# ODOUR MANAGEMENT PLAN
# (WESTWOOD GAS TO GRID)

## 1. Procedure Objectives

This Odour Management Plan (OMP) has been developed in conjunction with the requirements of the Environment Agency H4 odour management guidance to ensure emissions from activities shall be free from odour at levels likely to cause pollution outside the site, unless the operator has used appropriate measures, including, but not limited to, those specified in an approved Odour Management Plan, to prevent or where that is not practicable to minimise the odour.

## 2. Scope

This management plan is specific to the processes and equipment at Westwood AD plant.

## 3. Health and Safety considerations

There are no significant Health and Safety considerations with this Procedure.

## 4. Environmental considerations

As detailed in the plan.

## 5. Responsibility

The AD facility is the responsibility of the Chief Executive Officer, located at Biogen (UK) Ltd's Head Office in Milton Ernest, Bedfordshire.

The facility has a dedicated Site Manager who has overall responsibility for the daily operation of the site.

Routine preventative and reactive breakdown maintenance is the responsibility of the Site Manager. A technical maintenance support team provides assistance, but all works on site are authorised by the Site Manager.

Site staff at the AD facility are responsible for maintaining an awareness of general site performance during their daily activities. Staff are instructed to report any unusual odour occurrences to the Site Manager without delay

The Compliance Director is responsible for ensuring the Compliance Team conduct audits to assess conformance with the OMP. Deviations will be reported to the Site Manager, and a non-conformance and action plan will be completed as per the Problems, Complaints and Improvement Procedure.

## 6. Definitions

Carbon filter:

Activated Carbon is a form of carbon which has been treated such that it has a very large surface area. It is in the form of pellets, granules or a powder and contained within a vessel. Air is passed through the filter so that odorous (or polluting) chemicals are absorbed.

Wet Scrubber

A wet scrubber is a cylindrical vessel in which odorous air flows through a bed of specifically designed plastic pall ring media. Dilute sulphuric acid is introduced into the scrubber vessel and permeates through the media, reacting on contact with ammonia and other VOCs.

## 7. Associated Documents

All associated documents referred to in this Procedure are highlighted in bold and underlined.

## 8. Introduction

Biogen (UK) Ltd was established in 2005 to develop a new farm-based application of Anaerobic Digestion. In April 2017, Biogen was acquired by Ancala Bioenergy Limited.

Biogen has successfully established itself as the UK's leading operator of anaerobic digestion (AD) food waste plants in the UK.

The company uses technology called anaerobic digestion to provide a green solution to the significant food waste challenges that exist in the UK. Anaerobic digestion is a biological process which uses naturally occurring microorganisms in a sealed chamber to break down organic matter such as waste food into a valuable fertiliser and a methane rich biogas to produce renewable energy.

Biogen is a member of the Renewable Energy Association (REA).

Biogen recognises and shares values which include acting with responsibility and integrity whilst striving for excellence. Biogen recognise that we have a duty to ensure material is handled, stored and treated in an environmentally responsible manner.

Westwood AD plant is located in Rushden, Northamptonshire and has been operational since 2009 under Environmental Permit EPR/ FP3137GF.

## 9. Brief description of the site and process

Westwood AD site was built and commissioned in 2009 to treat waste food through anaerobic digestion.

The activities undertaken on site can be broken down into the following areas:

- Pre-treatment: Source segregated food waste is delivered to the plant where it is received into the reception hall after weighing and discharged into one of the bays where it will be visually inspected. From here it is picked up with a materials handler and passed through a hammermill, a series of macerators and foreign object traps. If necessary, liquid will be added to form the required consistency before it is stored in the raw waste buffer storage tank.

- Digestion: This is a continuous flow process whereby the feedstock is delivered into the digesters at regular intervals. The ‘health’ of the biological process is closely monitored to ensure optimum conditions for AD. The gas generated is stored in the gas holders before being utilised as a fuel in the Combined Heat and Power (CHP) engines and/or upgraded to biomethane pending injection into the national grid.

- Pasteurisation: The digestate is then pasteurised at 70.7$^{o}$C for 65 minutes to remove any pathogens as required by the Animal By-Product Regulations.

- Screening: The digestate has a final screening to remove any foreign objects such as plastic before being transferred to digestate storage tanks.

- Digestate Storage: The digestate will initially be stored in purpose-built tanks, before it is transported to be applied to local arable land as a bio-fertiliser.

- Combined Heat and Power Units: The CHP engines convert the biogas into electricity and heat. The electricity is first utilised within the plant, and the remainder will be sold via purchase agreement to the National Grid or to a third-party user. Approximately a third of the heat is used back in the process to maintain the temperature of the digesters and is also used for pasteurisation.

- Gas to Grid: Biogas will be transferred to a Biogas Upgrade Plant (BUP) whereby gas will be subject to cooling where moisture and contaminates will be filtered and removed. Compressed gas is passed through a multiple membrane system to separate $CO_2$ and $CH_4$. The separated biomethane (>97% methane) enters a Gas Entry Unit (GEU) pending export to the national grid via an approximate 5.6km gas pipeline.

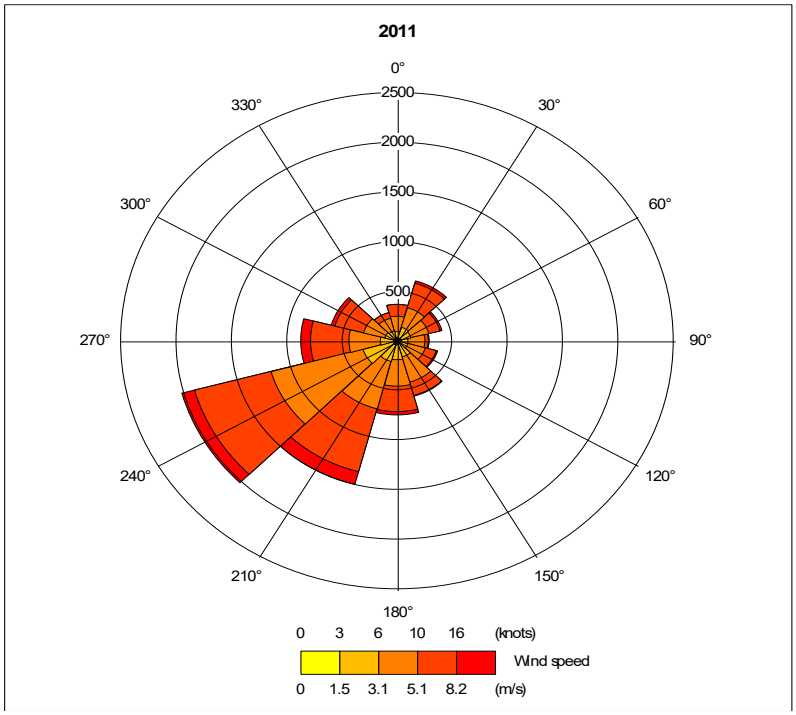
The site is located at the following address as shown on the map below: Westwood AD plant, Bedford Road, Rushden, Northamptonshire, NN10 0SQ. Grid reference: SP E 9889 N 6323 as show in figure 1.0.

