ODOUR & ENVIRONMENTAL ENGINEERING CONSULTANTS

Unit 32 De Granville Court, Dublin Rd, Trim, Co. Meath

Tel: +353 46 9437922
Mobile: +353 86 8550401
E-mail: info@odourireland.com
www.odourireland.com

Re: Response to EPA RFI dated 13th April 2012

Date: 10th May 2012

Dear Jim,

I am writing this letter in response to your request to generate a RFI response to the EPA letter dated 13th April 2012.

The responses are as follows:

Query 2

State how it has been determined that final stage pasteurisation is preferable and a better environmental option than initial stage pasteurisation. Take into consideration the potential risk of build up of pathogens or other harmful bacteria in the process prior to the pasteurisation, the potential loading due to microbiological build-up on the air treatment system, risk of cross contamination in the process and risk of cross contamination of pathogens or other harmful bacteria to the environment outside the biological treatment facility.

Answer 2

Final stage pasteurisation will be utilised in this facility for the following reasons:

The Department of agricultural require that before material leaves the facility, that it is pasteurised by reducing the material size to a fraction less than 12 mm and to apply a temperature in excess of 70 deg C for a period of greater than 1 hr. This forms part of the conditions for achieving ABPR approval.

In terms of the applied Dry fermentation process, it is necessary to ensure that a large proportion of the organic material be greater than 20 to 30 mm particle size so as to ensure that adequate anaerobic digestion occurs within each fermenter reactor. Reducing the material particle size will result in the fermenter not operating adequately and as such the recirculated fermenter liquor within the system will not percolate through the material if all of the material is less than or equal to 12 mm. Therefore in order for the process to operate efficiently, the incoming material cannot be reduced to 12 mm particle size and therefore pasteurisation in accordance with ABPR requirements cannot be achieved.

In terms of initial versus final pasteurisation, it is important to clarify the following:
Initial pasteurisation is commonly only associated with wet fermentation systems whereby all material entering the facility is liquidified and passed through a pasteurisation process. It is important to note the primary reason for this is three fold:

1. To provide some hydrolysis of the material to lend it to easier fermentation within the wet fermenters. Without this hydrolysis, hydraulic retention times would be longer within tanks and therefore larger tanks would need to be built.
2. Since you have a sealed process (as in the wet fermentation process) it is much easier to prevent subsequent contamination of the material following pasteurisation (as in the material is moved through sealed tanks without any secondary handling from loaders, etc).
3. The residual solids with a dry matter content of up to 40% (depending on material) can then be directly removed from the facility as a fertiliser without any secondary treatment which would require further infrastructure.

Back end pasteurisation is a preferred technique for handling solids for the primary reason of environmental protection. All material handled through the facility must pass out through the final pasteurisation step whereby it is treated in line with ABPR requirements. When the material has received it processing to ABPR requirements, it can be tested in situ and before it leaves the facility, it can be certified as pasteurised. Pasteurising solids at the front end of the process does not occur due to the issues of cross contamination and the ability to ensure none of the material has ABPR pathogen build-up while been further processed within the facility. This statement is underpinned by the ABPR permitting of many facilities by the Department of Agriculture utilising this process arrangement. Such facilities are also regulated by the EPA. These include:

- Kilmainhamwood composting Facility which pasteurises all material at the back end of the composting process and is regulated by the EPA and Dept of Agriculture.
- Bord Na Mona Composting facility which will pasteurises all material at the back end on the composting process.
- Acorn Recycling – Littleton Composting Facility, Littleton, Co. Tipperary which pasteurises all material at the near back end of the composting process and is regulated by the EPA and Dept of Agriculture.

Other facilities performing back end pasteurisation include:

- Ormonde Organics Sludge composting facility, Portlaw, Co. Waterford.
- New Earth Solutions Composting facility, Sharpness, Gloucestershire, UK which is regulated by the UK Department of Agriculture and Environment Agency
- New Earth Solutions Composting Facility, Bristol, Gloucestershire, UK which is regulated by the UK Department of Agriculture and Environment Agency.

