By Appointment to
Her Majesty The Queen
Supplier of Equine Bedding
Sundown Products Ltd
Huntingdon

Sundown
PRODUCTS LTD

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Huntingdonshire District Council
Pathfinder House
St Mary's Steet
Huntingdon
PE29 3TN

15.06.11

CENTRE
17 JUN 2011
CEIVED

Environmental & Community Health Services
17 JUN 2011

Dear Mr Bass

Sundown Products Ltd

Please find enclosed the results of the emissions monitoring from our site this year. I apologise for being a bit late in our submission, this was due to the contractor sampling the wrong sample point for the cooler cyclone on the first attempt.

You will note that the Secondary Cyclone emissions are over our limit. The secondary cyclone which was installed 18 months ago has clearly not achieved the results that we had hoped. We are now investigating the possibility of installing a further filter in the 'dust farm' and will revert to you with expected timings etc when I have more information.

If I can be of any further assistance in the meantime, please do not hesitate to contact me.

Yours sincerely

David Cubitt

David Cubitt

encl:
REC report No 71311p1r2 dated 10.06.11
REC report No 71311p1r0 dated 19.04.11

REC

Resource & Environmental Consultants Ltd

UKAS TESTING 2082

Environmental & Community Health Services

1 JUN 2011

MONITORING OF EMISSIONS FROM THE ANIMAL FEED MANUFACTURING PROCESS

23-24 MARCH 2011

Prepared for Sundown Products Ltd

REC Report 71311p1r0

Issued: 19 April 2011

REC Air Quality

GREEN ACHIEVER

SAFEcontractor APPROVED

REC Air Quality

UKAS TESTING 2082

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This report should not be reproduced except in full without the written approval of REC Ltd
Sampling identified as UKAS accredited was conducted in accordance with REC Ltd accredited Monitoring Methods.
Analyses identified as UKAS accredited were conducted by REC or approved sub-contractors in accordance with their SOPs

Prepared for:

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EXECUTIVE SUMMARY

Resource & Environmental Consultants (REC) Ltd was commissioned by Sundown Products Ltd to monitor emissions of pollutants released from the Animal Feed manufacturing process at their site in Huntingdon.

In accordance with the requirements of their site permit (permit number 2/06), monitoring has been undertaken for the following pollutant:-

- Total Particulate Matter

The following results were obtained from the emission monitoring survey and are compared with the current permit limit:-

Emission Point	Species	Accreditation Status	Emission Concentration (mg/Nm^3)	Permit Limit (mg/Nm^3)
Dryer	Particulate Matter	A	102.5	NA
BBF	Particulate Matter	E	4.1 Run 1 8.7 Run 2	20
Cooler	Particulate Matter	A	412.5	20
Secondary Cyclone	Particulate Matter	A	62.9	20

NOTE 1: All data are expressed in mg/Nm^3 at 273K, 101.3kPa unless otherwise stated. Emissions from the Dryer are further expressed at 17% O_2 content.
NOTE: UKAS Status:- (A) REC Ltd accredited for sampling and analysis. (E) REC Ltd not accredited for sampling, sub-contracted analysis not UKAS accredited.

1. INTRODUCTION

1.1 Background

Sundown Products Ltd commissioned REC Ltd to conduct an emission monitoring survey on various process emission stacks from their animal feed manufacturing process at their site in Huntingdon.

1.2 Scope of the Survey

An emission monitoring survey was required to determine the release concentrations of various pollutants from the manufacturing process. Concentrations of the following pollutants were quantified during the survey:

- Total Particulate Matter

Ancillary measurements of stack dimensions, temperature and velocity were also made.

All results were to be reported at 273K, 101.3kPa, wet gas without correction for oxygen content except on the dryer, which is corrected to 17% Oxygen.

1.3 Sampling Personnel

Monitoring was conducted by the following REC Ltd permanent staff:-

- Paul Jones - Team Leader, MM02 021, MCERTS Level 2, TE1-4
- Dave Burns - Assistant, MM05 579, MCERTS Level 2, TE 1-2

2. METHODOLOGY

2.1 Species & Techniques

The following table shows the reference methods used for the emission monitoring survey:

Species	UKAS Status	Method	Uncertainty (±%)	Limit of Detection
Moisture	A	In house method MM0010 based on BS EN 14790	20	0.1%vol
Particulate Matter	A	In house method MM0004 based on BS ISO 9096	10	1 mg/m^3
Oxygen	A	In house method MM0002 based on ISO 12039	10	0.1%vol
Particulate Matter	E	In house method MM0004 based on BS 3405	25	1 mg/m^3

NOTE: UKAS Status:- (A) REC Ltd accredited for sampling and analysis. (B) REC Ltd accredited for sampling only, UKAS accredited analysis conducted by SAL Ltd or RPS Ltd or NWSS or Butterworths or ESG. (C) REC Ltd accredited for sampling, sub-contracted analysis SAL Ltd or RPS Ltd or NWSS or Butterworths or ESG not UKAS accredited (D) REC Ltd not accredited for sampling, UKAS accredited analysis conducted by SAL Ltd or RPS Ltd or NWSS or Butterworths or ESG. (E) REC Ltd not accredited for sampling, sub-contracted analysis by not UKAS accredited.

2.2 Sampling & Analytical Methodology

Total Particulate Matter

To determine the concentration of particulate matter in emissions, isokinetic stack sampling equipment satisfying the requirements of BS ISO 9096 was utilised and in-house method MM0004 followed.

The Standard describes the methodology for measuring particulate matter under defined conditions and at discrete locations in the duct. Sampling is carried out under isokinetic sampling conditions i.e. the flowrate through the sampling nozzle is adjusted to equal the flowrate in the duct at the sampling positions. Velocity pressures were recorded throughout the monitoring period by means of an 'S' type pitot integral to the sampling probe and nozzle assembly.

A sample of the exhaust stream was removed from the stack via a titanium nozzle and titanium lined heated probe. It was then passed through a quartz fibre filter contained in a heated oven compartment. The temperature of the probe and filter box were maintained at 160°C i.e. above the dew point of the stack gases, to ensure moisture did not condense on the filter. Each filter used complied with the requirements of Section 6.2.7 of BS EN 13284-1:2001 in that the efficiency was better than 99.5% for particles of 0.3µm diameter (or 99.9% for particles of 0.6µm diameter).

The impinger train was seated in a water bath to cool the gas stream and condense out less volatile gases and water vapour.

The first two impingers encountered by the gas stream contained deionised water. The third impinger was left empty and the fourth contained anhydrous silica gel which was used to dry

the gas stream before passing it through a dry gas meter (DGM) to measure the volume of gas sampled.

All the impingers were weighed before and after the sampling run in order to determine the mass of water condensed by the impinger train (in house Method MM0010).

