WOLFSON LABORATORIES
UNIVERSITY OF EXETER
HIGHER HOOPERN LANE
EXETER, DEVON EX4 4SG
TEL 01392 430088
FAX 01392 430080

ADVANCE
ENVIRONMENTAL

PARTICULATE EMISSION MONITORING
AGGREGATE INDUSTRIES UK LIMITED
EXPRESS ASPHALT
COVENTRY
WARWICKSHIRE

Report on Particulate Emission Monitoring

to

Determine the Levels of Particulate Emission

from the

Parker Asphalt Plant

at

Aggregate Industries UK Limited

Express Asphalt

Coventry

Warwickshire

Report Submitted to:

Aggregates Industries UK Limited

Express Asphalt

Doyle Drive

Coventry

Warwickshire CV6 6NW

Report Prepared By:

K Gough
Company Principal

Date:

06 September ~~2003~~ 2004.

CONTENTS

1. INTRODUCTION

On 08 July 2004, particulate emission testing was undertaken by Advance Environmental at Aggregate Industries UK Limited, Express Asphalt, Coventry. During the test, the weather was noted as overcast and raining with an ambient air temperature of 12 °C.

The purpose of the emission testing was to ensure compliance with emission limits imposed by Coventry City Council in accordance with current regulatory requirements.

2. BACKGROUND

Part 1 of the Environmental Protection Act, 1990 came into force on the 1st. April, 1991 and introduced enhanced Industrial Pollution Control for HMIP (now the Environment Agency) and Local Authorities. Schedule 1 of the Environmental Protection (Prescribed Processes and Substances) Regulations 1991 (as amended), prescribed Part B processes for Local Authority Air Pollution Control.

Part 3 of the schedule covers mineral industries and the associated processes, which are operated by Aggregate Industries UK Limited at Express Asphalt, Coventry. The authorisation of these processes by local authorities has introduced emission monitoring requirements in accordance with the following process guidance note:-

- PG3/15(96) Secretary of State's Guidance - Mineral Drying and Roadstone Coating Processes.

It should be noted that this process will come under The Pollution Prevention and Control (PPC) regime introduced by the PPC Act which in due course will replace the Environmental Protection Act, 1990.

3. MONITORING CONTRACTOR

The emissions test was co-ordinated by Mr K Gough, Company Principal, Advance Environmental. Mr Gough has 18 years experience of undertaking particulate emission testing on plant used in the quarrying and allied industries. All Advance Environmental staff engaged in source emission testing are in the process of obtaining personal MCERTS accreditation.

4. MONITORING PROTOCOL

4.1 Test method and references

Isokinetic sampling of the contained emission sources was undertaken using the B.C.U.R.A. (British Coal Utilisation Research Association) test equipment and the monitoring protocols utilised followed the procedures given within the following British Standards and Technical Guidance Notes:-

- **BS 3405: 1983** Measurement of Particulate Emissions including grit and dust;
- **Environment Agency - Technical Guidance Document (Monitoring) M1** Sampling requirements for monitoring stack emissions to air from industrial installations; and
- **Environment Agency - Technical Guidance Document (Monitoring) M2** Monitoring of Stack Emissions to Air.

4.1.1 Accuracy of reference standards

According to BS 3405: 1983 the accuracy of the monitoring methods utilised will be about +/- 25% of the particulate concentration under defined conditions. However, in practice the level of accuracy will be much improved than that described by the standard given the experience and competence of the sampling personnel.

4.2 Sampling Procedure

4.2.1 Sampling equipment

The equipment used during the sampling procedure was the Airflow Developments Limited BCURA isokinetic particulate sampling equipment, which meets the requirement of the BS3405: 1983 standard method for the measurement of particulate emissions. The equipment was comprised of:-

- Probe;
- cyclone separator;
- sampling nozzle;
- grit hopper;
- filter holder;
- filter medium;
- pump;
- flexible hose; and
- flow rate control equipment.

Ancillary equipment used included a temperature probe, pitot-static tube, micro-manometer and balance, all of which meet the requirements specified in the standard method.

All equipment was inspected in the laboratory before being taken on to site to ensure it was in good condition. Tests were also undertaken to verify that there would be no leaks from the sampling train. The filter medium, which was comprised of 12 mm Dalfratex glass wool was prepared, conditioned and pre-weighed before use, as were the grit hoppers.

4.2.2 Preparation for sampling

No site visit was undertaken prior to undertaking the sampling procedure, as monitoring had previously been undertaken at the site, during which time the sampling position, working platform, sampling ports, access and safety precautions were found to be satisfactory.

Before sampling commenced, a preliminary velocity and temperature survey was undertaken using a pitot-static tube, Airflow Developments PVM100 micro manometer and Comark Limited KM450S temperature probe, the latter two instruments have current certificates of calibration. The micro manometer was zeroed before, during and after the sampling.

The internal dimensions of the flue were known from the previous monitoring undertaken. However, a further measurement was taken to check that the internal diameter had not changed.