Dry fermentation facilities located throughout Germany with the treatment of food waste with back end pasteurisation where necessary include:

- Gemes BioFert GMBH Dry fermentation facility, Saalfeld, Germany processing food waste.
- Munich -Abfallwirtschaftsbetrieb Dry fermentation facility, Munich, Germany processing food waste.
- Rendsburg - Abfallwirtschaftsgesellschaft Rendsburg-Eckernförde Dry Fermentation facility, Rendsburg, Germany processing food waste.
- Biomethan GmbH, Dry fermentation facility, Moosdorf, Germany processing food waste.

These facilities included above are identical in process flow to the proposed facility to be located in Panda Waste. The key elements of both the dry fermentation and composting process will be incorporated to achieve the requirements of ABPR requirements, Environmental Protection Agency environmental requirements with special attention to high efficecy odour control and material stabiliity requirements.

Please be aware that dry fermentation and composting are similar processes in terms of flow through with one major distinct difference. Dry fermentation occurs in the absence of Oxygen, while Composting occurs in the presence of Oxygen.

In terms of taking into consideration the potential build – up of pathogens or other harmful bacteria in the process prior to pasteurisation and its potential loading due to microbial build-up on the air treatment system, this is not considered a risk given evidence gather through bioaerosol studies performed on EPA and Environment Agency licensed biological treatment facilities throughout Ireland and UK with back end pasteurisation.

Odour Monitoring Ireland have performed numerous bioaerosol studies on such facilities as part of compliance work and indeed such a study was performed in the vicinity of Panda Waste biofilter treating odourous air from their in vessel composting tunnels that were operational at the facility up to 2010. These studies which are available from the EPA public file for the above named EPA licensed facilities concluded no notable impact downwind of the facility. In addition, the EPA performed a bioaerosol impact assessment in response to complaints from a nearby resident to the Kilmainhamwood Compost facility and in turn verified no notable impact with respect to bioaerosols. This concurred with the annual monitoring studies performed by Odour Monitoring Ireland at the facility since its operation. Reference to the EPA study can be obtained from Mr. Eamonn Merriman, OEE Inspector, Richview, Clonskeagh Rd, Dublin 14.

In addition, numerous bioaerosol studies performed by New Earth Solutions on their composting facility with back end pasteurisation also has noted no impact as a result of bioaerosols when compared to strict Environment Agency guidance.

In terms of licensing, it is anticipated that the EPA will condition Panda Waste to perform bioaerosol impact assessment in line with best available guidance contained in the published UK composting Association document "Standard protocols for the testing and enumeration of bioaerosols" in the vicinity of composting facilities. The EPA has included these monitoring requirements on all licensed biological treatment facilities to date in Ireland.

In terms of describing the air handling system that will be implemented, it is envisaged upon approval of the Agency following submission of Specified Engineering Works, that the following odour control system will be installed. The initial incoming air will be scrubbed efficiently utilising a high efficiency acid scrubber, which would not be the case for all operational facilities through Ireland, UK and Germany. This lends itself to wash the air stream for ammonia but will also lend itself to washing the air stream of particulate and indeed act as a means of cleaning the air of bioaerosols. This scrubbed air will then be passed through high efficiency vane eliminators whereby 99.5% of all water molecules greater than 1 um will be removed from the air stream. The cleaned air following scrubbing and mist elimination will then be passed through the biofilter where the remaining odourous compounds are polished from the incoming air. This air may then (following detailed design) be polished further utilising activated carbon filtration. Such filtration is in operation in 4 waste processing facilities (handling material similar to the reception hall in the biological treatment facility and RDF facility) throughout Ireland and these facilities are regulated by the EPA.

These include:

- Thornton's Recycling, Killeen Rd, Ballyfermot, Dublin 10.
- Greenstar Recycling, Sarsfieldcourt, Glanmire, Co. Cork
- Oxigen Recycling, Robinhood Industrial Estate, Ballymount, Dublin 10
- South Dublin County Council, Ballymount Baling Station, Dublin 12.

In essence the air stream receives Four stages of air treatment, with each stage in the treatment process providing a level of filtration and cleaning (e.g. incoming air is cleaned and scrubber and the outgoing air from the biofilter is cleaned and scrubber).

