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Sector Guidance Note IPPC SG 1 Integrated Pollution Prevention and Control (IPPC)

Secretary of State's Guidance for A2 Particleboard, Oriented Strand Board and Dry Process Fibreboard Sector

September 2006

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

Environment Agency

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1 Introduction

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 Particleboard, Oriented Strand Board and Dry Process Fibreboard sector.

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

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

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

1.5 General guidance explaining LA-IPPC and setting out the policy and procedures, is contained in the “General Guidance Manual on Policy and Procedures for A2 and B Installations” (**Ref 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 this sector.

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

1.7 If there are any applicable mandatory EU emission limits, these must be met, although BAT may go further. The same applies to UK regulations, except that, in reconciling BAT with the Control of Pollution (Oil Storage) (England) Regulations 2001, SI 2954, it may be acceptable to achieve an equivalent level of control to that specified in the 2001 regulations (although the oil storage regulations do not apply in Wales, they should be regarded as an indication of BAT in Wales)[1]

[1] Further guidance on the Oil Storage Regulations, if needed, is available from www.environment-agency.gov.uk/osr

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 installations, described in Section 6.1 Part A(2) (in England and Wales) of Schedule 1 to the PPC Regulations (**Ref 1**) as follows:

Manufacturing wood particleboard, orientated strand board, wood fibreboard, plywood, cement-bonded particleboard or any other composite wood based board

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

1.12 The manufacturing of cement bonded particleboard and plywood is not specifically covered in this guidance note, however there may be aspects of this guidance, for example point source and fugitive emissions of particulate matter, that are relevant to the operations.

Review and Upgrading Periods

Existing installations or activities

1.13 The previous guidance PG 6/4 (95) Secretary of State's Guidance Note for Processes for Manufacture of Particleboard and Fibreboard, relating to emissions to air, advised that upgrading to that standard should usually have been completed by 1st October 1996 and compliance with emission limits and controls which apply to presses and wood dryers should usually have been completed by 31 December 1997. Requirements still outstanding from any existing upgrading programme should be completed.

1.14 The previous version of this guidance, SG1 (03) contained improvements that were required to be completed up to 36 months after publication of the note as detailed in Table 1. Installations should be upgraded to these standards by the date of publication of this note.

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

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

Table 1: Compliance requirements

Guidance	Reference	Compliance Date
Water Recycling	BAT 19	From the date of publication of this note
Groundwater Contamination Risk Audit	3.61 & BAT 34	1 April 2006
Odour Assessments	3.67 & BAT 40	1 April 2006
Environmental Management Systems	3.75, 3.76 & BAT 42	1 April 2007
Competent Person for Regulator and Public Liaison	BAT 46	1 April 2006
Formal Structure for Environmental Control & Training	BAT 47 & BAT 48	1 April 2007
Raw Materials / Waste Minimisation Audit	BAT 53	Within 18 months of issue of the permit
Water Efficiency Audit	BAT 56	Within 18 months of issue of the permit
Benchmarking Raw Material Usage	BAT 52 & BAT 58	1 April 2006
Waste Storage Provisions	BAT 63 to BAT 66	1 April 2006
Recycling Markets	3.105 & BAT 67	1 April 2006
Energy Audit	BAT 69	Within 12 months of issue of the permit
New Additional Energy Efficiency Measures	BAT 74 & BAT 75	1 April 2007
Accident Prevention Measures	BAT 80 to BAT 87	1 April 2007
Noise Mitigation Measures	BAT 88 & BAT 91	1 April 2007
QA/QC of Monitoring Systems	BAT 101	1 April 2007
Water monitoring	BAT 111	1 April 2007
Annual Waste Reporting	BAT 112	1 April 2007
All Other Requirements		To be complied with as soon as practicable, which in most cases should be within 12 months of the publication of this note

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

New installations or activities

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

Substantially changed installations or activities

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

Permit Reviews

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

Summary of Release

Table 2: Summary of direct releases

Source → / Releases ↓	De-Barking	Recovered Wood handling	Chip Washing	Wood Chipping	(Prepared) Wood Particle Storage	Drying	Mixing of Resins /Additives	Mat Forming	Sanding & Finishing	Cooling Operations	Laminating Line	Effluent Plant	Boilers	WESP
Oxides of Sulphur						A							A	
Oxides of nitrogen and carbon						A							A	
Particulate/Total suspended solids	A	W	A	A	A	A		A	A		A	W	A	A
Formaldehyde							A W	A		A		W		A W
Isocyanates							A	A		A				
VOC						A		A		A				A
Total aldehydes						A	A	A		A				A
Solid waste or sludge			W				W					W	W	W
Phenol							A	A		A				
Ammonia												W		
Noise	***	*		***		**		** #						*
KEY	A – Release to Air, W – Release to Water, L – Release to Land *** - High, ** - Medium, * - Low # from fans													
Substances include their compounds, except where separate reference to the compound is made. Releases to air may also be released to land or water, depending upon the abatement technology employed, e.g. via collected dusts, sludges or liquors. N.B. It should be noted that this is not necessarily an exhaustive list. Equally not all installations will necessarily have all these releases.														

2 Emission limits and other provisions

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

Contained emissions to air associated with the use of BAT

2.2 Concentration limits are only applicable to contained emissions exhausted to external atmosphere.

Table 3: Contained emissions to air associated with the use of BAT

Determinand	Source	Limits	Type of monitoring	Frequency of monitoring
Offensive odour	Whole process	No offensive odour beyond the site boundary	Operator observations	At least daily
Visible emissions	Combustion plant	Ringlemann shade 1	Operator observations – dependent upon the type of combustion plant	At least daily
Particulate matter	All contained sources other than wood dryers and Medium Density Fibreboard (MDF) production.	50 mg/m^3	Continuous indicative Monitoring (where continuous monitoring is shown by the operator to be impractical, compliance with the emission limits should be demonstrated by selection of abatement equipment which is capable of meeting the specified emission limits and by continuous monitoring of the abatement equipment performance, for example by the installation of optical crossduct detectors on fabric filters or cyclones)	Continuous equipment should be checked at least daily to ensure it is functioning correctly) In cases where it has been shown that continuous monitoring is impractical, or where continuous monitoring only gives an indication of compliance with emission limits, emissions should be tested at least quarterly. A reduced frequency may be appropriate if monitoring results demonstrate consistent and reliable operation of the abatement plant and compliance with the emission limit
	Medium Density Fibreboard (MDF) production – all contained sources.	20 mg/m^3		
	Wood dryers	20 mg/m^3		
Condensible VOCs (excluding particulate matter)	Each emission to air	130 mg/m^3 (calculated as carbon and measured in accordance with the general method described in **Appendix 1**	Quantitative	At least quarterly

Formaldehyde	Replacement plant or new or substantially changed installations; each emission to air except emissions from wood dryers	5 mg/m^3 (measured as formaldehyde)	Quantitative	At least quarterly
	Replacement plant or new or substantially changed installations; each emission to air from wood dryers	20 mg/m^3 (measured as formaldehyde	Quantitative	At least quarterly
	Existing installations; Each emission to air including emissions from wood dryers	20 mg/m^3 (measured as formaldehyde	Quantitative	At least quarterly
Total aldehydes	Each emission to air from wood dryers	20 mg/m^3 (calculated as carbon)	Quantitative	At least quarterly
Temperature	Dryer inlet Dryer outlet Stack draught	n/a	Quantitative	Continuously monitored and recorded
Phenol	Presses and dryers	5 mg/m^3 (averaged over a 2 hour period as monohydric phenol)	Quantitative	At least quarterly
Isocyanate	Presses and dryers	0.1 mg/m^3 (averaged over a 2 hour period as total NCO group)	Quantitative	At least quarterly
Sulphur dioxide	From fuel burnt in combustion plant. Sulphur content of fuel.	When burning gas oil Note 1 - 0.2% wt/wt sulphur in fuel (before 1/01/ 2008) 0.1% wt/ wt sulphur in fuel (from 1/01/ 2008) When burning other oils - 1% wt/wt sulphur in fuel.	Certification by supplier using test method ASTM D86 distillation.	n/a

Note 1: Gas oil as defined in the Sulphur Content of Liquid Fuels Directive (1999/32/EC).
N.B. Additional emission limits, in particular for heavy metals and dioxins and furans, are being considered.

Benchmark emissions to water associated with the use of BAT

2.3 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 pollutants using precipitation, sedimentation and possibly filtration.. It is also practicable in many cases to re-use treated water. **Table 4** provides information regarding achievable levels associated with the use of wastewater treatment systems for discharges to surface water.

Table 4: Emissions to water associated with the use of BAT

Determinand	Benchmark release concentration, mg/litre
BOD	100
COD	130 (trade effluent) or 30 (controlled waters)
Total suspended solids	20
Ammoniacal nitrogen expressed as N	15
Formaldehyde	10

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".

3.3 Given the potential for fire and explosion at these installations, regulators should have particular regard to avoiding the imposition of requirements that would put at risk the health, safety or welfare of persons at work.

3.4 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.

Installation description and in-process controls

Main Activities

3.5 The meaning of “installation” and “directly associated activity” is addressed in chapter 2 of the General Guidance Manual.

3.6 Generic steps in the manufacture of particleboard (see **Figure 3.1**):

- raw material selection
- pre-treatment (de-barking, chipping, washing/steaming (MDF), milling)
- size classification
- drying
- mixing with resin
- forming the resinated material into a mat
- hot pressing
- cooling
- finishing

3.7 Equipment common to this sector includes:

- **Debarkers**: used to remove bark from logs
- **Woodchippers, hammermills, flakers, refiners**: used to reduce the size of wood to that suitable for the production process. Roundwood is comminuted using flakers
- **Dryers**: used to dry wood product. In the case of particleboard and OSB, drying is before blending with resin. For MDF, drying may be carried out after the wood fibre is mixed with resin
- **Resin mixer**: used to mix the wood product with resin
- **Presses**: used to apply heat and pressure to the mat of wood particles and resin
- **Wet ElectroStatic Precipitator (WESP)**: used to abate gaseous pollutants from the process
- **Cyclones**: used to recover wood dust for re-use in the process
- **Bag filters**: used to abate particulate matter from the process

3.8 A key production aspect of particleboard is the surface quality of the board. The following characteristics are considered important, density, porosity, homogeneity, smoothness, strength, thickness and swelling of particles. In applications where the particleboard is to be coated with foils, resin impregnated papers or laquers the most important properties of the surface layers are:

- uniformity
- moisture and density distributions
- chip characteristics
- strength and smoothness

