Report of Environmental Monitoring carried out at: -

Midland Steel Structures Ltd
Golden Acres Lane
Binley
Coventry
CV3 2RT

For the attention of Mr Tony Atkins

Examination, Assessment and Report by: -

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

tel 01480 387749

Authenticating Signature ..[redacted]

Date: - December 2008

1. Introduction

This report relates to a visit to the premises of Midland Steel Structures Ltd in Coventry on 10th December 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 Act 1999. The process is authorised by Coventry City Council, permit reference number PPC/063.

The emission points were monitored for particulate matter.

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

2. Reference documents

The reference documents used for the emissions monitoring were

- PG6/23 Secretary of State's Guidance- Metalcoating Processes
- EN 13284-1:2001, tangential method for particulates

3. 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.

4. Equipment used

The following equipment was used in the emissions monitoring

- DPM TT 570S 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.

5. Location and identification of sampling points

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

6. Deviations from standards

1. Due to the low level of overspray and the effectiveness of the spray booth filters it was necessary to run extended sampling times above the 30 minutes minimum suggested in PG6/23 in order to collect sufficient particulates for accurate analysis.

2. The air flow in the stacks in Unit 1 was generally consistent and followed the normal velocity gradient across the stack. The part of the spraybooth extracted by stacks 1 & 2 was used for spraying. That part extracted by stacks 3 & 4 was used for drying only.

The airflow in the stacks in Unit 2 was generally turbulent across the diameter but relatively stable at the particulate sampling positions. Most of the spraying took part in the section of both extracted by stacks 2 & 3.

3. The occupancy of the spray booth in Unit 1 was not continuous but representative of the current workload. Occupancy of the booth in Unit 2 was essentially continuous during the sampling period.

4. The sampling positions in all the Unit 1 ducts were not ideal due to the construction of the booth and the position of the overhead crane. The ports in the stacks in Unit 2 were correctly positioned but two were heavily corroded and not accessible during the survey. These should be investigated and made accessible for the next survey.

7. Results

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

Probable significant errors in the measurement of particulate matter are from air turbulence (10%) and low weight sample analysis (20%).

Stack Position	Particulate emissions
	average $mg.m^{-3}$
Unit 1 Spray booth	0.5
Unit 2 Spray booth	0.4

8. Conclusions and Discussion

Airless spraying systems were used to coat the metalwork. This type of application generates little overspray and the relatively large paint droplets tended to fall to the floor rather that be carried to the filters. The Andrea dry filters were in reasonable condition and so would be effective at removing overspray from the airflow.

Typical particulate emissions for metalcoating industries using dry filter media are 0-10 mg/m^3 for normal conditions and 10-15 mg/m^3 for poor filter condition.

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 a minimum 120-210 minute period at points specified in BS 3405:1983 or 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