Please be aware these filtration elements are been installed on the biological treatment facility for odour control and not for the filtration of bioaerosols as we believe based on gathered evidence on other facilities that there will be no impact as a result of bioaerosol from the facility. The secondary advantage of these filtration steps is that bioaerosol will be scrubbed from the air stream. Please note that there has been no scientifically recorded impact as a result of bioaerosols from operational biological facilities in Ireland This is underpinned through a study performed by the EPA on Kilmainhamwood Composting Facility.

With regards to control techniques within the facility itself, please see response to Query 4.

Query 3

Clarify how it is proposed to prevent a build up of pathogens and or other harmful micro-organisms in all stages of the process including the biotrickling filter, the carbon filter in the RDF plant and on equipment used prior to the pasteurisation step. Clarify how it is proposed to prevent similar build up in feedstock transport vehicles.

Answer 3

In terms of the biotrickling filter, a high efficiency wet acid scrubbing and mist eliminator systems will be installed prior to air entering the biotrickling filter. This will scrub particulate and bioaerosols from the air entering the biotrickling filter.

In terms of the carbon filter on the RDF facility, it is proposed to install high efficiency particulate removal prior to air entering the carbon filter. As an add on, we will install a plasma generator which will inject plasma into the air stream after the particulate filter and before the carbon filter. This plasma generator will result in the production of plasma which is utilised to provide sterilisation of hospital operating theatre, biosecure feed mills, etc. The plasma will mix with the incoming air prior to carbon filtration and thereby provide sterilisation of the carbon media and thereby prevent the build-up of micro-organisms within this filter. In addition, this will have the added benefit of enhancing odour control and also elongate the life span of the carbon filtration media for the removal of odourous gases. Details of this plasma generator are provided in the supporting documentation contained in Appendix I.

In terms of prevention microbial build up on feedstock vehicles, each vehicle will be washed using a steam pressure washer following delivery of their load to the facility. The truck will also pass though a wheel wash or as deem necessary by the ABPR permit. This is a requirement under the ABPR permit and the extent of same will be dictated by the Department of Agriculture. Please also refeer to detailed response to Query 4.

In terms of risk, currently there are over 20 biofilters in operation at biological treatment facilities throughout Ireland. The author of this RFI response is aware of a further 10 large scale facilities located throughout the UK. In terms of bioaerosols risks, there has been no reported incident of bioaerosol impact on any of these facilities to date. Facilities are regulated by either or Department of Agriculture, Environmental Protection Agency, Northern Ireland Environment Agency and Ministry of Agricultural Food and Fisheries UK.

The Irish Department of Agriculture will dictate the HAZOP plan for the facility operation and they will only permit the facility when they are adequately satisfied that the facility can prevent microbial contamination of the external environment through their HAZOP control mechanism.

Query 6

Confirm the maximum volume of bio-gas proposed to be stored at any one time at the facility

Clarify what controls are proposed in the biological treatment facility and the CHP plant to mitigate against fire and explosion risk and whether the relevant regulatory body has approved these control measures in accordance with relevant standards / legislation

Answer 6

Awaiting input from Fergal O Callaghan

Query 7

Elaborate on how the biotrickling filter design ensures it is capable of filtering pathogens / bacteria, bioaerosols, fine particles and other parameters from the process air prior to discharge.

Answer 7

The odour control system process flow is as follows:

- Primary treatment with high efficiency acid scrubbing to remove particulates, and bioaerosols (which are similar to fine particulates in the particle size range of 1 um to 2.5 um). This stage will also incorporate a high efficiency vane eliminator capable of removing all mist greater than 1 um to an efficiency of 99.5%.
- Second stage biotrickling filter for the removal of odours gases
- Third stage polishing utilising carbon filtration which will also assist in removing particles and odourous gases.
- Fourth stage injection of plasma after the biotrickling filter and prior to the carbon filter if deemed necessary by the regulator.

The initial stage of filtration will scrub the air using acidified water to remove alkaline based odours and also assist in the efficient removal of particulates and bioaerosols. This is further enhanced through the utilisation of a high efficiency vane eliminator to remove all water mist droplets from 1 um at an efficiency of 99.5% on average. This will ensure that the loading of micro-organisms will be minimal on the biotrickling filter although we would consider that attachment of micro organisms a healthy consideration to ensure efficiency odour removal. The bed medium in the biotrickling filter will be approximately 3.5 m high. This air will then be collected and passed through a highly efficient carbon filtration system whereby any residual odours and particles will be removed from the air stream. If it is deemed necessary by the regulator, we can inject plasma into the air stream after the biotrickling filter and before the carbon filter so as to enhance the overall odour removal of the odour control system and to provide sterilisation of the carbon filter bed. This will also prolong the performance of the carbon filter through the oxidation of reactive odourous compounds within the carbon bed media and thereby provide reactivation in situ.