3.9 The size and homogeneity of wood particles mostly affects surface quality.

Overview of activities in this sector

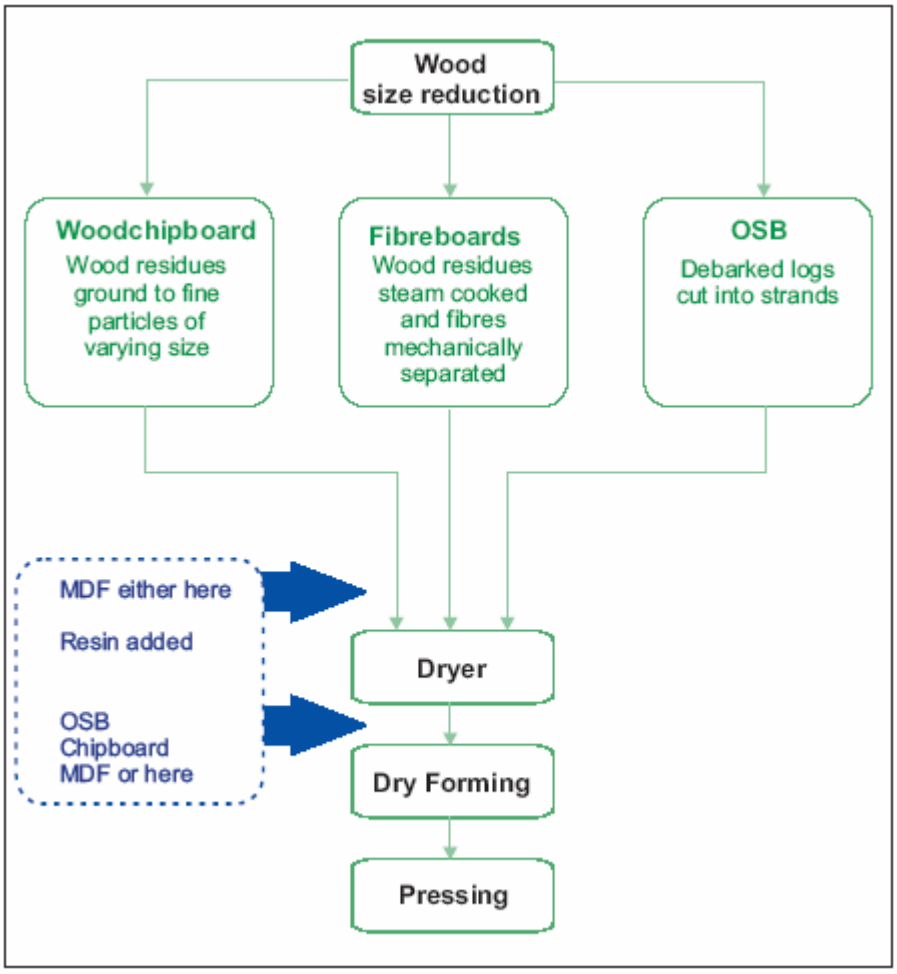
Reconstituted wood products

3.10 Reconstituted wood products manufactured in the UK such as particleboard, Medium Density Fibreboard (MDF) and Oriented Strand Board (OSB) are composed of wood which is combined with resins and other additives and formed into a mat, which is then pressed into a board. A generic process flow diagram is shown in **Figure 3.1**. The manufacturing processes and raw materials of these boards differ slightly and are described in more detail in manufacturing processes.

3.11 The manufacturing processes are summarised in **Figure 3.4**, **Figure 3.6** and **Figure 3.8**. The processes all involve size reduction of the raw wood, followed by drying, mixing with resin/ adhesive and pressing at above ambient temperatures. The processes involve the use of all parts of the sawn log and generate as little solid waste as possible. The solid waste that is generated is usually burnt in boilers used to provide heat for either dryers and/or presses. The principal environmental emissions from this manufacturing process are from dryers and presses and the associated abatement techniques employed for these emissions. Specifically in the UK wet electrostatic precipitators (WESPs) have been used to abate gaseous releases and these generate waste water on a discontinuous basis.

3.12 Additionally noise from debarking and wood size reduction operations is potentially problematic for this sector.

Figure 3.1: Generic process flow diagram



Manufacturing process

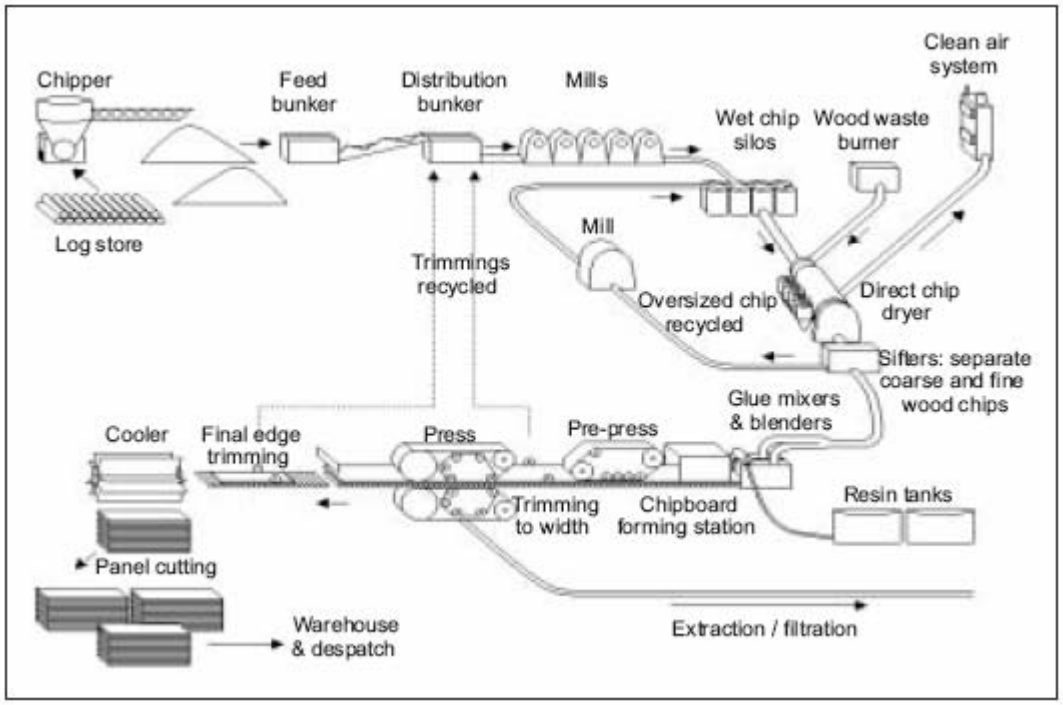
3.13 This section describes the manufacturing processes of:

- particleboard
- MDF
- OSB

Particleboard

3.14 Particleboard manufactured in the UK is generally of three layers, although single layer or five layer particleboard can be manufactured if required. The outer two layers are referred to as the surface or face layers and the inner layer is referred to as the core layer. The outer or face material is generally finer than core material. By altering the relative properties of the face and core layers, the bending and stiffness of the board can be increased. **Figure 3.2** illustrates an example particleboard process.

Figure 3.2: Particleboard process diagram



3.15 Raw materials for particleboard consist of wood particles. Primarily:

- recycled woodchips
- wood chips
- sawdust
- wood shavings

3.16 This material may be transported to the facility or generated onsite and stored until needed. Sawmills which generate chips onsite, will debark logs, saw wood to proper length and chip. The raw material for particleboard manufacture may then be further reduced in size by means of hammermills, flakers or refiners.

3.17 After milling, the material is either screened using vibrating or gyratory screens, or the particles are air-classified. This step removes fines and separates the core material from the surface material. The screened material is then transported to storage bins/silos. The core or surface material is taken from storage to dryers. Rotary dryers are the most commonly used in UK. Both single and triple-pass dryers are used. Some facilities also use tube dryers to dry the raw material.

3.18 The fuel for dryers can be waste wood from the site, natural gas or oil. Dryers may use a combination of these fuels depending on circumstances, for example, where an "interruptible" gas supply is provided to the site.

3.19 The moisture content of the particles entering the dryers may be as high as 50% (or 100% ovendry wood). Drying reduces the moisture content to between 2% - 8%. Dryer inlet temperatures may be as high as 871^{o}C (1144K) if the wood particles entering the dryer are wet. Where the wood particles are dry the inlet temperature is generally no higher than 260^{o}C (533K). When drying core material the dryers generally operate at higher temperatures than when drying surface material due to:

- the difference in core and surface particle characteristics (core material is more coarse), and
- lower moisture content is more desirable for core material

3.20 Where the moisture content of the incoming raw material is highly variable, a two-stage drying process can be used. The first stage (pre-dryer) equalises the moisture content of the raw material, the second stage is the main dryer. In such an arrangement tube dryer types may be used as a pre-dryer followed by a rotary dryer for the second stage.

3.21 After drying, the particles are ducted through a primary cyclone in order to recover product. From the cyclone the product/particles are transferred, usually pneumatically, to holding bins. From the holding bins core and surface material are transferred to the blenders. In the blenders the particles are mixed with resin and any other additive that may be required to give the final board specific properties. Resin is mixed with the wood particles using spray nozzles, tubes or atomisers.

3.22 The blender then discharges the resinated material into a plenum over a belt. The belt conveys the resinated material to the forming machine. The forming machine deposits the material as a continuous mat. The forming machine uses air to convey the resinated material, which is dropped, or thrown, into an air chamber above a moving belt or screen. The material then floats down into position. Where different layers are required, different forming heads can be used in series, or air currents can produce a gradation of particle size from face to core.

3.23 As the material (now a mat) leaves the forming machine it may be pre-pressed prior to trimming and pressing. The mats are then cut to the desired length and conveyed to the press. The press applies heat and pressure to activate the resin and bond the fibres into a solid panel. **Figure 3.3** shows a schematic of a mult-opening press. Platens range in size from 1.2m x 2.4m to 2.4m x 8.5m. The total press time is generally 2.5 minutes for single-opening presses and 4.2 - 5.8 minutes for multi-opening presses. Typical production capacities are shown in **Table 5**.

