PROCESS GUIDANCE NOTE
SEPTEMBER 2005

Process Guidance Note
NIPG 6/12 (Version 2)

Production of Natural Sausage Casings, Tripe, Chitterlings & other boiled green Offal Products

ENVIRONMENT (NI) ORDER 2002
POLLUTION PREVENTION AND CONTROL REGULATIONS (NI) 2003
INDUSTRIAL POLLUTION CONTROL (NI) ORDER 1997
IPC (PRESCRIBED PROCESSES AND SUBSTANCES) REGULATIONS (1998)

GUIDANCE FOR PROCESSES PRESCRIBED FOR
AIR POLLUTION CONTROL
AND
AIR POLLUTION PREVENTION AND CONTROL
BY DISTRICT COUNCILS

Department of the
Environment
www.doeni.gov.uk

The Department would like to acknowledge the work of the Environment Agency's Local Authority Unit in the drafting of this guidance note.

Environment Agency

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1 Introduction

1.1 This Note is issued by the Department of the Environment to give guidance on the conditions appropriate for the control of emissions into the air from natural sausage casings, tripe, chitterlings and other boiled green offal production processes/ installations[1] not involving the processing of raw materials. It supersedes guidance note NIPG 6/12 Version 1 that issued in March 1998.

1.2 This is one of a series of notes giving guidance on Best Available Techniques (BAT) and Best Available Techniques Not Entailing Excessive Cost (BATNEEC)[2]. The notes are all aimed at providing a strong framework for consistent and transparent regulation of installations.

Site specific BAT/ BATNEEC

1.3 This note is for use under both Local Air Pollution Control (LAPC) established by the Industrial Pollution Control (NI) Order 1997, and Local Air Pollution Prevention and Control (LAPPC) established by the Environment (NI) Order 2002[3]. It constitutes statutory guidance to regulators under regulation 38 of The Pollution Prevention and Control Regulations (NI) 2003. To the extent it provides guidance on techniques, it also constitutes statutory guidance to regulators under section 7(11) of the 1997 Order, and in any event regulators are expected to have regard to it. The note will be treated as one of the material considerations when determining any appeals against a decision under either the 1997 or 2002 Orders.

1.4 The note also (where appropriate) gives details of any mandatory requirements affecting air emissions which are in force at the time of publication, such as those contained in Directions from the Department.

1.5 All processes are subject to BAT/ BATNEEC. In general terms, what is BAT/ BATNEEC for one process in a sector is likely to be BAT/ BATNEEC for a comparable process; but in each case it is, in practice, for regulators (subject to appeal) to decide what is BAT/ BATNEEC for the individual process and the regulator should take into account variable factors (such as configuration, size and other individual characteristics of the process) and the locality (such as proximity of particularly sensitive receptors[4]). Ultimately, therefore, what constitutes BAT/ BATNEEC is site specific but this guidance note comprises guidance for the generality of processes in the sector and careful regard should be had to it, in order to maximise consistency of permits as appropriate.

Who is affected

1.6 This guidance is for:

- regulators: who must have regard to the guidance when determining applications and reviewing extant authorisations and permits
- operators: who are best advised also to have regard to it when making applications, and in the subsequent operation of their process
- members of the public: who may be interested to know what the Government considers (in accordance with the legislation) amounts to appropriate conditions for controlling air emissions for the generality of processes in this particular industry sector

1.7 The guidance is based on the state of knowledge and understanding at the time of writing of:

1. the term "process(es)" is used in the remainder of the note to mean both "processes" under the Industrial Pollution Control (NI) Order and "installations" and "activities" under the Environment (NI) Order 2002.
2. BATNEEC is the formulation used in the Industrial Pollution Control (NI) Order and BAT is used in the Environment (NI) Order 2002. For the purposes of this guidance note, the two concepts are regarded as having essentially the same effect.
3. In accordance with Part 2 of Schedule 3 to the PPC (NI) Regulations, SR 2003/46: Production of Natural Sausage Casings, Tripe, Chitterlings and Other Boiled Green Offal Production processes transfer from regulation under the 1997 Order to the 2002 Order from 1 April 2006.
4. Guidance on the relationship between BAT/BATNEEC and air quality objectives is contained in the General Guidance Manual on policy and procedures for Part C installations

- the production of natural sausage casings, tripe, chitterlings and other boiled green offal production processes
- their potential impact on the environment; and
- what constitutes BAT/ BATNEEC for preventing and reducing air emissions

1.8 The note may be amended from time to time in order to keep abreast with developments in BAT including improvements in techniques and new understanding of environmental impacts and risks. Such changes may be issued in a complete revision of this document, or in separate additional guidance notes which address specific issues. (It may not always be possible to issue amending guidance quickly enough to keep in absolute step with rapid changes, which is another circumstance where paragraph **1.5** above might apply.)

1.9 Steps will be taken to ensure that those who need to know about changes are informed. Operators (and their advisers) are, however, strongly advised to check with the regulator whether there have been any changes before relying on this note for the purposes of making an application under the 1997 or 2002 Orders or making any other decisions where BAT/ BATNEEC may be a consideration.

Consultation

1.10 This note has been produced in consultation with relevant trade bodies and representatives of regulators including members of the Industrial Pollution Liaison Committee and the NI Industrial Pollution Liaison Group.

Publication

1.11 This and other published guidance in this series are available, free of charge, via the Department at **www.doeni.gov.uk/epd**.

1.12 General guidance explaining policy and setting out LA-PPC policy and procedures is contained in the Department's "General Guidance Manual on Policy and Procedures for Part C Installations" available from **www.doeni.gov.uk/epd** and referred to in this document as the "General Guidance Manual". This is designed for operators and members of the public as well as district council regulators.

1.13 In addition to the General Guidance Manual referred to above, explanation or clarification of certain terms used in this sector guidance note can be found in a general guidance note issued under the Industrial Pollution Control (NI) Order 1997: "Interpretation of terms used in process guidance notes" that issued in March 1998 (NIGG4). Where there is any conflict between NIGG4 and the guidance issued in this note or in the General Guidance Manual, the latter two documents should prevail, as should any subsequent guidance issued in relation to LAPPC.

2 Timetable for compliance and reviews

Existing processes or activities

2.1 The previous guidance advised that upgrading to that standard should have been completed by 1 July 2002. Requirements still outstanding from any existing upgrading programme should be completed to the timescale of that programme.

Upgrading for this note

2.2 The new provisions of this note and the dates by which compliance with these provisions is expected are listed in the table below, together with the paragraph number where the provision is to be found. Compliance with the new provisions should normally be achieved by the dates shown. Authorisations/permits should be varied as necessary, having regard to the changes and the timetable.

Table 1: Compliance timetable

Provision	Relevant Paragraph/Row	Compliance Date
Inclusion of continuous monitoring provisions for odour arrestment plant	**5.11** and **5.12**	Within 24 months of the publication of this note.
Daily inspection of odour arrestment and air handling plant	**5.13**	Within 3 months of the publication of this note.
Testing of odour arrestment efficiency and inclusion of BS EN method	**5.14**	Within 12 months of the publication of this note.
Inclusion of provisions to limit the sulphur content of fuel where a thermal system is used for odour arrestment	**Table 2**, Rows 3, 4 and **5.15**	Within 6 months of the publication of this note.
Inclusion of a standard for odour arrestment efficiency	**Table 2**, Row 2	Within 24 months of the publication of this note.
Indicative guide values of 1ppm for releases of ammonia, amines and mercaptans instead of absolute limits	**Table 3**	Within 24 months of the publication of this note.
Where fitted, provision for mist eliminator for scrubbers	**6.7**	Within 12 months of the publication of this note.
Removal of condensable gases before scrubbing	**6.6**	Within 24 months of the publication of this note.
Alarms on vehicle access doors and possible airlock	**6.10**	Within 12 months of the publication of this note.
Level indicators, odour control venting, spillage management and bunding for liquid tanks	**6.14**	To be complied with as soon as practicable, which in most cases should be within 12 months of the publication of this note.
Provision for an Odour Response Procedure	**6.25**	Within 3 months of the publication of this note.
All other provisions	-	To be complied with as soon as practicable, which in most cases should be within 12 months of the publication of this note.

2.3 Replacement plant should normally be designed to meet the appropriate standards specified for new installations or activities.

Relaxation of conditions

2.4 Where provisions in the preceding guidance note have been deleted or relaxed, authorisations should be varied as necessary as soon as reasonably practicable. **Section 7** provides a summary of all changes.

New processes or activities

2.5 For new processes or activities, the authorisation/permit should have regard to the full standards of this guidance from the first day of operation.

Substantially changed processes or activities

2.6 For substantially changed processes or activities, the authorisation/permit should normally have regard to the full standards of this guidance with respect to the parts of the process that have been substantially changed and any part of the process affected by the change, from the first day of operation.

Permit reviews

Reviewing permits

2.7 Under LAPC the requirement is to review conditions in authorisations at least very four years. (Article 6(6) Industrial Pollution Control (NI) Order 1997).

2.8 Under LAPPC the legislation requires permits to be reviewed periodically but does not specify a frequency. It is considered for this sector that a frequency of once every six years ought normally to be sufficient for the purposes of Regulation 15(1) of Pollution Prevention and Control Regulations (NI) 2003.