All of these steps will ensure that the overall air handling system will prevent the release of any pathogens of significant environment concern been released to atmosphere, although we believe based on evidence collected through a review of data from other EPA licensed facilities throughout Ireland that there is minimal risk and that such an occurrence is extremely unlikely to occur (since it has not occurred to date with a number of facilities in operation in excess of 4 yrs), since it has not been recorded on other facilities to date.

It is also important to note that the facility has up to 14 people working within it and if there were a risk of pathogen build-up etc. this would result in an issue with operating the facility and staff within such buildings. This would be the case for a number of licensed facilities throughout Ireland and Germany and to date there has been no known recorded incident of pathogen contamination of staff within such facilities. Indeed such persons would be exposed to the highest available concentrations of bioaerosols.

These examples include:

- Thornton's Recycling, Killeen Rd, Ballyfermot, Dublin 10.
- Greenstar Recycling, Sarsfield Court, Glanmire, Co. Cork.
- Country Clean Recycling, Cork
- Panda Waste, Navan, Co. Meath
- Barna Composting Facility, Galway.
- Greenstar Recycling, Millennium Park, Blanchardstown, Dublin 15.
- ALBA Recycling, Berlin, Germany

- AWG, Enningerloh, Germany
- CAV, Chemnitz, Germany

Query 8

It has been proposed that during periods when the biomass furnace is not operational that air emissions will be discharged via the carbon unit. The dispersion modelling assessment examined the predicted emissions from a RTO and a biomass furnace. Describe anticipated emissions from the carbon filter.

State whether the predicted emissions from the carbon filter unit have been considered in the dispersion modelling assessment and confirm whether this alters the assessments conclusions that the facility will not impact on air quality in the surrounding area.

Answer 8

Please see Document 2011A395(1) submitted to the OEE, Mr. Niall Horgan, EPA in December 2011. This provides the predicted cumulative ground level impact of odours from the facility when all odour control plant is in operation. The predicted emissions are described in Table 4.2 and Table 4.3 of this document.

Please note that the negative air extraction system to be installed on the RDF building will be in operation all of the time. This will only extract emissions from the headspace of the RDF building as detailed in EPA Response to OEE Inspector Mr. Niall Horgan and be used to maintain the RDF building under negative pressure so as to prevent any odour imissions in the vicinity of the facility. This response also contained process flow and design drawings for the odour control system. These are included in Appendix II.

Query 9

Clarify why the parameters hydrogen chloride and hydrogen fluoride have not been added to Table 3.6 of the dispersion modelling assessment. Update Table 3.6 with the data relevant to these parameters.

Clarify if these emission rates were taken into account in Sections 4.1.5 and 4.1.6 of the report. If this data was omitted update these sections of the report and any other affected sections accordingly.

Table 3.6 lists emission values for specific parameters. Quantify the potential for dioxin emissions from the biomass furnace in particular during the combustion of process off gases.

Answer 9

The parameters hydrogen chloride and hydrogen fluoride have not been added to this table 3.6 as this only relates to the combustion of clean biomass such as wood chip within the biomass boiler. Please be aware at the time of the submission of this document, it was intended to utilise a Thermal oxidiser to treat the odour emissions from the thermal dryer. This process arrangement has changed whereby the thermal oxidiser was coupled to the biomass boiler and Document 2011A268(1) provides the updated process emissions arrangement for this emission point. Please see Appendix III of this letter.

The combustion of wood chip will not result in the formation of hydrogen chloride or hydrogen fluoride during its combustion. Please see Document 2011A268(1) which provides updated process emissions arrangement for this emission point.

The emission rates of hydrogen chloride and fluoride were not taken into account in this section as the biomass boiler utilising wood chip as a fuel will not results in such emissions occurring. Please see Document 2011A268(1) which provides updated process emissions arrangement for this emission point.

