Draft BAT Guidance Note on Best Available Techniques for the Intensive Agriculture Sector

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Contents

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1. INTRODUCTION

1.1 GENERAL

This Guidance Note is one of a series issued by the Environmental Protection Agency (EPA) which provide guidance on the determination of Best Available Techniques (BAT) in relation to:

- applicants seeking Integrated Pollution Prevention and Control (IPPC) licences under Part IV of the Environmental Protection Agency Acts, 1992 and 2003,
- existing Integrated Pollution Control (IPC) licensees whose licence is to be reviewed under the Environmental Protection Agency Acts, 1992 and 2003,
- applicants seeking Waste licences under Part V of the Waste Management Acts 1996 to 2005,
- existing Waste licensees whose licence is to be reviewed under the Waste Management Acts 1996 to 2005.

This Guidance Note shall not be construed as negating the installation/facility statutory obligations or requirements under any other enactments or regulations.

1.2 BAT GUIDANCE NOTE STRUCTURE

This Guidance Note has been structured as follows:

Section	Details
1	Introduction
2	Interpretation of BAT
3	Sector Covered by this Guidance Note
4	Process Description, Risk to the Environment, and Control Techniques
5	Best Available Techniques in the Intensive Agriculture Sector
6	BAT-Associated Emission Levels
7	Compliance Monitoring

Where relevant, references are made to other detailed guidance, such as the reference documents (BREF) published by the European Commission, Agency Guidance Notes for *Noise in Relation to Scheduled Activities*, *The Landspreading of Organic Waste*, and the determination of BAT should be made having regard to these.

The information contained in this Guidance Note is intended for use as a tool to assist in determining BAT for the specified activities.

2. INTERPRETATION OF BAT

2.1 STATUS OF THIS GUIDANCE NOTE

This Guidance Note will be periodically reviewed and updated as required to reflect any

changes in legislation and in order to incorporate technological advances as they arise.

Techniques identified in these Guidance Notes are considered to be current best practice at the time of writing. The EPA encourages the development and introduction of new and innovative technologies and techniques which meet BAT criteria and look for continuous improvement in the overall environmental performance of the sector's activities as part of sustainable development.

2.2 INTERPRETATION OF BAT

BAT was introduced as a key principle in the IPPC Directive 96/61/EC. This Directive has been incorporated into Irish law via the Protection of the Environment Act 2003. To meet the requirements of this Directive, relevant Sections of the Environmental Protection Agency Act 1992 and the Waste Management Act 1996 have been amended to replace BATNEEC (Best Available Technology not entailing Excessive Costs) with BAT.

Best available techniques (BAT) is defined in Section 5 of the Environmental Protection Agency Acts, 1992 and 2003, and Section 5(2) of the Waste Management Acts 1996 to 2005, as the "most effective and advanced stage in the development of an activity and its methods of operation, which indicate the practical suitability of particular techniques for providing, in principle, the basis for emission limit values designed to prevent or eliminate or, where that is not practicable, generally to reduce an emission and its impact on the environment as a whole", where:

B ***'best'*** in relation to techniques, means the most effective in achieving a high general level of protection of the environment as a whole

A ***'available techniques'*** means those techniques developed on a scale which allows implementation in the relevant class of activity under economically and technically viable conditions, taking into consideration the costs and advantages, whether or not the techniques are used or produced within the State, as long as they are reasonably accessible to the person carrying on the activity

T ***'techniques'*** includes both the technology used and the way in which the installation is designed, built, managed, maintained, operated and decommissioned.

The range of BAT associated emission level values specified in Section 6 indicate those that are achievable through the use of a combination of the process techniques and abatement technologies specified as BAT in Section 5. The licensee must demonstrate to the satisfaction of the Agency, during the licensing process, that the installation/facility will be operated in such a way that all the appropriate preventative measures are taken against pollution through the application of BAT and justify the application of other than the most stringent ELV in the range.

At the installation/facility level, the most appropriate techniques will depend on local factors. A local assessment of the costs and benefits of the available options may be needed to establish the best option. The choice may be justified on:

- the technical characteristics of the installation/facility;
- its geographical location;
- local environmental considerations;

– the economic and technical viability of upgrading the existing installation/facility.

The overall objective of ensuring a high level of protection for the environment as a whole will often involve making a judgment between different types of environmental impact, and these judgments will often be influenced by local considerations. On the other hand, the obligation to ensure a high level of environmental protection including the minimisation of long-distance or transboundary pollution implies that the most appropriate techniques cannot be set on the basis of purely local considerations.

