

Sector Guidance Note IPPC SG9

April 2005

Integrated Pollution Prevention and Control (IPPC)

Secretary of State's Guidance for
A2 Roadstone Coating, Mineral and
Other Processes that Burn
Recovered Fuel Oil

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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 37 of the Pollution Prevention and Control (England and Wales) Regulations 2000, SI 1973 (Ref 1) on the integrated pollution control standards appropriate for the generality of new and existing A2 installations in the following sector:

Roadstone coating, mineral and other processes that burn recovered fuel oil.

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 of the Waste Incineration Directive¹. Where the requirements of the Directive apply they are highlighted by using the word "must" rather than "should" which is used for provisions related to the determination of Best Available Techniques (BAT).
- 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 2) 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 local authority 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 roadstone coating, mineral and other processes that burn recovered fuel oil.

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 roadstone coating, mineral or other process burning recovered fuel oil 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. 2000/76/EC

1.7 If there are any applicable mandatory EU emission limits, these must be met, although BAT may go further. The same applies to UK regulations, such as The Control of Pollution (Oil Storage) (England) Regulations 2001, SI 2954.

Who is this guidance for?

1.8 This guidance is for:

- local authority 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 stone and mineral drying and vegetable matter drying installations that burn in particular recovered fuel oil (RFO - see glossary) that are listed in Section 5.1 Part A2 of Schedule 1 to the PPC Regulations amended in particular by the Waste Incineration Regulations 2002 (SI 2980) as follows

(a) The incineration of non-hazardous waste in an incineration plant with a capacity of less than 1 tonne per hour.

(b) Unless carried out as part of any other Part A activity, the incineration of non-hazardous waste in a co-incineration plant.

- 1.12 The burning of recovered fuel oil to dry stone, minerals or vegetable matter is co-incineration and is a listed activity within Part A2. When they burn recovered fuel oil (see glossary) the following are covered by this note:
- roadstone coating
 - mineral drying including sand
 - crop drying, including grain and pulses

Is recovered fuel oil a hazardous waste?

- 1.13 Recovered fuel oil is not subject to the WID hazardous waste provisions, as long as it satisfies all three of the following conditions:
- the mass content of polychlorinated aromatic hydrocarbons, for example polychlorinated biphenyls or pentachlorinated phenol, amounts to concentrations not higher than those set out in the relevant Community legislation
 - these wastes are not rendered hazardous by virtue of containing other constituents listed in Annex II to Council Directive 91/689/EEC on hazardous waste in quantities or in concentrations which are inconsistent with the achievement of the objectives set out in Article 4 of Council Directive 75/442/EEC on waste²; and
 - the net calorific value amounts to at least 30 MJ per kilogramme

Within section 5.1 of Schedule 1 to the Pollution Prevention and Control Regulations, burning of recovered fuel oil is considered to be the incineration or co-incineration of non-hazardous waste as long as it meets the same three criteria.

Quality assured recovered fuel oil usually meets these criteria. The change from "special waste" to "hazardous waste" in waste legislation is unlikely to alter this conclusion³.

- 1.14 The Waste Incineration Regulations 2002⁴, along with Directions issued by the Secretary of State to the Environment Agency and the local authorities, are how the Waste Incineration Directive, (the "WID") is implemented in the UK. The WID applies to industrial activities where waste, as defined by the Waste Framework Directive, is used as a fuel or is disposed of at a plant where energy generation or production is the main purpose.
- 1.15 Some parts of this guidance note describe requirements of the WID that "must" be met and other issues are subject to consideration of what "should" be done to achieve BAT. For example, WID emission limit values apply only when waste (eg RFO) is being burnt. Any emission limit values are based on BAT, not WID, during startup and shutdown and whenever waste is not being burnt.

2. OJ No. L194, 25.7.75, p.39 amended by Council Directives 91/156/EEC (OJ No. L78, 26.3.91, p.32) and 91/692/EEC (OJ No. L377, 31.12.91, p.48) and Commission Decision 96/350/EC (OJ No. L135, 6.6.96, p.32).

3. In England - Review of the Special Waste Regulations 1996 in England - Proposals for Replacement Hazardous Waste Regulations and List of Wastes Regulations

4. The Waste Incineration (England and Wales) Regulations 2002 (SI 2002 No. 2980) amended Section 5.1 of Part 1, Schedule 1 of the Pollution Prevention and Control (England and Wales) Regulations 2000 (SI 2000 No. 1973)

1.16 Some terms used in this note are introduced in the table below and explained in more detail in other parts of the note.

Table 1: Introduction to some WID terms

Term	Explanation	Further guidance
Mixing rule	This rule calculates emission limits based on the proportions of waste and non-waste in the fuel mix.	Paragraph 2.5 and Table 7
Process limit	The limit that would apply to the co-incineration plant when it operates without burning waste	paragraph 2.7
WID limit	The limit that would apply if the process was a incineration plant	Table 7
Standard oxygen condition	Uses a calculation method to ensure emission limit values are not met by dilution.	Appendix 3 and Glossary
Derogation	Permission to avoid meeting certain requirements of the Directive with regard to operating conditions	Paragraph 2.11 and Table 7
Measurement uncertainty	As measurements are not exact, WID allows for the uncertainty of measurements	3.194 and Glossary
Abnormal operating conditions	As plant and monitoring devices can fail, WID sets limits on the allowable amount of failure time while burning waste, and limits actions during those failures	3.153

Installation

1.17 The installation includes the activities listed in the Regulations above plus the directly associated activities which have a technical connection and which may have an effect on pollution. (see General Guidance Manual for a full definition and explanation, plus the following paragraphs)

1.18 The Waste Incineration Directive definition of co-incineration plant covers the site and the entire plant including all co-incineration lines, waste reception, storage, on-site pretreatment facilities, waste-, fuel-, and air-supply systems, boiler, facilities for the treatment of exhaust gases, on-site facilities for treatment or storage of residues and waste water, stack devices and systems for controlling incineration operations, recording and monitoring incineration conditions.

A2 Installation boundary

1.19 For roadstone coating and other plant which are part of a large site, the following may be useful in determining the A2 installation boundary, particularly between the Part A2 installation and any separate Part B installation.

1.20 A stone store that supplies several different uses on a site is unlikely to be part of the A2 roadstone coating installation. It is not inevitable that that stone in the store will go into the roadstone coating activity and the technical connection can be considered to be broken.

1.21 A conveyor is not necessarily a technical connection. For example, in a quarry, stone crushing is normally not part of the A2 installation. A self-contained A2 roadstone coating plant is likely to include the stone storage etc.

1.22 As long as the roadstone coating activity is not the principal user of the waste water handling plant, it is not directly associated with it. For plant with dry gas cleaning plant, the shared waste water handling plant can be considered as off-site holding capacity for contaminated rain and firefighting water.

1.23 Plant with wet gas treatment will have Directive emission limits to meet and so is likely to be the most dependent user of the waste water treatment plant, in which case the A2 installation would include the waste water treatment plant.

Review and Upgrading Periods

Existing installations or activities

- 1.24 For A2 installations, any requirements still outstanding from an existing upgrade programme under LAPC should be completed, other than in exceptional circumstances and depending on the activity and its history by the dates in the appropriate process guidance notes in the table below.

Table 2: Existing compliance timetable

Previous guidance - Secretary of State's Guidance Note	Upgrading to those standards should have been completed by	Comments
PG3/15a Roadstone coating	1 April 1996	
PG3/15b Mineral drying processes	1 April 1996	
PG6/27 Vegetable matter drying processes	1 October 1998	

- 1.25 The new provisions of this note and the dates by which compliance with these provisions is expected, are listed in [Table 3](#) and [Table 4](#) 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 notes in [Table 3](#) and [Table 4](#), 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 3](#) and [Table 4](#) below.
 - (2) Where standards or provisions in PG notes in [Table 3](#) and [Table 4](#) have been deleted in this guidance note or where this guidance note specifies less stringent provisions than in PG notes in [Table 3](#) and [Table 4](#), the new LA-IPPC permit should reflect this straightaway.
- 1.26 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 local authority regulator within 6 months of the date of issue of the permit.

Table 3: Compliance timetable for roadstone coating and other mineral processes

Provisions	Reference	Compliance Date
WID emission limit values for hydrogen chloride, particulate matter from waste incineration, sulphur dioxide, hydrogen fluoride, nitrogen oxides, volatile organic compounds, certain metals including cadmium thallium and mercury, dioxins	Table 7	28 Dec 2005
WID requirements for waste handling, operating conditions, residues	Table 7	28 Dec 2005
Existing roadstone coating plant, and existing mineral drying plant has a new emission limit of 50 mg/m ³ for particulate matter depending upon the consistency of current performance of arrestment systems, except where arrestment equipment is replaced.	Table 7 particulate matter	From the date of the publication of this note
Emission limit for particulate matter of 50 mg/m ³ for all new roadstone coating and mineral drying plant and any existing roadstone coating or mineral drying plant where the arrestment equipment is replaced.	Table 7 particulate matter	On commissioning.
For arrestment plant handling dry dust which discharges externally, other than that serving roadstone coating plant, mineral drying plant or silos. Design specification to achieve an emission limit for particulate matter of 50 mg/m ³ for discharges with exhaust flow greater than 100 m ³ /min.	Table 9	Where 50 mg/m ³ design criteria can be designed into existing plant, by the use of higher grade replacement filters for example, then this should be complied with as soon as practicable, which in most cases should be within 12 months of the publication of this note. New or replacement plant should be designed to this specification prior to installation. Where 50 mg/m ³ design criteria cannot be designed into existing plant then replacement plant is required and this should be commissioned by 2010.
New arrestment plant (other than that serving roadstone coating plant, mineral drying plant or silos) should be designed to achieve the limit of 50 mg/m ³ for particulate matter when functioning correctly for discharges with an exhaust flow greater than 100 m ³ /min.	Table 9	Prior to installation.
For all new silo filtration plant, a design specification to operate to an emission standard of less than 10 mg/m ³ .	3.19	Prior to installation.
New silos to be fitted with automatic protection systems or a system demonstrated to provide an equivalent level of control and agreed by the regulator.	3.24 and BAT19	On installation.
Facilities should be provided at loading points for stone etc into rail vehicles to ensure adequate dust suppression for the duration of the journey.	3.104	It is considered that this can technically be achieved within 12 months of the publication of this note and this should normally be the upgrading timescale; however, local authorities should consider allowing an extension of up to a further 12 months where good reason is given for the delay such as the need to plan any track closures needed for relevant improvement works to be carried out.
All other provisions for roadstone coating and other mineral processes.	-	To be complied with as soon as practicable, which in most cases should be within 12 months of the publication of this note.

Table 4: Compliance timetable for vegetable matter drying processes

Provisions	Reference	Compliance Date
WID emission limit values for hydrogen chloride, particulate matter from waste incineration, sulphur dioxide, hydrogen fluoride, nitrogen oxides, volatile organic compounds, certain metals including cadmium thallium and mercury, dioxins.	Table 7	28 Dec 2005.
WID requirements for waste handling, operating conditions, residues.	Table 7	28 Dec 2005.
Daily inspection of odour arrestment and air handling plant.	3.205	Within 3 months of the publication of this note.
Requirement for an Odour Response Procedure.	3.146	Within 3 months of the publication of this note.
Inclusion of provisions to limit the sulphur content of fuel where a thermal system is used for odour arrestment.	Table 9	Within 6 months of the publication of this note.
Testing of odour arrestment efficiency annually and inclusion of BS EN method.	BAT 161	Within 12 months of the publication of this note.
Emission limit for particulate matter reduced to 20 mg/Nm ³ for sources other than dryers and coolers.	Table 9	Within 12 months of the publication of this note.
Requirement for emissions to be free from visible smoke	3.124	Within 12 months of the publication of this note
Inclusion of a standard for odour arrestment efficiency	Table 9	Within 24 months of the publication of this note *
Management and control of silos for dusty materials	3.24	Within 12 months of the publication of this note
Requirement for mist eliminator for scrubbers	3.136	Within 12 months of the publication of this note
Inclusion of continuous monitoring provisions for odour arrestment plant	3.210	Within 24 months of the publication of this note
All other provisions for vegetable matter drying processes	-	To be complied with as soon as practicable, which in most cases should be within 12 months of the publication of this note.

* In the case of existing processes where odour arrestment plant has been installed to meet the requirements of the previous guidance notes, the regulator should consider establishing a date for full compliance allowing for the use of the existing equipment until the end of its reasonable operational life provided that emissions from the equipment do not result in offensive odours beyond the process boundary.

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

New installations or activities

- 1.28 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

- 1.29 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

1.30 Permits should be reviewed in accordance with the guidance in chapter 26 of the General Guidance Manual. The review frequencies given in that chapter are considered appropriate for activities and installations covered by this sector guidance note.

Summary of releases

Table 5: Summary of releases - Roadstone coating and other mineral drying processes using recovered fuel oil





Source  Releases 	Aggregate delivery and storage	Bitumen delivery and storage	Raw material stockpile, if part of the installation	Hardstandings and storage areas. Roadways including haulage ways	Vehicle bodies and wheels	Material transfers, charges and discharges including hoppers, conveyors, silos and sheds	Screening	recovered fuel oil combustion in driers followed by Wet scrubbers	recovered fuel oil combustion in driers followed by Dry scrubbers	Recovered oil storage	Waste water treatment	Discharge and purging of storage bins
Particulate matter / Total suspended solids	A		A	A	A	A	A	A	A		W	A
Oxides of sulphur								A	A			
Fluorides								A	A			
Chlorides								A	A			
Oxides of nitrogen								A	A			
TOC / VOC / fume (see Table 7 for TOC explanation)		A						A	A			
Dioxins								A	A		W	
Odour		A						A	A	A		A
Solid waste or sludge									L		L	
Liquid effluent								W			W	
Metals								A W	A		W	
Noise	N	N	N				N					
KEY A - Release to Air, W - Release to Water, L - Releases to Land, N - Noise release												

Table 6: Summary of releases - Vegetable matter drying processes using recovered fuel oil

Source  Releases 	effluent before drying dryer feed handling and storage	grinders	cooler	handling of waste and effluent	handling and storage of products,	RFO combustion in driers followed by cyclone/s/scrubbers	RFO storage	Waste water treatment
Particulate matter / Total suspended solids	W	A	A	W	A	A		W
Oxides of sulphur						A		
Fluorides								
Chlorides						A		
Oxides of nitrogen						A		
TOC / VOC / fume (see Table 7 for TOC explanation)						A		
Dioxins								W
Odour			A	A	A		A	
Solid waste or sludge				L		L		L
Liquid effluent	W			W				W
Metals						A		W
Noise								
KEY A - Release to Air, W - Release to Water, L - Releases to Land, N - Noise release								

There is considerable variation from site to site within the vegetable matter drying sector

2 Emission limits and other requirements

- 2.1 This section contains emission limits, mass release rates and other provisions that are judged for the generality of the activities within the sector to represent BAT.
- 2.2 The intention of this note is
- to comply with WID whilst waste (RFO) is being burnt,
 - and to guide as to BAT (as in Section 1) whenever waste is not being burnt; eg during start-up, shutdown or idling; or in full operation with no waste being combusted.

Emissions to air associated with the use of BAT

- 2.3 For vegetable matter dryers, the WID emission limit values and other provisions of [Table 7](#) must be applied after the process limits in [Table 8](#) are substituted into [Table 7](#).
- 2.4 For roadstone coaters and other mineral dryers, the WID emission limit values and other provisions of [Table 7](#) must be applied.
- 2.5 To meet the requirements of WID, emission limit values (ELVs) for continuously monitored pollutants must be determined in the following way;
- if the mixing rule applies (see [Table 7](#)) then:
 - (1) check what reference oxygen condition must be applied and
 - (2) check what percentages of recovered fuel oil and virgin fuel are burnt, excluding oil burnt during start-up and shut down
 - (3) use the method shown in [Appendix 4](#) and [Appendix 5](#) to calculate half hour and daily values. In that method, the permit limits are calculated from the WID limits and the Process limits in [Table 7](#).
 - a half hour average limit is set for CO alone
 - set daily average limits

Setting daily and half hourly average limits

Compliance with daily and half hourly average limits while RFO is being burnt

- 2.6 Compliance with daily and half hourly average limits while waste (eg RFO) is combusted.
- continuous measurements while RFO is combusted, (aggregated if necessary) produce measured half hourly averages.
 - measured half hourly averages are adjusted for uncertainty to produce validated half hourly averages. Paragraphs starting [3.194](#) explain how
 - the daily average value is obtained from the validated half hourly averages. Paragraphs starting [3.196](#) explain how.
 - the daily average value is compared with the daily average limit
 - limited exceedances of limits and limited unavailability of monitoring results are allowed during abnormal operating conditions (paragraphs starting [3.153](#) explain)

Periodic measurements for WID compliance, eg dioxins, metals, may be measured for a period which includes some times when RFO is not being burnt. [Table 7](#) says whether the mixing rule applies.

Compliance with daily and half hourly average limits whenever RFO is not being burnt

- 2.7 Compliance with daily and half hourly average limits while no wastes are being combusted
- particulate emissions should be continuously monitored, incl normal and abnormal operation and start up, shut down and idling.
 - for plant that complies regularly with WID when burning RFO, daily limits should not usually be applied to continuously monitored pollutants whilst not burning waste .
 - process limits are not usually reported. (Process limits are continuous measurements, aggregated if necessary to produce daily values, when drying stone whilst burning gas oil alone and there is sufficient stone dust to abate pollutants such as SO₂ and HCl). If process limits are measured then emissions during startup, shutdown, abnormal operation and idling periods should not be included.

SO₂ process limit review

- 2.8 At the time that this guidance note is published, there is insufficient data to confidently set the sulphur dioxide process limit for roadstone coaters at 85mg/m³. Using data gathered from continuously monitored plant, the SO₂ process limit will be reviewed 12 months after publication, and a decision taken whether to tighten it .
- 2.9 The WID limits in [Table 7](#) and [Table 8](#) must apply when waste (eg RFO) is being burnt. Abnormal operating conditions are dealt with in paragraphs [3.153](#) - [3.156](#). Strict compliance may not be achievable during the commissioning of new plant (see [Ref 14](#)).
- 2.10 Oxygen reference conditions for emission limit values are explained in [Appendix 3; Expressing concentrations at different oxygen conditions](#), which contains two examples.

