MONA AD FACILITY EXECUTIVE SUMMARY OF ENVIRONMENTAL PROPOSALS

Mona AD Plant, Mona Industrial Estate, Gwalchmai

GRAYS BIOGAS LTD

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1.0	11 March 2016	JE		Summary of Key Points for permit variation application following change in Technical Provider and should be read as part of and in conjunction with the EMS and other associated submission documents

CONTENTS

1 KEY POINTS : MONA AD FACILITY (Overview)

The applicant has identified the following key issues and designed the AD facility accordingly. This document outlines the information presented in the various applicant documents submitted including the Environmental Management System and associated appendices , Odour Management Plan, Dust Management Plan, Odour Assessment Report, Noise Assessment Report and the various technical documents provided by the client and their Technical Providers.

1.1 Digestion of waste

1.1.1 Consistency if feedstock

1.1.2 Sampling and monitoring during digestion process, residence time, good agitation

1.1.3 These are critical factors in managing the efficiency of the digestion process, maximising biogas and producing a fully stabilized digestate.

1.2 Odour

1.2.1 The handling and processing of materials that may contain volatile organic compounds or other sulphur containing substances may potential lead to odour noticeable beyond the site boundary.

1.2.2 Odours may arise from waste/non waste feedstock reception and handling areas, open top tanks, from pressure relief valves, condensate handling and storage of biogas.

1.2.3 Failure to adequately inspect and maintain plant and equipment is a contributory cause of fugitive emissions.

1.2.4 Recognising where the potential release of odorous compounds may arise is paramount in order to design such releases out or manage and minimise odours from the site.

1.2.5 Reception of odorous or potentially odorous waste should take place within an enclosed building/structure and discharge air via emissions abatement system. Access points should avoid wash out of odour through ventilation design, use of high speed roller shutter doors.

1.2.6 The extraction systems capable of providing a minimum of 3 air changes per hour to the operational area to prevent build up of odours and gases.

1.2.7 A site specific Odour Management Plan (ODM) based on H4 to be developed for the site detailing feedstocks and the odours likely to arise from the various parts of the process and the mitigation that have been put in place to reduce or prevent these odours impacting on local sensitive receptors.

1.3 Containment

1.3.1 Loss of containment can give rise to contamination of groundwater, boreholes, streams and other water bodies as well as give rise to odour.

1.3.2 Losses can arise from poor handling of material, overfilling of tanks, foaming events and failure of equipment. Tank failure may arise from corrosion and other extreme events eg agitators breaking from their housing and puncturing the tank.

1.3.3 All foreseeable events should be planned for and secondary containment provided to prevent pollution.

1.4 Releases to Air

1.4.1 Apart from fugitive emissions of odorous compounds, burning biogas in gas engines will give rise to releases to air. Releases of oxides of nitrogen and sulphur are of particular interest.

1.4.2 Adequate stack height, release temperature and velocity will give good dispersion characteristics, which ensure the impact is acceptable. Auxiliary flare shall only be used during plant maintenance or to safeguard the plant.

1.5 Systems and Procedures

1.5.1 An environmental management system is essential to help meet good environmental standards of the AD process and also to meet the technical/regulatory regulations detailed in the EA/NRW guidance documents.

1.5.2 The EMS identifies the risks and measures to be taken to prevent or minimise those risks for the site and not cause pollution.

2 MATERIAL HANDLING CONSIDERATIONS

2.1.1 Pre-acceptance procedures to assess the waste feedstocks. Mona AD is only proposing to accept two waste streams ie chicken litter and dairy DAF (from two customers), plus non waste (maize, rye and glycerol). All pre-acceptance checks in place but the wastes are regarded to be of a consistent nature.

2.1.2 Feedstocks delivered in a controlled and safe manner to minimise release of fugitive emissions.

2.1.3 Waste storage: Chicken litter stored in designated shed, maintained under negative air pressure with odour abatement system (OCU) and fast acting roller shutter doors. Only sufficient loads stored (proposed 3 days supply) to minimise potential odour issues. Ensure first in first out procedure. The shed emptied and cleaned at least weekly.

