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: - January 2008

Contents

Introduction

This report relates to a visit to the premises of Burbidge & Son Ltd. at Awson Street in Coventry on 28th January 2008 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 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
- 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

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

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. 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 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 booths 3 and 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^3
Spraybooth 1- left	1.4
Spraybooth 1- right	2.1
Spraybooth 2- left	0.7
Spraybooth 2- right	1.9
Spraybooth 3	1.1
Spraybooth 4	0.9
Stain Cab 1	0.4
Lacquer Cab 2	0.7

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

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.

SAMPLING PROTOCOL 2

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 13284-1:2002, 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.

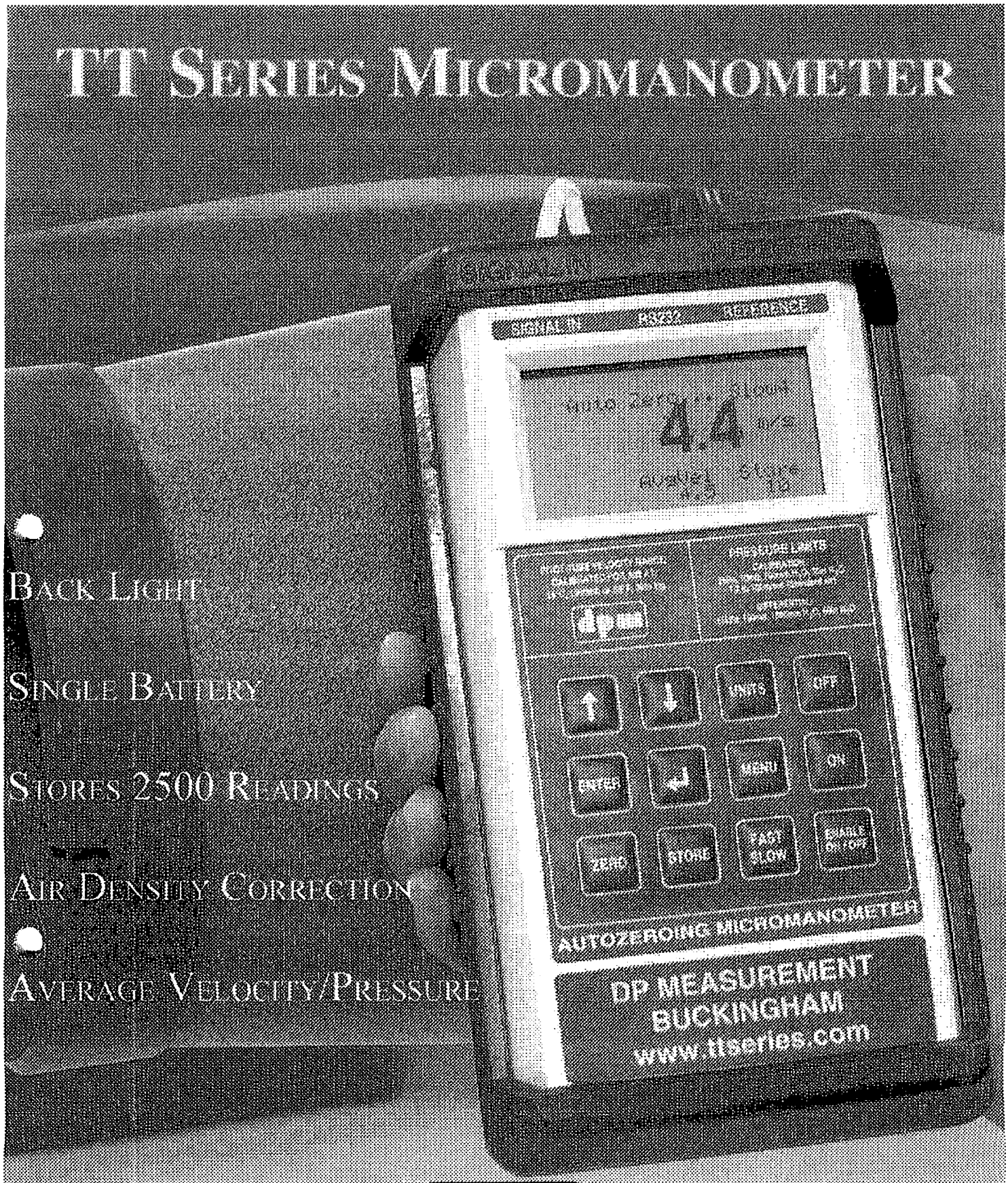
4. Presentation of results
   Particulate sampling is assessed by weight (gravimetrically). The weight is normally expressed in milligrams.