Figure 3.3: Schematic of multi-opening board press

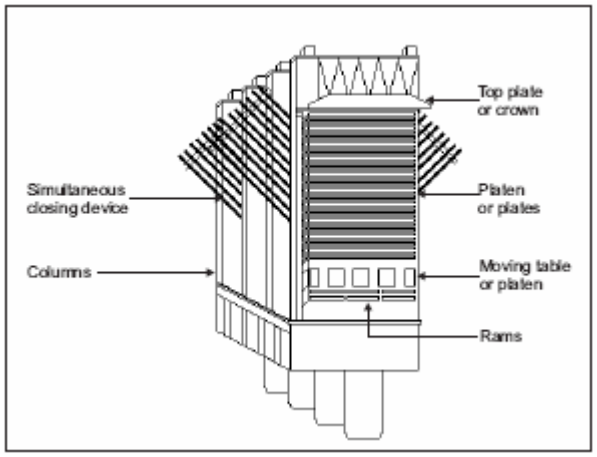


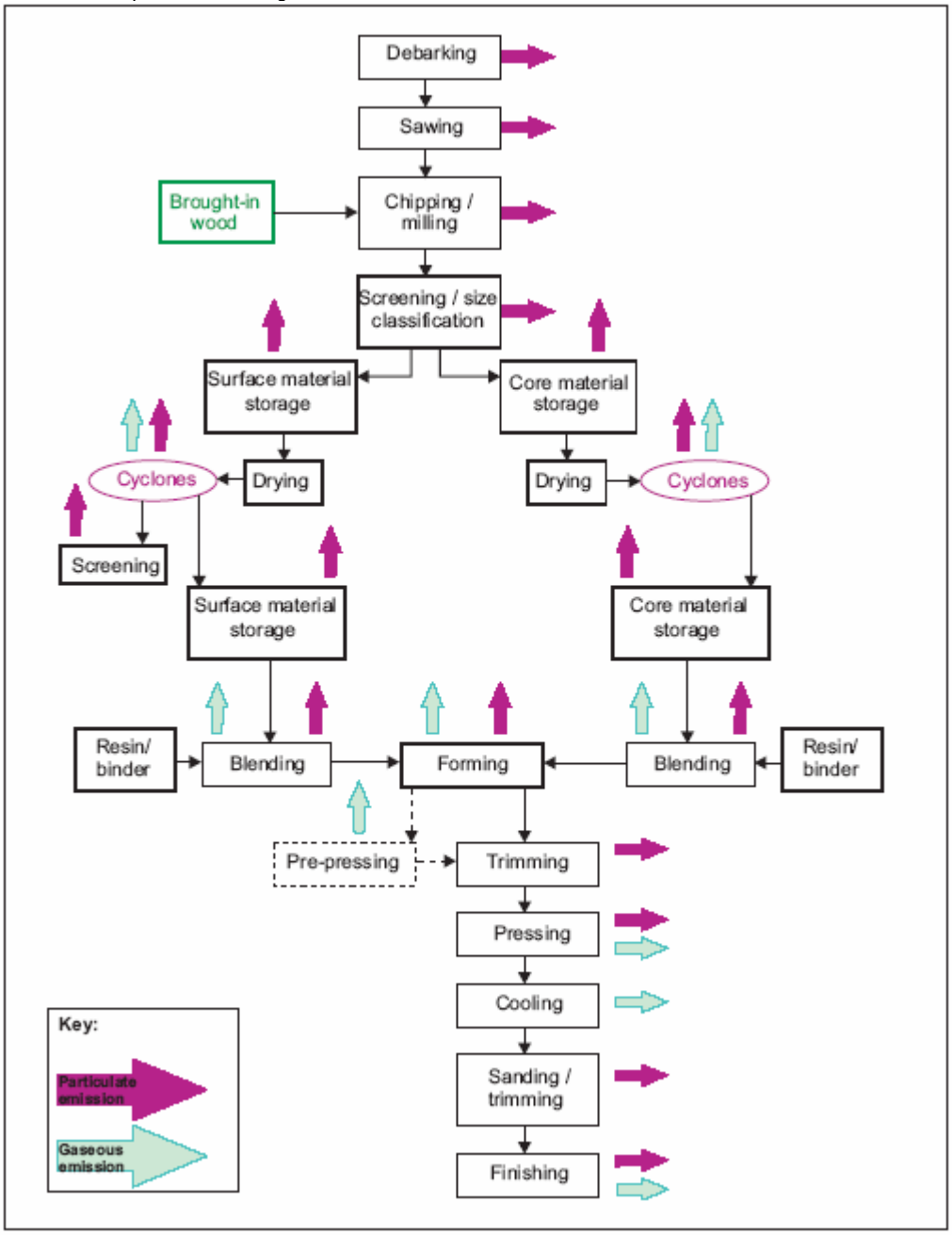
Table 5 : Typical production capacities

	Single opening presses	Continuous presses	Multi-opening
Production capacity (per day)	260 – 1100 m^3	900 – 1800 m^3	500 – 1200 m^3
Operating temperature range	Up to 220 ^oC	Up to 200 ^oC	Up to 200 ^oC

3.24 Presses are generally heated either by steam, or hot oil and hot water.

3.25 Following the pressing operation, boards are usually cooled before sanding and trimming to the required size. Other finishing operations may include edge painting, the application of a laminate or veneer. The finished product is then packaged ready for despatch.

Figure 3.4: Particleboard process flow diagram



Medium Density Fibreboard (MDF)

3.26 MDF is a "dry formed panel product manufactured from lignocellulosic fibres combined with a synthetic resin or other suitable binder". The panels are compressed in a hot press to a density of between 450 - 950 kg/m3. MDF has a more uniform density throughout the board than particleboard and has smooth tight edges, which can be machined.

3.27 Wood chips are either prepared onsite (by de-barking, sawing, chipping) or bought in from other facilities, for example, sawmills. If required wood chips are washed/steamed to remove dirt and other debris. Refer to **Figure 3.5**.

3.28 The wood chips are steamed or cooked to soften prior to refining. The refiners (also known as attrition mills) use single or double rotating disks to mechanically pulp the chips to obtain wood fibre. This material looks something like light brown cotton wool. The fibre is then transported from the refiners to the drying and blending areas. Typically tube dryers are used to reduce the moisture content of the fibre to the required level. Dryers are typically fired by either gas or oil. Where the moisture content of the fibre is highly variable two-stage dryers may be used; the first stage to equalise the moisture content, the second stage is the main dryer. The drying and blending sequence is dependent upon the method used to blend or mix the resin with the fibre. Some plants inject resins into a short retention time blender; other plants inject resin into a blowline system. Where resin is added in a separate blender, the fibres are dried and separated from the gas stream by a primary cyclone, then conveyed to the blender. In the blender the fibre is mixed with resin and any other additive as required and conveyed to a dry storage bin. Typically urea-formaldehyde (UF) resin is used, however, melamine resins, polymeric diphenylmethane di-isocyanate resin (pMDI) and phenolic resins may also be used.

3.29 Where a blowline is used the fibre is blended with resin (and other additives as required) in the blowline that discharges to the dryer. After drying the resinated fibre is separated from the gas stream by a primary cyclone and then conveyed to a dry fibre storage bin.

3.30 From the dry storage bin resinated fibre is pneumatically transferred to the forming machine. In the forming machine resinated fibre is deposited onto a continuously moving belt or screen. The continuously formed mat is pre-pressed before being loaded into the hot press. Depending upon the type of press some operations may trim the mat between pre-pressing and final hot press. The recycled material from this trimming is fed back into the forming machine.

3.31 The final press applies heat and pressure to activate the resin and bond the fibres into a solid panel. The mat may be pressed in a continuous hot press, or the pre-compressed mat may be cut into individual mats that are then loaded into a batch type hot press.

3.32 Press platens are typically heated by thermal oil. After pressing, the boards are cooled, sanded, trimmed to the required dimension and finished, prior to packing for despatch.

Figure 3.5: MDF process diagram

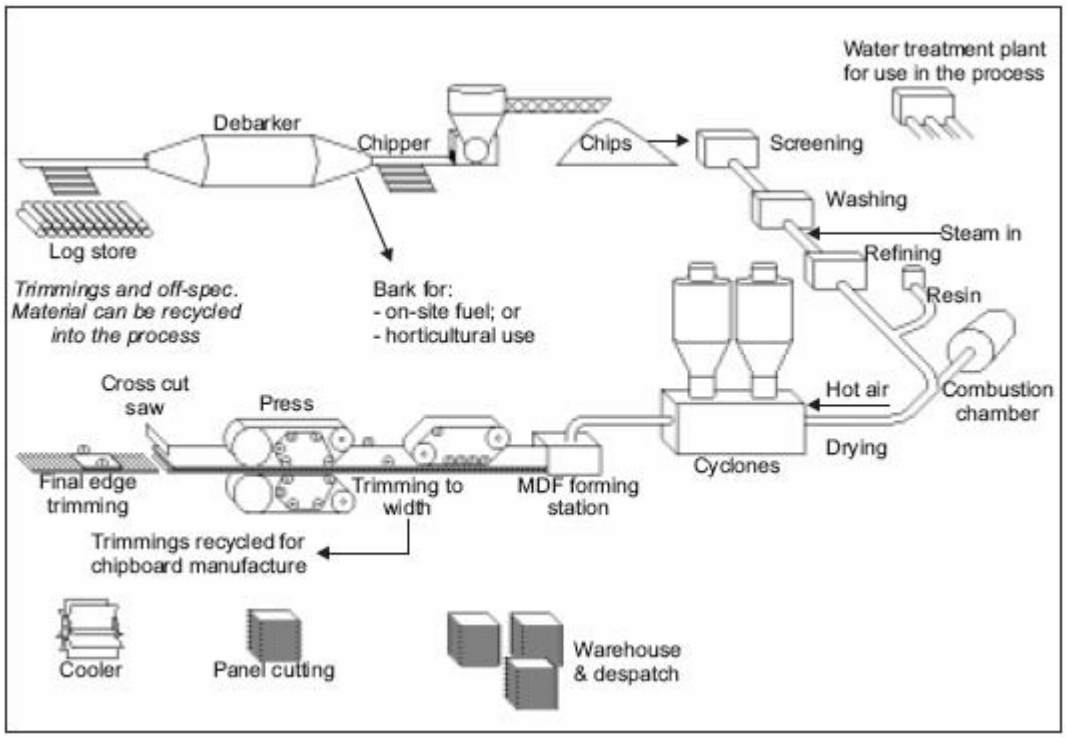
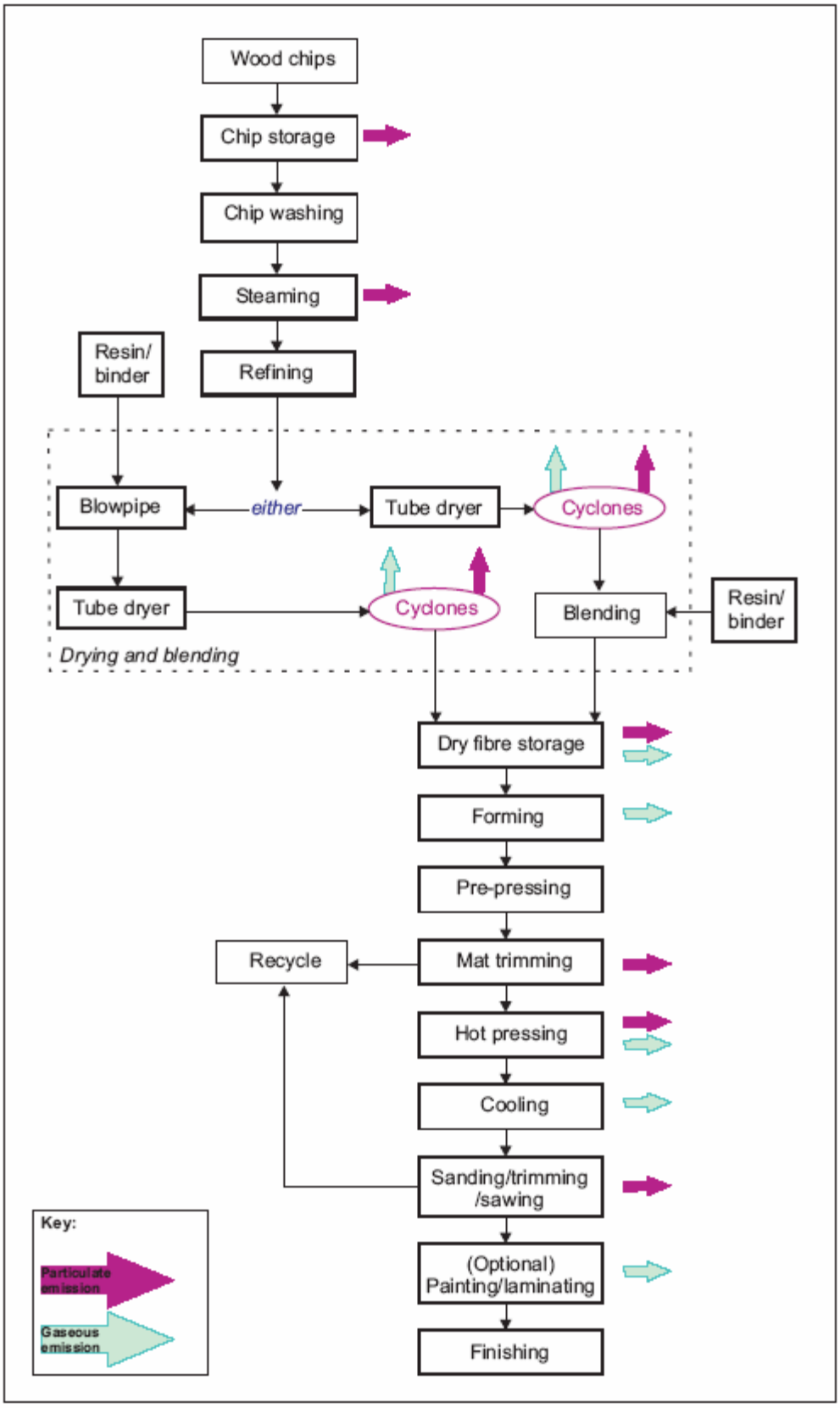