The sample volume collected was in excess of the minimum requirement stated in MM0004. The minimum sample volume ensures the results would be representative of normal plant operating conditions.

Upon completion of sampling, the filter was removed to a clean petri dish, labelled and sealed. The probe and filter housing were rinsed with acetone and water. The washings were collected in a container and submitted for analysis along with the filter.

On the BBF stack, due to access restrictions REC could not conduct particulate sampling in accordance with BS ISO 9096. To determine the concentration of particulate matter in the emissions, stack sampling equipment satisfying the requirements of BS 3405 was used. REC is not accredited for particulate sampling to this standard.

The Standard describes the methodology for measuring particulate matter under defined conditions and at discrete locations in the duct. Sampling is carried out under isokinetic sampling conditions i.e. the flow rate through the sampling nozzle is adjusted to equal the flow rate in the duct at the sampling positions.

A sample of the exhaust stream was removed from the stack via a stainless steel nozzle and filter housing. The filter housing is deployed in stack, so the filter is at the temperature of the stack gas to ensure moisture did not condense on the filter. The gas then passed through an impinger that contained anhydrous silica gel which was used to dry the gas stream before passing it through a dry gas meter (DGM) to measure the volume of gas sampled.

Upon completion of sampling, the filter was removed to a clean petri dish, labelled and sealed. The probe and filter housing were rinsed with acetone. The washings were collected in a container and submitted for analysis along with the filter.

Oxygen

To determine the concentration of oxygen (O_2) in emissions, a Testotherm Model 330 multigas analyser was used. The analyser incorporates a gas conditioner to enable the gas stream to be presented to the electrochemical cells on a dry gas basis. In house method MM0002 was followed.

The analyser satisfies the requirements of the following Standards:-

O_2 - ISO 12039

For each parameter the measured value (m.v.) and accuracy associated with this type of measurement using the Testo 350XL is:

O_2 ± 0.8% of full scale deflection

The analyser would be calibrated against traceable test gases prior to the survey.

The Standards describe the methodology for measuring the combustion gases listed above under defined conditions in the duct. Sampling is carried out under anisokinetic sampling conditions as it is assumed that the gas is homogenous across the sample plane.

Stack Temperature and Velocity

To determine the stack temperature, a calibrated thermocouple and digital indicator were employed. The exhaust gas velocity was investigated using a pitot static probe (to MM0004) and digital manometer.

3. SAMPLING AND OPERATIONAL DETAILS

3.1 Process Description

The operation of the processes at Sundown Products Ltd, Huntingdon are to be classified as a Part B process under the Environmental Permitting Regulations, 2008. The process is under Local Authority regulation and must demonstrate compliance with the emission limits stipulated in the site permit (permit number 2/06).

The site manufactures a wide range of animal feeds mainly for the equine and poultry markets.

3.2 Sampling Positions

Dryer - 1 x 4"BSP provided on small platform (not to EA TGN M1), sampling to BS ISO 9096 was possible at limited points.

BBF – 1 x 4" BSP provided on a small platform (not to EA TGN M1) and would not allow safe sampling to BS ISO 9096. Sampling to BS 3405 was therefore undertaken outside our scope of UKAS accreditation.

Cooler - 1 x 4"BSP provided on small platform (not to EA TGN M1), sampling to BS ISO 9096 was possible at limited points.

Secondary Cyclone - 1 x 4"BSP provided on small platform (not to EA TGN M1), sampling to BS ISO 9096 was possible at limited points.

Diagrams detailing the sampling positions and taken from Site Worksheets are provided in Appendix 1

3.3 Uncertainty

Sampling on the Dryer, Cooler and Secondary Cyclone was only possible on a single sampling plane and at limited points and this will increase the measurement uncertainty from the standard ±10%. The sample plane does not meet the requirements stated in Environment Agency Technical Guidance Note M1.

Sampling on the BBF was conducted using an unaccredited method with an estimated uncertainty of no better than ±25%. The sample plane does not meet the requirements stated in Environment Agency Technical Guidance Note M1.

REC has calculated uncertainty budgets for all of the pollutants listed in the Method Details Table in Section 2.1 above in accordance with calculations and methodology supplied by the Source Testing Association (STA). These uncertainties are quoted in the Tables section of this report.

3.4 Emission Monitoring Survey Details

The emission monitoring survey was carried out on the Manufacturing Process over the period 23-24 March 2011. The table overleaf summarises the actual sampling periods.

SAMPLING PERIODS

Stack	Parameter	Sample Time (& Date)
Dryer	Particulates, Oxygen	(23/03/11)
BBF	Particulates	(23/03/11)
Cooler	Particulates	(24/03/11)
Secondary Cyclone	Particulates	(24/03/11)

4. RESULTS AND DISCUSSION

4.1 Initial Velocity and Temperature Traverse

An initial pitot-static pressure and temperature traverse was carried out. From these data stack velocity, expressed in metres per second (m/s), and volumetric flowrates expressed in cubic metre per hour (m^3/hr) have been calculated.

The results are reported at actual stack conditions and the volumetric flowrate is further expressed at the standard reference conditions of 273K, 101.3kPa i.e. standard temperature and pressure (STP). The results are summarised in Table 1.

4.2 Particulate Matter

The results of the particulate sampling runs are summarised in Tables 3 to 6. From the mass of particulate matter on the filter and in the acetone/water wash residue and volume sampled an emission concentration was calculated.

All results were to be reported at 273K, 101.3kPa, wet gas without correction for oxygen content except on the dryer, which is corrected to 17% Oxygen.

4.3 Oxygen

The results of the combustion gas monitoring tests are summarised in Table 2. The table presents the average of concentrations measured throughout the sample period.

Measured concentrations on a wet gas basis.

====== End of Report Text ======

TABLES

TABLE 1

FLOW DATA

Stack Ref.	Stack Temp	Av Pitot ΔP	Duct Diam	X-Sect. Area	Velocity (actual)	Volume Flow (m^3/hr)	
	(^{0}C)	(Pa)	(cm)	(m^2)	(m/s)	(actual)	(@ ntp)
Dryer	81	117	100	0.785	15.3	43,263	33,349
BBF	35	21	50	0.196	6.0	4,263	3,781
Cooler	14	955	35	0.096	39.4	13,650	12,993
Secondary Cyclone	22	2826	45	0.159	68.7	39,362	36,414

