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Sector Guidance Note IPPC SG 8 Integrated Pollution Prevention and Control (IPPC)

Secretary of State's Guidance for the A2 Rendering Sector

November 2008 (Revised December 08)

Llywodraeth Cynulliad Cymru
Welsh Assembly Government

SCOTTISH EXECUTIVE

defra
Department for Environment
Food and Rural Affairs

Department for Environment, Food and Rural Affairs
Nobel House
17 Smith Square
London SW1P 3JR
Telephone 020 7238 6000
Website: www.defra.gov.uk

Information about this publication is available from:

Defra
Area 3C, Ergon House
17 Smith Square
London SW1P 3JR

Tel: 020 7238 5558

Email: pgnotes@defra.gsi.gov.uk

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Environment Agency

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

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1 Introduction

Background

1.1 This sector guidance note is issued by the Secretary of State and the Welsh Assembly Government (WAG), following consultation with relevant trade bodies, representatives of regulators including members of the Industrial Pollution Liaison Committee, and other interested organisations.

1.2 The note constitutes statutory guidance under regulation 64 of the Environmental Permitting (England and Wales) Regulations 2007, SI 3538 (Ref 3) on the integrated pollution control standards appropriate for the generality of new and existing A2 installations in the processing of animal remains and by-products sector.

These installations require a permit to operate in accordance with the 2000 Regulations under what is known as the Local Authority-Integrated Pollution Prevention and Control (LA-IPPC) regime. Local authority regulators are required by regulation 37 to have regard to this guidance. The Secretary of State / WAG will also treat this guidance as one of the material considerations when determining any appeals made under the Regulations against a local enforcing authority decision.

1.3 The guidance also (where appropriate) gives details of any mandatory requirements affecting emissions and impacts from these installations, which are in force at the time of publication. These include requirements contained in directions from the Secretary of State / WAG.

1.4 This is one of a series of such guidance notes aimed at providing a strong framework for consistent and transparent regulation of LA-IPPC installations.

1.5 General guidance explaining LA-IPPC and setting out the policy and procedures, is contained in the “General Guidance Manual on Policy and Procedures for A2 and B Installations” (Ref 11) available from www.defra.gov.uk/environment/ppc/index.htm to be referred to in this document as the "General Guidance Manual.” This is designed for operators and members of the public, as well as for regulators.

Best Available Techniques (BAT)

1.6 BAT is the main basis for determining standards in LA-IPPC. This sector guidance note addresses what is considered by the Secretary of State/WAG to constitute BAT for the processing of animal remains and by-products.

As made clear in chapter 12 of the General Guidance Manual, BAT for each installation should be assessed by reference to the appropriate sector guidance note, and these notes should be regarded by local authorities as their primary reference document for determining BAT in drawing up permits. In general terms what is BAT for one installation is likely to be BAT for a comparable installation. However, determination of what is BAT is ultimately a matter for case by case decision taking into account that individual circumstances may affect BAT judgements and what are the appropriate permit conditions.

Thus for each processing of animal remains and by-products installation, local authorities (subject to appeal to the Secretary of State / WAG) should regard this guidance note as a baseline, but ensure they take into account any relevant case-specific factors such as the individual process configuration and other characteristics, its size, location and any other relevant features of the particular installation. Further guidance on this, including the issue of taking account of operators' individual financial position, is contained in chapter 12 of the General Guidance Manual.

1.7 If there are any applicable mandatory EU emission limits, these must be met, although BAT may go further.

Who is this guidance for?

1.8 This guidance is for:

- regulators: who must have regard to the guidance when determining applications and when regulating installations which have a permit
- operators: who are best advised also to have regard to it when making applications and in the subsequent operation of their activities
- members of the public: who may be interested to know what standards are envisaged for the generality of installations in this sector.

1.9 The guidance is based on the state of knowledge and understanding of installations in this sector, their potential impact on the environment, and the available control techniques at the time of writing. The guidance may be amended from time to time in order to keep abreast with developments, including improvements or changes in techniques and new understanding of environmental impacts and risks. Any such amendments may be issued in a complete revision of this note, or in separate additional guidance notes which address specific issues. (N.B. It may not always be possible to issue amending guidance quickly enough to keep in absolute step with rapid changes, which might be another justification in particular, cases for diverging from this note.) Steps will be taken to ensure that those who need to know about changes are informed of any amendments. Operators (and their advisers) are, however, strongly advised to check with the relevant local authority whether there have been any amendments before relying on this note for the purposes of applying for a permit or making any other decisions where BAT and related matters may be a consideration.

Terminology

1.10 In addition to the General Guidance Manual referred to Above, explanation or clarification of certain terms used in this sector guidance note may be found in a general guidance note issued under Part I of the Environmental Protection Act 1991: 'Interpretation of terms used in process guidance notes', known as General Guidance Note 4 - GG4 - published by HMSO in 1991. Where there is any conflict between GG4 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 LA-IPPC.

Installations covered

1.11 This note covers installations described in Section 6.8, Part A(2) of Schedule 1 to the EPR Regulations (Ref 3) as follows:

"Disposing of or recycling animal carcasses or animal waste by rendering at plant with a treatment capacity exceeding 10 tonnes per day of animal carcasses or animal waste, or, in aggregate, of both."

1.12 This guidance note refers to:

- the processing of animal remains and by-products. Animal by-product rendering installations take the residues arising from the slaughter of animals and poultry in abattoirs and poultry processing plants as well as similar materials arising in meat deboning and packing plants, butchers' shops, knackers' yards and other sources. This material is dehydrated by the application of heat in an evaporative rendering process and in some circumstances sterilised. Manufactured products from such processes are traditionally associated with the animal feed, soap and oleochemical industries, although many highly specialised outlets also exist.

- the processes which take in blood and either process it to produce dry blood, or part process it. Usually, the processing involves coagulation, followed by separation and drying of solids. It also refers to processes, other than slaughterhouses, where animal remains or by-products are stored before being dispatched to a processor. The by-products concerned might include hoof and horns, bones and fat. Hide and skin dealers are covered by PG6/21(96) Hide and Skin Processes.

1.13 In some cases, animal by-product rendering processes operate combustion units which burn meat and bone meal (MBM) or tallow. Further guidance on the combustion of Over Thirty Month Scheme meat and bone meal is provided in the Environment Agency's IPC Guidance Notes S2 1.05 (Combustion of Fuel Manufactured From or Comprised of Solid Waste) and S2 5.01(Waste Incineration) as amended by Amplification Note No.1 which deals specifically with the combustion of meat and bone meal. Regard should be had to this guidance in relation to all appliances with a net rated thermal input of 3MW or more on which meat and bone meal are burned, and the guidance may well also be applicable to smaller appliances. The combustion of tallow should not normally require the setting of specific emission limits other than those in Ref 12. This position may shortly change in the light of new guidance being produced by Defra on WID.

The installation includes the main activities above plus the associated activities which have a technical connection with the main activities and which may have an effect on emissions and pollution.

Review and upgrading periods

Existing installations or activities

1.14 Previous guidance, PG6/1(00), advised that upgrading to that standard should, other than in exceptional circumstances, have been completed by 1 April 2001. Requirements still outstanding from any existing upgrading programme should be completed. The previous version of this guidance SG8 (04) contained improvements that were required to be completed over a range of dates up to 2008. These were listed in Table 1 of the note. Where a date or time period in the Note has been passed then installations should have been upgraded to these standards by the date of publication of this Note.

1.15 The new provisions of this note and the dates by which compliance with these provisions is expected, are listed in Table 1 below, together with the paragraph number where the relevant guidance is to be found. Compliance with the new provisions should normally be achieved by the dates shown. Permits should be drafted having regard to this compliance timetable.

(1) Where this guidance note specifies provisions which are additional to, higher than or different to those in PG note (PG 6/1 (00)), only in exceptional circumstances should upgrading of existing installations and activities having regard to these additional/higher/different provisions be completed later than the compliance date specified in Table 1 below.

(2) Where standards or provisions in PG note (PG 6/1 (00)) have been deleted in this guidance note or where this guidance note specifies less stringent provisions than those in PG note (PG 6/1 (00)), the new LA-IPPC permit should reflect this straightaway.

1.16 A programme for upgrading within the specified timescales, to those new / additional provisions in this guidance which involve significant improvement work, should be submitted to the relevant regulator within 6 months of the date of issue of the permit.

Table 1: Compliance Timetable

	Guidance	Reference	Compliance Date
Existing plant currently not upgraded to the requirements of PG6/1(00)	Treatment by incineration of high intensity process odours and those containing incondensable gases.	BAT 54	1 November 2005
	Enclosure of conveyors transporting raw, processed and dusty material.	BAT 59	1 April 2005
Existing plant upgraded to the requirements of PG6/1(00)	Treatment by incineration of high intensity process odours and those containing incondensable gases.	BAT 54	1 April 2008
	Enclosure of conveyors transporting raw, processed and dusty material.	BAT 59	1 April 2005
New plant	High intensity containing odorous emissions should be directed through odour arrestment equipment at least as efficient as a dedicated thermal oxidiser.	BAT 58	1 November 2004
	Enclosure of conveyors transporting raw, processed and dusty material.	BAT 59	
All plant	Emissions to water	Paragraph 3.34-3.38 and BAT 14-18	1 November 2005
	Groundwater contamination audit risk	BAT 14-18	1 November 2005
	Raw materials / waste minimisation	Paragraph 3.69-3.77 and BAT 73-75	1 April 2006
	Energy audit	Paragraph 3.86-3.87 and BAT 84-88	1 November 2005
	Hazard identification / risk analysis	Paragraph 3.92-3.93 and BAT 91-93	1 November 2005
	Noise and vibration	Paragraph 3.97-3.98 and BAT 101	1 April 2005
	All other requirements	-	1 November 2005 or as otherwise specified in the text of the guidance.

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

New installations or activities

1.18 For new installations or activities - from the first day of operation the permit should have regard to the full standards of this guidance.

Substantially changed installations or activities

1.19 For substantially changed installations or activities - as from the first day of operation, the permit should normally have regard to the full standards of this guidance with respect to the parts of the installation that have been substantially changed and any part of the installation affected by the change.

Permit reviews

1.20 Permits should be reviewed in accordance with the guidance in chapter 26 of the General Guidance Manual. For this sector it is considered appropriate that the frequency of review should be at least every 4 years.

The EU Waste Framework Directive

1.21 In some cases, it will be necessary for local authority regulators to control animal rendering installations as waste disposal or waste recovery operations subject to the requirements of the EU Waste Framework Directive ("WFD") (75/442/EEC as amended by 91/156/EEC). In these circumstances, local authority regulators are designated as "competent authorities" for the purpose of Article 6 of the WFD and their functions are set out in regulation 19 of and Schedule 4 to the Waste Management Licensing Regulations 1994 ("the 1994 Regulations") (S.I. 1994 No.1056 (as amended)).

1.22 Appendix 1 to this note sets out the views of the Secretary of State/WAG on the control of animal rendering installations as waste disposal or waste recovery operations.

1.23 The key provision of the WFD is Article 4 which provides that Member States must "…take the necessary measures to ensure that waste is recovered or disposed of without endangering human health or the environment…" Article 4 of the WFD is transposed as the "relevant objectives" in paragraph 4 of Schedule 4 to the 1994 Regulations. Local authority regulators must determine permit applications for the disposal or recovery of waste animal by-products in rendering installations, and regulate installations for which a permit is issued, on the basis of the risk posed to the attainment of the "relevant objectives" (see paragraphs 8-10 of Appendix 1).

1.24 In practice, local authority regulators' application of BAT having regard to the provisions of this guidance should generally be sufficient also to comply with Article 4 of the WFD. However, regulators must consider also, in all cases involving the disposal or recovery of waste animal byproducts, the applicability of the guidance in Appendix 1 to this note in relation to the particular installation and must include additional or different conditions where appropriate. Permits must also contain conditions in accordance with paragraphs 11-13 of Appendix 1 and regulators should note that the WFD requires local authority regulators to carry out "appropriate periodic inspections" of waste disposal and recovery operations (see paragraphs 14-15 of Appendix 1).

Summary of releases

Table 2: summary of direct releases

Source → / Release ↓	Delivery of materials	Unloading of material	Crushing and transportation of material	Processing of material	Treatment of extracted gases	Effluent treatment	Cleaning of vehicles	Storage of processed material	Cleaning of surface	Drainage systems	Tallow storage
Odour	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
Oxides of sulphur					**A**						
Oxides of nitrogen					**A**						
Carbon dioxide					**A**						
Carbon monoxide					**A**						
Particulate/Total suspended solids	**A/W**	**A/W**	**W**	**A/W**	**A/W**	**L/W**		**A/L/ W**	**W**		
Ammonia	**W**	**W**	**W**			**W**	**W**		**W**		
COD	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**
BOD	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**
Solid waste or sludge	**L/W**	**L/W**	**L/W**	**L/W**	**L/W**	**L/W**	**L/W**	**L/W**	**L/W**	**L/W**	**L/W**
Oils and greases	**L/W**	**L/W**	**L/W**	**L/W**			**L/W**	**L/W**	**L/W**	**L/W**	**L/W**
Noise	*	**	**	**	*		*		*		

KEY
A-Release to Air, W-Release to Water, L-Release to Land, *-High potential for noise, **-Medium potential for noise, *-Low potential for noise**

Substances include their compounds, except where separate reference to the compound is made.

Releases to air may also be released to land or water, depending upon their arrestment technology employed, eg, via collected dusts, sludges or liquors.