4.2.3 Sample collection

During the sample collection procedure, samples were taken from four sampling points at the centre of four equal areas along two sampling planes at 90^0 to each other.

Four sampling points were chosen because the flue area was less than 2.5 m^2.

Cumulative sampling was undertaken along each sampling plane and the sampling duration at each sampling point was four minutes.

After the first set of samples were taken, the velocity and temperature measurements were repeated to ensure that the conditions were still within the required range. A duplicate set of samples were then taken, as outlined above. Velocity and temperature measurements were also undertaken at the end of the sampling procedure.

At all times during the sampling procedure the sampling technicians were in contact with the process operator to ensure that the plant was in full production and there were no changes in the process that might affect the representative nature of the samples collected.

4.2.4 Analysis of samples

On returning to the laboratory, the cyclone separator was washed and the residue was dried. The filters and grit hoppers were also dried, conditioned in a desiccator and weighed. The weighing equipment used was a Sartorious Research R180D analytical balance, capable of weighing to five decimal places. The balance is calibrated annually and a current certificate of calibration is held.

4.2.5 Calculation of results

The calculations were made using the formula specified for cumulative sampling in section 10 of BS 3405: 1983.

The recorded filter weights, velocity, temperature, sampling duration and internal flue dimensions were used to calculate:-

- The mass rate of solids emission in kg/hr; and
- The solids concentration in mgm^{-1}

4.3 Sampling Results

An emission limit of 100 mg/m^3 at standard conditions of 273 K and 101.3 kPa without correction for water vapour content, is applied to the Parker asphalt plant.

At the time of sampling, the ratio of higher to lower result was greater than 1.5:1. However it should be noted that during Test 1, it was noted that problems with the process plant were being experienced which resulted in a deterioration of the emission. Although remedial action was implemented it was not known whether to problem had been corrected. It is considered that the earlier events were still having an effect and residual dust was still present in the system during Test 2.

Due to lack of production, it was not possible to undertake a third test therefore the higher result from the two tests (Test 2) is quoted as the measured emission. It can be concluded that a particulate matter concentration of 275.5 mg/m^3 was recorded and that the emission from this plant failed to comply with the emission limit currently imposed.

4.4 Comments

During each sampling period, the average results from the Alpha continuous emission monitor were logged. Readings of 15.17 mg/m^3 (Test 1) and 26.33 mg/m^3 (Test 2) were recorded during the measurement periods. The present gain setting was noted as 10.1900. It was concluded that the monitor may not operating correctly and requires attention.

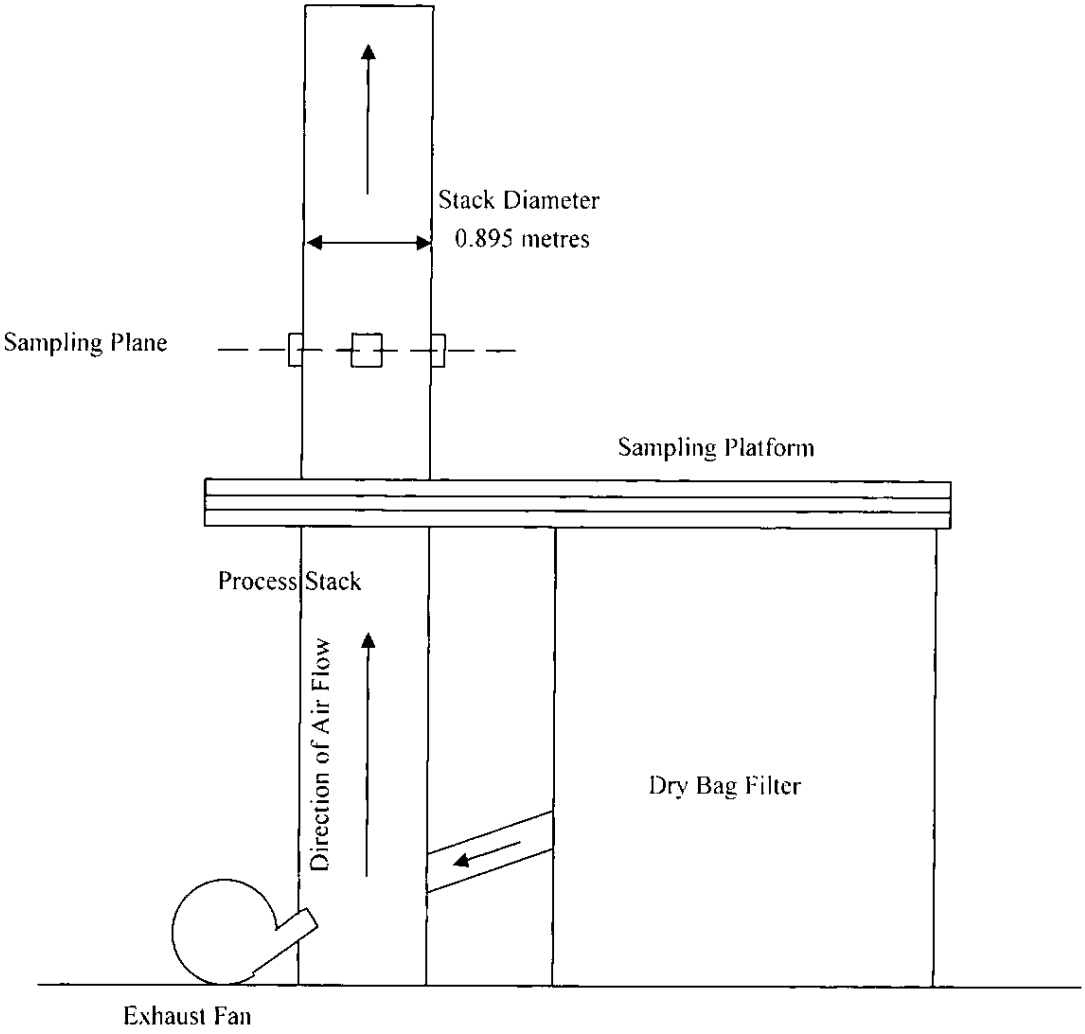
In addition to the variances stated in 4.3 above, the full procedural requirements of BS 3405: 1983 could not be achieved due to low particulate loading and the repeat velocities following tests 1 and 2 being outside the permitted range (although this could be a consequence of the plant operational problems).