TABLE 2

OXYGEN EMISSION DATA SUMMARY – DRYER

Date/Time	*O2 vol%*
23/03/2011 12:28	19.6
23/03/2011 12:29	19.5
23/03/2011 12:30	19.6
23/03/2011 12:31	19.5
23/03/2011 12:32	19.6
23/03/2011 12:33	19.6
23/03/2011 12:34	19.5
23/03/2011 12:35	19.6
23/03/2011 12:36	19.6
23/03/2011 12:37	19.6
23/03/2011 12:38	19.6
23/03/2011 12:39	19.4
23/03/2011 12:40	19.5
23/03/2011 12:41	19.5
23/03/2011 12:42	19.6
23/03/2011 12:43	19.5
23/03/2011 12:44	19.4
23/03/2011 12:45	19.5
23/03/2011 12:46	19.7
23/03/2011 12:47	19.6
23/03/2011 12:48	19.6
23/03/2011 12:49	19.6
23/03/2011 12:50	19.5
23/03/2011 12:51	19.6
23/03/2011 12:52	19.5
23/03/2011 12:53	19.5
23/03/2011 12:54	19.5
23/03/2011 12:55	19.5
23/03/2011 12:56	19.6
23/03/2011 12:57	19.6
23/03/2011 12:58	19.6
23/03/2011 12:59	19.5
23/03/2011 13:00	19.6
23/03/2011 13:01	19.6
23/03/2011 13:02	19.6
23/03/2011 13:03	19.6
23/03/2011 13:04	19.5
23/03/2011 13:05	19.5
23/03/2011 13:06	19.6
23/03/2011 13:07	19.5
23/03/2011 13:08	19.5

TABLE 3

PARTICULATE EMISSION DATA SUMMARY – DRYER

DATE: 23/3/11 12:28-13:08

Sampling Data	
Run Time (min)	40
Total mass H_2O collected (g)	46.0
Pitot tube constant, Cp	0.84
Dry gas meter (DGM) volume (m^3)	0.697
Temperature DGM (^oC)	29
Temperature stack (^oC)	81
Mean pitot tube pressure drop, delta P (mm H_2O)	27.4
Orifice meter pressure drop, delta H (mm H_2O)	26.1
Barometric Pressure (kPa)	102.0
X-sectional area of stack (m^2)	0.785
Nozzle size (mm)	5.09
Flow Data	
Velocity, actual (m/s)	19.8
Velocity, ntp (m/s)	15.3
Vol. Flow, actual (m^3/hr)	56,010
Vol. Flow, ntp (m^3/hr)	43,343
Volume sampled, ntp, dry gas (m^3)	0.640
Volume sampled, ntp, wet gas (m^3)	0.698
Analytical Data	
Filter Weight Gain (mg)	14.5
Acetone Wash Residue Weight (mg)	8.2
Total Particulates (mg)	22.7
Partics Field Blank (mg)	0.8
Emission Data	
O_2 (%vol)	19.6
H_2O (% vol)	8.2
Percentage Isokinetic	93.3
Particulates (mg/m^3 at ref O_2)	102.5
Uncertainty (± mg/m^3)	18.2

TABLE 4

PARTICULATE EMISSION DATA SUMMARY – BBF

Sampling Data	Run 1	Run 2
Start Time/Date	14:21, 23/03/11	15:03, 23/03/11
End Time/Date	14:51, 23/03/11	15:33, 23/03/11
Sampling Period (min)	30	30
DGM start (dry m^3)	5893.520	5893.936
DGM end (dry m^3)	5893.935	5894.321
Volume Sampled (dry m^3)	0.415	0.385
Ambient Temp (^oC)	16.8	16.8
Ambient Press (kPa)	102	102
Wt of Water (g)	6.9	8.2
Volume Water (m^3)	0.009	0.010
Volume Sampled, 273K, 101.3kPa (dry m^3)	0.394	0.365
Volume Sampled, 273K, 101.3kPa (wet m^3)	0.402	0.375
Analytical Data		
Wt gain filter (mg)	0.40	1.39
Wt acetone wash (mg)	1.20	1.80
Total particulate matter (mg)	1.60	3.19
Emission Concentration Data		
Moisture (%vol)	2.1	2.7
Particulates (mg/m^3)	4.1	8.7

TABLE 5

PARTICULATE EMISSION DATA SUMMARY – COOLER

DATE: 24/3/11 9:19-9:59

Sampling Data	
Run Time (min)	40
Total mass H_2O collected (g)	5.2
Pitot tube constant, Cp	0.84
Dry gas meter (DGM) volume (m^3)	1.095
Temperature DGM (°C)	15
Temperature stack (°C)	15
Mean pitot tube pressure drop, delta P (mm H_2O)	114.9
Orifice meter pressure drop, delta H (mm H_2O)	70.6
Barometric Pressure (kPa)	103.0
X-sectional area of stack (m^2)	0.096
Nozzle size (mm)	4.00
Flow Data	
Velocity, actual (m/s)	36.1
Velocity, ntp (m/s)	34.5
Vol. Flow, actual (m^3/hr)	12,513
Vol. Flow, ntp (m^3/hr)	11,961
Volume sampled, ntp, dry gas (m^3)	1.065
Volume sampled, ntp, wet gas (m^3)	1.071
Analytical Data	
Filter Weight Gain (mg)	389.2
Acetone Wash Residue Weight (mg)	52.7
Total Particulates (mg)	441.9
Partics Field Blank (mg)	1.0
Blank % of ELV	4.7
Emission Data	
H_2O (% vol)	0.6
Percentage Isokinetic	102.9
Particulates (mg/m^3)	412.5
Uncertainty (± mg/m^3)	8.1

TABLE 6

PARTICULATE EMISSION DATA SUMMARY – SECONDARY CYCLONE

DATE: 24/3/11 10:33-11:13

Sampling Data	
Run Time (min)	40
Total mass H_2O collected (g)	5.3
Pitot tube constant, Cp	0.84
Dry gas meter (DGM) volume (m^3)	0.624
Temperature DGM (°C)	17
Temperature stack (°C)	24
Mean pitot tube pressure drop, delta P (mm H_2O)	34.8
Orifice meter pressure drop, delta H (mm H_2O)	45.8
Barometric Pressure (kPa)	103.0
X-sectional area of stack (m^2)	0.159
Nozzle size (mm)	4.00
Flow Data	
Velocity, actual (m/s)	20.1
Velocity, ntp (m/s)	18.7
Vol. Flow, actual (m^3/hr)	11,522
Vol. Flow, ntp (m^3/hr)	10,680
Volume sampled, ntp, dry gas (m^3)	0.603
Volume sampled, ntp, wet gas (m^3)	0.609
Analytical Data	
Filter Weight Gain (mg)	28.1
Acetone Wash Residue Weight (mg)	10.2
Total Particulates (mg)	38.3
Partics Field Blank (mg)	1.2
Blank % of ELV	10.0
Emission Data	
H_2O (% vol)	1.1
Percentage Isokinetic	108.3
Particulates (mg/m^3)	62.9
Uncertainty (± mg/m^3)	2.3