More frequent review may be necessary in individual cases for the reasons given in Regulation 15(2). Further guidance on permit reviews is contained in the General Guidance Manual available on **www.doeni.gov.uk/epd**. Regulators should use any opportunities to determine the variations to authorisations/permits necessitated by paragraph **2.2** above in conjunction with these reviews.

2.9 Under both LAPC and LAPPC, conditions should be reviewed where complaint is attributable to the operation of the process and is, in the opinion of the regulator, justified.

3 Process description

Regulations

3.1 Production of Natural Sausage Casings, Tripe, Chitterlings and Other Boiled Green Offal Production processes are prescribed for:

- **Local air pollution control, LAPC,** under section 6.9 of Schedule 1 to the IPC (Prescribed Processes and Substances) Regulations 1998, SR 28.
- **Local air pollution prevention and control, LAPPC**, under section 6.8 of Schedule 1 of the Pollution Prevention and Control Regulations (NI) 2003 SR 46.

In the event that any of the following definitions apply, such processes are prescribed for Chief Inspector integrated pollution prevention and control, IPPC, in accordance with the Pollution Prevention and Control Regulations NI 2003:

(1) Processing if it may result in the release into water of any substance listed in paragraph 13 of Part 2 of Schedule 1 of the Pollution Prevention and Control Regulations (NI) 2003 in a quantity which, in any period of 12 months, is greater than the background quantity by more than the amount specified in relation to the substance in that paragraph, or

(2) disposing of or recycling animal carcasses or animal waste, other than by rendering or by inceration falling within Section 5.1 of this part of this Schedule, at plant with a treatment capacity exceeding 10 tonnes per day of animal carcasses or animal waste or, in aggregate of both, or

(3) involve slaughtering animals at plant with a carcass production capacity of more than 50 tonnes per day, or

(4) treating and processing of materials intended for the production of food products from animal raw materials (other than milk) at plant with a finished product production capacity of more than 75 tonnes per day.

3.2 Regulation 9 (1) requires that no person should operate an installation after the prescribed date except under and to the extent authorised by a permit granted by the regulator. The date for section 6.8 Part C processes in Northern Ireland is 1st April 2006. (See Schedule 3 Part 2 paragraph 9 (3) regarding applications being deemed to have been made for existing Part C processes).

3.3 In respect of the interface with Part A:-

(a) it is not envisaged that any natural sausage casing or green offal boiling processes would fall under IPPC control by virtue of the definition in Section 6.8 Part (A) (f) (that is involve the release of a substance in paragraph 13 of Part 2 of Schedule 1 of the Regulations to water).

(b) it is not envisaged that any natural sausage casing or green offal boiling processes would fall under IPPC control by virtue of the definition in Section 6.8 Part (A) (d) (that is involve the treating and processing for the production of food of more than 75 tonnes per day of animal materials).

(c) it is possible that a natural sausage casing or green offal boiling process could involve the disposal or recycling of animal carcasses or animal waste, at plant with a treatment capacity exceeding 10 tonnes per day of animal carcasses or animal waste (section 6.8 Part (A) (c)) or could be carried on at a slaughterhouse with a capacity of more than 50 tonnes per day (section 6.8 Part (A) (b)). In either of these cases the process would fall to Chief Inspector IPPC control.

3.4 This note refers to edible animal by-products processes producing primarily natural sausage casings, tripe, chitterlings or other boiled green offal products although it is also applicable to cat gut manufacturers.

Process or activity

3.5 In the context of this note, “process” or “activity” comprises the whole process from receipt of raw materials via production of intermediates to dispatch of finished products, including the treating, handling and storage of all materials and wastes relating to the process.

Natural sausage casing manufacture

3.6 This process involves taking the intestines arising from the slaughter of animals (principally sheep and pigs) at slaughterhouses, stripping the mucosa and treating with salt prior to sorting and grading. The process is quite seasonal with the peak production period being between July and January. The finished stripped intestines are used primarily as natural sausage casings (although some pig intestines may be further processed into chitterlings).

3.7 The intestines are initially processed in the gut room of a slaughterhouse where the gut waste (manure) is washed and stripped from the intestines. This material is then placed into lidded containers with water (sodium metabisulphite may be added as preservative). The material is then stored in refrigerated storage before processing.

3.8 The first phase of the operation is the inspection of the material largely to identify any hygiene issues (gut contents on the material) or decomposition. Material that is unsuitable may be either removed from site for disposal or may be minced and transferred into the effluent storage tank. The intestines are then passed through a stripper/crusher machine that comprises a set of irrigated paired nip rollers that separates the mucosa and threads from the intestines. The waste mucosa and liquids are usually pumped to effluent storage or an effluent treatment plant (some materials which are low in solids and residues may be discharged to the sewer).

3.9 The finished products are then stored in a brine solution and refrigerated before sorting and packing.

Tripe, chitterlings and boiled green offal

3.10 The term 'a set of tripe' in respect of cattle gut applies to the first and second stomach (the tripe), the fourth stomach (the reed), the roll, weasand (oesophagus), feet and occasionally the third stomach (manifold). The use of these materials for food has greatly reduced and now the main materials processed would be the first and second stomachs for tripe.

3.11 The chitterlings comprise the large intestine and often the stomach of the pig and are cooked and used as food.

3.12 The degree of processing of the green offal depends upon the operations carried out at the slaughterhouse. As the gut and stomach contents have a high microbiological activity unless the processing is integrated at a single site, it is common for the tripes to be scalded and scraped and the chitterlings pre-cleaned to remove stomach and gut waste at the slaughterhouse.

3.13 In the case of tripes they may arrive fresh in water or frozen (in which case they are soaked in a weak ammonia solution to defrost) and are inspected before cooking. The main reason for rejection would be due to colour and in this case they may be minced and used for animal feed. The cooking is usually for approximately 1 hour in boiling water and after cooling the tripe is chemically bleached for 48 hours before final trimming, rinsing and packing.

3.14 In the case of chitterlings, they are often transported frozen in which case the first process is defrosting or they may arrive in salt water. After inspection the chitterlings are cooked in boiling water before cooling and packing (they may have additives for colour control).

4 Potential releases

Pollutants and sources

4.1 The key emissions from these processes that constitute pollution for the purposes of the Industrial Pollution Control (NI) Order 1997 or the Pollution Prevention and Control Regulations 2003 and therefore warrant control are those with may lead to offensive odour beyond the process boundary. The odorous emissions are a complex cocktail of chemical species and may contain ammonia, amines, organic sulphur compounds, and volatile organic compounds.

4.2 The primary releases from the process are odours and these are required to be contained. The potential release points are:

- raw material reception, storage and handling
- from the process operations (mucosa separation and cleaning)
- from the cooking process
- from the storage, handling and transport of the waste remaining at the end of the process
- from the storage and discharge of liquid waste and effluent from the process and odour arrestment plant
- from the odour arrestment plant discharge (this may be a stack or vent or may be a biofilter with an area source at ground level).

4.3 Where the odour arrestment plant comprises a scrubber, emissions of materials which are added to the scrubber for improved performance (such as acids, hypochlorite, sodium hydroxide etc.) may be released with the plume if the scrubber and mist eliminator are not properly managed.

4.4 Where a thermal oxidiser or other combustion plant is used for the arrestment of odours, the emissions will be characteristic of the combustion releases from the fuel. These will include:-

- sulphur dioxide from the burner, influenced by the sulphur content of the fuel.
- oxides of nitrogen from the combustion equipment. The emission depends on the nitrogen content of the fuel, the amount of excess air, the flame temperature and the burner type.
- carbon monoxide, which may be emitted if the combustion process is badly managed.
- metals, volatile organic compounds, chlorides and fluorides may also be emitted where waste or recovered oil is used in the combustion equipment.

5 Emission limits, monitoring and other provisions

5.1 Subject to paragraph **5.2**, it should be the aim that any location at or beyond the site boundary is free from offensive odour as percieved by the regulator. This should be achieved by applying the process controls, management controls and arrestment provisions of this note.

5.2 The locality of a process site will influence the assessment of the potential for odour impact. In cases where the site has a low odour impact due to its remoteness from sensitive receptors and the escape of offensive odour beyond the site boundary would be unlikely to cause harm, the provision in this note to arrest odorous emissions may not be necessary to demonstrate BAT. In these circumstances it is expected that the operations should be optimised to minimise odour emissions (as outlined in paragraphs **6.14** to **6.20**) and also that effective process management is applied (as outlined in paragraphs **6.21** to **6.26**). Assessment of the potential for odour impact beyond the site boundary should take account of all predicted wind directions and weather conditions which are typical of the location in question.

- Monitoring of emissions should be carried out according to the method specified in this section or by an equivalent method agreed by the regulator.
- The reference conditions for limits in **Table 2** are 273K, 101.3 kPa, without correction for water vapour content.