NB. **It should be noted that this is not necessarily an exhaustive list. Equally, not all installations will necessarily have all these releases.**

2 Emission limits and other provisions

2.1 This section contains emission limits, mass release rates and other requirements that are judged for the generality of the activities within the sector to represent BAT.

Emissions to air associated with the use of BAT

Table 3: Emissions to air associated with the use of BAT.

Determinand	Source	Limit	Type of monitoring	Frequency of monitoring
Offensive odour	Whole process	No offensive odours across the site boundary in accordance with BAT 34	Visual and olfactory	At least daily
Visible emissions	Combustion plant	Ringlemann shade 1	Operator observations (dependent upon type of combustion plant)	At least daily
Particulate matter	All contained sources	50 mg/m^3	Continuous indicative monitoring (where continuous monitoring is shown by the operator to be impractical, compliance with the emission limits should be demonstrated by selection of arrestment equipment which is capable of meeting the specified emission limits and by continuous monitoring of the arrestment equipment, performance, for example by the installation of optical cross-duct detectors on fabric filters or cyclones).	Continuous (equipment should be checked at least daily to ensure it is functioning correctly) In cases where it has been shown that continuous monitoring is impractical, or where continuous monitoring only gives and indication of compliance with emission limits, emissions should be tested at least quarterly: a reduced frequency may be appropriate if monitoring results demonstrate consistent and reliable operation of the arrestment plant and compliance with the emission limit.

Determinand	Source	Limit	Type of monitoring	Frequency of monitoring
Sulphur dioxide	From fuel burnt in combustion plant	0.1% wt/wt sulphur in fuel	Certification as gas oil by supplier using test method ASTM D86 distillation	Certificate to be provided for the fuel used and a new certificate is required on a change of fuel.
		When burning other fuel – 1% wt/wt sulphur in fuel		

Emissions to water associated with the use of BAT

2.2 Limit values for water discharges will be specified in individual cases taking account of the receiving environment. The following table provides information regarding achievable levels associated with the use of wastewater treatment systems.

Table 4: Emissions to water associated with BAT

Determinand	Benchmark release concentration, mg/litre
COD	130 (trade effluent consent) or 30 (surface water)
BOD	60
Total hydrocarbon oil	5
Total suspended solids	80
Ammoniacal nitrogen expressed as N	15
The appropriateness of the above release concentrations will vary depending upon the sensitivity of the receiving water and should be proportionate to the scale of the operations.	

3 Techniques for pollution control

3.1 This section summarises, in the outlined BAT boxes, what BAT should be in most circumstances. The boxes should not be taken as the only source of permit conditions; compliance with emission limits and other provisions contained in this guidance note together with any relevant case-specific considerations will also need to be taken into account. For the purposes of this note, in the event of a conflict between the provisions in any part of BAT 34 and any other provision within the note the former should take precedence.

3.2 The standards cover the techniques and measures which, in combination with those in the relevant previous (LAPC/IPC/Waste) guidance, have been identified as representing BAT in a general sense. They also cover the other requirements of the Pollution Prevention and Control (England and Wales) Regulations 2000 and requirements of other regulations, such as the Waste Management Licensing Regulations and the Groundwater Regulations insofar as they are relevant to an IPPC permit.

3.3 The main environmental concern from the processing of animal remains and by-products is odour. Many of the control techniques contained in this guidance note are, therefore, aimed at preventing odorous emissions across the site boundary. The control techniques tend to be additive and it is the cumulative affect of implementing all or many of such techniques which will achieve no odorous emissions across the site boundary in accordance with BAT 34. It is important, therefore, that regulators not only consider individual parts of the process but how these parts interrelate with each other.

3.4 The management of the process and maintenance of plant and arrestment equipment are key to minimising the environmental impact of animal rendering processes. This is reflected in a number of the BAT conditions contained within this note. Experience in regulating such processes has shown that problems have occurred due to poor management or inadequate maintenance. In this regard regulators and operators should ensure that robust pro-active systems are in place which eliminates the potential for problems to occur as a result of poor management or maintenance. The "Management" section of this note contains further details on this.

Process description and in-process controls

3.5 Where techniques or operating conditions are referred to in the BAT boxes below, provided that it is demonstrated to the satisfaction of the regulator that an equivalent or better level of control of environmental impacts will be achieved, and then other techniques or operating conditions may be used.

Summary of activities

3.6 The meaning of "installation" and "directly associated activity" is addressed in chapter 2 of the General Guidance Manual.

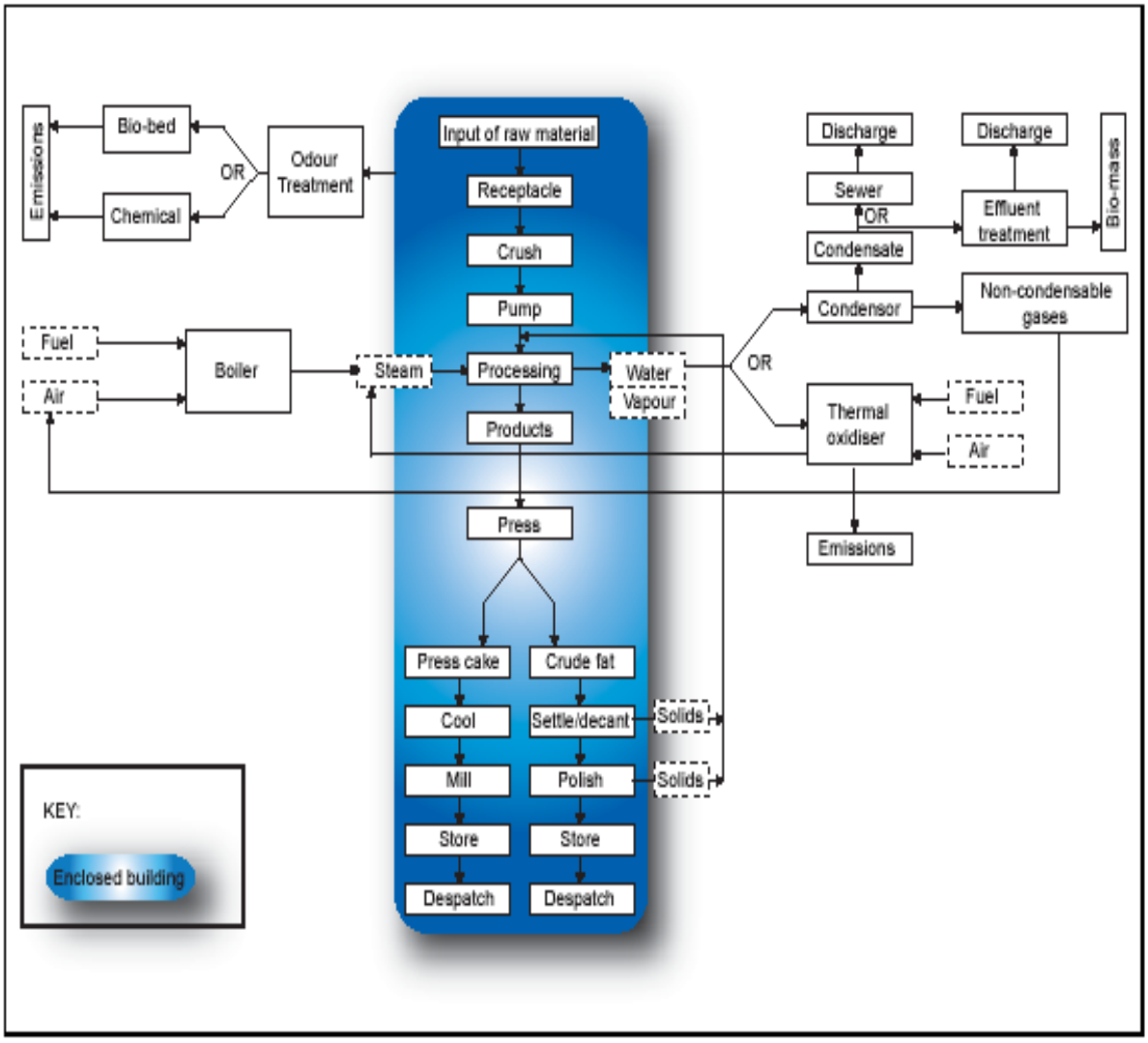
3.7 Generic steps in the processing of animal remains and by-products:

- raw material reception
- storage and handling of raw materials
- size reduction of raw materials
- processing of materials
- treatment of odorous emissions
- storage of processed materials
- washing and cleaning
- effluent treatment (on site or to discharge)

3.8 Equipment common to this sector includes:

- purpose designed transportation vehicles: vehicles designed to minimise offensive odour
- and spillage of liquid or solid matter
- fast closing doors: maintain an airlock
- ordinary door: negative pressure/extraction between internal and external doors
- sealed, extracted reception and processing areas: ensure capture and arrestment of odorous
- emissions
- storage hoppers: containment of stored materials
- crushers: size reduction of material prior to processing
- conveyors: contained transportation of material
- cookers: separation of material into bone meal and tallow
- storage silos: storage of processed material
- boilers: production of steam, treatment of odorous emissions
- condensers: separate out condensable gases
- biological scrubbers: treat odorous emissions
- scrubbers: treat odorous emissions
- thermal oxidisers: treat odorous emissions

Figure 3.1: Example of a typical rendering plant operation



Overview of activities in this sector

Receipt and storage of raw materials

3.9 Raw materials are generally animal by-products from meat production such as slaughterhouses, meat processing plants, butchers shops, supermarkets and livestock rearing facilities. The by-products include carcasses, parts of carcasses, heads, feet, offal, excess fat, excess meat, skins, hides, feathers and bones.

3.10 Material arriving at the plant will generally already be beginning to degrade. The amount of degradation is a function of the time and storage conditions at source and the time and storage conditions during transportation. The more degradation the more odorous the material is likely to be. It is important therefore that the received material arrives as fresh as possible as this will result in easier handling and a reduced loading on odour arrestment plant.

Processing of raw materials

3.11 There are a number of different configurations for the processing of material and the process may be continuous or batch. In general however, the following steps will be involved:

- raw material receipt & storage
- size reduction
- heat processing / cooking
- separation
- storage

Raw Material receipt & storage

3.12 Raw material is delivered to site by vehicle and the materials are either tipped directly into reception hoppers or the material is tipped onto the floor of the reception hall prior to being loaded into the reception hoppers.

Size reduction

3.13 The raw material is generally gravity fed from hoppers or via screw conveyors into a mechanical crusher where the material is crushed to a minimum size as required by the specific method approved by the ABPR/1774.

Processing (by heat / cooking)

3.14 This part of the process is conventionally termed “cooking”. Seven generic processes are approved by the ABPR/1174 and the main differences between all of the methods is how the heat process / cooking is applied. Therefore, the exact configuration of the cooker will depend upon whether it is a batch or continuous process and whether sterilisation is part of the cooking process. The basic principles, however, remain the same. Raw materials are fed into the cooker where they are heated. Heat is generally provided by steam which is fed into a jacket surrounding the material. This has the effect of evaporating off the moisture and melting the fat.

Separation

3.15 As with cooking the separation process will depend upon the configuration of the process. Liquid and solid material must then be separated. It is common for the material to firstly pass over a screen through which the liquid and small solid particles will pass. This will separate out the material into a liquid stream containing small particles and a relatively solid phase which still has a fat content. The liquid phase will then be subject to other separation techniques such as a centrifuge where the fine particles are removed. These fine particles are then combined with the solid phase and are commonly passed to a press where the majority of the excess fat is squeezed out. This fat will also contain small particles and it is fed through the centrifuging. The pressed solid material is then dried and the remaining fat removed. Once dried and the fat removed, the solid material is referred to as meat and bone meal (MBM). The clarified fat is referred to as tallow. Any spillages or residues are commonly fed back through the cooker.

Storage of processed materials

3.16 Tallow is pumped to storage silos where it is then either removed from site or used as a fuel in the boilers to produce steam. The MBM is stored in silos or sealed warehouses pending disposal. Like tallow it has a high calorific value and a few plants use it in combined heat and power plants to produce energy.

Other materials

3.17 The above description is based on the rendering of animal by-products from cattle, sheep, pigs and chickens. Other materials such as feathers and pig hair may also be processed at rendering plants. Such materials generally have a very low fat content which necessitates the use of different process equipment to that described above. In essence the principles are the same i.e. the application of heat to evaporate the moisture, and / or a pressure step if required by the ABPR/1774. In the case of blood, heat may be applied to coagulate the blood, followed by the separation of the blood solids which are dried to make blood meal. In the case of feathers or hair, the pressure step is incorporated to hydrolyse the keratin protein to make it digestible and suitable for use as an animal feed ingredient.

Odour control

3.18 The main environmental impact from rendering processes is odour. Odour is generally controlled at such sites by the following methods in order:

- preventing odours
- minimising odours
- capture and treatment of odours

The above hierarchy should be adhered to as far as possible. Certain local circumstances however, may preclude the above order from being strictly followed. It is the integration of the above methods, as reflected in the BAT conditions later in this document, which prevents offensive odours from crossing the site boundary. It is the intention of the following paragraphs to provide some background information that will help to explain the reasoning and necessity for certain BAT conditions.

