
# BAT Guidance Note on Best Available Techniques for the Purposes of the Production of Food Products from Vegetable & Animal Raw Materials

(1st Edition)

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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) licenses under Part IV of the Environmental Protection Agency Acts 1992 to 2007,
- existing Integrated Pollution Prevention and Control (IPPC) Licensees, whose licence is to be reviewed under the Environmental Protection Agency Acts 1992 to 2007,
- applicants seeking Waste Licenses under Part V of the Waste Management Acts 1996 to 2008,
- existing Waste Licensees, whose licence is to be reviewed under the Waste Management Acts 1996 to 2008.

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 |
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| 1 | Introduction |
| 2 | Interpretation of BAT |
| 3 | Sector covered by this Guidance Note |
| 4 | Process Description, Risk to the Environment, and Control Techniques |
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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*, and the determination of BAT should be made giving 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

The concept of BAT was introduced as a key principle in the IPPC Directive 96/61/EC. This Directive has been incorporated into Irish law by 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. Thus, for activities falling within the scope of the Directive and regulated by these Acts, BAT must be applied.

Best available techniques (BAT) is defined in Section 5 of the Environmental Protection Agency Acts 1992 to 2007 and Section 5(2) of the Waste Management Acts 1996 to 2008 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 values designed to prevent or eliminate or where that is not practicable, generally to reduce an emission and its impacts 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 the 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 out 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 facility/installation;
- Its geographical location;
- Local environmental considerations;
- The economic and technical viability of upgrading existing installations

The overall objective of ensuring a high level of protection for the environment as a whole will often involve making trade-off judgments between different types of environmental impacts, 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 to 2007 (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 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 minimise 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 organisation, 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 to the Environmental Protection Agency Acts 1992 to 2007:

7.8 Treatments or processes for the purposes of the production of food products from:

(a) animal raw materials (other than milk) with a finished product production capacity greater than 75 tonnes per day,

(b) vegetable raw materials with a finished product production capacity greater than 300 tonnes per day (average value on a quarterly basis).

This guidance note also specifically covers the manufacture of animal meal and pet foods manufactured from both (a) animal raw materials and (b) vegetable raw materials.

# 4. PROCESS DESCRIPTION, RISK TO THE ENVIRONMENT, AND CONTROL TECHNIQUES

(Note: any reference to BREF in this document means the reference document on *Best Available Techniques in the Food, Drink and Milk Industry*, published by the European Commission, January 2006).

## 4.1 DESCRIPTION OF PROCESS

The primary steps involved in the manufacture of food products from animal & vegetable raw materials are:

- Materials, handling, unpacking and storage (see BREF Section 2.1.1.1)
- Sorting, screening, grading, dehulling, trimming (see BREF Section 2.1.1.2)
- Cutting, Slicing, chopping, mincing, pulping (see BREF Section 2.1.2.1)
- Mixing, blending, conching, homogenisaton (see BREF Section 2.1.2.2)
- Grinding, milling, crushing (see BREF Section 2.1.2.3)
- Forming, moulding, extruding (see BREF Section 2.1.2.4)
- Cooling, chilling (see BREF Section 2.1.7.1)
- Packing, filling (see BREF Section 2.1.8.1)

Then For Pet Foods - Moist and Dry:

- Cooking, boiling (see BREF Section 2.1.5.3)
- Tempering (see BREF Section 2.1.5.7)
- Pasteurisation, sterilisation, UHT (see BREF Section 2.1.5.8)
- Freezing (see BREF Section 2.1.7.2)

Then For Dry Pet Foods only:

- Coating, spraying, enrobing, agglomerisation, encapsulation (see BREF Section 2.1.4.13)
- Baking (see BREF Section 2.1.5.4)
- Roasting (see BREF Section 2.1.5.5)
- Frying (see BREF Section 2.1.5.6)
- Drying (see BREF Section 2.1.6.2)
- Dehydration (see BREF Section 2.1.6.3).

### 4.1.1 Cleaning

In addition to the above processing steps, cleaning of process equipment, containers, floors, etc. is carried out on a daily basis. In animal meal production CIP is not relevant and intense cleaning is minimal (see BREF Section 2.1.9.1).

### 4.1.2 Utility Processes

A number of utility processes are utilised in the manufacture of food products from animal & vegetable raw materials including energy generation/consumption, water treatment, refrigeration and compressed air & vacuum generation (see BREF Sections 2.1.9.2, 2.1.9.3, 2.1.9.4, 2.1.9.5 and 2.1.9.6).

## 4.2 RISK TO THE ENVIRONMENT

The key environmental issues associated with the manufacture of food products from animal & vegetable raw materials are high water and energy consumption, wastewater with a high dissolved organic load, dust and malodorous emissions. See description in BREF Section 3.2 for emissions to the environment from specific unit operations as listed in Section 4.1 of this document.

### 4.2.1 Water Consumption

Water consumption for the manufacture of food products from animal & vegetable raw materials is mainly used in the technology for cooling and commercial sterilisation. Cleaning of equipment, particularly at intake and blending, cooking and filling can result in increased water consumption. For animal meal however, water consumption is minimal.

### 4.2.2 Energy Use

Energy consumption is associated with heating processes such as direct steam injection, cooking, drying, commercial sterilisation and cooling. See description in BREF Section 3.2 for details and energy consumption for specific unit processes as detailed in Section 4.1 of this document.