Figure 3.6: MDF process flow diagram



Oriented Strand Board (OSB)

3.33 Oriented strand board (OSB) panels are structural panels made from wood flakes specially produced from logs at the plant. **Figure 3.8** shows a typical process flow diagram for OSB manufacture. Whole logs are cut to approximately 2.5 metre lengths then passed through the de-barker. Following de-barking the wood may be cut into lengths of approximately 0.84 metres. These lengths are referred to as bolts. From this point the wood (or bolt) is fed into the flakers, where the logs are sliced into flakes approximately 3.8 cm wide by 3 cm long by 0.07 cm thick. Flakes are then either conveyed to storage bins or screened to separate surface material from core material prior to storage. This storage is termed “wet storage”.

3.34 Flakes are dried to a moisture content of between 4 - 10%. This is a low moisture content in order to compensate for the moisture that is gained during the addition of resin or other additives. Dryers are normally fired with wood residue from the plant, but may also be capable of using oil or gas as a fuel. Dryers are normally dedicated to drying either core or surface material, this allows the moisture content of the material to be adjusted independently. Such independent adjustment is important where different resins are used in core and surface materials.

3.35 Following drying the flakes are pneumatically conveyed from the dryer and separated from the gas stream at a primary cyclone. Here, flakes are screened to remove fines and separated by surface area and weight. The gas stream continues through the cyclone and collected fines are passed to dry storage bins for use as fuel in either the boiler or wood dryer.

3.36 The dried flakes are conveyed from the cyclone to the blender where they are mixed with resin, wax and other additives as required. Phenol-formaldehyde (PF) is most commonly used in the UK although pMDI and melamine urea formaldehyde (MUF) resins may be used. The resins used require the application of heat for curing. From the blender, the resinated flakes are metered out on a continuously moving screen.

3.37 The flakes are oriented either by electrostatic forces or mechanically into a single direction as they fall to the screen below. The next layer of flakes is oriented perpendicular to the previous layer. The alternating orientation of the layers result in a structurally superior panel when compared to random orientation of flakes (waferboard). The continuously formed mat is cut to the required length then passed to the accumulation press loader and sent to the hot press. The press applies heat and pressure to activate the resin and bond the wafers into a solid reconstituted product. In most hot presses heat is provided by thermal oil which is generated from a boiler fed on wood waste from the site. After cooling the bonded panel is trimmed to its final dimensions, finished (if required) and packaged ready for despatch.

Figure 3.7: OSB process diagram

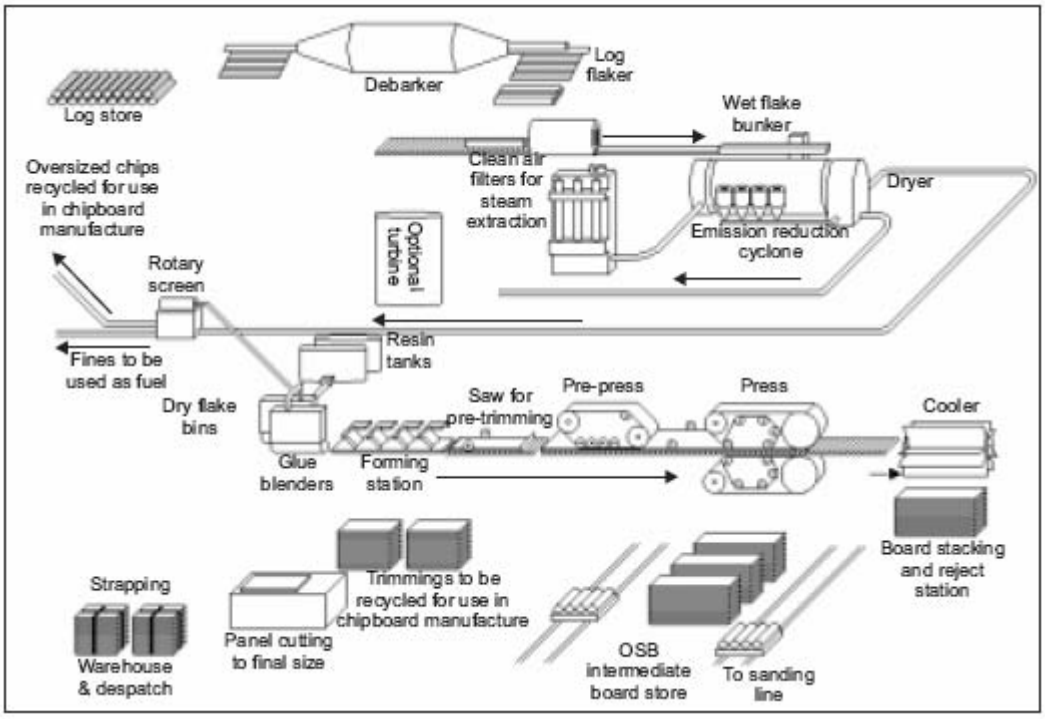
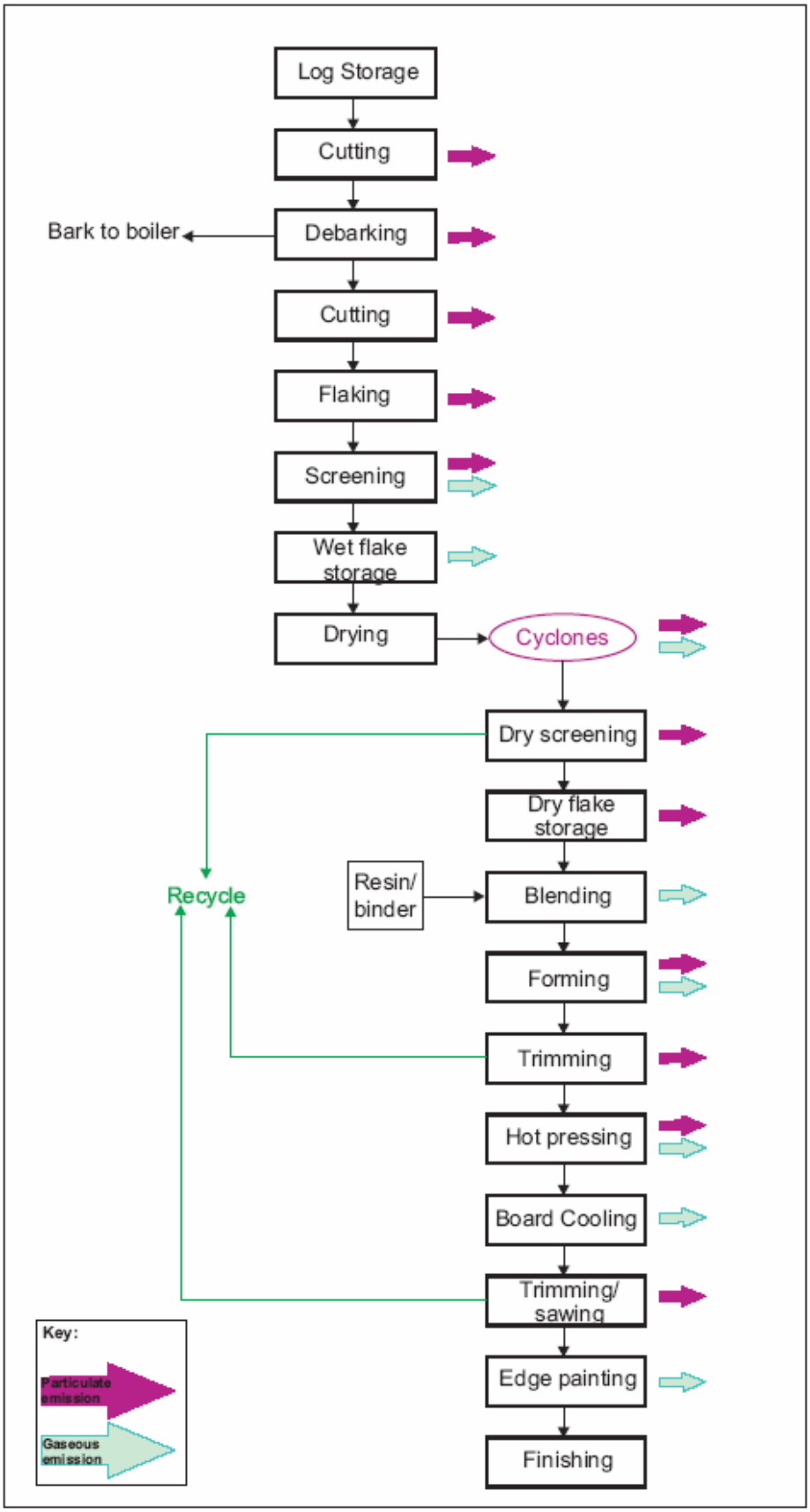


