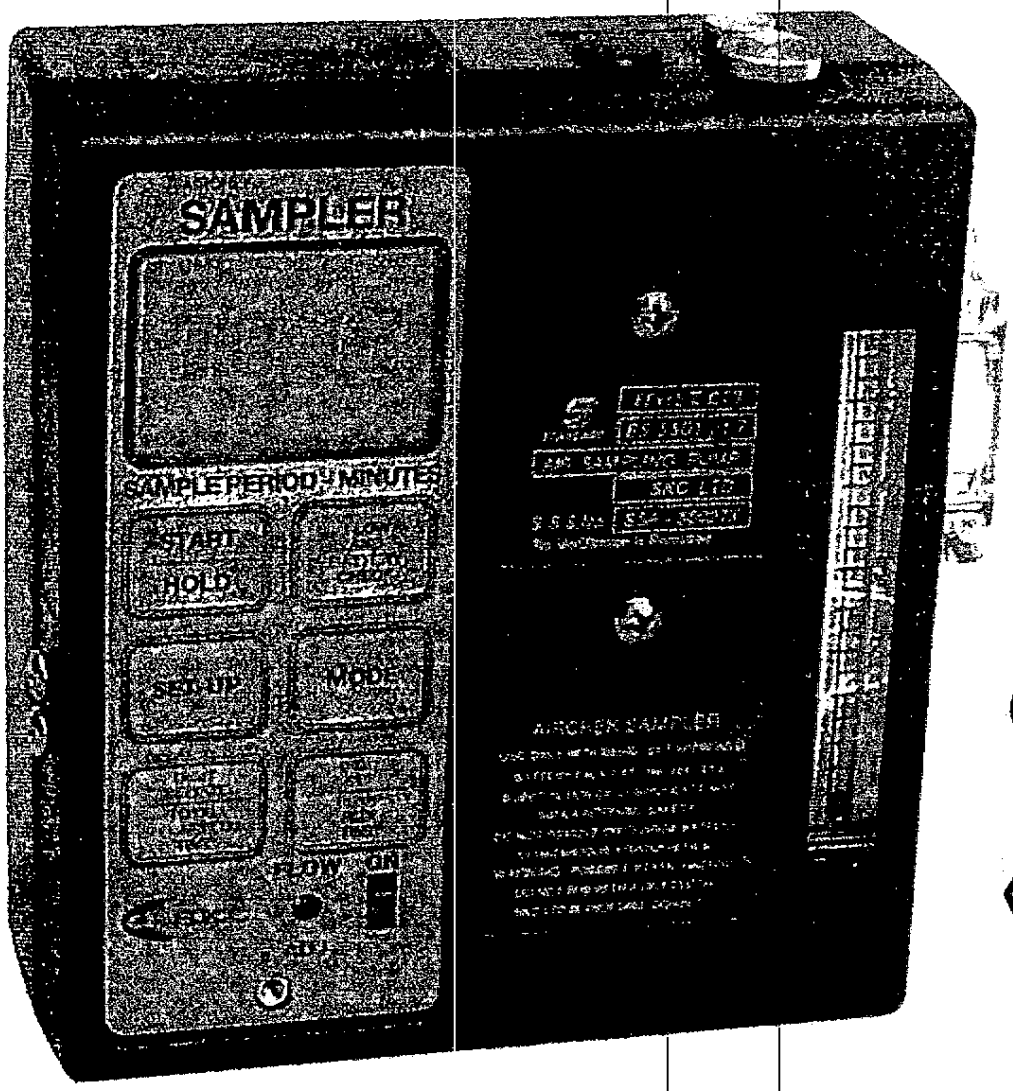
This is to certify that the instrument detailed below has been calibrated using standards which are periodically verified and are traceable to National Standards where these exist.