Table 7: WID Emission limits, monitoring and other provisions for roadstone coating and other mineral drying processes

Determinand	Source	Emission limit/provision (subject to paragraphs 3.190-3.199)		Type of monitoring	Monitoring frequency
		Process limit	WID limit Daily average value		
					See footnote ¹ for first year of operation
Particulate matter Mixing rule applies	Process dust, RFO, fuel	50 mg/m ³ see footnote ² 17% O ₂	10 mg/m ³ 3% O ₂	BS ISO 10155: 1995 / corr2002 BS ISO 9096	Continuous + extractive - 2 a year
Gaseous and vaporous organic substances expressed as total organic carbon (abbreviated to TOC) Mixing rule applies but see footnotes ^{3 4}	bitumen fume, RFO fuel	10 mg/m ³ 3% O ₂	10 mg/m ³ 3% O ₂	BS EN 12619:low concentrations	Continuous
HCl Mixing rule applies.	RFO	nil	10 mg/m ³ 3% O ₂	CEMS to MCERTS standard or Extractive to NCAS Technical standard 15_01	Continuous
HF Mixing rule applies.	RFO	nil	1 mg/m ³ 3% O ₂	US EPA method 26A	Extractive only - 2 a year
Sulphur dioxide Mixing rule applies but see footnotes ^{5 6}	RFO, fuel	85 mg/m ³ 3% O ₂	50 mg/m ³ 3% O ₂	BS 6069-4.4:1992 (ISO 7935)	Continuous
Nitrogen oxides Mixing rule applies but see footnote ⁷	RFO fuel	400mg/m ³ 3% O ₂	400mg/m ³ 3% O ₂	ISO 10849:1996	Continuous
Carbon monoxide Mixing rule usually applies but see footnotes ^{3 8}	RFO , fuel oil	50 mg/m ³ 3% O ₂	50 mg/m ³ 3% O ₂	ISO 12039:2001	Continuous
	The daily limit is complied with if 97% of the daily average values over the year do not exceed the limit A half hourly limit of 100mg/m ³ at 3% oxygen must also be set.				
Sb, As, Pb, Cr, Co, Cu, Mn, Ni, and V; and their compounds Mixing rule applies	RFO, fuel oil	nil	0.5mg/m ³	Average over 30 minute to 8 hour sample BS 14385:2004	Extractive - 2 a year
Cd and Tl Mixing rule does not apply		total 0.05 mg/m ³ at 11% O ₂		Average over 30 minute to 8 hour sample USEPA method 29	Extractive - 2 a year

Table 7: WID Emission limits, monitoring and other provisions for roadstone coating and other mineral drying processes

Determinand	Source	Emission limit/provision (subject to paragraphs 3.190-3.199)		Type of monitoring	Monitoring frequency
		Process limit	WID limit Daily average value		
Mercury Mixing rule does not apply		0.05 mg/m ³ at 11% O ₂		Average over 30 minute to 8 hour sample USEPA method 29	Extractive - 2 a year See footnote ¹ for first year of operation
Dioxin Mixing rule does not apply. See footnotes ^{9 10}	RFO, co-incineration	0.1ng/m ³ I-TEF at 11%O ₂		BS EN 1948 sample period 6 to 8 hours	Extractive - 2 a year
Dioxin like PCBs See footnote ¹⁰	RFO, incineration	no limit set but report results using WHO -TEF		sample may be divided for analyses	Extractive - 2 a year
PAH Results of monitoring to be reported as individual PAH. No limit is set, but monitoring is required by a Direction	RFO, co-incineration	<ul style="list-style-type: none"> - Anthanthrene - Benzo[a]anthracene - Benzo[b]fluoranthene - Benzo[k]fluoranthene - Benzo(b)naph(2,1-d)thiophene - Benzo(c)phenanthrene - Benzo[ghi]perylene, - Benzo[a]pyrene - Cholanthrene - Chrysene - Cyclopenta(c,d)pyrene - Dibenzo[ah]anthracene - Dibenzo[a,i]pyrene - Fluoranthene - Indo[1,2,3-cd]pyrene - Naphthalene 		BS ISO 11338-1 and BS ISO 11338-2	Extractive - 2 a year
WID Operating Conditions - Combustion requirements					
Residence Time		2 seconds even under the most unfavourable circumstances. See footnote ¹¹			
Temperature		850°C See footnotes ^{12 13 14}	Record temperature Combustion gas temperature must be measured near the inner wall or another representative point in the combustion chamber as authorised by the regulator. The temperature measurement point must be located after the last injection of combustion air, including secondary air and re-circulated flue gases where carried out. See footnote ¹⁵		Continuous

Table 7: WID Emission limits, monitoring and other provisions for roadstone coating and other mineral drying processes

Determinand	Source	Emission limit/provision (subject to paragraphs 3.190-3.199)		Type of monitoring	Monitoring frequency
		Process limit	WID limit Daily average value		
Waste feed interlock		An interlock must prevent recovered fuel oil feed when: <ul style="list-style-type: none"> temperature is less than 850°C emission limits values are exceeded unless it is during an abnormal condition; see 3.153 - 3.156 		Record events Record when waste is being burnt	See footnote ¹ for first year of operation Continuous Continuous
Start up fuel		Must not be a waste, should be gas oil, natural gas or liquefied gas, or fuel that causes no higher emissions than those arising from the burning of gas oil. See footnote ¹⁶		compare fuel specification with gas oil. See footnote ¹⁷	

Installations may apply for a derogation from certain WID combustion requirements (ie time, temperature and waste feed interlock). See paragraph 2.11.

- In the first year of operation, where extractive testing is required, the frequency must be increased from 2 to 4 times in the year
- For existing plant, at which 50 mg/m³ currently achieved, but only inconsistently, the limit should be 100 mg/m³ PLUS efforts should be made to improve consistency.
Where 50 mg/m³ is not currently achieved: the limit should be 100 mg/m³.
The position will be revisited in 2 years in the light of practical experience
- As the process limit and the WID limit are the same, the mixing rule simply gives the same figure.
- For plants that have a derogation from the requirement for 850°C for 2 seconds, the mixing rule does not apply and these total organic compounds (TOC) limits must always be met, ie no exceedances during normal or abnormal operations.
- Sulphur in virgin gas oil is limited to 0.2% until 1/1/2008 and 0.1% after that. Sulphur in Certain Liquid Fuels Regs (SI2000/1460) which implement the Sulphur Content of Certain Liquid Fuels Directive (1999/32/EC).
- At the time that this guidance note is published, there is insufficient data to confidently set the sulphur dioxide process limit for roadstone coaters at 85mg/m³. Using data gathered from continuously monitored plant, the SO₂ process limit will be reviewed 12 months after publication, and a decision taken whether to tighten it.
- As the process limit and the WID limit are the same, the mixing rule simply gives the same figure.
- For plants that have a derogation from the requirement for 850°C for 2 seconds, the mixing rule does not apply and these carbon monoxide limits must always be met, ie no exceedances during normal or abnormal operations.
- Average value over the 6-8 hours sampled continuously. The sample period may have to include some periods when waste (eg RFO) is not being burnt.
- Equivalence factors for I - TEF and WHO-TEF are listed on p57 of Defra's WID guidance edition 2 [Ref 14](#)
- For the combustion of quality assured recovered fuel oil, residence time is unlikely to vary significantly once the 850°C is established.
- The temperature must be raised in a controlled and homogeneous fashion. With combustion of quality assured recovered fuel oil this is straightforward.
- The Directive also requires that the above temperatures are achieved under the most unfavourable conditions. With quality assured recovered fuel oil this is straightforward
- Temperatures must be maintained during shutdown until all the waste in the combustion chamber has been burnt. With recovered fuel oil this is straightforward.
- Secondary air does not include any process air added after the 2 seconds residence time.
- This refers to the combustion emissions alone. It does not refer to the process emissions eg limestone/hardstone dust
- Comparison can usually be restricted to the Annexe V pollutants unless the fuel contains a substance of particular concern

Table 8: Process limits for vegetable matter drying: for use in the WID mixing rule

Determinand	Source	Process limit
Particulate matter	Process dust from dryers	150mg/m ³ expressed at 17% oxygen
Emissions from direct-fired drying operations		
Sulphur dioxide	Solid fuel	mg/m ³ expressed at 6% oxygen
	Liquid fuel	mg/m ³ expressed at 3% oxygen
	Gaseous fuel	mg/m ³ expressed at 3% oxygen
Sulphur dioxide abatement levels are still being determined for vegetable matter dryers. The process limit will be determined by continuous measurements within approximately 9 months of publication of this note and Defra will review the data within a further three months .		
Nitrogen oxides	Solid fuel	400mg/m ³ expressed at 6% oxygen
	Liquid fuel	400mg/m ³ expressed at 3% oxygen
	Gaseous fuel	200mg/m ³ expressed at 3% oxygen

Table 9: Emission limits, monitoring and other provisions for emissions to which WID does not apply

Determinand	Source	Emission limits/provisions	Type of monitoring	Monitoring frequency (subject to paragraphs 3.190-3.199)
For Roadstone coaters and other mineral drying processes				
(Note Table 7 limits apply to all emissions from stacks from which recovered fuel oil combustion emissions are sometimes emitted)				
Total particulate matter	All authorised emission points	No abnormal emission	Operator observations	At least daily
Total particulate matter	Silo inlets and outlets	No visible emission	Operator/driver observations Record start and finish times	Every delivery
Total particulate matter	Arrestment equipment** with exhaust flow >300 m ³ /min	Designed to achieve 50 mg/m ³	Recorded indicative monitoring	Continuous
Total particulate matter	Arrestment equipment** with exhaust flow >100 m ³ /min	Designed to achieve 50 mg/m ³	Indicative monitoring to demonstrate that the arrestment equipment is functioning correctly	Continuous
Total particulate matter	Arrestment equipment** with exhaust flow = or <100 m ³ /min	No visible emission	Operator observations OR Indicative monitoring to show that the equipment is functioning correctly	At least daily OR Continuous
* The position will be revisited in 2 years in the light of practical experience.				
** where the plant is discharging to the external environment (other than that serving roadstone coating plant and silos)				
For vegetable matter drying processes				
(Note Table 7 : as amended by Table 8 : limits apply to all emissions from stacks from which recovered fuel oil combustion emissions are sometimes emitted; odour is the exception.				

Table 9: Emission limits, monitoring and other provisions for emissions to which WID does not apply

Determinand	Source	Emission limits/provisions	Type of monitoring	Monitoring frequency (subject to paragraphs 3.190-3.199)
Odour	Odour emissions from contained and fugitive sources.	Aim that any location at or beyond the site boundary is free from offensive odour.	Determination by process assessment (see Odour and Introduction)	
	Contained High Odour Intensity Process Releases (see paragraph 4.6 for description).	Any odour arrestment plant installed on high odour intensity emissions (see paragraph 4.3) should have an odour removal efficiency of not less than 95%†.	Determination by manual extractive sampling and analysis by dynamic olfactometry in accordance with BS EN13725.	Annual
	Contained Lower Odour Intensity Process Releases (see paragraph 4.6 for description).	Any odour arrestment plant installed on lower odour intensity emissions (see paragraph 4.3) should have an odour removal efficiency of not less than 85%†.		
<p>† Where the inlet odour concentrations are very low and the 95% and 85% destruction efficiency is difficult to demonstrate due to measurement reproducibility and equipment efficiency at low concentrations, the final discharge to air should contain less than 500 odour units/m³.</p> <p>In cases where emissions from both high and lower odour intensity sources are vented to the same odour arrestment plant, odour should be calculated in terms of mass odour flows and the overall destruction efficiency should be sufficient to ensure that the high odour intensity source has been reduced by 95%.</p> <p>For example if the high intensity odour source was 126,000ou/m³ in 4,000m³/hr of air and the lower intensity source was 4,000 ou/m³ in 27,000m³/hr, this equates to a mass flow of 140,000 ou/s and 30,000ou/s respectively. The required destruction efficiency would lead to a maximum emission of 7,000ou/s from the high intensity source (95%) and 4,500ou/s from the lower intensity source (85%). The maximum permitted emission would be 1,335ou/m³ in a total flow of 31,000m³/hr.</p>				
sulphur in fuel	process gas oil	0.2% wt/wt (before 1/01/2008) 0.1% wt/wt (from 1/01/2008)	Certification by supplier	
	process heavy fuel oil	1% wt/wt		
particulate matter	Emissions from coolers	150mg/m ³	indicative monitoring plus extractive test to BS ISO 9096: 2003	Continuous Annual
	Emissions from process sources other than dryers and coolers (except where the final discharge of the arrestment plant is within buildings)	20mg/m ³	indicative monitoring plus extractive test to BS ISO 9096: 2003	Continuous Annual

Derogation from Waste Incineration Directive

- 2.11 Some operators may apply for a derogation from Waste Incineration Directive (WID) operating conditions - combustion requirements. The Waste Incineration Directive Article 6(4) allows the regulator to give derogations from certain of its requirements under certain circumstances, and makes additional requirements when derogations are granted. When the regulator considers a request for a derogation for a co-incineration line, the procedure to follow is set out below, and the factors to consider follow.
- 2.12 Derogation procedures:
- An installation operator applies to the regulator for a derogation as part of an application.
 - The regulator may grant the derogation from certain operating conditions requirements subject to the provisions of paragraph [2.13](#).
 - Defra will agree with regulators a mechanism to collect the information concerning derogations that must be notified to the European Commission.
- 2.13 If requested by the operator, regulators should grant a derogation from the requirement from the operating conditions- combustion requirements (ie time/temperature/waste feed interlock) for most new and all existing installations, as long as the following provisions will be met;
- TOC and CO limits must always be met, ie no exceedances during normal or abnormal operation
 - Abnormal operations are limited as in [3.153](#) - [3.156](#)
 - All other WID limits must be met
 - New drum mix plant is unlikely to be built, but in any case is not considered suitable for the derogation.

Emissions to water associated with the use of BAT

- 2.14 Limit values for water discharges will be specified in individual cases taking account of the receiving environment. Wastewater treatment systems can maximise the removal of metals using precipitation, sedimentation and possibly filtration. The reagents used for precipitation may be hydroxide, sulphide or a combination of both, depending on the mix of metals present. It is also practicable in many cases to re-use treated water. The following table provides information regarding achievable levels associated with the use of wastewater treatment systems.
- 2.15 In all cases the effluent discharged from the installation must not give rise to a potential breach of an EQS or an EAL for the final receiving water, when taken with compliance with any water company permit.
- 2.16 The Waste Incineration Directive sets limits for discharges of waste water from the cleaning of exhaust gases which must be included in the permit, unless tighter limits are imposed. As wet abatement is not common in the installations covered by this note, no further detail is given here. Full details can be found in the Guidance on the Waste Incineration Directive [see [Ref 14](#)]

Table 10: Emissions to water associated with the use of BAT

Determinand	Emission limit values are expressed in mass concentrations mg/l for unfiltered samples
Suspended matter	95% - 30 mg/l; 100% - 45mg/l
Hg	0.03 mg/l
Cd	0.05 mg/l
Tl	0.05 mg/l
As	0.15 mg/l
Pb	0.2 mg/l
Cr	0.5 mg/l
Cu	0.5 mg/l
Ni	0.5 mg/l
Zn	1.5 mg/l
Dioxins I-TEQ	0.3 ng/l

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.
- 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. For the sake of brevity these boxes simply use the term "BAT".

Process description and in-process controls

Products covered in this note

- 3.3 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, then other techniques or operating conditions may be used.

Summary of activities

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

See also section [1.19 - 1.23](#)

Structure of section

- 3.5 This section contains a summary of the processes. Not all A2 installations will contain all of the stages eg some stages and parts of stages may be in an adjoining Part B installation. The process is divided into the subprocesses below. Each subprocess is described giving;
- the process and its controls
 - the significance of its potential environmental impacts
 - BAT boxes

Then text common to processes restarts at [3.78](#)

- 3.6 The products covered by this note include
- asphalt for roadstone coating see [3.8 -3.54](#), and [3.78](#) onwards
 - mineral drying see [3.13 to 3.37](#), [3.55 - 3.61](#), and [3.78](#) onwards
 - vegetable matter drying see [3.13 to 3.29](#), [3.63 - 3.77](#), and [3.78](#) onwards
- 3.7 Subprocesses
- silos and bulk powdered material transfer [3.13](#)
 - recovered fuel oil deliveries and storage [3.26](#)
 - stone etc deliveries and storage [3.31](#)
 - bitumen deliveries and storage [3.38](#)
 - continuous plants incl drying, hot storage, coating and hot storage of product [3.40](#)
 - batch plants including drying, coating and delivery [3.48](#)
 - sand or mineral drying that is not part of roadstone coating [3.55](#)
 - vegetable matter drying [3.62](#)

Overview of roadstone coating products

- 3.8 Asphalt is a mixture of aggregate, sand, filler, bitumen and occasionally a number of additives, such as adhesion agents, modifiers and fibres that influence the performance of the product. Sometimes old asphalt or demolition waste is recycled to replace part of the binder and the virgin aggregate. The asphalt production process also allows the incorporation of waste materials from other industries such as concrete waste, fly ash, incinerator ash, etc.
- 3.9 The production rate of a mixing plant varies with its size from 25 - 800 tonnes per hour, but typical plant capacities are 100 - 150 tonnes per hour. Production may take place in fixed or mobile plant. The process may be batch or continuous, although batch mix plants are more common.
- 3.10 Bitumen is derived as a residual product from the refining of crude oil. Tar is derived from the pyrolysis of coal. The use of tar in roadstone coating processes is rare due to health and safety concerns relating to the high concentration of polyaromatic hydrocarbons (PAHs), which may be 10,000 times higher than that of bitumen.
- 3.11 Hot mix asphalt is a mixture of approximately 92% of well-graded aggregates, together with filler and sometimes additives. Bitumen is the binder that “glues” the asphalt together; it makes up less than 8% of the product. Filler is used to fill out the smallest voids and to stabilise the binder.
- 3.12 In a number of applications bitumen emulsion is used as a binder. Emulsion based mixes are referred to as “cold mixes”. The final properties of cold mix asphalt are different from hot mixes.

Hot and cold asphalt mixes

Bulk powdered material transfer inc Silos

- 3.13 Powdered materials are delivered by road or rail in bulk tankers, or by water in barges or ships. The powder materials are transferred through a closed system of heavy duty hoses to storage silos, using compressed air as a carrier medium. Silos are vented to allow air to escape through filters, so controlling dust emission.
- 3.14 The delivery of powder from road tankers relies on a compressor (blower) mounted on the tanker lorry providing a supply of air which is used in three ways:
- To pressurise the tank vessel with air so that inside the vessel there is significant pressure which helps feed the powder out of the tankers. The tank is pressurised at the start of the blow, and can be repressurised as necessary during the course of discharging.
 - A separate feed from the air supply passes to the distributor system which fluidises the powder around the distributor plate.
 - A third feed of air receives fluidised powder and flows from the tanker, along the connecting pipework and into the silo. The powder fed from the distributor system is thus transferred to the silo in the air stream.
- 3.15 The flow of air/material through the pipe depends on the pressure in the blowing line and hence the pressure in the tankers. The pressure required to successfully convey the powders is determined by the resistance to flow and gravity that is to be overcome which varies depending upon the height to which the powders are to be pumped (i.e. the height of the silo) and the pipe length and diameter.
- 3.16 The tanker discharge is controlled by the tanker driver. The driver controls the flow of air to the tank, the distributor and the silo to maintain a constant flow of material into the silo without exceeding the flow capacity of the filter system or exerting excessive pressure in the silo (which is not a pressure vessel).
- 3.17 In the event that the silo becomes pressurised the pressure relief valve should lift for safety reasons. If the pressure relief valve is not designed to relieve the pressure quickly enough, the silo may rupture or the filter unit may be ejected from the top of the silo. Such incidents give rise to an unacceptable emission to atmosphere. Such incidents have been caused by excessive pressure being blown from the delivery tanker into the silo at the end of the delivery cycle.