*Figure 1.0.*


Meteorological conditions can influence the potential for odorous emissions from any facility. Generally higher windspeeds result in increased dispersion due to the turbulence and lower windspeeds can inhibit dispersion.

A wind rose demonstrating the predominant wind direction can be seen below on figure 2.0 for the site.

*Figure 2.0.*

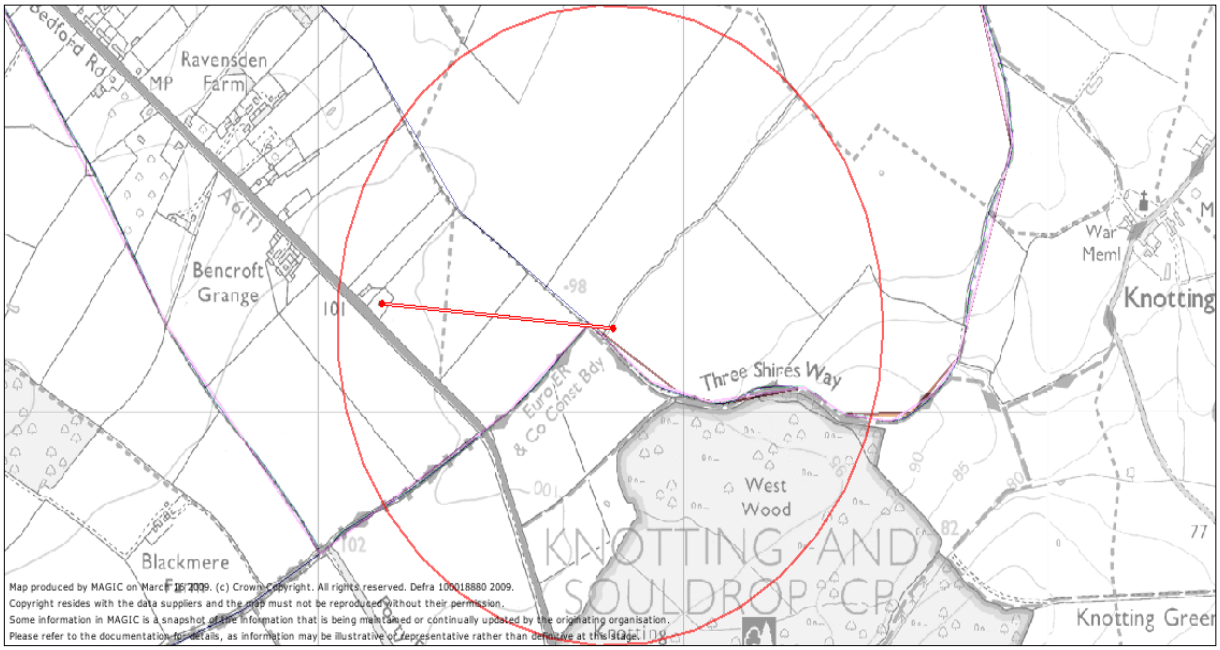



**Westwood AD Site**

This wind rose demonstrates that the predominant (prevailing) winds are from a south westerly direction. This direction takes any potential odours from the facility away from the nearest residential receptors which are discussed in more detail in the following section.

The Westwood AD facility is situated in a very remote location with the nearest receptor approximately 500 metres from site (as shown on the map below in figure 3.0).

*Figure 3.0.*



## 10. Inventory of odours

The Westwood AD facility is to be designed and engineered to treat a maximum of 110,000 tonnes of food waste per year which is equivalent to a 60% increase. The table below provides an inventory of the potential odour emissions likely to be produced on site including the likely source, site activity and emission or release point. This inventory also discusses the control measures in place to ensure emissions shall be from odour at levels likely to cause pollution outside the site to prevent or where that is not practicable to minimise odour.

| Source | Location | Activities and Materials Involved | Types of Emissions | Potential Odour | Means of Control | Release to atmosphere Description / Characteristics | |
|---|---|---|---|---|---|---|---|
| Waste delivery and acceptance | Site Access road and front concrete apron | Incoming loads of organic waste | Fugitive | Food waste odour | Liquid feedstocks will be delivered in enclosed containers or tankers. Tankers will reverse into the sealed purpose designed waste reception building and will discharge directly to the RWBT following maceration.<br><br>All other feedstocks will be delivered in sealed or covered containers in accordance with the requirements of the Duty of Care Regulations.<br><br>The discharge of feedstocks will not take place until the fast-acting roller shutter doors are fully closed. | Possible fugitive emissions along access road and on front concrete apron.<br><br>Waste reception building is served by a new ventilation and negative air extraction providing a minimum of 3 air changes per week. Air is extracted through to a new purpose designed carbon filter prior to emission to air via a stack to aid dispersion. | An increase in the maximum annual throughout to 110,000 tonnes is equivalent to an approximate maximum of 301 tonnes of feedstock to be accepted each day between Monday to Sunday which equates to only an additional 123 tonnes per day. This is comparable to approximately 5 additional articulated vehicle loads per day. |
| | Waste reception hall | Opening and closing of roller shutter doors | Fugitive | Food waste odour | The waste reception building is served by fast acting roller shutter doors which are only opened for access and egress requirements. Incoming vehicles are not allowed to discharge until the doors are completely closed. The roller shutter doors aren't allowed to be opened again until the vehicle has discharged and is ready to depart as specified in the | Fugitive emissions from doors opening during abnormal operating conditions. | Possible intermittent and localised release of odour. |