Receipt and storage of materials

3.19 The freshness of the material is a consideration to preventing/minimising odours from it. Over time raw materials will thermally and biologically degrade, resulting in an increase in offensive odours and an increase in the liquid fraction of the material. This increases the chances of an odour problem arising as smaller releases are more likely to be noticeable and a greater loading will be placed on existing odour arrestment equipment. Furthermore, the increase in the liquid fraction will increase the pressure on joints and seals which may increase the likelihood of leaks and spillages, which can in turn, lead to odours escaping. Processing material of a similar consistency is also important for odour control where abatement technologies other than thermal oxidation are employed. Such plants will be optimised to process material of a certain consistency, more odorous material may overload the system and result in an odorous emission.

3.20 As the freshness of raw material is so important to the prevention of odorous emissions, operators should only accept the receipt of older material which is particularly odorous in exceptional circumstances. In this instance, exceptional circumstances would include exceptional transport delays or the particular transportational difficulties associated with bringing material from geographically remote areas such as the Scottish islands. In such circumstances it is important that received material is prioritised and processed as quickly as possible without undue delay to avoid further degradation. It may be the case that certain sites have a market for processing particularly odorous material. In such circumstances sites should be specifically designed, operated and managed to ensure that the processing of such materials meets with the requirements of Row 1, Table 3.

Processing of raw materials

3.21 The processing of materials will give rise to high intensity odorous emissions. These emissions are generally abated in one of two ways:

(i) Boiler: emissions from the processor are first passed to a condenser to condense out water and other liquids. The liquid condensate is passed to a suitable water treatment plant, either on or off-site. The non-condensable and odorous gases are then passed to the combustion side of the boiler where they are combusted to destroy odours. There is a risk in a number of plants where this type of arrestment is used that during times when steam is not required, boilers are not operating at sufficiently high temperatures to break down odorous molecules and hence the destruction of high intensity odours may not be achieved. It is important in plants with such a configuration that the temperature within the boiler combustion zone is monitored to ensure that temperatures are sufficiently high to ensure adequate combustion of the odorous emissions.

(ii) Dedicated thermal oxidiser: vapours from the processor are passed directly to a thermal oxidiser without passing through a condenser. Again the odours are destroyed by high temperature combustion. In this case, however, the thermal oxidiser has been purposely designed to destroy high intensity odorous emissions. It is usual to fit a boiler to the thermal oxidiser for the purposes of making steam through the reclamation of heat from the combustion process.

Key Environmental Impacts

3.22 The following list identifies key environmental impacts:

Water: Run off from storage areas, haulage roads and vehicles, condensate

Spillages: During transportation, handling, cleaning of tallow filters, de-sludging tallow storage tanks

Leakages: From stored materials, vehicles, during handling

Land: Spillages during handling

Air: Odour from stored materials, unloading of material, cooking of material, contaminated vehicles, surfaces and containers, failure of arrestment equipment

Waste: Waste water from cleaning

Energy: Use of energy for heating and producing steam

Accidents: Spillage of materials during handling operations. Leakage and containment failure of vehicles, containers etc. Blockages in the cookers resulting in build up of pressure and leading to spillages, major plant failure leading to build of stored material which will degrade over time

Noise: Vehicles and delivery operations may cause noise disturbance, especially if close to the site boundary, disturbances such as pump noise, resonation in pipe work

Emissions control

Point source emissions to air

3.23 The nature and source of the emissions to air expected from each activity are given in previous sections. In general they comprise:

- SO_X, NO_X and CO from the combustion plant and odour arrestment plant
- Particulates from odour arrestment plant
- Odorous compounds from odour arrestment plant

Dispersion and dilution of stack emissions

3.24 The basis upon which stack heights are calculated using HMIP Technical Guidance Note D1 (D1) (Ref 6) is that pollutants are dispersed and diluted in the atmosphere to ensure that they ground at concentrations that are harmless under the theoretical conditions of the D1 model. The emission limits in this sector note should be used as the basis for stack height calculation. 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 takes into account the relevant air quality standards that apply for the emitted pollutants.

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 efflux velocity and achieve greater dispersion.

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 A2 activity itself is a significant contributor to the problem.

An operator may chose to meet a tighter emission limit in order to reduce the required stack height.

3.25 Where an emission consists purely of air and particulate matter, the above provisions relating to stack height calculation for the purpose of dispersion and dilution should not normally be applied. However, if the emission point is within a designated air quality management area with respect to PM_{10}, then this may have to be reviewed.

3.26 Dispersion models for vent and stack height calculations should take into account any emissions of the same pollutants from any other permitted activity on the installation, in order to avoid exceeding local ground-level pollution thresholds and limit national and transboundary pollution impacts. Such models should be based on the most sensitive receptor, be it human health, soil or terrestrial ecosystems.

3.27 Vent and stack heights should be sufficient to ensure adequate dispersion under circumstances of foreseeable process upsets or equipment failure that may give rise to abnormally high emission levels over short periods.

3.28 Where offensive odour is likely outside the installation boundary, the assessment of stack or vent height should take into account the need to render harmless residual offensive odour.

3.29 Exhaust gases from a wet scrubber should be heated by the use of all available waste heat to raise the temperature of the exhaust gases and prevent immediate condensation on the exit from the vent. This procedure also aids the thermal buoyancy of the plume. Where there is no available waste heat and the vent contains no significant environmentally harmful substances, the operator may be able to demonstrate that the BAT criteria have nonetheless been met.

3.30 Arrestment plant should be used where practicable to ensure particulates are recovered and reused within the process.

3.31 Liquid condensation on internal surfaces of flues and exhaust ducts might lead to corrosion and ductwork failure or to droplet emission.

- adequate insulation should be provided to minimise the cooling of waste gases and prevent liquid condensation by keeping the temperature of the exhaust gases above the dewpoint

3.32 Unacceptable emissions of droplets could possibly occur as a result of entrainment from wet abatement plant where the linear velocity within the associated ductwork exceeds 9 m/s. The use of mist eliminators reduces the potential for droplet emissions.

- where a linear velocity of 9 m/s is exceeded in the ductwork of existing wet abatement plant, the linear velocity should be reduced, subject to health and safety considerations, to ensure that droplet fallout does not occur

3.33 The dispersion from all emission points to air can be impaired by low exit velocity at the point of discharge, or deflection of the discharge.

- flues and ductwork should be cleaned to prevent accumulation of materials, as part of the routine maintenance programme
- a minimum discharge velocity should be required in order to prevent the discharged plume being affected by aerodynamic down wash

BAT

All releases to air

The operator should:

1 Ensure that all operations which generate emissions to air are contained and adequately extracted to suitable arrestment plant, where this is necessary to meet specified emission limits.

2 Ensure that emissions from combustion processes in normal operation are free from visible smoke and in any case do not exceed the equivalent of Ringelmann Shade 1 as described in British Standard BS 2742:1969.

3 Ensure that hot emissions take place from the minimum practicable number of stacks, in order to obtain maximum advantage from thermal buoyancy. This is particularly important when new plants are being designed or when changes are being made to existing processes. If practicable a multi-flue stack should be used.

4 Ensure that stack heights are sufficient to ensure adequate dispersion under normal conditions.

5 Be able to demonstrate to the regulator that all reasonably practicable steps are taken during start-up and shut-down, and changes of fuel or combustion load in order to minimise emissions.

6 Where waste gas treatment includes an afterburner or a thermal oxidiser or catalytic oxidiser or boiler furnaces, asses the stack height on the basis of the need to comply with BAT 34. The stack height so obtained should be adjusted to take into account local meteorological data, local topography, nearby emissions, and the influence of plant structures. The calculation procedure in HMIP Technical Guidance Note D1, as supplemented by the additional guidance subsequently produced by AEA Technology, should be used as a basis for the assessment, insofar as it is relevant. Alternative dispersion models may be used by agreement with the regulator.

7 Ensure that all discharges to air, other than water vapour, are free from persistent visible emissions.

8 Ensure that emissions of water vapour are free from droplet fallout.

BAT

9 Ensure that liquid entrainment in the duct of wet arrestment, leading to droplet fallout, does not occur as a result of the linear flow rate within the duct exceeding 9m/s.

10 Ensure that flues and ductwork are cleaned to remove any accumulation of materials, as part of the routine maintenance programme.

11 Ensure that exhaust gases discharged through a stack achieve an exit velocity greater than 15m/sec during normal operating conditions to achieve adequate dispersion.

12 Ensure that stacks are not 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.

13 Ducts should be designed and the velocity inside them maintained such that the accumulation of material inside them is minimised.

Point source emissions to surface water and sewer

3.34 The nature and source of the emissions expected from each activity is given in previous sections. In general, wastewater can arise from cleaning and hygiene operations, from storm water, from cooling water, from accidental emissions of raw materials, products or waste materials and from fire fighting.

3.35 Discharges to water and sewer from the animal rendering sector arise principally from:

- Storm water
- Surface water run-off from yards, haulage roads, loading and unloading areas;
- Cooling water;
- Process wash down & hygiene operations
- Vehicle washing areas
- Process condensate;
- Effluent treatment plant;
- Other wash down water, for example, dryer cleaning effluent;
- Accidental emissions of raw materials, products or waste materials;
- Fire fighting;

3.36 Contaminated water is of particular concern in the animal rendering plants as it has the potential to have a high biological oxygen demand and as a result can be very damaging to any receiving waters it may enter into. Contaminants in such water are likely to degrade releasing odours and removing oxygen from the water body. Fats, greases and other animal matter in such water are prone to solidifying. This causes blockages in drainage systems and leads to the build up of material which can degrade causing odour problems.

3.37 The following general principles should be applied in sequence to control emissions to water:

- water use should be optimised and wastewater re-used or recycled
- contamination risk of process or surface water should be minimised
- wastewater treatment systems can maximise the removal of pollutants, for example metals, using precipitation, sedimentation and filtration. The mix of pollutants will define the methods and reagents used. Concentrated effluents should be pre-treated as necessary before discharge into the final effluent treatment system

- ultimately, surplus water is likely to need treatment to meet the requirements of BAT (and statutory and non-statutory objectives). Generally, effluent streams should be kept separate as treatment will be more efficient. However, the properties of dissimilar waste streams should be used where possible to avoid adding further chemicals, e.g. neutralising waste acid and alkaline streams. Also, biological treatment can occasionally be inhibited by concentrated streams, while dilution, by mixing streams, can assist treatment
- systems should be engineered to avoid effluent by-passing the treatment plant

3.38 The nature of the receiving water should be taken into account, with regard to any pollutant released to this media. For example, the water treatment techniques required for discharges to sewer should be fit for purpose for that media. However, irrespective of the receiving water, the adequacy of the plant to minimise emissions must be considered.

Local Authority Regulation

3.39 Regulation 58 of The Environmental Permitting (England and Wales) Regulations 2007 states that:

- "(1) This regulation applies to Part A installations and Part A mobile plant for which a local authority is the regulator."
- "(2) At any time the Agency may give notice to the local authority specifying the emission limit values or the conditions it considers appropriate for preventing or reducing emissions into water from the installation or plant."
- "(3) If such a notice is issued, the local authority must exercise its functions under these Regulations to ensure the environmental permit for the installation or plant includes-
  (a) the emission limit values or conditions specified in the notice; or
  (b) such stricter limit values or more onerous conditions as the authority thinks fit.
- "(4) In this regulation, "emission limit value" means the mass, expressed in terms of specific parameters, concentration or level of an emission, which must not be exceeded during a period of time."

Off site effluent treatment

3.40 Where an operator discharges to a Sewage Treatment Works via sewer, the sewerage undertaker is a statutory consultee and must be sent a copy of the application. The STW operator is likely to confirm to the Environment Agency and the local authority the levels of pollutants (considering levels specified in the trade effluent consent) that the sewer is able to take.

In all cases the effluent discharged from the installation must not give rise to a potential breach of an EQS or EAL for the final receiving water, when taken with compliance with any water company permit. In a significant number of cases the Environment Agency finds that the STW operator's discharge consent and the Environment Agency's concerns to protect watercourses are closely aligned. Where they are aligned and there is a simple discharge, it is common Agency practice just to rely on the consent and not to replicate limits in permit conditions.

3.41 For rendering activities, although certain effluents can be defined as complex, it is unlikely that BAT equates with tighter limits than those specified by the Environment Agency. Therefore, the consent can be relied upon (as for simple discharges above) without replicating limits in permit conditions.

Further guidance on regulating water discharges from A2 Installations can be found in Chapter 10 of the General Guidance Manual.

BAT

The operator should ensure that:

14 All emissions are controlled, as a minimum, to avoid a breach of water quality standards. (Calculations and/or modelling to demonstrate this may be required to be submitted to the regulator).

15 Run-off from the installation should be controlled and managed and where necessary (given the nature of the run-off) treated before discharge in a suitable effluent treatment plant.

16 All interceptors:
- are impermeable
- are subject to at least weekly visual inspection and, where necessary to ensure the continuous function, contamination removed
- have an annual maintenance inspection; prior to inspection all contents should be removed

17 Process effluent is kept separate from surface drainage unless agreed with the regulator.

18 Where effluent is treated off-site at a sewage treatment works, the operator should demonstrate that a suitable monitoring programme is in place to avoid a breach of sewage discharge consent conditions.

Point source emissions to groundwater

3.42 There should be no point source emissions to groundwater from the animal rendering sector (Ref 10).

BAT

19 There should be no point source emissions to groundwater.

Fugitive emissions to air

3.43 Common sources of fugitive emissions are:

- Odorous emissions from throughout the process
- Particulates from yards and haul roads and the handling and storage of bone meal

Where there are opportunities for reductions in fugitive emissions, the permit may require an updated record of fugitive emissions to be submitted on a regular basis.