Customer	:	**Mike Thomas**
Customer Identifier	:	**N/A**
Manufacturers Name	:	**TSI**
Type	:	**8705 Micromanometer**
Manufacturers Serial Number	:	**00110061**
BSRIA Identifier	:	**26973**
Previous BSRIA Identifier	:	**23224**
Calibration Date	:	**13 November 2002**
Recommended Next Calibration Date	:	**12 November 2003**
Certificate Number	:	**26973**
Test Number	:	**N/A**
Laboratory Conditions	: **Temperature**	23 ± 4°C
	: **Humidity**	40 ± 15% RH

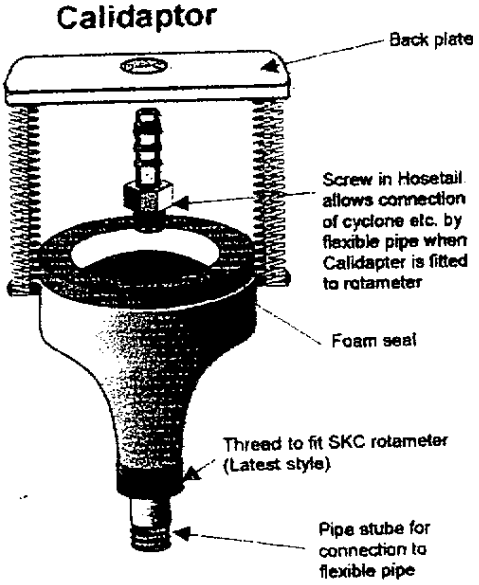
Approved Signature

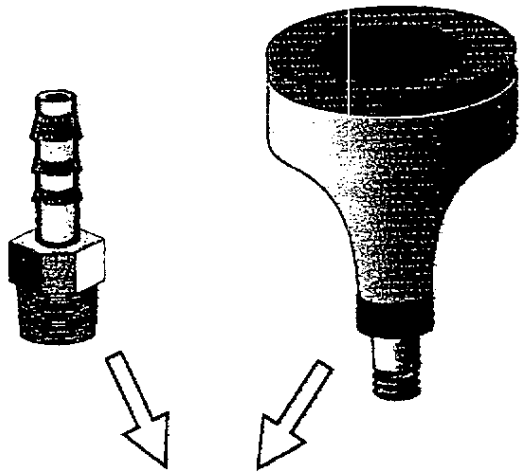
BSRIA
Quality Approved
[redacted]
M.J. Trotter

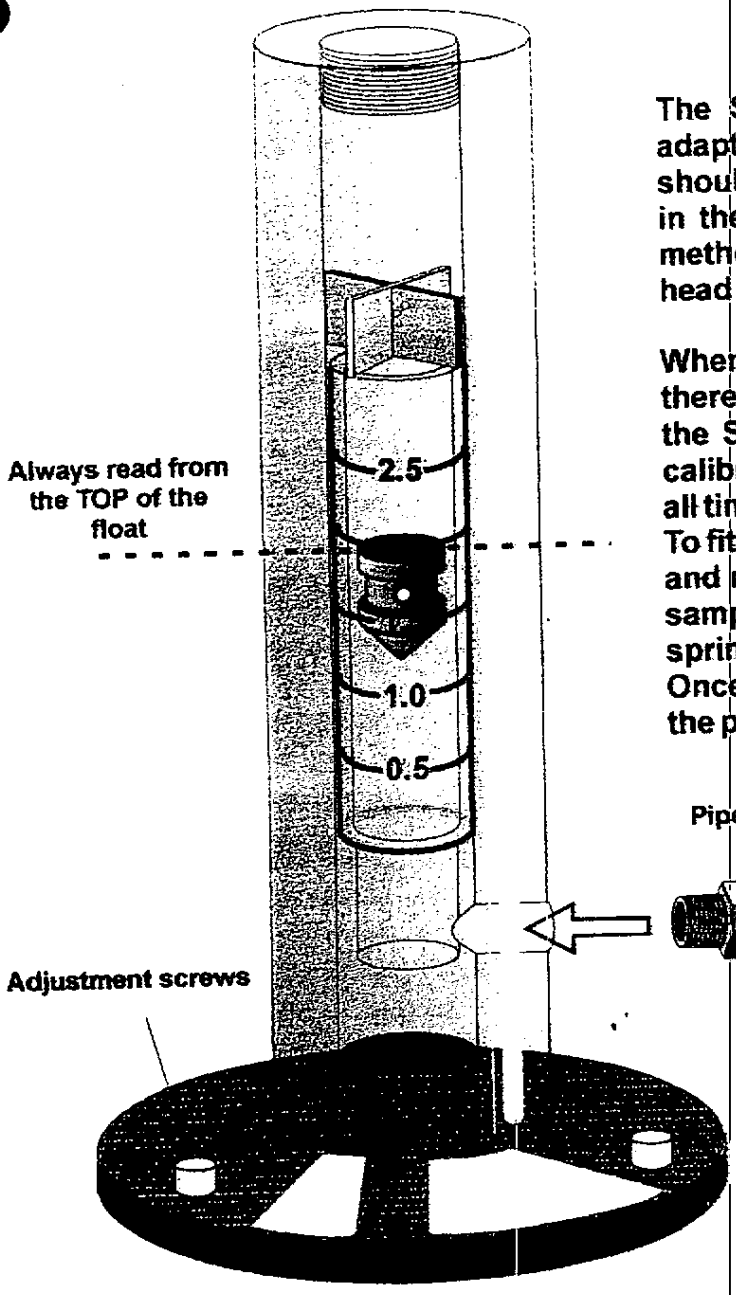
BSRIA Instrument Solutions
Old Bracknell Lane West, Bracknell, Berkshire RG12 7AH UK