Figure 3.8: OSB process d diagram



Key Environmental Impacts

Environmental impact

Water: sources of waste water include:
- WESP and wet scrubbers
- plant wash down water
- chip wash / chip steaming effluent (MDF)
- surface water run-off

Land: refer to Accidents

Air: releases from the dryers and presses include:
- formaldehyde and other volatile organic compounds, total aldehydes and particulate matter from dryers
- particulate matter, formaldehyde and other volatile organic compounds from presses. Three factors affect formaldehyde emissions from presses:
  - the press temperature
  - the quantity of excess formaldehyde content in resin, and
  - the amount of resin used

Other releases include:
- phenol (from PF) or isocyanate (from pMDI) depending upon the resin used
- water vapour from WESP and wet scrubbers
- particulate matter from debarking, size reduction operations and cyclones
- ammonia from the breakdown of the urea (where UF resin used)
- combustion gases from boiler plant

Waste: the range of solid wastes include:
- offcuts, trimmings, sander dust, fines, ash from combustion activities, WESP crumb, MDF fibre, chipwash solid waste, cake from belt presses in effluent treatment plants and off-spec material
- oils and greases and other spent or contaminated lubricants

Energy: composite wood based panel manufacture requires significant quantities of both heat and electricity. The largest use of heat is for drying chips, fibre or flake.

Accidents: key aspects of the process that could give rise to accidents which may have significant environmental impact are:
- blockages caused by “choked” woodchips or fibres within the cyclones which could give rise to excessive particulate matter emissions
- leaks from storage tanks
- spillage when filling storage tanks
- resin spillage causing land contamination
- failure of abatement systems
- fires, either within the process or in the raw materials storage areas

Noise: Debarking and chipping wood can be very noisy. Standard noise protection measures should be taken to minimise disturbance in the local neighbourhood.

Emissions control

Point source emissions to air

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

- SOx, NOx and CO from the combustion plant
- particulates from wood comminution, sieving and screening operations and other sources as identified in **Figure 3.4**, **Figure 3.6** and **Figure 3.8**
- formaldehyde and other aldehydes from wood and resins
- phenols and/or isocyanates from wood and resins (where PF or pMDI is used)
- other VOC from the timber/wood
- odorous compounds from both wood and resins

3.39 **Figure 3.9** is a schematic representation of a WESP (Wet Electrostatic Precipitator) widely used in this sector in the UK to control emissions.

3.40 The WESP is a device for which there are many versions and styles available the main components are as follows:

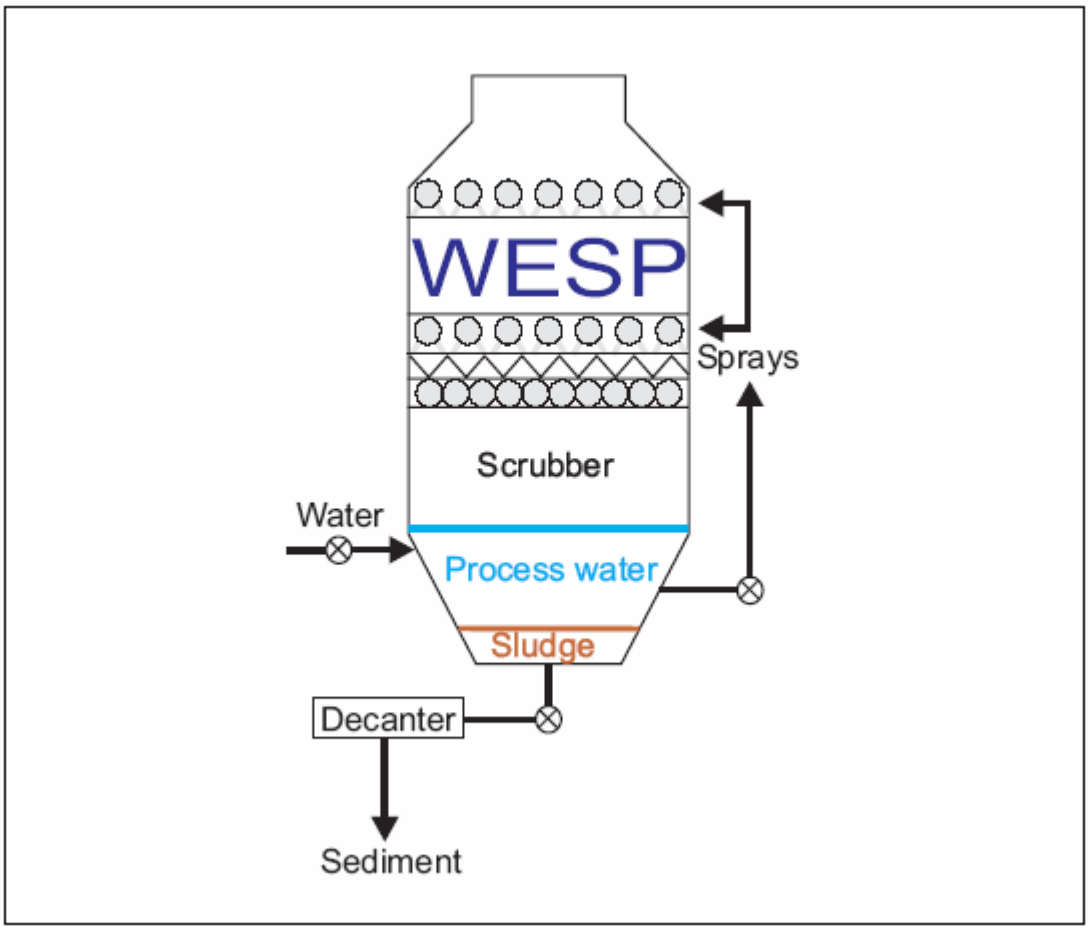
- An insulated and lagged shell
- Collection plates
- Discharge electrodes
- Wet Scrubber
- Decanter system
- Hoppers

A WESP operates by having dust laden gases pushed or pulled through the shell with the assistance of a fan. The air flow is channelled into lanes formed by the collection plates or tubes. Discharge electrodes are centred between each collection plate/tube to provide a negative charge to the surrounding dust particles. The collection plates/tubes are positively grounded and act as a magnet for the negatively charged dust particles. The collected dust is washed down the collection plates by a flow of water into the collection hopper.

3.41 Key control / performance parameters for a WESP include:

- high tension / high voltage at the electrode
- corona current
- rinse water quality
- quench water quality
- inlet air temperature
- exit exhaust temperature
- temperature of circulating liquor
- washdown period
- washdown frequency

Figure 3.9: Wet Electrostatic Precipitator (WESP)



Dispersion and dilution of stack emissions

3.42 The basis upon which stack heights are calculated using HMIP Technical Guidance Note D1 (D1) (**Ref 5**) is that pollutants are dispersed and diluted in the atmosphere to ensure that they ground at concentrations that are harmless under the theoretical conditions of the D1 model. The emission limits in this sector note should be used as the basis for stack height calculation. The stack height so obtained is adjusted to take into account local meteorological data, local topography, nearby emissions and the influence of plant structure. It is necessary that the assessment also takes into account the relevant air quality standards that apply for the emitted pollutants.

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

3.43 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.

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

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

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

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

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

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

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

3.50 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

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

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

BAT

All releases to air
The operator should:

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

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

3 Ensure that hot emissions take place from the minimum practicable number of stacks, in order to obtain

maximum advantage from thermal buoyancy. This is particularly important when new plants are being designed or when changes are being made to existing processes. If practicable a multi-flue stack should be used.

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

5 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.

6 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.

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

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

9 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.

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

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

12 Ensure that stacks are not fitted with any restriction at the final opening such as a plate, cap or cowl, with the exception of a cone which may be necessary to increase the exit velocity of the emissions.

Process operations

The operator should:

13 Ensure that fumes from all pressing, curing, impregnation and coating operations are captured and extracted to suitable abatement plant, where necessary to meet the emission limits in **Table 3**.

14 Ensure that the inlet and outlet temperatures of wood dryers are as low as practicable, whilst achieving the necessary final moisture content of the wood, in order to meet the emission limits in **Table 3**.

15 Certain drying processes use high efficiency cyclones to separate the fibre after drying. In such circumstances where a WESP is not used, the minimum stack height for exhaust gases from the cyclones should be 30 metres unless methods are used for substantially reducing the quantity of water vapour and steam from the final emission.

Point source emissions to controlled surface water and sewer

3.52 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.

3.53 The amount of process water used in Medium Density Fibreboard plants is high and discharges comprise principally:

- discharge from the steaming or cooking of wood chips
- site drainage and stormwater

3.54 The amount of process water used in particleboard and Orientated Strand Board plants is low and discharges comprise principally:

- discharge from the chip cleaning plant
- site drainage and stormwater

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

- water use should be minimised and wastewater reused 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 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

3.56 Minimising the use of water and minimising the level of pollutants in each water stream are the primary aims, followed by the recycling of waste water streams wherever possible. In this industry cleaning the water to 20 mg/l of suspended solids is likely to ensure that most of the insoluble pollutants will be within their normal limits. Such cleaned water would generally be of good quality and should be considered for recycling - however it is also important to consider the levels of dissolved chemicals before concluding that recycling of the water is viable.

3.57 For board gas cleaning, wet cleaning systems are universally applied, with a wet cleaning system there is no need for an aqueous discharge if appropriate measures are taken to clean the water and recycle it. As long as solids are removed to a level acceptable to the scrubbing device solubles can normally be allowed to reach saturation without any adverse effects

3.58 Abatement for the removal of suspended solids may be appropriate for achieving ELVs for other determinands given in Table 4.

3.59 Oils and grease may be present in drainage from yard areas. Yards should be designed to minimise contamination of drainage in order to meet the 20 mg/l ELV for Total Suspended Solids in Table 4. Should water treatment be needed either separators can be used . It is not likely that chemical treatment would be needed but can be used as an additional measure.

3.60 Additional abatement is unlikely to be needed in achieving the ELV for BOD given in Table 4. However, in IPPC the prevention or reduction of BOD is also subject to BAT and further reductions which can be made at reasonable cost should be carried out. Furthermore, irrespective of the receiving water, the adequacy of the plant to minimise the emission of specific persistent harmful substances must also be considered.