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

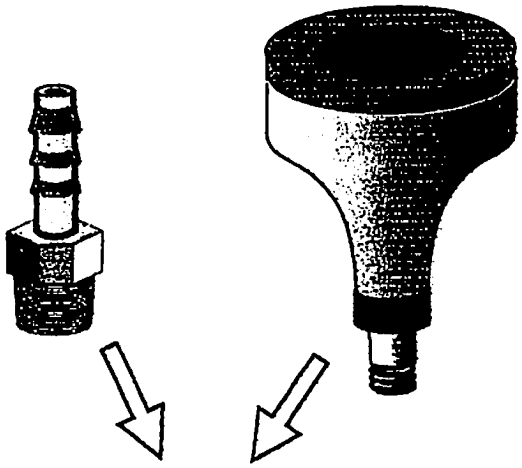
By [redacted] Date Oct. 7, 1999

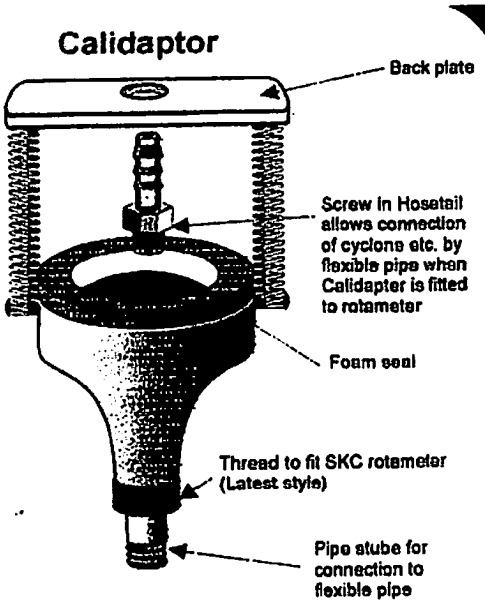
- Timing Output

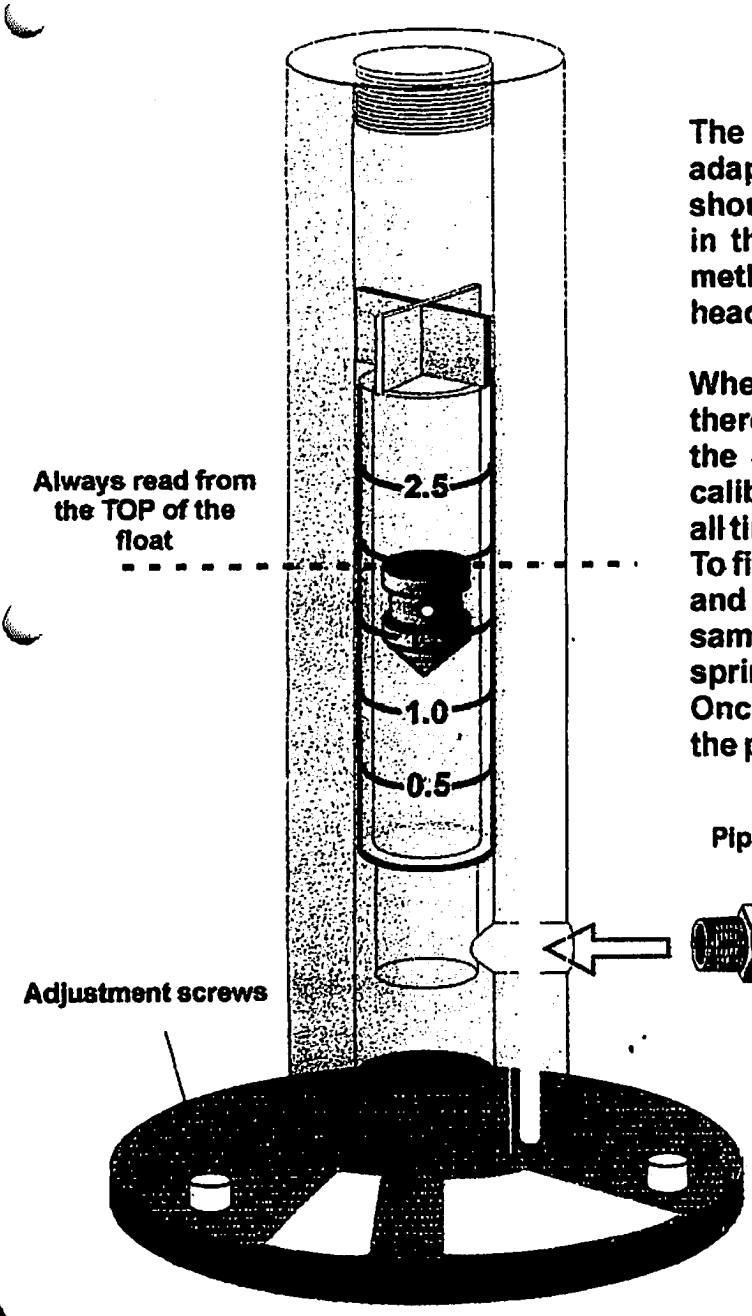
DCL: 100.07285 ms ± 0.05% (100.0228 to100.1289 ms)