SAMPLER
SAMPLE PERIOD - MINUTES
START
HOLD
SET-UP
MODE
FLOW
ON
AIRCHEK SAMPLER

Calidaptor



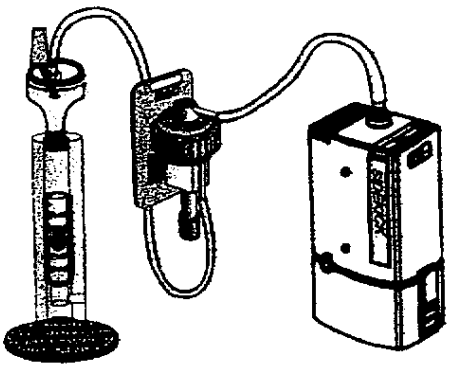




The SKC rotameter is supplied with an adapter and two pipe stub fittings which should be screwed into position as shown in the diagram opposite. This provides a method of connecting either a sampling head or flexible pipe to the rotameter.

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



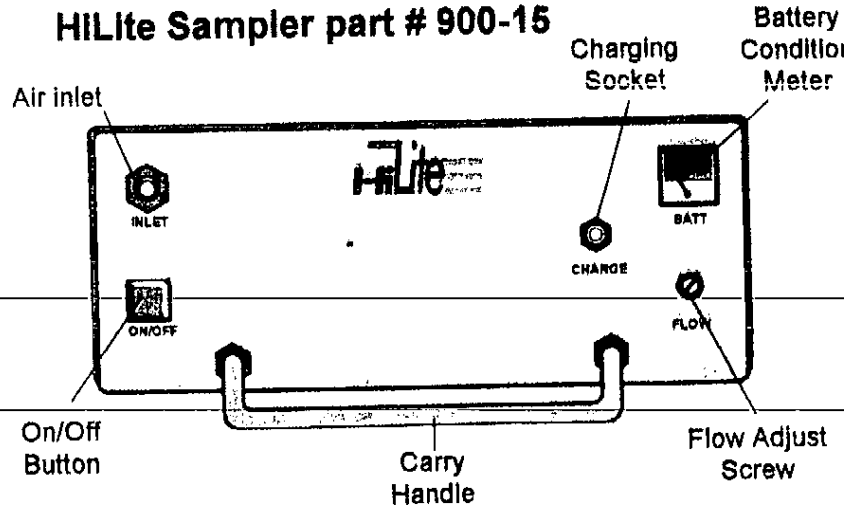
Set up showing cyclone being calibrated