- 3.18 Venting the residual air from a tanker should be via a flow restrictor, which limits the rate at which the air is discharged, if it has to be discharged through the silo. Rather than venting through the silo, it is preferable that residual air should be vented to atmosphere using a filtered vent on the tanker.
- 3.19 If the filter system on the silo is not capable of handling the large flow of air that is generated during the delivery process, this may cause an increase in pressure within the silo. Filter manufacturers supply information on the pressure drop across filters and the filtration rate. It is important that the filter size is calculated to match the flow rates of air through the silo. The filter systems must be cleaned to prevent blockages and accumulation of powder in the filter system.
- 3.20 During silo filling it is most likely that any emissions would be released during the first and last five minutes of the delivery. The first few minutes is when emissions due to leaks or split hoses would first be noticed. The last few minutes is when excess pressure from the tanker may cause an emission through the pressure relief valve if the driver is not controlling the delivery correctly. During silo filling procedures isokinetic monitoring of emissions from the arrestment plant is not likely to be possible as the delivery period is so short. For this reason there is no numerical emission limit for such plant. It is important however that the plant is designed to cope with the delivery flow rate that is used for the silo.
- 3.21 Silo systems require appropriate inspections and assessments to minimise potential for emissions during the filling process.
- 3.22 Reduced inspection frequency of silos may be appropriate:
 - (a) where pressure drop sensors or other continuous monitors are used to monitor the arrestment plant; such monitors should be inspected according to manufacturers recommendations to ensure their proper operation.
 - (b) for filters fitted with reverse jets or with mechanical shakers where operating experience has demonstrated satisfactory operation of the arrestment plant.
 - (c) where the process operation is infrequent.
- 3.23 Careful delivery by trained personnel will avoid materials being blown into silos at a rate which is likely to result in pressurisation of the silo, especially towards the end of the delivery when the quantity of material entering the ducting is reduced.
- 3.24 Continuous high level monitoring systems are currently available and in use in storage silos. They may be used telemetrically to monitor stock within the silo. They may also be used to automatically stop delivery of material to the silo. The silo management system includes high level alarms, arrestment plant and pressure relief valve. Use of alternative techniques may be acceptable provided that they achieve an equivalent level of control with regard to potential for emissions to air.
- 3.25 Where silos are used for meal storage the measures relating to arrestment plant on silos and other silo management techniques are only applicable where the silo vents to the external environment or where silo emissions may escape from inside a building into the external environment.

Environmental impact

Water: Not significant

Land: Not significant

Air: Particulate matter in delivery air emitted

Waste: Not significant

Energy: Not significant

Accidents: Over-pressurisation can lead to silo rupture, filter failure or filter housing ejection

Noise: Delivery blowers can be noisy

BAT (Sheet 1 of 2)

The operators should

- 1 Inform tanker drivers of the correct procedures to be followed concerning noise spillage leaks and dusty emissions.
- 2 Ensure that visual assessment of emissions from silo inlet connections and the silo arrestment plant are undertaken throughout the duration of all bulk deliveries.
- 3 Record the start and finish times of all deliveries.
- 4 Inspect silo arrestment plant and arrestment plant serving other process at the frequency specified in [Table 11](#)
- 5 Check the outlet for signs that emissions have occurred.
- 6 Check the equipment for defects in the air flow or the cam shakers. If emissions or defects are detected then corrective action should be taken promptly and before another delivery takes place. Any failure of the silo management system (e.g. high level alarms, filter, pressure relief valve) should lead to full investigation of the operation of the plant and equipment.
- 7 Store all dusty or potentially dusty materials in silos, in confined storage areas within buildings, or in fully enclosed containers / packaging. Where the storage is open within a building, then suitable precautions should be taken to prevent wind whipping.
- 8 During delivery to a silo or bulk storage tank, either vent displaced air to suitable arrestment plant (for example cartridge/bag filters) or backvent it to the delivery tanker, in order to minimise emissions.
- 9 Ensure arrestment plant fitted to silos is of sufficient size (and kept clean) to avoid pressurisation during delivery.
- 10 In order to minimise fugitive emissions during the charging of silos, ensure that the transfer lines are securely connected to the silo delivery inlet point and the tanker discharge point, in that order.
- 11 Equip bulk storage tanks and silos containing dry materials with audible and/ or visual high level alarms, or volume indicator, to warn of overfilling.
- 12 Check the correct operation of such alarms weekly or before a delivery takes place, whichever is the longer interval.
- 13 Cease silo filling if emissions of particulate matter are visible from ducting, pipework, the pressure relief valve or dust arrestment plant during silo filling; rectify the cause of the problem prior to further deliveries taking place.
- 14 Check the seating of pressure relief valves on silos at least once a week, or before a delivery takes place, whichever is the longer interval.
- 15 Prevent further deliveries immediately it appears that the pressure relief valve has become unseated during silo filling, no further delivery should take place until corrective action has been taken. Examine the pressure relief valve to check for defects before re-setting, and fit a replacement valve if necessary.

BAT (Sheet 2 of 2)

- 16 Ensure deliveries to silos from road vehicles are only made using tankers with an on-board (truck mounted) relief valve and filtration system.
- 17 During the period of upgrading, take particular care to avoid pressurisation of silos when venting air through the silo at the end of the delivery, if deliveries are accepted from tankers without on board relief valve and filtration systems.
- 18 Take care to avoid delivering materials to silos at a rate which is likely to result in pressurisation of the silo. Particular care is required towards the end of the delivery when the quantity of material entering the ducting is reduced and hence the air flow is increased.
- For new silos
- 19 Fit all new silos with an automatic system to cut off delivery in the event of pressurisation or overfilling.
- 20 New silos should be designed to operate to an emission standard of 10mg/m³

Table 11: Frequency of visual inspection

Filters	Frequency of visual inspection
Fitted with reverse jets	At least once a month
Fitted with mechanical shakers	At least once a week
Requiring manual shaking	Daily inspection or prior to any delivery being made if deliveries are not daily

Recovered fuel oil deliveries and storage

- 3.26 Recovered fuel oil is delivered by road tanker to bunded oil tanks.
- 3.27 The permit must state what categories of waste oil (ie RFO etc)(using the six-digit codes) from the European Waste Catalogue are permitted to be burnt [Ref 14](#).
- 3.28 RFO might be designed to meet customer specified limits for chlorine and sulphur, particularly where that enables the emission limit values to be met confidently. Where this mixing of RFO and other oils occurs offsite, the product is considered to be RFO and the Annexe II mixing rule does not apply. 'Designed' oil is considered to be RFO.
- 3.29 The chlorine content of waste and recovered fuel oil deliveries can vary suddenly and substantially. Quality assurance and tightly specified contracts are important controls on the chlorine content of the RFO. Continuous monitoring of the hydrogen chloride emissions also provides a continuous check on the quality of the oil delivered and the extent of the abatement achieved. Sampling and testing by the operator must be carried out, 3 month intervals should be appropriate.
- 3.30 Suitable methods for the analysis of oil include
- Pentachlorophenol (PCP):- Alkaline extraction then back extraction to solvent, followed by gas chromatography.
 - PCBs:- EN 12766-1:2001 Separation by GC ECD (also numbered as BS 2000: 462 : 2001 and IP 462/2001)
- ASTM D4059 Polychlorinated Biphenyls in Insulating Liquids by Gas Chromatography
 - Metals Sb, As, Pb, Cr, Co,Cu, Mn, Ni, and V; Hg, Cd, Tl:
- IP 501/2001 - Al, Si, V, Ni, Fe, Na, Ca, Zn and P in residual fuel oil ICPES (Inductively coupled plasma emission spectroscopy) The method is extended for the other metals

- Chlorine: - IP 510 Organic halogens (also numbered as EN 14077)
- Fluorine: - ASTM D3761 Total Fluorine by the Oxygen Bomb Combustion/Ion Selective Electrode Method
- Sulphur: - ASTM 5453 Total Sulfur in Light Hydrocarbons, Motor Fuels and Oils by Ultraviolet Fluorescence

Environmental impact

Water: Spillage

Land: Spillage

Air: not significant

Waste: Not significant

Energy: Not significant

Accidents: fire fighting water and spillage would be significant

Noise: not significant

BAT	
21	The mass of every load of recovered fuel oil delivered must be recorded.
22	Pentachlorophenol, PCBs, metals (Sb, As, Pb, Cr, Co,Cu, Mn, Ni, and V; Hg, Cd, Tl) sulphur, chlorine, fluorine must be sampled and tested by the operator.

Stone etc deliveries and storage

Aggregate storage (non-mobile plant)

- 3.31 The BAT conditions should only be applied where emissions to the external environment are likely to arise.
- 3.32 In areas where aggregate is being offloaded appropriate dust control measures may include the following:
 - enclosure fitted with extract ventilation to arrestment plant
 - enclosure fitted with water sprinklers

Stockpiles and ground storage

- 3.33 Consideration should be given to the siting of stockpiles, based upon such factors as the prevailing winds, sheltered positions, proximity of neighbours and site operations. A method of stockpiling should be employed which minimises dust emissions, e.g. profiling. Minimisation of drop height is very important in stockpiling to reduce wind whipping of particulates. Loading to and from stockpiles should be carried out in such a manner as to minimise wind-borne dust e.g. taking place at sheltered points.
- 3.34 When necessary to control dust emissions from stockpiles, methods such as limiting the height of stockpiles or using dust suppressants may be used. Other possible controls include wind breaks on stock piles, bunding or fencing around the pile and strategic arrangement of stockpiles. Periodic conditioning with water, according to weather conditions, may be an appropriate measure. Installation of fixed water sprays should be considered for long term stocking areas if appropriate.

Conveying

- 3.35 There are various ways of keeping conveyor belts and the surrounding areas clean. For example, where chevron belts are used, catch plates may be fitted to contain dust falling from the underside of the belt at the turning point. From a health and safety perspective this is not always possible and hoses and sprinklers is a possible alternative. New conveyors can be designed to minimise free fall at discharge points. A chute, or similar equipment, at the point of discharge from a conveyor reduces dust arising. Arrestment plant might be a suitable control option if dusty emissions arise from conveyor transfer points. The conditions relating to conveyors should not be applied where material has been screened to remove particles under 3 mm in size, unless visible dust emissions have been observed from the conveyors.

- 3.36 In areas where aggregate is being offloaded appropriate dust control measures may include the following:
- enclosure fitted with extract ventilation to arrestment plant
 - enclosure fitted with water sprinklers

Mobile plant

- 3.37 Mobile roadstone coating operations are operations of a transient contract nature carried on away from a normal operation - for example, at motorways or airfields. They usually operate for less than 3 years, although, in accordance with the definition of “mobile plant” in section 1(6) of the 1990 Act, the period of operation in one place is not a factor in determining whether a particular plant is mobile. The definition of mobile plant under PPC does not differ from the 1990 Act.

Environmental impact

Water: Not significant

Land: Not significant

Air: Particulate matter from delivery and storage

Waste: Not significant

Energy: Not significant

Accidents: Not significant

Noise: Tipping can be briefly noisy

BAT (Sheet 1 of 2)

For new processes, where the plant is at a quarry:

- 23 plant should be fed with stone directly by conveyor from storage hoppers, bays or covered stores, except for material imported onto site which may be fed from refeed hoppers.

For existing processes where plant is at a quarry;

- 24 storage of stone should comply with BAT 28 and all feed hoppers should be located within a structure consisting of at least 3 walls and a roof.

For a plant that is not situated at a quarry and that has a permit in its own right (for example, satellite depots and plant at sand and gravel pits) the provisions of BAT 25, 26, 28, and 29 should apply.

For new plant supplied mainly by road:

- 25 the day to day stocks of materials, except sand or washed product, should be held in storage bays within a structure consisting of at least three walls and a roof, and of sufficient capacity to enable normal daily requirements to be met without recourse to the use of externally stored material. Stocks in excess of this requirement may be stored in the open so as to comply with the requirements of BAT 28 and 29. All feed hoppers should be located within a structure consisting of at least three walls and a roof.

For existing plant, and for new plant supplied mainly by rail or ship:

- 26 storage of stone should comply with BAT 28 and all feed hoppers should be located within a structure consisting of at least 3 walls and a roof.

- 27 For storage in the open, as limited by previous BAT in this box:

- 28 No material should be stored in the open except for:
- (a) material that has been screened to remove material 3 mm and under;
 - (b) sand;
 - (c) scalpings;
 - (d) material used for road sub-bases (commonly known as "MOT material") that has been conditioned before deposition;
 - (e) crusher run material or blended material that has been conditioned before deposition;
 - (f) material under 3 mm that is in excess of the internal storage capacity (the internal storage capacity should be approved by the local enforcing authority). Where the only practicable option for the storage of material under 3 mm is external stockpiles, particularly careful consideration should be given to the measures discussed below.

For mobile operations:

- 29 Aggregate materials may be held in open stockpiles except for stockpiles of stone under 3 mm where normal day-to-day supplies should be held in storage bays, silos or hoppers.
- 30 Equipment for the crushing, grinding and screening of minerals should be fitted with dust extraction which is vented to air through arrestment plant.
- 31 Where dusty materials are conveyed, the conveyor (which might be a bucket elevator) and any transfer points should be enclosed to such an extent as to minimise the generation of airborne dust.
- 32 Where dried materials are handled, transfer points should be ducted to arrestment plant.
- 33 Conveyors should be fitted with effective means for keeping the return belt clean and for collecting materials removed by this cleaning operation. For example, belt scrapers fitted at all head drum returns and catch plates fitted to contain falling dust.
- 34 Conveyor belts should not be overloaded.
- 35 Where the free fall of material gives rise to external dust emissions, techniques should be used at the point of discharge to minimise this, for example the use of a chute or similar equipment
- 36 Where dust emissions from conveyors are visible, dust suppression equipment should be used or the plant should be vented to suitable arrestment equipment, as agreed with the regulator.
- 37 Planned preventative maintenance schedules should include conveyor systems.

Bitumen deliveries and storage

- 3.38 Emissions of bitumen fume from deliveries can be reduced by fitting ground based pumps. It is considered that such pumps should only be required in cases where there is an existing or reasonably anticipated odour problem arising from such deliveries. Where lorry based compressors are used to discharge the delivery, emissions of odour and fume can be reduced; one procedure which can be used in some cases, when clearing hose and lines, is to use two short bursts of air rather than one long one. The procedure to be used should be agreed by the regulator.
- 3.39 In order to minimise emissions of fume and the associated odour, all bitumen and tar should be stored and handled within the appropriate temperature range for its grade. See [Appendix 2 Recommended bitumen* handling and storage temperatures](#).

Environmental impact

Water: Not significant

Land: Not significant

Air: Odour, bitumen fume

Waste: Not significant

Energy: Not significant

Accidents: Not significant

Noise: Delivery air compressors can be noisy

BAT

- 38 The temperature gauge on all hot binder storage tanks should be displayed. A high temperature trip device, to prevent the binder overheating, should be operational at all times.
- 39 Where practicable in relation to the viscosity and temperature of material being handled, bulk bitumen and tar storage tanks should be fitted with a high-level alarm or volume indicator to warn of overfilling. Where the fitting of such devices is not practicable, procedures to prevent overfilling should be agreed with the regulator.

Continuous plant including drying, hot stone storage, mixing, hot product storage

- 3.40 The permit must specify the maximum capacity of the plant to burn recovered fuel oil in tonnes per hour. (Assume 100% recovered fuel oil as fuel and maximum throughput of roadstone in an hour)
- 3.41 Aggregate is conveyed from the cold feed hoppers in metered proportions depending upon the mix required. It is transported to the intake of the rotary drum dryer perhaps 5 diameters long. This is a steel cylinder placed on a slight inclination, with flights placed on the inside. As the drum rotates, the flights lift the material and let it fall down through the hot air stream in the drum. For the heating and drying process a gas or oil fired burner is positioned at the bottom end of the drum. The gas flow direction is usually opposite to the flow of the aggregate material. Water vapour and exhaust air are extracted from the cold end of the drum to particulate arrestment plant, which is usually a bag filter house. The dust collected is fed back into the mixing process or goes to a separate silo.
- 3.42 The dryers vary but the burners may have a turn down ratio of perhaps 10:1 Start up and shut down are on gas oil. The criteria for the change to burning recovered fuel oil are that the oil heating system is thoroughly warmed through and the oil temperature has reached a temperature of between 50°C and 60°C depending on oil viscosity. Start-up includes the loading of the first load of stone into the dryer, and continues until sufficient dust is present in the abatement system to give satisfactory abatement of pollutants. Similarly for the restart after idling.

- 3.43 The hot aggregates (135 - 180 °C) drop into a bucket elevator and are lifted to the top of the mixing tower. They are transferred onto vibrating screens and separated into different nominal sizes in individual hot storage bins.
- 3.44 The required grade of aggregate is dropped to a weigh hopper then into a pug mill (mixer) where it is coated with bitumen which is pumped from a heated storage tank, weighed and injected into the mixer. Mixing times vary between 25 - 90 seconds depending on plant and mix type. The finished asphalt mix is then transferred directly to a waiting truck for immediate delivery to the site or by a conveyor to heated asphalt storage silos.
- 3.45 When recycling materials, the process is modified slightly to account for the reclaimed materials such as:
 - recycled aggregate product
 - glassphalt
- 3.46 Emissions from the process operations covered by this note comprise fine particulate matter, in the form of dust, the products of combustion and odour. The control of dust emissions from these processes is mainly by the use of enclosures and extraction to particulate arrestment plant. Internal transport of dusty materials should be carried out so as to prevent or minimise airborne dust emissions, as this then reduces the potential for fugitive emissions.
- 3.47 Drum mix plants are less flexible in changing mixes; there are only a few drum mix processes left in the UK. In drum mix plants, both heating and drying of aggregates and the mixing with filler and bitumen takes place in the drum, i.e. no pug mill is involved. Proportional feed controls are used to ensure the correct mix is delivered to the drum. The aggregate is fed into the revolving drum and heated and dried by the burner gases. About midway along the drum, filler and liquid bitumen are injected where they mix with and coat the dried aggregates. From the drum, the finished asphalt is discharged to a conveyor and carried to heated storage bins.

Environmental impact

Water: Not significant unless wet gas treatment

Land: Not significant

Air: Particulate matter in delivery air emitted

Waste: Not significant

Energy: Not significant

Accidents: Flame instability,

Noise: Burners and loading are noisy

BAT	
	The operators should
40	All hot storage bins should have level indication and any overflow chutes should have dust arrestment facilities fed into the main dust arrestment system.
41	Plant should be designed and operated so that emission of dust during the discharge of surplus dried stone or filler is minimised.

Batch plants incl drying, mixing and delivery

- 3.48 The permit must specify the maximum capacity of the plant to burn recovered fuel oil in tonnes per hour. (Assume 100% recovered fuel oil as fuel and maximum throughput of roadstone in an hour.
- 3.49 Non-continuous batch mix plants are designed to accommodate frequent product changes by drying a carefully proportioned mix of aggregates in cycles. The gain in flexibility is compromised by a reduced overall output capacity, which limits the ability to cope with peak demand periods.