Certified with Phillips Universal Counter/Timer NIST Test Number 971062

By [redacted] Date Oct. 7, 1999

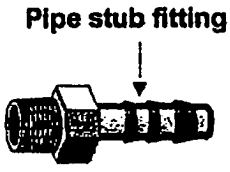


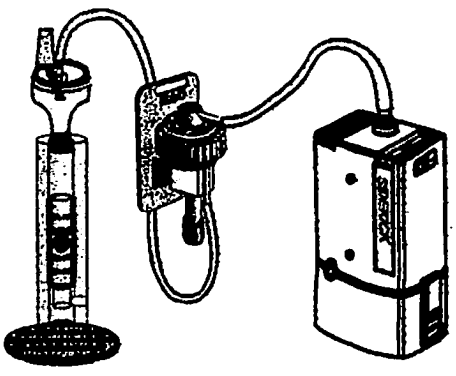




The SKC rotameter is supplied with an adapter and two pipe stub fittings which should be screwed into position as shown in the diagram opposite. This provides a method of connecting either a sampling head or flexible pipe to the rotameter.

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

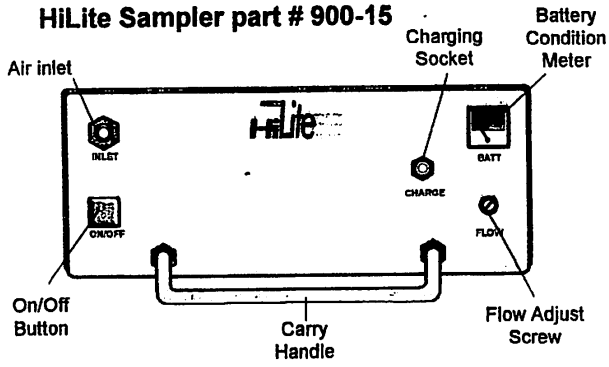
FEATURES

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

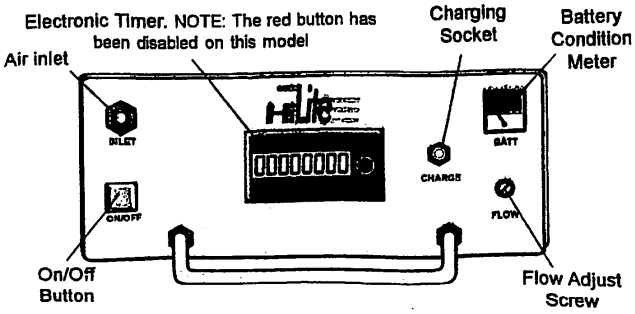
ON/OFF SWITCH. When pressed down to the ON position the pump will start to run, and the LCD (if fitted) activate showing eight ZEROS. If left running the timer will increase in one minute steps to a maximum of 99999999 minutes.

