



Caring for the environment and creating safer workplaces

## Report for the Periodic Monitoring of Emissions to Atmosphere

Associated Recycling Solutions Ltd RSL: Plant . Com
--

Operator:	Greener Engineering Ltd
Permit Number:	Unknown
Installation:	Mobile Asphalt Recycling Plant
Monitoring Dates:	29 November 2010
Site Address:	Off Barford Road Great Barford Bedford MK44 3LF

Report Number:	J 4495
Version:	1
Date of Report:	3 December 2010
Report Author:	Mr D Fisher
MCERTS Registration N°:	MM 08 963
MCERTS Level:	Level 1 (TE1)

Report Approved by:	Mr C Mann
MCERTS Registration N°:	MM 06 695
MCERTS Level:	MCERTS Level 2 (TE1, TE2, TE3, TE4)
Function:	Senior Environmental Consultant
Signed:	

<b>Contents</b>	<b>Page Number</b>
<b>Part 1 : Executive Summary</b>	<b>3</b>
1.1 Monitoring Objectives	3
1.2 Monitoring Results	4
1.3 Operating Information	4
1.4 Monitoring Deviations	4
<b>Part 2 : Supporting Information</b>	<b>5</b>
2.1 Appendix 1 : General Information	5
2.2 Appendix 2 : Stack 1 Results and Discussions	6

## **Part 1: Executive Summary**

### **1.1 Monitoring Objectives**

At the request of Mr. Kevin Ward, Envirocare Technical Consultancy were contracted to undertake an emission monitoring campaign from a mobile Asphalt recycling plant in Great Barford. The plant takes scrapings removed during road re-surfacing and heats them up to ~150°C in a mixer after which they can be re-used. Heat is provided by a Diesel fired burner.

Each batch last approximately 30 minutes of which the extraction fan is on for approximately 20 minutes. The monitoring test lasted 40 minutes and covered 2 separate batches.

The results obtained form the basis of this report.

#### **Emission Point Identification**

<b>Substances to Be Monitored</b>	<b>Stack 1</b>
Total Particulate Matter	✓

## 1.2 Monitoring Results

Emission Point Reference	Substance to be Monitored	Emission Limit Value	Periodic Monitoring Result	Uncertainty	Units	Reference Conditions	Date of Sampling	Start and End Times	Monitoring Method Reference	Accreditation for use of Method	Operating Status
Stack 1	Total Particulate Matter	70	6.2	0.2	mg/Nm <sup>3</sup>	273K, 101.3kPa	29/11/10	12:17-13:28	BS EN 13284	MCERTS	Normal

## 1.3 Operating Information

Emission Point Reference	Date	Process Type	Process Duration	Fuel	Feedstock	Abatement	Load	Comparison of Operator CEMS and Periodic Monitoring Results			
								Substance	CEMS Results	Periodic Monitoring Results	Units
Stack 1	29/11/10	Asphalt Recycling Plant	~30 mins per batch	Diesel	Road scrapings	Bag Filter	7-8 Tonnes per batch	N/A	N/A	N/A	N/A

## 1.4 Monitoring Deviations

Emission Point Reference	Substance Deviations	Monitoring Deviations	Other Relevant Issues
Stack 1	None	None	None

## **Part 2: Supporting Information**

### **2.1 Appendix 1: General Information**

#### **2.1.1 Monitoring organisation staff details**

Mr C G Mann	MCERTS Level 2 (TE1, TE2, TE3, TE4)	MM 06 695
Mr J Piatka	MCERTS Trainee	

#### **2.1.2 Monitoring organisation method details**

##### **2.1.2.1 Standard Reference Conditions**

All pollutant concentrations measured have been expressed at standard reference conditions of 273K and 101.3 kPa. The temperatures and local barometric pressure levels are measured to correct the data, where necessary, to the reference conditions, and were measured as follows:

##### **2.1.2.2 Temperature**

A 1.5mm diameter Type K thermocouple coupled to a digital display (Tenma) was used to measure the ambient temperature on the day of monitoring.

##### **2.1.2.3 Local Atmospheric Pressure**

An aneroid barometer was used to measure this parameter at several times during the days of monitoring.