Table 2: Emission limits, monitoring and other provisions

Row	Substance	Source	Emission limits/provisions	Type of monitoring	Monitoring frequency (subject to paragraph **5.17**)
1	Odour	Odour emissions from contained and fugitive sources.	Aim that any location at or beyond the site boundary is free from offensive odour (subject to the provisions of paragraph 5.2).	Determination by process assessment (see **5.10** - **5.14**)	Daily
2		Contained process releases.	Where installed any odour arrestment plant installed on contained emissions (ventilation air from the process building and cooking vapour) should have an odour removal efficiency of not less than 95%.	Determination by manual extractive sampling and analysis by dynamic olfactometry in accordance with BS EN13725.	On installation of new/ replacement odour arrestment equipment and/or in circumstances in paragraph **5.14** .
3	Sulphur dioxide	All processes where oil-fired thermal oxidisers or combustion plant are used for odour control.	Maximum concentration of Sulphur in fuel 1% wt/wt	Statement of compliance	Confirmation of compliance by each delivery
4		All oil-fired thermal oxidsers or combustion plant used for odour control and all oil-fired dryer dryers. Whre the fuel used is gasoil as defined in the Sulphur Content of Liquid Fuels Regulations (NI) 2002.	0.2% wt/wt (before 1/01/2008) 0.1% wt/wt (from 1/01/2008)		

5.3 In the case of existing processes where odour arrestment plant has been installed to meet the requirements of the previous guidance notes, the regulator should consider permitting the use of the existing plant until the end of its reasonable operational life provided that emissions from the plant meet the provisions of paragraph **5.1**. The regulator should still require that the available plant is optimised for odour removal and should establish an odour arrestment efficiency based upon operating data. Where emissions from the odour arrestment plant do not meet the provisions of paragraph **5.1**, the plant should be required to be upgraded to the specified efficiency in **Table 2**.

- In determining the 'reasonable operational life' of odour arrestment plant, the operator would be expected to continue to maintain and repair the plant to prolong it's operational life. The regulator should consider the physical condition of the arrestment plant (potential for leaks, unavailability of spares, increased frequency of malfunction or failure) and the odour arrestment efficiency (the arrestment plant no longer capable of achieving the interim odour arrestment efficiency determined as above) as key indicators of plant reaching the end of it's operational life.

Existing arrestment plant

5.4 It may be the case that operators can demonstrate that lower odour removal efficiencies than those in **Table 2** will meet the provisions of paragraph **5.1**.

For existing plant, provided the operator can satisfactorily demonstrate that the operation of plant at lower odour removal efficiencies meets the provisions of **5.1** then these lower odour removal efficiencies shall apply.

New / replacement arrestment plant

Where it can be demonstrated that the provisions of paragraph **5.1** are being met new/replacement plant may be operated at odour removal efficiencies lower than the 95% in **Table 2** To provide such demonstration, operators should determine, using dispersion modelling or alternative appropriate technique, what percentage efficiencies are required to meet the provisions of paragraph **5.1**.

Monitoring, investigations and recording

5.5 The need for and scope of testing, and the frequency and time of sampling depend on local circumstances, operational practice and the scale of operation. As part of proper supervision the operator will monitor emissions, make tests and inspections of the process and keep records, in particular:

- The operator should keep records of inspections, tests and monitoring, including all non-continuous monitoring, inspections and visual assessments. The records should be:
  - kept on site
  - kept by the operator for at least two years; and
  - made available for the regulator to examine

Information required by the regulator

5.6 The regulator needs to be informed of monitoring to be carried out and the results; the results should include process conditions at the time of monitoring.

- A summary of the data from continuous monitoring of the performance of the odour control system in accordance with paragraph **5.12** should be submitted to the regulator at least every 6 months, identifying the times, dates and duration of alarm events.
- The operator should notify the regulator at least 7 days before any periodic monitoring exercise to determine compliance with emission limit values. The operator should state the provisional time and date of monitoring, pollutants to be tested and the methods to be used.
- The results of non-continuous emission testing should be forwarded to the regulator within 8 weeks of the completion of the sampling.
- Adverse results from **any** monitoring activity (both continuous and non-continuous) should be investigated by the operator as soon as the monitoring data has been obtained/received. The operator should:
  - identify the cause and take corrective action

- record as much detail as possible regarding the cause and extent of the problem, and the action taken by the operator to rectify the situation
- re-test to demonstrate compliance as soon as possible; and
- notify the regulator

- The operator should hold either on site or available for inspection if required, a list of key arrestment plant and should have a written procedure for dealing with its failure, in order to minimise any adverse effects. (See paragraph **6.25**)

Odorous emissions - general guidance

5.7 The following general guidance is provided to assist regulators in assessment of compliance with the odour condition of Row 1 in **Table 2**.

Whilst it is possible to measure the odour strength using a standardised method (dynamic olfactometry as detailed in BS EN 13725:2003), it is not possible to use dynamic olfactometry to quantify the offensiveness of the odour. It is also not possible to use dynamic olfactometry as a field measurement.

In general odour effects are not caused by one single pollutant or chemical species, odour is a 'cocktail' of chemical species emitted from a process. The nose is an extremely sensitive receptor of odour - it can respond to small variations in concentration over periods of a few seconds and at concentrations of fractions of a part per billion.

Different people respond differently to the same odour, and the nature of any odour can vary (because of meteorology, process changes etc.) both in time and between different areas very close to one another.

Assessment of offensiveness of odour should take account of the nature of the odour, the frequency with which it arises, and its persistence. Local authorities should bear in mind that dispersal of odour may, from time to time, be adversely affected by temporary meteorological conditions.

Visible emissions

5.8 Visible emissions should be limited and monitored as follows. Abnormal emissions require action as described in paragraph **5.9**.

- Emissions from combustion processes used for arrestment of odour should be free from visible smoke.
- All releases to air, other than condensed water vapour, should be free from persistent visible emissions.
- All emissions to air should be free from droplets.

Abnormal events

5.9 The regulator needs to be notified about certain events, whether or not there is related monitoring showing an adverse result, and the operator should respond to problems which may have an adverse effect on emissions to air.

- In the case of abnormal emissions, malfunction or breakdown leading to abnormal emissions the operator should:
  - investigate and undertake remedial action **immediately**
  - adjust the process or activity to minimise those emissions; and
  - promptly record the events and actions taken
- The regulator should be informed without delay if there is an emission that is likely to have an effect on the local community.
- A simple wind direction indicator (such as a windsock or wind vane) should be installed in order that likely emission paths and areas of potential odour impact can be identified in the case of abnormal emissions.

Indicative tests for odour arrestment plant

5.10 If offensive odours are detected beyond the process boundary or complaints received but there is no obvious cause of odour release it may be necessary to check the odour arrestment plant performance. **Table 3** provides guide values which would indicate problems with arrestment plant. Depending upon the type of arrestment plant used, the following are the indicative tests it is envisaged would normally be used:

- In the case of thermal oxidisers or combustion plant, the combustion efficiency is a good indication of performance. Emissions may be tested for carbon monoxide and the indicative guide value in Row 4 of **Table 3** should be used. If emissions exceed this indicative guide value it is likely that the odour destruction efficiency of the arrestment plant is reduced and it should be further investigated to identify reasons for the reduced performance.
- In the case of biofilters or scrubbers, emissions may be tested for ammonia, amines/amides or mercaptans/hydrogen sulphide and the indicative guide values in Rows 1, 2 and 3 of **Table 3** should be used. If emissions exceed this indicative guide value it is likely that the odour destruction efficiency of the odour arrestment plant is reduced and the scrubber/biofilter should be further investigated to identify reasons for the reduced performance. This testing can be carried out using gas detection tubes. This testing can be carried out using gas detection tubes (further guidance on gas detection tubes is included in **Appendix 2**, paragraph 5).
- In the case of open top biofilters, the sampling method detailed in **Appendix 2** of this note should be used.
- The operator should provide a list of key arrestment plant and should have a written procedure for dealing with its failure, in order to minimise any adverse effects.

The table below provides indicative guide values which if exceeded indicate that the odour destruction efficiency of the arrestment plant is reduced and the plant should be further investigated to identify reasons for the reduced performance.

Table 3: Indicative guide values

Row	Odour Indicators	Indicative Guide Values
1	Ammonia	1 ppm v/v
2	Amines and amides	1 ppm v/v
3	Organic and inorganic sulphides including mercaptans and hydrogen sulphide (as total sulphur)	1 ppm v/v
4	Emissions of carbon monoxide from thermal oxidisers or combustion plant.	100 mg/m^3 expressed as a 30-minute mean at 273K and 101.3kPa.
N.B. The above values are only to be used in conjunction with the provisions of paragraph **5.10**		

Continuous monitoring - general

5.11 Whilst there are no reliable continuous emission monitoring options for odours, where thermal oxidation or combustion plant is used for odour control, continuous monitoring of carbon monoxide is an option (see paragraph **5.12**). Where continuous monitoring (as described in **5.12**, **5.13** and **5.14**) is required it should be carried out as follows:

- The activation of alarms should be automatically recorded.
- All continuous monitors should be operated, maintained and calibrated (or referenced) in accordance with the manufacturers' instructions, which should be made available for inspection by the regulator. The relevant maintenance and calibration (or referencing) should be recorded

- All continuous monitoring readings should be on display to appropriately trained staff.
- Instruments should be fitted with audible and visual alarms, situated appropriately to warn the operator of arrestment plant failure or malfunction.
- Purchasers of new or replacement monitoring equipment should specify the requirement for less than 5% downtime over any 3-month period, on ordering.

Continuous monitoring - odour arrestment plant

5.12 Where odour control plant is used, continuous monitoring (linked to alarms) should be installed in order to demonstrate compliance with the provisions of this note.