The quoted efflux velocity is measured at the sampling position, not at discharge.

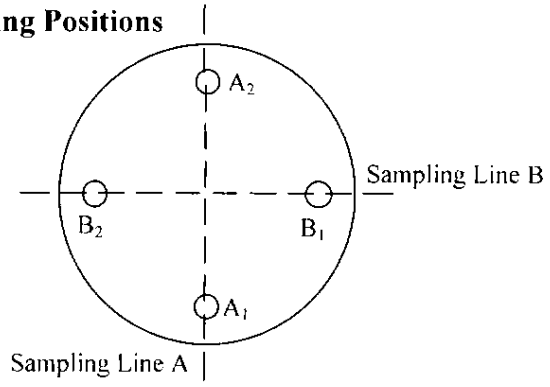
Full details of the sampling location, conditions and measurements taken are provided in the following sections.

5. SAMPLING LOCATION

5.1 Process Plant Layout



5.2 Sampling Positions



6. SUMMARY REPORT

ADVANCE ENVIRONMENTAL
PARTICULATE EMISSION TEST
SUMMARY REPORT

SITE :	Express Asphalt - Coventry	PLANT :	Parker	EQUIPMENT :	Dry bag filter system	DATE OF TEST :	08.07.04

METEOROLOGICAL CONDITIONS

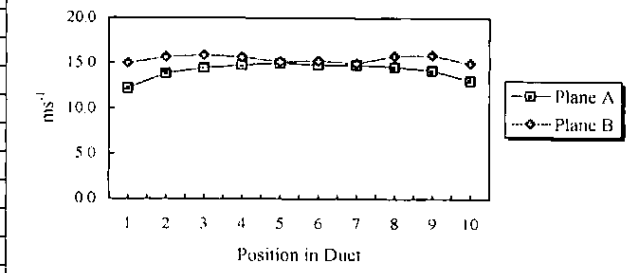
Weather:	Overcast and raining	Ambient Air Temperature (°C):	12

PLANT DETAILS

Operating Conditions:	Continuous production of coated roadstone during the period of test.	Cross Sectional Area of Duct (m²):	0.629
		Authorisation Emission Limit (mg/m³):	100

VARIATION OF PITOSTATIC AIR VELOCITY

Position	Plane A	Plane B
1	12.2	15.0
2	13.9	15.7
3	14.5	15.9
4	14.8	15.7
5	15.0	15.2
6	14.8	15.3
7	14.8	15.0
8	14.6	15.8
9	14.2	15.9
10	13.1	15.0



TEST RESULTS TO BS 3405:1983 (AT 273K AND 101.3 KPa)

	Test 1	Test 2	Mean
Gas Temperature (°C)	83.5	79	
Nozzle Size (m²)	0.0002	0.0002	
Total Sampling Time (mins)	16	16	
Gas Flow Rate (m³/min)	431	368	
Solids Emission Rate (Kg/hr)	3.07	6.09	-
Solids Concentration (mg/m³)	118.5	275.5	-
Efflux Velocity (m/s)			14.8
Gas Flow Rate At Operating Temperature (m³/min)			559

LABORATORY ANALYSIS

Cyclone No.	E	F		
Lab. Ref. No.				
Final Wt. (g)				
Initial Wt. (g)				
Total Wt. (g)	0.0226	0.0274		
Filter No.	23	24		
Lab. Ref. No.	AE/F/11904	AE/F/12004		
Final Wt. (g)	118.7199	124.7964		
Initial WT. (g)	118.6775	124.7476		
Total Wt. (g)	0.0424	0.0488	0.0000	0.0000
% Wt. Cyclone (g)	0.0041	0.0027		
Total Wt. (g) A	0.0465	0.0515	0.0000	0.0000
Hopper No.	23	24		
Lab. Ref. No.	AE/H/11904	AE/H/12004		
Final Wt. (g)	46.4386	45.5109		
Initial Wt. (g)	46.2434	45.0711		
Total Wt. (g)	0.1952	0.4398	0.0000	0.0000
% Wt. Cyclone (g)	0.0185	0.0247		
Total Wt. (g) B	0.2137	0.4645	0.0000	0.0000
Total A + B	0.2602	0.5160	0.0000	0.0000