- 3.50 Aggregate is conveyed from the cold feed hoppers in precise proportions depending upon the mix required. It is transported to a holding hopper then despatched to the intake of the rotary drum dryer around 1 diameter long. This is a steel cylinder, with flights placed on the inside. As the drum rotates, the flights lift the material and let it fall down through the hot air stream in the drum. For the heating and drying process a gas or oil fired burner is positioned at one end of the drum. Water vapour and exhaust air are extracted from the drum to particulate arrestment plant, which is usually a bag filter house. The dust collected is fed back into the mixing process or goes to a separate silo.
- 3.51 Start up and shut down are on gas oil.
- Most batch heater plants operate with a continuous pilot burner running on gas oil which ignites the main flame. After ignition, the main flame may take perhaps a minute to stabilise at 10% of maximum heat output. It is then increased to a predetermined setting where it fires until the aggregate batch has reached the desired temperature.
- The criteria for the main burner to operate on RFO is that the oil heating system is thoroughly warmed through and the oil temperature has reached at temperature of between 50°C and 60°C depending oil viscosity.
- 3.52 The drying cycle can take up to 3 minutes, and the hot aggregates (135 - 180 °C) drop directly into the mixer (typically of 3 - 4 tonnes capacity) where they are coated with bitumen that is pumped from a heated storage tank, weighed and discharged into the mixer. Reclaimed or imported filler is also introduced from a weigh hopper fed by pneumatic or screw conveyor from the storage silos. Mixing times may vary between 25 - 90 seconds depending on plant and mix type.
- 3.53 During periods of inactivity the burner will operate at low flame or shut down completely. As there is less dust in the abatement system, abatement efficiency of other pollutants drops, and so gas oil should be burnt during tickover with no stone. This is not intended to apply to the short intervals between loads when the plant is running at capacity.
- 3.54 The finished asphalt mix is then transferred directly to a waiting truck for immediate delivery to the customer, or by a conveyor or travelling skip to heated or insulated asphalt storage bins prior to discharge into vehicles.

Environmental impact

Water: Not significant unless wet gas treatment or spraying of stockpiles

Land: Not significant

Air: products of combustion inc metals, dioxin, carbon monoxide, nitrogen oxide, odour

Waste: Not significant

Energy: Significant

Accidents: Flame instability

Noise: Burners and loading are noisy

BAT	
	The operators should
42	Burn gas oil during standby, not recovered fuel oil

Sand and mineral drying plants that are not part of roadstone coating plant

Sand drying	<p>3.55 The permit must specify the maximum capacity of the plant to burn recovered fuel oil in tonnes per hour. (Assume 100% recovered fuel oil as fuel and maximum throughput of mineral in an hour.</p> <p>3.56 When sand is quarried it typically has a moisture content of about 6%. Sand is used in large quantities by the construction industry, in foundries, by the glass industry and in water filtration and sewage treatment works. The major uses require different qualities - for example, in the foundry industry the grade of sand used is critical, in the glass industry its chemistry is critical. Sand is fed into a dryer where it is dried according to the customer requirement. It is then cooled, screened and conveyed via a totally enclosed system to silo storage.</p>
Fluid bed dryers	<p>3.57 Fluid beds are generally used where throughput is 50 - 100 tonnes of sand per hour. Fluid beds utilise air in generating a fluid bed. The fluid bed ensures a good transfer of heat from the air to the sand, so exhaust temperatures are typically quite low at around 48 °C. They are designed with a large expansion chamber and the dust presented to the arrestment plant is a fine fraction. In order to keep the temperature of the emissions above the dew point of around 50 - 60 °C it is often necessary to trace heat the arrestment plant.</p>
Rotary dryers	<p>3.58 Rotary dryers tend to be older units and use about 40% more energy than fluid beds, although there are wide variations due to differences in type of fuel, moisture content of feed, discharge temperature etc. Below around 30 tonnes per hour rotary dryers tend to be cheaper than fluid beds. They are used for throughputs of 30 - 50 tonnes of sand per hour.</p>
Mineral drying other than sand	<p>3.59 As a result of their porous structure other minerals can have a moisture content up to 30%. Such minerals are dried for use in a range of industries, including construction, refractory, ceramic and metallurgical industries. Some operators carry out mineral drying processes as “jobbers” or “toll manufacturers”. This means that they do not consistently dry one type of material but work to customer demand.</p> <p>3.60 Such operations may involve frequent changes in the material being dried, and the quantity of any material to be dried will vary. Occasionally materials are brought in for drying that are significantly different to materials that have previously been dried on site eg. “distressed cargo”. It is not always clear whether the arrestment plant will be capable of meeting the emission limits/provisions when such unusual materials are being processed. In such instances it is expected that the operator would carry out a preliminary evaluation by drying a small quantity of material to determine that the plant is capable of meeting the provisions. If the provisions are not met then further material of this type should not be dried using this plant.</p>
Arrestment plant	<p>3.61 Cyclones, wet scrubbers and bag filters can be used to abate emissions of particulate matter to air. The industry predominantly currently uses cyclones and wet scrubbers to achieve their emission limit of 100 mg/m³. The cyclone separates out the coarser dust fraction and the wet arrestor separates out the finer fraction. Such plant is usually considered BAT for processes drying minerals with a high moisture content.</p>
Potential environmental impact	<p>Water: Not significant unless wet gas treatment or spraying of stockpiles</p> <p>Land: Not significant</p> <p>Air: products of combustion inc metals, dioxin, carbon monoxide, nitrogen oxide, odour, particulate matter</p> <p>Waste: Not significant</p> <p>Energy: Significant</p> <p>Accidents: Flame instability</p> <p>Noise: Burners and loading are noisy</p>

Vegetable matter drying

Vegetable matter drying - Processes

- 3.62 The vegetable matter drying sector is very diverse and there are a number of other guidance notes which refer to processes which may be carried out in conjunction with an vegetable matter drying process. There are separate Guidance Notes for processes involving the production of meat meal (PG6/1) and fish meal (PG6/19), pet food manufacture (PG6/24), animal feed compounding (PG6/26) and also for processes involving the drying of residues from the extraction of edible oils (PG6/25)
- 3.63 This section refers to processes for drying vegetable matter by the application of heat principally for the purpose of animal feed production. There are in principle three main types of raw material:-
- material arising from other food production processes, such as malt and grain distilleries, sugar beet, starch extraction, bakery residues and cider/brewery residues,
 - material which is dried as a pre-treatment step before use in animal feed or food manufacturing operations such as ground nut residue
 - drying of green crops such as alfalfa and grass.
- 3.64 In the context of this note, “process” or “activity” comprises the whole process from receipt of raw materials via production of intermediates to dispatch of finished products, including the treating, handling and storage of all materials and wastes relating to the process.
- 3.65 Guidance for silos at vegetable matter drying plants is at paragraphs [3.13](#) to [3.24](#).
- 3.66 In the case of grain distillery residues, they may be screened and centrifuged, the centrifugate is then evaporated to a syrup and the centrifuge cake further dewatered by screw pressing. The combined syrup and press cake are then dried either directly or indirectly prior to cyclone separation and pelletising: Malt distillery residues differ in that the spent grains (or draff) are separated after mashing and are screw pressed to reduce the moisture content. The expressate and pot ale are evaporated to a syrup and combined with the press cake for final drying, cyclone separation and pelletising: In some circumstances the wet cereal residues may be removed from the production site and processed elsewhere. Often in these cases, pot ale or centrifuged spent wash may be evaporated to a syrup. This latter process (i.e. the evaporation of centrifuged spent wash or pot ale) generally leads to emissions into the air which are trivial and would not normally be taken to be a prescribed process under Part B (see Regulation 4 of SI 472/1991). However if they burn recovered fuel oil then they are subject to the Waste Incineration Directive and the WID limits and other provisions in this guidance must be applied.
- 3.67 In the case of sugar beet drying, the beet co-product from the diffusion process is dried together with molasses in a direct fired rotary kiln dryer. Dust is separated by cyclone and added back to the product prior to pelletisation. The green crop drying process is similar except a hammer mill is often used for particle size reduction. The products may be sold directly for use as animal feed or sold to animal feed compounders for blending or may be blended on-site.
- 3.68 There is separate guidance for animal feed production from edible oil extraction processes (PG6/25) and for animal feed compounding processes (PG6/26) but where they burn recovered fuel oil the WID emission limits in this note must apply and the other provisions should apply. The Part B notes should be of use for the process description and for the process emission limit values.
- 3.69 The drying of materials arising from certain food manufacturing processes such as sugar beet and starch processing is likely to be a process involving the processing of vegetable matter resulting in the production of more than 300 tonnes per day of product and hence would fall to national regulatory IPPC control ie Part A1.

WID over-rules previous agricultural exemptions

- 3.70 There are a number of drying processes undertaken by agricultural concerns receiving grain, pulses and seed. In these cases the moisture content is generally low compared to the other drying operations outlined above. The following processes were expressly designated an exempt process under both section 6.9 Part B of Schedule 1 to the Environmental Protection (Prescribed Processes and Substances) Regulations 1991, SI 472 (as amended) and under section 6.8 Part B of Schedule 1 of the Pollution Prevention and Control (England and Wales) Regulations 2000 SI 1973:-
- any process for cleaning, and any related process for drying or dressing, seeds, bulbs, corms or tubers
 - the drying of grain or pulses.
 - However if they burn recovered fuel oil then they are subject to the Waste Incineration Directive and the WID limits and other provisions in this guidance must be applied
- 3.71 The process may also involve the proportioning and blending of raw materials, grinding, mixing and the addition of liquids such as fats and molasses and may be sold as a meal or pellet.

Vegetable matter drying - controls

- 3.72 Vegetable matter drying is carried out under carefully controlled process conditions within enclosed atmospheric dryers. The adoption of effective materials handling and spillage prevention practices and good engineering practice in dryer design (such as recirculation of waste gases) can greatly reduce the volumes of air necessary for odour containment by avoiding uncontrolled odour release. The selection of the most effective control system may be affected by the presence of large quantities of particulate matter and moisture in the waste gases.
- 3.73 The following are examples of relevant odour control techniques:
- the potential for process change to minimise odour release should be reviewed for example by avoiding drying operations completely, changing operating temperature or change of dryer design (for example by steam drying)
 - good housekeeping and raw material handling practices
 - containment of odours within process equipment by maintaining material handling and storage facilities such that they are leakproof and spillproof as far as possible
 - control and minimisation of odours from residual materials, effluent and waste
 - containment of strong odour sources and treatment in odour control equipment
 - it is possible to reduce odorous emissions by careful process optimisation - for example dryer design, moisture content, processing temperature and raw material and additive characteristics will have a significant impact on odour.

**Vegetable matter drying
Summary of best
available techniques**

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

Table 12: Summary of control techniques for vegetable matter drying

Release source	Substance	Control techniques
Raw material, effluent and waste storage	Odour	Within enclosed silos, tanks, containers or stores under negative pressure and vented to odour arrestment plant Spillage management including tank level management
Loading and unloading processes	Odour	Backventing of storage tanks as necessary Spillage management
Drying and cooling processes	Odour	Within process equipment under negative pressure and vented to odour arrestment plant as necessary Gas recirculation Condensing moisture depending upon effluent disposal issues Appropriate construction
Ventilated air	Odour	Vent to suitable arrestment plant <ul style="list-style-type: none"> • preliminary condensers • biofilters • thermal oxidisers/combustion plant • scrubbers • located to take account of sensitive receptors
Waste gas from dryer and odour arrestment plant	Odour	dispersion of any residual odorous releases
Waste gas from dryer and odour arrestment plant	Sulphur oxides	Abatement by the process itself, Limit sulphur in fuel
Waste gas from dryer odour arrestment plant	Carbon monoxide	Good combustion
Waste gas from dryer odour arrestment plant	Nitrogen oxides	Good combustion
Raw material and product storage	Particulate matter	Potentially dusty materials should be stored in buildings or appropriate containers
Silos	Particulate matter	Process control on delivery to silos Dust arrestment <ul style="list-style-type: none"> • bag filters • cartridge filters
Dryer and cooling processes	Particulate matter	Process control In-line solid material recovery from waste gases <ul style="list-style-type: none"> • cyclones • scrubbers
Pelletising and grinding processes	Particulate matter	Process control Spillage management Dust arrestment <ul style="list-style-type: none"> • bag filters • cartridge filters • cyclones/wet arrestors

- 3.75 Where the processing of raw materials or the packing of dried vegetable matter into bags necessitates the installation of local exhaust ventilation, suitable arrestment plant, for example bag filters, should be installed to minimise emissions of dust.
- 3.76 The on - site transfer of raw materials to the processing plant should be undertaken in a manner to prevent spillage and minimise disturbance of material. The material transfer method should be suitable for the raw materials handled and the final use of the material, for example, small-scale and infrequent material handling may be by containers or bins, and in other cases slurries should be pumped and finely divided materials moved by gravity; screw auger or pneumatic means.
- 3.77 A high standard of housekeeping should be maintained. A regular programme of cleaning should be instigated and this should also address external horizontal surfaces and ledges, for example, gutters and roofs, as well as roads and internal surfaces. External surfaces and ledges should normally be cleared at least once a year; roads and internal surfaces will often require more frequent cleaning. Cleaning operations should be carried out by methods which minimise emissions of particulate matter to the air, for example by vacuum cleaning, wet cleaning or other appropriate methods.

Potential environmental impact

Water: Not significant unless wet gas treatment or spraying of stockpiles

Land: Not significant

Air: odour, particulate matter, products of combustion inc metals, dioxin, carbon monoxide, nitrogen oxide,

Waste: Not significant

Energy: Significant

Accidents: Flame instability

Noise: Burners are noisy

BAT	
43	Roadways and other areas where there is regular movement of vehicles should be hard surfaced, and kept clean, in order to minimise the emission of airborne dust.

Emissions control

Point source emissions to air

- 3.78 The nature and source of the emissions to air expected from each activity are given in previous sections. In general they comprise:
- 3.79 **Particulate matter** potentially arises from all parts of the process where dried mineral aggregates or dried vegetable materials are handled.
 - drying and heating drum. The amount of dust arising from the sand and stone in the drum is determined by the operating conditions and the quality of the aggregates.
 - filling of the silos
 - vegetable matter product coolers and grinders

- 3.80 The following parts of the process may give rise to other pollutants:
- **Sulphur dioxide** from the burners, influenced by the sulphur content of the fuel. Some of the SO₂ is absorbed by the mineral aggregate and the alkaline dust layer in the dust filter.
 - **Oxides of nitrogen** are emitted from the drum. The emission depends on the nitrogen content of the fuel, the amount of excess air, the flame temperature and the burner type.
 - **Carbon monoxide** is emitted from the combustion process.
 - **Hydrocarbon emissions** arise from incomplete combustion of the fuels being used and also from the use of organic constituents in the production process, especially bitumen. Release agents (e.g. gas oil) may also be a source of organic emission if they come into contact with hot surfaces.
 - **Metals and their compounds** arise from the combustion of recovered fuel oil.
 - **Dioxins** arise from the combustion of recovered fuel oil.
- 3.81 The following parts of the roadstone process may give rise to **bitumen fumes**:
- bitumen tanks, especially during loading
 - the batch mixer or drum mixer
 - the skip into which the mixer contents are emptied
 - the loading station of the asphalt lorries
 - heating of reclaimed asphalt
 - where RAP (reclaimed asphalt pavement) is added “cold” into the batch mixer (stack emission)
- 3.82 **Odour** may arise from the following roadstone and mineral drying processes:
- bitumen fumes
 - poor combustion of recovered fuel oil
 - reclaimed asphalt when heated - more so if it contains tar products and especially at high moisture content
 - some additives may emit perceptible odours
- 3.83 **Odour** may arise from the following vegetable matter drying processes:
- raw material reception, storage and handling
 - from the physical process operations (grinding etc.)
 - from the application of heat during the drying process
 - from the cooling process
 - from the storage, handling and transport of the product during processing
 - from the storage and discharge of liquid waste and effluent from the odour arrestment plant
 - from the odour arrestment plant discharge (this may be a stack or vent or may be a biofilter with an area source at ground level).

Dispersion and dilution of stack emissions

- 3.84 The basis upon which stack heights are calculated using HMIP Technical Guidance Note D1 (D1) (Ref 4) 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 impeding 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.

Where an emission consists purely of air and particulate matter, (i.e. no products of combustion or any other gaseous pollutants are emitted) 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 PM10, then this may have to be reviewed.

- 3.85 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
- 3.86 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.
- occasional cleaning of flues and ductwork may be necessary but any build-up of dusts is likely to be indicative of the need to address inadequate airflow
 - 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:

- 44 Should ensure that all operations which generate emissions to air are contained and adequately extracted to suitable abatement plant, where this is necessary to meet specified emission limits.
- 45 Should 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.

BAT

The operator:

- 46 Should 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.
- 47 Must ensure that stack heights are sufficient to ensure adequate dispersion under normal conditions.
- 48 Should ensure that the minimum stack height is 3 metres above roof ridge height of any building within a distance of 5 times the uncorrected stack height and in no circumstances should it be less than 8 metres above ground level.
- 49 Should 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.
- 50 Should discharge exhaust gases through a stack or vent to achieve an exit velocity which is normally greater than 15 m/sec during normal operating conditions to achieve adequate dispersion. A lower velocity may be acceptable provided it achieves adequate dispersion and dilution (See paragraph [3.84](#)).
- 51 Should investigate the cause and nature of any persistent visible emissions and provide a report to the regulator.
- 52 Should ensure that emissions of water vapour are free from droplet fallout.
- 53 Should ensure that liquid entrainment in the duct of wet abatement, leading to droplet fallout, does not occur as a result of the linear flow rate within the duct exceeding 9 m/s.
- 54 Should 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.

Point source emissions to surface water and sewer

- 3.87 Emission limit values must be applied to emissions from wet abatement plant. For details, see Defra's WID guide [Ref 14](#)
- 3.88 The nature and source of the emissions expected from each activity is given in previous sections. In general, wastewater can arise from storm water, from cooling water, from accidental emissions of raw materials, products or waste materials and from fire-fighting. In addition to the techniques below, guidance on cost-effective effluent treatment techniques can be found in ETBPP/Envirowise Guides ([Ref 3](#)).
- 3.89 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 pretreated 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
- 3.90 The nature of the receiving water should be taken into account, with regard to any pollutant released to this media. Irrespective of the receiving water, the adequacy of the plant to minimise emissions must be considered. Guidance on treatment of persistent substances can be found in [Ref 3](#).

Local Authority Regulation

- 3.91 Regulation 13 of The Pollution Prevention and Control (England and Wales) Regulations 2000 states that:
- "(1) In the case of a Part A installation or Part A mobile plant in relation to which a local authority regulator exercises functions under these Regulations, the Environment Agency may, at any time, give notice to the local authority regulator specifying the emission limit values or conditions which it considers are appropriate in relation to preventing or reducing emissions into water."
 - "(3) Where a notice under paragraph (1) specifies conditions in relation to emissions into water from an installation or mobile plant, the permit authorising the operation of that installation or mobile plant, shall include those conditions or more onerous conditions dealing with the same matters as the local authority regulator considers to be appropriate."

BAT

55 No BAT specific to this section is given here.

Point source emissions to groundwater

Groundwater protection legislation

- 3.92 The Groundwater Regulations for the UK came into force on 1 April 1999. If List I or List II substances are discharged to groundwater or may be discharged to groundwater then the Environment Agency will provide advice as part of their statutory consultation duties. For further guidance see chapter 31 in the General Guidance Manual.
- 3.93 The application should state whether any substances are or may be discharged to groundwater.

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- 56 No emission from the Permitted Installation should give rise to the introduction into groundwater of any substance in List I (as defined in the Groundwater Regulations 1998 (S.I. 1998 No. 2746
- 57 No emission from within the Permitted Installation should give rise to the introduction into groundwater of any substance in List II (as defined in the Groundwater Regulations 1998 (S.I. 1998 No. 2746)) so as to cause pollution (as defined in the Groundwater Regulations 1998 (S.I. 1998 No. 2746)).
- 58 For substances other than those in List I or II (as defined in the Groundwater Regulations 1998 (SI 1998 No.2746)), the Operator should use BAT to prevent or where that is not practicable to reduce emissions to groundwater from the Permitted Installation provided always that the techniques used by the Operator shall be no less effective than those described in the Application.

