Appropriate measures for the biological treatment of waste

Consultation draft July 2020

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We help people and wildlife adapt to climate change and reduce its impacts, including flooding, drought, sea level rise and coastal erosion.

We improve the quality of our water, land and air by tackling pollution. We work with businesses to help them comply with environmental regulations. A healthy and diverse environment enhances people's lives and contributes to economic growth.

We can’t do this alone. We work as part of the Defra group (Department for Environment, Food & Rural Affairs), with the rest of government, local councils, businesses, civil society groups and local communities to create a better place for people and wildlife.

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Contents

Table of Contents

- identifying the staff who have taken any decisions about accepting or rejecting waste streams and who have decided on recovery or disposal options
- linking each waste container accepted to its consignment or transfer note
- non-conformances and rejections

96. The tracking system must be able to report:

- the total quantity of waste present on site at any one time
- the total quantity of end of waste product materials on site at any one time, where applicable
- a breakdown of the waste quantities you are storing pending on-site treatment or awaiting onward transfer
- a breakdown of the waste quantities by hazardous property
- an indication of where a batch or load of waste is located based on a site plan
- the quantity of waste on site compared with the limits authorised by your permit
- the length of time a waste has been on site

97. You must store back-up copies of computer records off-site. Records must be easily accessed in an emergency.

98. You must hold acceptance records for a minimum of 2 years after you have treated the waste or removed it off site. You may have to keep some records for longer if they are required for other purposes, for example hazardous waste consignment notes.

7. Waste storage, segregation, transfer and handling

Waste storage, segregation and handling

1. Your facility must have enough physical and permitted capacity for the wastes, raw materials and end of waste materials that you store on site. You must comply with the limits set in your environmental permit and with any additional regulatory requirements that may apply, for example:

- The Animal By-Products (Enforcement) (England) Regulations 2013
- COMAH regulations

2. You must store waste in locations that minimise the handling of waste and have handling procedures in place. Waste handling must be carried out by competent staff using appropriate equipment.

3. Where possible, you must locate storage areas away from watercourses and sensitive perimeters (for example those close to public rights of way, housing or schools). You must store all waste within the security protected area of your facility to prevent unauthorised access and vandalism.

4. You must clearly document the maximum storage capacity of the site and the designated storage areas. You must not exceed these maximum capacities. You must define capacity in terms of, for example, maximum tank or vessel capacities, tonnage or numbers of pallets or containers. You must regularly monitor the quantity of stored waste on the site and in designated areas to check against the allowed maximum storage capacities.

5. For biological treatment plants such as in-vessel composting and anaerobic digestion, available storage capacity and throughput will be influenced by the period of time that the waste is in the treatment vessels. You must make sure you have sufficient capacity to store

- sterilising waste in an autoclave - before mechanical treatment

42. If you use chemical, thermal, ultrasonic or biological pre-treatment you must have appropriate controls and procedures in place for their storage, handling and use. For example if you use these treatments:

    - using oxidative chemicals
    - adding acids or alkalis
    - using high-temperature heating
    - paper enzyme addition

43. You must avoid decanting sacks or drums of chemicals directly into treatment tanks or vessels. You must monitor any reactions and make sure control mechanisms are in place to manage such reactions.

44. Pre-treating waste feedstocks is sometimes done off-site from a treatment facility. For example de-packaging, blending or pasteurising waste before transporting it to one or more treatment facilities. The objectives and requirements for pre-treatment at a third party facility are equivalent to an on-site facility. The pre-treatment facility will require a separate environmental permit and biowaste material must be transported to and from sites in accordance with Duty of Care legislation. You must apply pre-acceptance and acceptance procedures. You must comply with animal by-products regulations. This has been referred to as the Hub and Pod concept for AD. The process risk is controlled by HACCP assessment.

Treatment and process control

Aerobic treatment

45. An aerobic treatment of waste facility may include the following processes (or combination of processes):

    - in-vessel composting (including rotating drum systems, containers and vertical towers)
    - open-air windrow composting (animal by-products excluded)
    - hall (housed) composting
    - static aeration
    - biodrying and biostabilisation (MBT)
    - thermophilic aerobic digestion (TAD)
    - aerated lagoons and activated sludge (for wastewater treatment)

46. You must equip vessels used for batch processing of solid waste, for example in-vessel composting or biostabilisation for MBT, with the capability to carry out continuous, representative temperature monitoring during sanitisation. You must link monitoring to an alarm system that you can monitor remotely and that provides you with remote alarm notification.

47. In order to reduce emissions to air and to improve environmental performance, you must monitor and control the key waste and process parameters, including:

    - waste input characteristics (for example, C to N ratio, particle size, pH, porosity)
    - temperature and moisture content (at different points if in a windrow)
    - aeration (for example, via windrow turning frequency, O2 and CO2 concentrations, temperature of air streams in the case of forced aeration)
    - for windrow composting: height and width of composting piles

138. The design requirements for digestate storage lagoons and tanks are in the section Waste storage, segregation and handling. You must design digestate storage to minimise the release of liquid and gaseous emissions at all times.

139. You must include all tanks and lagoons used for the on-site storage of digestate, whether waste or non-waste, within your permitted boundary and follow the guidance in this document.

140. You must make sure you operate your anaerobic digestion process in order to manage the biodegradation of your feedstocks into a stable digestate. The stability of digestate will depend on the type of feedstock, the pre-treatment and digestion process and how you manage your organic load and residence time.

141. You must test your digestate to confirm that the process is achieving the required level of treatment and it is suitable for its intended end use.

You must take measures to remove contaminants before digestion, for example plastic. If you use post-digestion treatment methods, for example strain presses, you must make sure they are maintained. You must be able to demonstrate how effective they are at removing contaminants. You must not solely rely on post-treatment technology to remove known contaminants.

142. You must make sure contingency measures are in place to manage any untreated or unscreened digestate in the event of technology failure. You must consider potential hazards, for example the release of residual biogas emissions and ammonia, and manage these in accordance with appropriate measures.

143. You must consider the design, process flow and intended use of digestate treatment technology during the planning and design stage of your plant. You must match the design of the technology to the properties of the digestate being separated and to the qualities of the separated products required. For example, a screw press may be more suitable for fibrous material.