COMMENTS:

The current maximum permitted concentration of solids in the flue gas for this plant is 100 mg/m3. The measured emission of 275.5 mg/m3 was therefore above this limit at the time of the test.
Note: The requirements of BS 3405: 1983 could not be achieved. please refer to main report.
Note: The efflux velocity quoted is measured at the sampling position not at the point of discharge.

K Gough - ADVANCE Environmental

7. SAMPLING RECORDS

Preliminary Velocity and Temperature Survey

Sample Point No.	Sample Line A			Sample Line B		
	Distance Along Line (m)	Gas Velocity (ms^{-1})	Gas Temperature (°C)	Distance Along Line (m)	Gas Velocity (ms^{-1})	Gas Temperature (°C)
1	0.05	12.2	85	0.05	15.0	88
2	0.15	13.9	85	0.15	15.7	88
3	0.25	14.5	85	0.25	15.9	87
4	0.35	14.8	85	0.35	15.7	87
5	0.45	15.0	85	0.45	15.2	87
6	0.55	14.8	86	0.55	15.3	86
7	0.65	14.8	86	0.65	15.0	86
8	0.75	14.6	86	0.75	15.8	86
9	0.85	14.2	86	0.85	15.9	85
10	0.95	13.1	86	0.95	15.0	85
Mean			85.5 (1)			86.5 (2)

Mean gas temperature 1 = 85.5 °C

Mean gas temperature 2 = 86.5 °C

Mean gas temperature (in K) $T_p = \frac{(\text{mean (1)} + \text{mean (2)})}{2} + 273 = 359$

Permitted range of gas temperature readings (in °C)= $(0.9T_p - 273)$ to $(1.1T_p - 273)$

= 50 to 122

Highest gas velocity reading (either sampling line) (in ms^{-1}) = 15.9

Lowest gas velocity reading (either sampling line) (in ms^{-1}) = 12.2

Ratio highest/lowest = 1.3:1 (maximum permitted ratio = 3:1)

With a circular duct of 0.895 m, the flue area = 0.629 m^2

Sampling can be undertaken at the selected location and samples to be taken at 4 sampling points located on two sampling lines.

Test 1

SAMPLING POINT		GAS VELOCITY		GAS TEMPERATURE	
Sample Position	Distance Along Line (m)	Initial v_1 (ms^{-1})	Final v_2 (ms^{-1})	Initial t_1 (°C)	Final t_2 (°C)
A_1	0.15	13.9	13.0	85	81
A_2	0.85	14.2	12.7	86	81
B_1	0.15	15.7	12.8	88	81
B_2	0.85	15.9	11.8	85	81
		Total		Mean85	
		59.7	50.3*	86	81
				t_m = 83.5	

Permitted range of total v_2 = 0.95 (total v_1) to 1.05 (total v_1) = 57 to 63

* Outside permitted range

Sample Position	Nozzle Area (m^2)	Duration of Sampling (s^{-1})	Cyclone DP (kPa)
A_1	0.0002	240	1.35
A_2	0.0002	240	1.40
B_1	0.0002	240	1.75
B_2	0.0002	240	1.85

Cumulative Sampling Undertaken

Sample Container	Ref. Number	Initial Weight (g)	Final Weight (g)	Collected Solids (g)	Mass of Collected Solids (g)
Filter 23	AEF11904	118.6775	118.7199	0.0424	0.2602
Grit Pot 23	AEH11904	46.2434	46.4386	0.1952	
Cyclone E				0.0226	

Test 2

SAMPLING POINT		GAS VELOCITY		GAS TEMPERATURE	
Sample Position	Distance Along Line (m)	Initial v_1 (ms^{-1})	Final v_2 (ms^{-1})	Initial t_1 (°C)	Final t_2 (°C)
A_1	0.15	13.0	13.5	81	75
A_2	0.85	12.7	14.1	81	75
B_1	0.15	12.8	16.5	81	78
B_2	0.85	11.8	16.0	81	78
		Total		Mean	
		50.3	60.1*	81	76.5
				t_m = 79	

Permitted range of total v_2 = 0.95 (total v_1) to 1.05 (total v_1) = 48 to 53

* Outside permitted range

Sample Position	Nozzle Area (m^2)	Duration of Sampling (s^{-1})	Cyclone DP (kPa)
A_1	0.0002	240	2.10
A_2	0.0002	240	1.05
B_1	0.0002	240	1.10
B_2	0.0002	240	0.95