3.61 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.

Local Authority Regulation

3.62 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."

Off site effluent treatment

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

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

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

Further guidance on regulating water discharges from A2 Installations can be found in AQ11(05) (Ref 3).

BAT

The operator should ensure that:

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

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

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

19 For new plant, water used for wet abatement should be recycled in a closed circuit in order to minimise or avoid effluent discharge

20 Where necessary to protect the environment, process effluent is channelled / transported to suitable effluent treatment plant.

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

Point source emissions to groundwater

3.65 There should be no intentional point source emissions of List I and List II substances to groundwater from the particleboard, orientated strand board and dry process fibreboard sector (**Ref 13**).

BAT

22 There should be no intentional point source emissions of List I and List II substances to groundwater.

Fugitive emissions to air

3.67 Common sources of fugitive emissions are:

- storage areas (e.g. bays, stockpiles etc.)
- the loading and unloading of transport containers
- transferring material from one vessel to another
- conveyor systems
- pipework and ductwork systems (e.g. pumps, valves, flanges, catchpots, drains, inspection hatches etc.)
- poor building containment and extraction
- potential for bypass of abatement equipment (to air or water)
- accidental loss of containment from failed plant and equipment including leakage e.g. from WESP

BAT

23 Operations such as handling and transfer of dusty materials, finishing and handling of odorous raw materials should be controlled to minimise fugitive emissions.

24 Operations should also be controlled with the aim of preventing visible emissions.

25 Where dusty materials are handled, dust should normally be controlled by covering of skips and vessels, using enclosed conveyors, spraying water on conveyors, minimising drops and by avoiding outdoor or uncovered stockpiles.

26 External surfaces of the process buildings, roofs, guttering, ancillary plant, roadways and open yards and storage areas should be inspected at least annually. Cleaning operations should be carried out if necessary to prevent the accumulation of dusty material using methods which minimise emissions of particulate matter to air

27 When transferring volatile liquids, the following techniques should be employed; subsurface filling via filling pipes extended to the bottom of the container; the use of vapour balance lines that transfer the vapour from the container being filled to the one being emptied; or an enclosed system with extraction and abatement where necessary to minimise offensive odour at the site boundary.

28 Vent systems should be chosen to minimise breathing emissions (e.g. pressure/vacuum valves) and, where relevant, be fitted with knock-out pots and appropriate abatement equipment.

29 Stocks of dusty, or potentially dusty, materials should be stored in such a manner as to minimise wind whipping and loading to and from stockpiles should be carried out so as to minimise emissions to the air.

30. All dusty materials should be stored in covered containers, purpose-built silos, sealed bags or undercover whenever practicable.

31. Transport of dusty materials should be carried out so as to prevent or minimise airborne particulate matter emissions. Vehicle speeds should be adjusted accordingly. Double handling of dusty materials should be avoided.

32. A high standard of housekeeping should be maintained. All spillages should be cleared as soon as possible; solids by vacuum cleaning, wet methods, or other appropriate techniques. Dry sweeping of dusty spillages should not be permitted in circumstances where it may result in the generation of airborne dust.

Fugitive emissions to controlled surface water, sewer and groundwater

3.68 The operator should have a clear diagrammatic record of the routing of all installation drainage for surface water and process effluent, to include subsurface pipework, the position of any sumps and storage vessels including the type and broad location of the receiving environment[2].

3.69 An inspection and maintenance programme should be established for all subsurface structures. Inspection frequencies and test methods should be chosen to prevent pollution by minimising leaks from subsurface pipework, sumps and storage vessels, having regard to the risk factors in paragraph **3.71** below.

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

3.70 Examples of inspection and test methods are pressure tests, leak tests, material thickness checks, and CCTV survey. Using secondary containment and/or leakage detection can serve to reduce the inspection frequency to the minimum quoted in paragraph **3.69**.

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

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

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

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

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

3.73 Operational areas comprising site transport routes(1)and wood storage areas should be equipped with an impervious surface, spill containment kerbs, sealed construction joints, and connection to a sealed drainage system. All such areas should be identified on a site plan held at the operator's premises. The reason for these provisions is the potential leakage of transport pollutants on roadways and the leaching of resins (which have a high BOD) in storage areas. Management controls should be put in place, involving, in particular, regular checks of the condition of the impervious surface to ensure its integrity is maintained. These checks should identify whether there are any parts which require maintenance to prevent the seepage of polluting liquids. The results of all such inspections should be recorded in the log book together with any necessary maintenance action arising.
Storage areas for roundwood ought not to need these measures provided groundwater is more than 1 metre below ground level and that soil porosity (measured by BS6297 at ground level) is greater than 100Sec/mm.
It should also normally be acceptable to exempt from these measures storage areas for other wood which are either a) used temporarily for a just a short number of weeks in any year, or b) used only

[2] The Groundwater Regulations 1998 require that List I substances are prevented from entering groundwater, and that List II substances are controlled so that pollution of groundwater does not occur. Any discharge of listed substances onto or into land must be subject to a prior investigation under the terms of the Groundwater Regulations, and this investigation should be carried out by the applicant and submitted in support of the permit application.

for small quantities of wood and consequently are not likely to give rise to significant leachate, subject to the same provisos concerning groundwater and soil porosity or risk assessment.

(1) Site Transport Routes do not include vehicular movement areas between storage piles on wood storage areas as spill containment kerbing in these areas will interfere with the operation of plant.

3.74 The operator should ensure that all tanks containing liquids whose spillage could be harmful to the environment are contained. Bunds should be impermeable and resistant to the stored materials, have no outlet (drains, soakaways etc) and drain to a blind collection point. Pipework should be routed within bunded areas with no penetration of contained surfaces. Bunds should be designed to have a holding capacity of at least 110% of the largest tank and be located more than 10m from watercourses and 50m from drinking water boreholes

It is good practice for bunds to be fitted with a high-level probe and an alarm as appropriate and are inspected regularly by the operator. Rainwater should be prevented from entering bunds, but any spills and rainwater accumulations should be removed as soon as possible.

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

BAT

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

34. The operator should identify the potential risk to the environment from drainage systems above and, an inspection and maintenance programme devised having regard to materials transferred, the age of the drainage systems and the local vulnerability of groundwater

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

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

37. All storage tanks should be located within bunds that are designed, constructed and located following to appropriate standards and ensuring that the volume is more than 110% of the largest tank.

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

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

Odour

3.76 Typically the most odorous processes involve the drying and pressing of the raw wood flakes and chips .

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

Assessment

3.78 Operators should assess the likely sources of odour and carry out olfactory assessments at the site boundary. Odour control should be carried out in the following order of priority:

- Prevention - substitution
- Containment and extraction
- Abatement

3.79 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 due to extreme weather conditions. It may be necessary to include additional controls to avoid offensive odours, for example where local meteorological conditions frequently lead to poor dispersion conditions.

3.80 The overall aim should be that all emissions are free from offensive odour outside the installation boundary, as perceived by the regulator. The locality will influence the assessment of the potential for odour impact for example local meteorological conditions (all predicted wind directions and weather conditions) which may lead to poor dispersion conditions. 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, operations should still be optimised as described above.

Prevention

3.81 Operators should seek to prevent and minimise odours from the installation by prevention i.e. by reducing the production of odorous chemicals.

Minimisation

3.82 Where odour generation is not preventable, odours should be minimised at source and/or contained with effective treatment prior to discharge.

Containment, Extraction and Abatement

3.83 The odour impact should be assessed to determine whether additional controls are required such as extraction and abatement are needed in order to minimise the odour impact.

3.84 In the case of existing processes where odour abatement equipment has been installed, the regulator should consider permitting the use of the existing equipment provided that emissions from the equipment do not result in offensive odours beyond the installation boundary. The regulator should still require that the available equipment is optimised for odour removal and should establish the odour abatement efficiency based upon operating data. Where emissions from the odour abatement equipment are still leading to offensive odours beyond the process boundary, the equipment should be upgraded.

BAT

40. Operators should conduct odour assessments to determine whether emissions result in offensive odours at or beyond the installation boundary

Management

3.85 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.

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

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

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

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

Operations and maintenance

3.88 **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

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

3.90 **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.

3.91 **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.

BAT

Environmental Management System

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

Operations and maintenance

42. Effective operational and maintenance systems should be employed on all aspects of the installation whose failure could impact on the environment. As a minimum this should include, abatement plant, extraction fans and also major 'non productive' items such as tanks, pipework, retaining walls, bunds, ducts and filters. Such systems should be reviewed and updated annually.

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

44. For equipment referred to in 43 (above):
    - Alarms or other warning systems should be provided, which indicate equipment malfunction or breakdown.
    - Such warning systems should be maintained and checked to ensure continued correct operation, in accordance with the manufacturer's recommendations
    - Essential spares and consumables for such equipment should be held on site or be available at short notice from suppliers, so that plant breakdown can be rectified rapidly.

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

Competence and training

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

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

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

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

Accidents/incidents/non conformance

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

Raw Materials

3.92 This section covers the use of raw materials and water and the techniques for optimising their use and minimising their impact by selection (Energy and fuels are covered under **Energy**).

3.93 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

3.94 Raw materials used in processes consist of:

- roundwood logs
- woodchips
- recycled woodchips
- slabwood
- sawdust/shavings/fines
- resins e.g. urea-formaldehyde resin (UF), phenol-formaldehyde (PF), polymeric di-phenylmethane
- di-isocyanate resin (pMDI)
- other additives e.g. waxes

3.95 Examples of good practice in materials selection is:

- use of recycled timber
- re-use of water within the process
- minimising the use of resins
- use of biodegradable hydraulic oil

3.96 The primary consideration for operators when selecting board making techniques is the ability of the plant to produce board of the required quality at a competitive price. The key factor that can differentiate one product from another is the resin (and any additive used in its manufacture). Quality requirements feed forward to board manufacture, and ultimately to the raw materials to be used. However when selecting a new resin system or reviewing an existing one, the environmental impact should be considered and where practicable, a resin system selected with a reduced impact.

3.97 Different resins are used depending on the required product. Urea-formaldehyde resins tend to be used in boards intended for interior applications. Phenol-formaldehyde resins are generally used in boards for exterior applications. Other additives may be used, for example, melamine as a waterproofing agent, waxes to impart water resistance and increase the stability of the finished product under wet conditions and to reduce the tendency for equipment plugging. Ammonium salts may be used as an additive to impart fire retardant qualities. Catalysts may be mixed with resin and particles during blending to accelerate the time taken for the resin to cure and to reduce the time required in the press. Formaldehyde scavengers may also be added to the product at the blending step to reduce formaldehyde emissions from the process

3.98 The criteria in Table 6 should be considered when selecting raw materials

Table 6: Selection of raw materials

Raw material	Selection criteria
Timber	Timber should be free from contaminants (paint, oil, grease or rubber and plastic).
Water	Identify most sustainable source (consider recycled sources)
Fuel oils	Sulphur content should be minimised. The maximum sulphur content of heavy fuel oil shall be 1% by weight from 1st January 2003.*
Resins and Waxes	Resin system – consider generation of odours etc.
*Sulphur in liquid fuels regulations, Regulation 3 (3) states that combustion plant (other than new large combustion plant covered by the LCPD for which there is a separate provision) can burn heavy fuel oil with a sulphur content greater than 1% so long as the sulphur dioxide emissions from the plant is less than or equal to 1700mg/m3 at 3% oxygen dry. Defra is the enforcing authority for these regulations.	