144. You must carry out the separation of digestate either within an enclosed:

- building served by an appropriate air ventilation and extraction system that directs exhaust air to an abatement system or for recovery
- system designed to effectively contain emissions

The abatement system must be capable of treating the type of emissions produced. The design and engineering of the containment and abatement must be determined by the emissions risk profile of the waste. This is to make sure it removes or minimises the impact of emissions on receptors.

145. You must effectively minimise fugitive emissions from dewatered digestate fibre and digested sewage sludge cake. You must store it under a suitable cover or in an enclosed building fitted with an air ventilation and extraction system.

146. If you compost digestate fibre, you must compost it following the requirements for the aerobic treatment of waste. You must compost digestate fibre to promote aerobic conditions either in:

- an enclosed building fitted with a suitably designed ventilation, extraction and air abatement system
- the open - with negative aeration connected to an appropriate air extraction system with abatement or suitable covered system

We will not permit open processes where there are sensitive human receptors within 250m unless you can adequately control the risk of bioaerosols.

147. If you dry the digestate, you must carry this out in a system designed for the throughput to be processed. You must contain, collect, extract and treat all emissions during the drying process.

Burning dried digestate as a fuel, for example, using dried digestate pellets, is considered a waste recovery activity which will require additional authorisation.

148. All extraction and abatement systems must be appropriately engineered, sized and designed to a relevant industry standard to treat the emissions produced. These may include for example, ammonia, residual biogas, odorous chemicals, particulates and bioaerosols.

149. You must consider within your risk assessments any health and safety hazards associated with all your digestate treatment and storage areas. For example biogas release from processing digestate and the potential creation of confined spaces within bunds and buildings.

150. You must separate and process digestate on an impermeable surface with a contained drainage system that meets CIRIA 736.

Record keeping for treatment residues

151. You must record in the computerised waste tracking system:

- that a waste has been treated
- what the treatment residues are and their weight
- what end of waste products have been made and their weight

152. You must keep records of non-waste materials leaving the site, including:

- the type of material
- batch number
- date of export off-site
- tonnage exported off-site

9. Emissions Control appropriate measures

1. You must identify, characterise and control all emissions from your activities that may cause pollution.

2. You must establish and maintain an inventory of your wastewater and waste gas emissions. This must be part of your management system and incorporate the information about the characteristics of the waste emission such as:

- average and maximum values and variability of flow and temperature
- average and maximum concentration and load values of relevant substances and their variability (for example, speciated organic compounds and ammonia)
- flammability, lower and higher explosive limits, reactivity
- the presence of other substances that may affect the waste gas treatment system or plant safety (for example, oxygen, nitrogen, water vapour, dust)

The scope (for example, level of detail) and nature of the inventory will generally be related to both the:

- nature, scale and complexity of the facility
- range of environmental impacts it may have (determined also by the type and amount of wastes processed)

Point source emissions to air (channelled emissions – including open-topped biofilters)

3. You must where possible contain, collect, extract and direct all emissions to air from plant, equipment and processes (for example shredding). You must use a suitably designed and engineered abatement system or gas recovery system for treatment before release.

4. You must make an assessment of the fate and impact of the substances emitted to air, following the Environment Agency's air emissions risk assessment methodology.

5. To reduce point source emissions to air (for example ammonia, dust, organic compounds and odorous compounds) from your biological treatment process, you must use one or a combination of the relevant abatement techniques:

   - biofiltration, biotrickling or bioscrubbing
   - scrubbing (for example wet or chemical)
   - adsorption, for example activated carbon
   - thermal oxidation
   - fabric filter – in the case of mechanical biological treatment to remove dust

6. You must adequately disperse emissions from stacks and vents using appropriate designs, locations and heights. You must use dispersion modelling where possible to demonstrate the emissions do not impact on sensitive receptors.

7. You must install a suitable monitoring point on stacks and vents with appropriate safe access. You must monitor emissions in accordance with Environment Agency guidance on monitoring stack emissions.

Emissions abatement

8. You must choose the type of abatement system you require for your facility, considering the following:

   - waste feedstock and intended purpose
   - chemical composition of the waste gas stream, considering for example variations in composition from individual processes
   - available space on site for locating the equipment, for example biofilters may require a large footprint depending on the volume of gas requiring treatment
   - pre-treatment requirements such as humidifying, gas cooling, pre-scrubbing, particulate removal
   - sizing and residence time for effective odour or chemical reduction
   - activity giving rise to the gas – aerobic or anaerobic
   - ability to monitor visually (where appropriate) and using data monitoring
   - ability to monitor flow, temperature, compaction, back-pressure, moisture, redox potential
   - ability to monitor pollutant removal efficiency
   - infrastructure requirements, drainage and emissions control
   - inspection, maintenance, regeneration of media and contingency planning

   You may need to use a combination of abatement steps to make sure that emissions are treated effectively.

9. In order to make sure the abatement system is effective in treating odorous and chemical emissions you must monitor and maintain your abatement to achieve continual optimum conditions. To demonstrate effective control, monitoring and assessment may include the following parameters (depending upon the abatement system used):

- gas flow or loading rate
- bacterial viability (applicable to bio-oxidisation treatment systems)
- pH
- acid growth (indicated by pH)
- gas temperature
- pollutant removal efficiency rate
- chemical injection (redox potential - applicable for chemical scrubbing and bio-oxidisation systems)
- spent solutions (for waste recovery or disposal)
- humidity or moisture content
- back-pressure
- thatching and compaction of media (thatching is the formation of a natural barrier to the ingress of additional water to the surface layer)
- channelling (preferential pathways for gas flow) and vegetation growth
- ammonia, hydrogen sulphide and odour concentrations (in both input and exhaust gas streams)
- energy requirements for providing adequate and continuous airflow

In all cases you must trend monitoring results to allow observation of changes over time, which could indicate that additional maintenance is required.

10. You must have procedures in place to make sure that you correctly operate, monitor and maintain abatement equipment and address the following:

- the effect of a loss of abatement due to the introduction of toxic compounds
- a program of filter media replacement informed by performance and condition (for biofilters and carbon filters)
- the replenishment of reagents (for chemical scrubbers)
- commissioning and re-commissioning new filter media or abatement and a contingency for the treatment of gases during down-time

11. You must consider the flow and fate of materials through the biological treatment process when designing containment and abatement systems for controlling emissions. For example, the re-circulation of waste back through the process via a reception building may increase the potential emission loading on the system.