- In the case of thermal oxidisers or combustion plant, emissions should be continuously monitored and continuously recorded for carbon monoxide, or the operating temperature may be used as a surrogate measurement. The monitor should be fitted with an audible and visual alarm to activate if the operating temperature falls below 1123K (850^{o}C) or if the carbon monoxide level exceeds the indicative guide value in Row 4 of **Table 3**.
- In the case of scrubbing equipment, pH or Redox of the liquor and liquor flow should be continuously monitored. All liquid scrubbers should be fitted with an audible and visual alarm to activate if the liquor circulation fails or if the pH or Redox falls outside the operating range established during commissioning testing.
- If a bioscrubber is used, in addition to flow and pH or Redox monitoring, the pressure drop across the scrubber packing should be continuously monitored. The monitor should be fitted with an audible and visual alarm to activate if the pressure drop falls outside the operating range established during commissioning testing.
- If a biofilter is used the pressure drop across the biofilter should be continuously monitored. This can be achieved by measuring the delivery pressure on the main fan. The monitor should be fitted with an audible and visual alarm to activate if the pressure drop falls outside the operating range established during commissioning testing. If the process has more than one fan for different process areas and these fans are not operated when the areas are not in use (for example during the winter period when production levels are low) the value used for alarming may need to be variable depending upon the volume of air being treated and process conditions. In this case, where the alarm level is varied, the set point of the alarm should be recorded.
- The operating levels of the pH, Redox and pressure drop where monitored should be recorded daily to identify trends.
- The cooling liquid flow of all direct or indirect condensers used for pre-treatment of emissions from cookers, dryers and coolers (including spray tower scrubbers) should be continuously monitored.

Odorous emissions - monitoring installation performance

5.13 The operator should monitor the performance of the installation for emissions which may result in offensive odours beyond the boundary. This assessment should include inspections of the process, buildings and equipment to check that emissions are being contained and treated to meet the standards of this note.

In addition to the continuous indicative monitoring outlined in paragraph **5.12** the following should be carried out:

- The odour arrestment plant should be inspected at least once a day to verify correct operation and to identify any malfunctions. This inspection should include:
  - identification of any leaks in air handling equipment and ductwork. Where a key component of the odour arrestment plant cannot be adequately access for inspection then arrangements to enable this should be made.
  - in the case of scrubbing equipment, thermal oxidisers and other combustion plant, verification of the operation of the continuous monitoring equipment, any blockages and also identification of any leaks of either odorous air or liquid

- in the case of biofilters, the surface should be inspected to identify any cracking of the surface or voids in the bed, leaks around the edge of the filter or air handling equipment, review of the moisture content (considering both flooding and drying out) and looking for signs of compaction or uneven flow
- in the specific case of soil biofilters, the growth of plants and weeds. Excessive flow or odour escape is often indicated by scorching of the earth or plant growth dying off

- The results of all inspections should be recorded and action should be taken immediately in the case of abnormal emissions. Additional guidance on abnormal emissions is included in paragraphs **5.9** and **5.10**.

Calibration and compliance monitoring

5.14 Calibration and compliance monitoring should meet the following provisions asappropriate depending upon the type of arrestment plant used:

- Testing of odour arrestment plant should be carried out if possible when the process is operating at peak production.
- Odour testing should take place on commissioning of new/replacement plant todemonstrate compliance with the requirements of **Table 2**, row 2. In addition, it may be necessary to carry out monitoring of emissions of odour at other times where the process is subject to justified complaint of offensive odour and the investigations carried out in accordance with paragraph **5.8**, **5.9** and **5.13** cannot identify a cause for the odour.
- No monitoring result should exceed the emission concentration limits specified in **Table 2**.
- The destruction efficiency of any odour arrestment plant required to meet the provisions in **Table 2** should be tested in accordance with the main procedural requirements of BS.EN13725:2003. This testing should be carried out by dynamic olfactometry based upon manual extractive sampling undertaken simultaneously at the inlet and outlet of the odour arrestment plant. At least three samples should betaken from both the inlet and outlet. Where the odour arrestment plant comprises an open top biofilter, the guidance in **Appendix 2** should assist in developing a sampling protocol.

5.15 Where oil-fired thermal oxidisers or combustion equipment is used for arrestment of odours, every delivery of liquid fuel should be confirmed by the fuel suppliers as being compliant with the "Sulphur Contents of Liquid Fuels Regulations (NI) 2002, as required by **Table 2**.

- Where it is intended to use waste or recovered oil reference should be made to the Departments guidance on the Waste Incineration Directive in relation to any such use.

5.16 Exhaust flow rates should be consistent with efficient capture of emissions, good operating practice and meeting the requirements of the legislation relating to the workplace environment.

Varying monitoring frequency

5.17 Where there is consistent compliance with the odour removal efficiency standard in Row 2 of **Table 2**, regulators may consider reducing the frequency of testing. When determining 'consistent compliance' factors to consider include:

(a) the number of arrestment plant continuous indicative monitor alarms
(b) the number and frequency of complaints regarding offensive odour
(c) how the indicative surrogate performance monitoring of the odour arrestment plant reflects actual plant performance. For example, the operating temperature and carbon monoxide emissions of a thermal oxidiser or combustion plant are a good surrogate indicator compared to the pressure drop across a biofilter which is a less reliable surrogate indicator
(d) the margin between the results and the emission limit, for example, results which range from 95 - 96% destruction when the limit is 95% destruction efficiency might not qualify for a reduction in monitoring

- As the odour arrestment performance of a biofilter is very dependant upon operating conditions and biomass loading, it is not appropriate that reduced monitoring be applied where a biofilter is used.
- Consistent compliance should be demonstrated using the results from at least three or more monitoring exercises carried out over a period of at least two years.
- Any significant process or arrestment plant changes which might have affected the destruction efficiency of the plant should be taken into account.
- The continuous indicative monitoring required by paragraph **5.12** is to demonstrate correct functioning of the odour arrestment plant. In this context it is not appropriate that reduced monitoring be applied.

5.18 The frequency of testing should be increased, for example, as part of the commissioning of new or substantially changed processes, or where emission levels are near to or approach the emission concentration limits.

Sampling provisions

5.19 Care is needed in the design and location of sampling systems in order to obtain representative samples for all release points.

- Sampling points on new plant should be designed to comply with the British or equivalent standards. e.g. BS ISO 9096: 2003, BS EN 13284-1or BS ISO 12141:2002 for sampling particulate matter in stacks.
- The operator should ensure that adequate facilities for sampling are provided on stacks or ducts.
- Where monitoring is not in accordance with the main procedural provisions of the relevant standard, deviations should be reported as well as an estimation of any error invoked.
- The operator should ensure that adequate facilities for sampling are provided on vents or ducts.
- Sampling points on new plant should be designed to comply with the British or equivalent standards.

6 Control techniques

6.1 The process is largely carried out in open vessels and equipment and hence emissions are released into the process building. The containment of potentially odorous emissions is therefore the key to effective control.

6.2 The following are examples of relevant odour control techniques:

(a) containment of odours within process buildings by good design and extract ventilation

(b) good housekeeping and raw material handling practices

(c) containment of odours within process equipment by maintaining material handling and storage facilities leakproof and spillproof as far as possible

(d) control and minimisation of odours from residual materials, effluent and waste

(e) containment of strong odour sources and treatment in odour control equipment

Summary of best available techniques

6.3 The following table provides a summary of the best available techniques that can be used to control the process in order to meet the emission limits and provisions in **Section 5**. Provided that it is demonstrated to the satisfaction of the regulator that an equivalent level of control will be achieved, then other techniques may be used.

Table 4: Summary of control techniques

Substance	Source	Control techniques
Odour	Loading and unloading processes	Within buildings Enclosed vehicles and containers
	Raw material, effluent and waste storage	Within buildings under negative pressure and vented to odour arrestment plant Within enclosed silos, tanks, containers or stored under negative pressure and vented to odour arrestment plant Refrigeration of raw materials unless used within 12 hours of arrival at site Spillage management including tank level management
	Cooking process	Within buildings under negative pressure and vented to odour arrestment plant Spillage management Appropriate construction • impervious and easy to clean surfaces
	Vehicles	Washing of vehicle surfaces (material contact) within buildings as above
	Ventilated air	Vent to suitable arrestment plant • biofilters • thermal oxidisers/combustion plant • scrubbers • located to take account of sensitive receptors
	Waste gas from odour arrestment plant	Dispersion of any residual odorous releases
Carbon monoxide		Good combustion
Sulphur oxides		Limit sulphur in fuel

Techniques to control emissions from contained sources

6.4 Emissions from the process operations covered by this note comprise odours of mixed chemical species. The main principles for preventing odour emissions are;

- containment of the odours in the process plant
- raw material handling operations (as detailed below); and
- final treatment by arrestment of odour emissions

This containment is achieved by ensuring that all operations with potential releases are carried out within a building provided with sufficient extract ventilation to prevent fugitive emissions. The effectiveness of containment and treatment measures should finally be judged by the perception of odours in the environment by the regulator

6.5 Ventilation should be provided to maintain an adequate negative pressure within the raw material handling and processing areas where odours are present (this includes cooking areas, gut scraping areas but does not usually include areas where packing, sorting and grading is carried out). In addition, local exhaust ventilation should be provided to contain emissions from the cooking process. The required ventilation rate will depend upon many factors (such as environmental conditions, building design and construction, raw material quality, effectiveness of cooking vapour containment) but as a guide the ventilation rate should achieve a minimum of 12 air changes per hour. The ventilation equipment should be vented to suitable odour arrestment plant to meet the provisions of **Table 2**.