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



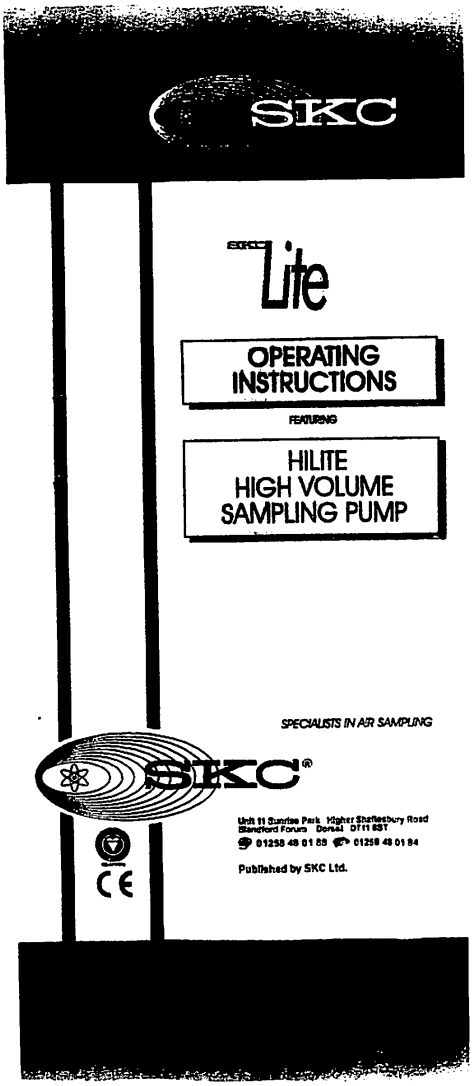
FLOW ADJUST. Below the level of the hole marked FLOW is a small screw. To adjust the flow use a small screwdriver, making sure the screwdriver end is located in the slot. To increase the flow turn clockwise. The span of this screw is around 5 turns. **DO NOT FORCE** the flow adjust screw, and flow range 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.



CERTIFICATE OF CALIBRATION

Issued By BSRIA Instrument Solutions

Date of Issue 19 June 2008

Certificate Number
STD14780

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 714868