12. You must do a detailed, periodic (at least annually) efficiency assessment of your abatement system.

Biofilters (open and closed fixed bed systems)

13. You must use a filter medium that is suitable for maintaining bacterial communities that will degrade the identified contaminants and provide an efficient and effective system. In determining an appropriate filter bed material, you must consider water retention capacity, bulk density, porosity, structural integrity, surface area, nutrient viability and particle size.

14. The biofilter must be connected to a suitable ventilation and air circulation system to make sure a uniform air distribution through the bed and a sufficient residence time of the waste gas inside the bed.

15. Pre-treatment of the waste gas before the biofilter (for example, with a water or acid or alkaline scrubber) may be necessary. You must make sure gas is pre-treated where required to minimise the risk of carry-over of pollutant gases.

16. You must consider designing biofilters on a modular basis so that some parts of the abatement system can be kept in operation during staged refurbishment. The installation of your biofilter must be designed so that any liquid which accumulates in the base can be drained to an appropriate leachate collection or treatment system.

17. All ductwork conveying the inlet air to the biofilter must be made from corrosion resistant materials and must incorporate low points to prevent the build-up of condensed liquid within the ducts, as this can lead to corrosion and a drop in the systems overall efficiency.

18. You must monitor your biofilter to make sure it is effective in controlling odorous air emissions. As a minimum you must monitor the following parameters:

    - gas inlet temperature (inlet and outlet on closed systems)
    - gas inlet flow rate (inlet and outlet on closed systems)
    - filter media moisture
    - thatching and compaction using back-pressure measurement
    - pH (this should be monitored from the biofilter drainage effluent)

    Advisable additional monitoring includes:

    - gas inlet humidity
    - gas inlet and outlet concentrations for ammonia, hydrogen sulphide and odour
    - bacterial viability

    You must visually monitor your biofilter where it is possible and safe to do so. This includes assessing the:

    - absence of vegetation, moss and fungus – the media must be in good condition and clear of vegetation. You can use a photographic record of the media bed to determine how the bed changes over time
    - media depth to identify decomposition and compaction over time – you can do this using vertical rulers located in the biofilter bed
    - surface condition – to identify any channelling, gaps or signs of shrinkage of the biofilter bed
    - irrigation – to identify wet and dry spots and the uniformity of sprinkler systems where installed

19. You must assess the efficiency of your biofilter to make sure the microbial culture is vigorous and healthy and the system operating parameters are being maintained at optimum designed values. This includes a review of:

    - media health (for example bacterial viability, particle size distribution and depth)
    - volumetric air-flow or surface air-flow distribution (in open biofilters)
    - emission removal efficiency, for example odour removal

Removal efficiency is typically calculated using the concentrations sampled from the biofilter inlet and outlet. You must carry out sampling in accordance with recognised standards, for example BS EN 13725 for determining odour concentration.

20. Further information on biofilters and assessing their effectiveness is available in the reports titled Biofilter Performance and Operation as Related to Commercial Composting and Understanding Biofilter Performance and Determining Emission Concentrations Under Operational Conditions.

Understanding Biofilter Performance and Determining Emission Concentrations under Operational Conditions outlines some of the key parameters that you could use for the routine monitoring and control of biofilters. You can directly measure a number of the parameters. Some parameters will require more complex testing periodically using accredited methodology.

21. Biofilter media must be re-mixed or replaced when required. This could either be following your planned routine maintenance schedule or more frequently if your monitoring assessment identifies it is needed.

Wet and chemical scrubbers

22. You must select the most appropriate aqueous absorbing solutions for treating the pollutants in the air stream. Where a mix of pollutant gases are identified you may require a multi-stage process using a combination of solutions or technologies.

23. You must make sure flow rates allow for sufficient residence time and to prevent excess carry-over of scrubbing solution into the air stream.

24. You must monitor your abatement scrubber to make sure it is effective in controlling odorous air emissions. As a minimum you must monitor the following parameters:

- gas temperature and flow rate (inlet and outlet)
- moisture content or humidity (inlet and outlet for dry scrubbers only or outlet if used before other abatement systems)
- back-pressure (for packing scrubbers only)
- pH of scrubber solution
- chemical injection rate (redox potential) where possible to do so

Advisable additional monitoring includes gas inlet and outlet concentrations for ammonia, hydrogen sulphide and odour.

25. You must continuously monitor the flow rate, temperature and pH of the scrubber solution before and after abatement.

26. You must manage spent or recovered solutions, for example ammonium sulphate, as waste.

Activated carbon

27. You must monitor your activated carbon filter to make sure it is effective in controlling odorous air emissions. As a minimum you must monitor the following parameters:

- inlet and outlet gas temperature and flow rate
- inlet moisture content or humidity
- back-pressure
- carbon bed temperature where possible to do so

Advisable additional monitoring includes gas inlet and outlet concentrations for ammonia, hydrogen sulphide and odour.

28. You must continuously monitor the flow rate and temperature at the inlet and outlet.

29. You must make sure that carbon is either replaced or regenerated prior to saturation to prevent reduced performance.

30. You must make sure the concentrations of volatile organic compounds within the gas stream are below their lower explosive limit (LEL) to avoid explosion and combustion.

31. You must not exceed the activated carbon manufacturers' recommended maximum operating temperature unless a cooling system is installed and effective.

32. You must make sure impurities such as particulates are removed before gases pass through the carbon filter.

33. You must not allow exothermic reactions to occur during the maintenance of activated carbon filters.

34. You must store activated carbon safely to prevent spontaneous combustion. You must store it following supplier or manufacturers' recommendations.

Masking agents, neutralising agents and topical barriers

35. You must not substitute effective process monitoring and management to prevent emissions by using masking agents (for example deodorisers) or topical barriers.

36. You must only use chemical treatments (for example neutralising agents) to destroy or to reduce the formation of odorous compounds as part of a more comprehensive emissions treatment plan and in an environment where their benefit is clearly understood and demonstrable and it is safe to use. Using chemical treatments must not affect the quality of the compost or digestate.