### 4.2.3 Emissions to Air

Emissions to air include SOx, NOx, CO and particulates from energy generation and dust from material intake, e.g. dust from grain intake and grinding processes, gels, gums and additives handling. Odorous emissions can also be an issue from the cooking and drying of animal raw materials as well as emissions at cyclones from vegetable by-products.

### 4.2.4 Emissions to Water

Emissions to water from the manufacture of food products from animal & vegetable raw materials consist of organic material contributing BOD, suspended solids, and oils fats and greases.

### 4.2.5 Waste

Solid waste and by-products from the production of products from animal & vegetable raw materials include raw meat material, particulates, grains, packaging waste, oils fats and greases from the cooking process and sludges from wastewater (High solids content sludge, sludge for effluent treatment).

### 4.2.6 Noise

The main sources of noise associated with the manufacture of food products from animal & vegetable raw materials are from the high-speed grinders, direct steam

injectors, conveyors, refrigeration units (mobile and stationary) and filling lines. Transport noise from delivery vehicles is also an issue. See BREF Section 3.2 for general description of noise sources from specific unit processes in the food and drink sector.

## 4.3 CONTROL TECHNIQUES

The existing or possible measures for eliminating, reducing and controlling emissions in the manufacture of food products from animal & vegetable raw materials are described in this Section. References to more details and descriptions in the BREF document are given.

### 4.3.1 General Preventative Techniques

The following general techniques can be applied to all facilities producing food from animal & vegetable raw materials plants:

- Environmental Management (see BREF Section 4.1.1)
- Monitoring and targeting of energy, water consumption, waste and wastewater emissions (see BREF Sections 4.1.6).

#### *4.3.1.1 Minimisation of Water Consumption*

The following techniques can minimise water usage in the manufacture of food products from animal & vegetable raw materials:

- Implement a methodology for reducing water consumption (see BREF Section 4.1.6)
- Ensure the regular maintenance of utility systems to reduce water consumption and wastewater production (see BREF Section 4.1.5)
- Eliminate the use of water where possible (see BREF Section 4.2.14)
- Optimise cleaning procedures and provide training (see BREF Section 4.3)
- Employ good housekeeping measures (see BREF Section 4.1.7.11) such as optimising water consumption by monitoring water pressure and the condition of water spray nozzles
- Recycling/reuse water where possible (see BREF Section 4.1.7 and 4.1.8).

#### *4.3.1.2 Minimisation of Energy Consumption*

The following techniques can minimise energy consumption in the manufacture of food products from animal & vegetable raw materials:

- Apply a methodology for improving energy efficiency:
    - Carry out energy consumption analysis (see BREF Section 4.1.6.2.2)
    - Identify energy efficiency measures (see BREF Section 4.1.6.4)
    - Implement an energy management system (see BREF Section 4.1.6.6)
- Employ good housekeeping and process optimisation (see BREF Section 4.1.7 and 4.1.8)
- Employ energy efficiency techniques:
    - Employ heat recovery (see BREF Section 4.2.13.4)

- Use combined heat and power generation for electricity and thermal requirements (see BREF Section 4.2.13.1.1)
- Use frequency converters on motors (see BREF Section 4.2.13.9)
- Minimise heat/energy losses through proper insulation of steam and water pipework (see BREF Section 4.2.13.3)
- Use fluidized bed drying or low temperature drying followed by high temperature for concentration of solids

- Use an energy monitoring system (see BREF Section 4.1.6.7).

#### *4.3.1.3 Minimisation of Emissions to Air*

The following techniques can prevent or minimise the formation of air emissions and odour in the manufacture of food products from animal & vegetable raw materials:

- Air emissions control strategy (see BREF Section 4.4.1)
- Use natural gas in boilers, where a natural gas supply is available, or biomass fuels (see BREF Section 3.2.38.4). Otherwise use low sulphur fuel oil (Sulphur content <1%)
- Use appropriate storage and handling techniques to contain emissions, e.g. dust (see BREF Section 4.2.1)
- Reduce odour through frequent cleaning of material storage areas (see BREF Section 4.3.10)
- Short term and possibly cold storage of raw materials (i.e. animal materials) before processing (see BREF Section 4.1.7.3)
- Enclose raw materials (e.g. grains) during transport, loading / unloading and storage to reduce odour and dust and enclose all odour generating activities using negative pressure extraction units such as in storage, handling and processing areas.
- Ensure all spillages are cleaned as soon as possible to reduce risk of odour and dust emissions (see BREF Section 4.3.10)
- Audit odour to identify and characterise sources and determine any action required (see BREF Section 4.4.1.2). Remove malodorous material to appropriate storage.
- Employ good management techniques to ensure optimum inventory control and material rotation (see BREF Section 4.1.7)
- Aerate and cover wastewater treatment plants to prevent odour if required. Alternatively use anaerobic digestion for wastewater treatment.

#### *4.3.1.4 Minimisation of Wastewater*

The following techniques can minimise or prevent the volume and contamination level of emissions to water from the manufacture of food products from animal & vegetable raw materials:

- Segregation of process water from uncontaminated storm or other water (see BREF Section 4.1.7.8)
- Optimise cleaning procedures to reduce wastewater load (see BREF Section 4.3).