3.44 Odorous fugitive emissions are dealt with specifically in the odour section.

3.45 Internal transport of dusty materials can generate fugitive emissions. Attention to preventing fugitive emissions, and if prevention has failed cleaning up deposits of dust on external support structures and roof will minimise wind entrainment of deposited dust.

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20 Operations should be controlled to minimise fugitive emissions.

21 The operator should make an inventory of fugitive emissions. The operator should update the inventory of fugitive emissions on an annual basis and submit to the regulator to demonstrate progress in reducing emissions.

22 Transportation of materials on site should be carried out in such a manner so as to prevent fugitive releases of particulates.

Greave and meal processing

23 All plant should be constructed and linked in such a manner that prevents spillage.

Storage

24 Stocks of dusty material, such as processed greaves and meal, should be stored in suitable silos, closed containers or an enclosed store. Storage silos for dusty materials should be vented to air through suitable equipment to meet the requirements of BAT 34 and to minimise the emissions of particulate matter.

25 The transportation and handling of dusty materials should be carried out by methods which do not give rise to dust emissions. Preferred methods include enclosed containers or covered conveyors. Conveyors should be of sufficient capacity to handle maximum loads and conveyor discharges should be arranged to minimise free fall of dusty materials. Transfer points should be enclosed and ducted to suitable equipment as approved by the regulator to meet the requirements of BAT 34 and to minimise emissions of particulate matter.

Fugitive emissions to surface water, sewer and groundwater

3.46 The operator should have a clear diagrammatic record of the routing of all installation drainage for surface water and process effluent, to include subsurface pipe work, the position of any sumps and storage vessels including the type and broad location of the receiving environment.

3.47 An inspection and maintenance programme should be established for all subsurface structures. Inspection frequencies and test methods should be chosen to prevent pollution by minimising leaks from subsurface pipe work, sumps and storage vessels, having regard to the risk factors in paragraph 3.49 below.

The minimum inspection frequency should normally be no less than once every five years for yard drainage (i.e. rainwater from roofs, hardstanding etc) and no less than once every three years for process effluent. The precise choice of inspection frequency and the sophistication of the method should be guided by the level of risk presented but a likely maximum frequency may be once per annum.

3.48 Examples of inspection and test methods are pressure tests, leak tests, material thickness checks, and CCTV survey. Using secondary containment and/or leakage detection can serve to reduce the inspection frequency to the minimum quoted in paragraph 3.47

3.49 The likely risk to the environment from drainage systems is dependant on the following factors:

- nature and concentration of contaminants in the water transferred in the drainage systems
- volume of water transferred
- vulnerability of the groundwater in the locality
- proximity to surface waters.

For yard drainage, it is likely that the minimum inspection frequency and least complex inspection methods will suffice irrespective of volume of water, vulnerability of local groundwater and proximity to surface waters.

3.50 The vulnerability is defined by the nature of the subsurface, and is mapped for England and Wales in a series of Groundwater Vulnerability maps. An additional measure of risk is whether the installation sits within a Groundwater Source Protection Zone (GPZs) as defined by the Environment Agency's Groundwater Protection Policy. GPZs help to identify areas, which are particularly sensitive to groundwater pollution because of their proximity to an important water supply.

The location of GPZs can be searched on the Environment Agency website by inserting the post code of the installation http://www.environment-agency.gov.uk/maps/info/groundwater/

3.51 Operational areas should be equipped with an impervious surface, spill containment kerbs, sealed construction joints and connection to a sealed drainage system. All such areas should be identified on a site plan held at the operator's premises. The reason for these provisions is the potential leakage of transport pollutants on roadways. Management controls should be put in place, involving, in particular, regular checks on the condition of the impervious surface to ensure its integrity is maintained. These checks should identify whether there are any parts which require maintenance to prevent the seepage of polluting liquids. The results of all such inspections should be recorded in the log book together with any necessary maintenance action arising.

3.52 The operator should ensure that all tanks containing liquids (including tallow) whose spillage could be harmful to the environment are contained. Bunds should be impermeable and resistant to the stored materials, have no outlet (drains, soakaways etc) and drain to a blind collection point. Pipework should be routed within bunded areas and sealed to a standard which maintains the bunds integrity where there is penetration of contained surfaces. Bunds should be designed to have a holding capacity of at least 110% of the largest tank and be located more than 10m from watercourses and 50m from drinking water boreholes. It is good practice for bunds to be fitted with a high-level probe and an alarm as appropriate and are inspected regularly by the operator. Rainwater should be prevented from entering bunds, but any spills and rainwater accumulations should be tested for contamination and removed as soon as possible.

3.53 All storage tanks should be fitted with high-level alarms or volume indicators to warn of overfilling. Where practicable the filling system should be interlocked to the alarm system of prevent overfilling. Tanks should have delivery connections located within a bunded area, fixed and locked when not in use and have their integrity inspected, recorded and documented, particularly where corrosive substances are involved. These inspections should be included in the maintenance schedule.

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26 The operator should have a clear diagrammatic record of the routing of all installation drains, subsurface pipe work, sumps and storage vessels including the type and broad location of the receiving environment.

27 The operator should identify the potential risk to the environment from drainage systems recorded by **BAT 26** and should devise an inspection and maintenance programme having regard to the nature and volume of waste waters, groundwater vulnerability and proximity of drainage systems to surface waters.

28 The operator should ensure that all operational areas are equipped with an impervious surface, spill containment kerbs, sealed construction joints, and connected to a sealed drainage system or such alternative requirements as approved by the regulator. The condition of the impervious surface should be checked regularly and the results of inspections and intended maintenance arising should be recorded in the log book.

29 It is preferable that sustainable urban drainage system techniques should be used for the drainage of open storage areas. In the event that these techniques cannot be employed then oil and grit interceptors will be required.

BAT

30 All sumps should be impermeable and resistant to stored materials.

31 All liquid storage tanks should be located within bunds that are designed, constructed and located away from watercourses and drains to appropriate standards and ensuring that the volume is more than 110% of the largest tank.

32 Storage tanks should be fitted with high-level alarms or volume indicators to warn of overfilling and where practicable the filling system should be interlocked to the alarm system to prevent overfilling. Delivery connections should be located within a bunded area, fixed and locked when not in use.

33 All tanks bunds and sumps should be subject to regular visual inspection as agreed with the regulator, placed on a preventative maintenance programme. The contents of bunds and sumps should be pumped out or otherwise removed as soon as is practicable after checking for contamination.

Odour

3.54 The following list covers areas which may give rise to offensive odours:

- Build up of raw materials
- Receipt and processing of odorous material
- Poor extraction and building containment
- Loss of negative pressure in buildings through open doors, windows and compromised structural integrity
- Accidental loss of containment from failed plant and equipment (e.g. extraction system failure)
- The potential for bypass of arrestment equipment (to air or water)
- Conveyor systems (e.g. raw material conveyors)
- Open vessels (e.g. effluent treatment plant, lagoons)
- Storage areas (e.g. raw materials reception
- Loading and unloading of transport vehicles
- Vehicle washing areas
- Pipework and ductwork systems (e.g. pumps, valves, flanges, catchpots, drains, inspection hatches etc)
- Spillages and leaks
- Contaminated surfaces, build up of residues
- Condensate production and effluent handling
- Burning of poor quality tallow

3.55 Chapter 17 of the General Guidance Manual provides guidance on controlling odour from installations and the information required in an application.

3.56 There are a number of odour control techniques that can be applied to animal rendering processes. Such techniques are additive in that it is the combination of some or all of these which will prevent or reduce the escape of offensive odour across the site boundary in accordance with BAT 34. In this regard regulators and operators should approach particular processes in a systematic manner applying the control techniques contained in this guidance where appropriate.

3.57 Implementation of the best available techniques and the emission limit values and provisions of this note should ensure that offensive odours are not perceived beyond the site boundary, other than where unavoidable plume grounding occurs. It may be necessary to include additional controls to avoid offensive odours, for example where local meteorological conditions frequently lead to poor dispersion conditions.

3.58 The locality will influence the assessment of the potential for odour impact, for example, where the site has a low odour impact due to its remoteness from sensitive receptors, the escape of offensive odour beyond the installation would be unlikely to cause harm. In these circumstances it is expected that the operations should be optimised to minimise odour emissions and also that effective process management is applied. Assessment of the potential for offensive odour beyond the site boundary should take account of all predicted wind directions and weather conditions, which are typical of the location in question.

BAT

34 Permits should include specific technical conditions in accordance with this guidance to prevent or generally reduce the escape of offensive odour across the site boundary. As discussed below, whether the emphasis should be on prevention or on reduction depends on the type of process (and thus the type of odour) under consideration.

Animal rendering

i Subject to what is said below, in the case of animal rendering - which gives rise to odours that are particularly offensive - conditions should be imposed preventing (rather than just reducing) the escape of offensive odour beyond the site boundary. In these cases the specific technical conditions imposed to prevent such escapes should be supplemented, as a back-up measure, with a general condition (an odour boundary condition) requiring emissions to be free from offensive odour outside the site boundary.

ii When imposing an odour boundary condition local authorities should take account of the fact that there may be circumstances where offensively odorous emissions are released for reasons which are beyond the direct control of the installation operator, for example where there is a total breakdown of arrestment equipment through no fault of' the operator. Allowance should be made for such occurrences by providing in the permit that it will not be a breach of the condition in a particular case if the operator can show that he or she took all reasonable steps and exercised all due diligence to prevent the release of offensive odour.

iii Local authorities will need to investigate incidents where offensive odour escapes across the site boundary to establish whether there has been a breach of any odour boundary condition. The Secretary of State would expect that if a rendering process is properly managed, with the operator taking all reasonable steps and exercising all due diligence, there should be very few escapes of offensive odour beyond the site boundary. Certainly he would expect local authorities to investigate very carefully whether an operator was taking all reasonable steps and exercising all due diligence if there were more than two such occurrences in any 12-month period. In the event of any occurrence the operator should immediately take remedial action to prevent any further escape of offensive odour and he would expect this to be effective within at most two hours. Again, the Secretary of State would expect local authorities to investigate with particular care the management of a rendering activity where remedial action had not been effective within 2 hours*.

iv There may be cases of animal rendering where the escape of offensive odours beyond the site boundary would be unlikely to cause any harm (for example, because the area potentially affected by the release of any offensive odour is uninhabited countryside). In such cases it would not be appropriate to require an operator to ensure that no such odours cross the site boundary and no odour boundary condition should be imposed.

Other Activities

i In the case of the activities covered by this note other than animal rendering, local authorities should consider whether the odour generated by such activities is comparable in its offensiveness to that generated by animal rendering. If so, the considerations set out above in relation to the imposition of odour boundary conditions will apply equally to such cases. In other cases, where the emissions are likely to be less offensive, specific conditions designed to minimise the escape of offensive odours should be sufficient.

ii inspector and should take into account the nature of the odour.

iii The guidance in BAT **34** supersedes the advice in additional guidance note AQ16(95) in relation to the imposition of odour boundary conditions in the case of the activities covered by this note.

* Where local authorities are drafting an odour boundary condition in line with the provisions in BAT 34 iii, they should have regard to the following:

a) include the phrase: “it shall not be a breach of the condition in a particular case if the operator can show that he or she took all reasonable steps and exercise all due diligence to prevent the release of offensive odour” ; and

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b) include a qualification of the meaning of "due diligence", confirming (by means of a footnote or otherwise), that the use of these words in the odour boundary condition means that there shall not be a breach of the condition if the operator can show that he/she employed BAT.

Accordingly, any emission of offensive odour where the operator can show that he/she employed BAT ought not to give rise to the regulator issuing proceedings against the operator for the breach of an odour boundary condition.

35 Hosing points or other methods such as high pressure steam cleaning should be provided for the effective cleaning of any area of spillage and for the effective cleaning of plant.

36 All points of transfer should be designed to be leak-proof and spill-proof. Means for cleaning and transferring spillages back to the raw material reception area should be provided and agreed with the regulator.

Processing Equipment

37 For batch rendering processes, cookers should be charged under a sufficiently reduced pressure to prevent the escape of substances prescribed for air or offensive odours, or the charging area should be hooded and the extracted gas vented to a suitable arrestment plant. Automated charging should be used.

38 All emissions of substances prescribed for air or offensive odours should be prevented or contained and ducted to suitable arrestment plant as approved by the regulator. Sources at rendering processes which must be dealt with include:

a) odorous emissions arising from the cooker during the cooking process;
b) the intermittent or continuous discharge from cookers;
c) presses or centrifuges receiving hot processed material;
d) driers;
e) ducts and glands on the processing equipment or transfer pipelines;
f) the transfer of processed or semi-processed material.

39 Cooker exhaust gases should pass in turn through an interceptor and then be directed to:
(i) a thermal oxidiser; or
(ii) an indirect condenser and the non condensable gases directed to suitable arrestment plant and effluent to water treatment plant.
There is a range of condensers acceptable for the purpose of minimising odours. Operators should ensure that the type which they propose to use is acceptable both in relation to the quantity and quality of liquid discharges.

40 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 arrestment plant efficiency.

Tallow processing and liquid storage

41 All tanks should be lidded, sealed or vented to suitable arrestment plant to prevent odour emissions. Catchment provisions - for example, bunding or spillage containment kerbs - should be provided.

42 Bulk storage tanks should be fitted with a high-level alarm or volume indicator to warn of and thereby minimise the possibility of overfilling.

Liquid effluent

43 The handling and treatment of liquid effluent should be carried out so as to minimise the emission of offensive odours. Where necessary to prevent odour emissions, tankers or transportable tanks should be vented to suitable arrestment plant or back vented.