Control of fugitive emissions to air

Roadstone and other mineral drying

- 3.94 Common sources of fugitive emissions are:
- 3.95 **Particulate matter** potentially arises from all parts of the process where dry mineral aggregates are handled and may arise as fugitive dust. The following parts of the process may give rise to fugitive particulate matter:
- tipping by lorries
 - transfer of dusty materials including discharge into hoppers and onto conveyors
 - conveyor belts, screens, scales, addition into the mixer
 - roadways if dry
- 3.96 The following parts of the roadstone coating process may give rise to **bitumen fumes**:
- the skip into which the mixer contents are emptied
 - the loading station of the asphalt lorries
 - heating of reclaimed asphalt
- 3.97 **Odour** may arise from the following parts of the roadstone coating process:
- bitumen fumes
 - some additives may emit perceptible odours

Vegetable matter drying

- 3.98 Common sources of fugitive emissions are:
- 3.99 **Particulate matter** potentially arises from all parts of the process where dry vegetable matter is handled and may arise as fugitive dust. The following parts of the process may give rise to fugitive particulate matter:
- discharge into hoppers and onto conveyors
 - delivery to storage silos and sheds.
 - material collected by bag filters may become re-entrained if it is not securely contained and carefully handled
- 3.100 **Odour** may arise from the following:
- dusts may also be odorous
 - vegetable matter drying

Techniques to control fugitive emissions

3.101 Fugitive dust emissions should be prevented whenever practicable. When this is not practicable emissions should be controlled at source by measures agreed between the regulator and the operator. Examples include correct storage of raw materials, organising the process in such a way that spillage is avoided, and maintaining high standards of internal and external housekeeping. Where water is used as a method of dust suppression, processes should have an adequate supply of water and all water suppression systems should have adequate frost protection. To make buildings as dust tight as necessary to prevent visible emissions, self-closing doors and close-fitting entries and exits for conveyors are among the options that may be used. Attention should be paid to preventing and cleaning up deposits of dust on external support structures and roofs, in order to minimise wind entrainment of deposited dust. If necessary, emissions should be controlled and abated using suitable arrestment equipment.

Loading, unloading and transport

3.102 Effective dust control measures are required for all vehicles arriving at or leaving the site where the load may give rise to dust in transportation, bearing in mind that emissions from moving vehicles may give rise to a significant problem. Such controls should not normally be required for the transportation of designated material which is above 75mm, as these materials are unlikely to give rise to dust emissions.

3.103 Sheeting is the usual technique required to prevent dust emissions from road vehicles. Where stone is loaded or unloaded, dust emissions should be minimised by water suppression or by local dust extraction.

3.104 Rail wagons that are either aerodynamically designed to prevent or virtually eliminate product blow off or “canopied” should be considered for use when transporting such products. Application of aqueous polymer dispersions can also provide adequate protection for such loads. Suppression using water has been found to be adequate for short journeys, normally of duration less than 1 hour.

A load that contains a significant amount of material less than 6mm is considered to have a much higher potential for dust emissions during transit than a load containing a minimal amount of this size fraction.

3.105 Where specific techniques are referred to below the regulator should agree an alternative method provided it is demonstrated to achieve an equivalent level of control.

3.106 Where plant is situated close to populated areas, and particularly when tar is used as a binder, it may be necessary to abate emissions of binder fume to prevent odour problems during delivery. The following options may be useful and should be considered in such circumstances:

- deliveries from road and rail vehicles, wherever practicable having regard to the availability of suitably equipped vehicles, may be pumped into bulk storage tanks and displaced air backvented to the delivery tanker. Alternatively
- fume arising from storage tank vents may be ducted to the drier burner provided it is in operation; this should combust any odour arising.

Mineral sites Roadways and transportation

3.107 In designing a new process, minimising vehicle movement in the site layout will enable better control of roadways with the potential for fugitive emissions.

3.108 Vehicle exhausts directed above the horizontal are preferred as these avoid the impact of the exhaust raising dust when travelling on internal roadways.

3.109 On some sites wheel-cleaning facilities may be useful to prevent dust being carried off the site. Where the plant is co-located with a quarry which has wheel wash and underbody wash facilities available, these might be used where necessary. If a plant is co-located with a quarry which does not have wheel-wash facilities, it may not be appropriate to install them. Vehicles may also be effectively cleaned, prior to leaving site, with a brush and hose. Sometimes the presence of a long access road ensures that any dust falls off the vehicles and does not reach the public highway. Hard surfacing for roadways should normally comprise compacted stone chippings between the loading points and the wheel wash (where present), and macadam or concrete for the final section of road leading to the public highway. Sweeping, wetting or sealing are all techniques that may be used to reduce dust emissions from roads. The technique that should be used depends upon the type of road under consideration.

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- 59 Operations should be controlled to minimise fugitive emissions.
- 60 All process buildings should be made as dust tight as is necessary to prevent visible emissions.
- 61 All process buildings should be cleaned regularly, according to a written maintenance programme, to minimise fugitive emissions.
- 62 All new buildings housing processing machinery should be externally clad with materials that can be readily cleaned.
- 63 Where local exhaust ventilation is used, emissions should be ducted to suitable arrestment plant.
- 64 Dusty wastes should be stored in closed containers and handled in a manner that avoids emissions of dust.
- 65 The method of collection of product or waste from dry arrestment plant should be such that dust emissions are minimised.
- 66 A high standard of housekeeping should be maintained.
- 67 All spillages which may give rise to dust emissions should be cleaned up promptly, normally by wet handling methods. Dry handling of dusty spillages should not be permitted other than in fully enclosed buildings. (N.B. Dry handling of dusty spillages within fully enclosed buildings may not be acceptable under COSHH.) In the event of a major spillage it should be dealt with on the same day that it occurs, and measures to minimise emissions, such as wetting the surface to create a crust, should be taken immediately.

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- 68 Where particulate matter emissions are abated using a wet scrubber, the scrubber should be regularly inspected and maintained. Action should be taken to deal with any blockages that occur due to accumulation of solids, for example adding flocculating agents to the liquor to settle the solids out.
- 69 Where road vehicles are used to transport potentially dusty materials, they should be sheeted or otherwise totally enclosed as soon as possible after loading and before leaving the site.
- 70 For short rail journeys (typically of duration less than 1 hour) or for rail wagons carrying mineral loads with a minimal content of particles below 6mm. Water suppression or better should be use to prevent emissions in transit
- 71 For longer rail journeys or where a higher proportion of fine material is being transported by rail. Either application of an aqueous polymer dispersion to the surface of the load should be used, or rail wagons used that are “canopied” or aerodynamically designed to prevent or virtually eliminate product blow off.
- 72 Where stone with the potential to give rise to dust emissions in transit is being delivered to the quarry, the above measures for road and rail vehicles should be complied with prior to the vehicle being admitted on site.
- 73 Loading and unloading of product for transport by road, rail or sea should be carried out so as to minimise the generation of airborne dust.
- 74 Tankers carrying dusty materials should discharge only into silos fitted with an effective dust collecting system.
- 75 Internal road transport of processed materials likely to generate dust should be carried out in closed tankers or sheeted vehicles, or the materials conditioned with water.
- 76 Roadways in normal use and any other area where there is regular movement of vehicles should have a hard surface capable of being cleaned or kept wet. They should be kept clean or wet, in order to prevent or minimise dust emissions. They should be adequately drained to avoid ponding of water. They should be kept in good repair. This provision only applies to roads inside a working quarry to the extent that they form part of the Part B installation. (Guidance on the meaning of “installation “can be found in Annex III of the “General Guidance Manual”)
- 77 Where necessary to prevent visible dust being carried off site, wheel-cleaning facilities should be provided and used by vehicles before leaving the site.

For vegetable matter drying

- 78 Adequate provision should be made for the containment of liquid and solid spillages.
- 79 All spillages should be cleared as soon as possible and in the case of solid materials this should be achieved by the use of vacuum cleaning, wet methods, or other appropriate techniques.
- 80 Dry sweeping of dusty spillages should not be permitted in circumstances where it may lead to the deposition of dust outside the site boundary.
- 81 All dusty, or potentially dusty materials should be stored in covered containers, sealed bags or purpose built silos or hoppers. The storage of dried products should be permitted inside processing buildings provided that adequate steps are taken to prevent entrainment of particulate matter outside the building, for example by the use of plastic strip curtains on building access points, screening, covering or dampening.
- 82 The bulk transfer of dry raw materials, other than delivery to site storage, should be by suitable mechanical handling systems - for example, screw feeder, gravity or pneumatic means.
- 83 All internal transport of dusty materials should be carried out to prevent, or where prevention is not practicable, minimise air borne dust emissions.
- 84 Where conveyors are used they should be of sufficient capacity to handle maximum loads. External conveyor discharges should be arranged to minimise free fall at all times.
- 85 External conveyors used for transport of dusty material should be fully enclosed, subject to technical feasibility, cost, and whether adequate protection against wind whipping can be provided by other means such as the fitting of side boards.
- 86 Where necessary, in order to minimise emissions of dust, extraction should be provided from transfer points to arrestment plant - for example, a bag filter.
- 87 Emissions from bulk storage vessels during offloading should either be vented to suitable arrestment plant, for example a bag filter for particulate matter, or backvented to the delivery tanker to minimise emissions of odour and dust.
- 88 Where raw materials are delivered to bulk storage by tipper lorries, the raw material acceptance area should be provided with protection against wind whipping of particulate matter (i.e. a covered, screened area) and local exhaust ventilation should be installed and emissions should be discharged through suitable arrestment plant-for example, a bag filter-to minimise dust emissions.
- 89 Where materials are removed from site in bulk vehicles, the loading area should be provided with protection against wind entrainment of particulate matter, for example carried out in a covered, screened area. The discharge of products into the vehicles should be carried out in order to minimise the generation of airborne dust, and fall heights from discharge pipes should be reduced. Where necessary, these areas should be fitted with local exhaust ventilation discharging through suitable arrestment plant, for example bag filters, to minimise emissions of dust.
- 90 All tanks for liquid material storage should be fitted with level indicators or high level alarms to warn of potential overfilling (it may be acceptable to rely upon regular dipping of the tanks associated with a documented material transfer protocol). All such tanks should be vented to odour arrestment plant where necessary to meet the odour boundary provisions of [Table 6](#).

Fugitive emissions to surface water, sewer and groundwater

- 3.110 Operations should be controlled so as to minimise fugitive emissions. A record of fugitive emissions should be submitted on a regular basis, and normally at least once a year.
- 3.111 WID has requirements about contaminated rainwater and firefighting water.
- 3.112 The Directive specifically states that storage capacity shall be provided for contaminated rainwater run-off from the site or for contaminated water arising from “spillage or fire fighting operations.”
- 3.113 In the context of this requirement, “contaminated rainwater” should also be taken to include all areas where there is reasonable risk of contamination by the installation. This would normally exclude roof water, access road drainage and office or other ancillary operations. Contamination of rainwater and spillages caused by the storage of feedstock wastes, chemicals, fuels and all residues should be avoided by storage under cover, on suitably impermeable surfaces with contained or controlled drainage. A risk assessment process should be used to determine the volume of storage that is required to contain fire water. At new sites it is likely that it will be possible for site drainage to be engineered such that complete containment is provided. This may include, for example, the use of bunding, or the routing of drainage to a holding tank or an on-site effluent treatment plant using an emergency valve. If more detail is needed see the Defra WID guide.
- 3.114 Fires involving recovered fuel oil are unlikely to be tackled using water, foam is the most likely approach.
- 3.115 Recovered fuel oil is usually held in bunded tanks and so contaminated rainwater will be limited in quantity.

BAT (Sheet 1 of 2)

- 91 With regard to **subsurface structure**, the operator should:
- establish and record the routing of all installation drains and subsurface pipework
 - identify all subsurface sumps and storage vessels
 - engineer systems to minimise leakages from pipes and ensure swift detection if they do occur, particularly where hazardous (i.e. listed) substances are involved
 - provide, in particular, secondary containment and/or leakage detection for such subsurface pipework, sumps and storage vessels
 - establish an inspection and maintenance programme for all subsurface structures, e.g. pressure tests, leak tests, material thickness checks or CCTV
- 92 For **surfacing**, the operator should:
- ensure that all operational areas are equipped with an impervious surface, spill containment kerbs, sealed construction joints, and connection to a sealed drainage system unless the operator justifies that this is not necessary to the satisfaction of the regulator.
 - keep records of the design and condition of the surfacing of all operational areas - relevant information may include, as appropriate, capacities, thicknesses, falls, material, permeability, strength/reinforcement, and resistance to chemical attack
 - have an inspection and maintenance programme of impervious surfaces and containment kerbs
 - justify where operational areas have not been equipped with:
 - an impervious surface
 - spill containment kerbs
 - sealed construction joints
 - connection to a sealed drainage system

- 93 The operator should ensure that all tanks containing liquids whose spillage could be harmful to the environment are contained. The operator should ensure that all bunds:
- are impermeable and resistant to the stored materials
 - have no outlet (that is, no drains or taps) and drain to a blind collection point
 - have pipework routed within bunded areas with no penetration of contained surfaces
 - are designed to catch leaks from tanks or fittings
 - have a capacity of at least 110% of the largest tank *
 - are visually inspected weekly and any contents pumped out or otherwise removed under manual control after checking for contamination

* A Code of Practice on the use and storage of solvents is currently being drawn up and will be published on the Defra website. www.defra.gov.uk/environment/water/ground/solvents/index Where the Code, when published, contains anything more stringent as regards bunding, account should be taken of it.

- where not frequently inspected, are fitted with a high-level probe and an alarm as appropriate
- have an annual maintenance inspection (normally visual but extending to water testing where structural integrity is in doubt)

94 All sumps should:

- be impermeable and resistant to stored materials
- be subject to regular visual inspection agreed with the regulator and any contents pumped out or otherwise removed after checking for contamination

95 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 to prevent overfilling
- have delivery connections located within a bunded area, fixed and locked when not in use
- have their integrity inspected, recorded and documented, particularly where corrosive substances are involved. These inspections should be included in the maintenance schedule

96 Storage areas and containers should be designed and operated to minimise the risk of fugitive releases to surface water, sewer and groundwater, in particular:

- storage areas should be located away from watercourses and should be protected against vandalism
- the maximum storage capacity of storage areas should be stated and not exceeded
- the maximum storage period for containers should be specified
- storage areas and silos should be inspected at least once a week to check for signs of leakage or potential leakage

Odour

- 3.116 Chapter 17 of the General Guidance Manual provides guidance on controlling odour from installations and the information required in an application.
- 3.117 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.
- 3.118 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.

Vegetable matter dryers VMD

- 3.119 Paragraphs [3.120 -3.146](#) all start “VMD” and apply only to vegetable matter drying installations, not to roadstone coating and minerals.
- 3.120 VMD - Subject to paragraph [3.121](#), it should be the aim that any location at or beyond the site boundary is free from offensive odour. This should be achieved by applying the process controls, management controls and arrestment provisions indicated in this note except for the provisions of paragraphs [3.31 -3.61](#) and their associated BAT boxes.
- 3.121 VMD - The locality of a process site will influence the assessment of the potential for odour impact. In cases where the site has a low odour impact due to its remoteness from sensitive receptors and the escape of offensive odour beyond the site boundary would be unlikely to cause harm, the provision in this note to arrest odorous emissions may not be necessary to demonstrate BAT. In these circumstances it is expected that the operations should be optimised to minimise odour emissions and also that effective process management is applied (as outlined in [Management](#)). Assessment of the potential for odour impact beyond the site boundary should take account of all predicted wind directions and weather conditions which are typical of the location in question.
- 3.122 VMD - In the case of existing processes where odour arrestment plant has been installed to meet the requirements of the previous guidance notes, the regulator should consider permitting the use of the existing plant until the end of its reasonable operational life provided that emissions from the plant meet the provisions of paragraph [3.120](#). The regulator should still require that the available plant is optimised for odour removal and should establish an odour arrestment efficiency based upon operating data. Where emissions from the odour arrestment plant do not meet the provisions of paragraph [3.120](#), the plant should be required to be upgraded to the specified efficiency in [Table 8](#).

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

- 3.123 VMD - It may be the case that operators can demonstrate that lower odour removal efficiencies than those in [Table 8](#) will meet the provisions of paragraph [3.120](#).

For existing plant, provided the operator can satisfactorily demonstrate that the operation of plant at lower odour removal efficiencies meets the provisions of [3.120](#) then these lower odour removal efficiencies should apply.

Where it can be demonstrated that the provisions of paragraph [3.120](#) are being met new/replacement plant may be operated at odour removal efficiencies lower than those in [Table 8](#). In such cases operators should determine, using dispersion modelling for example, what percentage efficiencies are necessary to meet the provisions of paragraph [3.120](#). New/replacement plant should, however, be designed to have the capacity to operate at the odour removal efficiencies specified in [Table 8](#) to ensure that the provisions of [3.120](#) are met should there be an increase in odorous emissions resulting from changes to the process, practical circumstances or local considerations.

Odours - principles of BAT in this note

- 3.124 VMD - The approach promulgated in this note to reflect BAT/BATNEEC includes:
- An emission standard for odour ([Table 8](#)) and a performance standard for odour arrestment plant ([Table 8](#))
 - Containment of odours.
 - Daily inspections of odour arrestment plant.
 - Indicative tests for odour arrestment plant ([3.210](#)) in the case of offensive odours being detected or complaints being received.
 - The preparation of an Odour Response Plan (see paragraph [3.145](#)) which will include an assessment of all emission sources, control methods, odour impacts, abnormal operations and measures to mitigate effects in the case of abnormal conditions.

Odorous emissions - general guidance

- 3.125 VMD - The following general guidance is provided to assist regulators in assessment of compliance with the odour condition in [Table 8](#).

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

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

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

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

- 3.126 VMD - The assessment as to whether an odour is offensive should be left to the perception of the regulator. The vegetable matter drying provisions of this note which detail BAT/BATNEEC should be sufficient to enable vegetable matter drying processes to operate without causing offensive odour beyond the process boundary (subject to the comments in paragraph [3.124](#)). Further guidance on assessment of odour can be found in "Odour Measurement and Control-An Update" published by National Environmental Technology Centre, Culham, Abingdon. Oxon OX14 3DB. ISBN 0-85624--8258. (Ref. h)
- 3.127 VMD - The presence of fugitive emissions and odours from building air should be greatly reduced where odours are effectively contained within the processing equipment. It is possible to reduce odours by careful process evaluation and by changing, for example, the raw material type, quality and the process configuration.
- 3.128 VMD - Operators are advised that careful consideration should be given to the impact of relatively minor process changes on odour releases from the process. It will be necessary to review the Odour Response Procedure detailed in [Appendix 6](#) to identify the potential effects of the proposed changes.