APPENDIX 1

Diagrams of Sampling Points

Resource & Environmental Consultants Ltd

VELOCITY & TEMPERATURE PROFILE WORKSHEET

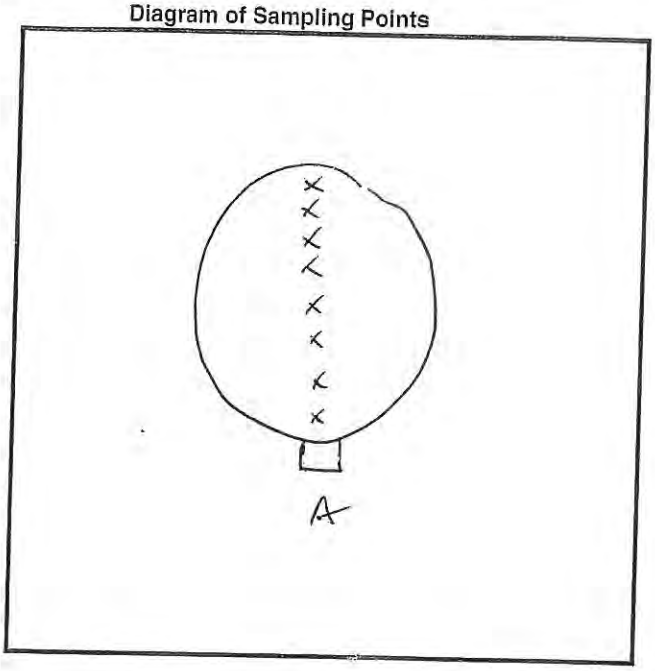
Job No.: 71331
Stack Ref: Dryer

Date: 23/4/04 & 07/2011
Carried out by: B/OB
Checked by: A
Date: 26/3/11

Equipment Used

Pitot Ref (AQ No)	299
Pitot "L" or "S" type	S
Pitot Calibration Factor	0.844
Manometer Ref (AQ No)	126
Barometer Ref (AQ No.)	124
Thermocouple Ref (AQ No.)	144
T/C Reader Ref (AQ No.)	126
Timer Ref (AQ No.)	308

Diagram of Sampling Points



Stack Details

Stack Diameter (cm) (circular stack)	100
Stack length (cm) (rectangular stack)	–
Stack width (cm) (rectangular stack)	–
X Sectional area (m^2)	0.7855

TEST POINTS

Sample Points

Diameter	No. of Pts	Location of Pts.						
< 0.35 m	SP=1	0.50d						
0.35 - 1.1 m	SP=4	0.146d	0.847d					
	SP=5	0.113d	0.5d	0.887d				
1.1 - 1.6 m	SP=8	0.67d	0.25d	0.75d	0.933d			
	SP=9	0.059d	0.211d	0.5d	0.789d	0.941d		
		12/0	12/2	10/10	10/2	0/12		
> 1.6 m	SP=12	0.044d	0.146d	0.296d	0.704d	0.854d	0.956d	
	SP=13	0.04d	0.133d	0.26d	0.50d	0.74d	0.867d	0.96d

Area (square/rectangular stacks)

< 0.1m^2	1
0.1 - 1.0 m^2	4
1.1 - 2.0 m^2	9
> 2.0 m^2	Minimum of 12 and at least 4 per m^2

VELOCITY & TEMPERATURE PROFILE WORKSHEET

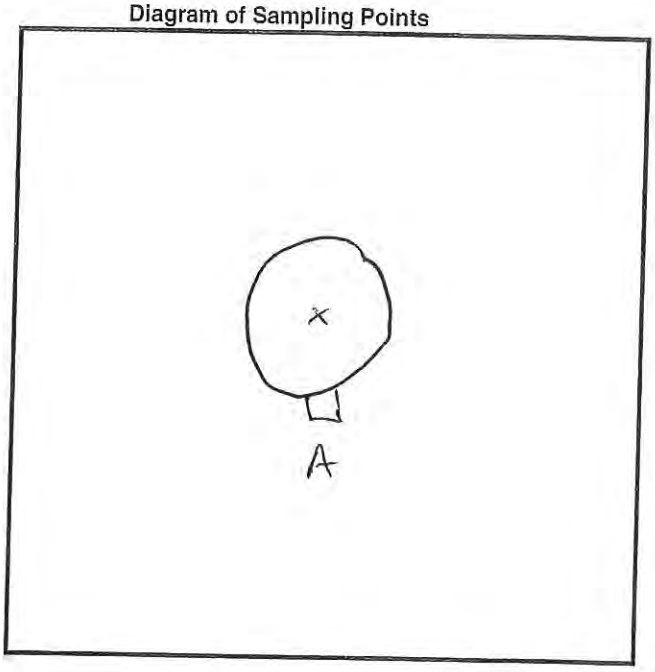
Job No.: 71331
Stack Ref: BSC

Date: 23/3/11
Carried out by: DB / PJ
Checked by: S
Date: 24/3/11

Equipment Used

Pitot Ref (AQ No)	290
Pitot "L" or "S" type	L
Pitot Calibration Factor	.994
Manometer Ref (AQ No)	071
Barometer Ref (AQ No.)	124
Thermocouple Ref (AQ No.)	307
T/C Reader Ref (AQ No.)	310
Timer Ref (AQ No.)	308

Diagram of Sampling Points



Stack Details

Stack Diameter (cm) (circular stack)	50
Stack length (cm) (rectangular stack)	—
Stack width (cm) (rectangular stack)	-
X Sectional area (m^2)	.7855

TEST POINTS

Sample Points

Diameter	No. of Pts	Location of Pts.						
< 0.35 m	SP=1	0.50d						
		10						
0.35 - 1.1 m	SP=4	0.146d	0.847d					
	SP=5	0.113d	0.5d	0.887d				
1.1 - 1.6 m	SP=8	0.67d	0.25d	0.75d	0.933d			
	SP=9	0.059d	0.211d	0.5d	0.789d	0.941d		
> 1.6 m	SP=12	0.044d	0.146d	0.296d	0.704d	0.854d	0.956d	
	SP=13	0.04d	0.133d	0.26d	0.50d	0.74d	0.867d	0.96d

Area (square/rectangular stacks)

< 0.1 m^2	1
0.1 - 1.0 m^2	4
1.1 - 2.0 m^2	9
> 2.0 m^2	Minimum of 12 and at least 4 per m^2