| Source | Location | Activities and Materials Involved | Types of Emissions | Potential Odour | Means of Control | Release to atmosphere Description / Characteristics | |
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| | | | | | Delivery Off-Loading Procedure. This includes following a wheel wash procedure.<br><br>The roller shutter doors are subject to a yearly inspection and serviced by a specialist industrial door installation company. This includes any repairs or replacements. All records are available for inspection.<br><br>All pedestrian doors must remain closed at all times. Pedestrian doors are for access and egress only and shall be immediately closed following entry or egress. All doors are fitted with self-closing mechanisms.<br><br>The waste reception hall is to be served by a new purpose designed ventilation and negative air extraction system which will maintain a minimum of three air changes per hour. Extracted air is channelled through to a carbon filtration system for treatment prior to emission to air via stack to aid dispersion. The carbon filter is bespoke designed bulk system. | | |
| | | Tipping of waste | Fugitive | Food waste odour | Vehicles are not discharged until the fast-acting shutter doors are closed. All waste is subject to pre-acceptance checks in accordance with the | Carbon filter stack | Continuous release of treated air from the |

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| | | | | | Feedstock Pre-Acceptance Procedure which involves a three person sign off for all new waste streams. The Compliance Director is responsible for assessing the waste from a compliance perspective; particularly odorous wastes will not be approved and therefore not accepted on site.<br><br>The fast-acting roller shutter doors are opened only to allow immediate access and egress of vehicles, and they remain shut at all other times to minimise the risk of fugitive emissions escaping from the building.<br><br>The waste reception building is maintained under negative air pressure and benefits from a minimum of three air changes an hour. This is provided by a new purpose designed ventilation and extraction system. The waste reception hall is allied to a new purpose designed carbon filtration system and treated air is exhausted through an emission stack to aid dispersion. The carbon filter is installed with the necessary process monitoring ports and inlet and outlet sample points. The carbon filter will be subject to routine maintenance and testing including weekly RAE tube testing both inlet and outlet for hydrogen sulphide and ammonia to test for removal efficiency and performance. | | carbon filtration system. |

| Source | Location | Activities and Materials Involved | Types of Emissions | Potential Odour | Means of Control | Release to atmosphere Description / Characteristics | |
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| | | | | | Emissions from the filtration system will be subject to six monthly MCerts testing.<br><br>All attempts at reducing $NH_3$ levels are targeted at source as much as possible. This includes pre-acceptance checks and feedstock management.<br><br>Incoming feedstocks will be visually checked during and following tipping. Any non-conforming items will be removed and stored in a segregated and labelled quarantine area. | | |
| | | Waste Storage | Controlled | Food waste odour | In the event particularly odorous waste is accepted and can't be removed from site following tipping, it will be prioritised for processing as overseen by the site or duty manager.<br><br>Daily housekeeping measures including jet washing activities with an approved ABP disinfectant help to ensure contamination and odours are minimised.<br><br>The waste reception bays are routinely cleared of all waste as can be demonstrated with CCTV footage on request. Having multiple bays in reception helps to maintain and demonstrate the 'first in, first out' | | |

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| | | | | | principle by ensuring the oldest waste is processed first.<br><br>The maximum storage time for feedstock within the reception building prior to processing is 48 hours. This is a worst-case scenario and would only approach this length of time in the event of significant plant malfunction.<br><br>It is not within Biogen's best interests to allow feedstocks to deteriorate or to accept feedstocks subject to depreciation. This is because any deterioration in the quality and digestive nutritional value of feedstocks is likely to generate lower gas yields and/or produce malodours. Due to the continuous nature of the anaerobic digestion process, feedstocks cannot remain in the reception hall for long periods, as continuous feeding of the digesters is essential for digester health and biogas production. Consequently, uninterrupted pre-treatment of feedstocks must take place.<br>The AD process operates on a continuous flow process and with Biogen's strict pre-acceptance waste procedures in place, the maximum storage capacity for feedstock within the reception building will not be exceeded. In the unlikely event further feedstocks cannot be accepted on site, Biogen | | |

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| | | | | | would divert feedstocks elsewhere to any of the other 11 food waste AD sites within the company, with the closest sites being at Twinwoods (7 miles) and Bygrave (34 miles).<br><br>The maximum storage capacity in the reception building is approximately 400 tonnes at any one time.<br><br>The maximum storage capacity in the reception building is approximately 400 tonnes at any one time. The two hammermills on site can typically process around 10-12 tonnes of feedstock each per hour, therefore approximately 276 tonnes (combined) a day of feedstock could be processed throughout the 11.5 hour shift pattern.<br><br>The waste reception building is served by a new ventilation and negative air pressure extraction system and benefits from a minimum of three air changes an hour. Extracted air is channelled through to a carbon filtration system and treated air is exhausted through a new emission stack to aid with dispersion. | | |
| | | Waste Handling | Fugitive | Food waste odour | Waste processing will only take place with the roller shutter doors closed. In the event of odorous materials being delivered to site they would be given | | |

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| | | | | | priority and processed into the external sealed RWBT as soon as possible.<br><br>The waste reception building is maintained under negative pressure and benefits from a minimum of three air changes an hour. There is a new purpose designed ventilation and extraction system. Air from the extracted building is channelled through to a carbon filtration system and treated air is exhausted through a new purpose-built stack to aid with dispersion.<br><br>Feedback on the nature and description of any odourous feedstocks would be reported to our Commercial team to determine the suitability of further acceptance of this particle waste stream. | | |
| Anaerobic Digestion | External Process tanks | Storage in external Raw Waste Buffer Tank (RWBT) | Sealed tank | Food waste odour | The new process tanks are gas tight vessels and therefore do not release to atmosphere. All of the transfer pipework is sealed and therefore there is no potential for odour release. The integrity of the process tanks is inspected daily as part of the Daily Checks Procedure. The Pressure Relief Valves (PRV) are inspected on a weekly basis. The pressure relief valves are new Assentech valves equipped with isolation valves and spool pieces and will be serviced on a 3-yearly basis, or | Fugitive emissions only under abnormal conditions. | No release in normal operation, possible intermittent release in abnormal conditions |
| | | Treatment in Digesters | Seal tanks | Digestate odour | | | |
| | | Pasteurisation | Sealed tanks | Digestate / cabbage odour | | | |