2.1.4 Waste storage: Dairy DAF waste will be transferred from the delivery tanker via sealed pipeline.

2.1.5 Biomass: Feedstock storage to provide sufficient buffering capacity as biomass is seasonal Maize harvested in June/July and Rye October/November. The biomass is tightly stacked in concrete walled clamps sealed with tarpaulin or plastic cover sheet. The resulting effluent collected from the biomass while in storage is captured in the leachate tank and is then feed back into the AD process. Details of the drainage containment system can be found in the EMS and associated appendices.

2.1.6 Feedstock material to be utilised as soon as possible in order to prevent its decomposition prior to digestion to reduce avoidable fugitive emissions and prevent loss of biogas yield.

2.1.7 Material will be stored safely and adequate accumulation time (contingency storage space has been designed into the sizing of the storage containers but further contingency includes

i) The chicken litter is from the neighbouring site so can be stored on the site of production for additional time when there is a problem at the AD plant
ii) Dairy DAF can be stored at site of production for additional time when there is a problem at the AD plant
iii) Silage/Biomass x3 biomass clamps have been provided at the Mona AD facility.

2.1.8 Waste handling and transportation- the storage areas are provided as near as possible to the digesters, solid feedstock transported over short distance with load bucket and transferred via lidded hopper to digestion tanks. Liquid feedstocks transported via enclosed pipework into process tanks. Storage tanks have odour abatement system to prevent release of gases to the environment.

2.1.9 As process requires for PAS 110, no cross contamination, each treatment vessel and storage tank clearly labelled and used as detailed in the site's specific process flow diagram (copy located in Appendix N of the EMS).

2.1.10 The process tanks are located on impermeable surface with sealed drainage with sealed construction joints. Secondary containment provided which equates to 110% of the largest tank volume.

2.1.11 Regular inspection of bunds undertaken ensuring rainwater regularly emotied and all connections and fill points are within the bunded area and no pipework penetrating the bund wall.

2.1.12 The infrastructure is provided to the highest specification, with containment of feedstock and process tanks meeting the relevant regulatory standards. Operating areas for unloading, preparing and processing feedstocks have impermeable paved surfaces designed to relevant BS standards and will accommodate all the static and dynamic loads imposed by the vehicles, stored materials, machinery and process plant. The pavement design, construction and maintenance takes account of proposed movements, tipping, unloading, loading of material using mechanical shovels, water containing contaminants dripping from vehicles and washing down of floor for cleaning purposes including abrasive and chemical

resistance and suitable for pressure/jet washing. All of the wash water and any spillages drain into the site's surface water containment drainage system. Refer to Technical specification documents for confirmation (Appendix N and O of EMS).

2.1.13 The storage/processing tanks will be fitted with gas tight lids.

3 AD PROCESS

3.1.1 Seeding of the digester will be conducted to provide active biomass prior to loading the digester with feedstock material. A stepped increase in loading based on the rate of conversion of feedstocking and the reactor not at 100% capacity. A copy of the commissioning table proposed by the Technical provider can be found in Appendix N of the EMS. Digested materials (inoculums) will be introduced to encourage the necessary micro organism population, the presence of methane producing bacteria vital for start up. Gradual loading of the digester is required to ensure that optimal conditions for the growth of anaerobic micro- organisms are maintained. VFA concentration and pH will be monitored to assess the performance of the digester during start up. During gradual loading nitrogen gas may be used to flush away any empty air spaces in the digester to prevent the creation of explosive atmosphere and to prevent loss of viable methanogenic biomass.

3.1.2 The tanks are insulated and have an intergrated heating system, heated by heat from the on site CHP unit

3.1.3 The process tanks will be fitted with high level pH, temperature and pressure monitors which are automatic and continuous linked to the telemetry system which includes a clear display in the control room. The system has audible alarms. The AD process is heated up to 37^{o}C/38^{0}C for approximately 30 days.