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Odour arrestment plant

44 The use of odour-masking agents and counteractants to meet the requirements of BAT **34** of this note should not be permitted.

Existing Plant

45 Emissions of differing odour intensity are likely to be produced within the process. In the case of rendering processes, the odour streams should normally be kept separate and treated by appropriate treatment plant which has been suitably designed to deal with specific types of odour. For example, high intensity process odours and those containing incondensable gases should be treated by incineration, either within the plant boilers or a dedicated thermal oxidiser, or by alternative means which can be demonstrated to be equally effective. Less intense odours, for example from storage areas, may be vented to chemical scrubbers, biological filters or similar suitable arrestment plant.

46 Where chemical scrubbers are used, the liquid circulation and scrubber efficiency should be monitored by suitable instruments; for example, pH meters and variable orifice meters to give continuous indication of effective operation and an audible alarm to give an indication of failure. Automatic reagent dosing equipment should be used. Instrument readings should be observed regularly (for example, on start up and then twice per shift) and the readings should be recorded in the log.

47 Where condensers are used, the inlet and outlet temperatures should be continuously monitored and recorded. In the case of batch processes, the times when processing took place should be noted.

48 Where biological filters are used, care should be taken at the design stage to ensure that the residence time is adequate for the minimising odour. The temperature of waste gases entering the biological filter media, their humidity and the resistance to the flow of exhaust gases should be continuously monitored and recorded. In the case of batch processes, the times when processing took place should be noted. There should be a programme of regular weed control, agreed with the local enforcing authority, and regular inspection should take place in order that fissures due to low moisture content can be quickly identified and corrective action taken.

New/Substantially Changed Plant

49 Any new or substantially changed installation should be fitted with odour arrestment equipment at least as efficient as a dedicated thermal oxidiser. All contained high intensity odorous emissions should be directed through such arrestment equipment. Low intensity emissions should be dealt with in the same manner as BAT **54**.

General

50 All conveyors transporting raw, processed and dusty materials should be fully enclosed.

51 Without prejudice to BAT **34**, in the event of arrestment plant breakdown the system should be fail safe and allow diversion of odour streams to other suitable arrestment plant or cause interruption of the process. For example, where boilers are used for waste gas treatment, in the event of failure to reach the incineration temperatures an automatic diversion facility should be fitted to divert the emissions to alternative equipment. Where necessary flame traps should be fitted. A contingency plan covering arrestment plant failure should be devised and agreed with the regulator.

52 Gases from process and materials handling equipment should be extracted directly to arrestment to ensure the efficient treatment of odour.

Management

3.59 The following guidance on management should be read in the context of chapter 11 of the General Guidance Manual on operator competence.

3.60 Within EPR, an effective system of management is a key technique for ensuring that all appropriate pollution prevention and control techniques are delivered reliably and on an integrated basis.

3.61 An effective Environmental Management System (EMS) will help the operator to maintain compliance with regulatory requirements and to manage other significant environmental impacts. An EMS includes an environmental policy and programmes which:

- includes a commitment to continual improvement and prevention of pollution;
- includes a commitment to comply with relevant legislation and other requirements to which the organisation subscribes; and
- Identifies, sets, monitors and reviews environmental objectives and key performance indicators independently of the Permit.

3.62 The operator should have demonstrable procedures (e.g. written instructions) which incorporate environmental considerations into process control, design, construction and review of new facilities and other capital projects (including provision for their decommissioning), capital approval and purchasing policy.

Audits should be carried out, at least annually, to check that all activities are being carried out in conformity with the above requirements. Reporting should be carried out annually on environmental performance, objectives and targets, and future planned improvements. Ideally, these should be published environmental statements.

Operations and maintenance

3.63 Maintenance - It is good practice to ensure:

- effective preventative maintenance on all aspects of the process the failure of which could impact on the environment
- clear written maintenance instructions for all relevant items are developed and maintained
- a method of reviewing maintenance needs, with demonstrable evidence that this process takes place

3.64 Training – all relevant (including operational) staff should be trained in the regulatory implications of the permit, all potential environmental impacts (under normal and abnormal circumstances). Training should also include the procedures for dealing with a breach of the permit conditions, prevention of accidental emissions and action to be taken when accidental emissions occur and also in all operating procedures.

3.65 Responding to problems - The regulator needs to be notified about certain events and expects the operator to respond to problems, which may have an effect on emissions to the environment. Such problems may arise within the process itself or, for example, with the abatement plant.

3.66 Contractors on site - It is important to be aware that in complying with their permit, operators will be responsible for work undertaken by contractors. Operators are advised to provide instructions to contractors regarding protecting the environment whilst working on site.

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Environmental Management System

53 Operators should use an effective Environmental Management System with policies and procedures for environmental compliance and improvements. Audits should be carried out against those procedures at regular intervals.

Operations and maintenance

54 Effective operational and maintenance systems should be employed on all aspects of the installation whose failure could impact on the environment. As a minimum this should cover all abatement and extraction equipment. Such systems should be reviewed and updated annually.

55 Environmentally critical process and abatement equipment (whose failure could impact on the environment) should be identified and listed. The regulator should be provided with a list of such equipment.

56 For equipment referred to in BAT 55:

- Alarms or other warning systems should be provided, which indicate equipment malfunction or breakdown.
- Such warning systems should be maintained and checked to ensure continued correct operation, in accordance with the manufacturer's recommendations
- Essential spares and consumables for such equipment should be held on site or be available at short notice from suppliers, so that plant breakdown can be rectified rapidly.

57 Records of breakdowns should be kept and analysed by the operator in order to eliminate common failure modes.

Competence and training

58 A competent person should be appointed to liaise with the regulator and the public with regard to complaints. The regulator should be informed of the designated individual(s).

59 A formal structure shall be provided to clarify the extent of each level of employee's responsibility with regard to the control of the process and its environmental impacts. This structure shall be prominently displayed on the company within the process building at all times. Alternatively, there must be a prominent notice referring all relevant employees to where the information can be found.

60 Personnel at all levels shall be given training and instruction sufficient to fulfil their designated duties under the above structure. Details of such training and instruction shall be entered into the employees' record and be made available for inspection by the regulator.

61 The potential environmental risks posed by the work of contractors should be assessed and instructions provided to contractors about protecting the environment while working on site.

Accidents/incidents/non conformance

62 There should be written procedures for investigating incidents, (and near misses) which may affect the environment, including identifying suitable corrective action and following up.

Raw Materials

3.67 This section covers the use of raw materials and water and the techniques for optimising their use and minimising their impact by selection.

3.68 As a general principal, the operator will need to demonstrate the measures taken to:

- **reduce** the use of chemicals and other materials (**Waste minimisation (optimising the use of raw materials)**)
- **substitute** with materials presenting lower risks to the environment
- **understand** the fate of by-products and contaminants and their environmental impact

Raw materials selection

3.69 Raw materials used in the rendering sector may include:

- Water used in the production of steam, cleaning and scrubbing waste gases.
- Water treatment chemicals
- Process additives
- Fuel oil
- Machine oils

3.70 The main concern with animal carcasses / by-products is receiving as fresh material as possible in order to limit degradation and the production of odours. This is already referred to in the process description and the odour section.

3.71 The criteria in Table 5 should be considered when selecting raw materials

Table 5: Selection of raw materials

Raw material	Selection criteria
Water	Identify most sustainable source (consider recycled sources)
Water treatment chemicals	Select chemicals with a lower potential for causing odour problems
Process additives	Select most appropriate chemicals for anti-foam, anti-oxidant etc.
Fuel oils	Sulphur content should be minimised. The maximum sulphur content of heavy fuel oil should be 1%.
Machine oils/emulsions	Minimise organic content of emulsions Consider synthetic oils
*Sulphur in liquid fuels regulations, Regulation 3 (3) states that combustion plant (other than new large combustion plant covered by the LCPD for which there is a separate provision) can burn heavy fuel oil with a sulphur content greater than 1% so long as the sulphur dioxide emissions from the plant is less than or equal to 1700mg/m3 at 3% oxygen dry. Defra is the enforcing authority for these regulations.	

BAT
63 The operator should adopt procedures to control the specification of those types of raw materials with the main potential for environmental impact, in order to minimise any potential environmental impact. An annual review of alternative raw materials should be carried out with regard to environmental impact.

Waste minimisation (optimising the use of raw materials)

3.72 Waste minimisation can be defined simply as: *"a systematic approach to the reduction of waste at source, by understanding and changing processes and activities to prevent and reduce waste".*

3.73 A variety of techniques can be classified under the term waste minimisation and they range from basic housekeeping techniques through statistical measurement techniques, to the application of clean technologies.

3.74 Key operational features of waste minimisation should be:

- the ongoing identification and implementation of waste prevention opportunities
- the active participation and commitment of staff at all levels including, for example, staff suggestion schemes
- monitoring of materials' usage and reporting against key performance measures or benchmarks

3.75 Using this information, opportunities for waste reduction, changes in process and improved efficiency should be generated and assessed, and an action plan prepared for the implementation of improvements.

3.76 A list should be kept of all the different raw materials used in the process (but not fuel which is addressed by the energy section of this note), and the quantity used in each year. The purpose of this is to monitor changes in the amount of raw materials used against the amount of product produced, so as to be able to compare year-on-year efficiencies and have the basis for considering the scope for reducing the amount of raw material inputs.

3.77 There should be continuous movement towards more Sustainable Consumption and Production (i.e. doing more for less) as laid out in Government Guidance " Changing Patterns - UK Government Framework for Sustainable Consumption and Production" (Ref 13). Section 3.3 of the guidance identifies advice and funding programmes available to achieve more sustainable production practices. The National Industrial Symbiosis Programme shares information across all industrial sectors to produce guidance and case studies for resource efficiency (Ref 13). See also Envirowise Guides (Ref 13) for information

BAT

64 The operator should record materials usage and waste generation in order to establish internal benchmarks. Assessments should be made against internal benchmarks to maintain and improve resource efficiency.

65 The operator should carry out a waste minimisation audit at least as frequently as the permit review period. If an audit has not been carried out in the 2 years prior to submission of the application it should be completed within 18 months of the issue of the first EPR permit. The methodology used and an action plan for optimising the use of raw materials should be submitted to the regulator within 2 months of completion of the audit.

66 Specific improvements resulting from the recommendations of audits should be carried out within a timescale approved by the regulator.

Water use

3.78 Water use should be minimised within the BAT criteria for the prevention or reduction of emissions and be commensurate with the prudent use of water as a natural resource.

3.79 Reducing water use may be a valid environmental and/or economic aim in itself, perhaps because of local supply constraints. Also, from the point of view of reducing polluting emissions, any water passing through an industrial process is degraded by the addition of pollutants, and there are distinct benefits to be gained from reducing the water used. These include:

- reducing the size of (a new) treatment plant, thereby supporting the cost benefit BAT justification of better treatment
- cost savings where water is purchased or disposed of to another party
- associated benefits within the process such as reduced energy requirements for heating and pumping, and reduced dissolution of pollutants into the water leading to reduced sludge generation in the effluent treatment plant

The use of a simple mass balance for water use may help to reveal where reductions can be made.

[Advice on cost-effective measures for minimising water use can be found in **Ref 4**.]

3.80 The following general principals should be applied in sequence to reduce emissions to water:

- water-efficient techniques should be used where possible
- water should be recycled within the process from which it issues, treating it first if necessary. Where this is not practicable, it should be recycled to another part of the process which has a lower water quality requirement

3.81 Cooling water (and wet abatement systems) can be maintained within a closed circuit recycling system. Operators should monitor the quality of the return water to ensure that levels of contamination are kept to a minimum. Treatment may be required. The quality specification may be constrained by the need to discharge a recycle purge. The need to purge may be removed by dilution from make-up water required to compensate for evaporative losses.

3.82 The volumes of water used by an installation should normally be metered so that water efficiency audits can be carried out and benchmarks can be set for optimal efficiency. In addition, sub-processes that are principal water users should be metered to optimise water usage at individual process plant.

BAT

67 The operator should carry out a regular review of water use (water efficiency audit) at least as frequently as the permit review period. If an audit has not been carried out in the 2 years prior to submission of the application it should be completed within 18 months of the issue of the first EPR permit.

68 Using information from the audits (referred to in BAT 76 above), opportunities for reduction in water use should be assessed and, where appropriate, should be carried out in accordance with a timescale approved by the regulator.

69 Information from audits should be used to establish benchmarks. Operators should keep records of such benchmarks and make measurement against them to reveal whether the process is being maintained “in control” or to track improvements.

70 The volume of mains and abstracted water used in the activities should be directly measured when the installation is operating once a day for at least a fortnight and there after, once a week with an annual exercise taking daily measurements for at least a fortnight. All measurements should be recorded and the records held on site.

Waste handling

3.83 Good segregation of materials is essential to facilitate opportunities for recovery, recycling and re-use and to maximise scope for good waste management.

BAT

71 The operator should produce an inventory of the quantity, nature, origin and where relevant, the destination, frequency of collection, mode of transport and treatment method of any waste which is disposed of or recovered.

72 Operators should ensure that waste stored in containers that are durable for the substances stored and that incompatible waste types are kept separate.

73 Operators should ensure that waste storage areas are clearly marked and signed, and that containers are clearly labelled.