- 3.129 VMD - Whilst the odours will vary depending on the raw material type, quality and the process configuration, it is possible to divide the releases into high intensity and lower intensity odours. The presence of fugitive emissions and odours from building air should be greatly reduced where odours are effectively contained within the processing equipment and, if the process is well managed, it is often only necessary to arrest the higher intensity odours from the drying/cooling process. The following are the five main odour emission sources along with a preliminary categorisation of the typical odour intensity:-
- Fugitive emissions from dryer feed handling and storage. The feed to the dryer is often an integrated part of another process and fully enclosed. In other cases, providing that the raw materials are effectively managed (based upon raw material quality and storage conditions), these emissions should be lower intensity.
 - Fugitive emissions from leakage during transfer in process. These emissions will typically be contained within a building and provided the processing equipment is enclosed and maintained under a negative pressure, emissions from this source should be lower intensity.
 - Emissions from the dryer would be regarded as high intensity odours.
 - Emissions from the cooler would be regarded as high intensity odours.
 - Fugitive emissions from handling and storage of products, waste and effluent should be regarded as lower intensity odours.
- 3.130 VMD - Where the odour arrestment plant comprises a scrubber, emissions of materials which are added to the scrubber for improved performance (such as acids, hypochlorite, sodium hydroxide etc.) may be released with the plume if the scrubber and mist eliminator are not properly managed.
- 3.131 VMD - There will also be characteristic combustion releases from the fuel used in the dryer and also from the odour arrestment plant where a thermal oxidiser or other combustion plant is used. These will include:-
- metals, volatile organic compounds, chlorides and fluorides may also be emitted where the dryer fuel is derived from a waste (such as waste or recovered fuel oil).
- 3.132 VMD - emission limit values that comply with WID must be applied to odour arrestment plant burning recovered fuel oil.
- 3.133 VMD - Emissions from the process operations covered by this note comprise odours of mixed chemical species. The main principles for preventing odour emissions are;
- containment of the odours in the process equipment,
 - raw material handling operations (as detailed below); and
 - final treatment by arrestment of odour emissions.

Containment is achieved by ensuring that all operations with potential releases are carried out within enclosed equipment under a slight negative pressure and other fugitive odours are controlled by building extract ventilation.

- 3.134 VMD - Ventilation should be provided to maintain an adequate negative pressure within the process equipment (including tanks and vessels for holding condensate) to contain process releases within the equipment during process operation. The required ventilation rate will depend upon many factors (such as environmental conditions, raw material quality, effectiveness of process containment) but generally maintaining a negative pressure should be sufficient to prevent fugitive releases. The ventilation equipment should be vented to odour arrestment plant as necessary to meet the provisions of [Table 8](#).

- 3.135 VMD - Suitable odour arrestment plant should be provided and operated at all times where necessary, to meet the provisions for vegetable matter drying in this note (further information is available at Ref. h). Examples of the type of arrestment plant which are suitable include biofilters, high efficiency biological scrubbers, multi-stage chemical scrubbers, thermal incinerators and other forms of combustion plant. In the case of vegetable matter drying processes, adsorption equipment is not anticipated to offer adequate odour removal due to the types of chemical species in the odour and the risk of odour breakthrough and re-entrainment.
- The presence of significant moisture and also the nature of the particulate matter in the dryer exhaust gas is likely to mean that primary particulate matter arrestment will rely upon cyclones. In this case the presence of particulate matter may have an adverse effect on the operation of the odour arrestment plant and it is likely that additional particulate matter removal will be necessary using for example a scrubber before arrestment of the odour.
 - The process may produce emissions of differing odour intensity (building air and drying odours) and it may be more effective to separate the odour streams and divert to different odour arrestment plant (where it is necessary to control the lower intensity odours to meet the provisions of [Table 8](#)). High odour intensity emissions and those incondensable gases (such as cooking emissions) should be diverted to thermal oxidation/combustion or multi-stage scrubbers, whilst those of lesser odour intensity may be treated in a single stage scrubber or biofilter.
 - It may be appropriate to provide a number of smaller biofilters rather than one large bed to achieve more even gas flows throughout the filter. This will also provide standby facilities in case of breakdown or failure of one bed if the biofilter capacity is designed for this purpose.
 - The presence of water vapour in the emissions from drying and cooling processes can adversely effect the operation of the odour arrestment plant. The water vapour will significantly increase emission volumes and is likely to condense within odour arrestment plant and this can lead to corrosion of materials of construction. Also in the case of scrubbing equipment, the condensation of significant volumes of water vapour will result in continuous liquid overflow and dilution of the scrubbing liquor. Where scrubbing systems are used for odour control the emissions from cooking, drying and preliminary cooling operations should be condensed (for example by the use of a direct condenser such as a spray tower or quench scrubber or an indirect condenser) prior to odour treatment of the non-condensable gases. Pre-treatment of process gases by condensation should also be considered for thermal oxidation and combustion systems as the removal of condensable gases will reduce the odour load for treatment in the combustion system. There may be occasions when condensation of the water vapour could lead to the generation of an effluent stream which is difficult to treat before discharge. In this case it may be more appropriate to control the amount of condensation across the odour arrestment plant by careful temperature management in order to minimise condensation. The use of condensers should be carefully evaluated for all odour arrestment plant taking account of local circumstances.
- 3.136 VMD - Where odour arrestment plant is required it needs to be optimised to meet the odour destruction efficiency provisions of [Table 9](#). Depending upon the type of arrestment plant used, this optimisation will include the following:
- In the case of thermal oxidisers or combustion equipment the operating temperature of the system should be maintained above 1123K (850°C). In the case of boilers, care is needed in their use for odour arrestment as the operating temperature and residence time may not have been designed for odour arrestment and there is the potential for quenching in the boiler. In addition, a minimum firing rate for the boiler to ensure that the boiler conditions are always optimised for odour removal should be established. The measurement of odour arrestment efficiency of the boiler can be used to demonstrate the correct operating parameters of the boiler.
 - In the case of scrubbing equipment, it is likely that multi-stage scrubbing will be necessary to meet the odour destruction efficiency provisions of [Table 9](#). In order to optimise the performance of the scrubber, it is important to ensure that it is well designed (adequate gas/liquid contact), well maintained, that the odours are sufficiently reactive with the scrubbing liquor to remove the odour and also that the reaction products do not themselves produce a volatile odour. In addition, additives to the liquor need to be automatically dosed with control by pH/

Redox (over-dosing can lead to secondary odours from the scrubber associated with the chemical reagent). The scrubber will require regular inspection to identify possible blockage by salts which are typically formed when treating emissions from boiled green offal processes.

- Scrubbing equipment should be fitted with a mist eliminator.
 - If a bioscrubber is used, it is important to ensure that it is well designed (adequate gas/liquid contact), well maintained and that potential odours from scrubbing liquor are well managed. The scrubber will require regular inspection to identify possible blockage by biomass. In addition the pH of the liquor will need to be controlled as the microbial activity of the biomass will be adversely affected by high alkalinity (which is a potential problem with emissions from certain vegetable matter drying processes).
 - Biofiltration can be undertaken using packaged, enclosed biofilters or open biomass (such as peat/heather). If a peat and heather biofilter is used, it is essential to control the pH of the biomass as the microbial activity will be adversely affected by high alkalinity (which is a potential problem with the high levels of ammonia). In this case it may be necessary to pre-treat the emissions for example by water scrubbing (this will also have the beneficial effect of humidifying the air). In order to optimise the performance of the biofilter, the biomass must be maintained below 30°C, must be kept moist, must have a gas flow at all times and leakage through edges and fissures must be avoided. Biofilters will require regular treatment to overcome consolidation - this may be regular surface turning or deconsolidation by digging-out the bed.
 - The required residence time for the biofilters will depend upon many design conditions and will have to be sufficient to meet the provisions of [Table 8](#). However the recommended residence time for peat and heather filters is a minimum of 60 seconds for lower intensity odours.
- 3.137 VMD - The use of odour masking agents and counteractants should not be permitted (other than as a scrubber liquor additive).
- 3.138 VMD - Process operations should be carried out to minimise releases of odour
- 3.139 VMD - Where possible submersible pumps should be used to minimise the potential for odour escape.
- 3.140 VMD - Emissions of particulate matter from dryers, grinders, extruders, bagging equipment and coolers should be contained, extracted and arrested if necessary to meet the visible emission provisions or the limits described in [Table 8](#) for particulate matter. In the case of emissions which are both odorous and contain particulate matter, it may be necessary to treat the releases from the particulate matter arrestment plant to remove the odour before final dispersion of residual odour.
- 3.141 VMD - The methods of removal of collected particulate matter from arrestment plant should be undertaken carefully to avoid re-entrainment of dust. The discharge from particulate matter arrestment plant should be to screw auger, pneumatic transfer, enclosed containers or enclosed conveyors. The potential for blockage of the rotary valve, discharge point or hopper should be continuously monitored and alarmed (for example by the use of a rotation sensor on the rotary seal or a level indicator in the hopper). These indicative monitors should be fitted with an audible and/or visual alarm to activate when blockages occur.
- 3.142 VMD - The spray application of materials to finished products in vehicles solely for the purpose of providing a beneficial odour, should not be permitted in circumstances where it may lead to offensive odour beyond the process boundary
- 3.143 VMD - The effluent produced has the potential to generate a significant odour. All effluent should therefore be carefully handled and treatment should be carried out in a manner which will minimise the emission of offensive odours and will render any emission inoffensive and harmless.

- 3.144 VMD - All potentially odorous wastes should be stored within an enclosed storage area, tank or container whilst awaiting removal for either disposal or further processing.
- The storage area should be provided with extract ventilation to suitable arrestment plant where necessary to meet the provisions of [Table 8](#).
 - All waste should be removed as soon as the waste container is full and at least once per week. High odour intensity waste should be moved more frequently where necessary to ensure compliance with [Table 8](#).
- 3.145 VMD - The operator should prepare an Odour Response Procedure as outlined in [Appendix 6](#). This is a summary of the foreseeable situations which may compromise his/her ability to prevent and/or minimise odorous releases from the process and the actions to be taken to minimise the impact. It is intended to be used by operational staff on a day-to-day basis and should detail the person responsible for initiating the action.
- The Odour Response Procedure should include a list of essential spares for the odour arrestment plant. The equipment manufacturer should recommend which spares are subject to wear and foreseeable failure and are critical for the correct operation of the odour arrestment plant (such as pumps, nozzles etc.) and these should be held on site. It may be acceptable for certain spares to be available on guaranteed short delivery if the absence of a supply at the site would not lead to complete failure of the odour arrestment plant or to offensive odours beyond the site boundary.
- 3.146 VMD - The Odour Response Procedure (see [Appendix 6](#) and paragraph [3.145](#)) should include analysis of actions in the case of arrestment plant breakdown or malfunction. Immediate arrangements should be made to divert odour streams to other suitable arrestment plant. Failure to provide suitable temporary arrestment plant may lead to the suspension of the process and consequently emergency standby arrangements should be detailed in the Odour Response Procedure. This may include:
- suspending process operations
 - reducing the scale of high odour intensity process operations, for example stopping cooking operations or reducing throughput
 - by-pass emissions to stand-by or alternate odour arrestment plant, for example using a boiler as an emergency odour arrestment system.

Odour control

Best Available Techniques(Sheet 1 of 2)

For mineral drying incl roadstone coating

Use relevant BAT from other BAT boxes

For vegetable matter drying

- 97 Process tanks and vessels should be enclosed to minimise emissions.
- 98 Provision should be made for effective and rapid cleaning of any area of spillage. High pressure jetting, steam cleaning or mechanical cleaning with foaming chemical systems are effective methods of cleaning and, where used, sufficient hosing points should be made available. Spillages should be contained and cleared as soon as reasonably practicable.
- 99 Ventilation should be provided to maintain an adequate negative pressure within the dryers, extruders and coolers. The ventilation equipment should be vented to suitable arrestment plant.
- 100 All effluent should be drained via interceptor traps to the normal sewerage system or to an effluent treatment plant or storage tank.
- 101 All effluent storage tanks should be vented to suitable odour arrestment plant where necessary to meet the provisions of [Table 8](#). A minimum extracted air volume should be maintained to the tank at all times (depending upon the tank design it may be necessary to isolate the tank from the odour arrestment plant during emptying to avoid tank damage). Care should be taken in emptying the effluent tanks to minimise odour release - consideration should be given to venting the collecting tanker to the odour arrestment plant.
- 102 All effluent storage tanks should be emptied regularly and at least once every week.
- 103 All effluent tanks should be fitted with level indicators or high level alarms to warn of potential overflowing.
- 104 All tanks and effluent storage systems including cesspits and septic tanks should be adequately covered and effluent treatment systems should be properly maintained in accordance with the maintenance programme included in the Odour Response Procedure ([3.145](#)).
- 105 All effluent tanks should be protected by a bund to contain spillages and the tanker connection point should also be provided with bunding or spillage containment kerbs. Provision should be made for effective and rapid cleaning of any area of spillage. High pressure jetting or steam cleaning are effective methods of cleaning and, where used, sufficient hosing points should be made available. Spillages should be contained and cleared immediately
- 106 Potentially odorous waste should not be moved from process buildings to another building or outside unless in sealed containers. (Covered skips should not be regarded as sealed containers.
- 107 There should be no offensive odour across the process boundary as perceived by the regulator, subject to the provisions of paragraphs [3.120](#) and [3.121](#)

Management

3.147 Within IPPC, 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.

3.148 An effective Environmental Management System (EMS) will help the operator to maintain compliance with regulatory requirements and to manage other significant environmental impacts.

Operations and maintenance

3.149 **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

3.150 **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.

3.151 **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.

Natural person

3.152 Natural person means a real person rather than a company. Competence at existing plant will be demonstrated by means of compliance with permit conditions, level of personnel training, availability of written instructions and the operator's ability to deliver any actions necessary to improve compliance. A prosecution by the regulator for breaches of the authorisation does not necessarily mean that the operator is not competent.

Abnormal operating conditions

3.153 Article 6.3 (c) of the WID requires that waste feed should be automatically stopped whenever the continuous measurements required by this Directive show that any emission limit value is exceeded due to disturbances or failures of the purification devices. However, in some cases it may be possible for the operator to undertake quick remedial action to resolve the problem without the necessity of shutting the plant down. Article 13 of the Directive recognises this possibility and allows the regulators to lay down in the permit the maximum permissible periods of any technically unavoidable stoppages, disturbances, or failures of the purification devices or the measurement devices, during which the concentrations in the discharges into the air and the purified waste water of the regulated substances may exceed the prescribed ELVs. This time-limited derogation (amounting to less than 1% of average annual operating time) is conditional on the following requirements being met.

3.154 If the plant breakdown is likely to be longer than the permitted time period, plant operations should be reduced or stopped altogether as soon as practicable. This means that if the operator knows that the fault cannot be rectified within the allowable period, he should not wait till the end of this period before initiating shutdown.

3.155 The maximum allowable period for any one episode of abatement or monitoring equipment failure (separately or together) must not exceed 4 hours. In addition, the total allowable period in a year must not exceed 60 hours. If, in a given year, the operator has used up his allowance of 60 hours then any further failures will require plant shut down until normal operations can be resumed.

- 3.156 In the case of plants derogated from certain WID operating conditions, other requirements that must be met during the abnormal operations include:
- compliance with the operating conditions energy recovery; this is straightforward when product is being dried
 - compliance with ELVs for CO and TOC and
 - dust emissions must remain below 150 mg/m³ at all times

In practice this means that the pollutants that can be exceeded during abnormal operations are HCl, SO₂, NO_x and dust (**limited to 150 mg/m³**).

BAT(Sheet 1 of 2)

Operations and maintenance

- 108 Effective operational and maintenance systems should be employed on all aspects of the installation whose failure could impact on the environment, in particular there should be:
- documented operational control procedures
 - a documented preventative maintenance schedule, covering all plant whose failure could lead to impact on the environment, including major 'non productive' items such as tanks, pipework, retaining walls, bunds, ducts and filters; this should be reviewed and updated annually
 - documented procedures for monitoring emissions
- 109 The regulator should be provided with a list of key process equipment and abatement equipment. Such equipment should be provided with alarms or other warning systems 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.
- 110 Essential spares and consumables should be held on site or be available at short notice from suppliers, so that plant breakdown can be rectified rapidly.
- 111 Records of breakdowns should be kept and analysed by the operator in order to eliminate common failure modes.
- 112 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.

Audits

- 113 All audit records of raw materials usage, water usage, energy usage and waste production should be referenced to annual production.

Competence and training

- 114 Training systems, covering the following items, should be in place for all relevant staff:
- awareness of the regulatory implications of the permit
 - awareness of all potential environmental impacts under normal and abnormal circumstances
 - awareness of the procedures for dealing with a breach of the permit conditions
 - prevention of accidental emissions and action to be taken when accidental emissions occur
 - awareness of all operating procedures
- 115 The skills and competencies necessary for key posts (which may include contractors and those purchasing equipment and materials) should be documented and records of training needs and training received for these posts maintained.
- 116 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.
- 117 The management of the plant must be in the hands of a natural person who is competent to manage the plant

Accidents/incidents/non conformance

- 118 There should be written procedures for investigating incidents, (and near misses) including identifying suitable corrective action and following up.
- 119 If the emission limit values are exceeded whilst burning recovered fuel oil, then the fuel must be switched to gas oil.

Raw Materials

- 3.157 This section covers the use of raw materials and water and the techniques for both optimising their use and minimising their impact by selection (Energy and fuels are covered under [Energy](#)).
- 3.158 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

3.159 The raw materials used in the sector vary with location and product. Process optimisation is the technique for all processes either to comply with emission limit values or to minimise the use of abatement materials and the production of wastes. The issues in **Table 13:** should be considered when selecting raw materials.

Table 13: Raw material selection

Raw material	Selection criteria
recovered fuel oil	reliability of chlorine, water, heavy metal and sulphur content, viscosity, freedom from low flash point contaminants, PCBs
aggregate	product constituents to be developed to meet specification and sustainability goals and to work towards improvement
bitumen	ditto
filler	ditto
glass	ditto
RAP - recycled asphalt product	ditto
pigments	ditto
fibres	ditto
ash	ditto

BAT
<p>120 The operator should:</p> <ul style="list-style-type: none"> • maintain an inventory covering the principal types of raw materials used • annually review alternatives for the principal types of raw materials used with regard to their environmental impact • have quality procedures to control the specification of raw materials used, in order to minimise any potential environmental impact • complete any long term studies needed into the less polluting options and make any material substitutions identified within the review period

Waste minimisation (optimising the use of raw materials)

3.160 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”*.

3.161 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.

3.162 Key operational features of waste minimisation will 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

3.163 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.

- 3.164 The use and fate of all materials should be mapped onto a process flow diagram using data from the raw materials inventory and other company data as appropriate. Data should be incorporated for each principal stage of the operation in order to construct a mass balance for the installation. The mass balance can then be used to identify opportunities for improvements.

BAT

- 121 The operator should carry out a waste minimisation audit at least as frequently as the review period of the 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.
- 122 If an audit has not been carried out in the 2 years prior to submission of the application then the first audit should take place within 18 months of the issue of the permit.
- 123 Specific improvements resulting from the recommendations of audits should be carried out within a timescale approved by the regulator.

Water use

- 3.165 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.
- 3.166 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 3](#).

- 3.167 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

Water use

BAT

- 124 The operator should carry out a regular review of water use (water efficiency audit). Where one has not been carried out recently, an initial comprehensive audit should be carried out at the earliest opportunity. Audits should be at least as frequent as the IPPC permit reviews.
- 125 Using this information, 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.
- 126 The volume of mains and abstracted water used in the activities should be directly measured normally once a day for a fortnight each year and then monthly for the rest of the year, or at a frequency agreed with the regulator, when the installation is operating all measurements should be recorded and the records held on site.