The guidance issued in this Note in respect of the use of any technology, technique or standard does not preclude the use of any other similar technology, technique or standard that may achieve the required emission standards and is demonstrated to the Agency to satisfy the requirement of BAT.

2.3 BAT HIERARCHY

In the identification of BAT, emphasis is placed on pollution prevention techniques rather than end-of-pipe treatment.

The IPPC Directive 96/61/EC and the Environmental Protection Agency Acts 1992 and 2003 (Section 5(3)), require the determination of BAT to consider in particular the following, giving regard to the likely costs and advantages of measures and to the principles of precaution and prevention:

(i) the use of low-waste technology,

(ii) the use of less hazardous substances,

(iii) the furthering of recovery and recycling of substances generated and used in the process and of waste, where appropriate,

(iv) comparable processes, facilities or methods of operation, which have been tried with success on an industrial scale,

(v) technological advances and changes in scientific knowledge and understanding,

(vi) the nature, effects and volume of the emissions concerned,

(vii) the commissioning dates for new or existing activities,

(viii) the length of time needed to introduce the best available techniques,

(ix) the consumption and nature of raw materials (including water) used in the process and their energy efficiency,

(x) the need to prevent or reduce to a minimum the overall impact of the emissions on the environment and the risks to it,

(xi) the need to prevent accidents and to minimize the consequences for the environment, and

(xii) the information published by the Commission of the European Communities pursuant to any exchange of information between Member States and the industries concerned on best available techniques, associated monitoring, and developments in them, or by international organisations, and such other matters as may be prescribed.

3. SECTOR COVERED BY THIS GUIDANCE NOTE

This Guidance Note covers the following activities under the First Schedule of the Environmental Protection Agency Acts 1992 and 2003:

6.1 The rearing of poultry in installations, whether within the same complex or within 100 metres of the same complex, where the capacity exceeds 40,000 places.

6.2 The rearing of pigs in an installation, whether within the same complex or within 100 metres of the same complex, where the capacity exceeds—

750 places for sows in a breeding unit, or

285 places for sows in an integrated unit, or

2,000 places for production pigs.

In this paragraph—

‘breeding unit’ means a piggery in which pigs are bred and reared up to 30kg in weight;

‘integrated unit’ means a piggery in which pigs are bred and reared to slaughter;

‘production pig’ means any pig over 30kg in weight which is being fattened for slaughter;

‘sow’ means a female pig after its first farrowing.

4 PROCESS DESCRIPTION, RISK TO THE ENVIRONMENT AND CONTROL TECHNIQUES

(Note: any reference to BREF in this document means the IPPC Reference Document on Best Available Techniques for Intensive Rearing of Poultry and Pigs (July 2003) published by the European Commission.)

4.1 DESCRIPTION OF PROCESS

Intensive agriculture involves the rearing, growing and finishing of animals for meat and/or egg production. As with all livestock production, intensive agriculture is concerned with the processing of feed into a form that is suitable for human consumption; the objective being to optimise feed utilisation while using production methods that are not harmful to the environment or to people and provide suitable animal welfare. The production systems do not generally require highly complex equipment and installations, but they increasingly require a high level of expertise to properly manage all the activities and to balance the production aims with the animals' welfare. Intensive livestock farms which have animal numbers above the IPPC thresholds are generally characterised by a high degree of specialisation and organisation.

The following relevant activities are considered part of the process, although not all of the activities will be found on every farm:

- farm management (including maintenance and cleaning of equipment)
- feeding strategy (and feed preparation)
- rearing of animals
- collection and storage of manure
- on-site treatment of manure
- landspreading of manure
- waste water treatment.

4.2 RISK TO THE ENVIRONMENT

Potentially, agricultural activities on intensive poultry and pig farms can contribute to a number of environmental phenomena:

- acidification (NH_3, SO_2, NO_X)
- eutrophication (N, P)
- reduction of ozone-layer (CH_3Br, when used as a fumigant)
- increase of greenhouse effect (CO_2, CH_4, N_2O)
- desiccation (groundwater use)
- local disturbance (odour, noise)
- diffuse spreading of heavy metals and pesticides.

The key environmental aspect of intensive livestock production is related to the natural living processes, i.e. that the animals metabolise feed and excrete a high proportion of the nutrients via manure. The quality and composition of the manure and the way it is stored and handled are the main factors which determine the emission levels of intensive livestock production.