Waste re-use, recovery, recycling or disposal

3.84 Waste should be re-used, recovered or recycled unless the regulator has accepted a satisfactory BAT justification.

BAT

74 The operator should carry out an annual review to demonstrate that the best environmental options are being used for dealing with the waste from the installation

Energy

3.85 BAT for energy efficiency under the EPR Regulations will be satisfied provided the operator

meets the following conditions:
either
• the operator meets the basic energy efficiency requirements below and is a participant to a Climate Change Agreement (CCA) or EUETS commitments
or
• the operator meets the basic energy efficiency requirements below and the additional energy efficiency requirements

Basic energy efficiency requirements

3.86 The requirements of this section are basic, low cost, energy standards that apply whether or not a CCA is in force for the installation or the operator has EUETS commitments for the installation.

BAT

75 The operator should produce a report annually on the energy consumption of the installation.

76 The operator should monitor energy flows and target areas for reduction which should be updated annually. ("Sankey" diagrams and energy balances would be useful as aids.)

77 Optimisation of combustion will improve fuel efficiency. Monitoring oxygen in waste gases will enable the operator to ensure that the process of combustion is optimised.

78 The operator should ensure that all plant is operated and maintained to optimise the use and minimise the loss of energy.

79 The operator should ensure that all appropriate containment methods, (e.g. seals and self-closing doors) are employed and maintained to minimise energy loss.

Additional energy efficiency requirements

3.87 Within EPR it is valid to consider both the emission of direct (heat and emissions from on-site generation) and indirect (emissions from a remote power station) pollution when considering options for energy efficiency.

BAT

Energy efficiency techniques

80 The following techniques should be considered:
- heat recovery from different parts of the processes
- minimisation of water use and closed circulating water systems
- good insulation
- plant layout to reduce pumping distances
- phase optimisation of electronic control motors and fans
- optimised efficiency measures for combustion plant
- preventative maintenance programme targeting energy drops

Energy supply techniques

81 The following techniques should be considered:
- use of Combined Heat and Power (CHP)
- generation of energy from waste
- use of less polluting fuels

Accidents

3.88 For accident management, there are three particular components:

• **identification of the hazards** to the environment posed by the installation/activity
• **assessment of the risks** (hazard x probability) of accidents and their possible consequences
• implementation of **measures to reduce the risks** of accidents, and contingency plans for any accidents that occur

3.89 Further guidance can be found in chapter 20 of the General Guidance Manual and provide guidance that may be relevant in the event of fire. See also Ref 7 and Ref 11.

Identification of the hazards

3.90 In identifying the hazards particular areas to consider may include, but should not be limited to,

the following:

- Transfer of materials
- Plant or equipment failure (pump or fan failure, blocked drain)
- Fire
- Vandalism
- Vehicle movements

Identification of the risks

3.91 The hazards having been identified, the process of assessing the risks should address the following:

- how likely is the particular event to occur (source frequency)?
- what substances are released and how much of each (risk evaluation of the event)?
- where do the released substances end up (emission prediction - what are the pathways and receptors, is the emission harmful to human health or the quality of the environment)?
- what are the consequences (consequence assessment – what are the effects on the receptors)?
- what is the overall risk (determination of overall risk and its significance to the environment)?
- what can prevent or reduce the risk (risk management – measures to prevent accidents and/or reduce their environmental consequences)?

Measures to reduce the risks (identified by risk assessment)

3.92 Risk reduction can be achieved by process management controls and preventative measures.

The following techniques will be relevant to most installations, although this is not an exhaustive list.

Process management controls

- process design, alarms, trips and other failsafe control techniques to ensure the safe operation of the plant
- security systems to prevent unauthorised access
- records of all incidents, near-misses, changes to procedures, abnormal events and findings of maintenance inspections and procedures to learn from such incidents
- personnel suitably trained in accident management
- guidance for specific accident scenarios
- procedures to ensure good communication among operations staff during shift changes and maintenance or other engineering work
- safe shutdown procedures
- established communication routes with relevant authorities and emergency services

Preventative measures

- procedures to ensure that the composition of the contents of a bund /sump is checked before treatment or disposal
- drainage sumps equipped with a high-level alarm with automatic pump to storage (not to discharge)
- high-level alarms etc. (which should not be routinely used as the primary method of level control)
- adequate standby plant or equipment maintained and tested to operational standards
- sufficient storage to contain process waters, site drainage waters, emergency firewater, chemically contaminated waters and spillages of chemicals, which should be routed where necessary, having regard to a site-specific assessment of risks, to the effluent system
- provision to contain surges and storm-water flows, which should be treated where necessary, having regard to a site-specific assessment of risks, before emission to controlled waters or sewer
- spill contingency procedures to minimise the risk of accidental emission of raw materials, products and waste materials and to prevent their entry into water
- procedures should be in place for checking and handling raw materials and wastes to ensure compatibility with other substances with which they may accidentally come into contact.
- suitable barriers to prevent damage to equipment from the movement of vehicles, as appropriate, having regard to a site-specific assessment of risks
- there should be procedures for responding to and learning from incidents, near-misses, etc.
- the roles and responsibilities of personnel involved in incident management should be formally specified.
- where indicated by the site-specific assessment of risks, containment or abatement for accidental emissions from vents and safety relief valves/bursting discs should be provided.
- where this may be inadvisable on safety grounds, attention should be focused on reducing the probability of the emission

BAT

Accidents/incidents/non conformance

82 There should be written procedures for investigating incidents and near misses, including identifying suitable corrective action and following up.

83 The operator should maintain an accident management plan covering the matters listed in paragraphs **3.90** to **3.92** above and to the satisfaction of the regulator. The plan should be available for inspection by the regulator.

84 In the case of abnormal emissions arising from an accident, such as a spillage for example, the operator should:
- Investigate undertake remedial action immediately
- promptly record the events and actions taken
- ensure the regulator is made aware without delay

Specific conditions

85 Specific conditions may need to be included within permits to prevent accidents. Examples of these are given below.

86 Operators should provide for safe storage and conveying systems for both liquid raw materials and wastes in order to minimise the potential for vandalism or accidental damage. Regular inspection should be carried out on pipelines, valves and pumps to inspect for damage and wear.

87 The operator should maintain procedures for the control of spills and of firewater to ensure containment and disposal of liquids in order to prevent or minimise pollution.

88 Systems should be used to avoid excessive transfer rates of solids by pneumatic conveyors that might lead to over pressurisation and filter failure or tank / silo overfilling leading to spillage of liquids or powders.

89 Operators should ensure that materials are charged into the correct silo or tank to minimise the potential for causing waste, spillage or uncontrolled chemical reaction.

BAT

90 Operators should design delivery routes to minimise accidental damage by vehicles to any storage facilities for liquids or dusts. Where a risk of vehicular damage to such storage areas has been identified, crash barriers should be fitted.

91 Stockpiles of MBM should be managed that the risk of spontaneous combustion is minimised. Techniques include fire breaks between stockpiles, limiting the height / angle of repose, control of the moisture and oil content and temperature of MBM entering storage.

Noise and Vibration

3.93 Within this section, "noise" should be taken to refer to noise and/or vibration as appropriate, detectable beyond the site boundary.

3.94 The most significant source of noise arises as a result of the following activities:

- Transport
- Fans, pumps & motors
-

3.95 Noise surveys, measurement, investigation (which can involve detailed assessment of sound power levels for individual items of plant) or modelling may be necessary for either new or existing installations depending upon the potential for generating significant noise. Operators may have a noise management plan as part of their management system. Where an installation poses no risk of noise related environmental impact because the activities undertaken are inherently quiet or remote from receptors; these measures would not normally be required.

3.96 Following investigation of the impact of the installation, systems to minimise the environmental impact of the noisiest operations should be employed. The level of noise control required depends on the scale of operations and the proximity of operations to the public. Table 6 identifies the noisiest operations and the control measures the have been employed to mitigate problems.

3.97 Further guidance can be found in chapter 16 of the General Guidance Manual.

Table 6: Noise Mitigation Measures

Operation	Control Measure
Site Vehicle Movements	▪ Using vehicles with "directional and localised sound" for reverse alarms to concentrate noise at the area of immediate danger ▪ Replacing diesel powered forklift trucks with electric or LPG powered ▪ Minimising vehicle movements at night ▪ Using even roadways for vehicle movements
Fans, pumps and motors	▪ Acoustic screens, enclosures and baffles ▪ Fitting silencers to avoid noise travelling along ducting ▪ Selection of less noisy engineering equipment ▪ Fitting resilient hangers for wall-mounted equipment
General	▪ Fitting noise reducing flaps to outside doors ▪ Maintaining a closed doors policy ▪ Improving sound insulation of buildings ▪ Holes and openings closed off (use mechanical where necessary) ▪ Enclose operations within buildings ▪ Fitting anti-vibration mounts on plant ▪ Using flexible connections between vibrating and fixed plant ▪ Preventative maintenance programme e.g. equipment wear, bearings
* Noise mitigation measures that are likely to be needed in most cases	

BAT

92 The operator should identify key plant and equipment (or operations) with the potential to give rise to significant noise and take such measures as are necessary by way of mitigation and maintenance of existing plant and equipment in order to minimise noise having regard to paragraph **3.96** and **Table 6** above.

Monitoring

3.98 This section describes general monitoring and reporting requirements for emissions to all environmental media. Guidance is provided for the selection of the appropriate monitoring methodologies, frequency of monitoring, compliance assessment criteria and environmental monitoring. The specific monitoring requirements with respect to emissions to air are described in Table 3.

Standards for monitoring equipment and procedures

3.99 The Environment Agency has introduced its Monitoring Certification Scheme (MCERTS) to improve the quality of monitoring data and to ensure that the instrumentation and methodologies employed for monitoring are fit for purpose.

- operators should ensure their monitoring arrangements comply with the requirements of MCERTS where available, e.g. using certified instruments and equipment, and using a registered stack testing organisation etc.

See **http://www.environment-agency.gov.uk** for listing of MCERTS equipment.

Sampling and analysis standards

3.100 The sampling analytical methods selected for compliance monitoring given in Table 3 and Appendix 2 should normally be used in the following order of priority:

- Comité Européen de Normalisation (CEN)
- International Standardisation Organisation (ISO)
- British Standards Institution (BSI)
- United States Environmental Protection Agency (US EPA)
- American Society for Testing and Materials (ASTM)
- Deutsches Institut für Normung (DIN)
- Verein Deutcher Ingenieure (VDI)
- Association Française de Normalisation (AFNOR)

3.101 Guidance on standards for monitoring releases (to air, water and land) relevant to EPR can be found in Ref 9.

3.102 When selecting monitoring test methods, it is important to note that test methods are normally applicable to specific matrices (in relation to water) and concentrations of various pollutants (in relation to air). It is necessary to identify the most appropriate method in consideration of the hierarchy of methods. For example, if two methods are appropriate, the hierarchy is used to determine priority.

3.103 If in doubt the operator should consult the regulator.

Monitoring and sampling protocols

3.104 Where monitoring is needed the operator should devise a monitoring strategy to address the following:

- determinands to be monitored
- selection of monitoring points
- monitoring methods and procedures (selection of appropriate Standard Reference Methods)
- reference conditions and averaging periods
- measurement uncertainty of the proposed methods and the resultant overall uncertainty
- drift correction for continuous analysers
- quality assurance (QA) and quality control (QC) protocols, including accreditation and certification
- equipment calibration and maintenance, sample storage and chain of custody/audit trail
- reporting procedures, data storage, interpretation and review of results, reporting format for the provision of information to the regulator

Monitoring frequency

3.105 The frequency of testing should be increased, for example, as part of the commissioning of new or substantially changed activities, or where the emission levels are near to or approach the emission limit.

3.106 Where non-continuous quantitative monitoring is required, the frequency may be varied. Where there is consistent compliance with emission limits, regulators may consider reducing the frequency. When determining 'consistent compliance' factors to consider include:

- the variability of monitoring results, for example, results which range from 15 - 45 mg/m^3 , against an emission limit of 50 mg/m^3 might not qualify for a reduction in monitoring
- the margin between the results and the emission limit, for example, results which range from 45 - 50 mg/m^3 when the limit is mg/m^3 might not qualify for a reduction in monitoring

3.107 Consistent compliance should be demonstrated using the results from at least three or more monitoring exercises within two years or two or more monitoring exercises in one year supported by continuous monitoring. Any significant process changes which might have affected the results should be taken into account.

3.108 Where effective surrogates are available they may be used to minimise monitoring costs.

3.109 Where monitoring shows that substances are not emitted in significant quantities, consideration can be given to a reduced monitoring frequency.

Monitoring emissions to air

3.110 The reference conditions of substances in releases to air from point sources are: [temperature 273.15 K (0°C), pressure 101.3 kPa (1 atmosphere) and measured wet, no correction for water vapour.] To convert measured values to reference conditions, see Technical Guidance Note M2 (Ref 9) for more information.

Monitoring emissions to water

3.111 The appropriateness of the monitoring requirements in Section 2 will vary depending upon the sensitivity of the receiving water and should be proportionate to the scale of the operations, nature of the discharge and receiving water. For each release point the following information is required:

- the specific volume flow from the process to sewer/controlled water
- the quality of the receiving water
- the volume of discharge compared to the percentage dry river flow of the receiving water

Environmental monitoring (beyond installation)

3.112 Environmental monitoring may be required, for example, when:

- there are vulnerable receptors
- the emissions are a significant contributor to an Environmental Quality Standard (EQS) which may be at risk
- the operator is looking for departures from standards based on lack of effect on the environment
- the operator is required to validate modelling work

3.113 Further guidance is given in chapter 15 of the General Guidance Manual.

Monitoring of process variables

3.114 Some process variables will have potential environmental impact and these should be identified and monitored where they have an environmental relevance. For rendering activities, examples of monitoring these variables include:

- keeping inventories of materials used and disposed of
- monitoring temperature or pressure where relevant
- plant efficiency monitoring

BAT

Monitoring and reporting

93 The operator should monitor emissions, make tests and inspections of the process and keep records; in particular the operator should keep records of audits, inspections, tests and monitoring, including all non-continuous monitoring, inspections and visual assessments. Monitoring may include process variables and operating conditions where relevant to emissions. In such cases:
- Current records should be kept on site and be made available for the regulator to examine
- Records should be kept by the operator for at least two years

94 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

95 The results of non-continuous emission testing should be forwarded to the regulator within 8 weeks of the completion of the sampling. Results from continuous monitoring systems should be recorded and be made available for inspection by the regulator.