Resource & Environmental Compliance Ltd

VELOCITY & TEMPERATURE PROFILE WORKSHEET

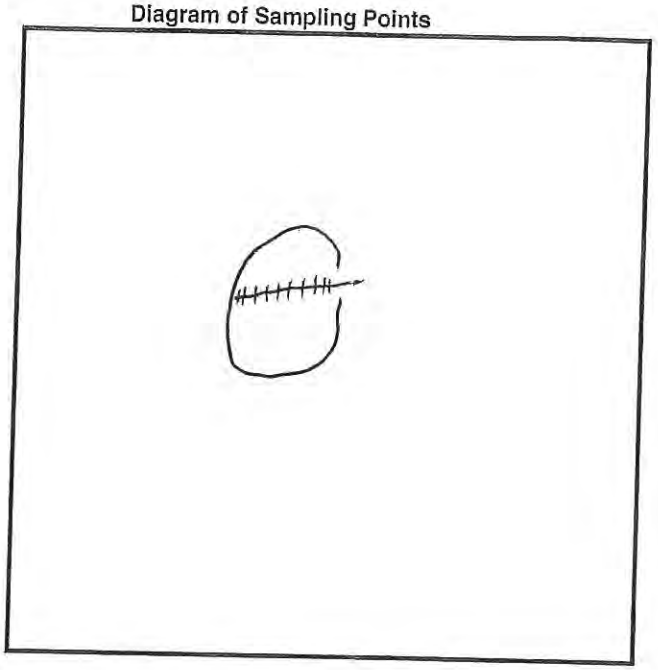
Job No.: 71331
Stack Ref: cooler

Date: 24/3/11
Carried out by: A/D
Checked by: [illegible]
Date: 24/3/11

Equipment Used

Pitot Ref (AQ No)	299
Pitot "L" or "S" type	S
Pitot Calibration Factor	0.84
Manometer Ref (AQ No)	126
Barometer Ref (AQ No.)	124
Thermocouple Ref (AQ No.)	166
T/C Reader Ref (AQ No.)	126
Timer Ref (AQ No.)	308

Diagram of Sampling Points



Stack Details

Stack Diameter (cm) (circular stack)	35
Stack length (cm) (rectangular stack)	–
Stack width (cm) (rectangular stack)	–
X Sectional area (m^2)	0.385

TEST POINTS

Sample Points

Diameter	No. of Pts	Location of Pts.						
< 0.35 m	SP=1	0.50d						
0.35 - 1.1 m	SP=4	0.146d	0.847d					
	SP=5	0.113d	0.5d	0.887d				
1.1 - 1.6 m	SP=8	0.67d	0.25d	0.75d	0.933d			
		1.07	1.0	1.5	1.93			
	SP=9	0.059d	0.211d	0.5d	0.789d	0.941d		
> 1.6 m	SP=12	0.044d	0.146d	0.296d	0.704d	0.854d	0.956d	
	SP=13	0.04d	0.133d	0.26d	0.50d	0.74d	0.867d	0.96d

Area (square/rectangular stacks)

< 0.1m^2	1
0.1 - 1.0 m^2	4
1.1 - 2.0 m^2	9
> 2.0 m^2	Minimum of 12 and at least 4 per m^2

Resource & Environmental Consultants Ltd

VELOCITY & TEMPERATURE PROFILE WORKSHEET

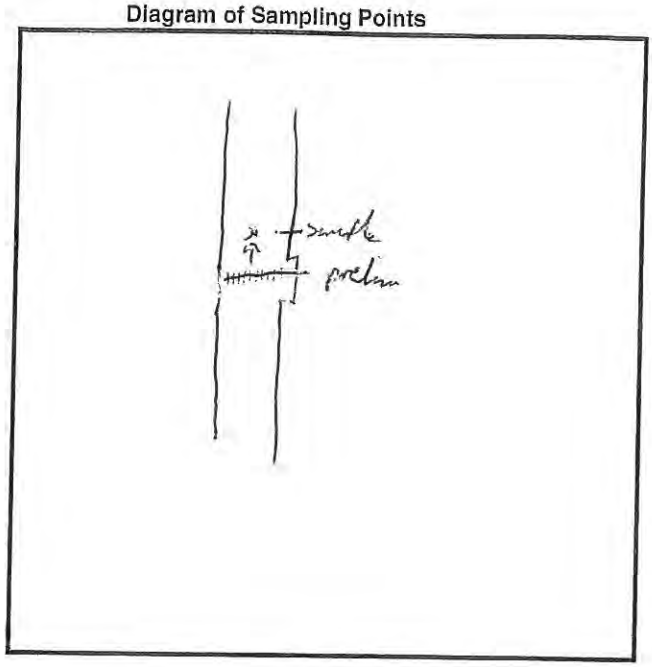
Job No.: 71331
Stack Ref: Secondary Cyclone

Date: 24/3/11
Carried out by: B/DB
Checked by: [illegible]
Date: 24/3/11

Equipment Used

Pitot Ref (AQ No)	106
Pitot "L" or "S" type	S
Pitot Calibration Factor	0.848
Manometer Ref (AQ No)	126
Barometer Ref (AQ No.)	124
Thermocouple Ref (AQ No.)	313
T/C Reader Ref (AQ No.)	122
Timer Ref (AQ No.)	304

Diagram of Sampling Points



Stack Details

Stack Diameter (cm) (circular stack)	65
Stack length (cm) (rectangular stack)	–
Stack width (cm) (rectangular stack)	–
X Sectional area (m^2)	0.159

TEST POINTS

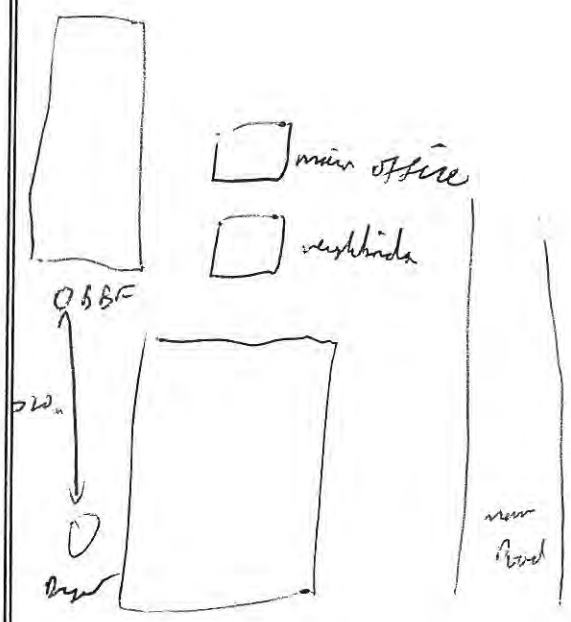
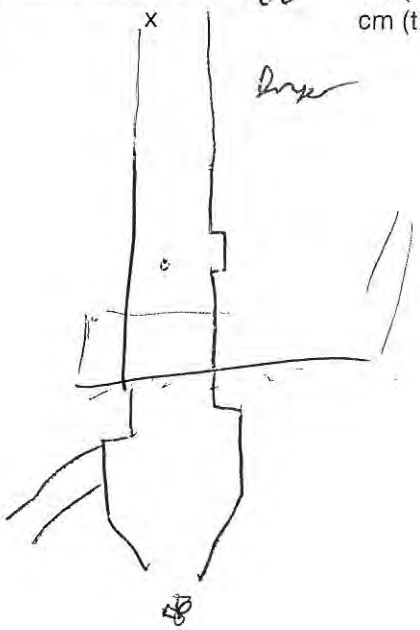
Sample Points