   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 $mg.m^{-3}$.

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

DP MEASUREMENT
Unit 11, Top Angel, Buckingham Industrial Park, Buckingham. MK18 1TH
Tel/Fax: 01280 817122 e-mail: dpm@ttseries.com www.ttseries.com

CALIBRATION CERTIFICATE

Micromanometer Type: **TT 570S**
Serial Number: **6012**
Test Date: **13/03/2007**

Room Temperature: **21°c**
Due Date: **13/03/2008**

Calibration Points Pascals	Indicated Readings	Error	Calibration Points m/sec	Indicated Readings	Error
POSITIVE					
40	40	0	5.0	5.0	0.0
80	80	0	8.2	8.2	0.0
160	160	0.0%	11.5	11.5	0.0%
400	400	0.0%	15.0	15.0	0.0%
800	800	0.0%	16.3	16.3	0.0%
1.60	1.60	0.0%	25.8	25.8	0.0%
3.00	3.00	0.0%	36.5	36.5	0.0%
6.00	6.00	0.0%	50.0	50.0	0.0%
NEGATIVE					
-6.00	-6.00	0.0%			
-3.00	-3.00	0.0%			
-1.60	-1.60	0.0%			
-800	-800	0.0%			
-400	-401	0.3%			
-160	-160	0.0%			
-80	-80	0			
-40	-40	0			

The velocity range is calibrated for ellipsoidal nose (NPL Type) pitot static tubes used at air density 1.20 kg / m^3.

The above mentioned instrument has been calibrated against a instrument whose serial number is 2288 which in turn has been calibrated against equipment that is traceable to UK National Standards via Sheffield Testing Laboratories.(UKAS number 0157)

Signed: [redacted]

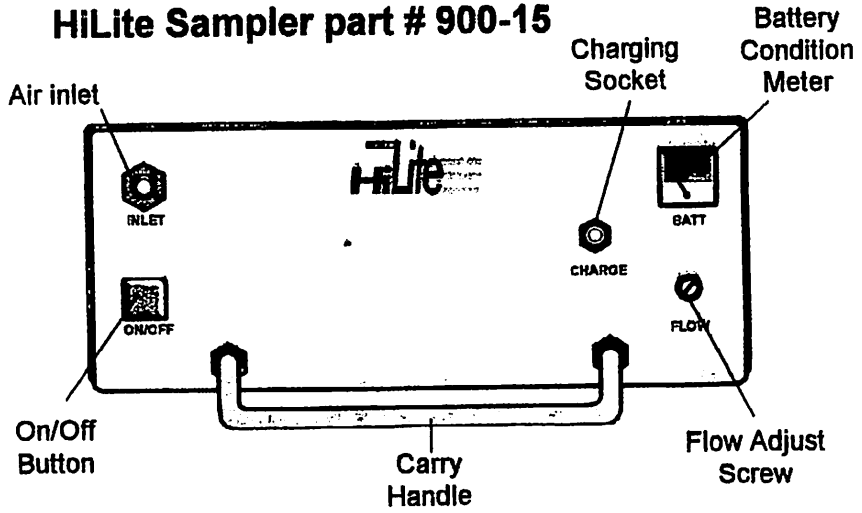
H Khimji Calibration Officer.

FEATURES

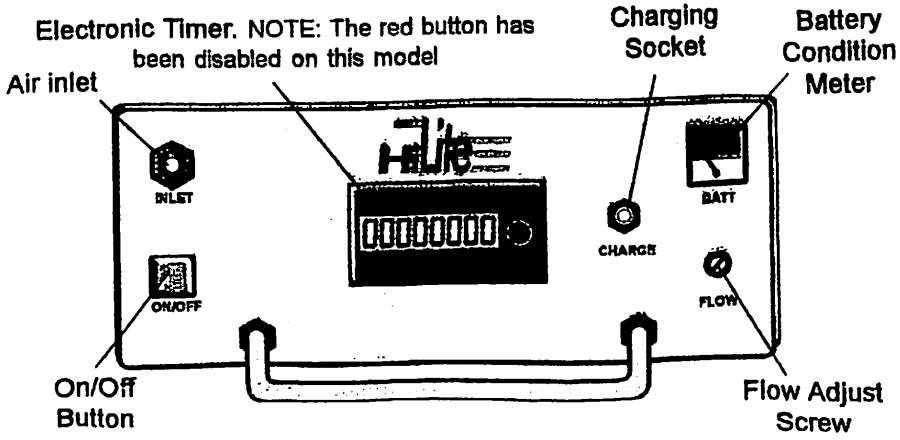
Where are the controls located? All the controls of the HiLite series are located on the front panel.