96 All results submitted to the regulator should include details of process conditions at the time of monitoring, monitoring uncertainty as well as any deviations from the procedural requirements of standard reference methods and the error invoked from such deviations.

97 Results exceeding the emission limit value from **any** monitoring activity (both continuous and non-continuous) and malfunction or breakdown leading to abnormal emissions should be investigated and corrective action taken immediately. The operator should ensure that the regulator is notified without delay identifying the cause and corrective action taken. Where there is immediate danger to human health, operation of the activity should be suspended.

98 Sampling points on new plant should be designed to comply with CEN or Other Standards. e.g. BS EN 13284-1 or BS ISO 9096: 2003 for sampling particulate matter in stacks

99 Continuous monitoring is normally expected for the main abated releases in **Table 3**. Where continuous monitoring is required by the permit instruments should be fitted with audible and visual alarms, situated appropriately to warn the operator of arrestment plant failure or malfunction, the activation of alarms should be automatically recorded and readings should be on display to appropriately trained operating staff.

BAT

100 All continuous monitors should be operated, maintained and calibrated (or referenced) in accordance with the appropriate standards and manufacturers' instructions, which should be made available for inspection by the regulator. Instruments should be operated to ensure less than 5% downtime over any 3-month period and all relevant maintenance and calibration (or referencing) should be recorded.

101 Where available, operators should use monitoring equipment and instruments certified to MCERTS and use a stack-testing organisation accredited to MCERTS standards or such alternative requirements as approved by the regulator.

Monitoring and reporting of emissions to air

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

103 The introduction of dilution air to achieve emission concentration limits should not be permitted.

104 Dilution air may be added where justified for waste gas cooling or improved dispersion. In such cases, monitoring should be carried out upstream of the dilution air input or procedures designed to correct for the ratio of input air to the satisfaction of the regulator.

105 Monitoring to determine compliance with emission limit values should be corrected to the following standard reference conditions: temperature, 273.15 K (0^{o}C), pressures 101.3 kPa (1 atmosphere) and measured wet, no correction for water vapour.

106 Periodic visual assessment of releases should be undertaken as required by the regulator to ensure that all final releases are colourless, free from persistent visible emissions and free from droplets.

107 Frequency of monitoring for all pollutants (including particulate matter) where arrestment equipment is necessary to meet specified emission limits should be at least annually.

Monitoring and reporting emissions to water and sewer

108 The appropriateness of the monitoring requirements will vary depending upon the sensitivity of the receiving water and should be proportionate to the scale of the operations, nature of the discharge and receiving water. For each release point the following information is required:
- the specific volume flow from the process to sewer/controlled water
- the sensitivity of the receiving water
- the volume of discharge compared to the percentage dry river flow of the receiving water

109 Increased monitoring should be carried out where substances to which the local environment may be susceptible could be released from the installation, e.g. where releases of common pesticides or heavy metals may occur.

110 A full analysis, to include the substances listed in Schedule 5 of the Pollution Prevention and Control (England & Wales) Regulations 2000, should be carried out annually on a representative sample from each release point, unless it is agreed with the regulator that this is inappropriate.

Monitoring and reporting of waste

111 The following should be monitored and recorded:
- Quantity nature and origin of the waste
- the physical description of the waste
- a description of the composition of the waste
- any relevant hazardous properties (hazard and risk phrases)
- European Waste Catalogue code
- Handling precautions and substances with which it cannot be mixed
- Disposal routes for each waste category

Information Provisions

3.115 This guidance note contains many provisions relating to information. There are two general categories of information identified in this note:

- Reports or notifications
- Additional information

3.116 Reports are required and notifications are information that should be sent to the regulator at a frequency that is specified in this guidance. Such information provisions are summarised in Table 7 below.

Table 7: Summary of Provisions for Reporting and Notification

BAT Clause	Provision	Information Category	Frequency
BAT 64	List of key process equipment and process and abatement equipment whose failure could impact on the environment	Report	Within 12 months of publication of this note
BAT 105 & 106	Report of results from non-continuous emission testing forwarded to the regulator.	Report	Within 8 weeks of the completion of the sampling – typically annual
BAT 67	Notification of appointed competent person to liaise with the regulator and the public with regard to complaints	Notification	Reactive
BAT 93	Investigation of abnormal emissions arising from an accident. Remedial action taken immediately. Prompt recording of the events and actions taken. Notification of the regulator without delay*	Notification	Reactive
BAT 103	Notification at least 7 days before any periodic monitoring exercise to determine compliance with ELVs	Notification	Reactive
BAT 106	Investigation of results exceeding an ELV from any monitoring activity and malfunction or breakdown leading to abnormal emissions. Corrective action taken immediately. Notification without delay* identifying the cause and corrective action taken.	Notification	Reactive
***Without delay** In most cases it should be enough to notify the local authority (by telephone or facsimile) within an hour of the start or detection of the emission. Local authorities will wish to consider what notification arrangements to require outside working hours.			

3.117 Additional information relates to procedures or records (including details of assessments, investigations and audits). Such information should be held by the operator and be accessible so that the regulator may view the information. For much of the information, on-site inspection may be sufficient for the regulator, subject to the particular circumstances. Regulators may be more likely to ask operators to send them copies of those items marked with an asterisk. The majority of this information is likely to be the same as would be required in any event when using an effective EMS, so documents can be produced which serve both purposes.

3.118 Annex 4 of ISO 14001 gives some detailed examples of information and document control but by way of generality A.4.4 states that “The extent of the environmental management system documentation may differ from one organization to anther depending on

(a) the size and type of organization and its activities, products of services,
(b) the complexity of processes and their interactions, and
(c) the competence of personnel

Examples of documents include

- statements of policy, objectives and targets,
- information on significant environmental impacts,
- procedures,
- process information,
- organisational charts,
- internal and external standards,
- site emergency plans, and
- records"

3.119 Relating to documentation, Annex I of the EC Regulation No 761/2001 on the eco-management and audit scheme (EMAS) states that "the organisation shall establish and maintain procedures for controlling all documents required by this International Standard…" The Annex goes on to provide details on what is required and includes the following headings:

- Structure and responsibility
- Training, awareness and competence
- Management review
- Communication
- Environmental management system documentation
- Document control
- Operational control
- Emergency preparedness and response
- Monitoring and measurement
- Non-conformance and corrective and preventive action
- Records
- Environmental management system audit

3.120 Additional information provisions are summarised in Table 8 below.

Table 8: Summary of Provisions for Additional Information

BAT Clause	Category	Subject
BAT 5	Procedures	Start-up and shut down, and changes of fuel or combustion load in order to minimise emissions
BAT 18	Procedures	Monitoring of sewer emissions
BAT 33	Procedures	Preventative maintenance programme for tanks bunds and sumps
BAT 40	Procedures	Comprehensive cleaning program
BAT 57	Procedures	Biofilter maintenance program
BAT 60	Procedures	Arrestment failure contingency plan
BAT 68 & 69	Procedures	Formal structure of employee's responsibility for process control and environmental impacts and training provisions
BAT 71	Procedures	Investigating accidents, incidents and non-conformance
BAT 72*	Procedures	Control the specification of raw materials with respect to their environmental impact. Review of alternative raw materials
BAT 91	Procedures	Incidents and near misses investigation. Corrective action and following up
BAT 96	Procedures	Spills and firewater control to ensure containment and disposal of liquids
BAT 21	Records	Registry of fugitive emissions
BAT 28	Records	Inspections of external surfaces of process buildings, roofs, guttering, ancillary plant, roadways and open yards and storage areas
BAT 26	Records	Subsurface structure mapping
BAT 36	Records	Amount type and origin of raw materials
BAT 55	Records	Instrument readings
BAT 56*	Records	Timings of batch processes
BAT 66	Records	Analysis of breakdowns in order to eliminate common failure modes.
BAT 73 & 78	Records	Raw material and water usage benchmarks

BAT Clause	Category	Subject
BAT 74	Records	Waste minimisation audits
BAT 76 & 79*	Records	Water efficiency audit and water efficiency improvement programme
BAT 80*	Records	Waste inventory and treatment method
BAT 84*	Records	Annual energy audit
BAT 92*	Records	Accident management plan
BAT 101	Records	Identification of key plant and equipment with the potential to give rise to significant noise. Mitigation measures
BAT 104	Records	Results from continuous monitoring systems
BAT 109	Records	Maintenance and calibration of continuous monitoring systems
BAT 120	Records	Records of waste monitoring and recording
* Information that Regulators may be more likely to ask operators to send them copies of rather than relying only on inspection		

3.121 The amount of information and size of reports or documents required under the information provisions should be decided on a 'fit for purpose' basis. The label 'report' or 'record' should not be taken to imply that a sizeable document must be submitted if the required information can be provided in much shorter form. A report could comprise a paragraph or two if that was agreed to be sufficient for the purpose. Alternatively, lengthy documents may be necessary in particular circumstances.

All the information listed in Tables 7 and 8 is considered necessary either

a) for regulators to keep a watch on the performance of an installation (e.g. monitoring data and who is the competent person to liaise with over complaints) or on the operator's efforts to improve performance (e.g. waste minimisation and energy audits), and/or
b) for operators to maintain an appropriate level of control over the installation, and which regulators should have access to should they wish to check that the information is being properly kept or to examine the information for regulatory purposes.

References

Environment Agency documents referred to below are available from the Environment Agency website http://www.environment-agency.gov.uk. Many of the references below are being made available free of charge for viewing or download on the website. The same information can also be accessed via the SEPA website http://www.sepa.org.uk, or the NIEHS website www.ehsni.gov.uk.

Ref 1 *IPPC Reference Document on Best Available Techniques in the Slaughterhouses and Animal By-products Industry European Commission* http://eippcb.jrc.es

Ref 2 *The Pollution Prevention and Control Act (1999)* (www.legislation.hmso.gov.uk)

Ref 3 *The Environmental Permitting (England and Wales) Regulations (SI 3538 2007)* (www.legislation.hmso.gov.uk) or the Scottish equivalent *The Pollution Prevention and Control* (*Scotland) Regulations SSI 323 2000 as amended*

Ref 4 Water efficiency references:

- ETBPP, Simple measures restrict water costs, GC22
- ETBPP, Effluent costs eliminated by water treatment, GC24
- ETBPP, Saving money through waste minimisation: Reducing water use, GG26
- ETBPP (is now Envirowise) Helpline 0800 585794

Ref 5 Environment Agency (1998) Optimum use of water for industry and agriculture dependent on direct abstraction: Best practice manual. R&D technical report W157, WRc Dissemination Centre, Swindon (tel 01793 865012)

Ref 6 *HMIP Technical Guidance Note (Dispersion) D1*, 1993 The Stationery Office ISBN 0 11 752794 7 (EA website)

Ref 7 *BS 5908: Code of Practice for Fire Precautions in the Chemical and Allied Industries*

Ref 8 *Environment Agency, Pollution Prevention Guidance Note* - Pollution prevention measures for the control of spillages and fire-fighting run-off, PPG 18, gives information on sizing firewater containment systems (EA website)

Ref 9 Monitoring Guidance (EA website)

- *M1 Sampling requirements for monitoring stack emissions to air from industrial installations*, Environment Agency July 2002
- *M2 Monitoring of stack emissions to air*. Environment Agency November 2002
- *M3 Standards for IPC Monitoring Part 1: Standards, organisations and the measurement infrastructure*, HMIP, August 1995, ISBN 0-11-753133-2
- *M4 Standards for IPC Monitoring Part 2 : Standards in support of IPC Monitoring,* HMIP Revised 1998
- *MCERTS approved equipment link via* http://www.environment-agency.gov.uk/epns "Guidance for Business and Industry"
- *Direct Toxicity Assessment for Effluent Control: Technical Guidance (2000), UKWIR 00/TX/02/07*

Ref 10 *"Policy and Practice for the Protection of Groundwater"* (PPPG) (EA website)

Ref 11 *Secretary of State's Guidance (England and Wales): General Guidance Manual on Policy and Procedures for A2 and B Installations , January 2008* - available from the Defra website and, in hard copy, from the Defra Publications line 08459 556000 www.defra.gov.uk/environment/ppc/index.htm

Ref 12 *Defra Draft Guidance, Guide to Directive 2000/76/EC on the Incineration of Waste* http://www.defra.gov.uk

Ref 13 Management, Resource Efficiency and Waste Minimisation References

- Defra/DTI – Changing Patterns – UK Government Framework for Sustainable Consumption and Production Sept 2003.
- National Symbiosis Program www.nisp.org.uk
- Envirowise, GG025, Saving money through waste minimisation: Raw Material Use

Abbreviations

BAT	Best Available Techniques – see EPR General Guidance Manual or the Regulations for further definition
BOD	Biochemical Oxygen Demand
BREF	BAT Reference Document
CCA	Climate Change Agreement
CEM	Continuous Emissions Monitoring
CHP	Combined Heat and Power plant
COD	Chemical Oxygen Demand
DPA	Direct Participation Agreement
EA	Environment Agency
ELV	Emission Limit Value
EMS	Environmental Management System
ETBPP	Environmental Technology Best Practice Programme
ETP	Effluent Treatment Plant
EU	European Union
EUETS	European Union Emissions Trading Scheme
EQS	Environmental Quality Standard
IPPC	Integrated Pollution Prevention and Control
ITEQ	International Toxicity Equivalents
MBM	Meat and Bone Meal
MCERTS	Monitoring Certification Scheme
NIEHS	Northern Ireland Environment and Heritage Service
PPC	Pollution Prevention and Control
SAC	Special Areas of Conservation
SECp	Specific Energy Consumption
SEPA	Scottish Environment Protection Agency
SPA	Special Protection Area
TSS	Total Suspended Solids
TOC	Total Organic Carbon
VOC	Volatile Organic Compounds
WID	Waste Incineration Directive

Appendix 1: EU Waste Framework Directive

1.Articles 9 and 10 of the WFD require that any establishment or undertaking which carries out the waste disposal or waste recovery operations listed in Annexes IIA or IIB to the Directive must obtain a permit from the competent authority. A permit issued under the Pollution Prevention and Control (England and Wales) Regulations 2000 is a permit for the purposes of the WFD and the disposal or recovery of waste.