6.6 Suitable odour arrestment plant should be provided and operated at all times where necessary, to meet the provisions of **Section 5** of this note (further information is available at Ref. **(h)**). Examples of the type of arrestment plant which are suitable include biofilters, high efficiency biological scrubbers, multi-stage chemical scrubbers, thermal incinerators and other forms of combustion plant.

- The process may produce emissions of differing odour intensity (building air and cooking odours) and it may be more effective to separate the odour streams and divert to different odour arrestment plant. High odour intensity emissions and those incondensable gases (such as cooking emissions) should be diverted to thermal oxidation/combustion or multi-stage scrubbers, whilst those of lesser odour intensity may be treated in a single stage scrubber or biofilter.
- It may be appropriate to provide a number of smaller biofilters rather than one large bed to achieve more even gas flows throughout the filter. This will also provide standby facilities in case of breakdown or failure of one bed if the biofilter capacity is designed for this purpose.
- The presence of water vapour in the emissions from cooking, drying and preliminary cooling processes can adversely affect the operation of the odour control equipment. The water vapour will significantly increase emission volumes and is likely to condense within odour control equipment; this can lead to corrosion of materials of construction. Also in the case of scrubbing equipment, the condensation of significant volumes of water vapour will result in continuous liquid overflow and dilution of the scrubbing liquor. Where scrubbing systems are used for odour control the emissions from cooking, drying and preliminary cooling operations should be condensed (for example by the use of a direct condenser such as a spray tower or quench scrubber or an indirect condenser) prior to odour treatment of the non-condensable gases. Pre-treatment of process gases by condensation should also be considered for thermal oxidation and combustion systems as the removal of condensable gases will reduce the odour load for treatment in the combustion system.

Odour arrestment plant - optimisation

6.7 Where odour arrestment plant is required it needs to be optimised to meet the odour destruction efficiency provisions of **Table 2**. Depending upon the type of arrestment plant used, this optimisation will include the following:

- In the case of thermal oxidisers or combustion plant the operating temperature of the system will need to be maintained above 1123K (850^{o}C). In the case of boilers, care is needed in their use for odour arrestment as the operating temperature and residence time may not have been designed for odour arrestment and there is the potential for quenching in the boiler. In addition, a minimum firing rate for the boiler to ensure that the boiler conditions are always optimised for odour removal should be established. The measurement of odour arrestment efficiency of the boiler can be used to demonstrate the correct operating parameters of the boiler.
- In the case of scrubbing equipment, it is likely that multi-stage scrubbing will be necessary to meet the odour destruction efficiency provisions of **Table 2**. In order to optimise the performance of the scrubber, it is important to ensure that it is well designed (adequate gas/liquid contact), well maintained, that the odours are sufficiently reactive with the scrubbing liquor to remove the odour and also that the reaction products do not themselves produce a volatile odour. In addition, additives to the liquor need to be automatically dosed with control by pH/Redox (overdosing can lead to secondary odours from the scrubber associated with the chemical reagent). The scrubber will require regular inspection to identify possible blockage by salts which are typically formed when treating emissions from boiled green offal processes.
- Mist eliminators should be fitted where droplet emissions occur and, in relation to new or replacement scrubbing plant, where there is a potential for such occurrence.
- If a bioscrubber is used, it is important to ensure that it is well designed (adequate gas/liquid contact), well maintained and that potential odours from scrubbing liquor are well managed. The scrubber will require regular inspection to identify possible blockage by biomass. In addition the pH of the liquor will need to be controlled as the microbial activity of the biomass will be adversely affected by high alkalinity (which is a potential problem with emissions from certain pet food manufacturing processes).
- Biofiltration can be undertaken using packaged, enclosed biofilters or open biomass (such as peat/heather). If a peat and heather biofilter is used, it is essential to control the pH of the biomass as the microbial activity will be adversely affected by high alkalinity (which is a potential problem with the high levels of ammonia). In this case it may be necessary to pre-treat the emissions for example by water scrubbing (this will also have the beneficial effect of humidifying the air). In order to optimise the performance of the biofilter, the biomass must be maintained below 30^{o}C, must be kept moist, must have a gas flow at all times and leakage through edges and fissures must be avoided. Biofilters will require regular treatment to overcome consolidation - this may be regular surface turning or deconsolidation by digging-out the bed.
- The required residence time for the biofilters will depend upon many design conditions and will have to be sufficient to meet the provisions of Rows 2 and 3 of **Table 2**. However the recommended residence time for peat and heather filters is a minimum of 60 seconds for lower intensity odours.

6.8 The use of odour masking agents and counteractants should not be permitted (other than as a scrubber liquor additive).

Techniques to control fugitive emissions

Materials handling

6.9 All animal matter should be transported from the source of arising to the processing site as quickly as practicable. The design and use of vehicles and containers should be such as to prevent the emission of any offensive odour or substance prescribed for air. Totally enclosed containers or vehicles should be used for the collection of animal matter.

- Refrigeration of green offal at the slaughterhouse is the preferred method of handling unless materials are removed within 12-hours of production. All green offal should be chilled or refrigerated during transport. All containers used for transporting raw materials should be closed to prevent odour release (this does not apply to materials transported in a frozen condition).
- All vehicles, containers, trailers and equipment used for the collection, transfer and handling of the aforementioned raw materials and for holding waste should be readily cleansable, impervious and kept clean.
- Materials should be processed as soon as possible after receipt. If this cannot be affected within 12 hours, the material should be placed into frozen or refrigerated storage facilities.
- Materials should be stored in a designated enclosed area. Acceptable storage facilities are:-
  - enclosed silos, tanks or areas of the process building equipped with extraction to arrestment plant to meet the provisions of **Table 2** of this note, or
  - refrigerators where materials are contained in closed containers.
- Vehicles and containers should be emptied in a designated, enclosed reception area to contain odour releases. All surfaces which have been in contact with animal matter should be cleaned as soon as possible after delivery in this designated area. Vehicles containing raw materials should only be parked within this designated area.
- All tanks for liquid material storage should be fitted with level indicators or high level alarms to warn of potential overfilling. All such tanks should be vented to odour arrestment plant.

Building construction

6.10 All surfaces and equipment liable to come into contact with animal material or waste and all walls of areas where such materials are handled should be impervious, capable of being readily cleansed and should be kept clean.

- All floors of animal material reception, storage and processing areas and designated vehicle or container cleaning areas should be of impervious construction laid to fall to trapped drainage inlets. Drains should be provided where necessary, with sedimentation tanks and interceptors to prevent the transmission of material likely to impair the free flow of any receiving sewerage system.
- Buildings should be constructed of suitable materials (for example brick or concrete walls and sealed metal sheet roofing) and the integrity of the buildings should be regularly inspected and maintained to prevent the uncontrolled escape of air from the raw material receipt, processing and storage areas. All doors for personnel access and egress should be self-closing and doors for vehicle access should only be opened to allow vehicles to enter or exit.
- Areas of the building into which vehicles enter should be of sufficient size to accommodate the whole vehicle, including lowered tailgates, and to allow doors to close once the vehicle is inside the building. Where this cannot be achieved consideration should be given to the installation of an airlock or additional localised ventilation should be provided to ensure that offensive odours beyond the process boundary do not occur during the vehicle access.

- Where vehicle access doors are automatically operated, an audible alarm should sound when the door is open to warn of the potential for odour escape.

Process operations

6.11 Process operations should be carried out to minimise releases of odour.

Where possible submersible pumps should be used to minimise the potential for odour escape.

- Process tanks and vessels should be lidded to minimise emissions.
- Provision should be made for effective and rapid cleaning of any area of spillage. High pressure jetting or steam cleaning are effective methods of cleaning and, where used, sufficient hosing points should be made available. Spillages should be contained and cleared as soon as reasonably practicable.
- The transfer of animal material to the processing equipment should be undertaken in such a manner as to prevent spillage and minimise disturbance of material, and such areas should be enclosed. All points of transfer should be designed to be leak proof with suitable means for cleaning.
- Ventilation should be provided to maintain an adequate negative pressure within the raw material reception and storage areas, processing areas and waste storage areas in order to eliminate the possibility of odours escaping to atmosphere without treatment. The ventilation equipment should be vented to suitable arrestment plant. As regards the exhaust flow rate within the building, attention is drawn to the need to ensure compliance with the provisions of the legislation and standards applicable to the workplace environment, particularly with respect to occupational exposure limits. A properly designed and installed local exhaust ventilation system close to the points of odour generation (such as cooking vessels) will provide more effective containment of odours.

6.12 Good housekeeping should be practised at all times. The adoption of good cleaning and working practices as a routine will reduce process odour emissions and consequently lead to higher nominal arrestment plant efficiency. A proper cleaning programme should be instituted. This should cover all structures, equipment and internal surfaces and containers used for animal matter processing and collection and waste storage. The cleaning and disinfecting of all drainage areas and collecting tanks, yards and roads should be undertaken regularly and at least once a week.

6.13 A senior manager who recognises the importance of controlling the odours produced by the natural sausage casing, tripe, chitterlings and boiled green offal process should be designated to be specifically responsible for all aspects of liaison with the regulator and where applicable with members of the general public.

Effluent and waste

6.14 The effluent produced has the potential to generate a significant odour. All effluent should therefore be carefully handled and treatment should be carried out in a manner which will minimise the emission of offensive odours and will render any emission inoffensive and harmless.