#### *4.3.1.5 Waste Minimisation*

The following techniques can minimise the volume of waste from the manufacture of food products from animal & vegetable raw materials:

- Implement a waste minimisation methodology (see BREF Section 4.4.1)
- Reduce waste emissions during storage and handling (see BREF Section 4.4.4.1):
    - Control dust during loading/unloading, conveying, grinding and storage
    - Contain emissions, e.g. bunding, local extract systems, etc. (see BREF Section 4.6.4)
- Optimise packaging line efficiency (see BREF Section 4.2.12.4)
- Optimise the process through good housekeeping (see BREF Section 4.4.2.1) and operating practices (see BREF Section 4.1.7 and 4.2.12)
- Improve process control (see BREF Section 4.1.8)
- Use raw materials more efficiently (see BREF Section 4.1.9)
- Recycle or reuse solid by products or sludge produced:
    - Recycle packaging waste (e.g. cans, cardboard, paper, plastic) (see BREF Section 4.1.9)
    - Recycle high solids waste for pet food manufacture for resale as animal feed following further processing (see BREF Section 4.1.7.7).

#### *4.3.1.6 Minimisation of Noise*

General techniques for the reduction of noise from food industrial activities include:

- Use silencers on ventilation systems (see BREF Section 4.2.16.3)
- Modify external fans to produce higher frequency noise (see BREF Section 4.1.3.3)
- Insulate pipework or use pipework with better insulating properties for the transport of materials (see BREF Section 4.1.3.4)
- Enclose noisy equipment (e.g. grinding equipment) in insulated buildings where possible (see BREF Section 4.1.3.5)
- Installation design considerations (see BREF Section 4.1.4).

### 4.3.2 Preventative Techniques of Specific Unit Operations

#### *4.3.2.1 Raw Materials Reception and Preparation*

- Ensure supply of fresh raw material and product demand are balanced economically to prevent raw material degradation and foul odour generation (see BREF Section 4.1.7.3)
- Employ appropriate storage and handling techniques to ensure integrity of raw materials, e.g. cold storage, freezing and to contain emissions such as dust from gels, gums and additive handling (see BREF Section 4.2)
- Employ good housekeeping measures (see BREF Section 4.1.7.11) such as optimising water consumption by monitoring water pressure and the condition of water spray nozzles (see BREF Section 4.1.8)

- Consider using a central washing system. Use appropriate cleaning chemicals, hot water and medium pressure systems
- Monitor drips to floor from process equipment
- Collect spillage in return containers rather than washing to drain
- Prevent meat scraps, ingredient and product from entering the drains where practicable
- Use appropriate measures to minimise noise at conveyors and cooling fans
- Optimise the process control to minimise spoilage, out of specification product, water usage and other losses through measurement of parameters such as temperature, pressure and flow (see BREF Section 4.1.8).

#### *4.3.2.2 Size Reduction, Mixing, Forming, Product Processing*

- Enclose noisy equipment (e.g. grinding equipment) in insulated buildings where possible (see BREF Section 4.1.3 and 4.1.4) and use appropriate process measures to minimise noise at live steam injectors
- Meter process water for mixing
- Minimise heat/energy losses through proper insulation of steam and water pipework (see BREF Section 4.2.13.3)
- Employ efficient dust handling techniques - bag filtering, multicyclone systems, local to intake, blending and conveying or install an appropriate and efficient dust blowing system for independent handling
- Particulate matter should be recovered in extracted air and reused in the process where practicable (see BREF Sections 2.1.5.5.3)
- Employ odour neutralisers at cyclones in the animal meal industry to prevent malodours to the atmosphere arising from vegetable by-products such as citrus pulps
- Prevent meat scraps, ingredient and product from entering the drains where practicable
- Optimise the process control to minimise spoilage, out of specification product, water usage and other losses through measurement of parameters such as temperature, pressure and flow (see BREF Section 4.1.7 and 4.1.8)
- Apply a methodology for improving energy efficiency such as frequency converters on motors (see BREF Section 4.2.13).

#### *4.3.2.3 Heat Processing*

- Use efficient retort sterilisers
- Identify measures for reducing water consumption (see BREF Section 4.1.6.2.1)
- Optimise sterilisation process to improve on frequency of water change
- Recover steam condensate for reuse where practicable, e.g. boiler feed water
- Optimise the process control to minimise water usage and other losses through measurement of parameters such as temperature, pressure and flow (see BREF Section 4.1.8)
- Optimise start up and shut down procedure for retort sterilisers
- Employ energy efficient techniques (see Section 4.3.1.2 of this document).

#### *4.3.2.4 Processing by Removal of Heat*

- Use closed circuit cooling systems instead of once through cooling (see BREF Section 4.2.10.3)
- Employ heat recovery (see BREF Section 4.2.13.4 and 4.2.13.15). Reuse water from sterilisation following treatment for cooling cycles, cleaning and washing water (cans) where possible (see BREF Section 4.1.7.6)
- Use appropriate handling techniques to contain emissions such as dust during suction cooling, e.g. bag houses, mutlicyclones (see BREF Section 4.4.3.5).

#### *4.3.2.5 Post Processing Operations*

- Collect spillage in return containers rather than washing to drain
- Optimise the process control for flushing of the system prior to product changeover (see BREF Section 4.3.4)
- Use appropriate measures to minimise noise at conveyors
- Recycle packaging. Employ appropriate equipment to aid recycling such as high density compactors for cardboard
- Segregate packaging material waste. Recycle packaging and waste package materials (e.g. cans, cardboard, paper, plastic) waste (see BREF Section 4.2.12.3)
- Optimise packaging line efficiency (see BREF Section 4.2.12.4)
- Avoid overfilling of product to containers (see BREF Section 4.2.12.6).