The environmental issues associated with the relevant activities (listed in 4.1 above) include:

- the use of energy and water
- emissions to air (e.g. ammonia, odour and dust)
- emissions to soil and groundwater (e.g. nitrogen, phosphorus, metals)
- emissions to surface water
- emissions of waste other than manure or carcasses

4.3 Control Techniques

Good Agricultural practice for environmental management
The key to good practice is to consider how activities on pig and poultry farms can effect the environment and then take steps to avoid or minimise emissions or impacts; thereby putting environmental considerations firmly into the decision making process. For good practice to be achieved, the owner/manager must ensure that:

- Site selection and spatial aspects are considered (See BREF section 4.1.1).
- Education and training practices are identified and implemented (See BREF section 4.1.2).
- Activities are properly planned (See BREF section 4.1.3).
- Inputs and wastes are monitored (See BREF section 4.1.4).
- Emergency procedures are put in place (see BREF section 4.1.5).
- A repair and maintenance programme is implemented (see BREF section 4.1.6).

Nutritional management

Preventative measures will reduce the amounts of nutrients excreted by animals and thereby reduce the need for curative measures further down the production cycle. The following could be applied:

- Phase feeding (see BREF section 4.2.2).
- Addition of amino acids to make low protein, amino acid supplemented diets for pigs and poultry (see BREF section 4.2.3).
- Addition of phytase to make low phosphorous, phytase supplemented diets for pigs and poultry (see BREF section 4.2.4).
- Highly digestible inorganic feed phosphates (see BREF section 4.2.5).
- Other feed additives (see BREF section 4.2.6)

Water minimisation

A reduction of water use on farms can be achieved by reducing spillages when watering the animals and by reducing all other uses not immediately related to nutritional needs. Sensible use of water can be considered part of good agricultural practice (see BREF section 4.3).

Efficient use of energy

The efficiency of energy use can be improved by paying attention to the following areas:

- Fuels for heating (see BREF section 4.4.1.1)
- Electricity (see BREF section 4.4.1.2)
- Low-energy illumination (see BREF section 4.4.1.3)
- Heat recovery in broiler housing with heated and cooled littered floor (combideck) (see BREF section 4.4.1.4).

Minimisation of emissions to air

Emissions to air can be minimised on pig and poultry farms by a combination of measures under the following headings:

- Techniques for reducing emissions from poultry housing (see BREF section 4.5)
- Techniques for reducing emissions from pig housing (see BREF section 4.6)
- Techniques for the reduction of odour (see BREF section 4.7)
- Techniques for the reduction of emissions from storage (see BREF section 4.8).
- Techniques for on-farm processing of manure (see BREF section 4.9).
- Techniques for the reduction of emissions from application of manure to land (see BREF section 4.10).
- Techniques to reduce noise emissions (see BREF section 4.11).
- Techniques for the treatment and disposal of wastes other than manure and carcasses (see BREF section 4.12)

5 BEST AVAILABLE TECHNIQUES IN THE INTENSIVE AGRICULTURE SECTOR

5.1 INTRODUCTION

As explained in Section 2, this Guidance Note identifies BAT but obviously does so in the absence of site-specific information. Accordingly, it represents the requirements expected of any new activity covered by the Note, and ultimately the requirements expected of existing facilities, but exclude additional requirements, which may form part of the granting of a licence for a specific site.

5.2 BAT – GENERAL PREVENTIVE MEASURES

Good agricultural practice in the intensive rearing of pigs and poultry

To improve the general environment performance of an intensive livestock farm BAT is to do all of the following:

- Identify and implement education and training programmes for farm staff (see BREF section 4.1.2)
- Keep records of water and energy usage, amounts of livestock feed, waste arising and field applications of inorganic fertilisers and manure (see BREF section 4.1.4).
- Have an emergency procedure to deal with unplanned emissions and incidents (see BREF section 4.1.5).
- Implement a repair and maintenance programme to ensure that structures and equipment are in good working order and facilities are kept clean (see BREF section 4.1.6).
- Plan activities at the site properly, such as the delivery of materials and the removal of products and waste (see BREF section 4.1.3), and
- Plan the application of manure to land properly (see BREF section 4.1.3), such that:
    - (i) landspreading operations comply with the European Communities (Good Agricultural Practice for Protection of Waters) Regulations 2006 (S.I. No. 378 of 2006),
    - (ii) land is maintained in Good Agricultural and Environmental Condition (GAEC) as per Article 5 and Annex IV of Council Regulation (EC) No. 1782/2003; and
    - (iii) Manure is applied as a soil fertiliser in accordance with a nutrient management plan on clearly identified parcels of land.