- All effluent arising outside buildings that contain processing and treatment plant should be drained via interceptor traps to the normal sewerage system or to an effluent treatment plant or storage tank.
- All effluent arising within buildings including floor washings should be drained to an effluent treatment plant or storage tank.
- Any waste material which is minced on-site and discharged with effluent should not be discharged to the normal sewerage system but should be discharged to an effluent treatment plant or storage tank.

- All effluent storage tanks should be vented to suitable odour arrestment plant where necessary to meet the provisions of Row 1 of **Table 2**. A minimum extracted air volume should be maintained to the tank at all times (depending upon the tank design it may be necessary to isolate the tank from the odour arrestment plant during emptying to avoid tank damage). Care should be taken in emptying the effluent tanks to minimise odour release - consideration should be given to venting the collecting tanker to the odour arrestment plant.
- All effluent storage tanks should be emptied regularly and at least once every week.
- All effluent tanks should be fitted with level indicators or high level alarms to warn of potential overfilling.
- All tanks and effluent storage systems including cesspits and septic tanks should be adequately covered and effluent treatment systems should be properly maintained in accordance with the maintenance programme included in the Odour Response Procedure (paragraph **6.26**).
- All effluent tanks should be protected by a bund to contain spillages and the tanker connection point should also be provided with bunding or spillage containment kerbs. Provision should be made for effective and rapid cleaning of any area of spillage. High pressure jetting or steam cleaning are effective methods of cleaning and, where used, sufficient hosing points should be made available. Spillages should be contained and cleared immediately.

6.15 All potentially odorous wastes should be stored within an enclosed storage area, tank or container whilst awaiting removal for either disposal or further processing.

- The storage area should be provided with extract ventilation to suitable arrestment plant where necessary to meet the provisions of Row 1 of **Table 2**.
- All waste should be removed as soon as the waste container is full and at least once per week. High odour intensity waste should be moved more frequently where necessary to ensure compliance with Row 1 of **Table 2**.
- Waste should not be moved from process buildings to another building or outside unless in sealed containers. (Covered skips should not be regarded as sealed containers).

Air quality

Ambient air quality management

6.16 In areas where air quality standards or objectives are being breached or are in serious risk of breach and it is clear from the detailed review and assessment work under Local Air Quality Management that the Part C process itself is a significant contributor to the problem, it may be necessary to impose tighter emission limits. If the emission limit that is in danger of being exceeded is not an EC Directive requirement, then industry is not expected to go beyond BATNEEC/BAT to meet it. Decisions should be taken in the context of a district council's Local Air Quality Management action plan. For example, where a Part C process is only responsible to a very small extent for an air quality problem, the council should not unduly penalise the operator of the process by requiring disproportionate emissions reductions. More guidance on this is provided in the revised Local Air Quality Management Technical Guidance, LAQM. TG (03) and in the Environment (NI) Order 2002 Local Air Quality Management Policy Guidance. Both of these documents are available from the Environment and Heritage Service website **www.ehsni.gov.uk**.

Dispersion and dilution

6.17 Pollutants that are emitted via a stack require sufficient dispersion and dilution in the atmosphere to ensure that they ground at concentrations that are harmless. This is the basis upon which stack heights are calculated using HMIP Technical Guidance Note D1 (D1). The stack height so obtained is adjusted to take into account local meteorological data, local topography, nearby emissions and the influence of plant structure. It is necessary that the assessment also take into account the relevant air quality standards that apply for the emitted pollutants.

Revised stack height calculations should not be required unless it is considered necessary because of a breach or serious risk of breach of an EC Directive limit value and because it is clear from the detailed review and assessment work that the Part C process itself is a significant contributor to the problem.

The calculation procedure of D1 is usually used to calculate the required stack height but alternative dispersion models may be used in agreement with the regulator. D1 relies upon the unimpeded vertical emission of the pollutant. A cap or other restriction over the stack impedes the vertical emission and hinders dispersion. For this reason where dispersion is required such flow impeders should not be used. A cone may sometimes be useful to increase the exit velocity and achieve greater dispersion.

An operator may choose to meet tighter emission limits in order to reduce the required chimney height.

6.18 The assessment of chimney or vent height should take into account the need to ensure that no offensive odour is emitted beyond the boundary.

Stacks, vents and process exhausts

6.19 Liquid condensation on internal surfaces of stacks and exhaust ducts might lead to corrosion and ductwork failure or to droplet emission. Adequate insulation will minimise the cooling of waste gases and prevent liquid condensation by keeping the temperature of the exhaust gases above the dewpoint. Stacks and ductwork should be leakproof.

6.20 The dispersion from all stacks and vents can be impaired by low exit velocity at the point of discharge, or deflection of the discharge. Unacceptable emissions of droplets could possibly occur from wet arrestment plant where the linear velocity within the associated ductwork exceeds 9 m/sec. The use of mist eliminators reduces the potential for droplet emissions.

- Where a linear velocity of 9 m/sec is exceeded in the ductwork of existing wet arrestment plant, it should be reduced to the extent that is practicable to ensure that droplet fallout does not occur.
- Flues and ductwork should be cleaned to prevent accumulation of materials, as part of the routine maintenance programme.
- Exhaust gases discharged through a stack or vent should achieve an exit velocity which is normally greater than 15 m/sec during normal operating conditions to achieve adequate dispersion. A lower velocity may be acceptable provided it achieves adequate dispersion and dilution in accordance with paragraph **6.18** above.
- Stacks or vents should not be fitted with any restriction at the final opening such as a plate, cap or cowl, with the exception of a cone which may be necessary to increase the exit velocity of the emissions.

Management

Management techniques

6.21 Important elements for effective control of emissions include:

- proper management, supervision and training for process operations
- proper use of equipment;
- effective preventative maintenance on all plant and equipment concerned with the control of emissions to the air; and
- it is good practice to ensure that spares and consumables are available at short notice in order to rectify breakdowns rapidly. This is important with respect to arrestment plant and other necessary environmental controls. It is useful to have an audited list of essential items

- Spares and consumables - in particular, those subject to continual wear - should be held on site, or should be available at short notice from guaranteed suppliers, so that plant breakdowns can be rectified rapidly.

Appropriate management systems

6.22 Effective management is central to environmental performance; It is an important component of BAT and of achieving compliance with permit conditions. It requires a commitment to establishing objectives, setting targets, measuring progress and revising the objectives according to results. This includes managing risks under normal operating conditions and in accidents and emergencies. It is therefore desirable that processes put in place some form of structured environmental management approach, whether by adopting published standards (ISO 14001 or the EU Eco Management and Audit Scheme [EMAS]) or by setting up an environmental management system (EMS) tailored to the nature and size of the particular process. Operators may also find that an EMS will help identify business savings.

Regulators should use their discretion, in consultation with individual operators, in agreeing the appropriate level of environmental management. Simple systems which ensure that LAPC considerations are taken account of in the day-to-day running of a process may well suffice, especially for small and medium-sized enterprises. While authorities may wish to encourage wider adoption of EMS, it is outside the legal scope of an LAPC authorisation/LA-PPC permit to require an EMS for purposes other than LAPC/LA-PPC compliance. For further information/advice on EMS refer to EMS Additional Information in **Section 8**.

Training

6.23 Staff at all levels need the necessary training and instruction in their duties relating to control of the process and emissions to air. In order to minimise risk of emissions, particular emphasis should be given to control procedures during start-up, shut down and abnormal conditions.

Training may often sensibly be addressed in the EMS referred to above.

- Training of all staff with responsibility for operating the process should include:
  - awareness of their responsibilities under the permit
  - minimising emissions on start up and shut down
  - action to minimise emissions during abnormal conditions
- The operator should maintain a statement of training requirements for each operational post and keep a record of the training received by each person whose actions may have an impact on the environment. These documents should be made available to the regulator on request.

Maintenance

6.24 Effective preventative maintenance should be employed on all aspects of the process including all plant, buildings and the equipment concerned with the control of emissions to air. In particular:

- A written maintenance programme should be provided to the regulator with respect to pollution control equipment; and
- A record of such maintenance should be made available for inspection.

All external pipework used for scrubbing liquor, cleaning water, irrigation water and process liquid transfer should be protected against frost.

Odour Response Procedure

6.25 The operator should prepare an Odour Response Procedure as outlined in **Appendix 3**. This is a summary of the foreseeable situations which may compromise his/her ability to prevent and/or minimise odorous releases from the process and the actions to be taken to minimise the impact. It is intended to be used by operational staff on a day-to-day basis and should detail the person responsible for initiating the action.

- The Odour Response Procedure should include a list of essential spares for the odour arrestment plant. The plant manufacturer should recommend which spares are subject to wear and foreseeable failure and are critical for the correct operation of the odour arrestment plant (such as pumps, nozzles etc.) and these should be held on site. It may be acceptable for certain spares to be available on guaranteed short delivery if the absence of a supply at the site would not lead to complete failure of the odour arrestment plant or to offensive odours beyond the site boundary.

6.26 The Odour Response Procedure (see **Appendix 3** and paragraph **6.25**) should include analysis of actions in the case of arrestment plant breakdown or malfunction. Immediate arrangements should be made to divert odour streams to other suitable arrestment plant. Failure to provide suitable temporary arrestment plant may lead to the suspension of the process and consequently emergency standby arrangements should be detailed in the Odour Response Procedure. This may include:

- suspending process operations
- reducing the scale of high odour intensity process operations, for example stopping cooking operations or reducing throughput
- by-pass emissions to stand-by or alternate odour arrestment plant, for example using a boiler as an emergency odour arrestment system

7 Summary of changes

Reasons for the main changes are summarised below.