#### *4.3.2.6 Cleaning and Sanitation*

- Optimise cleaning procedures and provide training (see BREF Section 4.3)
- Select cleaning materials/chemicals for minimal impact on the environment (see BREF Section 4.3.8)
- Use of pressure cleaning and pressure controlled water via nozzles throughout the installation (see BREF Section 4.3.7)
- Fit cleaning hoses with hand operated triggers (see BREF Section 4.3.6)
- Optimise cleaning procedures (e.g. CIP) to reduce water consumption and wastewater load (see BREF Section 4.3.9).

### 4.3.3 Treatment Techniques

#### *4.3.3.1 Treatment of Air Emissions*

The following techniques can be used for the manufacture of food products from animal & vegetable raw materials to treat air emissions and odour:

- Use dynamic, bag filters, multicyclones or electrostatic separators on exhaust air to remove particulates (see BREF Section 4.4.35 and 4.4.3.7)
- Use of biofilters or bioscrubbers on exhaust air to remove odour (see BREF Section 4.4.3.10)
- Use of masking agents / odour neutralisers

- Use of an absorption system such as a packed bed or plate absorber on exhaust air to remove odour (see BREF Section 4.4.3.8)
- Use of an adsorption system such as activated carbon on exhaust air to remove odour (see BREF Section 4.4.3.9)
- Use thermal, boiler or catalytic treatment to control emissions from exhaust air (see BREF Section 4.4.3.11)
- Dispersion of odours through capture of air and exhausting through an appropriately designed stack of sufficient height and configuration (see BREF Section 4.4.3.13).

#### *4.3.3.2 Treatment of Wastewater*

The following techniques can be used to treat wastewater from the manufacture of food products from animal & vegetable raw materials:

- Select between treatment at source, centralised on site treatment or off site treatment of wastewater (see BREF Sections 4.5.1)
- Segregation of process water from uncontaminated storm or other water so that uncontaminated water may be recycled (see BREF Section 4.1.7.8)
- Use of primary treatment such as screening, sedimentation and flotation (see BREF Section 4.5.2)
- Use biological treatment systems to biodegrade organic substances:
    - Anaerobic treatment for high strength wastewater (see BREF Section 4.5.3.2)
    - Aerobic treatment (see BREF Section 4.5.3.1)
- Use tertiary treatment systems for further removal of organic and inorganic substances for discharges to water courses or recycling of final effluent is required (see BREF Section 4.5.4).

#### *4.3.3.3 Treatment of Waste*

The following techniques can be used to treat/dispose waste from the manufacture of food products from animal & vegetable raw materials:

- Recycle/reuse/recover where possible:
    - Recycle packaging waste (e.g. cans, cardboard, paper, plastic) (see BREF Sections 4.3.6 and 4.2.12.3)
    - Reuse collected dust particulates in the process where practicable.
- In treating wastewater sludges, the following techniques alone or in combination may be used (see BREF Section 4.5.6):
    - Thickening of the sludge
    - Dewatering of the sludge
    - Stabilization of the sludge through chemical, thermal or biological (aerobic or anaerobic digestion) means
    - Drying
- Landfilling. Applicable for material that is not suitable for reuse/recycle.

# 5. BEST AVAILABLE TECHNIQUES FOR THE PRUPOSES OF THE PRODUCTION OF FOOD PRODUCTS FROM VEGETABLE & ANIMAL RAW MATERIALS

## 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.

The technical feasibility of the measures listed below has been demonstrated by various sources. Used singly, or in combination, the measures represent BAT solutions when implemented in the appropriate circumstances. These circumstances depend on nature of process, plant scale, fuels used, etc.

## 5.2 BAT – GENERAL PREVENTATIVE MEASURES

For all food products manufactured from animal & vegetable raw materials, BAT is to do the following:

- Operate an environmental management system (see BREF Section 5.1.1)
- Substitution or reduction of the use of some auxiliary materials, e.g. chemicals to minimise environmental impacts (see BREF Section 5.1(21))
- Employ good housekeeping practices (see BREF Section 5.1(16)).

### 5.2.1 Minimisation of Water Consumption

For all food products manufactured from animal & vegetable raw materials, BAT is to do the following:

- Apply a methodology for reducing water consumption (see BREF Section 5.1(5))
- Provide water in a sufficient amount and good quality (see BREF Section 5.1(19))
- Eliminate the use of water where possible (see BREF Sections 5.1(13) and 5.1(13))
- Employ good housekeeping measures (see BREF Section 5.1(16))
- Optimise cleaning procedures and provide training (see BREF Section 5.1(5) and 5.1.3)
- Use dry cleaning methods where practicable (see BREF Section 5.1.3(3))
- Optimise start-up and shut down procedure for retort steriliser
- Ensure the regular maintenance of utility systems to reduce water consumption and wastewater production (see BREF Section 5.1(4))
- Recycling/reuse water where possible (see Section 4.3.1.1 of this document). Reuse cooling water from sterilisation following appropriate treatment.