##### **2.1.2.4 Particulate Matter**

Isokinetic sampling utilised a CAE sampling system. The system incorporated a stainless steel integrated sample probe consisting of an 'S'-type pitot, thermocouple and sampling nozzle, with an out-stack filter unit containing a 37 mm Whatman QMA in-line filter (whose efficiency is quoted as 99.99% at 0.3µm). The nozzle and pitot/thermocouple arrangement complied with the requirements of BS EN 13284.

The sample gases were drawn through a cooling and drying impinger train before reaching the CAE console control unit. The impinger train allowed the duct moisture content to be calculated. The control unit comprised a pump, manometers to measure the pitot pressure and orifice pressure differences, from which the required volume flow to maintain isokinetic conditions was calculated, and a dry gas meter to indicate the total volume sampled. Further adjustment of flow rates during sampling was made to compensate for differences in duct and gas meter temperatures.

Due to the stack's small size (i.e. less than 35cm) sampling took place from the central point of the stack. Two filters were used over a 40 minute run. The particulate emission was determined by gravimetric analysis.

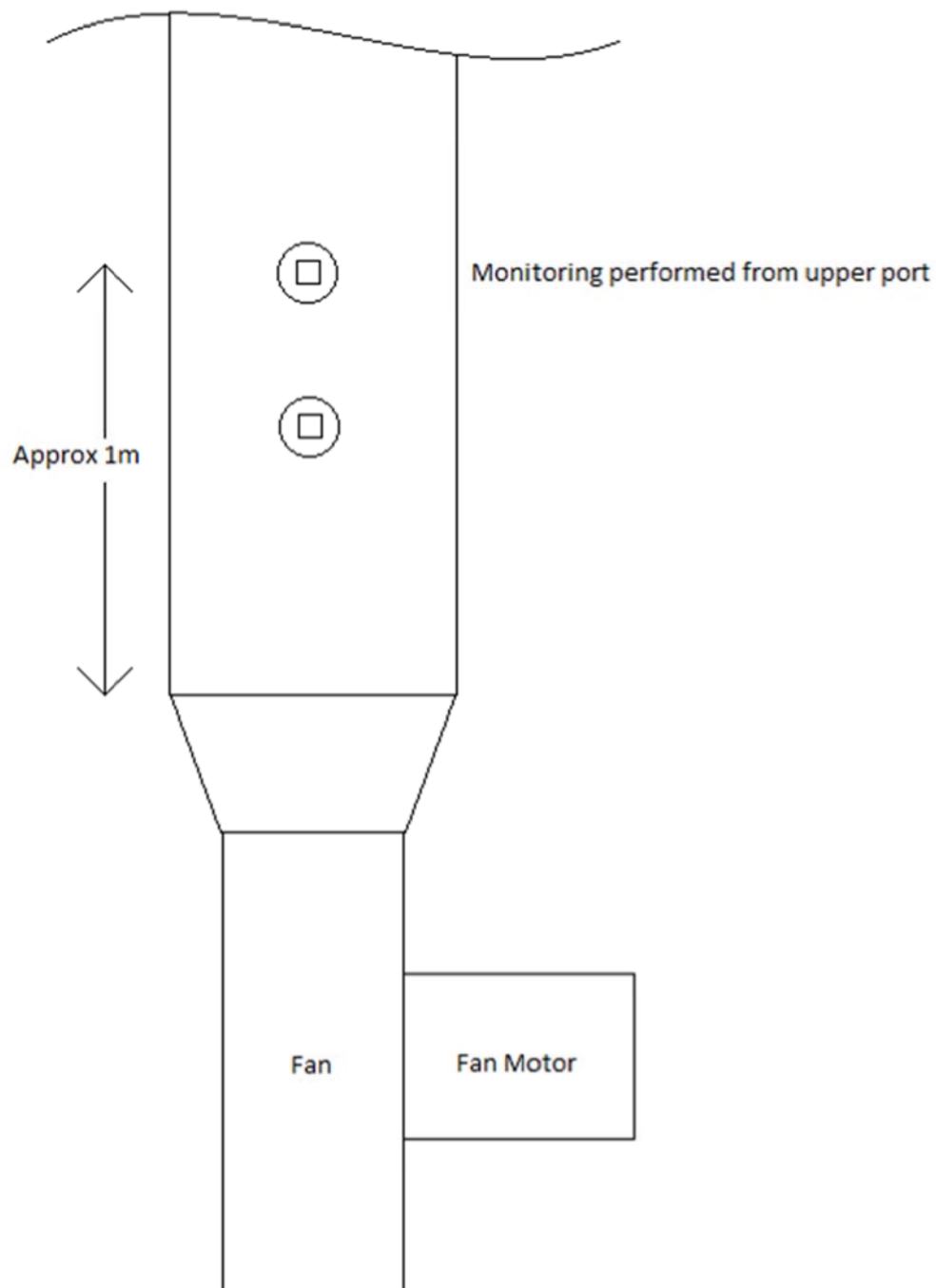
At the end of the run, the nozzle and sampling tube upstream of the filter is washed with 2 washes of Analar Water and one wash of Analar Acetone. The washing is then evaporated in a pre-weighed crucible to ascertain the mass of particulate in the sampling tube. This mass is apportioned to the filters according to the volume of gas sampled in each run.