FEATURES

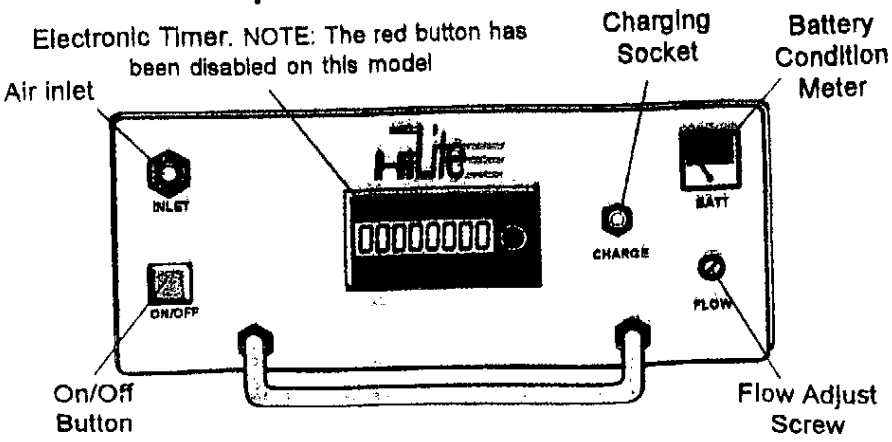
Where are the controls located? All the controls of the HiLite series are located on the front panel.

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

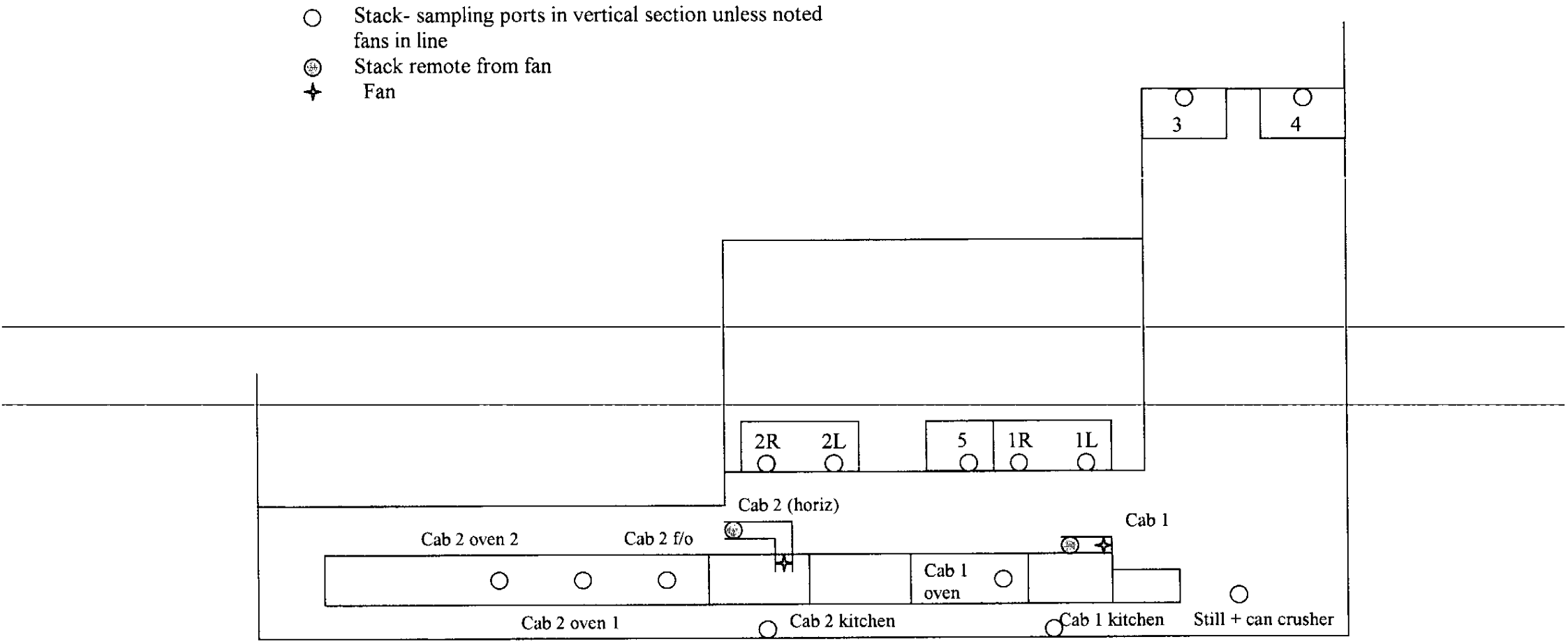
SKC®

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

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 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	11.0	8.3	434	0.7	205	1701.5	0.4	
perpendicular port, 0.85D	12.3	9.2	497	0.3	140	1288.0	0.2	