### 5.2.2 Minimisation of Energy Consumption

For all food products manufactured from animal & vegetable raw materials, BAT is to do the following:

- Apply a methodology for improving energy efficiency (see BREF Section 5.1(5))
- Energy management system (see BREF Section 5.1.5(5))
- Employ good housekeeping and process optimisation (see BREF Sections 5.1(16) and 5.1(19))
- Optimise process utilities such as compressed air, steam, refrigeration and electricity supply (see BREF Section 5.1(15) and 5.1.4.12 and 5.1.4.13)
- Employ energy efficiency techniques (see BREF Section 5.1.4.10) such as heat recovery (see BREF Section 5.1.4.10(2)); use combined heat and power generation for electricity and thermal requirements (see BREF Section 5.1.4.10(1)); frequency converters on motors (see BREF Section 5.1.4.10(8)); and minimise heat/energy losses through proper insulation of steam and water pipework (see BREF Section 5.1.4.10(7))
- Use an energy monitoring system (see BREF Sections 4.1.6.7 and 5.1(6)).

### 5.2.3 Minimisation of Emissions to Air

For all food products manufactured from animal & vegetable raw materials, BAT is to do the following:

- Apply a control strategy to identify, quantify and select appropriate abatement options for emissions to air (see BREF Section 5.1.5(1))
- Use appropriate storage and handling techniques to contain emissions, e.g. dust (see BREF Section 5.1(18))
- Use natural gas in boilers, where a natural gas supply is available, or biomass fuels. Otherwise use low sulphur fuel oil (Sulphur content <1%)
- Audit odour to identify and characterise sources and determine any action required (see BREF Section 5.1.5(5)), e.g. remove offending material from site
- Select process techniques with maximum possible product yield and minimum emissions to the environment
- Optimise start up and shut down procedures and other special operating situations (see BREF Section 5.1.5(3))
- Use substitutes for hazardous raw materials where possible (see BREF Section 4.1.9)
- Prevent or minimise emissions of substances that deplete the ozone layer, e.g. substituting such substances, collecting them during waste treatment (see BREF Section 4.1.9.3)
- Aerate and cover wastewater treatment plants to prevent odour if required. Alternatively use anaerobic digestion for wastewater treatment.

### 5.2.4 Minimisation of Emissions to Water

For all food products manufactured from animal & vegetable raw materials, BAT is to do the following:

- Ensure the regular maintenance of utility systems (see BREF Section 5.1(4))

- Optimise the use of water (see BREF Section 5.1(4) and 5.1(20))
- Selection of materials/chemicals used in cleaning (see BREF Section 5.1.3(9)). Optimise cleaning procedures and provide training (see BREF Section 5.1.3)
- Apply appropriate storage and handling techniques to control emissions such as dust during loading/unloading, conveying and storage, e.g. provide bunding for liquids, use cold storage and transfer systems for dusty materials (see BREF Section 5.1(9))
- Recycling/reuse water where possible to reduce emissions (see Section 5.2.1 of this document)
- Prevent meat scraps, ingredients and product from entering the drains where practicable (see BREF Section 5.1(12))
- Collect spillage in return containers rather than washing to drain
- Meter the volume of product into containers rather than filling to capacity to avoid overfilling (see BREF Section 5.1.4.9(4)).

### 5.2.5 Protection of Surface and Groundwater

For all food products manufactured from animal & vegetable raw materials, BAT is to do the following:

- Apply overfill protection on storage tanks and holding tanks (see BREF Section 4.1.8.3)
- Use bunds for storage tanks and holding tanks (see BREF Section 4.6.4)
- Seal the base and sides of WWTP tanks.

### 5.2.6 Waste Minimisation

For all food products manufactured from animal & vegetable raw materials, BAT is to do the following:

- Implement a waste minimisation programme (see BREF Sections 4.1.6.2.3 and 5.1(5))
- Apply good housekeeping practices (see BREF Section 5.1(16))
- Improve operating practices (see BREF Section 4.1.7)
- Optimise the process control to minimise spoilage, off specification product, water usage and other losses through measurement of parameters such as temperature, pressure and flow (see BREF Section 5.1(19))
- Recycle or reuse solid by-products or sludge's produced (see Section 4.3.1.5 of this document). Recycle sludge to land. Recycle high solids waste for further processing for animal meal production
- For storage and handling, reduce overfill levels to 0.03% - 0.1% by using in line check weighers or knowledgeable filler operator (see BREF Section 4.2.12.6)
- Apply appropriate storage and handling techniques to control emissions such as dust during loading/unloading, conveying and storage, e.g. provide bunding, use cold storage and transfer systems for dusty materials (see BREF Sections 5.1(18))
- Optimise packaging line efficiency (see BREF Section 4.2.12.4).

### 5.2.7 Prevention of Noise Emissions

For general preventative measures for abatement of noise, BAT is to (see BREF Sections 5.1(3) and 5.1 (17)):

- Use silencers in ventilation systems
- Use elastic linkages in between fans and ducts
- Install pipes with better sound insulation properties
- Increase wall thickness of pipes
- Insulate pipes in jackets
- Install machines on a basement with rubber
- Keep doors and windows closed.