e mail: info@bis.fm website: www.bis.fm

BSRIA
Quali[redacted]
M.J. Trevor

Approved Signatory

Customer : MIKE THOMAS.

Date Received : 17 June 2008

Instrument -

System ID :	51378
Description :	Micromanometer
Manufacturer :	D. P. Measurements
Model Number :	TT570S
Serial Number :	6012
Procedure Version :	MA275V1

Environmental Conditions

Temperature : 23°C +/- 4°C
Relative Humidity : <70% +/- %

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

Comments

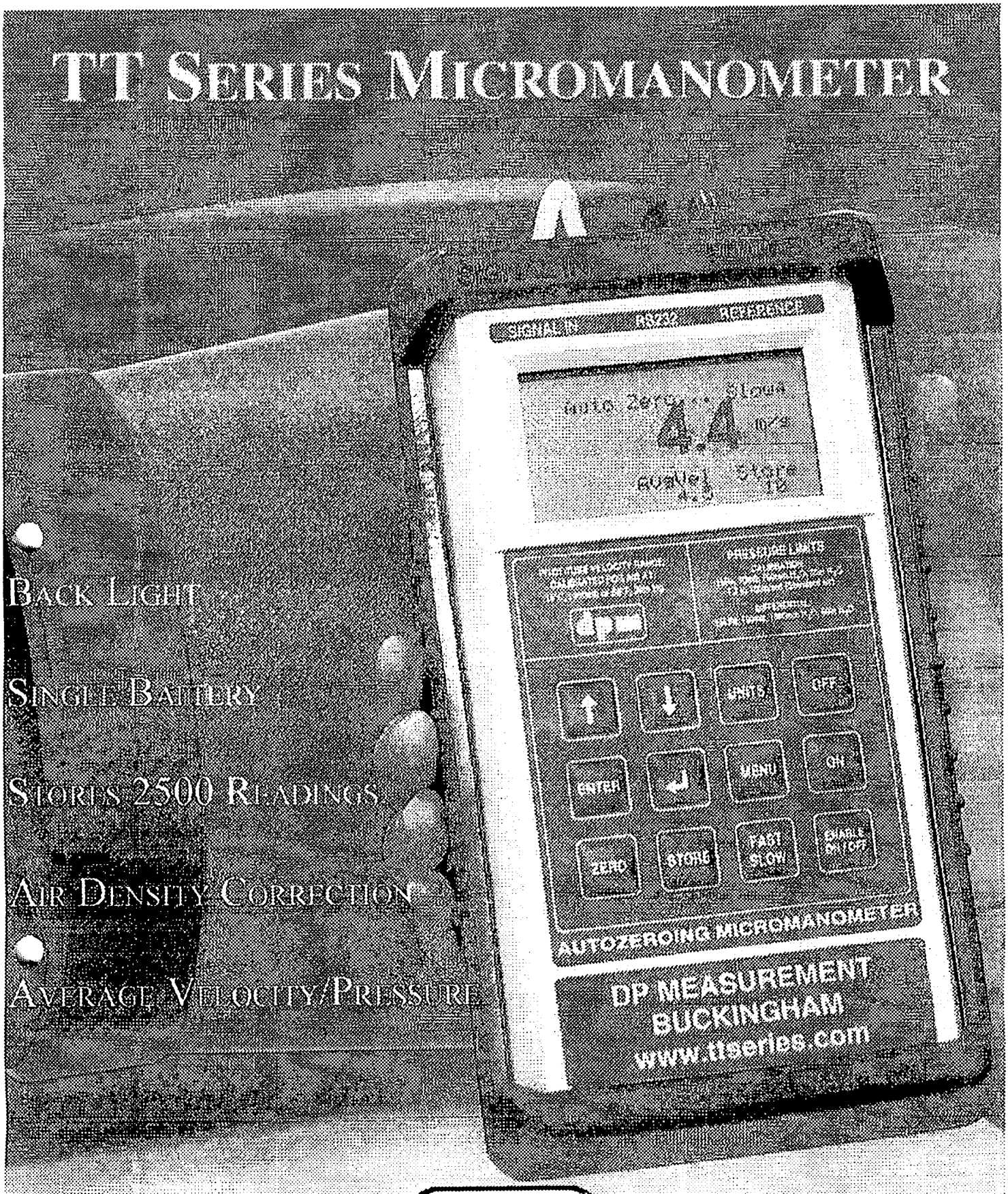
Instrument allowed to stabilise prior to reading.
True Differential pressure applied.
Instrument "zeroed" prior to start of procedure.
Results "As Found"

