GRAYS BIOGAS LTD
MONA AD Plant

Emissions and Monitoring

3407/819/C

Oaktree Environmental Ltd

Oaktree Environmental Limited -Registered in the UK - Company No. 4850754
Unit 5, Oasis Park, 19 Road One, Winsford, Cheshire CW7 3RY
Tel: 01606 558833
Fax: 01606 861182
E-mail: sales@oaktree-environmental.co.uk Web: www.oaktree-environmental.co.uk

Document History:

Version	Issue date	Status	Written by	Reviewed by
1.0	11/03/2016	For submission with variation application	David Young	Jan Edwards

Emission Sources

Air Emissions

The main potential air emission sources include the following:

- Engine(s) Exhaust stack;
- Auxiliary FLARE STACK
- Vent serving odour control unit serving chicken litter shed and DAF tanks; and,
- Waste/feedstock handling leading to potential fugitive release of odour.

Engine Exhaust Emissions

The combustion of the biogas within internal combustion engines will lead to release of combustion related pollutants. Engine emissions will be released and disperse to air via an elevated emissions stack. The air flow rate exiting the stack will ensure that that dispersion efficiency is maximised.

The main pollutant of concern would be nitrogen oxides (NO_x). There are two primary formation mechanisms for NO_x, formation of NO_x as a result of nitrogen in the fuel (fuel-bound) and thermal NO_x due to nitrogen in the air, created during high combustion temperatures. The main type of NO_x formed during the combustion of the biogas would be expected to be as a result of high combustion temperatures. The critical temperature for thermal NO_x formation is approximately 1200°C. As combustion temperature within the engine would be expected to be significantly below this threshold, thermal NO_x would be expected to be minimal. Formation of fuel-bound NO_x would be expected to be negligible, with consideration to the nitrogen content of the waste and the composition of the resultant biogas that is burnt to produce electricity.

Other combustion related pollutants include carbon monoxide (CO) and sulphur dioxide (SO_2). The level of SO_2 formation is dependent on the fuel sulphur content. As this would be expected to be negligible, minimal SO_2 emissions are expected. Emissions of CO can occur due to incomplete combustion. Such emissions will be controlled through engine design and operation, ensuring that there is sufficient excess air fed to the engines to ensure complete combustion of the biogas.

Odour Emissions

Please refer to the Odour Modelling Report for an assessment of potential odour impacts (ref:3388-819-A), which also outlines the potential odour sources. This has concluded that odour impacts will not be significant at sensitive receptors.

Fugitive Release of Dust and Odour

Reference should be made to document ref 3407/819/A for a description potential sources of fugitive dust and odour emission and the methods that will be used on site to control fugitive releases.

Water, Surface Water and Sewer Emissions

Refer to Drainage Design Report in Appendix O.

Engine Exhaust Emissions Monitoring

The AD plant will have to comply with Emission Limit Values (ELVs) which will be outlined in the permit. These will apply to the CHP exhaust. The emission limits likely to apply are outlined in Table 1. All emissions monitoring will be undertaken in accordance with Natural Resources Wales Technical Guidance Note M1[1] and will be undertaken by Monitoring Certification Scheme (MCERTS) accredited contractors using MCERTS methods and equipment.

[1] Technical Guidance Note (monitoring) M1: Sampling requirements for stack emission monitoring, Version 6, Environment Agency/NRW, 2010

Table 1 Emission Limit Values and Proposed Monitoring Frequency and Methods

Source of Emission Release	Parameters Measured	ELV ($mg.m^{-3}$)[(a)]	Frequency	Measurement Method
Engine Exhaust Emission Stack	NO_x	500	Annual	Undertaken by MCERTS certified contractor using MCERTS certified equipment
	CO	1400		
	SO_2	350		
	Total Volatile Organic Compounds Including Methane	1000		
	Non Methane Volatile Organic Compounds	75		