| Source | Location | Activities and Materials Involved | Types of Emissions | Potential Odour | Means of Control | Release to atmosphere Description / Characteristics | |
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| | | | | | when tanks are de-gritted (whichever is the sooner).<br><br>PRVs are installed on the RWBT, all five new Digesters, and both pasteurisers.<br><br>There is a Leak Detection and Repair (LDAR) programme in place, with twice yearly site-wide surveys completed using an Opgal EyeCsite camera. The company has purchased a Opgal EyeCsite gas detection camera at considerable cost and members of the Biogen compliance team are trained to use the camera to assist with the LDAR programme across the business. Where a methane leak is detected, corrective actions will be put in place. By having our own gas detection camera, we are in a position to not only fulfil the six monthly LDAR requirement, but to also address any potential concerns around methane slippage which can be investigated and resolved. Biogen has an appointed Technical Compliance Manager who oversees the LDAR schedule and monitoring schedule.<br><br>Biogen's own Opgal EyeCGas 2.0 Optical Gas Imager Camera uses a cooled (-263°C), highly sensitive MCT detector in the spectral range of 3.2 µm to 3.4µm. The combination of the sensitive, super-cooled detector and | | |

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| | | | | | narrow spectral range means the camera is highly sensitive to detecting gas releases.<br><br>Both auxiliary flares serving the gas to engines and gas to grid infrastructure will auto ignite at a pre-determined gas pressure or gas holder volume and in the unlikely event the flares fail to reduce gas pressures sufficiently, the PRVs would release.<br><br>All three CHP engines are equipped with upper and lower gas pressure sensors and would automatically switch off when triggered.<br><br>Gas pressures, tank levels, gas quality and tank temperatures for example are continuously monitored on SCADA and recorded daily on a live Plant Monitoring Spreadsheet. | | |
| Screening of digestate | Borger house (separator room) | | Fugitive | Digestate odour | Screening of digestate takes place in a new enclosed purpose designed building served by negative air extraction to a minimum of 10 air changes per hour extracted through to an new acid scrubber for treatment. | Fugitive emissions | No release in normal operation, possible intermittent release in abnormal conditions |

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|---|---|---|---|---|---|---|---|
| | | Screening | Fugitive | Digestate odour | The final stage screen (Borger separator) is to be installed within a new purpose constructed sealed building located within the secondary containment area. Unscreened material will discharged from the Pasteuriser to be processed through the separator before being transferred to the Digestate Storage Tanks via enclosed pipework.<br><br>The removed screenings (<2mm) will drop into a container which will be covered prior to being removed from site for disposal elsewhere typically around three times a week. The skip exchange will be carried out as efficiently as possible. Any odours during the skip exchange will localised to this part of the site.<br><br>The new separator building is equipped with a negative air extraction system providing a minimum of ten air changes per hour. Extracted air from the separator room is channelled through to a new purpose designed acid scrubber with an emission stack to aid dispersion.<br><br>The acid scrubber will be subject to twice yearly Mcerts emissions testing. | Emissions from biofilter and acid scrubber | No release in normal operation, possible intermittent release in abnormal conditions |

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|---|---|---|---|---|---|---|---|
| Storage of Digestate | Storage tanks | Storage of digestate | Fugitive | Digestate odour | The material stored in the three 9700m$^3$ Digestate Storage Tanks is to be fully treated to the PAS110 QP standards and is therefore stabilised. Storage tank 1 benefits from a fixed roof.<br><br>The second and third storage tanks benefit from Hex-a-Blocs which form a floating cover designed to prevent the release of odorous emissions. These were installed at significant cost in September 2024 to the replace the diminishing Lightweight Expandable Clay Aggregate (LECA) and have up to a 25-year design lifespan.<br><br>Biogen have successfully implemented floating covers on Digestate Storage tanks across a number of our AD facilities in England & Wales, including sites which operate in closer proximity to receptors, including residential properties. The majority of sites have installed LECA, a study by Nicolai, et. al, 2004 compared various covers and came to the following conclusion *'straw permeable covers are reported to have an odour control effectiveness of 40% when applied in a 4 inch depth and 90% at a 12 inch depth. Geotextile covers are reported to have an odour control effectiveness ranging from 40 – 60%, while a floating LECA cover is reported* | Biofilter emissions<br><br>Fugitive emissions | Intermittent releases of treated air from biofilter |

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| | | | | | *to have a **90%** odour control effectiveness'.*<br><br>The Hex-a-blocs work on the same principle as the LECA in that they form a floating cover, sitting immediately on the liquid surface, rising and falling with the liquid level in the tank. They are comprised of recycled polypropylene segments which float to create a flexible cover. The hexagonal pieces fit together and offer an effective way to significantly reduce emissions. The manufacturers state they prevent **~95%** of emissions by blocking light out and gas in. | | |
| Tanker point (digestate) | | Tanker filling operations | Fugitive | Odour from venting during tanker operations (displaced in air tanker) | All tanker operations are short lived, and any odour is intermittent. Odour monitoring during filling operations will take place.<br><br>The tanker point is subject to daily housekeeping including jet washing. The Daily Checks Sheet includes a visual check of the tanker sump level and a cleanliness check of the tanker area. All housekeeping including jet washing at the tanker point is carried out throughout the day as required and immediately following any minor spillages. The tanker point is served by a purpose | Low | Intermittent releases of displaced air during tanker operations |

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| | | | | | designed concrete shallow bund with its own isolated sealed drainage. | | |
| Storage of biogas | Process tank and gas to grid areas | Storage of gas before combustion<br>Storage of gas under abnormal conditions | Fugitive | Gaseous | The gas holders are specially designed and installed to the highest specification. The site is subject to periodic DSEAR conformance assessments. DSEAR plans are available on site and remotely, which are revised in advance of any infrastructural changes made.<br><br>The continuous nature of the process together with the engineered safety controls in place ensures additional storage capacity is available within the gas holders at all times. Gas pressures are continuously monitored on SCADA.<br><br>In the event of elevated gas pressures, the site has been designed and engineered that should all three CHP engines fail, the auxiliary gas flare would activate in order to achieve complete combustion of any excess biogas prior to the Pressure Relief Valves (PRVs) releasing to atmosphere. Likewise, in the event of gas to grid downtime, the newly installed auxiliary flare serving the gas to grid operations would also auto ignite to burn any excess biogas prior to the PRVs releasing.<br><br>The existing flare is repositioned adjacent to the new auxiliary flare to | Fugitive | No release in normal operation, possible intermittent release in abnormal conditions |