3.1.4 The digestate is heated up to 70^{o}C for a minimum of one hour to pasteurise the digestate.

3.1.5 Digester mixing- The mechanism proposed ensures no short circuiting of feedstock and uniform heat transfers and prevention of sedimentation of silt in the reactor.

3.1.6 Monitoring portholes are provided in the digesters to check process status and efficiency of the mixing.

3.1.7 Full details are given in the technical specification document copy in Appendix N of the EMS.

3.2 Biogas treatment and storage

3.2.1 The biogas storage tanks are gas tight and pressure resistant, UV, temperature and weather proof. They will have over and under pressure relief values fitted and isolation valves for inspection and maintenance events. The tanks have been sized to ensure a constant supply of biogas to the energy recovery plant and minimise fugitive biogas losses and unnecessary flaring.

3.2.2 The gas storage tanks will be checked for gas tightness prior to start up of the digesters. The correct system operation pressure maintained by venting the gas through a valve on the line to the gas holder. Pressure sensors provided on top of the digester tanks and the gas storage tanks. Alarms will be fitted which trigger if there is excessive pressure building up in the tanks for example due to pipe blockage. The venting systems would then be immediately instigated.

3.2.3 Gas conditioning unit with active carbon filter has been included in the proposal which can allow gas drying up to 850 Nm^3/h biogas by condensing followed by gas heating and subsequent pressure increase. An active carbon filter will remove further H_2S before the dried and cleaned biogas flows to the CHP unit.

3.3 MAINTENANCE OF PLANT & EQUIPMENT

3.3.1 Relief valves, monitoring equipment and alarms will be regularly checked to ensure they are in full working order. Storage and pipework, vessels and auxiliary equipment will be maintained and cleaned as per advice from the technical provider/supplier, inspected and tested to ensure layers of safety built into the design are maintained in operation.

3.3.2 All equipment will be ATEX certified.

3.4 BIOGAS MONITORING

3.4.1 Continuous monitoring systems are incorporated into the facility's design and technical details can be found in Appendix N of the EMS. They include input information and alarms featuring biogas pressure monitoring with alarm.

3.4.2 Fixed and portable gas monitoring equipment which is ATEX certified will be used on site to measure methane and H_2S etc.

4 GAS FLARE

4.1.1 An enclosed ground flare will be available for use at all times. Its use will be restricted however to short periods of breakdown or maintenance of the energy recovery equipment. The flare will be capable of achieving a minimum of 1000^{o}C and 0.3 seconds retention time at this temperature. Details of the flare can be found in the Technical Specification document in Appendix N.

4.1.2 The flare will be weatherproof and heat resistant and withstand wind stress. It will have a flame detector and alarm system to check that ignition has been successful and combustion is taking place. There will also be a slam shut valve to prevent gas flow to the burner in the event the flame is blown out.

4.1.3 The flare will be tested in accordance with the manufacturer's recommendations and in compliance with the latest regulatory guidance to ensure it is still fit for purpose.

4.1.4 On site digestate storage has been designed to prevent liquid run-off and to minimise gas emissions.

4.1.5 For Phase 1 where the digestate is not subject to further treatment the available storage capacity using the post digester tank and the 'storage tank', has been calculated to allow a maximum of 180 days storage which is sufficient for any unforeseen events when digestate cannot be taken to land for example if the land is waterlogged or frozen.

4.1.6 To prevent gaseous emissions both storage tanks are fitted with gas tight covers as detailed in the Technical specification document in Appendix N of the EMS.

4.1.7 The storage containers will be fit for purpose and located on impermeable pavement with sealed drained.

5 DIGESTATE TREATMENT AND STORAGE

5.1.1 Digestate sampling will be undertaken to confirm process is producing digestate to PAS 110 Standard.

5.1.2 For Phase 1 (ie this variation application) There will be no further treatment to separate the liquid and the solid fractions. The digestate will be applied to land "whole".