Nutritional techniques involved in rearing pigs and poultry

Preventative measures will reduce the amounts of nutrients excreted by animals and thereby reduce the need for curative measures further down the production cycle (see BREF Section 5.2.1.1 and 5.3.1.1).

Nutritional techniques applied to nitrogen excretion

BAT is to apply feeding measures.

As far as nitrogen and consequently nitrates and ammonia outputs are concerned, a basis for BAT is to feed animals with successive diets (phase-feeding) with lower crude protein contents. These diets need to be supported by optimal amino acid supply from adequate feedstuffs and/or industrial amino acids (lysine, methionine, threonine, tryptophan).

A crude protein reduction of 2% to 3% can be achieved for pigs and a crude protein reduction of 1% to 2% can be achieved for poultry depending on the breed/genotype and the actual starting point for each type of animal. The resulting range of dietary crude protein is reported in Table 1and Table 2. The values in the tables are indicative only, because they, amongst others, depend on the energy content of the feed. Therefore levels may need to be adapted to local levels. Further research on applied nutrition is currently being carried out in a number of member states and may support further possible reductions in the future, depending on the effects of changes in the genotypes.

Table 1: Indicative total crude protein levels in BAT-feeds for pigs

Species	Phases	Crude protein content (% in feed)	Remark
Weaner	<10kg	19-21	With adequately balanced and optimal digestible amino acid supply
Piglet	<25kg	17.5-19.5	
Fattening pig	25-50kg	15-17	
	50-110kg	14-15	
Sow	Gestation	13-15	
	Lactation	16-17	

Table 2: Indicative total crude protein levels in BAT-feeds for poultry

Species	Phases	Crude protein content (% in feed)	Remark
Broiler	Starter	20-22	With adequately balanced and optimal digestible amino acid supply
	Grower	19-21	
	Finisher	18-20	
Turkey	<4 weeks	24-27	
	5-8 weeks	22-24	
	9-12 weeks	19-21	
	13+ weeks	16-19	
	16+ weeks	14-17	
Layer	18-40 weeks	15.5-16.5	
	40+ weeks	14.5-15.5	

Nutritional techniques applied to phosphorous excretion

Similar to nitrogen where phosphorous is concerned, a basis for BAT is to feed animals with successive diets (phase-feeding) with lower phosphorous contents. In these diets, highly digestible inorganic feed phosphates and/or phytase must be used in order to guarantee a sufficient supply of digestible phosphorous.

A total phosphorous reduction of 0.03% to 0.07% can be achieved for pigs and a total phosphorous reduction of 0.05% to 0.1% can be achieved for poultry depending on the breed/genotype and the actual starting point for each type of animal. The resulting range of dietary total protein is reported in Table 3 and Table 4. The values in the tables are indicative only, because they, amongst others, depend on the energy content of the feed. Therefore levels may need to be adapted to local levels. Further research on applied nutrition is currently being carried out in a number of member states and may support further possible reductions in the future, depending on the effects of changes in the genotypes. Article 32 of the European Communities (Good Agricultural Practice for Protection of Waters) Regulations 2006 (S.I. No. 378 of 2006) provides for the consideration of such nutrient reductions in terms of the issuing a certificate in relation to nutrient content of fertiliser.

Table 3: Indicative total phosphorous levels in BAT-feeds for pigs

Species	Phases	Total phosphorous content (% in feed)	Remark
Weaner	<10kg	0.75-0.85	With adequate digestible phosphorous by using e.g. highly digestible inorganic feed phosphates and/or phytase
Piglet	<25kg	0.60-0.70	
Fattening pig	25-50kg	0.45-0.55	
	50-110kg	0.38-0.49	
Sow	Gestation	0.43-0.51	
	Lactation	0.57-0.65	

Table 4: Indicative total phosphorus levels in BAT-feeds for poultry

Species	Phases	Total phosphorus content (% in feed)	Remark
Broiler	Starter	0.65-0.75	With adequate digestible phosphorous by using e.g. highly digestible inorganic feed phosphates and/or phytase.
	Grower	0.60-0.70	
	Finisher	0.57-0.67	
Turkey	<4 weeks	1.00-1.10	
	5-8 weeks	0.95-1.05	
	9-12 weeks	0.85-0.95	
	13+ weeks	0.80-0.90	
	16+ weeks	0.75-0.85	
Layer	18-40 weeks	0.45-0.55	
	40+ weeks	0.41-0.51	

Use of Feed Additives

Feed additives may also benefit the environment by reducing emissions of odorants (see EPA (OdourNet) Report section 9.7.1).
A number of feed producers claim benefits from feed additives in terms of reduced emissions of odorants. Additives include fats and oils, absorbing additives (e.g., calcium bentonite, zeolite and activated charcoal), plant extracts (i.e. sarsponin from the yucca plant), enzymes and microbial formulae.