37. You must review your water-efficiency measures when considering the use of neutralising agents and topical barriers.

38. You must only use topical barriers, for example the localised application of water during composting, where the following conditions can be achieved:

    - there is sufficient water available to dissolve the chemicals
    - the solubility of the chemicals is optimised for the odours present
    - there is an active biological community established to help break down the chemicals once they are dissolved

Fugitive (Diffuse) emissions to air

39. You must use appropriate measures to prevent emissions of odour, ammonia, dust and particulates, mud and litter.

40. Where a dust management plan is required, you must develop and implement it following our guidance.

41. You must design, operate and maintain plant in a way that prevents and minimises fugitive emissions to air, for example by limiting drop height, using wind barriers, favouring gravity transfer rather than pumps or misting devices. This includes associated equipment such as:

    - screeners

- shredders
- conveyors
- skips or containers
- building fabric, including doors and windows
- pipework and ducting

42. To reduce fugitive emissions you must use high integrity components (for example seals or gaskets). You must minimise releases where possible. You must where possible contain, collect, extract and direct emissions from plant, equipment and processes to a suitably designed and engineered abatement system or gas recovery system.

43. You must use your waste pre-acceptance, waste acceptance and site inspection checks and procedures to identify and manage wastes that could cause, or are causing, fugitive emissions to air (for example of odour or dust). When you identify any such wastes you must:

- take appropriate risk assessed, measures to prevent and control emissions
- prioritise their treatment or transfer

44. If you need to prevent fugitive emissions to air from the storage and handling of such waste, you must use a combination of the following measures:

- keep enclosed buildings or equipment under adequate negative pressure with an appropriate ventilation and abated air circulation or extraction system, where possible, locating air extraction points close to potential emissions sources
- use fast-acting or ‘airlock’ doors that default closed
- store and handle the waste within an enclosed building
- use fully enclosed material transfer and storage systems and equipment (for example conveyors, hoppers, containers, tanks and skips)
- keep building doors and windows shut to provide containment (except when you need access for loading or unloading, or if doing so could create unsafe environments, or if you need to open them as part of a designed air ventilation strategy)
- use suitable covers which can include textile sheeting, synthetic membranes and organic materials such as straw and wood-chip. The choice of cover depends on the risk to receptors.

45. You must design and engineer containment infrastructure (for example a building or covered system) to make sure it is capable of containing emissions. This must include identifying opportunities to install localised containment to minimise area source releases.

46. You must design building containment following relevant ventilation standards such as BS EN 13779:2007 or guidance in the HSE Exhaust Ventilation Guide. You must use suitably qualified engineers to design and install complex systems and make sure relevant standards are applied. The HSE provides guidance on selecting, using and maintaining local exhaust ventilation (LEV) correctly.

47. You must review the effectiveness of building containment following its installation and periodically thereafter, in particular where changes to plant, process or feedstock occur. You must carry out assessments to recognised standards, for example BS EN ISO 9972:2015. A smoke test can be a simple technique to identify emission leaks from buildings. This may indicate where improvements are needed before you carry out a more thorough survey.

48. You must periodically review the effectiveness of all covers and contained air systems to make sure they are beneficial in minimising or preventing fugitive emissions to air.

49. You must regularly inspect and clean all waste storage and treatment areas and equipment (including conveyor belts). You must identify the frequency of inspection and cleaning in your management system.

50. Your maintenance and cleaning schedules must make sure that tanks and plant are regularly cleaned where possible, to avoid large scale decontamination activities.

51. You must take measures to prevent the corrosion of plant and equipment (for example, conveyors or pipes). This includes selecting and using appropriate construction materials, lining or coating equipment with corrosion inhibitors and regularly inspecting and maintaining plant.

52. You must have a programme of work that covers the maintenance of all plant and equipment. This must also include protective equipment such as curtains and fast-action doors used to prevent and contain fugitive releases. You must identify the frequency of maintenance in your management system and follow manufacturers' recommendations as a minimum.

53. If you carry out container washing activities, you must design and operate the washing process and associated equipment in a way that prevents fugitive emissions to air (for example, carrying out this activity in a contained or enclosed system).

54. You must use contained or fully enclosed material transfer and storage systems and equipment (conveyors, hoppers and skips) where possible.

55. You must consider dampening potential sources of fugitive dust emissions with water or fog, for example during turning of open windrows and on areas of moving traffic.

56. You must proactively reduce the risk of litter emissions from your facility. You must reject feedstocks that are heavily contaminated and could give rise to wind-blown litter. Where loads have a minor level of contamination you must take appropriate measures to remove the contaminants before processing in order to reduce the risk.

57. You must stop outdoor processing activities, for example shredding and turning when weather conditions may either:

    - increase the risk of impact on local receptors
    - give rise to wind-blown litter, dust, odour or bioaerosols

58. You must have robust housekeeping measures in place to reduce airborne emissions and install litter screens where necessary.

Leak detection and repair (LDAR) - (generally applicable to AD, MBT and TAD)

59. To mitigate fugitive emissions to air such as methane from treatment plant and associated infrastructure (for example, pipework, conveyors, lagoons or tanks), you must set up a leak detection and repair plan. You must use it to promptly identify and carry out repairs or replacement of plant and equipment. A risk-based approach can be applied depending on the:

    - biological treatment activity
    - design of the plant
    - amount and nature of the organic compounds concerned

    You must have a LDAR plan that includes:

- a map of the site processes that identifies all known locations (point and area sources) for potential emissions, for example seals, flanges, valves, pumps, connections, pipework, tanks, open post-composting windrows, building fabric and lagoons
- methods for locating unknown emission sources
- estimates of the type and volume of the potential emission at each leak location
- prioritised locations (from highest risk to lowest risk) based on potential quantity of release and environmental impact
- a risk-based LDAR programme of work for monitoring and controlling emissions
- identification of monitoring methods and frequency of monitoring to quantify significant emissions where possible
- possible mitigation measures

60. You must identify and reduce emissions of volatile organic compounds and other substances to air. If you monitor emissions, you must do this using recognised industry standards and techniques. The methodology must be appropriate to the characteristics of the emission source. Methods for identifying leaks include, for example:

- sniffing using organic compound analysers and bag sampling (carried out to EN15446 standards)
- optical gas imaging (OGI) using hand-held cameras to enable visualisation of gas leaks

To screen and quantify emissions you can use the following methods:

- solar occulation flux (SOF)
- differential absorption light detection and ranging (LIDAR)

61. You must consider all potential sources of leakage within your LDAR Plan, for example:

- double membrane roofs (air blower vent)
- roof and cover fixings
- pressure relief valves and vents
- feeding and digestate separation units
- gas pipes
- conveyors and presses
- compressor
- combined heat and power plant (methane slippage)
- gas upgrading plant
- reception storage
- digestate storage
- pits and sumps, for example condensate pits
- building containment

Further information on LDAR is available from the United States Environmental Protection Agency (EPA). Information on methane leakage from anaerobic digestion plants is available from the Department of Business Energy and Industrial Strategy (BEIS) and the International Energy Agency.