3.99 When selecting alternative raw materials, operators should ensure that decisions are taken on the basis of their environmental impact, whilst not compromising board quality and product integrity.

BAT

51. The operator should adopt procedures to control the specification of those types of raw materials with the main potential for environmental impact, such as input timber quality and resin materials in order to minimise any potential environmental impact. An annual review of alternative raw materials should be carried out with regard to environmental impact.

Waste minimisation (optimising the use of raw materials)

3.100 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".*

3.101 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

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

3.103 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.

3.104 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.

3.105 Monitoring and mapping material usage in this way can be carried out to determine benchmarks in terms of the amount of any given raw material used per tonne of product manufactured. Assessment against benchmarks can reveal whether the process is being maintained "in control" or to trigger investigations in to why raw material usage is increasing.

3.106 There should be continuous movement towards more Sustainable Consumption and Production (i.e. doing more for less) as laid out in Government Guidance " Changing Patterns - UK Government Framework for Sustainable Consumption and Production" (**Ref 7**). Section 3.3 of the guidance identifies advice and funding programmes available to achieve more sustainable production practices. The National Industrial Symbiosis Programme shares information across all industrial sectors to produce guidance and case studies for resource efficiency (**Ref 7**). See also Envirowise Guides (**Ref 7**) for information.

BAT

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

53. The operator should carry out a waste minimisation audit at least as frequently as the permit review period. If an audit has not been carried out in the 2 years prior to submission of the application it should be completed within 18 months of the issue of the first PPC 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.

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

55. For all board types minimisation of waste production should be achieved by a range of good practice measures such as computer controlled charging operations, simulation models, management and operational procedures to improve board yield and to optimise material flows

Water use

3.107 For significant users, 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.

3.108 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 6**.]

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

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

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

3.111 The volumes of water used by an installation should normally be metered so that water efficiency audits can be carried out and benchmarks can be set for optimal efficiency. In addition, sub-processes that are principal water users should be metered to optimimise water usage at individual process plant (see BAT 56).

BAT

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

57. Using information from the audits (referred to in 56 above), opportunities for reduction in water use should be assessed and, where appropriate, should be carried out in accordance with a timescale approved by the regulator.

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

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

60. Hosing down should not be used where vacuuming, scraping or mopping could be employed.

61. Trigger controls should be employed on all hoses, hand lances and washing equipment.

Waste handling

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

3.113 Other than scrap board, the most important wastes are:

- particulate matter collected in bag or cartridge filters from abatement
- scrubber liquors and sludges, and output from the effluent treatment plant
- chemical and oil containers
- general inert industrial waste
- packaging waste including wood and paper
- metals from packaging

Environmental impact

Water:	Not significant
Land:	Fugitive releases, particularly leaks from liquid wastes or “empty” containers.
Air:	Fugitive dust from handling and transfer.
Waste:	wastes are disposed of to landfill or are recycled offsite
Energy:	Not significant
Accidents:	Not significant
Noise:	Not significant

BAT

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

63. Operators should segregate the main waste types described in paragraph 3.113.

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

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

66. Liquid wastes should be stored in sealed containers in bunded areas. Operators should ensure that procedures are in place to deal with damaged or leaking containers.

Waste re-use, recovery, recycling or disposal

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

3.115 **Table 7** summarises the routes currently taken by the various waste streams from a typical board site. Whether re-use, recovery or recycling is possible at a particular site will depend on the particular fuels and raw materials being used, the products being made and the methods of operation employed. The table reflects where recycling can be achieved when the appropriate combination of these factors is in place.

- Scrap board recycling should be optimised. Recovery of board can minimise the need for raw material.
- Where recycling cannot be achieved scrap board can be beneficially used by third parties in the production of packaging provided the boards are kept dry and separate from other materials.

3.116 Operators should seek to establish markets for the recovery or recycling of wastes generated within the installation. In addition, the Waste & Resources Action Programme (WRAP) researches and can provide guidance into recycling of other wastes such as wood, paper, cardboard and plastics (**Ref 9**).

BAT

67. The operator should carry out an annual review to demonstrate that the best environmental options are being used for dealing with the waste streams listed on **Table 7**.

68. The operator should regularly investigate potential markets for the recovery/re-use of wastes that are currently disposed of to landfill.

Table 7: Solid waste stream: routes currently taken

Process waste stream	Fate
Wood process residues	Recycled where possible or energy recovered
Metal from screening of incoming timber	Recycled
Minerals from screening of incoming timber	Recycled where possible, or landfilled
Plastics from screening of incoming timber	Recycled where possible, or landfilled
Particulate matter collected in abatement plant	Recycled where possible, or landfilled
Scrubber liquors and sludges	Minimised, then to licensed waste disposal contractors
Wood, cardboard and paper	Segregated for off site re-use or recovery
Oil	Recovery off site

Energy

3.117 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 EUETS commitments

or

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

Basic energy efficiency requirements

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

BAT

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

70. 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.)

71. In order to optimise combustion, the operator should, where practicable, monitor carbon monoxide and oxygen in waste gases.

72. The operator should ensure that all plant is operated and maintained to optimise the use and

minimise the loss of energy.

73. 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

3.119 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

74. 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
    - phase optimisation of electronic control motors
    - optimised efficiency measures for combustion plant e.g. air/feedwater preheating, excess air etc.
    - plant layout to reduce pumping distances

Energy supply techniques

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

Accidents

3.120 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

3.121 Further guidance can be found in chapter 20 of the General Guidance Manual and provide guidance that may be relevant in the event of fire. See also **Ref 10** and **Ref 11**.

Identification of the hazards

3.122 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 silos or storage tanks)
- overfilling of 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

Identification of the risks

3.123 The hazards having been identified, the process of assessing the risks should address the following:
- how likely is the particular event to occur (source frequency)?
- what substances are released and how much of each (risk evaluation of the event)?
- where do the released substances end up (emission prediction - what are the pathways and receptors)?
- what are the consequences (consequence assessment – what are the effects on the receptors)?
- what are the overall risks (determination of overall risk and its significance to the environment)?
- what can prevent or reduce the risk (risk management – measures to prevent accidents and/or reduce their environmental consequences)?

Measures to reduce the risks (identified by risk assessment)

3.124 Risk reduction can be achieved by process management controls and preventative measures. The following techniques will be relevant to most installations, although this is not an exhaustive list.

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

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

- where indicated by the site-specific assessment of risks, containment or abatement for accidental emissions from vents and safety relief valves/bursting discs should be provided.
- where this may be inadvisable on safety grounds, attention should be focused on reducing the probability of the emission

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Accidents/incidents/non conformance

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

77. The operator should maintain an accident management plan covering the matters listed in paragraphs 3.122 to 3.124 above and to the satisfaction of the regulator. The plan should be available for inspection by the regulator.

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

Specific conditions

79. Specific conditions may need to be included within permits to prevent accidents. Examples of these are given in 80 - 87 below.

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

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

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

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

84. Operators should use safe systems for the handling and storage of wood fibre used for fibreboard manufacture in order to minimise the risk of fire and explosion which would cause an emission of smoke, particulate matter and other combustion products to air and deposition of wood fibre to land.

85. Storage of raw wood in the form of chip or sawdust in stockpiles should be time limited to prevent spontaneous combustion. Operators should record stockpile creation times and should ensure stockpile is completely moved within a timescale agreed with the regulator to prevent combustion.

86. Operators should carry out and record an assessment of the risk of explosion within enclosed buildings. Mitigation should be provided based on the findings of the explosive assessment .

87. Operators should maintain procedures for the removal of blockages caused by “choked” woodchips or fibres within the cyclones which could give rise
    - to excessive particulate matter emissions
    - fires

Noise and Vibration

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

3.126 The most significant source of noise arises as a result of the following activities:
- timber handling (deliveries and charging)
- other raw material handling
- fans and motors
- vehicle movements
- de-barking
- flaking and other timber reducing operations
- activities using compressed air

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

3.128 Following investigation of the impact of the installation, systems to minimise the environmental impact of the noisiest operations should be employed. The level of noise control required depends on the scale of operations and the proximity of operations to the public. Table 8 identifies the noisiest operations and the control measures the have been employed to mitigate problems.

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

Table 8: Noise Mitigation Measures

Operation	Control Measure
Timber Deliveries	▪ storage in enclosed area ▪ Minimising deliveries at night* ▪ Minimise the drop height for deliveries*
Timber Handling	▪ Develop storage systems to avoid double handing ▪ Use screens and barriers to conceal noise sources*
Site Vehicle Movements	▪ Using vehicles with “directional and locallised sound” for reverse alarms to concentrate noise at the area of immediate danger ▪ Replacing diesel powered forklift trucks with electric or LPG powered ▪ Minimising vehicle movements at night ▪ Using even roadways for vehicle movements
de-barking and flaking	▪ Acoustic screens and enclosures* ▪ Cushion impacts using resilient linings ▪ Make chutes and tables less effective noise radiators
Fans, pumps and motors	▪ Acoustic screens, enclosures and baffles ▪ Fitting silencers to avoid noise travelling along ducting ▪ Selection of less noisy engineering equipment
General	▪ Fitting noise reducing flaps to outside doors ▪ Maintaining a closed doors policy ▪ Improving sound insulation of buildings ▪ Holes and openings closed off (use mechanical where necessary) ▪ Enclose operations within buildings
▪ * Noise mitigation measures that are likely to be needed in most cases	

BAT

88. The operator should identify key plant and equipment with the potential to give rise to significant noise and take such measures as are necessary by way of mitigation and maintenance of existing plant and equipment in order to minimise noise having regard to paragraph 3.126 and Table 8 above.

89. Timber handling systems should be so designed, where practicable (having regard to legitimate space constraints) to avoid double handling and to minimise the drop height for deliveries and loading operations.

90. External log handling should, where practicable, be located in order to minimise noise.

91. Debarking and wood chipping operations should be carried out in enclosed buildings and those parts of the building containing operations with a significant noise-generating potential should be acoustically sound.

92. Drying and cyclone systems may give rise to duct and fan noise. Housing and / or suitable silencers should be used on relevant ducts and fans where necessary to minimise noise emissions.