## 5.3 BAT – Preventative Measures For Specific Unit Operations

### 5.3.1 Raw Materials Reception and Preparation

- Employ good housekeeping measures (see BREF Section 5.1(16)) such as optimising water consumption by monitoring water pressure and the condition of water spray nozzles. Consider using a central washing system. Use appropriate cleaning chemicals, hot water and medium pressure systems
- Employ a waste minimisation programme. Ensure supply of fresh raw material and product demand are balanced economically to prevent raw material degradation and foul odour generation (see BREF Section 5.1(5) and 5.1(10))
- Prevent meat scraps, ingredient and product from entering the drains where practicable
- Monitor drips to floor from process equipment
- Collect spillage in return containers rather than washing to drain
- Use appropriate measures to minimise noise at conveyors
- Use appropriate storage and handling techniques to contain emissions such as dust from gels, guns and additive handling (see BREF Section 5.1(8))
- Optimise the process control to minimise spoilage, out of specification product, water usage and other losses through measurement of parameters such as temperature, pressure and flow (see BREF Section 5.1(6)).

#### *5.3.1.1 Size Reduction, Mixing, Forming*

- Enclose noisy equipment (e.g. grinding equipment) in insulated buildings where possible (see BREF Section 5.1(3)) and use appropriate process measures to minimise noise at live steam injectors
- Meter process water for mixing (see BREF Section 5.1(6))
- Collect spillage in return containers rather than washing to drain
- Minimise heat/energy losses through proper insulation of steam and water pipework (see BREF Section 4.2.13.3)
- Employ efficient dust handling techniques / bag filtering systems local to intake, blending and conveying or install dust blowing system for independent handling

- Prevent meat scraps, ingredient and product from entering the drains where practicable (see BREF Section 5.1(12) and 5.1.3(2))
- Optimise the process control to minimise spoilage, out of specification product, water usage and other losses through measurement of parameters such as temperature, pressure and flow (see BREF Sections 5.1(19) and 5.1(6))
- Apply a methodology for improving energy efficiency such as frequency converters on motors (see BREF Section 4.2.13).

#### *5.3.1.2 Heat Processing*

- Use efficient retort sterilisers
- Identify measures for reducing water consumption (see BREF Section 5.1(5))
- Optimise sterilisation process to improve frequency of water change
- Recover steam condensate for boiler feed water
- Optimise the process control to minimise water usage and other losses through measurement of parameters such as temperature, pressure and flow (see BREF Sections 5.1(9) and 5.1(6))
- Optimise start up and shut down procedure for retort sterilisers
- Employ energy efficient techniques (see Section 5.2.2 of this document).

#### *5.3.1.3 Processing by Removal of Heat*

- Use closed circuit cooling systems instead of once through cooling (see BREF Section 4.2.10.3)
- Reuse water from sterilisation following treatment for cooling cycles, cleaning and washing water (cans) where possible.

#### *5.3.1.4 Post Processing Operations*

- Collect spillage in return containers rather than washing to drain
- Optimise the process control for flushing of the system prior to product changeover
- Use appropriate measures to minimise noise on conveyors
- Recycle packaging waste (e.g. cans, cardboard, paper, plastic) (see BREF Section 5.1.4.9)
- Employ appropriate equipment to aid recycling such as high density compactors for cardboard
- Segregate packaging material waste. Recycle waste package materials (see BREF Section 5.1.4.9(1))
- Optimise packaging line efficiency (see BREF Section 4.2.12.4)
- Avoid overfilling of product to containers (see BREF Section 5.1.4.9(4)).

#### *5.3.1.5 Cleaning and Sanitation*

- Optimise cleaning procedures and provide training (see BREF Section 5.1.3 & 4.3)

- Select materials/chemicals used in cleaning for minimal impact on the environment (see BREF Section 5.1.3(9))
- Use of pressure cleaning and pressure controlled water via nozzles throughout the installation (see BREF Section 4.3.7)
- Fit cleaning hoses with hand operated triggers where possible (see BREF Section 5.1.3(6))
- Optimise cleaning procedures (e.g. CIP) to reduce water consumption and wastewater load (see BREF Section 5.1.3(10))
- Monitor water utilisation at use points (see BREF section 5.1(6)).

## 5.4 BAT – Measures for Treatment, Abatement and Disposal

### 5.4.1 Treatment of Air Emissions

For all food products manufactured from animal & vegetable raw materials, BAT is to minimise the formation of air emissions and odours using measures outlined in Section 5.2 of this document and then if necessary, treat air emissions as follows:

- Use dynamic, wet, filter or electrostatic separators on exhaust air to remove particulates (see BREF Sections 4.4.35 & 4.4.37)
- Use of biofilters or bioscrubbers on exhaust air to remove odour (see BREF Section 4.4.3.10)
- Use of an absorption system such as a packed bed or plate absorber on exhaust air to remove odour (see BREF Section 4.4.3.8)
- Use of an adsorption system such as activated carbon on exhaust air to remove odour (see BREF Section 4.4.39)
- Use thermal, boiler or catalytic treatment to control emissions from exhaust air (see BREF Section 4.4.3.11).

### 5.4.2 Treatment of Wastewater

For all food products manufactured from animal & vegetable raw materials, BAT is to minimise the quantity and load of wastewater generated using measures outlined in Section 5.2 of this document, then treat wastewater as follows:

- Select between treatment at source, centralised on site treatment or off site treatment of wastewater (see BREF Section 4.5.1)
- Segregation of process water from uncontaminated storm or other water so that uncontaminated water may be recycled (see BREF Section 4.1.7.8)
- Use of primary treatment such as screening, sedimentation and flotation (see BREF Section 4.5.2 & 5.1.6)
- Use secondary treatment by means of biological treatment systems to biodegrade organic substances:
    - Anaerobic treatment for high strength wastewater (see BREF Sections 4.5.3.2 & 5.1.6)
    - Aerobic treatment (see BREF Sections 4.5.3.1 & 5.1.6)
- Use tertiary treatment systems for further removal of organic and inorganic substances for discharges to water courses or recycling of final effluent is required (see BREF Sections 4.5.4 & 5.1.6).