Dioxin emissions will not be formed in the air stream combusting biomass such as wood chip.

In the case where the thermal oxidiser is coupled to the biomass boiler, no dioxin emissions will be generated in the exhaust air stream. The biomass boiler will essentially act as a thermal oxidiser only with greater efficiency. The proposed thermal oxidiser would have achieved a retention time of 1.2 seconds and a thermal level of 800 deg C. The new biomass thermal oxidiser will achieve a retention time of 2 seconds and a thermal level of 850 deg C. This therefore provides for longer retention time and higher temperatures thereby providing more enhanced odour treatment of the air stream.

In terms of the exhaust air from the thermal dryer, this will be passed through twin high efficiency cyclones to be dedusted. A portion of this air will be dumped from the thermal drying loop so as to allow the thermal dryer perform the necessary drying of the wet material within the system (by dumping some air from the thermal loop, new ambient air is added thereby dropping the wet bulb temperature of the air within the thermal dryer loop and hence allowing for the lower wet bulb temperature air to collect moisture from the material and thereby perform drying).

This odourous air which is basically evaporated wet gases containing odours passes to the combustion chamber of the biomass boiler where it will be heated up to 850 deg C and retained within the system for 2 seconds in order to oxidise the odourous gases thereby de-odorising the exhaust air stream.

In terms of the thermal dryer, no combustion of any solid material will occur within the thermal dryer. Only free and interstitial water is evaporated from the material which will contain odourous gases. For dioxins to occur in this instance, the combustion of the solid waste material is required and temperatures of between 400 and 600 deg C present. This does not occur within the thermal dryer. This is essentially a more enhanced process in terms of process performance, energy efficiency, odour removal, etc.

To date there are approximately 9 thermal drying systems that we know off in operation in Ireland providing a similar application on municipal waste water treatment plants. There are no reported issues with such system to date. These include:

- Ringsend WWTP thermal drying facility, Ringsend, Dublin 3.
- Knockrobin WWTP Thermal drying plant, Wicklow, Co. Wicklow
- Limerick Main Drain WWTP thermal drying facility, Dock Rd, Limerick City.
- Carrigrehan WWTP, Cork Main Drain, Cork City.
- Tullamore WWTP thermal drying facility, Tullamore, Co. Offaly.
- Shanganagh WWTP, Shanganagh Cliffs, Kiliney, Co. Dublin.
- Portlaoise WWTP thermal drying facility, Portlaoise, Co. Laois
- Dundalk WWTP thermal drying system, Dundalk, Co. Louth.

There is one thermal dryer operating on a Hazardous Waste licence facility in Cork providing thermal drying of waste and chemical sludges. This includes:

- Eras Eco thermal drying facility, Foxhole, Youghal, Co. Cork.

In terms of waste thermal drying facilities, available data on dioxin levels were gathered from the following facilities. This included:

- ALBA Recycling, Berlin, Germany, waste thermal drying facility
- AWG, Enningerloh, Germany, waste thermal drying facility
- CAV, Chemnitz, Germany, waste thermal drying facility
- Oberstown Sludge drying facility, Oberstown, Co. Kildare

Following a review of the reports that were initiated by the German regulatory authorities, there were no dioxins detectable over the lower limits of detection of the sampling technique. This monitoring was performed by an approved contractor to the German regulator in accordance with EN1948. The emission values contained in Table 3.2 of Document 2011A268(1) conforms to the emission limit measured on these facilities and are achievable on the proposed installation. It is anticipated that the emissions contained in Table 3.2 will form part of the schedule of emissions to be monitored on the exhaust flue. The dispersion modelling assessment performed in accordance with EPA AG4 guidance has demonstrated that there will be no impact at receptor locations when compared to SI180 of 2011 and Directive 2008/50/EC.

Please be aware a very conservative approach was taken within the dispersion modelling assessment. Hydrogen chloride and fluoride were only included within the dispersion model report as means of risk assessment. It is anticipated that all emissions from the facility will be lower than the values stated in each of the emission Tables 3.2 to 3.5.

Please be aware that there was a subsequent submission on the dispersion model examination when it was decided to couple the thermal oxidiser process into the biomass boiler. Please see Document No. 2011A268(1) for updated dispersion model.