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

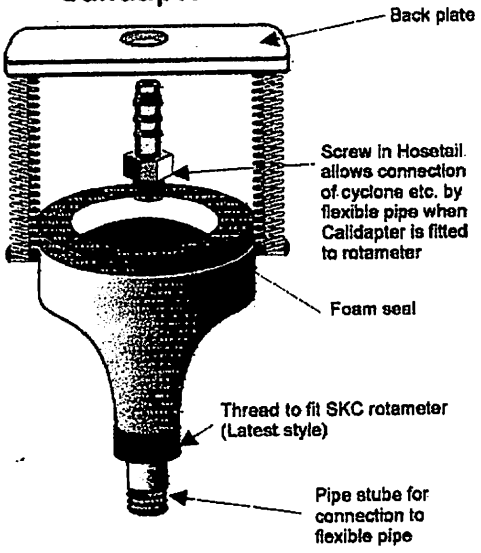
SKC®

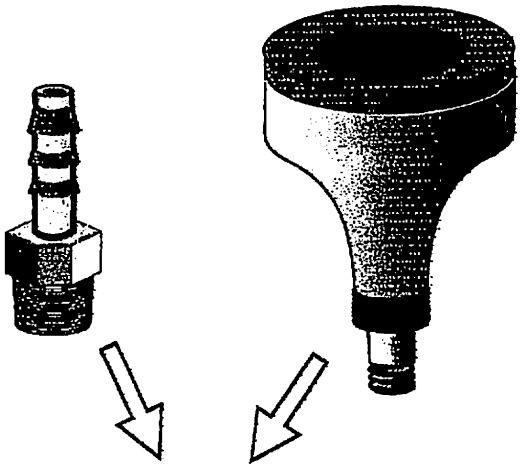
Unit 11 Sunrise Park Higher Shaftesbury Road
Blandford Forum Dorset DT11 8ST
01258 48 01 88 01258 48 01 84

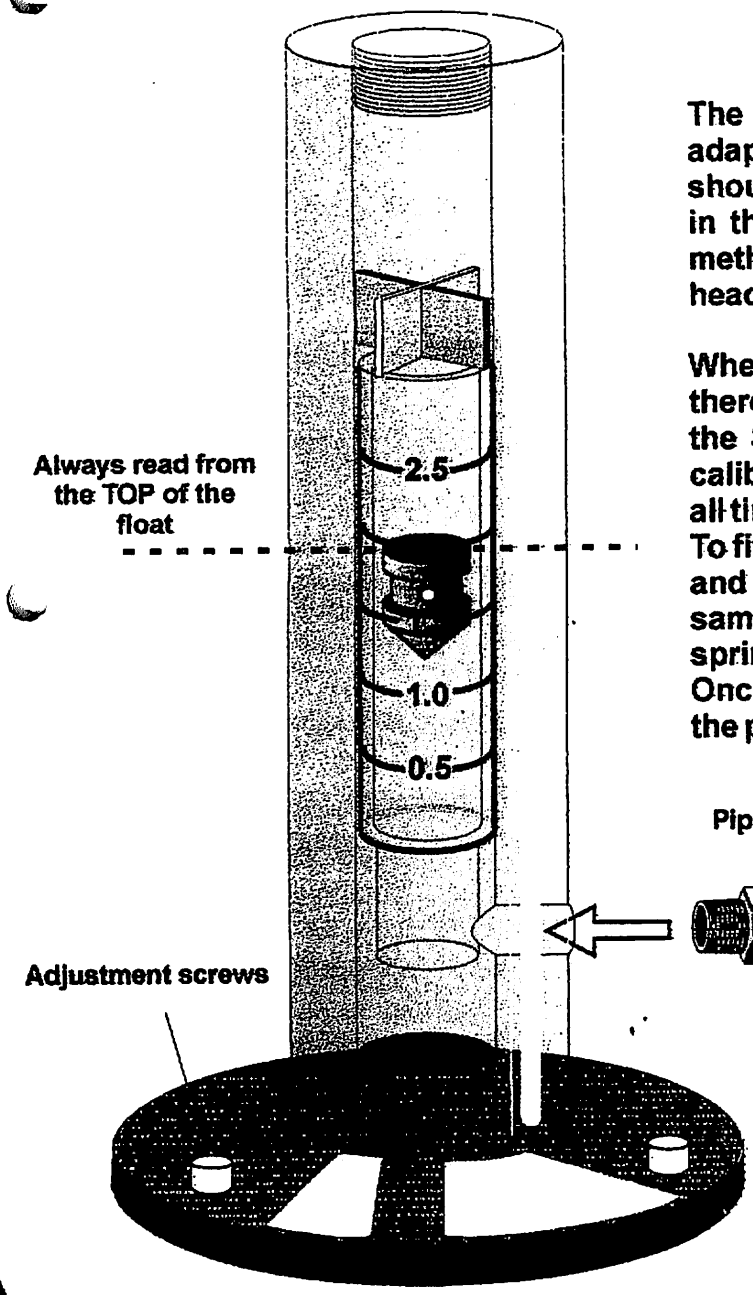
Published by SKC Ltd.