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| | | | | | serve the gas to grid infrastructure. Both auxiliary gas flares provide a 100% maximum design burn rate and would auto ignite when the capacity of each of the gas holders reaches a pre-determined volume or pressure and would reduce the gas holder volume down to a pre-set limit in accordance with SCADA settings.<br><br>The CHP engines are subject to routine servicing to maintain combustion efficiency. Records of all monitoring undertaken and for maintenance carried out are stored and available on request. Biogen operates a very intensive maintenance regime to ensure the optimal performance of all their CHP engines. This is contracted to a specialist third party. This includes, but not limited to, a 60,000-hour operating service which involves the engine being removed from site for a full service and recommissioning. This ensures the CHP engines are maintained to the highest standard.<br><br>The CHP engines are fitted with a 'Lenox' System, which evaluates the gas quality and adjusts itself to ensure the most efficient burn of the gas to eliminate any methane slippage that could occur. By having this advanced technology on the CHP engines and | | |

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| | | | | | also by maintaining it to such a high level, Biogen believe they are operating to the current highest level of BAT.<br><br>Emissions from the CHP engines are subject to annual MCerts emissions testing. The engines emissions are exhausted through an emission stack.<br><br>Pressure Release Valves (PRVs) are installed on all 5 Digesters, both Pasteurisers, and the RWBT. As a result, storage capacity within the gas holders will be maintained throughout the process. By installing an additional gas holder to serve the gas to grid operations, and to allow for an additional digester, gas levels and available storage capacity can be maintained throughout the process to allow for an increase in feedstock acceptance and biogas production. The sites critical control measures would continue to demonstrate the gas mass balance would be maintained at equilibrium at all times throughout the facility both for gas to engines and gas to grid operations.<br><br>In the unlikely event both CHP engines completely malfunctioned, and gas to grid network was unavailable all at the same time, both gas flares will have a maximum burn rate which would be more than satisfactory to burn the | | |

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| | | | | | maximum volume of biogas produced in a day should the rate and level of biogas generation not decrease through reduced feeding and/or by stopping mixing or by any other viable means.<br><br>Methane compression will take place which can be used as a contingency in the event of connection to national grid is unavailable. Methane compressed to less than 1% of the volume it occupies at standard atmospheric pressure. It can be stored in hard containers at a pressure of 20-25 megapascals in cylindrical or spherical shapes.<br><br>The continuous nature of the process together with the engineered safety controls in place ensures additional storage capacity will be available within both gas holders at all times.<br><br>The sites critical control measures would continue to demonstrate the gas mass balance would be maintained at equilibrium at all times throughout the facility. Gas monitoring equipment is used to monitor gas levels.<br><br>Hydrogen sulphide ($H_2S$) is a colourless gas with the characteristic foul odour of rotten eggs. It is associated with anaerobic degradation and is present in the biogas. To minimise the corrosive | | |

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| | | | | | nature of $H_2S$ throughout the anaerobic digestion process, ferrous dosing takes place directly into the feed line pre-RWBT. The daily quantities and dosing rates and associated data logged on SCADA are recorded on a Plant Monitoring Spreadsheet. The decision to dose with ferrous chloride is dictated by the $H_2S$ concentration within the biogas which is tested continuously with fixed gas analysers and with the use of RAE tubes 2 to 3 times per week. The $H_2S$ concentration in the biogas is typically maintained <200 ppm in accordance with BAT. Dosing reduces $H_2S$ levels to improve biogas quality and to prevent or minimise corrosion and damage to pipework, the CHP engines and the gas to grid infrastructure.<br><br>All Biogen employees and where appropriate contractors and visitors are supplied with personal $H_2S$ alarms which are set to alarm at levels of 5ppm upwards. Daily visual inspections of the infrastructure take place and any alarms are logged and an investigation into the cause of the alarm would be investigated.<br><br>There is a leak detection and repair (LDAR) programme in place, with twice yearly site-wide surveys completed using an Opgal EyeCsite camera. The | | |

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| | | | | | company has purchased a Opgal EyeCsite gas detection camera at considerable cost and members of the Biogen compliance team are trained to use the camera to assist with the LDAR programme across the business. Where a methane leak is detected, corrective actions will be put in place. By having our own gas detection camera, we are in a position to not only fulfil the six monthly LDAR requirement, but to also address any potential concerns around methane slippage which can be investigated and resolved. Biogen has an appointed Technical Compliance Manager who oversees the LDAR schedule and monitoring schedule. | | |
| Carbon filter odour abatement system | Adjacent to waste reception building | Treatment of extracted channelled air from the waste reception hall. | Point source | Food waste (if untreated) | A new purpose designed carbon filtration system extracts channelled air from the waste reception and waste process building.<br><br>The carbon filter extraction fan is purpose designed and engineered to provide sufficient extraction in accordance with the design capacity of the building and the carbon filter.<br><br>All extraction fans are monitored on SCADA and an alarm would activate in the event of malfunction. | Carbon filter emissions | Low risk of odour during normal operations, possible intermittent release during abnormal operations |

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| | | | | | There are multiple point source extraction vents within the waste reception hall. These are designed to extract channelled air through to a bulk vessel carbon filtration system for treatment prior to emission to air via an approximate 12.7 metre-high stack to aid dispersion. The carbon filter fans have Variable Speed Drives (VSD) to enable the fan settings to be changed in accordance with environmental conditions and operational requirements. However, normal practice is to leave the fans running to maintain a minimum of three air changes per hour to prevent the risk of fugitive emissions. This is also essential to maintain the optimum air residence time within the carbon filter.<br><br>There are no conventional functional windows within the waste reception hall and process building. Louvres are positioned within the building. These allow incoming fresh air to help maintain a healthy working environment with the extraction system maintained under negative pressure.<br><br>The extraction fan/s serving the carbon filter are periodically serviced and tested. | | |