Traceability Information

Instrument description	*Serial number*	*Certificate number*	*Cal. Date*	*Cal. Period*
FCO550 Pressure Calibrator	0010275	UK01420	18/04/2008	26

Calibrated By : D. M. Tovey [redacted] **Date of Calibration :** 19 June 2008

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

Fundamental improvements to the TT Series Micromanometers include

✓ **Large Display**	Easy to read
✓ **Orientation Free**	Readings remain stable at any angle
✓ **Air Density Correction Factor**	For non standard conditions
✓ **Data Logging**	For continuous monitoring
✓ **Manual Logging**	Press store key
✓ **Average Reading**	Calculates value when storing data
✓ **Extra Damping**	For turbulent flow / pressure
✓ **Down Loading Data**	PC or thermal printer
✓ **Pressure**	Minimum 1 Pa resolution
✓ **Velocity Range**	From 1.3m /s
✓ **Auto Zero**	Manual or preset

MODELS 570 S	570 M	570 A	570 B	570 C	570 D
Pressure					
pascals	✓				✓	✓
mmH2O		✓			✓	✓
in H2O			✓		✓	✓
mbar				✓	✓	✓
Velocity					
m/sec	✓	✓		✓	✓	
ft/min			✓			✓

SPECIFICATIONS

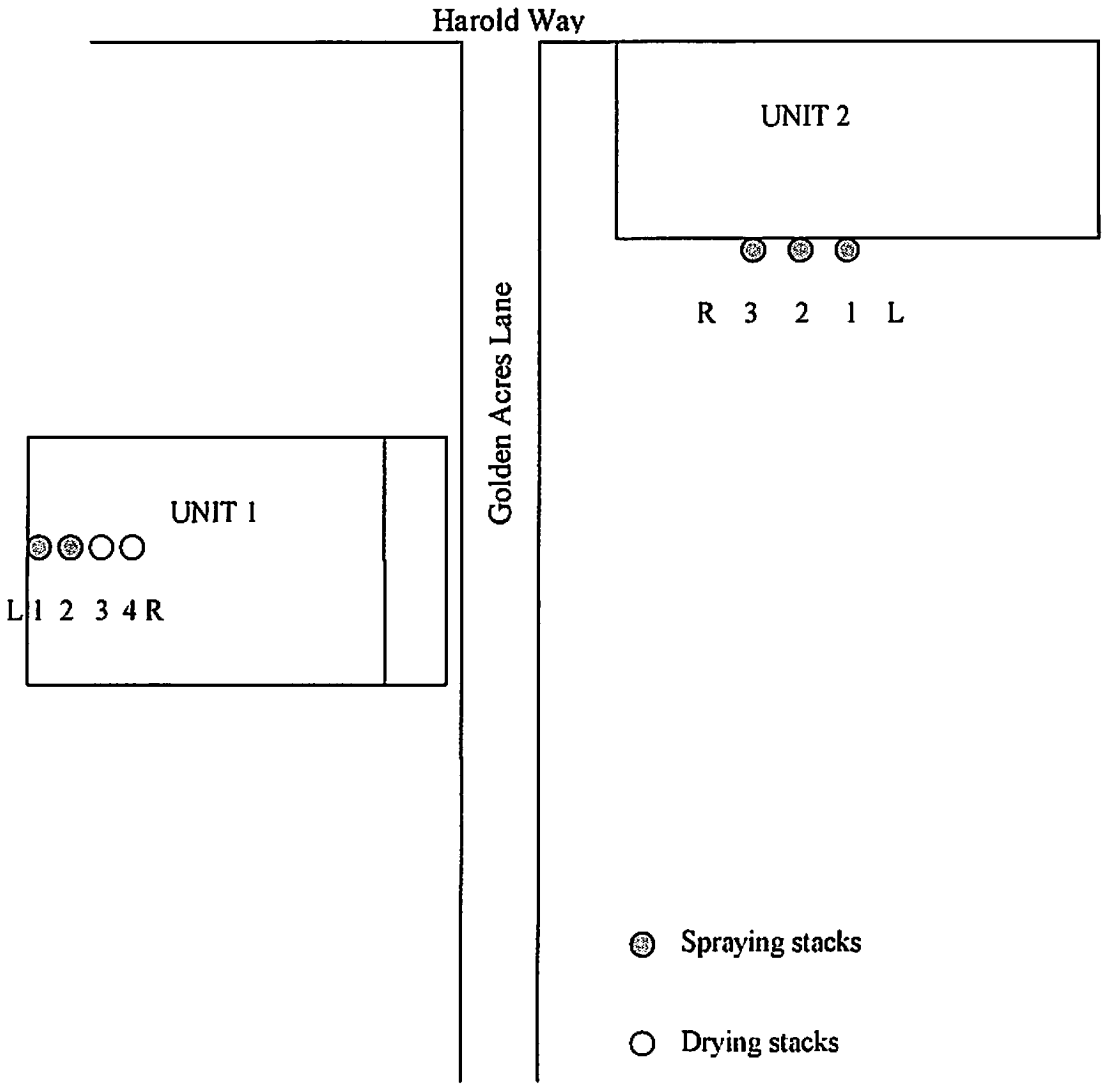
Pressure	
Pa	± 0 to 999 ± 1.00 to 7.50 Kpa
mmH2O	± 0 to 9.99 ± 10.0 to 9.99 ± 100 to 750
inH2O	± 0 to 9.99 ± 10.0 to 30.0
mbar	± 0 to 9.99 ± 10.0 to 75.0
Velocity	m/sec: 1.3 to 99.9 ft/min: 256 to 20,000
Accuracy @ 20°C	Readings < 100 counts ± 2 counts
Pressure, Velocity	Readings > 100 counts ± 1% of reading ± 1 count
Recommended operational limits	0° to 50°C (32° to 123°F)
Span Stability v Temperature	Better than 0.1% of range in use per °C (per 2°F)
Zero Drift	Negligible due to autozero system. When auto zero set at 1 minute intervals. (2 minute warm up)
Zero System Accuracy	± 1 count (any range)
Orientation Effect	(any 45° change) 0.1 pascal typical
Output Socket	RS 232 (baud rate 9600)
Data Logging	Up to 2500 any units.
Software	Down load readings to PC in a very basic form.
Power Source	Dry cell (MN1604, PP3) Rechargeable 8.4v 120mAh
System Air Leak (Typical)	0.1ml/minute at 5Kpa
Safe Line / Differential Pressure	15Kpa
Storage Temperature Limits	-5 to +50°C
Dimensions	45 x 92 x 185 mm
Weight	555 grammes with battery