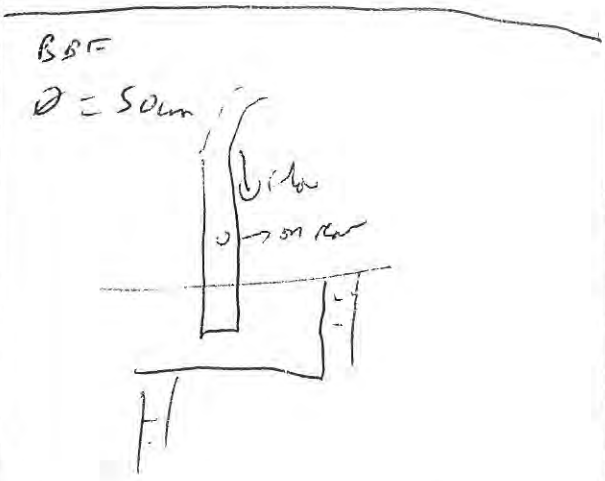
Diameter	No. of Pts	Location of Pts.						
< 0.35 m	SP=1	0.50d						
		10						
0.35 - 1.1 m	SP=4	0.146d	0.847d					
	SP=5	0.113d	0.5d	0.887d				
1.1 - 1.6 m	SP=8	0.67d	0.25d	0.75d	0.933d			
	SP=9	0.059d	0.211d	0.5d	0.789d	0.941d		
> 1.6 m	SP=12	0.044d	0.146d	0.296d	0.704d	0.854d	0.956d	
	SP=13	0.04d	0.133d	0.26d	0.50d	0.74d	0.867d	0.96d

Area (square/rectangular stacks)

< 0.1 m^2	1
0.1 - 1.0 m^2	4
1.1 - 2.0 m^2	9
> 2.0 m^2	Minimum of 12 and at least 4 per m^2

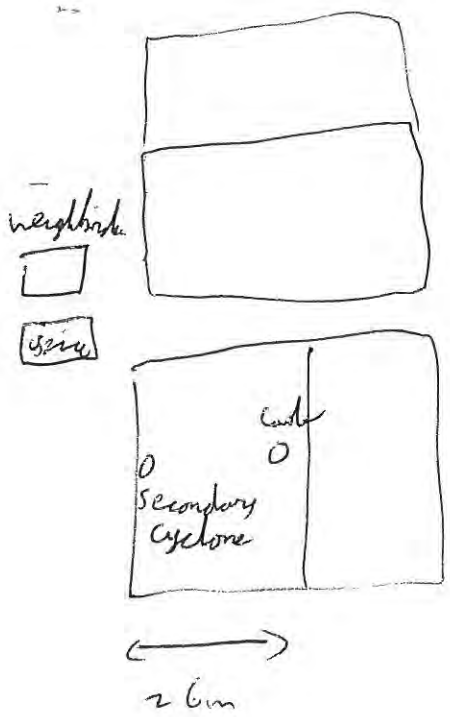
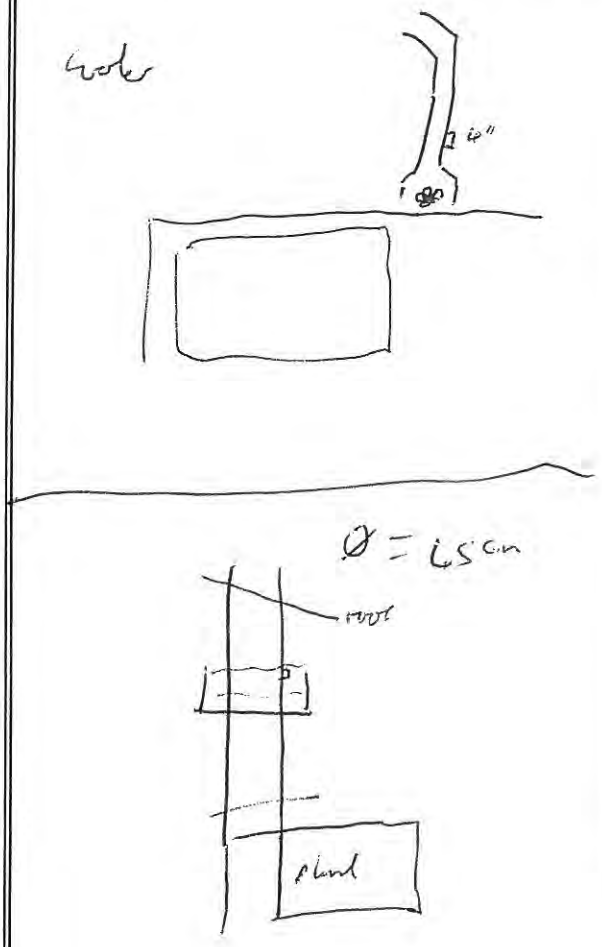
DIAGRAMS OF STACK

Plan of site layout including approx dimensions	Schematic diagram of the stack inc dimensions
	Stack Dimensions = 100 cm (diameter) x cm (traverse 1st) 



Other Notes

DIAGRAMS OF STACK

Plan of site layout including approx dimensions	Schematic diagram of the stack inc dimensions
	Stack Dimensions = 35 cm (diameter) x cm (traverse 1st) 

Other Notes

APPENDIX 2

Calculations

Conversion Factors

ppm ® mg/Nm³ (at 273K, 101.3kPa: STP)

CO	x	1.25	
SO_2	x	2.86	
VOC's	x	1.61	(ppm as C_3H_8 to mg/Nm^3 as C)
NO_X	x	2.05	(ppm NO + NO_2 to mg/m^3 as NO_2)

Oxygen Correction to Reference Value

Concentration at (STP) -> Concentration at 273K, 101.3kPa, reference O_2 and Dry Gas, i.e.

Concentration X ((20.9-O_2 ref)/(20.9-O_2 measured)) = Concentration at ref Oxygen state.

Example Calculation

SO_2 concentration at STP	=	170.7 mg/Nm³
Oxygen percentage in gas stream	=	13.8%
Reference Oxygen	=	11%

SO_2 concentration at reference O_2 conditions	=	170.7 ((20.9-11)/(20.9-13.8))
	=	238 mg/Nm³ at 273K, 101.3kPa, 11% O_2 and Dry Gas

Moisture Correction (Wet to Dry)

Concentration of Gas Dry = Concentration of x 100/100-Bws Gas Wet

Concentration of Gas Wet = Concentration of x 100-Bws/100 Gas Dry

Where Bws = moisture content of gas stream in percent (Vol/Vol).