CE

Calidaptor

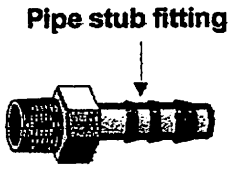


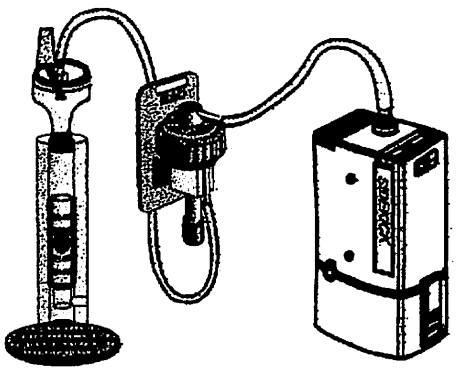




The SKC rotameter is supplied with an adapter and two pipe stub fittings which should be screwed into position as shown in the diagram opposite. This provides a method of connecting either a sampling head or flexible pipe to the rotameter.

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.





Set up showing cyclone being calibrated

BIOS INTERNATIONAL

CERTIFICATION OF NIST (NBS) TRACEABILITY

The DryCal DC-Lite is a true primary flow standard: Calibration is neither required or possible as accuracy is dependent upon the dimensions of the flow measuring cell and the accuracy of the internal computer's crystal clock. Verification of NIST traceability depends upon verification of these dimensions.

BIOS International certifies that the following DryCal DC-Lite has been tested against NIST-traceable measuring instruments, which are periodically checked by, approved testing laboratories:

- Cell DC-L500 Serial Number _____ I.D. 0.3660 inch ± 0.0005 inch
- Cell DC-L5K Serial Number _____ I.D. 0.6270 inch ± 0.0005 inch
- Cell DC-L12K Serial Number 2062 I.D. 0.9450 inch ± 0.001 inch
- Cell DC-L20K Serial Number_____ I.D. 1.2810 inch ± 0.001 inch
- Cell DC-L40K Serial Number_____ I.D. 1.7500 inch ± 0.001 inch

- Encoder Length 0.900 inches ± 0.001-inch ✓
- Encoder Length 1.300 inches ± 0.001-inch _____