Air emissions from pig housing

The reduction of ammonia emissions to the air from pig housing systems, as presented in Chapter 4, basically involves some or all of the following principles (see BREF section 5.2.2):

- Reducing emitting manure surfaces
- Removing the manure (slurry) from the pit to an external slurry store
- Applying an additional treatment, such as aeration, to obtain flushing liquid
- Cooling the manure surface
- Using surfaces (for example, of slats and manure channels) that are smooth and easy to clean.

Odour Emissions from Pig and Poultry Housing

Section 9.4 of the EPA OdourNet Report addresses the issue of Housing Design as a method for reduction of odour impact.

5.3 BAT – Preventive Measures for Specific Unit Operations

Housing systems for mating and gestating sows

BAT is:
- a fully or partly slatted floor with vacuum system for frequent slurry removal.
- a partly slatted floor and a reduced manure pit.

It is generally accepted that concrete slats give more ammonia emissions than plastic or metal slats. However, for the BAT mentioned above no information was available on the effect of different slats on the emissions or costs (see BREF section 5.2.2.1).

Housing system for growers and finishers

BAT is:
- a fully slatted floor with a vacuum system for frequent slurry removal, or
- a partly slatted floor with a reduced manure pit, including slanted walls and a vacuum system, or
- a partly slatted floor with a central, convex solid floor or an inclined solid floor at the front of the pen, a manure gutter with slanted sidewalls and a sloped manure pit.

It is generally accepted that concrete slats give more ammonia emissions than plastic or metal slats (see BREF section 5.2.2.2).

The following system is an example of what may be BAT for littered systems:

- A solid concrete floor with a littered external alley and a straw flow system (see BREF section 4.6.4.8).

Housing systems for farrowing sows

BAT is a crate with a fully slatted iron or plastic floor and with a:
- combination of water and manure channel, or
- flushing system with manure gutters, or
- manure pan underneath.

For new installations the following techniques are not BAT:

- crates with a partly slatted floor and a reduced manure pit, and
- crates with a fully slatted floor and a board on a slope.

However when these techniques are already in place it is accepted as BAT (see BREF section 5.2.2.3).

Housing systems for weaners

BAT is a pen:

- or flatdeck with a fully-slatted- or partly-slatted floor with a vacuum system for frequent slurry removal (see BREF section 4.6.1.1 and 4.6.1.6), or
- or flatdeck with a fully-slatted floor beneath which there is a concrete sloped floor to separate faeces and urine (see BREF section 4.6.3.1), or
- with a partly slatted floor (two-climate system) (see BREF section 4.6.3.4), or
- with a partly slatted iron or plastic floor and a sloped or convex solid floor (see BREF section 4.6.3.5), or
- with a partly slatted floor with metal or concrete slats and a shallow manure pit and channel for spoiled drinking water (see BREF section 4.6.3.6), or
- with a partly-slatted floor with triangular iron slats and manure channel with sloped side walls (see BREF section 4.6.3.9).

Air emissions from poultry housing

Housing system for layers (see BREF section 5.3.2.1),

BAT for cage housing is:

- a cage system with manure removal, at least twice a week, by way of manure belts to a closed storage system (see BREF section 4.5.1.4), or
- vertical tiered cages with manure belt with forced air drying, where the manure is removed at least once a week to covered storage (see BREF section 4.5.1.5.1), or
- vertical tiered cages with manure belt with whisk-forced air drying, where the manure is removed at least once a week to covered storage (see BREF section 4.5.1.5.2), or
- vertical tiered cages with manure belt with improved forced air drying, where the manure is removed at least once a week to covered storage (see BREF section 4.5.1.5.3), or
- vertical tiered cages with manure belt with drying tunnels over the cages; after 24-36 hours the manure is removed to covered storage (see BREF section 4.5.1.5.4).