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| | | | | | The carbon media is the form of a trays which can be easily removed, tested and replenished subject to performance emissions testing.<br><br>The theoretical empty bed air retention time within the carbon filter is accordance with the optimum BAT residence time.<br><br>The filter is equipped with both inlet and outlet temperature and flow rate probes to provide continuous readings.<br><br>The abatement plant process monitoring requirements are recorded on a Plant Monitoring Spreadsheet.<br><br>The carbon filter extraction fan is subject to a six-monthly service and repair programme conducted by site staff to ensure the fan is maintained and continues to operate effectively. Critical spares are held by the company and shared within a defined geographical area in accordance with the Contingency arrangements for equipment failure procedure. This includes, but not limited to, replacement fans and associated parts. This would enable the malfunction of critical fans including the carbon filter extraction fan to be repaired without incurring unreasonable delays. | | |

| Source | Location | Activities and Materials Involved | Types of Emissions | Potential Odour | Means of Control | Release to atmosphere Description / Characteristics | |
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| | | | | | The abatement systems are maintained in accordance with the requirements of the permit, the Odour Management Plan (OMP) and the manufacturers recommendations. This includes, but not limited to, media replacements (as required). Six monthly emissions testing together with the process monitoring requirements including, but not limited to, weekly RAE tube testing for ammonia and hydrogen sulphide in place ensures any deterioration in the systems performance is detected and addressed in a timely manner. If the performance of the carbon filter deteriorated, a full assessment of the filter including the media would take place to look for evidence of depreciation in the media's performance, composition and structure and the need to replace or replenish the media accordingly.<br><br>Emissions from the carbon filter stack are subject to periodic testing against specified ELV's in the permit and in accordance with BAT. This includes for $NH_3$, $H_2S$, odour concentration and an emissions removal efficiency test. The Odour Abatement Maintenance Procedure specifies the parameters routinely tested. | | |

| Source | Location | Activities and Materials Involved | Types of Emissions | Potential Odour | Means of Control | Release to atmosphere Description / Characteristics | |
|---|---|---|---|---|---|---|---|
| | | | | | Any sudden or unexpected reduction or change in the optimum filter conditions including temperature or air flow is unlikely. However, should this situation occur, immediate actions would be taken to identify the root cause of the failure, and the required remedial actions implemented. Qualified engineers are on site throughout operations, and a designated duty manager is available out of hours on a call out rota to attend site. If the optimal environmental conditions within the filter changed unexpectedly such a reduction in temperature for example, although the overall performance of the filters would reduce, this would take a significant period of time to ultimately cause adverse effects to the organisms thriving within the filters.<br><br>If emissions ever exceeded the Emission Limit Values (ELV) specified in the environmental permit and/or with BAT, an immediate retest would be scheduled to verify the performance. Any confirmed reduction in the carbon filters performance would involve an investigation to take place to identify the likely the root cause of the deterioration in performance and the Environment Agency would be notified. This would include what measures are to be taken to rectify the reason for the failure within | | |

| Source | Location | Activities and Materials Involved | Types of Emissions | Potential Odour | Means of Control | Release to atmosphere Description / Characteristics | |
|---|---|---|---|---|---|---|---|
| | | | | | specified timescales. In the unlikely event of a prolonged deterioration in the abatement plants performance or a significant malfunction with the extraction system, measures would be taken to reduce incoming feedstocks and front-end processing involving feedstock being diverted elsewhere to one of Biogen's 11 alternative food waste AD facilities. A minimum amount of feedstocks would continue to be accepted in order to continue to feed the digesters and maintain generation. A temporary alternative abatement plant could be hired in to provide increased treatment. Mobile fans could also be installed within the waste reception hall, process room and separator room to supply clean fresh air for added ventilation. | | |
| Acid scrubber | Adjacent to separator room | Extracted channelled air from the separator (Borger) building | Point source | Digestate and ammonia (if untreated) | A new purpose designed acid scrubber system treats extracted channelled air from the sealed purpose built separator (screening) room.<br><br>Digestate is screened to remove potential contaminants (predominantly plastics) from the final product down to <2mm particle size. The Borger separator is positioned within the sealed screening room. No other processes take place within the separator room which is in an isolated sealed room. | Acid scrubber emissions | Low risk of odour during normal operations, possible intermittent release during abnormal operations |

| Source | Location | Activities and Materials Involved | Types of Emissions | Potential Odour | Means of Control | Release to atmosphere Description / Characteristics | |
|---|---|---|---|---|---|---|---|
| | | | | | The acid scrubber extraction fan is purpose designed and engineered to provide sufficient extraction in accordance with the design capacity of the building. All fans are monitored on SCADA and an alarm would activate in the event of malfunction.<br><br>The extraction fan has a Variable Speed Drive (VSD) to enable the fan settings to be changed in accordance with environmental conditions and operational requirements. However, normal practice is to leave the fan running at 100% to maintain a minimum of ten air changes per hour to reduce the risk of fugitive emissions. This is also essential to maintain the optimum air residence time within the scrubber.<br><br>The screening room will be equipped with a gas detection system in the form of a traffic light system. This will inform staff whether it is safe to enter the room during operations.<br><br>The extraction fan serving the acid scrubber will be periodically serviced and tested. The fan is checked daily as part of the Daily Checks Sheet; this includes a check on SCADA to ensure the extraction fan is operating effectively. A visual inspection to ensure the abatement system is operating | | |

| Source | Location | Activities and Materials Involved | Types of Emissions | Potential Odour | Means of Control | Release to atmosphere Description / Characteristics | |
|---|---|---|---|---|---|---|---|
| | | | | | effectively also takes place as part of the Daily Shutdown Sheet.<br><br>The scrubber is equipped with both inlet and outlet monitoring probes to monitor performance.<br><br>The abatement plant process monitoring requirements are recorded on a Plant Monitoring Spreadsheet.<br><br>The scrubber extraction fan is subject to a six-monthly service and repair programme conducted by site staff to ensure the fan is maintained and continues to operate effectively. Critical spares are held by the company and shared within a defined geographical area in accordance with the Contingency arrangements for equipment failure procedure. This includes, but not limited to, replacement fans and associated parts. This would enable the malfunction of critical fans including the extraction fans to be repaired without incurring unreasonable delays.<br><br>The abatement system is maintained in accordance with the requirements of the permit, the Odour Management Plan (OMP) and the manufacturers recommendations. This includes, but not limited to, media replacements (as | | |