Query 10

Based on the mass emission rates reported in Tables 3.2 and 3.6 of the dispersion modelling assessment, the concentration limit values and the mass emission rates appear higher for the predicted emissions from the biomass furnace than the RTO. Previously in the application it is stated that the biomass furnace provides a higher level of treatment to odourous air than the previously proposed RTO system.
Clarify with regard to emission quality, and not process efficiencies, why the biomass furnace was chosen instead of the RTO.
Elaborate on how the biomass furnace is BAT for the treatment of process off-gases.

Answer 10

Please see response Answer 9, which will clarify the situation with respect to the differences in Table 3.6. This document was replaced and updated with document 2011A268(1). Within Document 2011A133(1), the biomass boiler was only producing heat for supply to the thermal dryer and not providing treatment of any air. The RTO was been installed to provide treatment of odourous air from the thermal dryer.

This arrangement is no longer the proposed solution and the new arrangement and process emissions are contained in Document 2011A268(1).

The biomass furnace is basically the same process arrangement as a thermal oxidiser. The air is heated up to 850 deg C and retained within the combustion chamber for a period of 2 seconds. This is a higher level of treatment than what was been provided by the original thermal oxidiser where only 1.2 seconds retention time and 800 deg C temperature were been achieved. This is considered an overall air treatment improvement of 70% over the original proposal when higher temperatures and longer retention time aretaken into account.

The biomass furnace is considered BAT for the treatment of these gases for the following reasons:

- The biomass furnace is a thermal oxidiser such as the thermal oxidiser proposed in the original proposal. The heat recovery element is coupled through the use of a heat exchanger which heats the thermal dryer loop indirectly.
- This system process will achieve greater than 70% better efficiency in terms of treatment in comparison to the thermal oxidiser originally proposed.
- In terms of air treatment, the thermal oxidation of air is the most reliable means of treating odourous air. Since the facility requires very low residual odour levels in the exhaust air stream, the only means of ensuring this level of treatment was to provide for thermal treatment. We can guarantee odour levels less than 500 Ou_E/m^3 even though we examined odour levels of less than 1,000 Ou_E/m^3 in the dispersion model (conservative worst case approach). This would not be possible with other technologies for the following reasons:

    - The air stream leaving the thermal dryer will be fully saturated with a relative humidity of 100%.
    - The air stream will leave the thermal dryer at a temperature of 78 degC.
    - The air stream will have a dust load of approximately 30 mg/Nm^3
    - The air stream will have a Total organic carbon (TOC) concentration of approximately 200 mgC/Nm^3.
    - The emission load from the thermal dryer will be cyclic and variable.

Taking into account the cyclic and variable load from the thermal dryer, the moisture content, temperature and TOC concentration of the exhaust air stream, technologies such as biofiltration, wet scrubbing, carbon filtration, dry chemical scrubbing etc would not function adequately and be in constant repair and shut down. Although more expensive toinstall and operate, this technology is considered BAT with respect to air treatment and provides us with the assurances we need to ensure the facility does not cause any odour impact

Query 11

Elaborate on how the carbon filters design ensures it is capable of filtering pathogens/bacteria, fine particles and other parameters from the process air prior to discharge.

Answer 11

The carbon filter will treat air collected from the headspace of the building. This will be dusty and odourous. As detailed in Answer 2, 3 and 8, the system will be made up of a first stage high efficiency dust filter, second stage carbon filter with plasma injection between the dust filter and carbon filter.

Such filtration systems are installed in Waste licensed facilities as follows:

- Thornton's Recycling, Killeen Rd, Ballyfermot, Dublin 10.
- Greenstar Recycling, Sarsfieldcourt, Glanmire, Co. Cork
- Oxigen Recycling, Robinhood Industrial Estate, Ballymount, Dublin 10
- South Dublin County Council, Ballymount Baling Station, Dublin 12.

In terms of process flow, a full description, process flow and detailed extraction system specification has been provided to the OEE, Mr. Niall Horgan, EPA. This has been included in Appendix IV for completeness.