APPLICATIONS

HVAC Commissioning and maintenance. Gas flow measurement. Aerodynamics and air flow research. COSHH requirements relating to airflow and pressure. Furnace draught measurement. Paint booth and clean room measurement. Wind tunnel testing.

DP MEASUREMENT
Unit 11, Top Angel, Buckingham Industrial Park,
Buckingham. MK18 1TH
Telephone / Fax ++44 (0) 1280 817122
www.ttseries.com

Appendix 3- Location and Identification of Sampling Points



Schematic of MSS spraybooth stacks 2008

Appendix 4- Results

Particulate Matter Stack Monitoring

Stack Identification/Position	**Unit 1**	Stack dimensions	**200mm x 1500mm**
Plant identification	**Spraybooth**	Process operation	**alkyd paints**

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
Duct 1 1/4 traverse	11.5	8.7	461	1.0	261	2270.7	0.5	
Duct 2 1/4 traverse	11.2	8.5	435	1.0	210	1785.0	0.6	
Duct 1 3/4 traverse	5.6	9.5	177	0.1	132	1254.0	0.1	6mm nozzle
Duct 2 3/4 traverse	6.0	4.5	308	0.4	138	621.0	0.7	

Particulate Matter Stack Monitoring

Stack Identification/Position	**Unit 2**	Stack dimensions	**650mm**
Plant identification	**Spraybooth**	Process operation	**alkyd paints**

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
Stack 1 Left port 0.85	6.6	11.1	345	0.4	177	1964.7	0.2	6mm nozzle
Stack 2 right port 0.15	10.0	7.5	340	1.0	194	1455.0	0.7	
Stack 3 Right port 0.15	9.2	6.9	332	0.3	130	897.0	0.3	
Stack 3 Left port 0.85	9	6.8	375	0.3	140	952.0	0.3	

Air Velocity measurement

Spraybooths - air flow in exhaust stacks
UNIT 1

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	11	12			
Stack 1	200x1500	11.5	0	9.5	2.7	12.8	10.2	11.5	5.6	11.9	6.2	7.5	0	7.5	8,046	150
Stack 2	200x1500	13.4	0	11.4	10.6	13.4	12.5	11.2	6	12.9	13.2	13.7	0	9.9	10,647	150
Stack 3	400x800	11.7	9.7	11.4	13.2	12.6	0							9.8	11,251	200
Stack 4	400x800	drive belt broken												0.0	0	

Air Velocity measurement

Spraybooths - air flow in exhaust stacks
UNIT 2

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			
Stack 1 L port	600	7.8	10.3	10.4	10.7	11	9.5	6.9	6.6	6.3	5.9	8.54	8,692	30
Stack 1 R port	600	port not accessible										0	0	
Stack 2 L port	600	port not accessible										0	0	
Stack 2 R port	600	7.7	9.3	9.2	9.3	8.7	6.3	0	0	0	0	5.05	5,140	15
Stack 3 L port	600	9.4	9.7	10.5	9.5	9	9.2	9.1	9	6.3	4.8	8.65	8,804	15
Stack 3 R port	600	12.7	12.3	10	9.2	9.2	8.4	2	0	0	0	6.38	6,494	