| Source | Location | Activities and Materials Involved | Types of Emissions | Potential Odour | Means of Control | Release to atmosphere Description / Characteristics | |
|---|---|---|---|---|---|---|---|
| | | | | | required). Six monthly emissions testing together with the process monitoring requirements including, but not limited to, weekly RAE tube testing for ammonia and hydrogen sulphide in place ensures any deterioration in the systems performance is detected and addressed in a timely manner.<br><br>If emissions ever exceeded the Emission Limit Values (ELV) specified in the environmental permit and/or with BAT, an immediate retest would be scheduled to verify the performance. Any confirmed reduction in abatement performance would involve an investigation to take place to identify the likely the root cause of the deterioration in performance and the Environment Agency would be notified. This would include what measures are to be taken to rectify the reason for the failure within specified timescales.<br><br>In the unlikely event of a prolonged deterioration in the abatement plants performance or a significant malfunction with the extraction system, measures would be taken to reduce incoming feedstocks and front-end processing involving feedstock being diverted elsewhere to one of Biogen's 11 alternative food waste AD facilities. A minimum amount of feedstocks would | | |

| Source | Location | Activities and Materials Involved | Types of Emissions | Potential Odour | Means of Control | Release to atmosphere Description / Characteristics | |
|---|---|---|---|---|---|---|---|
| | | | | | continue to be accepted in order to continue to feed the digesters and maintain digestion. A temporary alternative abatement plant could be hired in to provide increased treatment. Mobile fans could also be installed within the waste reception hall, process room and separator room to supply clean fresh air for added ventilation. | | |

## 11. Receptors

Biogen understands the importance of being a good neighbour and employ the following measures to engage with residents:

- Contact details are made available to the public for residents to contact a member of the Biogen team.
- Planned maintenance works which could cause disruption are communicated in writing and/or verbally to those who may be affected including the Environment Agency.
- Meetings with residents including site visits and attendance at council meetings will be held or undertaken when required.
- Any odour complaints are recorded on an electronic management system as an incident log. All complaints are investigated, and residents are provided with feedback in a timely manner.

## 12. Routine Maintenance

Scheduled and routine maintenance is critical to ensure the control of odours on-site. Biogen are committed to ensuring that all equipment is maintained to a high standard. To achieve this, Biogen have developed an Odour Abatement Maintenance Procedure which details the checks that must be undertaken on the odour abatement technologies deployed on-site and the records of such checks. Checks include, but not limited to, ductwork integrity, functionality of instrumentation (e.g. flow meters, temperature probes), media integrity (moisture content, media absorption capacity), recirculation water testing/integrity, Ultrasonic Non-Destructive Thickness Testing (NDT) etc.

Critical spares are held in stock or shall be available at short notice. Provision will be made for equipment to be repaired as soon as practicable.

All odour abatement will be inspected as per Biogen's scheduled maintenance system. Inspections are recorded on the electronic based system and include for example:

- Inspection of extraction fans
- Measurement of flow rate
- Media inspection to evaluate saturation rates.

The effectiveness of the odour abatement systems is also dependent on the containment of the reception hall, the screening room and the integrity of the ducting. The building and pipe work/ducting is inspected daily for integrity as part of the Daily Checks Procedure, visible signs of loss of integrity will be reported and addressed. This includes a six monthly 'deep' clean, maintenance and repair schedule to the extraction system including the vents. This is documented and incorporated into the Critical Maintenance Schedule. Repairs have taken place to the extraction ducting which had previously been damaged as a result of mobile plant operations. A periodic Non-Destructive Testing (NDT) regime takes place for all main pipework with the results recorded to determine any reduction in pipe thickness over time. This is a proactive approach to ensure they deteriorating pipework is replaced as required.

In the event the performance of the odour abatement systems reduces and/or the structural integrity of the waste reception hall or screening room is in question, a physical or virtual smoke test would be considered.

## 13. Routine Monitoring, Recording and Reporting

Biogen monitor the site to ensure site activities shall be free from odour at levels likely to cause pollution outside the site boundary. Biogen monitoring includes:

- A daily sniff test
- Monitoring of complaints
- Monitoring the performance of the odour abatement systems by gas absorption tubes and analysing bag samples taken pre and post abatement
- Monitoring of the process to give early warning of any potential odour issues
- Monitoring by sniff testing will be undertaken by a Biogen representative and is required for the following reasons:
    - On-site daily confirmation of the performance effectiveness of the odour control measures employed
    - Assess the likelihood of odours being detected by sensitive receptors.

A daily olfactory inspection is conducted during operational hours by a member of the site team. The site is frequently visited by non-site-based employees, it is company policy that all those attending site from both the operations and compliance team will also conduct an offsite odour check on their way to/from the site. Sniff testing will be undertaken at least once every day and recorded in the site diary with a rating of the detected odour in accordance with the Environment Agency scale below:

**Intensity (Detectability)**

- 0 - No odour (no odour can be detected)
- 1 - Very faint odour (only detectable if you specifically sniff for it)
- 2 - Faint odour (detectable if you casually sniff for it)
- 3 - Distinct odour (detectable by just standing there normally)
- 4 - Strong odour (unavoidable odour)
- 5 - Very strong odour (likely to leave lingering smell on clothes, or lingering taste)
- 6 - Extremely strong odour (likely to causes immediate physical symptoms such as nausea, sore throat and headaches).

In the event particularly odorous activities were taking place such as tank degrits, further odour checks shall be undertaken. To ensure the operators are not suffering from odour fatigue, they will not have operated with the waste reception hall or processing room immediately prior to conducting the assessment.

During the inspection, a walk around of the perimeter will be conducted and observations made concerning the type and nature of any odours detected, including the likely source. In the event that the Site Manager or nominated other detects odour at the site boundary which they believe has the potential to cause a nuisance, they are required to notify the Compliance Director/Head of Compliance and/or Regional Compliance Officer with immediate effect. The Environment Agency would be informed. The findings and remedial steps from such inspections are documented on the company's internal IMS including timescales for completion as overseen by the Compliance Director/Head of Compliance and/or Regional Compliance Officer to ensure the root cause of the odour was remediated to prevent reoccurrence.