Drying of the manure on the belts requires energy. Although energy requirements have not been reported for all techniques, a higher emission reduction generally requires a higher energy input.

BAT for non-cage housing is:

- a deep litter system with forced air drying (see BREF Section 4.5.2.1.2), or
- a deep litter system with a perforated floor and forced air drying (see BREF section 4.5.2.1.3), or
- an aviary system with or without range and/or outside scratching area (see BREF section 4.5.2.2).

Housing systems for broilers

BAT is (see BREF section 5.3.2.2):

- the naturally ventilated house with a fully littered floor and equipped with non-leaking drinking systems, or
- the well insulated fan ventilated house with a fully littered floor and equipped with non-leaking drinking systems (i.e. VEA system which is the Dutch abbreviation for “broiler low emission housing” where attention is paid to insulation of the building, to the drinking system to avoid spillage and the application of wood shavings/sawdust.)

BAT for housing systems that are already in place:

- A perforated floor system with forced air drying system (see BREF section 4.5.3.1), or
- A tiered floor with forced air drying system (see BREF Section 4.5.3.2), or
- A tiered cage system with removable cage slides and force drying of manure (see BREF section 4.5.3.3).

Poultry stocking density must not exceed 38kg/m^2 throughout the growing cycle.

Building specifications for agricultural housing can be found in the Department of Agriculture and Food documents on:

1) ‘S101: Minimum Specification for the Structure of Farm Structures’ for all superstructures.
2) ‘S102: Cladding Materials’ for all roof and side cladding.
3) ‘S123: Minimum Specification for Bovine Livestock Units and Reinforced Concrete Tanks’ for all tanks.
4) ‘S129: Farmyard Drainage’
5) ‘S144: Minimum specification for loose dry sow units.

5.4 BAT – Measures for Treatment, Abatement & Disposal

Water

Reduction of water use is a matter of awareness and is primarily a matter of farm management (see BREF section 5.3.3 and 5.2.3).

BAT for pig and poultry is to reduce water by doing all of the following:

- cleaning animal housing and equipment with high-pressure cleaners. Typically wash-down water enters the slurry system and therefore it is important to find a balance between cleanliness and using as little water as possible.
- carrying out a regular calibration of the drinking water installation to avoid spill.
- keeping record of water use through metering of consumption, and
- detecting and repairing leakages.
- Regular analysis of drinking water on poultry units for coliforms and faecal coliform.

Energy

BAT is to reduce energy use by application of good farming practices starting with animal housing design and by adequate operation and maintenance of the housing equipment (see BREF section 5.2.4 and 5.3.4).

BAT for pig housing is to reduce energy use by doing the following:

- Apply natural ventilation where possible; this needs proper design of the building and pens and spatial planning with respect to prevailing wind direction to enhance windflow; this applies only to new housing
- For mechanically ventilated houses: optimising the design of the ventilation system in each house to provide good temperature control and to achieve minimum ventilation rates in winter
- For mechanically ventilated houses: avoiding resistance in ventilation systems through frequent inspections and cleaning of ducts and fans, and
- Applying low energy lighting.

BAT for poultry housing is to reduce energy use by doing the following:

- Insulating buildings in regions with low ambient temperatures (U-values 0.4 $W/m^2/{}^oC$ or better)
- Optimising the design of the ventilation system in each house to provide good temperature control and to achieve minimum ventilation rates in winter
- Avoiding resistance in ventilation systems through frequent inspection and cleaning of ducts and fans, and
- Applying low energy lighting.

Manure storage

BAT is to design storage facilities for pig manure with sufficient capacity (26 weeks) until further treatment or land application can be carried out (see BREF

section 5.2.5 and 5.3.5). Storage for 26 weeks is specified under Nitrates Regulations S.I 378 of 2006 unless exemptions under the Regulation apply.

For a heap of pig or poultry manure that is always situated in the same place either on the pig/poultry farmyard or agreed location BAT is to:

- Apply a concrete base with a collection system and a tank for run-off liquid, and
- Locate any new manure storage facility where it is least likely to cause any annoyance to sensitive receptors for odours, taking into account the prevailing wind and the distance from the receptors.
- If poultry manure needs to be stored BAT is to store dried poultry manure in a barn with an impermeable floor and sufficient ventilation

For temporary manure heaps, BAT is to position the manure heap away from sensitive receptors such as, neighbours, and watercourses (including field drains) that liquid run-off might enter.