Waste handling

3.168 Good segregation of materials is essential to facilitate opportunities for recovery, recycling and re-use.

BAT	
127	<p>The operator should:</p> <ul style="list-style-type: none"> record 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 ensure that waste storage areas are clearly marked and signed, and that containers are clearly labelled ensure that appropriate storage facilities are provided for substances that are flammable, sensitive to heat or light etc, and that incompatible waste types are kept separate ensure that containers are stored with lids, caps and valves secured and in place (this also applies to emptied containers) ensure that procedures are in place to deal with damaged or leaking containers. segregate waste wherever practicable identify the disposal route for all waste, which should be as close to the point of production as possible

Waste re-use, recovery, recycling or disposal

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

Table 14: Solid waste stream routes

Process waste stream route	Fate
For roadstone coatings	
abatement plant dusts	most returned to process, some sold, some to landfill
purged stone	returned to process
contaminated aggregate	returned to process
spoilt batches	returned to process
For other sand and mineral drying	
wet abatement sludge	
For vegetable matter drying	
out of specification material from dryer	returned to process, disposed of

BAT	
128	<p>The operator should carry out an annual review to demonstrate that the best environmental options are being used for dealing with all waste from the installation.</p>

Energy

3.170 BAT for energy efficiency under the PPC 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 a Direct Participation Agreement (DPA) with the Government.

or

- the operator meets the basic energy efficiency requirements below and the additional energy efficiency requirements.

Basic energy efficiency requirements

3.171 **The requirements of this section are basic, low cost, energy standards that apply whether or not a CCA or DPA is in force for the installation.**

BAT	
129	The operator should produce a report annually on the energy consumption of the installation.
130	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.)
131	In order to optimise combustion, the operator should, where practicable, monitor carbon monoxide and oxygen in waste gases.
132	The operator should ensure that all plant is operated and maintained to optimise the use and minimise the loss of energy.
133	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

3.172 Within IPPC 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

134 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
- optimised efficiency measures for combustion plant e.g. air/feedwater preheating, excess air etc.

Energy supply techniques

135 The following techniques should be considered:

- use of Combined Heat and Power (CHP)
- generation of energy from waste
- use of less polluting fuels

Accidents

3.173 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

3.174 Further guidance can be found in chapter 20 of the General Guidance Manual.

BAT

Accidents/incidents/non conformance

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

137 The operator should maintain an accident management plan that identifies the hazards, assesses the risks and identifies the measures required to reduce the risk of potential events or failures that might lead to an environmental impact. The plan should identify:

- the actions to be taken to minimise these potential occurrences; and
- the actions to deal with such occurrences so as to limit their consequences

138 In the case of abnormal emissions arising from an accident, such as a spillage for example, the operator should:

- investigate immediately and undertake remedial action as soon as practicable
- promptly record the events and actions taken
- ensure the regulator is made aware, as soon as practicable

Identification of the hazards

- 3.175 In identifying the hazards particular areas to consider may include, but should not be limited to, the following:
- transfer of substances (e.g. loading or unloading from or to containers/silos or storage tanks)
 - overfilling of containers/silos or tanks
 - failure of plant and/or equipment (e.g. extraction fans or pumps, over-pressure of storage silos and pipework, blocked drains)
 - failure of containment (e.g. bund and/or overfilling of drainage sumps)
 - fires and problems arising from fighting fires such as failure to contain firewaters
 - making the wrong connections in drains or other systems
 - preventing incompatible substances coming into contact
 - unwanted reactions and/or runaway reactions
 - emission of an effluent before adequate checking of its composition has taken place
 - steam main issues
 - vandalism
 - vehicle movements

Measures to reduce the risks (identified by risk assessment)

- 3.176 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

3.177 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 redundancy or standby plant with maintenance and testing to the same standards as the main plant
- 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

- suitable barriers to prevent damage to equipment from the movement of vehicles, as appropriate, having regard to a site-specific assessment of risks
- 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

Noise and Vibration

- 3.178 Within this section, “noise” should be taken to refer to noise and/or vibration as appropriate, detectable beyond the site boundary.
- 3.179 Further guidance can be found in chapter 16 of the General Guidance Manual.
- 3.180 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 noise problems. 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.
- 3.181 Where the WID installation is a small part of an operator’s site, the WID installation boundary may well not be the most appropriate location for noise surveying.

BAT	
139	<p>The operator should employ basic good practice measures for the control of noise, in particular:</p> <ul style="list-style-type: none"> • identification of key plant and equipment with the potential to give rise to noise nuisance • documented maintenance systems for the identified key plant and equipment

Monitoring

- 3.182 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 7](#).

Standards for monitoring equipment and procedures

- 3.183 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

- 3.184 The analytical methods given in [Table 7](#) and [Table 16](#) must be used until superseded by CEN standards. CEN standards are being developed for
- Reference methods for NO_x, SO₂, CO, moisture and oxygen
 - performance specifications and a type testing scheme for continuous monitoring systems of gases and particulates

In the event of other substances needing to be monitored, or of substances needing to be measured outside the scope of a CEN standard (eg particulate matter above 50mg/m³), standards 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 Deutscher Ingenieure (VDI)
 - Association Française de Normalisation (AFNOR)
- 3.185 Further guidance on standards for monitoring gaseous releases relevant to IPPC is given in the Technical Guidance Note M4 (Monitoring) (see [Ref 8](#)). A series of updated Guidance Notes covering this subject is currently in preparation. This guidance specifies manual methods of sampling and analysis, which will also be suitable for calibration of continuous emission monitoring instruments. Further guidance relevant to water and waste is available from the publications of the Standing Committee of Analysts. See <http://dwi.gov.uk/regs/pdf/scabb202.pdf>
- 3.186 If in doubt the operator should consult the regulator.

Monitoring and sampling protocols

- 3.187 Where monitoring is needed the operator should address the following:
- determinands to be monitored
 - monitoring strategy and selection of monitoring points
 - monitoring methods and procedures (selection of Standard Reference Methods)
 - reference conditions and averaging periods
 - measurement uncertainty of the proposed methods and the resultant overall uncertainty
 - drift correction
 - quality assurance (QA) and quality control (QC) protocols, 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
 - the accreditation held by samplers and laboratories or details of the people used and the training/competencies

Monitoring frequency

- 3.188 The frequency of testing of most determinands is set by the Waste Incineration Directive, see [Table 7](#). The frequency of monitoring limits based on [Table 9](#) ie non WID emissions, can be varied.
- 3.189 Emission flow rates must be consistent with good operating practice and meeting the requirements of the legislation relating to workplace safety.

Monitoring emissions to air

- 3.190 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), 3% oxygen, measured dry. To convert measured values to reference conditions, see Technical Guidance Note [M2 Monitoring of stack emissions to air. Environment Agency November 2002](#)) for more information. Two examples of expressing emissions at different oxygen reference levels are given in [Appendix 3](#):
- 3.191 The following parameters must be measured:
- temperature at a representative point inside the combustion chamber authorised by the regulator
 - concentration of oxygen
 - pressure
 - temperature and water content of the exhaust gases. The continuous measurement of water vapour is not required if the sampled flue gas is dried before the emissions are analysed.

Compliance with permit limits while RFO is burnt

- 3.192 Two examples of the mixing rule are given in [Appendix 4](#) and [Appendix 5](#)
- 3.193 To show that the operator has complied with the emission limit values for air, the following criteria must apply:
- (a) For carbon monoxide, 97% of the daily average values over the year do not exceed the emission limit value of 50 mg/m³
 - (b) none of the other daily average values exceeds its emission limit value as calculated by the mixing rule, or if the mixing rule does not apply, as set out in [Table 7](#)
 - (c) none of the average values over the sample period set out for heavy metals and dioxins and furans exceed the emission limit values set out in [Table 7](#)
 - (d) CO emission limit values of 100 mg/m³ of combustion gas of all measurements determined as half hourly average values taken in any day are complied with. (A day starts and ends at midnight.)
 - (e) Abnormal operating conditions are dealt with separately in paragraphs [3.153 -3.156](#)

WID - Measurement uncertainty

- 3.194 Because monitoring is not exact, WID sets allowable uncertainties that are subtracted from the measured average value before checking compliance and reporting the figure to the regulator. If that gives minus values, those are reported as zero.
- 3.195 At the daily emission limit value level, the values of the 95% confidence intervals of a single measured result must not exceed the following percentages of the emission limit values:
- Carbon monoxide: 10%
 - Sulphur dioxide: 20%
 - Nitrogen dioxide: 20%
 - Total dust: 30%
 - Total organic carbon: 30%
 - Hydrogen chloride: 40%
 - Hydrogen fluoride: 40%.

For example, given a daily limit for hydrogen chloride of 10mg/m³, the allowable uncertainty is 40%, so half hourly measurements of 12mg/m³ are corrected to 12-4 = 8mg/m³. If the valid daily average value then comes to 8, that complies with the daily limit. BS EN ISO 14956 'Air quality - Evaluation of the suitability of a measurement procedure by comparison with a required measurement uncertainty' gives more details.

EN 14181 Quality assurance of AMS, (Automatic monitoring systems) gives a procedure that ensures monitoring systems are suitable at the outset and perform sufficiently to continue meeting the uncertainty requirements of the WID.

WID - Calculating daily average values

- 3.196 Half hourly averages start when recovered fuel oil starts being fed after start-up. For batch plant, (where the main flame is on and off every few minutes) the half hour continues through the stoppages and restarts, until the change back to gasoil.
- 3.197 For operation on non-waste (eg gas oil) the continuous limits should be applied to particulate matter but not to the other continuously monitored pollutants.
- 3.198 The validated half-hourly averages should be determined within the effective operating time from the measured averages after having subtracted the value of the confidence interval specified in [3.145](#). Effective period here does not include start-up or shut-down provided no waste is being burnt. The daily average values are then determined from those validated half hourly averages .
- 3.199 To obtain a valid daily average value:
- no more than five half-hourly average values in any day may be discarded due to malfunction or maintenance of the continuous measurement system
 - no more than ten daily average values per year shall be discarded due to malfunction or maintenance of the continuous measurement system

Note that values can only be discarded if the operator can confirm that the CEM(s) were under maintenance or malfunctioning. In other words, operators cannot simply discard five highest averages in a day.

Roadstone and other mineral drying

- 3.200 For sand and mineral driers that dry batches of different materials:
- Continuous particulate matter monitors fitted to drying plant may need to be fully insulated in order to function correctly. They also require to be configured for the material being dried. A change of material may require the instrument to be reconfigured appropriately. Manufacturers should be requested to provide information and training to ensure this is carried out correctly.
 - Where an operator frequently changes the material being dried any provision regarding continuous indicative monitoring for particulate matter may have to be modified. As the provision is to ensure correct operation of plant and arrestment equipment it is possible that the monitor should be set up and referenced with a material type that is often dried and operated as a check only when that material is being dried. In any case measures appropriate to ensure the correct operation of the arrestment plant should be in place.]
- 3.201 Where sand dryers and coolers operate predominantly on medium or coarse grades of sand (AFS 65 and below, which is roughly equivalent to AGS 230 micrometres and above 7) and compliance with the requirements is demonstrated, then they should be tested occasionally to the standards of this note when drying fine sand. Where a dryer is used predominantly for fine sand then compliance with the provisions should be demonstrated when operating on fine sand.

Vegetable matter drying

- 3.202 In the case of thermal oxidisers or combustion equipment, the combustion efficiency is a good indication of performance. Emissions may be tested for carbon monoxide and the indicative guide value in [Table 15](#) should be used. If emissions exceed this indicative guide value it is likely that the odour destruction efficiency of the arrestment plant is reduced and it should be further investigated to identify reasons for the reduced performance.
- 3.203 In the case of biofilters or scrubbers, emissions may be tested for a target pollutant which should be determined based upon the process characteristics.
- 3.204 In the case of open top biofilters, the sampling method detailed in Appendix 3 of this note should be used.
- 3.205 Whilst there are no reliable continuous emission monitoring options for odours, where thermal oxidation or combustion equipment is used for odour control, continuous monitoring of carbon monoxide is an option (see paragraph [3.210](#)).

Monitoring emissions to water

- 3.206 The appropriateness of the emission benchmarks 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
- 3.207 Wet scrubbers are uncommon in the roadstone coating and vegetable matter drying sectors and so monitoring of releases to water is unlikely to be needed. For details on monitoring emissions to water see [Ref 14](#).

Environmental monitoring (beyond installation)

- 3.208 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
- 3.209 Further guidance is given in chapter 15 of the General Guidance Manual.
- 3.210 If from vegetable matter drying offensive odours are detected beyond the process boundary or complaints received but there is no obvious cause of odour release it may be necessary to check the odour arrestment plant performance. [Table 15](#) provides guide values which would indicate problems with arrestment plant. Depending upon the type of arrestment plant used, the following are the indicative tests it is envisaged would normally be used:
- In the case of thermal oxidisers or combustion equipment, the combustion efficiency is a good indication of performance. Emissions may be tested for carbon monoxide and the indicative guide value in [Table 15](#) should be used. If emissions exceed this indicative guide value it is likely that the odour destruction efficiency of the arrestment plant is reduced and it should be further investigated to identify reasons for the reduced performance.
 - In the case of biofilters or scrubbers, emissions may be tested for a target pollutant which should be determined based upon the process characteristics.
 - In the case of open top biofilters, the sampling method detailed in Appendix 3 of this note should be used.

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

Table 15: Indicative Guide Values

Row	Odour Indicators	Indicative Guide Values
1	Emissions of carbon monoxide from thermal oxidisers or combustion equipment.	100 mg/m ³ expressed as a 30-minute mean at 273K and 101.3kPa.
N.B. The above values are only to be used in conjunction with the provisions of paragraph 3.210		

Monitoring of process variables

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

- temperature of aggregate
- temperature of exhaust gas
- gas oil temperature and pressure
- recovered fuel oil temperature and pressure
- temperature of wet aggregate

BAT

Monitoring and reporting

- 140 The need for and scope of testing and the frequency and time of sampling depend on local circumstances, operational practice, and the scale of operation. As part of proper supervision the operator 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
- 141 The regulator needs to be informed of monitoring to be carried out and the results. The results should include process conditions at the time of monitoring.
- 142 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
- 143 The results of non-continuous emission testing should be forwarded to the regulator within 8 weeks of the completion of the sampling.
- 144 Adverse results from **any** monitoring activity (both continuous and non-continuous) should be investigated immediately. The operator should ensure that:
- the cause has been identified and corrective action taken
 - as much detail as possible is recorded regarding the cause and extent of the problem and the action taken to rectify the situation
 - re-testing to demonstrate compliance is carried out as soon as possible, and
 - the regulator is notified
- 145 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 air. Such problems may arise within the process itself or with the abatement plant, for example.
- 146 In the case of abnormal emissions, malfunction or breakdown leading to abnormal emissions:
- investigation and remedial action should be undertaken immediately
 - the process or activity should be adjusted to minimise those emissions; and
 - the events and actions taken should be promptly recorded
 - In the case of non-compliance causing immediate danger to human health, operation of the activity should be suspended

147 The regulator should be informed without delay:

- if there is an emission that is likely to have an effect on the local community; or
- in the event of the failure of key abatement plant, for example, bag filtration plant or scrubber units
- if continuous monitoring shows an emission concentration exceeding double the limit value

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

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

Monitoring and reporting of emissions to air

149 Continuous monitoring must be carried out for releases with continuous emission limit values identified in [Table 7](#). Where continuous monitoring is required by the permit it should be carried out as follows:

- all continuous monitoring readings should be on display to appropriately trained operating staff
- instruments should be fitted with audible and visual alarms, situated appropriately to warn the operator of abatement plant failure or malfunction
- the activation of alarms should be automatically recorded
- all continuous monitors should be operated, maintained and calibrated (or referenced) in accordance with the manufacturers' instructions, which should be made available for inspection by the regulator. The relevant maintenance and calibration (or referencing) should be recorded
- all new continuous monitoring equipment should be designed for less than 5% downtime over any 3-month period

150 Monitoring of NO_x at WID stacks.

- NO_x must be reported as nitrogen monoxide (NO) plus nitrogen dioxide (NO₂), expressed as nitrogen dioxide.
- NO alone can be monitored at installations if there is evidence to show that the proportion of NO₂ is not more than 5% of the total NO_x, expressed as NO₂. In such cases, operators should use a conversion factor to calculate the total NO_x, based on the premise that the proportion of NO₂ is 5% of the total NO_x.
- If the proportion of NO₂ is up to 10% of the total NO_x, then operators should either monitor both NO and NO₂, or use a conversion factor based on the premise that the NO₂ makes up 10% of the total NO_x.
- If the proportion of NO₂ can exceed 10% of the total NO_x, then operators should monitor both NO and NO₂.
- Operators should specify how they will measure total NO_x and provide suitable evidence if they wish to measure NO alone and then use a conversion.

BAT

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

In addition to the continuous indicative monitoring outlined in BAT, the odour arrestment plant should be inspected at least once a day to verify correct operation and to identify any malfunctions. This inspection should include:

- Identification of any leaks in air handling equipment and ductwork
- In the case of scrubbing equipment, thermal oxidisers and other combustion equipment, the inspection should include verification of the operation of the continuous monitoring equipment, any blockages and also identification of any leaks of either odorous air or liquid.
- In the case of biofilters, the surface should be inspected to identify any cracking of the surface or voids in the bed, leaks around the edge of the filter or air handling equipment, review of the moisture content (considering both flooding and drying out) and looking for signs of compaction or uneven flow.
- In the specific case of soil biofilters, the growth of plants and weeds should be inspected as any excessive flow or odour escape is often indicated by scorching of the earth or plant growth dying off.

The following BAT apply to vegetable matter drying process emissions from stacks to which the WID does not apply. Should there be an odour arrestment plant emission to which the WID does apply, then the WID monitoring provisions must be applied, and then any additional monitoring from below should be added. BAT 151 - 160 must not be used to remove WID monitoring provisions.

152 In the case of thermal oxidisers or combustion equipment, emissions should be continuously monitored and continuously recorded for carbon monoxide, or the operating temperature may be used as a surrogate measurement. The monitor should be fitted with an audible and visual alarm to activate if the operating temperature falls below 1123K (850°C) or if the carbon monoxide level exceeds the indicative guide value in [Table 15](#).

153 In the case of scrubbing equipment, the pH or Redox of the liquor and liquor flow should be continuously monitored. All liquid scrubbers should be fitted with an audible and visual alarm to activate if the liquor circulation fails or if the pH or Redox falls outside the operating range established during commissioning testing.

154 If a bioscrubber is used, in addition to flow and pH or Redox monitoring, the pressure drop across the scrubber packing should be continuously monitored. The monitor should be fitted with an audible and visual alarm to activate if the pressure drop falls outside the operating range established during commissioning testing.

155 If a biofilter is used the pressure drop across the biofilter should be continuously monitored. This can be achieved by measuring the delivery pressure on the main fan. The monitor should be fitted with an audible and visual alarm to activate if the pressure drop falls outside the operating range established during commissioning testing. If the process has more than one fan for different process areas and these fans are not operated when the areas are not in use (for example during the winter period when production levels are low) the value used for alarming may need to be variable depending upon the volume of air being treated and process conditions. In this case, where the alarm level is varied, the set point of the alarm should be recorded.