Certified with Mitutoyo Master Gage Blocks NIST Test Number 821/256463-96

By [redacted] Date Oct. 7, 1999

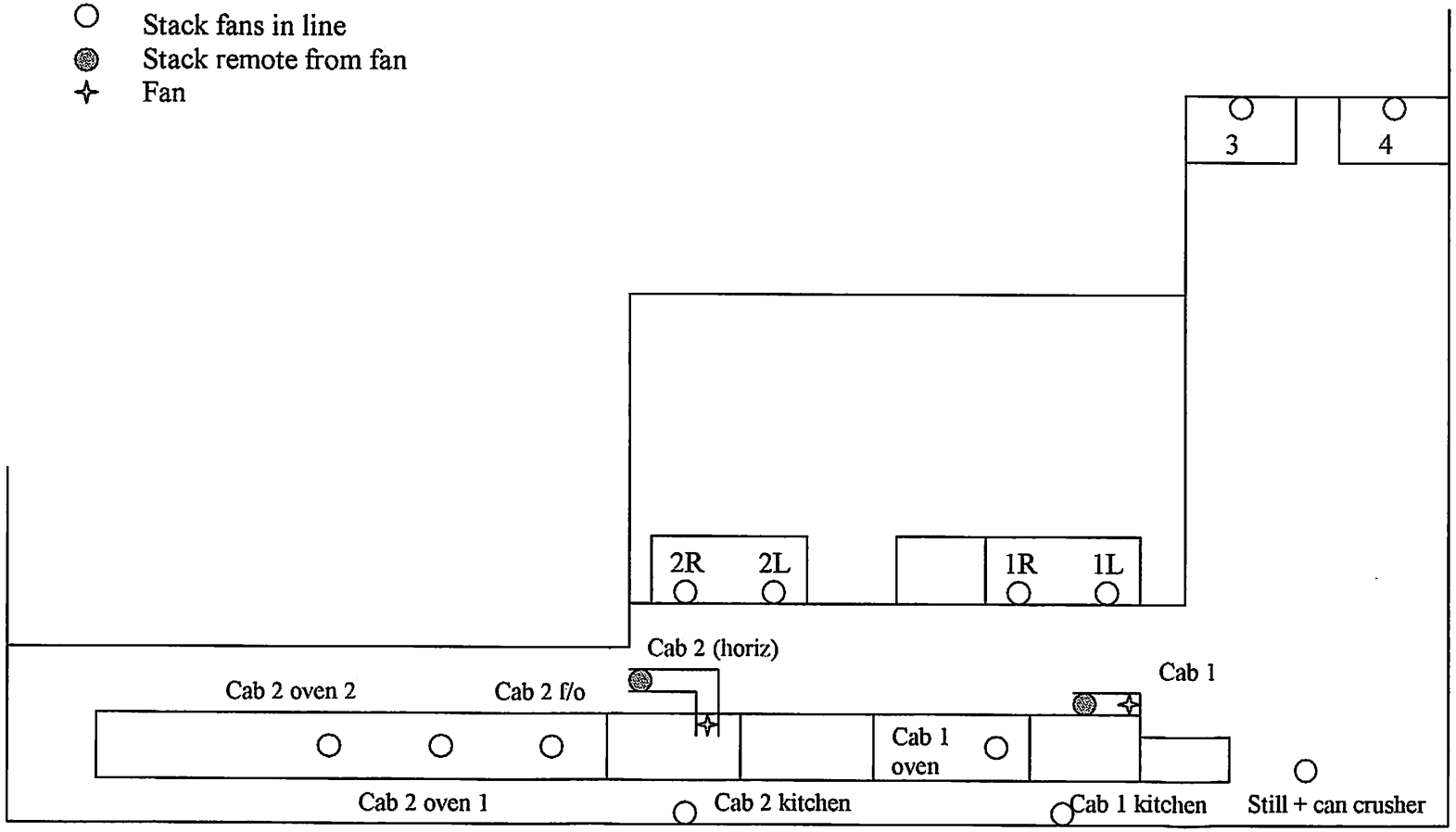
- Timing Output

DCL: 100.07285 ms ± 0.05% (100.0228 to100.1289 ms)

Certified with Phillips Universal Counter/Timer NIST Test Number 971062

By [redacted] Date Oct. 7, 1999

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	11.0	8.3	498	3.1	270	2241.0	1.4	
perpendicular port, 0.15D	9.5	7.2	434	1.7	177	1274.4	1.3	

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 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	5.8	10.0	433	3	271	2710.0	1.1	6mm nozzle
parallel port, 0.85D	12.7	9.6	421	5.7	191	1833.6	3.1	

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	8.1	6.1	340	0.8	189	1152.9	0.7	
parallel port, 0.85D	13.0	9.8	277	1.1	178	1744.4	0.6	

Stack Identification/Position	**Right 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	14.8	11.1	323	4.3	191	2120.1	2.0	
perpendicular port, 0.15D	9.4	7.1	148	2.1	174	1235.4	1.7	