The manure heap shall not be placed within:
(a) 250m of the abstraction point of any surface watercourse or borehole, spring or well used for the abstraction of water for human consumption in a water scheme supplying $10m^3$ or more of water per day or serving 50 or more persons;
(b) 50m of any other borehole, spring or well used for the abstraction of water for human consumption other than a borehole, spring or well specified at paragraph (a),
(c) 20m of a lake shoreline;
(d) 50m of exposed cavernous or karstified limestone features (such as swallow-holes and collapse features), or
(e) 10m of a surface watercourse (other than a lake or a surface watercourse specified at paragraph (a)).

BAT on the storage of slurry in a concrete or steel tank comprises all of the following:

- A stable tank able to withstand likely mechanical, thermal and chemical influences.
- The base and walls of the tank are impermeable and protected against corrosion
- The store is emptied regularly for inspection and maintenance, preferably every year
- Double valves are used on any valved outlet from the store
- The slurry is agitated, as necessary before emptying the tank.

It is BAT to cover slurry tanks using one of the following options:

- A rigid lid, roof or tent structure, or
- A floating cover such as chopped straw, natural crust, canvas, foil, peat, light expanded clay (LECA) or expanded polystyrene (EPS).

A method to reduce odour from slurry storage may be to encourage the formation of a crust in open slurry pits this may require the addition of fibrous material (see OdourNet report, section 9.9)

On farm manure processing

On farm processing is BAT only under certain conditions. The conditions of on-farm processing that determines if a technique is BAT relate to conditions such as land availability, local nutrient excess or demand, technical assistance, marketing possibilities for green energy and local regulations (see BREF Section 5.2.6 and 5.3.6).

Odour counter-actants and masking agents may be added to manure to provide immediate relief from manure odour (see OodourNet report, section 9.7.3)

Where air can be ducted to a central point for treatment there are a number of options for reducing the odour concentration in the exhaust air:
- Chemical scrubbing
- Biological scrubbing
- Biofiltration

The cost is the main factor in determining whether or not these strategies are feasible (see OdourNet report, sections 9.8.1 – 9.8.3)

Techniques for landspreading pig and poultry manure

BAT on the management of landspreading manure (see BREF Section 5.1 and 5.2.7):

- Manure should be applied to land in as accurate and uniform a manner as is practically possible.

- Not applying manure to land when :
  - the land is waterlogged
  - the land is flooded or likely to flood
  - the land is snow-covered or frozen
  - heavy rain is forecast within 48 hours.

- Not applying manure to steeply sloping fields and taking into account factors such as proximity to waters, soil condition, ground cover and rainfall, there is significant risk of causing water pollution.

- Not applying manure adjacent to any watercourse (leaving an untreated strip of land), and spreading the manure as close as possible before maximum crop growth and nutrient uptake occurs.
- Land application of manure must follow a field based nutrient management plan drafted according to approved recommendations and codes of good management practice.

BAT is managing the landspreading of manure to reduce odour nuisance where neighbours are likely to be affected, by doing all of the following:

- Spreading during the day when people are less likely to be at home and avoiding weekends and public holidays, and
- Paying attention to wind direction in relation to neighbouring houses.

BAT concerning the equipment for landspreading pig and poultry manure:

- Operators have to be trained in order to use the equipment to spread manure according to prescriptions and to perform regular calibration of the spreading equipment used.
- Equipment used must have a distribution system that provides good evenness of spread.
- On bare tillage ground the application of liquid manure must be performed at appropriate times by shallow injection or by band spreading or surface application followed by incorporation.
- The application of liquid manure on grassland and other growing crops must be carried out at the appropriate times using trailing shoes or band spreaders.
- Applying slurry to land using the conventional broadcast spreader is not BAT but is currently acceptable under Irish legislation (downward facing splashplate).
- BAT on landspreading – wet or dry – solid poultry manure is incorporation within 12 hours. Incorporation can only be applied to arable land that can be easily cultivated.
- BAT conclusions for landspreading of pig manure are shown in table 5.

The Nitrates Regulations S.I. 378 of 2006 specifies periods during the winter when the application of organic fertilisers and farmyard manure shall not be applied to land. Records in the form of a slurry register shall be maintained on-site in relation to all slurry/manure movements.