Emissions of odour

62. You must develop and implement an odour management plan following our guidance.

63. You must use pre-acceptance screening and waste acceptance checks to identify and manage the receipt of odorous wastes. If you receive waste that is odorous or at risk of becoming odorous, you must prioritise their treatment or transfer.

64. You must put in place and use procedures to minimise the amount of time odorous wastes spend in your storage and handling systems (for example, pipes, conveyors, hoppers, tanks). In particular, you must have provisions in place to manage waste during periods of peak volume.

65. You must have measures in place to prevent, contain, collect and treat odorous emissions where possible. This includes for example:

- using contained buildings with appropriate air ventilation, extraction and abatement
- using plant or equipment with enclosure capability
- adapting operations to minimise odour release, for example considering weather conditions and efficient waste flow
- minimal storage and handling of feedstock
- regular cleaning of handling and storage areas

66. You must monitor abatement systems to make sure they function to their designed performance specification, for example, ensuring that scrubber liquors are maintained at the correct pH and replenished or replaced at an appropriate frequency.

67. Contaminated wastewaters have the potential for odours and you must store them in covered or enclosed tanks, lagoons or containers. Storing this must not result in the build-up of unsafe environments.

68. Where you expect an odour pollution at sensitive receptors, or it has been substantiated, you must monitor odour emissions using EN standards, for example either:

- dynamic olfactometry according to EN 13725 in order to determine the odour concentration
- EN 16841-1 or -2 in order to determine the odour exposure

69. If you are using alternative methods for which no EN standards are available (for example, estimating odour impact), you must use ISO, national or other international standards to make sure you use data of an equivalent scientific quality. You must set out the monitoring frequency in the odour management plan.

70. Where you expect an odour pollution at sensitive receptors, or it has been substantiated, you must set up, implement and regularly review an odour management plan as part of your environmental management system. It must include all of the following elements:

- actions and timelines to address any issues identified
- procedure for conducting odour monitoring (as set out above)
- procedure for response to identified odour incidents, for example, complaints
- an odour prevention and reduction programme designed to identify the source(s), to characterise the contributions of the sources and to implement prevention and reduction measures

Pests

71. You must manage waste in a way that prevents an infestation of pests and vermin.

72. You must have specific measures in place to deal with wastes that are identified as causing pests or vermin. Where you are required to follow a pest and vermin management plan this must be part of your environmental management system and must include procedures for:

- the inspection and control of pests and vermin
- rejecting loads of infested waste
- treating pest and vermin infestations promptly
- the storage, handling and use of approved pest and vermin control products

Information on the use of pest control chemicals at work is available from the HSE

73. You must consider whether waste heat from your process can be passed through fresh input waste to such a temperature that fly larvae cannot survive. Guidance on fly management is available.

Emissions of noise and vibration

74. You must design the layout of the facility to make sure that, where possible, you locate potential sources of noise (including building exits and entrances) away from sensitive receptors and boundaries. You must locate buildings, walls, and embankments so they act as noise screens.

75. You must employ basic good practice measures to control noise, for example including:

- adequately maintaining plant or equipment parts which may become more noisy as they deteriorate (for example, bearings, air handling plant, the building fabric, and specific noise attenuation kit associated with plant or machinery)
- closing doors and windows of enclosed areas and buildings
- avoiding noisy activities at night or early in the morning
- minimising drop heights and the movement of waste and containers.
- using white noise reversing alarms and enforcing the on-site speed limit
- using low-noise equipment (for example, drive motors, fans, compressors, pumps)
- adequately training and supervising staff
- where possible, providing additional noise and vibration control equipment for specific noise sources (for example, noise reducers or attenuators, insulation, or sound-proof enclosures)

76. If you expect noise or vibration pollution at sensitive receptors, or if it has been substantiated, you must create, use and regularly review a noise and vibration management plan. This must be part of the environmental management system, and must include:

- actions and timelines to address any issues identified
- a procedure for conducting noise and vibration monitoring
- a procedure for responding to identified noise and vibration events, for example, complaints

77. The noise and vibration management plan must also include a noise and vibration reduction programme designed to:

- identify the source(s) of noise and vibration
- measure or estimate noise and vibration exposure
- characterise the contributions of the sources
- implement prevention and reduction measures

78. Where a noise and vibration management plan is required, you must develop and implement it following our guidance.

Point source emissions to land and water (including sewer)

79. You must identify the main chemical constituents of the site's point source emissions to water and sewer as part of the site's inventory of emissions to land, water and sewer.

80. You must assess the fate and impact of the substances emitted to water and sewer following the Environment Agency's risk assessment guidance.

81. Discharges to water or sewer must comply with the conditions of an environmental permit or trade effluent consent. Relevant sources of waste water include:

- process water or condensate collected from treatment process
- waste compactor runoff
- vehicle washing
- vehicle oil and fuel leaks
- washing of containers, tanks and vessels
- spills and leaks in waste storage areas
- loading and unloading areas

82. In order to reduce emissions to water, if you need to treat wastewater before discharge or disposal, you must use an appropriate combination of these techniques:

- preliminary or primary treatment – for example, equalisation, neutralisation or physical separation
- physico-chemical treatment – for example, adsorption, distillation or rectification, precipitation, chemical oxidation or reduction, evaporation, ion exchange, or stripping
- biological treatment – for example, activated sludge process or membrane bioreactor
- nitrogen removal – for example, nitrification and denitrification
- solids removal – for example, coagulation and flocculation, sedimentation, filtration or flotation

83. You must direct wash waters from cleaning vessels to foul sewer or a contained drainage system for off-site disposal or re-circulation. You may need to pre-treat the waters in order to meet any limits on the effluent discharge consent. The degree of recirculation will be limited by the water balance of your plant, the content of impurities or characteristics of the water streams, for example nutrients. Discharges to surface water or storm drains are not acceptable.

84. Where applicable to your process, in order to reduce the generation of wastewater and to reduce water usage you must use all of the following techniques:

- segregating leachate seeping from compost piles and windrows from surface water
- re-circulating process water streams, for example from de-watering of liquid digestate or using other water streams such as surface water run-off as much as possible
- optimising the moisture content of the waste in order to minimise the generation of leachate

Fugitive emissions to land and water

85. You must use appropriate measures to control potential fugitive emissions and make sure that they do not cause pollution.