### 5.4.3 Treatment and Disposal of Waste

For all food products manufactured from animal & vegetable raw materials, BAT is to minimise the quantity and load of waste generated using measures outlined in Section 5.2 of this document, then treat/dispose of waste as follows:

- Recycle/reuse/recover where possible:
    - Recycle packaging waste (e.g. cans, cardboard, paper, plastic) (see BREF Sections 4.2.12.3 & 5.1.4.9(1))
    - Reuse collected dust particulates in the process where practicable
- In treating wastewater sludges, the following techniques alone or in combination may be used (see BREF Sections 4.5.6 & 5.1.6):
    - Thickening of the sludge
    - Dewatering of the sludge
    - Stabilization of the sludge through chemical, thermal or biological (aerobic or anaerobic digestion) means
    - Drying
- Remove sludges (i.e. where animal raw materials are processed) produced and subject them to further animal by-product uses. These routes and their conditions of application are regulated by Animal By-Product Regulations 1774/2002/EC.

Further information on a number of waste gas and wastewater treatment techniques can be found in the BREF document on *Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector*, EIPPCB, February 2003.

# 6. BAT ASSOCIATED EMISSION LEVELS

## 6.1 EMISSION LEVELS FOR DISCHARGES TO AIR

The BAT-Associated emission levels for emissions to air are as follows:

**Table 6.1: BAT-Associated Emission Levels for Emission to Air**

| Constituent Group or Parameter | Emission Level ($mg/m^3$) | Mass Threshold (g/hr)[Note 1] |
|---|---|---|
| Ammonia | 30 | 150 |
| Hydrogen Sulphide | 3 | 15 |
| Organic sulphides (Total as S) | 2 | |
| Amines (Total) | 5 | |
| Total Particulate Matter | 5 - 50<br>150 | > 200<br>At mass flow up to 200g/hr |
| Total Organic Carbon (as C) | 50 | 500 |
| Hexane (solvent extraction)<br>- Rapeseed and maize germ<br>- Other seeds<br><br>VOC (solvent fractionation and refining processes excl. degumming)<br><br>VOC (degumming) | <br>2.0 kg/t of seed processed<br>1.5 kg/t of seed processed<br><br>1.5 kg/t of fat or oil subject to fractionation<br><br>4 kg/t of fat or oil subject to degumming | |
| Other | -- | Note 2 |

Note 1: The Mass Flow Threshold is calculated in g/hr or kg/hr and is determined to be the maximum emission, which can occur over any one-hour period of plant operation. Where the Mass Flow in the raw gas exceeds the mass flow threshold given in the Table, abatement will be required to reduce the emission to below the appropriate emission level or mass flow threshold

Note 2: Any relevant polluting substances as specified in Schedule to S.I. No. 394 of 2004: EPA (Licensing)(Amendment) Regulations, 2004.

### ODOUR EMISSION

Activities at the installation shall be carried out in a manner such that emissions of odours do not result in significant impairment of, and/or significant interference with amenities or the environment beyond the installation boundary. Reference shall be made to the Environmental Protection Agency's publication *Odour Impacts and Odour Emission Control Measures for Intensive Agriculture* (2001).

## 6.2 EMISSION LEVELS FOR DISCHARGES TO WATER

The following table sets out emission level values that are achievable using BAT for wastewater treatment. However establishing emission limit values within a licence for direct discharges to surface water from wastewater treatment plant and stormwater discharges must ensure that the quality of the receiving water is not impaired or that the current Environmental Quality Standards (EQS) are not exceeded.

All discharges to sewer are subject to approval from the Water Services Authority.

Compliance with the Water Framework Directive (2000/60/EC) is required where relevant, in particular Article 16.

**Table 6.2 BAT-Associated Emission Levels for Discharges to Water***

| Constituent Group or Parameter | Emission Level | Notes |
|---|---|---|
| pH | 6 - 9 | |
| Number of Toxicity Units (TU) | 5 | 1 |
| $BOD_5$ | >90% removal[3], or 20 - 40mg/l | |
| COD | >75% removal[3], or 125 - 250mg/l | |
| Suspended Solids | 50mg/l | |
| Total Ammonia (as N) | 10mg/l | |
| Total Nitrogen (as N) | >80% removal[3], or 5 - 25mg/l | 2,4 |
| Total Phosphorus (as P) | >80% removal[3], or 2 - 5mg/l | 4 |
| Oils, Fat and Grease | 10-15mg/l | |
| Mineral Oil (from interceptor) | 20mg/l | |
| Mineral Oil (from biological Treatment) | 1.0mg/l | |
| Other | -- | 5 |

* All values refer to daily averages based on a 24-hour flow proportional composite sample, except where stated to the contrary and for pH, which refers to continuous values. Levels apply to effluent prior to dilution by uncontaminated streams, e.g. storm water, cooling water, etc.

* Temperature measured downstream of a point of thermal discharge must not exceed the unaffected temperature by more than 1.5°C in salmonid waters and 3°C in cyprinid waters (Freshwater Fish Directive 79/659/EEC).