Example

VOC concentration	=	25 mg/Nm³ (Wet)
Moisture Content	=	27.1%
Concentration of VOC	=	25 (100/(100-27.1))

Carbon (C) to Trichloethylene (TCE)

ppm TCE = ppm C x 0.6715

TCE in mg/m^3 = TCE ppm x 5.864 (Mol Wt/22.4)

REC

Resource & Environmental Consultants Ltd

UKAS TESTING 2082

17 JUN 2011

MONITORING OF EMISSIONS FROM THE ANIMAL FEED MANUFACTURING PROCESS

25 MAY, 2011

Prepared for Sundown Products Ltd

REC Report 71311p1r2

Issued: 10 June, 2011

REC Air Quality

GREEN ACHIEVER

SAFEcontractor APPROVED

REC Air Quality

UKAS TESTING 2082

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation
This report should not be reproduced except in full without the written approval of REC Ltd
Sampling identified as UKAS accredited was conducted in accordance with REC Ltd accredited Monitoring Methods.
Analyses identified as UKAS accredited were conducted by REC or approved sub-contractors in accordance with their SOPs

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4.2 Particulate Matter 9

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2 Particulate Emission Data Summary – Cooler Stack

APPENDICES (3 Additional Pages)

1 Diagrams of Sampling Points
2 Calculations

EXECUTIVE SUMMARY

Resource & Environmental Consultants (REC) Ltd was commissioned by Sundown Products Ltd to monitor emissions of pollutants released from the Animal Feed manufacturing process at their site in Huntingdon.

In accordance with the requirements of their site permit monitoring has been undertaken for the following pollutant:-

- Total Particulate Matter

The following results were obtained from the emission monitoring survey and are compared with the current permit limit:-

Emission Point	Species	Accreditation Status	Emission Concentration (mg/Nm^3)	Permit Limit (mg/Nm^3)
Cooler	Particulate Matter	A	15.1	150

NOTE 1: All data are expressed in mg/Nm^3 at 273K, 101.3kPa unless otherwise stated. **NOTE: UKAS Status:-** (A) REC Ltd accredited for sampling and analysis.

1. INTRODUCTION

1.1 Background

Sundown Products Ltd commissioned REC Ltd to conduct an emission monitoring survey on the animal feed manufacturing process at their site in Huntingdon.

Report 71311p1r1 has been revised to include the results of a retest, on the Cooler process stack.

1.2 Scope of the Survey

An emission monitoring survey was required to determine the release concentrations of particulate matter from the Cooler stack process.

Ancillary measurements of stack dimensions, temperature and velocity were also made.

All results were to be reported at 273K, 101.3kPa, wet gas without correction for oxygen content.

1.3 Sampling Personnel

Monitoring was conducted by the following REC Ltd permanent staff:-

- Michelle Edwards - Team Leader, MM05 659, MCERTS Level 1, TE1&2
- Aidan Wrynne - Assistant, MM08 921, MCERTS Level 1

2. METHODOLOGY

2.1 Species & Techniques

The following table shows the reference methods used for the emission monitoring survey:

Species	UKAS Status	Method	Uncertainty (±%)	Limit of Detection
Moisture	A	In house method MM0010 based on BS EN 14790	20	0.1%vol
Particulate Matter	A	In house method MM0004 based on BS ISO 9096	10	1 mg/m^3

NOTE: UKAS Status:- (A) REC Ltd accredited for sampling and analysis

2.2 Sampling & Analytical Methodology

Total Particulate Matter

To determine the concentration of particulate matter in emissions, isokinetic stack sampling equipment satisfying the requirements of BS ISO 9096 was utilised and in-house method MM0004 followed.

The Standard describes the methodology for measuring particulate matter under defined conditions and at discrete locations in the duct. Sampling is carried out under isokinetic sampling conditions i.e. the flowrate through the sampling nozzle is adjusted to equal the flowrate in the duct at the sampling positions. Velocity pressures were recorded throughout the monitoring period by means of an 'S' type pitot integral to the sampling probe and nozzle assembly.

A sample of the exhaust stream was removed from the stack via a titanium nozzle and titanium lined heated probe. It was then passed through a quartz fibre filter contained in a heated oven compartment. The temperature of the probe and filter box were maintained at 160°C i.e. above the dew point of the stack gases, to ensure moisture did not condense on the filter. Each filter used complied with the requirements of Section 6.2.7 of BS EN 13284-1:2001 in that the efficiency was better than 99.5% for particles of 0.3µm diameter (or 99.9% for particles of 0.6µm diameter).

The impinger train was seated in a water bath to cool the gas stream and condense out less volatile gases and water vapour.

The first two impingers encountered by the gas stream contained deionised water. The third impinger was left empty and the fourth contained anhydrous silica gel which was used to dry the gas stream before passing it through a dry gas meter (DGM) to measure the volume of gas sampled.

All the impingers were weighed before and after the sampling run in order to determine the mass of water condensed by the impinger train (in house Method MM0010).

The sample volume collected was in excess of the minimum requirement stated in MM0004. The minimum sample volume ensures the results would be representative of normal plant operating conditions.

Upon completion of sampling, the filter was removed to a clean petri dish, labelled and sealed. The probe and filter housing were rinsed with acetone and water. The washings were collected in a container and submitted for analysis along with the filter.

Stack Temperature and Velocity

To determine the stack temperature, a calibrated thermocouple and digital indicator were employed. The exhaust gas velocity was investigated using a pitot static probe (to MM0004) and digital manometer.

3. SAMPLING AND OPERATIONAL DETAILS

3.1 Process Description

The operation of the processes at Sundown Products Ltd, Huntingdon are to be classified as a Part B process under the Environmental Permitting Regulations, 2008. The process is under Local Authority regulation and must demonstrate compliance with the emission limits stipulated in the site permit (permit number 2/06).

The site manufactures a wide range of animal feeds mainly for the equine and poultry markets.

3.2 Sampling Positions

On the cooler stack a single 4" BSP sampling port was installed on a horizontal plane. The sampling points provided were less than 4 hydraulic diameters from any flow disturbance both upstream and downstream from the sampling plane.

Both the port size and sample planes do not fully meet the requirements stated in Environment Agency Technical Guidance Note M1. TGN M1 of 2 x 5" BSP sockets located at least 5 x hydraulic diameters from any flow disturbance both upstream and downstream of the sampling plane. However the initial temperature and velocity traverse conducted along the sample plane showed that the flow requirements of TGN M1 were however met.

Diagrams detailing the sampling positions and taken from Site Worksheets are provided in Appendix 1

3.3 Uncertainty

Due to the absence of a second sample port, only one sampling plane could be utilised. However the number of sampling points was increased along this plane and therefore the standard uncertainties apply.