86. You must have the following measures in place in operational areas:

- an impermeable surface
- spill containment kerbs
- sealed construction joints
- connection to a contained drainage system

87. You must have measures in place to prevent overflows and failures from tanks and vessels, including where relevant:

- overflow detectors and alarms
- directing over-flow pipes to contained drainage system
- locating tanks and packaged liquids in suitable secondary containment (bunds)
- providing isolation mechanisms (for example, closing valves) for tanks, vessels and secondary containment

88. You must collect and treat separately each water stream generated at the facility, for example, surface run-off water or process water. Separation must be based on pollutant content and treatment required. In particular you must make sure that you segregate uncontaminated water streams from those that require treatment.

89. You must use suitable drainage infrastructure to collect surface drainage from areas of the facility where you store, handle and treat waste. You must also collect washing water and occasional spillages. Depending on the pollutant content, you must either recirculate what you have collected or send it for further treatment.

90. You must have design and maintenance provisions in place to detect and repair leaks. These must include regularly monitoring, inspecting and repairing equipment and infrastructure and minimising underground equipment.

91. You must take measures to prevent emissions from washing and cleaning activities, including:

- directing liquid effluent and wash-waters to foul sewer or collecting them in a contained system for off-site disposal – you must not discharge them to surface or storm drains
- where possible, using biodegradable and non-corrosive washing and cleaning products
- storing all detergents, emulsifiers and other cleaning agents in suitable bunded or containment facilities, within a locked storage area, or in a building away from any surface water drains
- preparing working strength cleaning or disinfection solutions in contained areas of the site and never in areas that drain to the surface water system

92. You must have measures to prevent pollution from the on-site storage, handling and use of oil and fuel.

93. You must produce and implement a spillage response plan and train staff to follow it and test it.

94. You must have procedures and associated training in place to make sure that you deal with spillages immediately.

95. You must keep spill kits at locations close to areas where spillage could occur and make sure relevant staff know how to use them. You must make sure kits are replenished after use.

96. You must stop spillages from entering drains, channels, gullies, watercourses and unmade ground. You must make available proprietary sorbent materials, sand, booms and/or drain mats for use when required.

97. You must make sure your spillage response plan includes information about how to recover, handle and correctly dispose of all waste produced from a spillage.

98. Container washing equipment must be purpose-built, contained and located in a designated area of the facility provided with self-contained drainage. The container wash must be designed to collect and contain all wash waters, including any spray. It must be operated by trained staff and inspected and maintained regularly.

99. For subsurface structures, you must:

- establish and record the routing of all site drains and subsurface pipework
- identify all sub-surface sumps and storage vessels
- engineer systems to minimise leakages from pipes and make sure they can be detected quickly if they do occur, particularly where hazardous substances are involved
- provide secondary containment and leakage detection for sub-surface pipework, sumps and storage vessels
- establish an inspection and maintenance programme for all subsurface structures, for example, pressure tests, leak tests, material thickness checks or CCTV

100. For surfacing, you must design appropriate surfacing and containment or drainage facilities for all operational areas, taking into account:

- collection capacities
- surface thicknesses
- strength and reinforcement
- falls
- materials of construction
- permeability
- resistance to chemical attack
- inspection and maintenance procedures
- available relevant standards of construction

101. You must have an inspection and maintenance programme to review the integrity of impermeable surfaces and water containment facilities. This must take account of the plant and equipment manufacturers’ recommended maintenance practices.

10. Emissions monitoring and limits appropriate measures

We may set emission limits and monitoring requirements in your permit, based upon your emissions inventory and environmental risk assessment. We may set additional limits and monitoring requirements for certain processes, for example dust and total volatile organic compounds (TVOCs).

1. Where you are required to monitor emissions to comply with the requirements of your environmental permit you must follow our monitoring guidance.

2. You must create and maintain an inventory (emissions inventory) of point source emissions to air and water (including emissions to sewer) for your facility.

3. If you treat water-based liquid waste, for example drying of liquid digestate, you must identify the main chemical constituents of the point source emissions to air and water from the process in your emissions inventory.

Emissions to air

4. Your facility's emissions inventory must include information about the relevant characteristics of emissions to air, such as the:

- average values and variability of flow and temperature
- average concentration and load values of relevant substances and their variability
- flammability, lower and higher explosive limits and reactivity
- presence of other substances that may affect the waste gas treatment system or plant safety (for example, oxygen, nitrogen, water vapour, dust)

5. Except for turned, open-windrow composting processes, sites that treat biodegradable, organic waste must reduce emissions of organic compounds to air using one or a combination of abatement techniques:

- adsorption
- biofiltration
- thermal oxidation
- wet scrubber
- fabric filters (in the case of MBT processes)

Bioaerosols

6. You must take measures to minimise the release of bioaerosols from your process.

You must document potential bioaerosol emission sources and identify measures to minimise their release. Measures include, for example:

- processing waste promptly and monitoring it according to defined processing conditions
- taking corrective measures to address unfavourable conditions
- using slow-speed shredders in sensitive locations with misting devices fitted where safe to do so, or carrying out these activities in covered areas
- taking into account meteorological conditions when managing activities
- avoiding activities such as turning and shredding in unfavourable meteorological conditions
- stopping activities when the wind is blowing in the direction of sensitive receptors
- dampening of haul roads and processing areas and stopping activities when the wind is blowing in the direction of sensitive receptors
- using static aeration, and covering piles where possible and practicable

7. If your facility is within 250 metres of a sensitive receptor, you will be required to:

- write and implement a site specific bioaerosol risk assessment
- monitor bioaerosols to make sure that the control methods you have stated are effective

You must implement the control measures identified in your risk assessment. You must also consider the exposure of staff and visitors, and take measures to avoid or reduce prolonged exposure to bioaerosols.

We will not permit open processes where there are sensitive human receptors within 250m unless you can adequately control the risk of bioaerosols.