5.1.3 The on-site storage containers are located on impermeable pavement with sealed drainage.

5.1.4 All containment tanks will be alarmed to prevent overfilling.

5.1.5 All containment tanks will be alarmed to notify if there is any structural failure and subsequent risk of leakage.

6 EMISSION CONTROL AND ABATEMENT

6.1 Point Source Emissions to Air

6.1.1 This should be read in conjunction with the Odour Assessment Report 3388/819/A, the Odour Management Plan (3388/819/OMP and the EMS and associated Appendices.

6.1.2 The main chemical constituents of the emissions have been considered and appropriate abatement technology has been selected to clean incidental emissions. The abatement equipment will be correctly operated and maintained following manufacturers recommendations. The two main abatement systems are the OCU for the waste reception storage area and the GCU for the biogas.

6.1.3 Monitoring of exhaust emissions from the exhaust stack on the gas engine will be undertaken in line with M1 guidance to ensure combustion characteristics have been optimised and drift in engine performance is minimised. The following will be tested for: NOx, CO, SO_2, Total VOCs including methane and non methane VOCs.

6.1.4 Vents and stack heights have been assessed for dispersion capability by the technical provider during the design stage of the proposal based on the relevant M10 guidance.

6.1.5 Testing will also be carried out on pressure relief valves/vents on the digester tanks x2, post digester tank and storage tank.

6.1.6 Records will be kept of the results.

6.1.7 Auxiliary flare - during periods of operation trained staff will undertaken olfactory monitoring (sniff testing) as detailed in the OMP.

6.2 Fugitive Emissions to Air

6.2.1 Majority of fugitive emissions occur during acceptance of waste and from the transfer of wastes to the bio-reactor and removing digestate from the bio-reactor. The proposed operational procedures which have been developed and followed to

minimise fugitive emissions during these processes have been outlined previously in this document and further clarity given in the EMS and the documents in Appendix A and C of the EMS including storage details and managing movements on site.

6.2.2 Other potential sources of fugitive emissions include those relating to vent valves and from poorly sealed water traps, flanges and other unions within/between pipework and the reactor headspace and within the gags collection pipework. Efficient design, construction, operation and maintenance of the AD Plant will prevent or minimise fugitive emissions from these sources. Regular scheduled checks including leak detection tests and regular plant monitoring will be carried out. Details of the proposed infrastructure and the safety mechanisms proposed are detailed in the Technical specification document in Appendix N of the EMS various management systems compiled for the site.

6.2.3 Fugitive gas emissions will be prevented as they pose fire or explosion risks as well as toxicity from gas such as H_2S and potential nuisance from the release of highly odorous compounds. A Fire Prevention & Risk Plan has been written for this site and a copy submitted with the variation application. Further details on the proposals for preventing gas emissions have been included in the various management systems and in the Technical Specification document including the CHP gas clean up using activated carbon odour abatement system.

6.2.4 A monitoring devise (weather station) will be positioned in the reception area to provide local weather conditions and provide information on the pathways from the odour source to the receptors potentially affected by odours. This will be continuous monitoring and data logging including wind speed, wind direction, barometric pressure, humidity and air temperature.

6.3 Odour Management and Monitoring –

6.3.1 The detailed Odour Modelling Assessment has been carried out as part of the variation request. The model incorporated potential sources of odour as emission sources including the storage, handling and processing of liquid and solid feedstocks and products. The modelled odour levels at sensitive receptors have

been predicted to be significantly below even the most stringent odour impact assessment criteria. The risk of significant odour impact at sensitive receptors is therefore considered to be negligible.

6.3.2 Odour management including Emissions abatement systems and monitoring proposal are as outlined in the various management systems submitted with the variation application for Phase 1.

6.4 Bio-aerosol monitoring

6.4.1 A background bio-aerosol assessment is to be carried out at the proposed Mona AD facility (scheduled for 17th March –weather permitting). The resulting report will be forwarded to NRW when available.