N.B (a) Based upon normal temperature and pressure and 5% O_2

M1 Requirements for Air Emissions Sampling Locations

The following has been taken from Environment Agency/NRW Technical Guidance M1, and summarises the sampling location criteria to be met:

1. The sampling plane criteria is usually met if the sampling location is located 5No. hydraulic diameters upstream and 2No. hydraulic diameters downstream. A hydraulic diameter is defined as (4 x Area of sampling plane / length of sampling plane perimeter).
2. All platforms, whether permanent or temporary must meet a minimum weight criteria of 400kg point load as defined in BS EN 13284-1.2002
3. The platform must contain guard-rails / barriers (approximately 0.5m and 1m high), toe-boards (approximately 0.25m high), should ladders be installed then ladder guards will be required.

4. The platform shall not accumulate any free-standing water, and if necessary, drainage is to be provided.
5. Removable chains or self-closing gates shall be installed at the platform.
6. The Platform shall have a minimum surface area of $5m^2$.
7. The sampling line should be located at a safe working height of 1.75m.
8. The minimum width at any point shall be 2m with the minimum length in front of the access port shall be 2m or the length of the probe (including nozzles, support tubes and associated filter holders) plus 1m, which-ever is greater.
9. The sampling platform shall also be wide enough to prevent sampling equipment extending beyond the platform.
10. The access port shall have a minimum diameter of 125mm, with the pipe stub length should be a minimum of 75 mm from the stack wall.
11. For stacks with an internal diameter bigger than 0.35m or area of $0.1m^2$, 2 sampling lines will be required located at 90° to each other.

The following indicates how the M1 sampling criteria will be met at Anglesey Ecoparc Mon:

1. The sampling port will be at least 5.5m (TBC by Technical Provider) downstream of the entry point of the exhaust into the vertical stack and at least 2.2m (TBC by Tech Provider) below the exit point of the stack.
2. The sampling platform will be a permanent structure, at least 400kg in weight.
3. The sampling platform will contain guard-rails approximately 0.5m and 1m high and toe-boards approximately 0.25m high.
4. Access to the platform will be via stairs, therefore the need for self closing gates or chains will not be required.
5. A grid type sampling platform will be used which will prevent the platform from accumulating any free-standing water.
6. The minimum platform floor area surrounding the stack will be $5m^2$.
7. 2No. sampling ports will be installed at 90° to each other at an approximate height of 1.75m above the base of the sampling platform / walkway.
8. The access port will have a minimum diameter of 125mm, with the pipe stub length being a minimum of 75 mm from the stack wall.

9. The minimum width at any point shall be 2m with the minimum length in front of the access port shall be 2m or the length of the probe (including nozzles, support tubes and associated filter holders) plus 1m, which-ever is greater.

A schematic indicating the relative locations of ports and platforms is shown in Figure 1 below.