In terms of operation, if the dust filtration system does not remove a minimum of 99.50% of all incoming dust, the carbon filtration will block and fail. Since this is a molecular filter, providing filtration of odourous gas molecules, any contribution of dust will tend to block the system and prevent air from passing through. This will result in the system failing and shutting down. Therefore it is essential that all dust is removed and therefore this is why high efficiency cartridge filtration is proposed prior to gas entering the carbon filter.

Following all removal of particulate the air stream will be mixed with plasma gas to provide odourous gas oxidation and regeneration of carbon filter available sites within the media. One major advantage with this plasma injection is that it will result in oxidation of any bacteria in the air stream and prevent the build up of pathogens within the filter. Please note we do not believe this to be an issue as it is not the case on any other of the licensed waste management facilities treating waste in a similar manner to what is proposed.

A process guaranteed odour emission rate value has been provided within supporting document 2011A395(1).

If you have any queries in relation to this correspondence, please do not hesitate to contact me on the details above.

Yours sincerely,

Brian Sheridan Ph.D Eng

For and on behalf of Odour Monitoring Ireland

awnconsulting

The Tecpro Building,
Clonshaugh Business & Technology Park,
Dublin 17, Ireland.

T: + 353 1 847 4220
F: + 353 1 847 4257
E: info@awnconsulting.com
W: www.awnconsulting.com

FC/12/9059/L01
10 May 2012

Dr Brian Sheridan
Odour Ireland
Unit 32 de Granville Court
Dublin Road
Trim
Co. Meath

Dear Brian,

RE: PROPOSED DRY FERMENTATION ANAEROBIC DIGESTION PLANT

Introduction

We understand the EPA has issued a request to your client in connection with the above facility.

EPA Request

"Clarify what controls are proposed in the biological treatment facility and the CHP plant to mitigate against fire and explosion risks and whether the relevant regulatory body has approved these controls measures in accordance with relevant standards / legalization".

Brief Description of Facility and Associated Hazards

The facility is a dry fermentation anaerobic digestion facility which is comprised of a number of sealed concrete tunnels of dimensions 30 m long x 7 m wide x 5 m high.

There is one access door for each tunnel to allow loading and unloading of material. Once each unit is loaded, it is pressurized to seal the door and leachate is recirculated over the material over a period of 35 days, with subsequent generation of biogas by methanogenation.

Cork Office
Unit 5, ATS Building,
Carrigaline Industrial Park,
Carrigaline, Co. Cork.
T: +353 21 438 7400
F: +353 21 483 4617

AWN Consulting Limited
Registered in Ireland No. 319812
Directors: F Callaghan, C Dilworth,
T Donnelly, E Porter
Associate Director: D Kelly

Gas leaves each vessel via a pressure relief valve, which is set at 25 mbar approximately, which classifies the system as low pressure. Each line is fitted with a flame arrestor and each line feeds to a common manifold, which in turn runs to the CHP engine room and through another flame arrestor, through a Heat Exchanger, through a Catalytic iron filter to remove H_2S. The gas is then heated back up to 30 deg C and then slightly pressurized and fed to the CHP engine at about 90 mbar, where it is burned to generate electricity and hot water.

There is no bulk biogas storage in place at the facility.

Biogas is only stored is in the headspace of each concrete tunnel. There may be up to 30 tunnels in the facility, 15 on either side of a corridor.

Hazards

The principal hazard associated with the biogas system is fire and explosion resulting from a gas leak with subsequent flash fire (FF) and vapour cloud explosion (VCE). Both of these events are more likely to occur when a bulk storage container ruptures and releases biogas to atmosphere, so the proposed facility is inherently lower risk than many anaerobic digestion facilities as it does not have a bulk storage component.

The most likely hazard is therefore gas leak from a leaking flange or valve, or line rupture due to external force such as collision with a vehicle (the system is low pressure so line rupture due to high pressure is unlikely).

Controls in Place to Minimise Hazards

"*The Safety, Health and Welfare at Work (General Application) Regulations 2007; Part 8: Explosive Atmospheres at Places of Work* states that an employer shall:

"where an explosive atmosphere is or is likely to be present at or may, from time to time, arise in a workplace, make a suitable and appropriate assessment of the risk arising from such explosive atmosphere to the employees concerned having regard to all the circumstances."