Cumulative Sampling Undertaken

Sample Container	Ref. Number	Initial Weight (g)	Final Weight (g)	Collected Solids (g)	Mass of Collected Solids (g)
Filter 24	AEF12004	124.7476	124.7964	0.0488	0.5160
Grit Pot 24	AEH12004	45.0711	45.5109	0.4398	
Cyclone F				0.0274	

Test Results

	Result of Test 1	Result of Test 2	Ratio of higher result to lower result	Mean result if ratio is not more than 1.5:1
Mass rate of Solids Emission, M (Kg/hr)	3.07	6.09	1.9:1	-
Solids Concentration, C (mg/m^{-3})	118.5	275.5	2.3:1	-

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Report Submitted to:

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Doyle Drive

Coventry

Warwickshire CV6 6NW

Report Prepared By:

K Gough
Company Principal

Date:

06 December 2004

CONTENTS

1. INTRODUCTION

On 12 October 2004, particulate emission testing was undertaken by Advance Environmental at Aggregate Industries UK Limited, Express Asphalt, Coventry. During the test, the weather was noted as dry and overcast with an ambient air temperature of 14 °C.

The purpose of the emission testing was to ensure compliance with emission limits imposed by Coventry City Council in accordance with current regulatory requirements.

2. BACKGROUND

Part 1 of the Environmental Protection Act, 1990 came into force on the 1st. April, 1991 and introduced enhanced Industrial Pollution Control for HMIP (now the Environment Agency) and Local Authorities. Schedule 1 of the Environmental Protection (Prescribed Processes and Substances) Regulations 1991 (as amended), prescribed Part B processes for Local Authority Air Pollution Control.

Part 3 of the schedule covers mineral industries and the associated processes, which are operated by Aggregate Industries UK Limited at Express Asphalt, Coventry. The authorisation of these processes by local authorities has introduced emission monitoring requirements in accordance with the following process guidance note:-

- PG3/15(96) Secretary of State's Guidance - Mineral Drying and Roadstone Coating Processes.

It should be noted that this process will come under The Pollution Prevention and Control (PPC) regime introduced by the PPC Act which in due course will replace the Environmental Protection Act, 1990. Once a PPC permit has been issued emission monitoring will be required in accordance with the following process guidance note:-

- PG3/15a (04) Secretary of State's Guidance - Mineral Drying and Roadstone Coating Processes.

Permit was issued in feb. 04!

3. MONITORING CONTRACTOR

The emissions test was co-ordinated by Mr K Gough, Company Principal, Advance Environmental. Mr Gough has 18 years experience of undertaking particulate emission testing on plant used in the quarrying and allied industries. All Advance Environmental staff engaged in source emission testing are in the process of obtaining personal MCERTS accreditation.

4. MONITORING PROTOCOL

4.1 Test method and references

Isokinetic sampling of the contained emission sources was undertaken using the B.C.U.R.A. (British Coal Utilisation Research Association) test equipment and the monitoring protocols utilised followed the procedures given within the following British Standards and Technical Guidance Notes:-

- **BS 3405: 1983** Measurement of Particulate Emissions including grit and dust;

- **Environment Agency - Technical Guidance Document (Monitoring) M1** Sampling requirements for monitoring stack emissions to air from industrial installations; and

- **Environment Agency - Technical Guidance Document (Monitoring) M2** Monitoring of Stack Emissions to Air.

4.1.1 Accuracy of reference standards

According to BS 3405: 1983 the accuracy of the monitoring methods utilised will be about +/- 25% of the particulate concentration under defined conditions. However, in practice the level of accuracy will be much improved than that described by the standard given the experience and competence of the sampling personnel.

4.2 Sampling Procedure

4.2.1 Sampling equipment

The equipment used during the sampling procedure was the Airflow Developments Limited BCURA isokinetic particulate sampling equipment, which meets the requirement of the BS3405: 1983 standard method for the measurement of particulate emissions. The equipment was comprised of:-

- Probe;
- cyclone separator;
- sampling nozzle;
- grit hopper;
- filter holder;
- filter medium;
- pump;
- flexible hose; and

- flow rate control equipment.

Ancillary equipment used included a temperature probe, pitot-static tube, micro-manometer and balance, all of which meet the requirements specified in the standard method.

All equipment was inspected in the laboratory before being taken on to site to ensure it was in good condition. Tests were also undertaken to verify that there would be no leaks from the sampling train. The filter medium, which was comprised of 12 mm Dalfratex glass wool was prepared, conditioned and pre-weighed before use, as were the grit hoppers.

4.2.2 Preparation for sampling

No site visit was undertaken prior to undertaking the sampling procedure, as monitoring had previously been undertaken at the site, during which time the sampling position, working platform, sampling ports, access and safety precautions were found to be satisfactory.

Before sampling commenced, a preliminary velocity and temperature survey was undertaken using a pitot-static tube, Airflow Developments PVM100 micro manometer and Comark Limited KM450S temperature probe, the latter two instruments have current certificates of calibration. The micro manometer was zeroed before, during and after the sampling.

The internal dimensions of the flue were known from the previous monitoring undertaken. However, a further measurement was taken to check that the internal diameter had not changed.