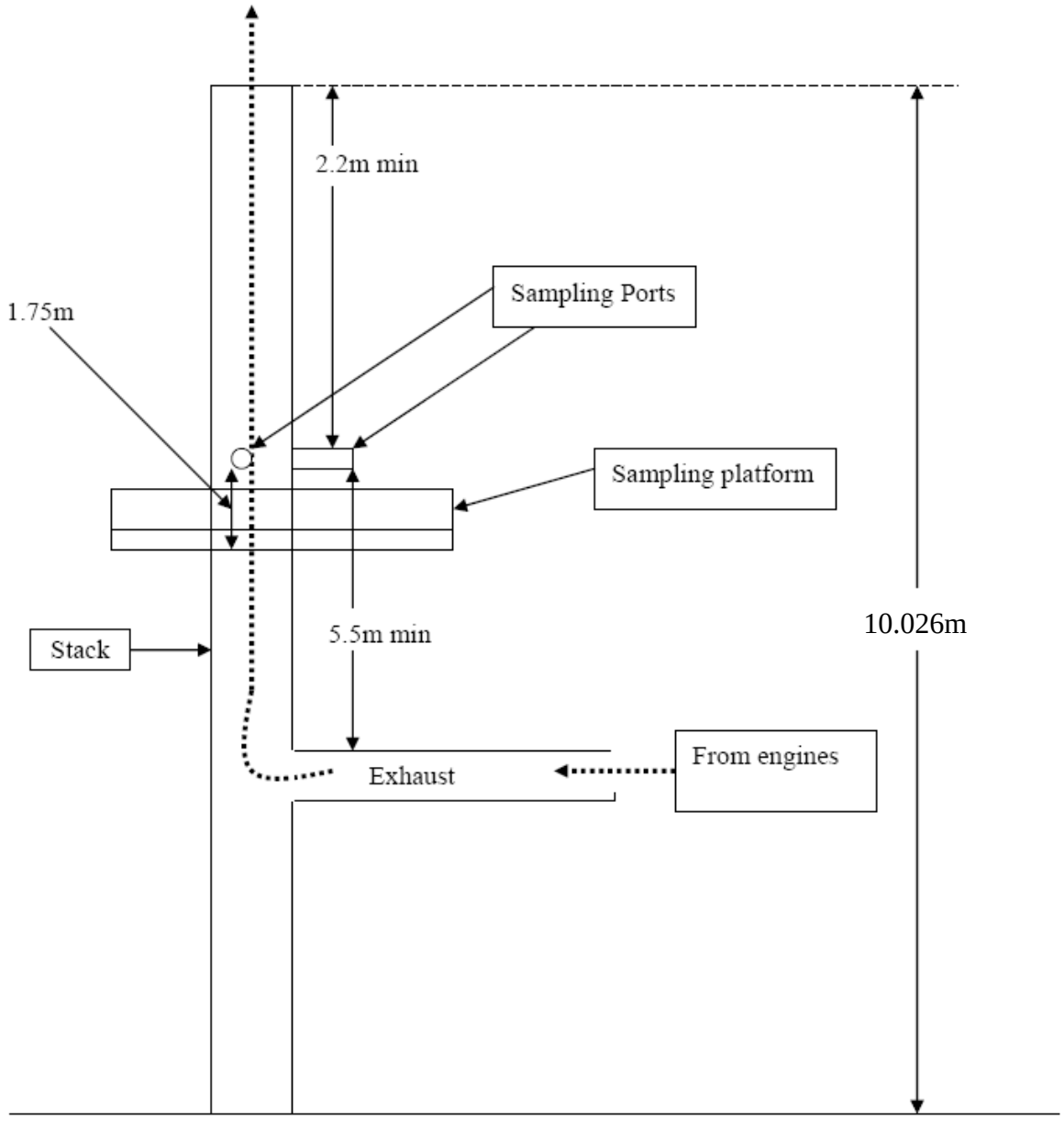

Figure 1 Example of Monitoring Location to be M1 Compliant

Biogas Monitoring

The biogas composition will be monitored as follows

Gas analysis in the technical building which monitors the gas composition (4 measuring points throughout the AD plant) every 15 minutes.

Monitoring will be undertaken within the CHP enclosure as follows: up to 96 gas measurements per day and there are x4 measuring points throughout the site. The measuring takes 10 minutes and is followed by 5 minutes of purging which is needed to define the reference point for the measurement and to make sure that the gas from the different measuring points cannot be mixed and therefore falsify the outcome.

The monitoring will be undertaken using an infrared-two beam sensor and will include the following parameters and measurement range:

- Methane (0-100%vol);
- Hydrogen sulphide (0-3000ppm); and,
- Oxygen (0-25%).

Due to the nature of the biogas being burnt, there would not be expected to be any particulate matter within the gas stream. Therefore sampling accuracy would not be affected by gravity and duct geometry and there would not be expected to be any significant variations in gas concentrations across the cross-section of the exhaust duct.