An explosive atmosphere is defined as:

"An explosive atmosphere means a mixture with air, under atmospheric conditions, of flammable substances in the form of gases, vapours, mists or dusts in which, after ignition has occurred, combustion spreads to the entire unburned mixture. An explosive atmosphere does not always result in an explosion, but if it caught fire, the flames would quickly travel through it. If this happens in a confined space (e.g. in plant or equipment) the rapid speed of the flames or rise in pressure could also cause an explosion."

While the risk of an explosive atmosphere occurring at the proposed facility is low, nevertheless the possibility that such an atmosphere could exist in an accident situation, cannot be discounted.

The facility will therefore be designed and operated in compliance with the 2007 Regulations noted above.

A risk assessment will be conducted at the design stage of the proposed design and building layout and the techniques of HAZID (Hazard Identification) and HAZOP (Hazard and Operability Study) will be applied to the proposed design to designate the facility under the Zoning criteria specified by the 2007 Regulations, as follows:

Zone 0:
A place in which an explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas, vapour or mist is present continuously or for long periods or frequently.

Zone 1:
A place in which an explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas, vapour or mist is likely to occur in normal operation occasionally.

Zone 2:
A place in which an explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas, vapour or mist is not likely to occur in normal operation but, if it does occur, will persist for a short period only.

Equipment to be used in the facility, including all potential sources of ignition such as electrical junction boxes, pump motors, fan motors, switches and light fittings will comply with these requirements:

- in zone 0 equipment marked category 1 by the manufacturer,
- in zone 1 equipment marked category 1 or 2 by the manufacturer,
- in zone 2 equipment marked category 1, 2 or 3 by the manufacturer.

The equipment will also comply with the provisions of:

- European Communities (Equipment and Guide to the Safety, Health and Welfare at Work (General Application) Protective Systems Intended for Use in Potentially Explosive Atmospheres) Regulations (S.I. No. 83 of 1999);
- Regulation 172(g) of S.I. No. 83 of 1999 which transposed Directive 94/9/EC8 and places duties on the manufacturers and suppliers of equipment that is intended for use in explosive atmospheres
- to design and manufacture such equipment in accordance with the essential health and safety requirements of Directive 94/9/EC and to affix the CE marking;
- Institute of Petroleum's Model Code of Safe Practice (Part 15)11

  and the

- ETCI Guide to the Selection of Electrical Apparatus for Use in Potentially Explosive Atmospheres.

The preparation of an EPD (Explosion Protection Document) under the above regulations will be undertaken prior to the commencement of the facility, which will detail all of the above, and will be submitted for the approval of the Health and Safety Authority prior to commencement of operations at the facility.

Yours sincerely,

DR FERGAL CALLAGHAN BSc (Chem) PhD (Chem Eng) MRSC AMIChemE MCIWM
Director
AWN Consulting

Encl Attachment A: F Callaghan Summary of Experience

ATTACHMENT A

Dr Fergal Callaghan
Summary of Professional Experience

Dr Fergal Callaghan is a Chemical Engineer with 22 years experience of preparing EPD (Explosion Protection Documents), Quantitative Risk Assessments, HAZID and HAZOP Studies, MAPP and SMS Documents, and consequence analysis and risk assessment modelling of Major Accident Hazard Scenarios across a wide range of the process industries. He has a BSc in Industrial Chemistry from the University of Limerick and a PhD in Chemical Engineering from the University of Birmingham.

He has recently completed a quantitative risk assessment and explosion risk assessment for a major anaerobic digestion plant (Dublin City WWTP) including quantitative risk assessment of fire and explosion risks.

He has a strong working relationship developed over many years with HSA (Health and Safety Authority), the body responsible for QRA in the process industries in the Republic of Ireland and other public authorities, including Fire Service, Environmental Health and Safety Officers and Local Authority Engineers;

He is a Technical Adviser to Clare Fire Brigade for a major bulk fuel storage and unloading terminal and has acted as Technical Expert and Inspector to An Bord Pleanala for a major accident hazard site public enquiry;

He is a Visiting Lecturer in Process and Safety Engineering at Queens University Belfast and a Visiting Lecturer at Trinity College Dublin for the Post-graduate Environmental Engineering Diploma. He has also recently been invited by Engineers Ireland to lecture on Seveso II and Seveso III and Process Safety and Fire and Explosion Modelling as part of their CPD programme.