4.2.3 Sample collection

During the sample collection procedure, samples were taken from four sampling points at the centre of four equal areas along two sampling planes at 90^0 to each other.

Four sampling points were chosen because the flue area was less than 2.5 m^2.

Cumulative sampling was undertaken along each sampling plane and the sampling duration at each sampling point was four minutes.

After the first set of samples were taken, the velocity and temperature measurements were repeated to ensure that the conditions were still within the required range. A duplicate set of samples were then taken, as outlined above. Velocity and temperature measurements were also undertaken at the end of the sampling procedure.

At all times during the sampling procedure the sampling technicians were in contact with the process operator to ensure that the plant was in full production and there were no changes in the process that might affect the representative nature of the samples collected.

4.2.4 Analysis of samples

On returning to the laboratory, the cyclone separator was washed and the residue was dried. The filters and grit hoppers were also dried, conditioned in a desiccator and weighed. The weighing equipment used was a Sartorious Research R180D analytical balance, capable of weighing to five decimal places. The balance is calibrated annually and a current certificate of calibration is held.

4.2.5 Calculation of results

The calculations were made using the formula specified for cumulative sampling in section 10 of BS 3405: 1983.

The recorded filter weights, velocity, temperature, sampling duration and internal flue dimensions were used to calculate:-

- The mass rate of solids emission in kg/hr; and
- The solids concentration in mgm^{-1}

4.3 Sampling Results

An emission limit of 100 mg/m^3 at standard conditions of 273 K and 101.3 kPa without correction for water vapour content, is applied to the Parker asphalt plant.

At the time of sampling, a mean particulate matter concentration of 34.6 mg/m^3 was recorded. It can be concluded, therefore, that the emission from this plant complied with the emission limit currently imposed.

4.4 Comments

During each sampling period, the average results from the Alpha continuous emission monitor were logged. Readings of 12.92 mg/m^3 (Test 1) and 14.17 mg/m^3 (Test 2) were recorded during the measurement periods. The present gain setting was noted as 10.1900. It can be concluded that the monitor is not operating to the required level of accuracy (under reading) and requires adjustment of the gain setting with a new gain of 26.0680.

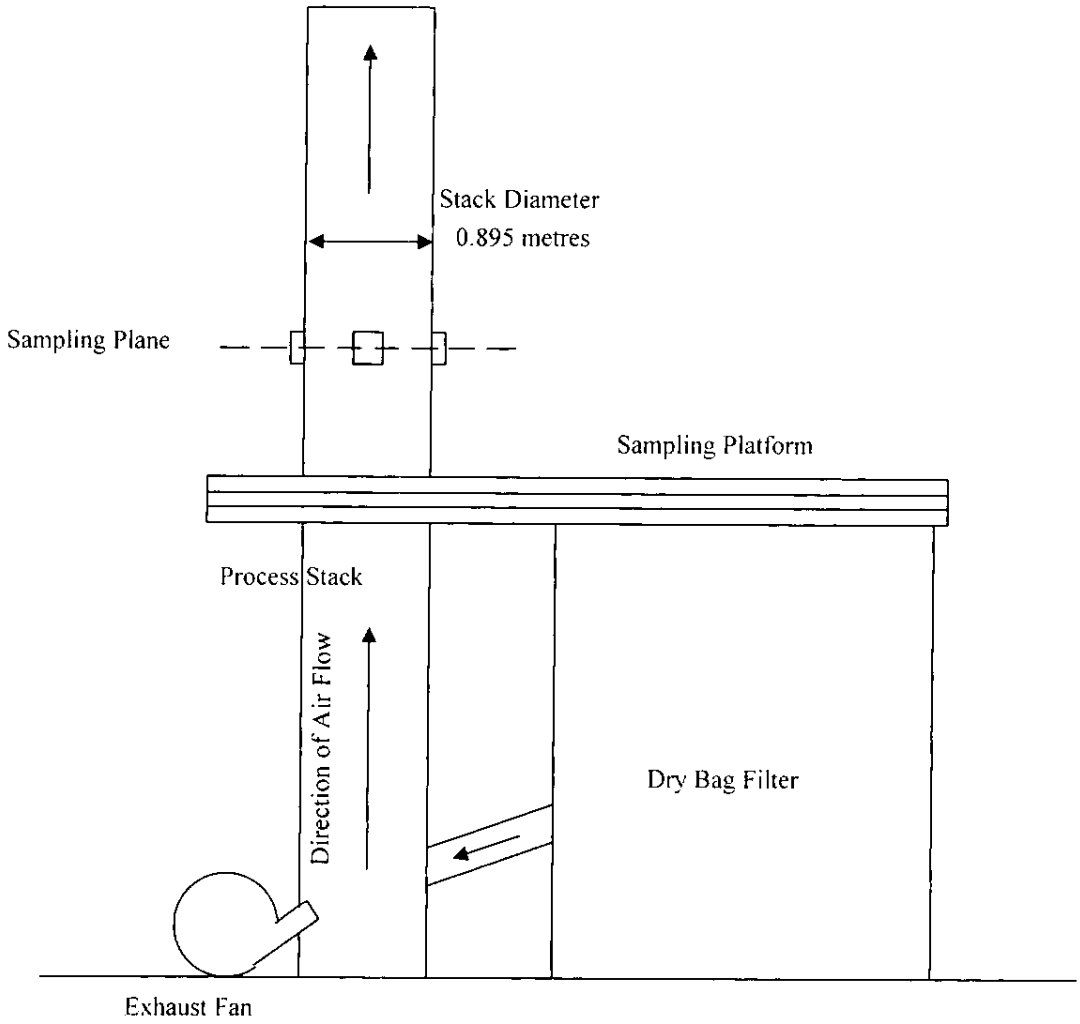
The full procedural requirements of BS 3405: 1983 could not be achieved due to low particulate loading.