#### **2.1.3 Monitoring organisation equipment check list references**

Equipment ID	Model Number	Purpose
CB2	CAE Console	Isokinetic Sampler

## 2.2 Appendix 2: Stack 1 Results and Discussions

### 2.2.1 Diagram of the sampling location and positions



## 2.2.2 Flow criteria measurements

<b>Stack reference:</b>		<b>Stack 1</b>
Duct diameter :	29.0	cm
Cross sectional area :	0.066	sq.metres
Barometric pressure:	1025	mbar
Ambient Temperature:	5.7	°C
Molecular weight of Stack Gas	28.840	g/gmole
Pitot Coefficient:	0.831	

Sample Line	Traverse Point	Traverse Position (%D)	Differential Pressure DP cmH <sub>2</sub> O	Stack Velocity (m/s)	Stack Temp (°C)	Angle of Rotation (°)
A	A1	0.067	3.800	22.2	67.0	-
	A2	0.150	3.600	21.6	68.0	-
	A3	0.250	3.600	21.6	69.0	-
	A4	0.350	3.500	21.4	71.0	-
	A5	0.450	3.300	20.9	74.0	-
	A6	0.550	2.800	19.3	77.0	-
	A7	0.650	2.600	18.7	79.0	-
	A8	0.750	2.500	18.3	80.0	-
	A9	0.850	2.250	17.4	81.0	-
	A10	0.933	2.175	17.1	82.0	-

<b>Velocity and Temperature Calculations</b>		
Mean Duct Velocity:	19.9	(m/s)
Ratio Highest:Lowest:	1.3	:1
Mean Stack Temperature:	74.8	(°C)
Ratio Highest:Lowest:	1.2	:1
Volumetric Flow Rate:	4722.1	(m <sup>3</sup> /hr)
<b>Corrected Gas Volume Flow :</b>	<b>3750.5</b>	(Nm <sup>3</sup> /hr)

## 2.2.3 Water vapour measurements

Water vapour measurements were performed as an integral part of the sample train, the result obtained was 5.5%.

## 2.2.4 Manual monitoring method - results – calculations

## Sampling Run No: 1

<b>Stack details: Stack 1</b>	<b>Duct diameter:</b>	29.0	(cm)	<b>Date:</b>	29/11/2010
	<b>Cross-sectional area:</b>	0.066	(m <sup>2</sup> )	<b>Operators:</b>	CM & JP

Meter Box No:	CB2	g/gmole cm H <sub>2</sub> O	Barometric Pressure (mbar)		Ambient Temperature (°C)		Leak Check (l/min)		Time	
Gas Meter Coefficient:	1.000		Before	After	Before	After	Before	After	Start	End
Pitot Coefficient	0.831		1025	1025	7.0	4.0	0.38	0.10	12:17	13:28
Molecular weight of Stack Gas	28.84									
Static Pressure in Stack	1.30									