Note 1: The number of toxic units (TU) = 100/x hour $EC/LC_{50}$ in percentage vol/vol so that higher TU values reflect greater levels of toxicity. For test

regimes where species death is not easily detected, immobilisation is considered equivalent to death.

Note 2: Total Nitrogen means the sum of Kjeldahl Nitrogen, Nitrate N and Nitrite N.

Note 3: Reduction in relation to influent load.

Note 4: Limits will depend on the sensitivity of the receiving waterbody.

Note 5: Any relevant polluting substances as specified in Schedule to S.I. No. 394 of 2004: EPA (Licensing)(Amendment) Regulations, 2004.

## 6.3 EMISSIONS TO LAND

In the assessment of the impact of landspreading of organic waste, reference shall be made to the relevant Environmental Protection Agency's guidance and any guidance from the Department of Agriculture and Teagasc.

# 7. COMPLIANCE MONITORING

The methods proposed for monitoring the emissions from the sector are set out below. Licence requirements may vary from those stated below due to site location considerations, sensitivity of receiving waters, and scale of the operation.

## 7.1 MONITORING OF EMISSIONS TO AIR

- Annual monitoring of boiler stack emissions for SOx, NOx, CO and particulates, as required by the licence, taking account of the nature, magnitude and variability of the emission and the reliability of the controls.
- Monitoring of boiler combustion efficiency in accordance with the manufacturer's instruction at a frequency determined by the Agency.
- Quarterly monitoring of air emissions from odour abatement equipment for ammonia, total amines and hydrogen sulphide and mercaptans, or as determined by the Agency.
- Odour monitoring should be conducted at the nearest odour sensitive receptor locations at a frequency determined by the Agency.
- Olfactory (sniff) assessment for odours should be carried out daily or as directed by the Agency at a minimum at four boundary locations and at the nearest odour sensitive locations.
- Periodic monitoring for other parameters as determined by the Agency.

## 7.2 MONITORING OF AQUEOUS EMISSIONS

- For uncontaminated cooling waters, continuous monitoring of temperature and flow.
- Continuous monitoring of flow discharge from wastewater treatment plant and any other parameters deemed necessary by the Agency.
- Daily monitoring of flow, volume, pH, temperature and any other relevant parameters deemed necessary by the Agency, taking account of the nature, magnitude and variability of the emissions and the reliability of the control technique.
- Establish existing conditions prior to start-up of key emission constituents and salient flora and fauna.
- Monitoring of influent and effluent for the waste water treatment plant to establish % BOD reduction and early warning of any difficulties in waste water treatment, or unusual loads.
- The potential for the treated effluent to have tainting and toxic effects should be assessed and if necessary measured by established laboratory techniques.
- Periodic biodegradability checks where appropriate on effluents to municipal waste treatment plants, both prior to start-up and thereafter.

## 7.3 MONITORING OF EMISSIONS TO GROUNDWATER

There should be no direct emissions to groundwater, including during the extraction and treatment of groundwater.

## 7.4 MONITORING OF SOLID WASTE

- The recording in a register of the types, quantities, date and manner of disposal/recovery of all wastes.
- Leachate testing of sludges and other material as appropriate being sent for landfilling.
- Annual waste minimisation report showing efforts made to reduce specific consumption together with material balance and fate of all waste materials.

# Appendix 1

## PRINCIPAL REFERENCES

### 1. E.C.

1.1 Reference Document on Best Available Techniques in the Food, Drink and Milk Industry (Draft May 2003).

1.2 Council Directive 96/61/EC of 24 September 1996 concerning Integrated Pollution Prevention and Control.

### 2. Ireland

2.1 Integrated Pollution Control Licensing BATNEEC Guidance Note for the Malting, Brewing, and Distilling (Draft 3, May 1996).

2.2 Environmental Protection Agency Guidance Note For Noise in Relation to Scheduled Activities - 2$^{ND}$ Edition (2006).

# Appendix 2

## GLOSSARY OF TERMS AND ABBREVIATIONS

| | |
|---|---|
| BAT | Best Available Technique |
| BOD | Biochemical Oxygen Demand |
| BREF | Reference document on Best Available Techniques in Food, Drink and Milk Industries, published by the European Commission, January 2006. |
| $^0C$ | Degree Celsius |
| CO | Carbon monoxide |
| COD | Chemical Oxygen Demand |
| $CO_2$ | Carbon dioxide |
| ELV | Emission Limit Value |
| Kg | Kilogram |
| K | Degree Kelvin ($0^oC$ = 273.15K) |
| $m^3$ | Cubic metre |
| mg | Milligram |
| MJ | Megajoule (1 MJ = 1000 kj = 106 joule) |
| $N_2$ | Nitrogen |
| $Nm^3$ | Normal cubic metre (101.3 kPa, 273 K) |
| $NH_3$ | Ammonia |
| $NH_4$ | Ammonium |
| NO | Nitrogen monoxide |
| $NO_2$ | Nitrogen dioxide |
| $NO_x$ | Nitrogen oxides |
| $O_2$ | Oxygen |
| $SO_2$ | Sulphur dioxide |
| $SO_x$ | Sulphur oxides |
| t | Tonne (metric) |
| VOC | Volatile Organic Compounds |
| WWTP | Wastewater Treatment Plant |