2.Article 1(a) of the WFD defines "waste" as:-
"…any substance or object…which the holder discards or intends or is required to discard."

3.Whether or not a substance or object is discarded as waste is a matter which must be determined on the facts of the case and the interpretation of the law is a matter for the Courts. The European Court of Justice ("ECJ") has issued several judgments on the definition's interpretation and the meaning of "discard". ECJ judgments are binding on Member States and their competent authorities. A summary of the ECJ's judgments on the definition of waste's interpretation is available at www.defra.gov.uk.

4.The Secretary of State/WAG recognise that there is a distinction between animal by-products which ABPR/1774 requires to be disposed of or recovered as waste and those intended for further uses as products. In relation to the former, in the context of the operations carried out by rendering installations, Articles 4(2), 5(2) and 6(2) of ABPR/1774 provide that:-

(a) Article 4(2)

Category 1 material, except as otherwise provided in Articles 23 and 24, shall be:-
• (b) processed in a processing plant under Article 13 and finally disposed of as waste by incineration or by co-incineration; or
• (c) with the exclusion of material referred to in Article 4(1)(a)(i) and (ii), processed in a processing plant approved in accordance with Article 13 and finally disposed of as waste by burial in a landfill approved under the Landfill Directive (1999/31/EC).

(b) Article 5(2)

Category 2 material, shall be:-
• (b) processed in a processing plant approved in accordance with Article 13 and, except in the case of rendered fats, disposed of as waste either by incineration or co-incineration; or
• (c) processed in a processing plant approved in accordance with Article 13 using processing method 1 and:-

(ii) transformed in a biogas plant or a composting plant approved in accordance with Article 15; or

(iii) disposed of by burial in a landfill approved under the Landfill Directive.

(c) Article 6(2)

Category 3 material, shall be:-
• (b) processed in a processing plant approved in accordance with Article 13 and disposed of as waste by incineration or co-incineration or in a landfill approved under the Landfill Directive.

5.Taking account of case law by the ECJ and the requirements of ABPR 1774/2002, the Secretary of State/WAG consider that the animal by-products (material) referred to in paragraph 4 above are discarded as waste within the meaning of Article 1(a) of the WFD when they are consigned to rendering installations in accordance with the listed provisions of ABPR 1774/2002.

6.The view set out in paragraph 5 above does not preclude the possibility that animal byproducts other than those identified in paragraph 4 above may also be consigned to rendering installations as waste. Local authority regulators should also note that the possibility of other animal by-products not being discarded as waste is not relevant to the issues addressed in this Appendix of the guidance unless there are any rendering installations which exclusively process animal by-products which are not discarded as waste - because a rendering installation that processes both waste and non-waste animal by-products will need a WFD compliant permit to control the processing of the former as a waste disposal or a waste recovery operation.
7.The lists of waste disposal and recovery operations in Annexes IIA and IIB to the WFD are transposed in Parts III and IV of Schedule 4 to the 1994 Regulations; and it will fall to local authority regulators as competent authorities to determine on a case-by-case basis the classification of the waste operation carried out by each rendering installation. In this context, the ECJ has held that:-

"..it is evident from the [Waste Framework] Directive that any treatment of waste falling within its scope of application must be classifiable either as disposal or recovery of waste, in order that the separate rules established by the Directive for those two categories of operations can be applied, in particular with regard to the authorisation system imposed on establishments and undertakings which carry out such operations…and a single operation may not be classified simultaneously as both a disposal and a recovery operation…Consequently, where, having regard solely to the wording of the operations in question, a waste treatment operation cannot be brought within one of the operations or categories of operations referred to in Annex IIA or IIB, it must be classified on a case-by-case basis in the light of the objectives of the Directive…it does follow from Article 3(1)(b) and the fourth recital of the Directive that the essential characteristic of a waste recovery operation is that its principal objective is that the waste serve a useful purpose in replacing other materials which would have had to be used for that purpose, thereby conserving natural resources." **(Case C-6/00 : Abfall Service AG (ASA)).**

8.The key provision of the WFD is Article 4 which provides that Member States must: "…take the necessary measures to ensure that waste is recovered or disposed of without endangering human health and without using processes or methods which could harm the environment, and in particular:

• Without risk to water, air, soil and plants and animals,
• Without causing a nuisance through noise or odours,
• Without adversely affecting the countryside or places of special interest."

9.Article 4 of the WFD is an objective provision - not an absolute one. It does not mean that local authority regulators must refuse permit applications unless they are sure there will be no risk to air, soil, plants animals etc. However, the purpose of the permits required by Articles 9 and 10 of the WFD is to ensure that waste is disposed of or recovered in ways which protect the environment and human health.

10.Article 4 of the WFD is transposed as the "relevant objectives" in paragraph 4 of Schedule 4 to the 1994 Regulations; and the effect of paragraph 2 of Schedule 4 is to require local authority regulators to discharge their functions, in relation to the disposal or recovery of waste, with regard to the "relevant objectives". This means that local authority regulators must determine permit applications for the disposal or recovery of waste animal by-products in rendering installations, and regulate installations for which a permit is issued, on the basis of the risk posed to the attainment of the "relevant objectives". It also means that local authority regulators should adopt a risk-based approach to the disposal and recovery of waste animal by-products and should regulate such rendering installations in a way which is proportionate to the environmental and human health risk posed by the operation being carried out at each installation.

11.Article 9 of the WFD requires that the permit for a disposal operation must cover the following matters - transposed in paragraph 6 of Schedule 4 of the 1994 Regulations:-

• the types and quantities of waste,
• the technical requirements,
• the security precautions to be taken,
• the disposal site,
• the treatment method.

12.Article 14 of the WFD - transposed in paragraph 14 of Schedule 4 of the WFD - requires an establishment or undertaking which carries out the disposal or recovery of waste:-

(a) to keep a record of the quantity, nature, origin and, where relevant, the destination, frequency of collection, mode of transport and treatment method of any waste which is disposed of or recovered; and

(b) to make that information available, on request, to the competent authorities.

13.In order to ensure compliance with the provisions in paragraphs 11 and 12 above, local authority regulators should include appropriate conditions in permits authorising the disposal or recovery of waste animal by-products in rendering installations.

14.Article 13 of the WFD - transposed in paragraph 13 of Schedule 4 to the 1994 Regulations - requires any establishment or undertaking which carries out the disposal or recovery of waste to be subject to appropriate period inspections by the competent authorities. The Secretary of State/WAG have issued statutory guidance to the Environment Agency under section 35(8) of the Environmental Protection Act 1990 which the Agency is required to have regard to in the discharge of its waste management licensing functions. This guidance is published in the form of Waste Management Paper No.4 ("WMP4").

Appendix 2: Some common monitoring and sampling methods

Measurement methods for common substances to water

Detmerinand	Method	Detection limit Uncertainty	Valid for range mg/l	Standard
Suspended solids	Filtration through glass fibre filters	1 mg/l 20%	10-40	ISO 001929:1997, EN872 – Determination of suspended solids
COD	Oxidation with di-chromate	12 mg/l 20%	50-400	ISO 6060:1989, Water Quality – Determination of chemical oxygen demand
BOD5	Seeding with micro-organisms and measurement of oxygen content	1 mg/l 2 20%	5-30	ISO 5815:1989, Water Quality Determination of BOD after 5 days, dilution and seeding method EN 1899 (BOD 2 Parts)
AOX	Adsorption on activated carbon and combustion	-- 20%	0.4-1.0	ISO 9562:1998, EN1485 – Determination of adsorbable organically bound halogens
Tot P				BS 6068: Section 2.28 1997, Determination of phosphorous – ammonium molybdate spectrometric method
Tot N				BS6068: Section 2.62 1998, determination of nitrogen Part 1 Method using oxidative digestion with peroxydisulphate, BS EN ISO 11906
pH				SCA The measurement of electric conductivity and the determination of pH
Turbidity				SCA Colour and turbidity of waters 1981, ISBN 0117519553 EN 27027:1999
Flow rate	Mechanical ultra sonic or electro-magnetic gauges			SCA Estimation of Flow and Load, ISBN 011752364X
Temperature				SCA temperature measurement for Natural, Waste and Potable Waters and other items of interest in the Water and Sewage Disposal Industry. ISBN 0117520179
TOC				SCA The Instrumental determination of Total Organic carbon and Related Determinants 1995, ISBN 0117529796 EN 1484:1997
Fatty acids				Determination of Volatile Fatty acids in Sewage Sludge 1979, ISBN 0117514624

Detmerinand	Method	Detection limit Uncertainty	Valid for range mg/l	Standard
Metals				BS 6068: Section 2.60 1998, Determination of 33 elements by inductively coupled plasma atomic emission spectroscopy
Chlorine				BS6068: Section 2.27 1990, Method for the determination of total chlorine: iodometric titration method
Trichloromethane (Chloroform) Bromoform				BS6068: Section 2.58, Determination of highly volatile halogenated hydro carbons – Gas chromatographic methods.
Dispersants Surfactants: Anionic Cationic Non-ionic				SCA Analysis of Surfactants in Waters, Wastewaters and Sludges, ISBN 0117516058 EN 903:1993 (Used for anionic surfactants)
Pentachlorophenol				BS5666 Part 6 1983, Wood preservative and treated timber quantitative analysis of wood preservatives containing pentachlorophenol EN 12673:1997 (used for chlorophenol and polychlorinated phenols)
Formaldehyde				SCA The determination of formaldehyde , other volatile aldehydes, ketones and alcohols in water
Phosphates and nitrates				BS 6068: Section 2.53 1997, Determination of dissolved ions by liquid chromatography
Sulphites and sulphates				BS 6068: Section 2.53 1997, Determination of dissolved ions by liquid chromatography
Ammonia				BS 6068: Section 2.11 1987, Method for the determination of ammonium: automated spectrometric method
Grease and oils	IR absorption	0.06 mg/kg		SCA The determination of hydrocarbon oils in waters by solvent extraction IR absorption and gravimetry, ISBN 011751 7283

Appendix 3: Summary of Changes

Reasons for the main changes are summarised below.

Summary of changes

Section/ Paragraph/ Heading	Change	Reason	Comment
1. Introduction			
Table 1	compliance timetable amended	New provisions of note	
2. Emission limits and other provisions			
No amendments			
3. Techniques for pollution control			
Installation description and in-process controls			
3.11 Raw Materials	Raw Material list altered	BAT/industry good practice	
Emissions Control			
3.51 -3.52 Fugitive emissions to surface water, sewer and groundwater	BAT provisions amended	BAT/industry good practice	
Management			
3.62 and BAT 62	Additional BAT provision for using effective EMS	BAT/industry good practice	
Raw Materials			
3.69 and Table 5	Amended text and table for selection criteria for raw materials	Extra guidance to regulators and operators	
BAT 76	BAT provision – establishing benchmarks for water use	BAT/industry good practice	
Waste Handling			
BAT 80 - 83	BAT provisions consolidated	BAT/industry good practice	Seven BAT clauses reduced to 4 in light of review information
Energy			
3.86, BAT 87 and 88	Additional provisions for energy efficiency and supply techniques	BAT	
Accidents			
3.93	Inclusion of text for identification of the risks	Extra guidance to regulators and operators	
BAT 94 to 100	Additional provisions – specific measures for accident prevention	Industry good practice	
Noise and Vibration			
Table 6	Additional text and new table identifying specific noise mitigation measures	BAT/industry good practice	
BAT 101	Additional provisions – identification of significant noise sources and implementing mitigation measures in Table 9.	BAT/industry good practice	
Monitoring			
3.104	Considering appropriateness when selecting test methods	Extra guidance to regulators and operators	
BAT 104	Reporting monitoring uncertainty	BAT	
BAT 120	Waste reporting	BAT/industry good practice	To assist in waste auditing to minimise the impact of waste to land
Information Provisions			
Tables 7 and 8	Additional text and new tables identifying information and reporting provisions	Extra guidance to regulators and operators	
References	Amended reference list	New guidance available	
Appendix 2	List of water test methods	Replacing Appendix 1	

Section/ Paragraph/ Heading	Change	Reason	Comment
Appendix 3 and Table 9	New Appendix 3 included as a summary of changes		