Emissions to water or sewer (discharge consents)

8. Your facility's emissions inventory must include information about the relevant characteristics of point source emissions to water or sewer, such as:

- average values and variability of flow, pH, temperature, and conductivity
- average concentration and load values of relevant substances and their variability - for example, COD and TOC, nitrogen species, phosphorus, metals, priority substances or micro-pollutants
- data on bio-eliminability - for example, BOD, BOD to COD ratio, Zahn-Wellens test, biological inhibition potential (for example, inhibition of activated sludge)

9. For relevant emissions to water or sewer identified by the emissions inventory, you must monitor key process parameters (for example, waste water flow, pH, temperature, conductivity, or BOD) at key locations. For example, these could either be at the:

- inlet or outlet (or both) of the pre-treatment
- inlet to the final treatment
- point where the emission leaves the facility boundary

10. We may apply emission limits and monitoring requirements in your permit, based on your waste water stream inventory. Sites that treat biodegradable, organic waste must reduce emissions to water using an appropriate combination of techniques, for example:

- neutralisation
- adsorption
- stripping
- flotation
- filtration

All BAT AEL's for emissions to water apply at the point where the emission leaves the facility.

11. Process efficiency appropriate measures

1. You must monitor and review the annual consumption of water, energy and raw materials as well as the annual generation of residues and waste water for your facility at least once a year. Residues includes the generation of waste and non-waste classified composts and digestates.

Energy efficiency (installations only)

2. You must create and implement an energy efficiency plan at your facility. This must:

- define and calculate the specific energy consumption of the activity (or activities) you carry out and waste stream(s) you treat
- set annual key performance indicators - for example, specific energy consumption (expressed in kWh/tonne of waste processed)
- plan periodic improvement targets and related actions

3. You must regularly review and update your energy efficiency plan as part of your facility's EMS.

4. You must have an energy balance record in place. This must provide a breakdown of your energy consumption and generation (including any exportation of energy or heat) by the type of source (electricity, gas, conventional liquid fuels, conventional solid fuels, and waste).

5. The record must include:

- information on energy consumption in terms of delivered energy
- information on energy exported from the facility
- energy flow information (for example, Sankey diagrams or energy balances) showing how the energy is used throughout the process

6. You must regularly review and update your energy balance record as part of your facility's EMS, alongside the energy efficiency plan.

7. You must have operating, maintenance and housekeeping measures in place for example:

   - air conditioning, process refrigeration and cooling systems (leaks, seals, temperature control, evaporator/condenser maintenance)
   - operation of motors and drives
   - compressed gas systems (leaks, procedures for use)
   - steam distribution systems (leaks, traps, insulation)
   - space heating and hot-water systems
   - lubrication to avoid high-friction losses
   - boiler operation and maintenance, for example, optimising excess air
   - other maintenance relevant to the activities within the facility

8. You must have basic low-cost physical techniques in place to avoid gross energy inefficiencies. These may include for example:

   - insulation
   - containment methods (such as seals and self-closing doors)
   - avoiding unnecessary discharge of heated water or air (for example, by fitting simple control systems such as timers and sensors)

9. Additional energy efficiency measures must be implemented at the facility as appropriate in accordance with our guidance.

Raw Materials (Installations only)

10. You must maintain a list of the raw materials used at your facility and their properties (including auxiliary materials and other substances that could have an environmental impact).

11. You must have procedures for regularly reviewing new developments in raw materials and using any suitable ones with an improved environmental profile. This must include, where possible, substituting raw materials with waste.

12. You must justify the continued use of any substance for which there is a beneficial alternative.

13. You must have quality-assurance procedures in place to control the content of raw materials.

Water use (installations only)

14. You must take measures to make sure you optimise water consumption in order to:

    - reduce the volume of waste water generated
    - prevent or, where that is not practicable, to reduce emissions to soil and water

15. Measures you must take include:

    - implementing a water saving plan (involving establishing water efficiency objectives, flow diagrams and water mass balances)

- optimising the use of washing water (for example, dry cleaning instead of hosing down, using trigger control on all washing equipment)
- recirculating and reusing water streams within the plant or facility, if necessary after treatment
- where relevant, reducing the use of water for vacuum generation (for example, using liquid ring pumps with high boiling point liquids)

16. You must carry out a review of water use (water efficiency audit) at least every 4 years.

17. You must also:

- produce flow diagrams and water mass balances for your activities
- establish water-efficiency objectives and identify constraints on reducing water use beyond a certain level (usually this will be site specific)
- use water pinch techniques in more complex situations such as chemical plant, to identify the opportunities for maximising re-use and minimising use of water
- have a time-tabled improvement plan for implementing additional water reduction measures

18. To reduce emissions to water, you must apply these general principles in sequence:

- use water-efficient techniques at source where possible
- re-use water within the process, by treating it first if necessary - or if not practicable, use it in another part of the process or facility that has a lower water-quality requirement
- if you cannot use uncontaminated roof and surface water in the process, you must keep it separate from other discharge streams - at least until after you have treated the contaminated streams in an effluent treatment system and have carried out final monitoring

19. You must establish the water-quality requirements associated with each activity and identify whether you can substitute water from recycled sources and where you can, include it in your improvement plan.

20. Where there is scope for re-use (possibly after some form of treatment) you must keep less contaminated water streams, such as cooling waters, separate from more contaminated streams.

21. You must minimise the volume of water you use for cleaning and washing down by:

- vacuuming, scraping or mopping in preference to hosing down
- reusing wash water (or recycled water) where practicable
- using trigger controls on all hoses, hand lances and washing equipment

22. You must directly measure fresh water consumption and record it regularly at every significant usage point - ideally on a daily basis.

Waste minimisation, recovery and disposal

23. You must create and implement a residues management plan that:

- minimises the generation of residues arising from the treatment of waste
- optimises the reuse, regeneration, recycling or energy recovery of residues including packaging
- ensures the proper disposal of residues where recovery is technically or economically impractical

24. Where you must dispose of waste, you must carry out a detailed assessment identifying the best environmental options for waste disposal.

25. You must review on a regular basis options for recovering and disposing of waste produced at the facility. You must do this as part of the EMS to make sure that you are still using the best environmental options and promoting the recovery of waste where technically and economically viable.

12. Inhibition values for aerobic and anaerobic processes

Table A - general inhibitors for anaerobic processes

Determinant	Threshold
pH hydrolysis and fermentation acido and aceto genesis	Optimal pH 5-7
methanogenesis	Optimal pH 7-8, Operational 6.5-8.5
Temperature - below optimum. (mesophillic optimum Temperature 37 °C, Thermophillic optimum temperature 55°C)	The rate of activity will drop by approximately 50% for every 10 degrees below the respective optimum temperature (Caine, 1990).
Temperature above optimum (mesophillic optimum Temperature 37 °C)	Where the temperature is raised gradually above the mesophillic optimum, the cultures will adapt and thermophiles will become established. During this period performance will be reduced. Where temperature is raised suddenly by 10°C performance may reduce significantly.
Temperature above optimum (thermophilic optimum temperature 55°C)	Performance of thermophiles will drop if temperature is raised above the optimum values but will survive extreme increase up to 100 °C
Ammonium inhibition	Ammonium build up may inhibit the anaerobic process.