Particulate Matter Stack Monitoring

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	
perpendicular port, 0.15D	10.1	7.6	195	0.0	151	1147.6	0.0	drying only
parallel port, 0.85D	13.0	9.8	497	0.1	179	1754.2	0.1	spraying patina

Particulate Matter Stack Monitoring

Stack Identification/Position	**Stack**	Stack dimensions	**700mm**
Plant identification	**Spraybooth 5**	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	9.5	7.2	340	1.3	158	1137.6	1.1	
parallel port, 0.85D	9.6	7.2	6	0.5	139	1000.8	0.5	

Particulate Matter Stack Monitoring

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
perpendicular port, 0.15D	10.5	7.9	178	3.7	203	1603.7	2.3	
parallel port, 0.85D	9.1	6.8	347	2.2	176	1196.8	1.8	

Particulate Matter Stack Monitoring

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, 0.85D	5.5	9.3	86	0.7	148	1376.4	0.5	6mm nozzle, very low use position

Particulate Matter Stack Monitoring

Stack Identification/Position	**Stack**	Stack dimensions	**700mm**
Plant identification	**Spraybooth 3**	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	6.7	5.1	345	0.5	148	754.8	0.7	low usage spray booth
parallel port, 0.15D	12.0	9.1	208	0.7	161	1465.1	0.5	

Particulate Matter Stack Monitoring

Stack Identification/Position	**Stack**	Stack dimensions	**700mm**
Plant identification	**Spraybooth 4**	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	6.9	5.2	461	2.2	171	889.2	2.5	
perpendicular port, 0.85D	4.0	6.8	83	1.1	124	843.2	1.3	6mm nozzle

Particulate Matter Stack Monitoring

Stack Identification/Position	**Stack**	Stack dimensions	**650mm**
Plant identification	**Spray cab 1**	Process operation	**stain**

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, 0.15D	9.0	6.8	308	1.9	121	822.8	2.3	
left port, 0.15D	8.3	6.3	192	2.4	130	819.0	2.9	

Particulate Matter Stack Monitoring

Stack Identification/Position	**Stack**	Stack dimensions	**550mm**
Plant identification	**Spray cab 2**	Process operation	**lacquer**

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
left port, 0.15D	16.0	12.1	495	2.5	137	1657.7	1.5	
right port, 0.85D	14.0	10.6	325	0.5	184	1950.4	0.3	

Measurement of VOC concentrations

sample	stack identification	total C microgram	pump rate ml/min	pump time min	air volume litre	emission mg/m3	Comments
1	s/b 1L	8.5	140	25	3.50	2.4	
2	s/b 1R	48	140	26	3.64	13.2	
3	s/b 5	66	160	23	3.68	17.9	
4	s/b 2L	39	160	27	4.32	9.0	
5	s/b 2R	8.5	160	15	2.40	3.5	
6	cab 1	2800	160	20	3.20	875.0	patina
7	cab 1 f/o	1000	160	27	4.32	231.5	
8	cab 2	780	180	20	3.60	216.7	
9	cab 2 f/o	330	180	23	4.14	79.7	

Measurement of VOC concentrations

sample	stack identification	total C microgram	pump rate ml/min	pump time min	air volume litre	emission mg/m3	Comments
10	oven 1	42	140	28	3.92	10.7	
11	s/b 4	59	140	23	3.22	18.3	
12	oven 2	33	140	29	4.06	8.1	
13	still	8.5	140	34	4.76	1.8	
14	stain kit	550	140	29	4.06	135.5	
15	lacq kit	330	130	35	4.55	72.5	
16	s/b 3	17	130	30	3.90	4.4	