156 The operating levels of the pH, Redox and pressure drop where monitored should be recorded daily.

157 The cooling liquid flow of all direct or indirect condensers used for pre-treatment of emissions (including spray tower scrubbers) should be continuously monitored.

- 158 Emissions from particulate arrestment plant (except where the final discharge of the arrestment equipment is within buildings) where the exhaust airflow exceeds 100 m³/min should be continuously indicatively monitored for particulate matter. (By continuous indicative monitoring is meant monitoring to indicate the relative performance and/or process variation. Such monitoring does not provide data to demonstrate compliance with a numerical emission limit.) The indicative monitor should be fitted with a visual and audible alarm which activates at a reference level agreed with the regulator.
- 159 The above continuous monitoring provision does not apply to wet emissions, for example from scrubbers, and in these circumstances emissions should be tested for particulate matter at least once a year.
- 160 Also the above continuous monitoring provision should be disapplied where emissions do not exceed the relevant particulate emission limit in [Table 9](#) without the use of arrestment plant. This should be demonstrated by a single sampling exercise undertaken in accordance with paragraph [3.205](#). A further such monitoring exercise may be required in the event of a substantial change to the process.
- 161 Where odour arrestment plant is used, continuous monitoring (linked to alarms) should be installed in order to demonstrate compliance with the non-WID provisions of this note.

Monitoring and reporting of emissions to air

- 162 The destruction efficiency of the odour arrestment plant required to meet the emission limits in [Table 9](#) should be tested in accordance with the main procedural requirements of BS EN13725 at least once a year. This testing should be carried out by dynamic olfactometry based upon manual extractive sampling undertaken simultaneously at the inlet and outlet of the odour arrestment plant. At least three samples should be taken from both the inlet and outlet. Where the odour arrestment plant comprises an open top biofilter, the guidance in Appendix 3 should assist in developing a sampling protocol.
- 163 In addition, it may be necessary to carry out monitoring of emissions of odour at other times where the process is subject to complaint of offensive odour and the investigations carried out in accordance with paragraph [3.124](#), [3.125](#) and [3.210](#) cannot identify a cause for the odour.
- 164 As the odour arrestment performance of a biofilter is very dependant upon operating conditions and biomass loading, it is not appropriate that reduced monitoring be applied.

Monitoring and reporting emissions to water and sewer

- 165 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 quality of the receiving water
 - the volume of discharge compared to the percentage dry river flow of the receiving water
- 166 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.
- 167 A full analysis, to include the substances listed in Schedule 5 of the Regulations, 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

- 168 The following should be monitored and recorded:
- the physical and chemical composition of the waste
 - its hazard characteristics
 - handling precautions and substances with which it cannot be mixed

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 *The Pollution Prevention and Control (England and Wales) Regulations (SI 1973 2000) as amended* (www.legislation.hmso.gov.uk) or the Scottish equivalent SSI 323 2000
- Ref 2 *Secretary of State's Guidance (England and Wales): General Guidance Manual on Policy and Procedures for A2 and B Installations*, March 2003 - 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 3 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 4 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 5 *HMIP Technical Guidance Note (Dispersion) D1*, 1993 The Stationery Office ISBN 0 11 752794 7
- Ref 6 *BS 5908: Code of Practice for Fire Precautions in the Chemical and Allied Industries*
- Ref 7 *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](http://www.environment-agency.gov.uk))
- Ref 8 Monitoring Guidance ([EA website](http://www.environment-agency.gov.uk))
- *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 October 2004
 - *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 9 *"Policy and Practice for the Protection of Groundwater" (PPPG)*([EA website](http://www.environment-agency.gov.uk))
- Ref 10 DOE/WO Additional Guidance AQ17(94), issued to local authorities by the Air and Environment Quality Division of DEFRA and by the Welsh Office, provides further advice on the assessment of odour. The Scottish equivalent of AQ17(94) is SN 11(94).
- Ref 11 *Odour Measurement and Control- An Update* published by National Environmental Technology Centre, Culham, Abingdon. Oxon OX14 3DB. ISBN 0-85624-8258.
- Ref 12 BS EN 13725:2003 - "Air Quality - Determination of Odour Concentration by Dynamic Olfactometry"
- Ref 13 IPPC H4 - Horizontal Guidance For Odour: Part 1 - Regulation and Permitting, Part 2 - Assessment and Control, (To be published by EA, EHS, SEPA.)
- Ref 14 *Guidance on the Directive 2000/76/EC on the incineration of waste 2 edition 2004-* Department for Environment, Food and Rural Affairs : publications line for hard copy 08459 556000, and from the Defra website www.defra.gov.uk

Abbreviations

BAT	Best Available Techniques – see IPPC General Guidance Manual or the Regulations for further definition
BOD	Biochemical Oxygen Demand
BREF	BAT Reference Document
CEM	Continuous Emissions Monitoring
CHP	Combined Heat and Power plant
COD	Chemical Oxygen Demand
EA	Environment Agency
ELV	Emission Limit Value
EMS	Environmental Management System
ETP	Effluent Treatment Plant
EU	European Union
EQS	Environmental Quality Standard
ITEQ	International Toxicity Equivalents
MCERTS	Monitoring Certification Scheme
NIEHS	Northern Ireland Environment and Heritage Service
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
VMD	Vegetable Matter Drying
CCA	Climate Change Agreement
DPA	Direct Participation Agreement
RFO	Recovered Fuel Oil

Glossary

Recovered Fuel Oil	These are oils which are subject to the Waste Incineration Directive when burnt. See Ref 14
Waste oil	
6 digit codes	The European Waste Catalogue chapter 13 is relevant for classifying oils according to 6-digit codes. See Ref 14 .
Mixing rule	The mixing rule is applied to calculate the appropriate emission limit values where the pollutant is produced both by the waste incineration and by the process including the combustion of non waste oil. In brief, it mixes the ELV for the process without waste incineration, with the WID ELV for the waste incineration to produce a limit suitable for the combined emission. Under WID, the start up and shutdown phases are disregarded as no waste is burnt during them.
Process	Within this note, process can refer to the installation or part of it.
Plant	Within this note, plant refers to the WID installation or to part of it.

Appendix 1: Method for sampling of emissions from biological (earth, peat and heather) filters using gas detection tubes

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

- (1) Routine monitoring of emissions from biological filters can be readily undertaken using gas detection tubes. However, it is important to ensure that a number of representative samples are obtained and that care is taken in the interpretation of results. The number of samples necessary will depend upon the gas distribution within the biological filter.
- (2) It is essential that samples are taken from a representative volume of emitted gas as near surface dispersion will significantly affect measured concentrations. Therefore, it is necessary to reduce dispersion and obtain a volume of gas from which to sample. This can be achieved by placing a purpose-made enclosure on top of the filter bed and allowing the emitted gases to accumulate.
- (3) The enclosure itself should be approximately 0.5 m³ - 1 m³ in volume, preferably with a 1 m square open base. The top of the enclosure should have an opening of approximately 50 mm diameter to facilitate sampling. The enclosure can be simply fabricated using a timber frame and plywood or hardboard sides and top with mastic or other suitable sealant applied to the side and top joints.
- (4) It will be extremely difficult to achieve a seal at the filter bed surface, however the enclosure should be located in order to minimise leakage from the points of contact with the filter bed. The enclosure should remain at the sample location for at least 10 minutes prior to sampling to ensure that a representative sample of emissions is obtained (allowing the volume of the enclosure to be purged three times).
- (5) The gas detection tubes should be used in accordance with the manufacturer's instructions and results should be evaluated against the indicative guide values in [Table 15](#). Amines and amides are a common interference with gas detection tubes for ammonia and therefore results obtained from ammonia gas detection tubes should be compared to a 2 ppm v/v indicative guide value. It may be necessary to monitor for hydrogen sulphide and mercaptans separately depending upon the detector tube specification and in this case the sum of the individual results should be compared with the indicative guide value in Row 3 of [Table 3](#).
- (6) This method is only suitable for open biomass type biofilters where no final discharge vent or stack exists.

Additional information is available in BS EN13725: 2003 - "Air Quality - Determination of Odour Concentration by Dynamic Olfactometry" and "Odour Measurement and Control - An Update" published by National Environmental Technology Centre, Culham, Abingdon. Oxon OX14 3DB. ISBN 0-85624-8258.

Appendix 2: Recommended bitumen* handling and storage temperatures.

(see paragraph 3.39 in this note)

Table 16: Recommended bitumen storage temperatures

Grade	Minimum Pumping Temperature (°C) See note 1	Typical Bitumen Temperature at Time of Application		Maximum Handling & Storage Temperature (°C) See note 1
		Mixing See note 2	Spraying See note 2	
Paving Grades (BS EN 12591: 2000				
250/330 pen	95	135	165	190
160/220 pen	100	140	175	190
100/150 pen	105	150	190	200
70/100 pen	110	160	195	200
50/70 pen	115	165		200
40/60 pen	125	165		200
35/50 pen	125	170		210
30/45 pen	135	175		220
20/30 pen	140	185		220
Hard Paving Grades (prEN 13294: Draft)				
15/25 pen	140	190	-	230
10/20 pen	140	190	-	230
Hard Grades (BS3690)				
H80/90	160	200		230
H100/120	190	230		230
Oxidised Grades (BS3690)				See note 1
75/30	150	195		230
85/25	165	210		230
85/40	165	210		230
95/25	175	220		230
105/35	190	230		230
115/15	205	230		230
Cutback Grades BS 3690)			See note 1	See note 1
50 secs	65	105	150	160
100 secs	70	110	160	170
200 secs	80	120	170	180
<p>1. Maximum pumping viscosity - 2000 cSt (all grades). 2. Based on generally satisfactory experience of the storage and handling of paving, hard paving and oxidised grades in contact with air. Subject to avoidance of flammable atmospheres in the vapour spaces of storage tanks. 3. Mixing / Coating viscosity - 200 cSt (all grades) 4. Spraying viscosity - 60 cSt (penetration grades) 5. In oxidised bitumen rundown tanks, i.e. those that are, or can be, directly connected to the process plant, and except where oxygen depletion is applied temperatures should not exceed 200°C. 6. Spraying viscosity - 30 cSt (cutback grades). 7. Based on generally satisfactory experience of storage and handling cutback grades in contact with air. Subject to avoidance of sources of ignition in the vicinity of tank vents and open air operations</p> <p>BS EN 12591:2000 'Bituminous and bituminous binders - specification for paving grade bitumens' is the standard which partially replaced BS3690 Part 1 from January 2002.</p>				

Appendix 3: Expressing concentrations at different oxygen conditions

Formula to calculate the emission concentration at the standard percentage oxygen concentration

- (1) To re-express a concentration measured at one oxygen level, at the standard (ie reference) oxygen level, use the formula in WID Annexe VI, which is

$$E_S = \frac{21 - O_S}{21 - O_M} \times E_M$$

E_S = calculated emission concentration at the standard percentage oxygen concentration

E_M = measured emission concentration

O_S = standard oxygen concentration

O_M = measured oxygen concentration.

- (2) example 1: what is 50mg/m³ @ 17%oxygen when expressed at 3% oxygen

$$\frac{21 - 3}{21 - 17} \times 50 = \frac{18}{4} \times 50 = 4.5 \times 50 = 225 \text{ mg/m}^3 @ 3\% \text{ oxygen}$$

- (3) example 2: what is 50 mg/m³ @ 17% oxygen expressed at 19% oxygen

$$\frac{21 - 19}{21 - 17} \times 50 = \frac{2}{4} \times 50 = \frac{1}{2} \times 50 = 25 \text{ mg/m}^3 @ 19\% \text{ oxygen}$$

- (4) These examples show that the following three emission concentrations are identical:

25 mg/m³ @ 19% oxygen

50 mg/m³ @ 17%oxygen

225 mg/m³ @ 3% oxygen

Converting Emission Limit Values

- (5) The formula can also be used to convert emission limit values (ELV) from one oxygen concentration to another.
- (6) When converting an emission limit value from one oxygen reference level to another, there are two standard levels to insert into the formula, instead of one measured and one standard level, and so it is possible to make a mistake and end up inverting the calculation. To check this, remember that the lower the oxygen, the higher the concentration.

Oxygen glossary

- (7) There are a number of different terms that express the same idea. The following are often interchangeable.
- (8) oxygen concentration
= oxygen level
= oxygen content
= oxygen condition
All are often expressed as an oxygen percentage
- (9) 'Standard' and 'reference' are also interchangeable.

Appendix 4: The mixing rule: a worked example

Roadstone coating: calculating the emission limit value for particulates

Assumptions

- V_{proc} is the volume of flue gas from burning 100% gas oil plus drying and other air necessary for the process and is limited to 17% oxygen
- V_{waste} (flue gas from burning recovered fuel oil) is calculated from fuel analysis and the level of substitution
- C_{waste} for particulate is 10mg/m^3 @ 3% oxygen
- C_{proc} is an authorised limit for particulate of 50mg/m^3 @ 17% oxygen (when burning gas oil) (See [Table 7](#) and [Table 8](#) for comments on '50' and for other process limits.)
- fuel is gas oil
- substitute fuel is recovered fuel oil (RFO), hazardous waste that complies with Article 3.2 exemption criteria so it is not dealt with by WID as hazardous waste

Additional assumption:

- (1) The volume of combustion gases from the combustion of 1kg of RFO and 1kg of gas oil is the same.

Calculations

Justification for additional assumption 1

- Combusted volume of 1kg of gas oil has been calculated by fuel analysis to be
Volume @ 0% O_2 = $12.1\text{m}^3/\text{kg}$ wet or = $10.8\text{m}^3/\text{kg}$ dry
- Combusted volume of 1 kg of RFO used in roadstone coating industry has been calculated by fuel analysis to be
Volume @ 0% O_2 = $11.9\text{m}^3/\text{kg}$ wet or = $10.6\text{m}^3/\text{kg}$ dry
- The difference of about 2% is not considered significant

The volume of flue gas from burning 1 kg of RFO has been calculated to be 10.6m^3 at 0% O_2

So the volume of the combusted gases at 3% O_2 is calculated to be

$$10.6 \times \frac{21-0}{21-3} = 10.6 \times \frac{21}{18} = 12.4\text{m}^3/\text{kg}$$

The air necessary for the process dilutes emissions to 17% O_2 . At 17% O_2 the volume of the gases is calculated to be

$$12.4 \times \frac{21-3}{21-17} = 12.4 \times \frac{18}{4} = 12.4 \times 4.5 = 55.8\text{m}^3/\text{kg}$$

So the volume of the necessary air added is $55.8 - 12.4 = 43.4\text{m}^3/\text{kg}$

The WID Annexe II mixing rule is

$$C = \frac{(C_{waste} \times V_{waste}) + (C_{proc} \times V_{proc})}{V_{waste} + V_{proc}}$$

V_{waste} varies with substitution level. Here it is calculated for 100% substitution.

$$C = \frac{10 \times 12.4}{12.4} + \frac{50 \times 43.4}{43.4} = \frac{124 + 2170}{55.8} = \frac{2294}{55.8} = 41.1 \text{ rounded to } 41$$

The following table gives the results of the calculation for different levels of substitution of RFO for fuel oil, and for different process limits (C_{proc}) for particulate. The result is a limit expressed at 17% oxygen. See [Appendix 3](#) to express it at other oxygen conditions.

When RFO is burnt alone, the 100% limit is appropriate.

The substitution level does not refer to the percentage of RFO in oil designed to specific chlorine or sulphur limits, nor to oil burnt when no RFO is burnt.

It does refer to mixes of RFO and gas oil mixed onsite, either in tanks or by feeding gas oil and RFO to the burner at the same time.

Table 17: Mixing rule - permit particulate limits for different process limits and substitution levels

Substitution level % waste oil RFO	Process limit for particulate in mg/m ³ , dry, at 17% oxygen, 273K 101.3kPa		
	50	100	150
100	41	80	119
85	42	82	123
50	45	89	133
0	50	100	150

Appendix 5: The mixing rule: worked example for hydrogen chloride

Calculating the emission limit value for hydrogen chloride for WID combustion

The mixing rule in WID is applied to produce the emission limit value for hydrogen chloride in two examples using different proportions of RFO and Gas oil burnt whilst RFO is burnt. Gas oil burnt when no waste is burnt at the same time is not included in the sum.

**85:15
RFO: gas oil**

Daily average limit value

When the proportion of (recovered fuel oil) to (gas oil burnt whilst RFO is burnt) is 85:15, the process limit for chloride is 0 mg/m^3 at 3% oxygen
the WID daily average value is 10 mg/m^3 at 3% oxygen

then the daily average limit value to put into the permit for WID combustion is
 $85\% \times 10 + 15\% \times 0$
ie $0.85 \times 10 = 8.5 \text{ mg/m}^3$ at 3% oxygen

100% RFO

Daily average limit value

For combustion of 100% RFO ie no gas oil is burnt during the period when RFO is burnt, the calculation is simpler; the daily average limit value to put into the permit for WID combustion is simply the WID daily average limit value
ie 10 mg/m^3 at 3% oxygen

Appendix 6: Guidance on the Preparation of an Odour Response Procedure

For Vegetable Matter Dryers

What is an Odour Response Procedure?

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

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

What is the Format for the Odour Response Procedure?

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

What should be included in the Odour Response Procedure?

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

1. changes in process conditions leading to more odour generation or a change in the odour characteristics
2. conditions which result in fugitive releases due to reduced odour containment
3. failures or reduced performance of odour arrestment plant
4. factors affecting the dispersion between the source and the receptor.

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

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

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

Table 18: Examples of issues to consider relating to odour release

Factors leading to odour release	Examples of issues to consider
Those which have potential to affect the process and the generation of odour	<ul style="list-style-type: none"> • Materials input - seasonal variation in weather may affect odour of materials particularly if putrescible. • Process parameters such as changes in temperature/pressures • Rate of throughput or increased hours of operation • High levels of ammonia within the process buildings (possibly due to high ambient temperatures).
Those which affect the ability to arrest/minimise odour	<ul style="list-style-type: none"> • Poor performance of biofiltration or poisoning (may be the result of poor maintenance or mis-operation) • Flooding of the biofilter due to abnormally high rainfall • External failure of other utilities, e.g. water supply, gas supply for combustion equipment where the operator has signed up to an interruptible gas supply • Mechanical breakdown of arrestment equipment such as pumps, fans etc • Power failure • Compaction of the biofilter or surface fissures • Saturation of a carbon filter bed and subsequent breakthrough of odours • Below optimum temperature of a thermal oxidiser or boiler etc • Saturation of scrubber liquor, blocked injection nozzles etc.
Those which affect the ability to contain odour	<ul style="list-style-type: none"> • Building damage which affects integrity due to for example storms • Power failure • Failure of automatic doors, i.e. in open position • Failure in procedures to maintain containment (human error)
Those affecting dispersion between the source and sensitive receptors‡	<ul style="list-style-type: none"> • Short term weather patterns which fall outside of the normal conditions for that area and are highly unusual (not just the normal meteorological pattern) - inversions and other conditions unfavourable to dispersion should have been considered in designing the process • Weather - wind direction, temperature, inversion conditions if these are normal variants of local weather • Loss of plume buoyancy/temperature
<p>‡ The process design should incorporate control measures in order that the aim that, under the normal range of meteorological conditions for the area, no emissions result in offensive odour that is detectable beyond the process boundary.</p>	