Table B - general inhibitors for aerobic processes

Determinant	Threshold
Moisture Content	Optimal range of 50-70%
pH	Optimal range of 6-8
C/N	Optimal range of 25:1-40:1

Table C – specific inhibitors aerobic treatment

The following table contains the inhibitive concentrations for a range of substances for aerobic treatment processes. Blanks indicate that there has been no data found within literature. The first column of data for aerobic treatment is based on the inhibition of respirometric activity, the second is based on the inhibition of nitrification.

This table does not list every substance which may prove inhibitory to aerobic or anaerobic organisms. You must also consider the potential inhibitory effect of other substances.

Parameter	Aerobic Treatment threshold mg/L Activated sludge	Aerobic Treatment threshold mg/L Nitrification	Comments/ Test methodology/Reference
Anthracene ug/l	500	-	
Arsenic (As)	0.1	1.5	
Cadmium (Cd)	1-10	5.2	
Chloride mg/kg	-	180	
Chromium (Cr) III	10-50	-	3.5 - 68 (trickling filter; EPA)
Chromium (Cr) total	1-100	0.25-1.9	1-100 (nitrification trickling filter EPA)
Chromium (Cr) VI	1	1-10*	*as chromate
Copper (Cu)	1	0.05-0.48	
Cyanide	0.1-5	0.34-0.5	30 (Trickling filter; EPA)
Iodine (I)	10	-	
Lead (Pb)	1-5 or 10-100	0.5	
Mercury (Hg)	0.1-1; 2.5 as Hg(II)	-	
Naphthalene	500 (EPA); 29-670	-	IC50 (mg/L) for Nitrosomonas and aerobic heterotrphs respectively
Nickel (Ni)	1.0-2.5; 5	0.25-0.5; 5	

Parameter	Aerobic Treatment threshold mg/L Activated sludge	Aerobic Treatment threshold mg/L Nitrification	Comments/ Test methodology/Reference
Phenantherene ug/l	500	-	
Sulphide	25-30	-	
Total ammonia nitrogen	480	-	
Zinc (Zn)	0.3-5; 5-10	0.08-0.5	

Table D – specific inhibitors anaerobic treatment

The following table contains the inhibitive concentrations for a range of substances for anaerobic treatment processes. Blanks indicate that there has been no data found within literature.

This table does not list every substance which may prove inhibitory to aerobic or anaerobic organisms. You must also consider the potential inhibitory effect of other substances.

Parameter	Anaerobic Treatment threshold g/L	Comments/ Test methodology/Reference
Acrylates	62 - 150 mg/l	Ref Blum and Speece
Alcohols	22-43000 mg/l	Short chain alcohols generally being less toxic than long chain alcohols (Blum and Speece)
Alkylbenzenes	160 - 580 mg/l	versus 1200 for benzene itself (Blum and Speece)
Aluminium (Al)	1	2% inhibition of methane production after 59 days. [150 mg/gTS not toxic (Mu et al., Chen)
Amines	13000 1-methylpyrrolidine mg/l	Ref Blum and Speece
Arsenic (As)	0.0016	"inhibitory concentration" EPA
Cadmium (Cd)	0.15-0.33	refs in Li and Fang
Calcium (Ca)	2.5-4	levels that can be tolerated; 8 g/L is strongly inhibitory (Chen)
Chlorinated aliphatics	0.5 - 600 mg/l	Depending on number and position of halo substituents (Blum and Speece)

Parameter		
Chromium (Cr) total	0.2	Methanogenesis (Li and Fang)
Copper (Cu)	0.009	acidogenesis is even more sensitive (by a factor of 10; Lin and Shiu) (Kerri et al)_
Fluoride (F)	0.018	Ref. Ochoa-Herrera
Halobenzenes	20-750 mg/l	depending on number and position of chloro substituents (Blum and Speece)
Halogenated alcohols	0.3 - 630 mg/l	Depending on the structure (Blum and Speece)
Halogenated carboxylic acids	< 0.001 to 0.01 mg/l	trichloroacetic acid is extremely toxic (Blum and Speece)
Halogenated phenols	2-300 for mono,-di and trichloros; 0.04 and 0.13 for penta and tetra mg/l	Ref Blum and Speece
Ketones	6000 - 50000 mg/l	Ref Blum and Speece
Lead (Pb)	3.2-8	refs in Li and Fang
Magnesium (Mg)	12	concentration tolerated by adapted methanogens (Chen)
Nickel (Ni)	0.1-1.6	refs in Li and Fang
Nitriles	90 - 28000 Acrylonitrile and Acetonitrile respectively mg/l	Ref Blum and Speece
Nitrobenzenes	13 nitrobenzene	Ref Blum and Speece
Nitrophenols	4-12 mg/l	Depending on the structure (Blum and Speece)
Phenol and alkylphenols	phenol 1850; o,m,and p-cresol 850, 925, 975 mg/l	Ref Fang

Parameter	Anaerobic Treatment threshold g/L	Comments/ Test methodology/Reference
Potassium (K)	2.8-14	sodium has antagonistic effects on potassium toxicity (Chen)
Silver (Ag)	0.1	100 mg/L is safe;
Sodium (Na)	5.6-53	differences attributed to adaptation period, antagonistic/synergistic effects, substrate and reactor configuration (Chen)
Sulphate	N/A	methane production is reduced by one mole for every mole of sulphate added due to sulphate reduction dominating over methanogenesis (Chen)
Sulphide	100-800	strong dependence on pH and speciation (Chen)
Surfactants	e.g. alkyl dimethylbenzylammonium chloride: 6.7; sodium alkyl ethersulfate: 11 mg/l	Madsen and Rasmussen
TiO_2 (mg/gTS)	150	not toxic (Mu et al.)
Total ammonia nitrogen	1.7-14	differences attributed to substrates, inocula, environmental conditions (temperature, pH and acclimation periods) (Chen)
Zinc (Zn)	0.03	as ZnO nanoparticles (Mu et al.)

(Inhibitory values are under review. Subject to that review, substances may be added or removed or values amended).