REC has calculated uncertainty budgets for all of the pollutants listed in the Method Details Table in Section 2.1 above in accordance with calculations and methodology supplied by the Source Testing Association (STA). These uncertainties are quoted in the Tables section of this report.

3.4 Emission Monitoring Survey Details

The emission monitoring survey was carried out on the animal feed manufacturing process on 25 May, 2011. The table below summarises the actual sampling periods.

SAMPLING PERIODS

Stack	Parameter	Sample Time (& Date)
Cooler	Particulates	10:12 - 11:12 (25/05/11)

4. RESULTS AND DISCUSSION

4.1 Initial Velocity and Temperature Traverse

An initial pitot-static pressure and temperature traverse was carried out. From these data stack velocity, expressed in metres per second (m/s), and volumetric flowrates expressed in cubic metre per hour (m^3/hr) have been calculated.

The results are reported at actual stack conditions and the volumetric flowrate is further expressed at the standard reference conditions of 273K, 101.3kPa i.e. standard temperature and pressure (STP). The results are summarised in Table 1.

4.2 Particulate Matter

The results of the particulate sampling runs are summarised in Table 2. From the mass of particulate matter on the filter and in the acetone/water wash residue and volume sampled an emission concentration was calculated.

All results were to be reported at 273K, 101.3kPa, wet gas without correction for oxygen content

====== End of Report Text ======

TABLES

TABLE 1

FLOW DATA

Stack Ref.	Stack Temp	Av Pitot ΔP	Duct Diam	X-Sect. Area	Velocity (actual)	Volume Flow (m^3/hr)	
	(^{0}C)	(Pa)	(cm)	(m^2)	(m/s)	(actual)	(@ ntp)
Cooler Stack	41	95	100	0.785	13.0	36,697	31,937

TABLE 2

PARTICULATE EMISSION DATA SUMMARY – COOLER

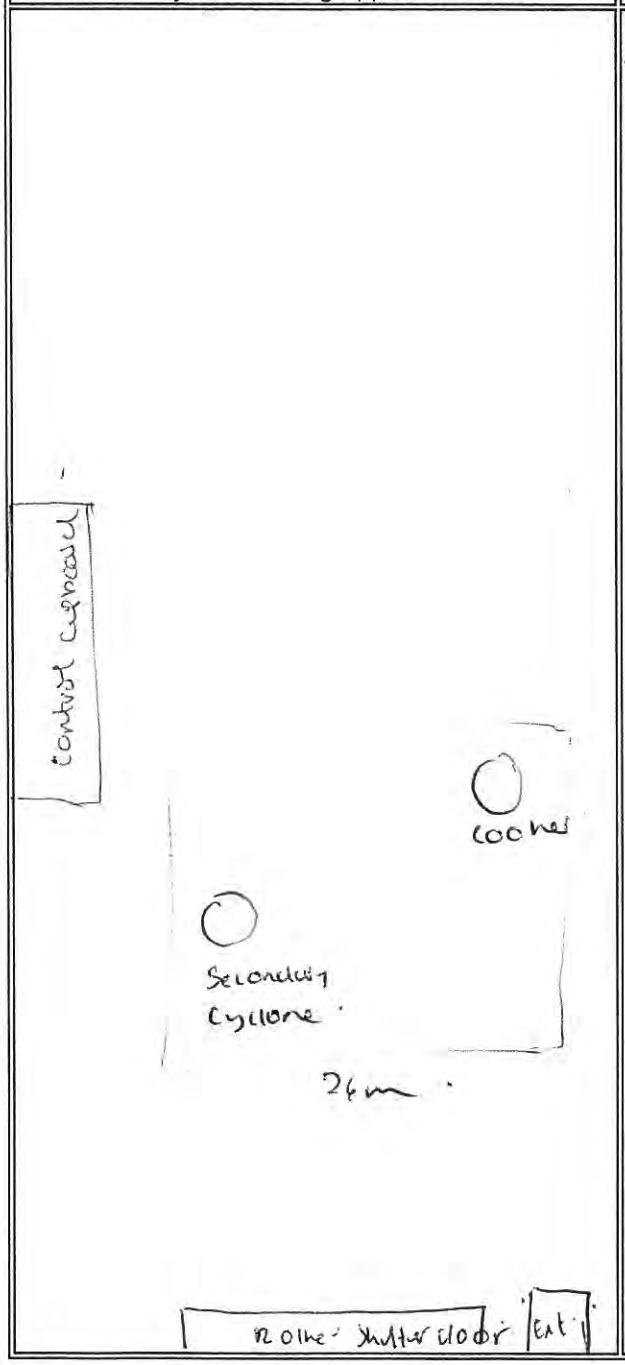
DATE: 25/05/11 **10:12 to 11:12**

Sampling Data	
Run Time (min)	60
Total mass H_2O collected (g)	12.6
Pitot tube constant, Cp	0.85
Dry gas meter (DGM) volume (m^3)	0.897
Temperature DGM (^oC)	30
Temperature stack (^oC)	45
Mean pitot tube pressure drop, delta P (mm H_2O)	9.1
Orifice meter pressure drop, delta H (mm H_2O)	25.0
Barometric Pressure (kPa)	101.3
X-sectional area of stack (m^2)	0.785
Nozzle size (mm)	6.04
Flow Data	
Velocity, actual (m/s)	10.8
Velocity, ntp (m/s)	9.3
Vol. Flow, actual (m^3/hr)	30,519
Vol. Flow, ntp (m^3/hr)	26,200
Volume sampled, ntp, dry gas (m^3)	0.845
Volume sampled, ntp, wet gas (m^3)	0.860
Analytical Data	
Filter Weight Gain (mg)	10.1
Acetone Wash Residue Weight (mg)	2.9
Total Particulates (mg)	13.0
Partics Field Blank (mg)	0.4
Blank % of ELV	0.3
Emission Data	
H_2O (% vol)	1.8
Percentage Isokinetic	90.1
Particulates (mg/m^3)	15.1
Uncertainty (± mg/m^3)	1.4

APPENDIX 1

Diagrams of Sampling Points

DIAGRAMS OF STACK

Plan of site layout including approx dimensions	Schematic diagram of the stack inc dimensions
	Stack Dimensions = Ø1.0 cm cm (diameter) x cm (traverse 1st)

Other Notes

APPENDIX 2

Calculations

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ppm ® mg/Nm³ (at 273K, 101.3kPa: STP)

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Concentration of Gas Wet = Concentration of x 100-Bws/100 Gas Dry

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VOC concentration	=	25 mg/Nm³ (Wet)
Moisture Content	=	27.1%
Concentration of VOC	=	25 (100/(100-27.1))

Carbon (C) to Trichloethylene (TCE)

ppm TCE = ppm C x 0.6715

TCE in mg/m^3 = TCE ppm x 5.864 (Mol Wt/22.4)