The quoted efflux velocity is measured at the sampling position, not at discharge.

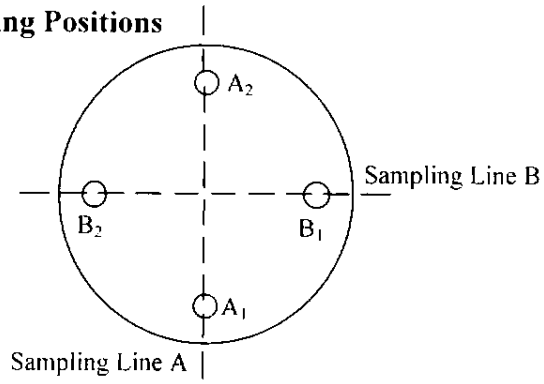
Full details of the sampling location, conditions and measurements taken are provided in the following sections.

5. SAMPLING LOCATION

5.1 Process Plant Layout



5.2 Sampling Positions



6. SUMMARY REPORT

ADVANCE ENVIRONMENTAL
PARTICULATE EMISSION TEST
SUMMARY REPORT

SITE :	Express Asphalt - Coventry	PLANT :	Parker	EQUIPMENT : Dry bag filter system	DATE OF TEST :	12.10.04

METEOROLOGICAL CONDITIONS

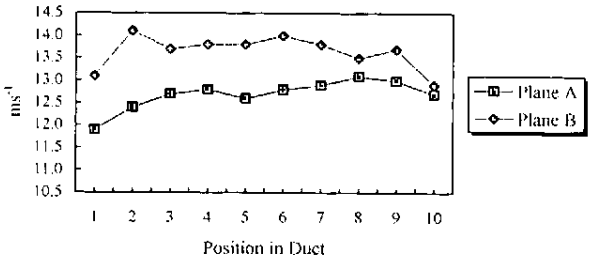
Weather:	Dry and overcast	Ambient Air Temperature (°C):	14

PLANT DETAILS

Operating Conditions:	Continuous production of coated roadstone during the period of test.	Cross Sectional Area of Duct (m²):	0.629
		Authorisation Emission Limit (mg/m³):	100

VARIATION OF PITOSTATIC AIR VELOCITY

Position	Plane A	Plane B
1	11.9	13.1
2	12.4	14.1
3	12.7	13.7
4	12.8	13.8
5	12.6	13.8
6	12.8	14.0
7	12.9	13.8
8	13.1	13.5
9	13.0	13.7
10	12.7	12.9



TEST RESULTS TO BS 3405:1983 (AT 273K AND 101.3 KPa)

	Test 1	Test 2	Mean
Gas Temperature (°C)	71	79	
Nozzle Size (m²)	0.0002	0.0002	
Total Sampling Time (mins)	16	16	
Gas Flow Rate (m³/min)	398	386	
Solids Emission Rate (Kg/hr)	0.82	0.81	0.82
Solids Concentration (mg/m³)	34.1	35.1	34.6
Efflux Velocity (m/s)			13.2
Gas Flow Rate At Operating Temperature (m³/min)			498

LABORATORY ANALYSIS

Cyclone No.	F	D		
Lab. Ref. No.				
Final Wt. (g)				
Initial Wt. (g)				
Total Wt. (g)	0.0399	0.0326		
Filter No.	14	15		
Lab. Ref. No.	AE/F/18204	AE/F/18304		
Final Wt. (g)	127.1074	124.1161		
Initial WT. (g)	127.1025	124.1068		
Total Wt. (g)	0.0049	0.0093	0.0000	0.0000
% Wt. Cyclone (g)	0.0068	0.0085		
Total Wt. (g) A	0.0117	0.0178	0.0000	0.0000
Hopper No.	14	15		
Lab. Ref. No.	AE/H/18204	AE/H/18304		
Final Wt. (g)	46.4296	46.2054		
Initial Wt. (g)	46.4052	46.1785		
Total Wt. (g)	0.0244	0.0269	0.0000	0.0000
% Wt. Cyclone (g)	0.0331	0.0241		
Total Wt. (g) B	0.0575	0.0510	0.0000	0.0000
Total A + B	0.0692	0.0688	0.0000	0.0000

COMMENTS:
The current maximum permitted concentration of solids in the flue gas for this plant is 100 mg/m3. The measured emission of 34.6 mg/m3 was therefore below this limit at the time of the test.
Note: The requirements of BS 3405: 1983 could not be achieved, please refer to main report.
Note: The efflux velocity quoted is measured at the sampling position not at the point of discharge.