Spraybooths and drying rooms- air flow in exhaust stacks

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	9.3	12.2	8.9	9.5	12.2	10.1	10.4	8.9	12.1	12.7	10.63	14,727	120
spraybooth 1 left stack, parallel port	700	15.5	15.1	12.7	8.1	8.5	11.7	13.2	13.6	16.1	15.8	13.03	18,052	
spraybooth 1 right stack, perpendicular port	700	9.5	11	9.9	8.5	11.5	11.7	12.8	12.3	16.8	15.9	11.99	16,611	130
spraybooth 1 right stack, parallel port	700	14.1	16.4	17.1	14.2	11.8	11.8	14.4	14.2	13.6	12.8	14.04	19,451	
spraybooth 2 left stack, perpendicular port	700	11.2	8.3	8.5	8.7	9.9	10.6	8.6	6.6	4.3	0	7.67	10,626	50
spraybooth 2 left stack, parallel port	700	10.4	11.3	11.9	11.1	9.3	6.3	11.2	11.4	9.8	8.7	10.14	14,048	
spraybooth 2 right stack, perpendicular port	700	9.9	8.5	7	7.6	9.6	9.7	10	8.7	8.2	4.7	8.39	11,624	40
spraybooth 2 right stack, parallel port	700	12.5	12.8	15	12.9	8.8	9.2	11.9	12.6	11.5	11.1	11.83	16,389	
new booth parallel port	700	11	9	7.9	9	9.7	10.5	9.5	11.1	9.8	9.5	9.7	13,438	60
new booth perpendicular port	700	9.5	9.5	10.5	10.4	10.2	10.2	9.7	8.5	9.1	8.6	9.62	13,328	

Spraybooths and drying rooms- air flow in exhaust stacks

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	6.1	7.7	9.2	10.6	11.3	11.8	13.1	13.7	16.4	17.3	10.26	3,022	110
spraybooth 3 parallel port	700	11.2	13.6	16.1	18.4	13.4	11	10.2	12	13.2	14.2	16.91	14,463	
spraybooth 4 perpendicular port	700	6.1	7.8	8.4	11.1	11.8	11.5	10.7	7.8	5.7	3.6	8.45	11,707	130
spraybooth 4 parallel port	700	15.5	17.1	14.9	15.1	13.2	10.7	10.5	11.4	15.2	12.9	13.65	18,911	
spray cab 1 right port	650	8.5	9.4	10.2	11.9	12	13.4	12.5	11.8	11.1	10.4	11.12	13,283	75
spray cab 1 left port	650	7	11.4	11.7	10.9	11.3	11.1	11.5	11.2	11.1	10.2	10.74	12,830	
cab 1 oven	250	17.5	16.2	16.1	17.1	17	18.7					17.10	3,022	220
spray cab 2 right port	550	17.1	18	17.9	18	17.9	17.7	17.3	16.4	15.7	13.1	16.91	14,463	220
spray cab 2 left port	550	14.8	18.3	18.5	18.1	18.2	18.1	17.6	17.4	17.5	16.3	7.87	2,318	
spray cab 2 flash-off right port	350	8.8	8.9	11.2	10.8	9.8	9.2					4.64	1,367	80

Spraybooths and drying rooms- air flow in exhaust stacks

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 left port	350	7.3	8.9	9	9.4	10.5	11.3					9.4	1,396	
spray cab 2 oven 1 right port	250	9.2	10.5	10.6	10.7	10.8	11					10.5	1,346	80
spray cab 2 oven 1 left port	250	10.4	10.3	10.8	11.2	12.6	13.5					11.5	2,026	
spray cab 2 oven 2 right port	250	12.9	13.4	13.9	14.5	14.8	14.5					14.0	2,474	95
spray cab 2 oven 2 left port	250	13.1	15.9	14.7	13.5	11.5	10.0					13.1	2,318	
cab 1 kitchen	250	8.2	8.6	9.0	8.8	7.3	4.5					7.7	1,367	105
cab 2 kitchen	250	7.6	7.9	8.7	8.6	7.8	6.8					7.9	1,396	110
still + can crusher	250	8	7.9	7.7	8	7.6	6.5					7.6	1,346	120