Table 5: BAT on landspreading equipment

Land use	BAT	Emission reduction	Type of manure	Applicability
Grassland and land with crop height below 30cm	Trailing shoe (bandspreading)	30% This may be less if applied on grass height >10cm	Slurry	Slope (<15% for tankers; <25% for umbilical systems; not for slurry that is viscous or has a high straw content, size and shape of the field are important
Mainly grassland	Trailing shoe (bandspreading)	40%	Slurry	Slope (<20% for tankers; <30% for umbilical systems); not viscous slurry, size and shape of the field, grass less than 8cm high.
Grassland	Shallow injection (open slot)	60%	Slurry	Slope <12%, greater limitations for soil type and conditions, not viscous slurry
Mainly grassland, arable land	Deep injection (closed slot)	80%	Slurry	Slope <12%, greater limitations for soil type and conditions, not viscous slurry
Arable land	Bandspreading and incorporation within 4 hours Note 1	80%	Slurry	Incorporation is only applicable for land that can be easily cultivated, in other situations BAT is bandspreading without incorporation
Arable land	Incorporation as soon as possible, but at least within 12 hours	Within 4 hrs: 80% 12 hrs: 60-70%	Solid pig manure	Only for land that can be easily cultivated

Note 1: The BREF note identifies that a split view was expressed on incorporation within 4 hours and it claimed that bandspreading itself gives reductions of 30-40%.

Recovery of Slurry/Manure

There is a requirement for the intensive agricultural sector to demonstrate recovery capacity for nutrients generated. A nutrient management plan (NMP) shall be prepared based on the available nutrients in the pig/poultry manure, the nutrient requirements of the land and the crop grown thereon. The NMP shall

take account of Teagasc, REPS and Nitrates Regulations recommendations and the parcels of land shall be clearly identified.

Application of organic fertiliser should be made only in the growing season and as early as possible.

Other Wastes

Carcasses should be stored on site in covered containers and transported to an approved rendering facility in covered, leakproof containers as soon as practical and at least once per fortnight.
Waste packaging materials should be recovered and recycled, where practicable. Packaging waste, contaminated drums, equipment and protective clothing, which are not reused or recycled, should be disposed of at an authorised facility.

6. BAT-ASSOCIATED EMISSION LEVELS

6.1 EMISSION LEVELS FOR DISCHARGES TO AIR

No emissions, including odours, from the activities carried on at the site shall result in an impairment of, or an interference with amenities or the environment beyond the installation boundary or any other legitimate uses of the environment beyond the installation boundary

6.2 EMISSION LEVELS FOR DISCHARGES TO WATER

There should be no emission of process or contaminated surface run-off to water.

6.3 EMISSIONS TO LAND

Land application of slurry/manure shall be undertaken in accordance with a nutrient management plan on clearly identified parcels of land.

7 COMPLIANCE MONITORING

7.1 MONITORING OF EMISSIONS TO AIR

Periodic monitoring of air quality, with regard to odour, at the boundary of the site and associated with the spreading of slurry/manure shall be undertaken as per licence.

7.2 MONITORING OF AQUEOUS EMISSIONS

Periodic surface water quality monitoring of relevant parameters shall be undertaken as per licence.

7.3 MONITORING OF EMISSIONS TO GROUNDWATER/GROUNDWATER QUALITY MONITORING SCHEME

Periodic groundwater quality monitoring of relevant parameters shall be undertaken as per licence.

7.4 MONITORING OF SOLID WASTE/NUTRIENT MANAGEMENT PLAN

A Nutrient Management Plan (NMP) prepared in accordance with Agency guidance should be maintained on site for the management of slurry/manure arising at the unit.

Appendix 1

PRINCIPAL REFERENCES

The Single Payment Scheme, Guide to Cross Compliance March 2005. The Department of Agriculture & Food.

The Single Payment Scheme, Guide to Cross Compliance Requirements to be Implemented in 2006 and 2007. The Department of Agriculture & Food.

Explanatory Handbook for Good Agricultural Practice Regulations, November 2006. The Department of Agriculture & Food.

Odour Impacts and Odour Emission Control Measures for Intensive Agriculture. Final Report. EPA 2001. Issued by OdourNet UK Ltd.

Chicken Quality Assurance Scheme, Code of Practice for Chicken Producers. Bord Bia Irish Food Board, Revision 01/January 2003.

Statutory Instruments S.I. No. 378 of 2006, European Communities (Good Agricultural Practice for Protection of Waters) Regulations 2006

IPPC Reference Document on Best Available Techniques for Intensive Rearing of Poultry and Pigs (July 2003) published by the European Commission