Table 5: Summary of changes

Section and paragraph	Change	Reason	Comment
Emission limits, monitoring and other provisions			
Paragraph **5.10**	Assessment of process and releases in the case of odours being detected, abnormal conditions or complaints	To identify causes and solutions to possible odour releases	Clarification of previous guidance
Paragraph **5.10**, **Table 3**	Absolute limits for releases of ammonia, amines and mercaptans changed to indicative guide values of 1ppm.	These values are achievable using BAT - no need to measure these when there are provisions of **Table 2** Rows 1 and 2	Weekly monitoring removed from previous note. Reflects BAT.
Paragraph **6.7**	Inclusion of continuous monitoring provisions for odour arrestment plant	BAT for operational control - also clarification of previous guidance and addition of thermal systems	Recording of monitors continuously replaced with alarm recording
Paragraph **5.13**	Daily inspection of odour arrestment and air handling plant	To identify abnormal activities	Replaces requirement for daily olfactory assessment
Table 2 Row 2	Inclusion of a standard for odour arrestment efficiency	To set a quantitative standard for odour removal	Reflects BAT
Table 2 Rows 3 and 4 plus **5.15**	Inclusion of provisions to limit the sulphur content of fuel where a thermal system is used for odour arrestment	To minimise oxides of sulphur releases.	Reflects BAT
Table 2 row 2	Testing of odour arrestment efficiency annually and inclusion of BS EN method	Reflects BAT - quantifies odour plant performance	New methods available
Paragraph **5.15**	Provision for sulphur contents of fuel to be certificated	Odour plant may be an oil-fired thermal system	Reflects EU requirements
Control Techniques			
Paragraph **6.6**	Removal of condensable gases before scrubbing	Optimise odour arrestment	Reflects BAT
Paragraph **6.7**	Provision for mist eliminator for scrubbers	To prevent droplets	Clarification of previous guidance
Paragraph **6.10**	Details on design and operation of odour arrestment plant	Additional guidance	Reflects BAT
Paragraph **6.10**	Alarms on vehicle access doors and possible airlock	To avoid odour release when doors are opened for vehicle access	Clarification of control
Paragraph **6.10** and **6.14**	Provision for level indication, bunding and odour arrestment on liquid storage tanks	To avoid spillage and high intensity odours from process and waste liquids	Reflects BAT
Paragraph **6.25**	Provision for an Odour Response Procedure	Abnormal conditions are a key odour risk and there needs to be a documented procedure in advance of the problem	Expanding previous guidance

8 Definitions and further information

This guidance	Process Guidance Note NIPG6/12 Version 2
Previous guidance	Process Guidance Note NIPG6/12 Version 1
LAPC	explained in the Introduction of this guidance
LAPPC	explained in the Introduction of this guidance
Permit	the written permission to operate an installation prescribed for LAPPC – (the replacement for authorisation under LAPC)
Authorisation	the written authority to operate a process prescribed for LAPC - (will be replaced by permit under LAPPC)
Existing process	should be taken to have the following meaning: • a process which was being carried on at some time in the 12 months immediately preceding the first day of the month following publication of this guidance note; • a process which is to be carried on at a works, plant or factory or by means of mobile plant which was under construction or in the course of manufacture or in the course of commission on the first day of the month following publication of this guidance note, or the construction or supply of which was the subject of a contract entered into before that date.
New process	not an existing process.
Installation	should be interpreted in accordance with the guidance contained in the General Guidance Manual on Policy and Procedures for Part C installations.
Process	the term "process" has been used in this guidance note to refer to both "processes" under the Industrial Pollution Control (NI) Order 1997 and "installations" under the Environment (NI) Order 2002.

Health and safety

Operators of processes and installations must protect people at work as well as the environment:

- requirements of a permit or authorisation should not put at risk the health, safety or welfare of people at work
- equally, the permit or authorisation must not contain conditions whose only purpose is to secure the health of people at work. That is the job of the health and safety enforcing authorities

Where emission limits quoted in this guidance conflict with health and safety limits, the tighter limit should prevail because:

- emission limits under the Industrial Pollution Control (NI) Order 1997 or the Environment (NI) Order 2002 relate to the concentration of pollutant released into the air from prescribed activities
- exposure limits under health and safety legislation relate to the concentration of pollutant in the air breathed by workers

- these limits may differ since they are set according to different criteria. It will normally be quite appropriate to have different standards for the same pollutant, but in some cases they may be in conflict (for example, where air discharged from a process is breathed by workers). In such cases, the tighter limit should be applied to prevent a relaxation of control

EMS additional information

Further information/advice on EMS may be found from the following:

- Envirowise at **www.envirowise.gov.uk** and **www.energy-efficiency.gov.uk** and Environment and Energy Helpline freephone 0800 585794
- ISO 14001 **www.bsi.org.uk** or telephone BSI information centre (020 8966 7022)
- EU Eco Management and Audit Scheme (EMAS) **www.emas.co.uk** or telephone the Institute of Environmental Management and Assessment (01522 540069)

Regulators and process operators may also like to be aware of:

BS 8555: a new standard to help SMEs implement an EMS, by offering a five-phase approach, is contained in BS 8555 which was published in 2003 following on from work undertaken by the Acorn Trust. The Institute of Environmental Management and Assessment, which has taken over the Trust's activities, is developing a scheme of accredited recognition for companies achieving different phases of BS 8555. BS 8555 can be used to achieve ISO 14001 and registration to the higher standard, EMAS.

Some of the **High Street banks**, such as NatWest and the Coop, now offer preferential loan rates to organisations that can demonstrate they are committed to improving their environmental performance. The NatWest also produce a self help guide for SMEs, 'The Better Business Pack', focusing on waste, utilities, transport and supply chain issues. It gives tools, guidance and examples. Contact: WWF-UK on 01483 426444.

References

(a) the Department's guide on LAPPC "General Guidance Manual on Policy and Procedures for Part C Installations", September 2003- available from the Department at **www.doeni.gov.uk/epd**.

(b) Section 10 of NIGG2 "Authorisations" (issued March 1998) provides further advice on the assessment of odour.

(c) Current air quality objectives are specified in: The Air Quality (NI) Regulations 2003 (2003 No 342).

(d) HMIP Technical Guidance Note D1: "Guidelines on Discharge Stack Heights for Polluting Emissions", published by The Stationery Office, ISBN 0-11-752794-7.

(e) M1 Sampling requirements for monitoring stack emissions to air from industrial installations, Environment Agency July 2002 **(EA website)**

(f) M2 Monitoring of stack emissions to air. Environment Agency May 2003 **(EA website)**

(g) Odour Measurement and Control- An Update published by National Environmental Technology Centre, Culham, Abingdon. Oxon OX14 3DB. ISBN 0-85624-8258.

(h) BS EN 13725:2003 - "Air Quality - Determination of Odour Concentration by Dynamic Olfactometry"

(i) IPPC H4 - Horizontal Guidance For Odour: Part 1 - Regulation and Permitting, Part 2 - Assessment and Control, (To be published by EA, EHS, SEPA.)

Web addresses

Web-site of the Department's Environmental Policy Division: **www.doeni.gov.uk/epd**

Web-site of the Department's Environment and Heritage Service: **www.ehsni.gov.uk**

Energy saving and environmental management measures can increase industry profits. Envirowise (formerly E.T.B.P.P.) show how at **www.envirowise.gov.uk** (or freephone 0800 585 794)

Appendix 1: Extract from Pollution Prevention and Control Regulations (NI) 2003, 2003 No 46

DEFINITION OF THE TREATMENT OF ANIMAL AND VEGETABLE MATTER AND FOOD INDUSTRIES IN SCHEDULE 1 TO THE POLLUTION PREVENTION AND CONTROL REGULATIONS (NI) 2003, 2003 No 46*.

THE TREATMENT OF ANIMAL AND VEGETABLE MATTER AND FOOD INDUSTRIES

(The processes for district council air pollution prevention and control are listed under "Part C". The "Part A" and Part "B" processes are for Chief Inspector control.)

SECTION 6.8

THE TREATMENT OF ANIMAL AND VEGETABLE MATTER AND FOOD INDUSTRIES

Part A

(a) Tanning hides and skins at plant with a treatment capacity of more than 12 tonnes of finished products per day.

(b) Slaughtering animals at plant with a carcass production capacity of more than 50 tonnes per day.

(c) Disposing of or recycling animal carcasses or animal waste otherwise than by incineration falling within section 5.1 of this Part of this Schedule at plant with a treatment capacity exceeding 10 tonnes per day of animal carcasses or animal waste or, in aggregate, of both.

(d) Treating and processing materials intended for the production of food products from -

(i) animal raw materials (other than milk) at plant with a finished product production capacity of more than 75 tonnes per day;

(ii) vegetable raw materials at plant with a finished product production capacity of more than 300 tonnes per day (average value on a quarterly basis).

(e) Treating and processing milk, the quantity of milk received being more than 200 tonnes per day (average value on an annual basis).

(f) Processing, storing or drying by the application of heat of the whole or part of any dead animal or any vegetable matter (other than the treatment of effluent so as to permit its discharge into waterways, underground strata or into a sewer unless the treatment involves the drying of any material with a view to its use as animal feedstuff) if -

(i) the processing, storing or drying does not fall within another Section of this Schedule or paragraph I of this Part of this Section and is not an exempt activity; and

(ii) it may result in the release into water of any substance listed in paragraph 13 of Part 2 of this Schedule in a quantity which, in any period of 12 months, is greater than the background quantity by more than the amount specified in relation to the substance in that paragraph.