Monitoring

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

Standards for monitoring equipment and procedures

3.131 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

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

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

3.133 Guidance on standards for monitoring releases (to air, water and land) relevant to IPPC can be found in Reference 8

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

3.135 If in doubt the operator should consult the regulator.

Monitoring and sampling protocols

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

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

Monitoring frequency

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

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

- the variability of monitoring results, for example, results which range from 15 - 45 mg/m$_3$, against an emission limit of 50 mg/m$_3$ might not qualify for a reduction in monitoring
- the margin between the results and the emission limit, for example, results which range from 45 - 50 mg/m$_3$ when the limit is 50 mg/m$_3$ might not qualify for a reduction in monitoring

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

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

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

Monitoring emissions to air

3.142 The reference conditions of substances in releases to air from point sources are: temperature 273.15 K (0°C), pressure 101.3 kPa (1 atmosphere) and measured wet, no correction for water vapour. To convert measured values to reference conditions, see Technical Guidance Note M2 (**Ref 12**) for more information.

Monitoring emissions to water

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

- the specific volume flow from the process to sewer/controlled water
- the quality of the receiving water

- the volume of discharge compared to the percentage dry river flow of the receiving water

Environmental monitoring (beyond installation)

3.144 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

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

Monitoring of process variables

3.146 Some process variables will have potential environmental impact and these should be identified and monitored where they have an environmental relevance. For board activities, examples of monitoring these variables include:
- keeping inventories of materials used and disposed of
- monitoring for contaminants in raw materials where there is inadequate supplier information
- monitoring temperature or pressure where relevant, for example compression oil temperature, pressure drop across bag filters
- plant efficiency monitoring, for example scrap reclamation plant efficiency

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Monitoring and reporting

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

94. The operator should notify the regulator at least 7 days before any periodic monitoring exercise to determine compliance with emission limit values. The operator should state the provisional time and date of monitoring, pollutants to be tested and the methods to be used

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

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

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

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

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

of alarms should be automatically recorded and readings should be on display to appropriately trained operating staff

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

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

Monitoring and reporting of emissions to air

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

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

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

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

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

107. Where abatement equipment is required to comply with the particulate matter provisions of this note then the particulate matter emissions should be continuously monitored to indicate the performance of the abatement plant. Where airflow is less than 150 m3 per minute, surrogate parameters as an alternative to continuous monitoring may be considered where the operator can demonstrate equivalent control to the satisfaction of the regulator.

108. Where wet scrubbers are being used, monitoring surrogate parameters may be acceptable as an alternative to continuous monitoring where the operator can demonstrate equivalent control. Scrubber liquor flow should be continuously monitored, triggering an alarm and stand-by pump in the event of pump failure.

Monitoring and reporting emissions to water and sewer

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

110. 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.

111. 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

112. The following should be monitored and recorded:
- quantity nature and origin of the waste
- the physical description of the waste
- a description of the composition of the waste
- any relevant hazardous properties (hazard and risk phrases)
- European Waste Catalogue code
- handling precautions and substances with which it cannot be mixed

Information Provisions

3.147 This guidance note contains many provisions relating to information. There are two general categories of information identified in this note:
- Reports or notifications
- Additional information

3.148 Reports are required and notifications are information that should be sent to the regulator at a frequency that is specified in this guidance. Such information provisions are summarised in Table 9a below.

Table 9a: Summary of Provisions for Reporting and Notification

BAT Clause	Provision	Information Category	Frequency
BAT 43	List of key process equipment and process and abatement equipment whose failure could impact on the environment	Report	Within 12 months of publication of this note
BAT 95 & 96	Report of results from non-continuous emission testing forwarded to the regulator.	Report	Within 8 weeks of the completion of the sampling – typically annual
BAT 46	Notification of appointed competent person to liaise with the regulator and the public with regard to complaints	Notification	Reactive
BAT 78	Investigation of abnormal emissions arising from an accident. Remedial action taken immediately. Prompt recording of the events and actions taken. Notification of the regulator without delay*	Notification	Reactive
BAT 94	Notification at least 7 days before any periodic monitoring exercise to determine compliance with ELVs	Notification	Reactive
BAT 97	Investigation of results exceeding an ELV from any monitoring activity and malfunction or breakdown leading to abnormal emissions. Corrective action taken immediately. Notification without delay* identifying the cause and corrective action taken.	Notification	Reactive

***Without delay** In most cases it should be enough to notify the local authority (by telephone or facsimile) within an hour of the start or detection of the emission. Local authorities will wish to consider what notification arrangements to require outside working hours.

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

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

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

Examples of documents include

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

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

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

3.152 Additional information provisions are summarised in Table 9b below.

Table 9b: Summary of Provisions for Additional Information

BAT Clause	Category	Subject
BAT 6	Procedures	Start-up and shut down, and changes of fuel or combustion load in order to minimise emissions
BAT 34	Procedures	Leak prevention from subsurface structures (control, maintenance and inspection).
BAT 39	Procedures	Preventative maintenance programme for tanks bunds and sumps
BAT 41	Procedures	Environmental Management System. Records of EMS audits
BAT 42*	Procedures	Operational and maintenance systems for all aspects of the installation whose failure could impact on the environment – annual review
BAT 47 & 48	Procedures	Formal structure of employee's responsibility for process control and environmental impacts and training provisions
BAT 50	Procedures	Investigating accidents, incidents and non-conformance
BAT 51*	Procedures	Control the specification of raw materials with respect to their environmental impact. Review of alternative raw materials
BAT 66	Procedures	Dealing with damaged or leaking containers
BAT 76	Procedures	Incidents and near misses investigation. Corrective action and following up
BAT 81	Procedures	Spills and firewater control to ensure containment and disposal of liquids
BAT 82	Procedures	Systems to avoid excessive transfer rates of solids
BAT 84	Procedures	Safe systems for the handling and storage of wood fibre
BAT 18	Records	Inspections and maintenance of interceptors
BAT 26	Records	Inspections of external surfaces of process buildings, roofs, guttering, ancillary plant, roadways and open yards and storage areas
BAT 34	Records	Subsurface structure mapping
BAT 39	Records	Visual inspection of tanks, bunds and sumps
BAT 40	Records	Odour assessments
BAT 45	Records	Analysis of breakdowns in order to eliminate common failure modes.
BAT 53 & 54*	Records	Waste minimisation audits and improvement programme
BAT 56 & 57*	Records	Water efficiency audit and water efficiency improvement programme
BAT 59	Records	Water usage measurements
BAT 62*	Records	Waste inventory and treatment method
BAT 67*	Records	Annual review of waste disposal and recovery options
BAT 69*	Records	Annual energy audit
BAT 77*	Records	Accident management plan
BAT 88	Records	Identification of key plant and equipment with the potential to give rise to significant noise. Mitigation measures
BAT 95	Records	Results from continuous monitoring systems
BAT 100	Records	Maintenance and calibration of continuous monitoring systems
BAT 111	Records	Analysis for Schedule 5 substances (where needed)
BAT 112	Records	Records of waste monitoring and recording

* Information that Regulators may be more likely to ask operators to send them copies of rather than relying only on inspection

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

All the information listed in tables 9a and b is considered necessary either

a) for regulators to keep a watch on the performance of an installation (e.g. monitoring data and who is the competent person to liaise with over complaints) or on the operator's efforts to improve performance (e.g. waste minimisation and energy audits), and/or

b) for operators to maintain an appropriate level of control over the installation, and which regulators should have access to should they wish to check that the information is being properly kept or to examine the information for regulatory purposes.

References

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

Ref 1 *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 Surface water & Groundwater Protection Guidance
- AQ11 (05) - Regulating water discharges from A2 Installations. Available via the Defra website **www.defra.gov.uk**
- Groundwater Protection Code – Solvent Use and Storage, Defra 2004

Ref 4 'Envirowise (formerly the Environmental Technology Best Practice Programme, ETBPP), Harwell International Business Centre, Didcot, Oxfordshire OX11 0QJ. Helpline 0800 585794. Good Practice Guides:
- GG025 Saving Money Through Waste Minimisation: Raw Material Use
- GG067 Cost-Effective Water Saving Devices and Practices
- GG152 Tracking Water Use to Cut Costs
- GC24 Effluent costs eliminated by water treatment

.

Ref 5 *HMIP Technical Guidance Note (Dispersion) D1,* 1993 The Stationery Office ISBN 0 11 752794 7 **(Environment Agency website)**

Ref 6 Water efficiency references available from Envirowise:
- GC22, Simple measures restrict water costs,
- GG26, Saving money through waste minimisation: Reducing water use, GG26

Ref 7 Management, Resource Efficiency and Waste Minimisation References
- Defra/DTI - Changing Patterns - UK Government Framework for Sustainable Consumption and Production Sept 2003
- National Industrial Symbiosis Programme **www.nisp.org.uk/**
- Envirowise, GG025, Saving money through waste minimisation: Raw Material Use

Ref 8 Process Optimisation References
- EN315 Support for the paper and board industry
- GG156 Cost-effective Effluent Treatment in Paper and Board Mills
- GG111 Practical Water Management in Paper and Board Mills
- GG151 Environmental Management Systems in Paper Mills
- GG195 Increasing Profit Through Improved Materials Additions: Technical Guide for Paper Mills
- GG194 Increasing Profit through Improved Materials Additions

Ref 9 Waste & Resources Action Programme (WRAP), The Old Academy, 21 Horse Fair, Banbury, Oxon OX16 0AH. **helpline@wrap.org.uk**

Ref 10 *BS 5908: Code of Practice for Fire Precautions in the Chemical and Allied Industries*

Ref 11 *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 **(Environment Agency website)**

Ref 12 Monitoring Guidance **(Environment Agency website)**

- *M1 Sampling requirements for monitoring stack emissions to air from industrial installations,* Environment Agency July 2002
- *M2 Monitoring of stack emissions to air.* Environment Agency October 2004
- *Guidance on sampling and testing of wastes to meet landfill waste acceptance procedures*. Environment Agency Version 4.3a December 2003
- *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*

Abbreviations

BAT	Best Available Techniques
BOD	Biochemical Oxygen Demand
BREF	BAT Reference Document
CCA	Climate Change Agreement
CEM	Continuous Emissions Monitoring
CHP	Combined Heat and Power plant
CO2	Carbon Dioxide
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
DPA	Direct Participation Agreement
ELV	Emission Limit Value
EMS	Environmental Management System
ETP	Effluent Treatment Plant
EU	European Union
EQS	Environmental Quality Standard
HC	Hydrogen Chloride
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
SO2	Sulphur Dioxide
TSS	Total Suspended Solids
TOC	Total Organic Carbon
VOC	Volatile Organic Compound
WAG	Welsh Assembly Government
WESP	Wet Electrostatic Precipitator