All members of the team will be trained to undertake odour investigations and the weather conditions, in particular wind direction and strength will be assessed prior to undertaking the inspection. The exact locations for monitoring will be dependent on the meteorological conditions at the time in a risk-based manner. An onsite weather monitoring station records the localised weather conditions at the time as well providing historical monitoring data which is remotely accessible. This is useful both for

completing odour checks but also for carrying out planned maintenance where such works could give rise to fugitive emissions.

Any complaints received are managed in accordance with the Problems, Complaints and Improvements Procedure and recorded as an Incident Log. All complaints received are recorded and an investigation is undertaken to identify the source of the odour. Complaints are reviewed as part of the Biogen IMS.

In addition to the daily sniff tests, an inspection of all plant and equipment that is critical from an odour prevention and abatement perspective including doors, extraction fans, carbon filters, acid scrubbers, pipework, PRVs, etc, will be conducted at the prescribed frequencies to ensure they are in good working order. The results of such inspections shall be recorded. Monitoring of the carbon filter inlet and outlet is undertaken using colorimetric gas detection tubes and the results are recorded.

The anaerobic digestion process is closely monitored to ensure efficient operation. The SCADA system automatically and continuously monitors specific parameters including temperature, tank levels, and gas quality for example. In addition to software controls, site staff are responsible for monitoring the biology of the process tanks and reporting these findings to the Operations Team.

Biogen keep records of all monitoring undertaken as part of this management plan. Records will be retained in accordance with the requirements of the Environmental Permit. All records will be made available to the Environment Agency on request.

In the unlikely event of an increase in odour emissions likely to be detected by a receptor outside the permit boundary, following an odour complaint received or following a reduction in odour abatement plant effectiveness, the site management team will action the following measures (as applicable):

- Check the operational performance of all odour abatement systems
- Where possible, temporarily cease the activity causing the odour in question
- Take steps to eliminate the root cause of the odour
- Where applicable, initiate immediate remedial actions or repairs
- Record the response and actions taken to rectify the problem; and/or
- Report to the Line Manager and Director of Compliance the situation and the actions taken.

## 14. Odour Control during maintenance and unusual events

Biogen has undertaken a full review of the foreseeable situations which might compromise the sites' ability to prevent and/or minimise odorous releases from the process and the actions taken to minimise the impact. This can be seen in the Environmental Accident Management Plan which covers eventualities such as fire/explosion, power failure, plant failure, flooding and highly odorous waste for example.

Other examples of unusual events or operational difficulties which may have the potential to cause odour at levels likely to cause pollution outside the site boundary include those listed in figure 4.0 below.

*Figure 4.0.*

| Event | Additional measures/steps if happens |
|---|---|
| Spillage of incoming feedstocks outside of the sealed waste reception building or loss of containment from primary vessels | Immediate steps would be taken to contain the spillage. The Environment Agency would be notified. A full clean-up would take place with immediate effect and any necessary remedial works undertaken. All material would be contained on impermeable surfacing served by sealed drainage. Multiple spill kits are available on site which are replenished as required. This includes sand for chemical spills as well as oil mats and booms for example. All primary storage and process vessels are positioned on impermeable surfacing served by sealed drainage surrounded by an impermeable concrete bund wall. Contained material would be discharged back into sealed system or removed offsite to a suitable permitted facility. |

| | |
|---|---|
| | Biogen have a number of 24/7 tanker emergency contacts to arrange for liquid wastes to be removed from site for suitable recovery or disposal elsewhere. Sandbags are held on site at all times. A documented Emergency Preparedness and Response Procedure would be instigated to ensure all incidents that are of an 'emergency' nature are dealt with in a manner that allows for control to be returned, in a manner that minimises risk to human health and the surrounding environment. All site operatives receive mandatory training on emergency incident response and preparedness. |
| Malfunction of doors | A contract is in place with an industrial door maintenance and supply company in the event site operatives were unable to rectify the malfunction. This ensures an efficient response time in order to carry out any repairs to the doors or replacements to minimise operational disruption with a response time of 24 hours. A preventative maintenance programme is in place which helps reduce the risk of door malfunction. In the unlikely event of principal door malfunction for a sustained period of time (more than 48 hours), wastes would be diverted elsewhere to other Biogen facilities and the Environment Agency would be notified accordingly. The closest sites being at Twinwoods (approximately 7 miles) and Bygrave (approximately 34 miles). |
| PRV failure or activation | PRVs are subject to routine maintenance and weekly checks. Any leaks would also be identified through the gas camera surveys aforementioned as part of the LDAR programme. The PRVs are a safety mechanism to prevent over-pressure or vacuum, the trends are reviewed on SCADA. In the event of high pressure and release this would be documented and the reasons behind investigated to prevent further releases, this would be recorded and notified to the EA accordingly. |

## 15. Training and competence

All staff on site are trained to ensure the odour abatement measures in place are well maintained and to recognise the importance of the management procedures associated with odour control. Staff who are responsible for the operation, maintenance and/or repair of odour abatement systems are fully trained and competent. Records are maintained demonstrating compliance with this. The typical areas highlighted include:

- General awareness of the root cause of odour and their direct responsibilities for avoiding odour nuisance
- Minimising emissions during normal operations; and
- Actions to be taken during abnormal or unusual conditions.

A record of training is maintained for each employee. Site staff receive periodic refresher training as identified on the company's Skills and Competency Matrix.

## 16. Handling complaints

The Problems, Complaints and Improvements Procedure details how complaints will be managed to ensure records are kept of all complaints and all remedial actions taken. Biogen will ensure prompt feedback is provided to the complainant where feedback is requested. All complaints are logged on an electronic IMS system and can be made available for inspection at the request of the Environment Agency.

## 17. OMP Reviews

Biogen will review the effectiveness of the OMP at least annually. However, this will be reviewed sooner in the following situations:

- Significant changes to site operations
- Complaints received have highlighted areas where further control measures or remedial actions are required; and/or
- At the request of the Environment Agency.

## 18. Complaints handling and communications

The **Problems, Complaints and Improvements Procedure** outlines how Biogen handles complaints relating to the AD Plant. This ensures a full record of all complaints is held and, where applicable, it details the remedial action taken to prevent a reoccurrence.

Biogen have held opening events for local residents, members of the public are able to contact Biogen by the following means:

E-mail: info@biogen.co.uk or 0844 326 7251 or out of office hours on 0844 8480 654

EA: By contacting the Environment Agency.