<b>Average Stack Velocity=</b>	<b>20.1</b>	<b>metres/second</b>
<b>Isokineticity =</b>	<b>96.9</b>	<b>%</b>
<b>Total Sampling Time=</b>	<b>40.0</b>	<b>minutes</b>
<b>Gasmeter Difference=</b>	<b>913.6</b>	<b>litres</b>
<b>Corrected Gasmeter Volume</b>	<b>913.6</b>	<b>(Gasmeter Coefficient)</b>
<b>Mean Sampling Rate =</b>	<b>22.8</b>	<b>litres/minute</b>

Filter Reference	Type
09-10-599 & 11-10-672	37mm QMA

**Emission Calculations**

Corrected Total Dry Gas Volume =	911.79	Litres (273K; 101.3kPa)
Total Particulate Matter Emission =	6.2	mg/Nm <sup>3</sup> (273K; 101.3kPa; Dry)
Mass of water collected Run1=	42.8	g
Volume of Mass of Water =	53.3	NLitres
Water Content =	5.5	%
<b>Corrected Total Particulate Matter Emission =</b>	<b>6.2</b>	<b>mg/Nm<sup>3</sup> (273K; 101.3kPa and dry gas)</b>
<b>Mass emission rate (M1) =</b>	<b>0.023</b>	<b>kg/hr</b>



## 2.2.5 Analysis results

### FILTER WEIGHINGS

Filter type	37mm QMA
Filter reference	09-10-599 & 11-10-672
	Run 1 mg
Filter weight post site	178.67
Filter weight pre site	174.48
Filter weight change	4.19
<b>Total deposit</b>	<b>5.68</b>

### PROBE WASH WEIGHINGS

	Sampling mg
Deposit + container	30557.19
Container	30555.70
<b>Probe wash</b>	<b>1.49</b>

### MOISTURE WEIGHINGS

	No.1 (g)	No.2(g)	No.3(g)	no.4(g)
Impinger end	849.0	734.2	441.2	878.2
Impinger start	814.3	733.0	441.4	871.1
Moisture in each impinger	34.7	1.2	-0.2	7.1
<b>Total Moisture</b>	<b>42.8</b>	g		

Emission Limit Value 70 mg/m<sup>3</sup>

## 2.2.6 Instrumental gas analyser site calibration measurements

Not applicable

## 2.2.7 Instrumental gas analyser results

Not applicable

## 2.2.8 Uncertainty calculations

### MEASUREMENT UNCERTAINTY CALCULATION

#### Stack 1

Emission Limit value =	70	mg/Nm <sup>3</sup>	Mean Emission Concentration =	6.23	mg/Nm <sup>3</sup>
Mean Sampling Rate =	22.84	litres/minute	Monitoring Time =	40.0	mins
Leak Rate =	0.24	litres/minute	Envirocare Console used =	CB2	
Barometric Pressure =	1538	mbar	Temperature uncertainty =	0.24	°C
Duct Temperature =	85.0	°C	Gasmeter uncertainty =	0.37	%
Sampled Gas Volume =	913.59	litres	Barometer used =	1	
			Barometer uncertainty =	1	mbar

Source of Uncertainty	ASD *	BS EN 13284		Envirocare Certified Value	Units	% Actual value	Source Uncert u	Combined Uncert u <sup>2</sup>
		Uncertainty Criteria	Max Uncert Value					
Weighing Procedure	Std	5% of limit value	3.5	0.1	mg	0.14	0.1000	0.01000
Leak Rate	Rect	<2% of sampling rate	0.46	0.24	l/min	1.05	0.0378	0.00143
Time	Std	1sec in 1hour = 0.028%	2	0.67	secs	0.03	0.0017	0.00000
Gasmeter Volume	Std	<2%	18.27	3.38	litres	0.37	0.0230	0.00053
Std Ref Conditions Corrections								
Temperature	Std	1% of value	3.6	0.24	°C	0.28	0.0176	0.00031
Pressure	Std	1% of value	15.375	1	mbar	0.07	0.0041	0.00002
<b>Total</b>								<b>0.01229</b>
<b>Combined Standard Uncertainty [(Sum u<sup>2</sup>)<sup>0.5</sup>]</b>								<b>0.111</b>
<b>Measurement Uncertainty (mg/Nm<sup>3</sup>) (95% Confidence Value)</b>								<b>0.22</b>

Data entered by: DF

ASD = Assumed Statistical Distribution  
Std Standard distribution  
Rect Rectangular Distribution