K Gough ADVANCE Environmental

7. SAMPLING RECORDS

Preliminary Velocity and Temperature Survey

Sample Point No.	Sample Line A			Sample Line B		
	Distance Along Line (m)	Gas Velocity (ms^{-1})	Gas Temperature (°C)	Distance Along Line (m)	Gas Velocity (ms^{-1})	Gas Temperature (°C)
1	0.05	11.9	71	0.05	13.1	71
2	0.15	12.4	71	0.15	14.1	71
3	0.25	12.7	71	0.25	13.7	72
4	0.35	12.8	71	0.35	13.8	72
5	0.45	12.6	71	0.45	13.8	72
6	0.55	12.8	71	0.55	14.0	71
7	0.65	12.9	70	0.65	13.8	70
8	0.75	13.1	70	0.75	13.5	70
9	0.85	13.0	70	0.85	13.7	69
10	0.95	12.7	70	0.95	12.9	69
Mean			71 (1)			71 (2)

Mean gas temperature 1 = 71 °C

Mean gas temperature 2 = 71 °C

Mean gas temperature (in K) $T_p = \frac{(\text{mean (1)} + \text{mean (2)})}{2} + 273 = 344$

Permitted range of gas temperature readings (in °C)= $(0.9T_p - 273)$ to $(1.1T_p - 273)$

= 37 to 105

Highest gas velocity reading (either sampling line) (in ms^{-1}) = 14.1

Lowest gas velocity reading (either sampling line) (in ms^{-1}) = 11.9

Ratio highest/lowest = 1.2:1 (maximum permitted ratio = 3:1)

With a circular duct of 0.895 m, the flue area = 0.629 m^2

Sampling can be undertaken at the selected location and samples to be taken at 4 sampling points located on two sampling lines.

Test 1

SAMPLING POINT		GAS VELOCITY		GAS TEMPERATURE	
Sample Position	Distance Along Line (m)	Initial v_1 (ms^{-1})	Final v_2 (ms^{-1})	Initial t_1 (°C)	Final t_2 (°C)
A_1	0.15	12.4	12.8	71	83
A_2	0.85	13.0	13.2	70	83
B_1	0.15	14.1	13.6	71	85
B_2	0.85	13.7	13.1	69	84
		Total		Mean85	
		53.2	52.7	70	84
				t_m = 71	

Permitted range of total v_2 = 0.95 (total v_1) to 1.05 (total v_1) = 51 to 56

Sample Position	Nozzle Area (m^2)	Duration of Sampling (s^{-1})	Cyclone DP (kPa)
A_1	0.0002	240	1.40
A_2	0.0002	240	1.45
B_1	0.0002	240	1.75
B_2	0.0002	240	1.60

Cumulative Sampling Undertaken

Sample Container	Ref. Number	Initial Weight (g)	Final Weight (g)	Collected Solids (g)	Mass of Collected Solids (g)
Filter 14	AEF18204	127.1025	127.1074	0.0049	0.0692
Grit Pot 14	AEH18204	46.4052	46.4296	0.0244	
Cyclone F				0.0399	

Test 2

SAMPLING POINT		GAS VELOCITY		GAS TEMPERATURE	
Sample Position	Distance Along Line (m)	Initial v_1 (ms^{-1})	Final v_2 (ms^{-1})	Initial t_1 (°C)	Final t_2 (°C)
A_1	0.15	12.8	12.3	73	86
A_2	0.85	13.2	12.4	73	86
B_1	0.15	13.6	12.8	71	86
B_2	0.85	13.1	12.5	73	86
		Total		Mean	
		52.7	50.0	72.5	86
				t_m = 79	

Permitted range of total v_2 = 0.95 (total v_1) to 1.05 (total v_1) = 50 to 55

Sample Position	Nozzle Area (m^2)	Duration of Sampling (s^{-1})	Cyclone DP (kPa)
A_1	0.0002	240	1.25
A_2	0.0002	240	1.30
B_1	0.0002	240	1.55
B_2	0.0002	240	1.20

Cumulative Sampling Undertaken

Sample Container	Ref. Number	Initial Weight (g)	Final Weight (g)	Collected Solids (g)	Mass of Collected Solids (g)
Filter 15	AEF18304	124.1068	124.1161	0.0093	0.0688
Grit Pot 15	AEH18304	46.1785	46.2054	0.0269	
Cyclone D				0.0326	

Test Results

	Result of Test 1	Result of Test 2	Ratio of higher result to lower result	Mean result if ratio is not more than 1.5:1
Mass rate of Solids Emission, M (Kg/hr)	0.82	0.81	1:1	0.82
Solids Concentration, C (mg/m^{-3})	34.1	35.1	1:1	34.6