Part B

Unless falling within Part A of this Section, treating feathers by hydrolysis where hydrogen sulphide or other sulphur containing compounds may be released into the air.

Part C

(a)Processing, storing or drying by the application of heat of the whole or part of any dead animal or any vegetable matter (other than the treatment of effluent so as to permit its discharge into waterways, underground strata or into a sewer unless the treatment involves the drying of any material with a view to its use as animal feedstuff) if -

(i) the processing, storing or drying does not fall within another Section of this Schedule or Part A or B of this Section and is not an exempt activity; and

(ii) the processing, storing or drying may result in the release into the air of a substance described in paragraph 12 of Part 2 of this Schedule or any offensive smell noticeable outside the premises on which the activity is carried out.

(b) Breeding maggots in any case where 5 kg or more of animal matter or of vegetable matter or, in aggregate, of both are introduced into the process in any week.

Interpretation of Section 6.

In this Section -

"animal" includes a bird or a fish;

"exempt activity" means -

(i) any activity carried out in a farm or agricultural holding other than the manufacture of goods for sale;

(ii) the manufacture or preparation of food or drink for human consumption but excluding -

(a)the extraction, distillation or purification of animal or vegetable oil or fat otherwise than as a activity incidental to the cooking of food for human consumption;

(b) any activity involving the use of green offal or the boiling of blood except the cooking of food (other than tripe) for human consumption;

(c) the cooking of tripe for human consumption elsewhere than on premises on which it is to be consumed;

(iii) the fleshing, cleaning and drying of pelts of fur-bearing mammals;

(iv) any activity carried on in connection with the operation of a knacker's yard, as defined in the Animal By-Products Order (Northern Ireland) 2002([5]);

(v) any activity for the manufacture of soap not falling within Part A of Section 4.1;

(vi) the storage of vegetable matter not falling within any other Section of this Schedule;

5. SR 2002 No. 209

(vii) the cleaning of shellfish shells;

(viii) the manufacture of starch;

(ix) the processing of animal or vegetable matter at premises for feeding a recognised pack of hounds registered under the Animal By-Products Order (Northern Ireland) 2002;

(x) the salting of hides or skins, unless related to any other activity listed in this Schedule;

(xi) any activity for composting animal or vegetable matter or a combination of both, except where that activity is carried on for the purposes of cultivating mushrooms;

(xii) any activity for cleaning, and any related activity for drying or dressing, seeds, bulbs, corms or tubers;

(xiii) the drying of grain or pulses;

(xiv) any activity for the production of cotton yarn from raw cotton or for the conversion of cotton yarn into cloth;

"food" includes -

(i) drink;

(ii) articles and substances of no nutritional value which are used for human consumption; and

(iii) articles and substances used as ingredients in the preparation of food;

"green offal" means the stomach and intestines of any animal, other than poultry or fish, and their contents;

"underground strata" has the same meaning as in Article 2(2) of the Water (Northern Ireland) Order 1999([6]);

"waterways" has the same meaning as in Article 2(2) of the Water (Northern Ireland) Order 1999.

*Every effort has been taken to ensure that this Appendix is correct at the date of issue of this Note, but readers should note that the Regulations are likely to be subject to periodic amendment, and this Appendix should not therefore be relied upon as representing the up-to-date position after the issue date.

6. S.I. 1999/662 (NI 6)

Appendix 2: Method for sampling of emissions from biological (earth, peat and heather) filters using gas detection tubes

METHOD FOR SAMPLING OF EMISSIONS FROM BIOLOGICAL (EARTH, PEAT AND HEATHER) FILTERS USING GAS DETECTION TUBES

Routine monitoring of emissions from biological filters can be readily undertaken using gas detection tubes. However, it is important to ensure that a number of representative samples are obtained and that care is taken in the interpretation of results. The number of samples necessary will depend upon the gas distribution within the biological filter.

It is essential that samples are taken from a representative volume of emitted gas as near surface dispersion will significantly affect measured concentrations. Therefore, it is necessary to reduce dispersion and obtain a volume of gas from which to sample. This can be achieved by placing a purpose-made enclosure on top of the filter bed and allowing the emitted gases to accumulate.

The enclosure itself should be approximately 0.5 m^3 - 1 m^3 in volume, preferably with a 1 m square open base. The top of the enclosure should have an opening of approximately 50 mm diameter to facilitate sampling. The enclosure call be simply fabricated using a timber frame and plywood or hardboard sides and top with mastic or other suitable sealant applied to the side and top joints.

It will be extremely difficult to achieve a seal at the filter bed surface, however the enclosure should be located in order to minimise leakage from the points of contact with the filter bed. The enclosure should remain at the sample location for at least 10 minutes prior to sampling to ensure that a representative sample of emissions is obtained (allowing the volume of the enclosure to be purged three times).

The gas detection tubes should be used in accordance with the manufacturer's instructions and results should be evaluated against the indicative guide values in **Table 3**. Amines and amides are a common interference with gas detection tubes for ammonia and therefore results obtained from ammonia gas detection tubes should be compared to a 2 ppm v/v indicative guide value. It may be necessary to monitor for hydrogen sulphide and mercaptans separately depending upon the detector tube specification and in this case the sum of the individual results should be compared with the indicative guide value in Row 3 of **Table 3**.

This method is only suitable for open biomass type biofilters where no final discharge vent or stack exists.

Additional information is available in BS EN13725 - "Air Quality - Determination of Odour Concentration by Dynamic Olfactometry" and "Odour Measurement and Control-:\n Update "published by National Environmental Technology Centre, Culham, Abingdon. Oxon OX14 3DB. ISBN 0-85624--8258.

Appendix 3: Guidance on the Preparation of an Odour Response Procedure

What is an Odour Response Procedure?

An Odour Response Procedure is a summary, provided by the operator, of the foreseeable situations which may compromise his/her ability to prevent and/or minimise odorous releases from the process and the actions to be taken to minimise the impact. It is intended to be used by operational staff on a day-to-day basis and should detail the person responsible for initiating the action.

The procedure is intended primarily to document foreseeable events which are outside of the control of the operator and those that are preventable by maintenance and operational control (for example pump failure, biofilter compaction or filter breakthrough). The procedure should include a maintenance programme for all odour arrestment plant and other odour containment measures (such as building structure, ventilation plant).

What is the Format for the Odour Response Procedure?

The Odour Response Procedure should be a written document which is available on-site and should be submitted to the regulator. The regulator may wish to set conditions in the permit/authorisation which reflect the undertakings given in the Procedure (for example maximum arrestment plant by-pass times, reduced throughput etc).

What should be included in the Odour Response Procedure?

There are four main reasons for releases which may lead to emissions of offensive odour which are:

1. changes in process conditions leading to more odour generation or a change in the odour characteristics

2. conditions which result in fugitive releases due to reduced odour containment

3. failures or reduced performance of odour arrestment plant

4. factors affecting the dispersion between the source and the receptor.

The occurrence of 2 and 3 above can be limited by the production of, and compliance with, an effective plant and building maintenance programme. Examples of other issues which should be considered in each of these categories are given in the Table below.

In order to prepare an assessment of possible abnormal conditions and the options for mitigation of the odour, the operator will need to consider:

- the activity which produces the odour and the point of odour release
- possible process or control failures or abnormal situations
- potential outcome of a failure in respect of the likely odour impact on local sensitive receptors
- what actions are to be taken to mitigate the effect of the odour release and details of the persons responsible for the actions at the site.

Table 6: Examples of issues to consider relating to odour release

Factors leading to odour release	Examples of issues to consider
Those which have potential to affect the process and the generation of odour	• Materials input - seasonal variation in weather may affect odour of materials particularly if putrescible. • Process parameters such as changes in temperature/pressures • Rate of throughput or increased hours of operation • High levels of ammonia within the process buildings (possibly due to high ambient temperatures).
Those which affect the ability to arrest/minimise odour	• Poor performance of biofiltration or poisoning (may be the result of poor maintenance or mis-operation) • Flooding of the biofilter due to abnormally high rainfall • External failure of other utilities, e.g. water supply, gas supply for combustion plant where the operator has signed up to an interruptible gas supply • Mechanical breakdown of arrestment plant such as pumps, fans etc • Power failure • Compaction of the biofilter or surface fissures • Saturation of a carbon filter bed and subsequent breakthrough of odours • Below optimum temperature of a thermal oxidiser or boiler etc • Saturation of scrubber liquor, blocked injection nozzles etc.
Those which affect the ability to contain odour	• Building damage which affects integrity due to for example storms • Power failure • Failure of automatic doors, i.e. in open position • Failure in procedures to maintain containment (human error)
Those affecting dispersion between the source and sensitive receptors‡	• Short term weather patterns which fall outside of the normal conditions for that area and are highly unusual (not just the normal meteorological pattern) - inversions and other conditions unfavourable to dispersion should have been considered in designing the process • Weather - wind direction, temperature, inversion conditions if these are normal variants of local weather • Loss of plume buoyancy/temperature
‡ The process design should incorporate control measures in order that the aim that, under the normal range of meteorological conditions for the area, no emissions result in offensive odour that is detectable beyond the process boundary.	