Particulate Matter Stack Monitoring

Stack Identification/Position	**Stack**	Stack dimensions	**700mm**
Plant identification	**Spraybooth 3**	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
perp 0.85	9.9	7.5	447	1.7	172	1290.0	1.3	
perp 0.15	7.2	5.4	325	0.6	154	831.6	0.8	

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, 0.85D	6.3	10.7	177	1.9	140	1498.0	1.3	6mm nozzle, mainly staining
perpendicular port, 0.15D	6.8	5.0	6	0.4	207	1035.0	0.4	

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
upper port, 0.15D	9.1	6.9	495	0.4	158	1090.2	0.4	walnut stain

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
right port, 0.85D	17.0	12.8	86	1.5	120	1536.0	1.0	
left port, 0.85D	16.4	12.4	110	0.5	162	2008.8	0.3	

Spraybooths - 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	13.9	12.9	9.5	7.8	7.7	9.6	9.7	11	13.3	12.1	10.75	14,893	6
spraybooth 1 left stack, parallel port	700	11.4	10.5	11.9	12	10	11.2	10.8	10.4	11.5	8.7	10.84	15,018	
spraybooth 1 right stack, perpendicular port	700	8.2	7.7	5.8	5.7	8.8	11.5	11.1	11.2	10.2	2	8.22	11,388	-20
spraybooth 1 right stack, parallel port	700	14.5	15.7	16.8	15.3	13.3	11.8	14.2	12.7	13.9	11.6	13.98	19,368	
spraybooth 2 left stack, perpendicular port	700	8	8.6	8.1	8.6	10.5	10.7	10.5	9.7	8.7	5.5	8.89	12,316	30
spraybooth 2 left stack, parallel port	700	13	12.8	14.9	14.8	12.5	12.3	13.2	13	6	10.2	12.27	16,999	
spraybooth 2 right stack, perpendicular port	700	6.9	9.3	9.4	10.4	10.5	10.8	8.6	4.7	0	0	7.06	9,781	25
spraybooth 2 right stack, parallel port	700	14.6	16.2	15.7	14.2	10.2	11.7	14.4	14.8	13.3	10.5	13.56	18,786	

Spraybooths - 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	0	5.1	7.2	8.6	11.1	11.1	10	9.9	10.6	6.8	8.04	11,139	-35
spraybooth 3 parallel port	700	16.3	18.4	18.2	17.9	14.6	14	17.3	17.1	16	14.2	16.4	22,721	
spraybooth 4 perpendicular port	700	0	5.7	6.8	8.1	11.3	12	9.2	6.3	6	0	6.54	9,061	-25
spraybooth 4 parallel port	700	17.6	18.6	18	15.7	11.9	13.8	17	17.6	16.8	13.9	16.09	22,291	
spray cab 1 right port	650	7.8	9.2	9.1	9.5	10.3	10.9	11.5	11.4	11.2	10.9	10.18	12,161	-20
spray cab 1 left port	650	7.7	7.9	7.7	7.6	7.1	7.3	7.4	8.3	9.1	8.2	7.83	9,353	
spray cab 2 right port	550	19.7	16.7	19.1	19	18.5	18.1	17.4	17	16.1	16.4	17.8	15,224	-30
spray cab 2 left port	550	19	18.4	18.2	17.6	17.5	17.8	16.8	16.4	15.9	15.6	17.32	14,813	

Spraybooths - 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 right port	350	8.2	8.6	8.7	9	10.6	9.1					9.0	1,414	50
spray cab 2 flash-off left port	350	6.4	8.1	8.2	8.9	9.5	10.6					8.6	1,543	
spray cab 2 oven 1 right port	250	8.9	10	10.4	12.5	13.2	9.9					10.8	1,296	85
spray cab 2 oven 1 left port	250	10.5	11.5	10.6	10.4	11.0	11.4					10.9	1,926	
spray cab 2 oven 2 right port	250	11.3	13.2	13.5	14.4	15.9	14.7					13.8	2,444	130
spray cab 2 oven 2 left port	250	13.2	13.6	14	13.6	12.9	11.6					13.2	2,324	
cab 1 kitchen	250	7.8	9.0	9.1	8.4	7.7	6.0					8.0	1,414	110
cab 2 kitchen	250	7.0	8.8	9.8	9.6	9.4	7.8					8.7	1,543	125
still + can crusher	250	8	7.9	7.9	7.1	6.5	6.6					7.3	1,296	105