Sector Guidance Note

IPPC S6.05

Integrated Pollution Prevention and Control (IPPC)

Guidance for the Textile Sector

ENVIRONMENT AGENCY

ENVIRONMENT AND HERITAGE SERVICE

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Note:

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Executive summary

This guidance has been produced by the Environment Agency for England and Wales in collaboration with the Scottish Environment Protection Agency (SEPA) and the Northern Ireland Environment and Heritage Service (EHS). Together these are referred to as "the Regulator" in this document. Its publication follows consultation with industry, government departments and non-governmental organisations.

What is IPPC

Integrated Pollution Prevention and Control (IPPC) is a regulatory system that employs an integrated approach to control the environmental impacts of certain industrial activities. It involves determining the appropriate controls for industry to protect the environment through a single permitting process. To gain a Permit, Operators will have to show that they have systematically developed proposals to apply the 'Best Available Techniques' (BAT) and meet certain other requirements, taking account of relevant local factors.

The Regulators intend to implement IPPC to:

- protect the environment as a whole;
- promote the use of "clean technology" to minimise waste at source;
- encourage innovation, by leaving significant responsibility for developing satisfactory solutions to environmental issues with industrial Operators; and
- provide a "one-stop shop" for administering applications for Permits to operate.

Once a Permit has been issued, other parts of IPPC come into play. These include compliance monitoring, periodic Permit reviews, variation of Permit conditions and transfers of Permits between Operators. IPPC also provides for the restoration of industrial sites when the permitted activities cease to operate.

This Guidance and the BREF

This UK Guidance for delivering the PPC (IPPC) Regulations in the Textiles sector is based on the BAT Reference document BREF (see Ref. 1) produced by the European Commission. The BREF is the result of an exchange of information between member states and industry. The quality, comprehensiveness and usefulness of the BREF is acknowledged. This guidance is designed to complement the BREF and is cross-referenced to it throughout. It takes into account the information contained in the BREF and lays down the standards and expectations in the UK (England and Wales, Scotland and Northern Ireland) for the techniques and standards that need to be addressed to satisfy the Regulations. The reader is advised to have access to the BREF. It should be stressed that the change in the definition of the processes that are included will mean that many processes originally not covered by IPC will now be covered by IPPC Regulations.

The aims of this Guidance

The aims of this Guidance are to:

- provide a clear structure and methodology which Operators making an application should follow to ensure that all aspects of the PPC Regulations (see Appendix 2 for equivalent legislation in Scotland and Northern Ireland) and other relevant Regulations have been addressed (see Section 1.2), and it should thereby assist the Operator to make a satisfactory application;
- minimise the effort by both Operator and Regulator in the permitting of an installation by use of clear indicative standards and the use of material from previous applications and from accredited Environmental Management Systems (EMSs);
- improve the consistency of applications by ensuring that all relevant issues are addressed;
- increase the transparency of the permitting process by having a structure in which the Operator's response to each issue, and any departures from the standards, can be seen clearly;
- improve consistency of regulation across installations and sectors by facilitating the comparison of applications;
- provide a summary of the BAT techniques for pollution control from the BREF and UK experience which are relevant in the UK context expressed, where possible, as clear indicative standards and which need to be addressed by Applicants;
- provide an arrangement of information which allows the reader to find, quickly all of the guidance associated with:
  - a subject (e.g. accidents, energy or noise) (Sections 2.1 and 2.5 - 2.11);
  - the technical areas (e.g. Wool scouring and effluent treatment (Sections 2.3 - 2.4);
- particular emissions (e.g. NOx or pesticides) (Section 3).

Additionally, to assist Operators in making applications, separate, horizontal guidance is available on a range of topics such as waste minimisation, monitoring, calculating stack heights etc. The majority of this guidance is available free through the Environment Agency, SEPA or EHS (Northern Ireland) web sites (see References).

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1.1 Understanding IPPC and BAT

IPPC and the Regulations

Integrated Pollution Prevention and Control (IPPC) is a regulatory system that employs an integrated approach to control the environmental impacts of certain industrial activities. It involves determining the appropriate controls for industry to protect the environment through a single permitting process. To gain a Permit, Operators will have to show that they have systematically developed proposals to apply the 'Best Available Techniques' (BAT) and meet certain other requirements, taking account of relevant local factors.

The essence of BAT is that the selection of techniques to protect the environment should achieve an appropriate balance between realising environmental benefits and costs incurred by Operators.

IPPC operates under the Pollution Prevention and Control (England and Wales) Regulations, (see Ref. 3 and Appendix 2). These Regulations have been made under the Pollution Prevention and Control (PPC) Act 1999 and implement the EC Directive 96/61 on IPPC. Further information on the overall system of IPPC, together with Government policy and more detailed advice on the interpretation of the Regulations, can be found in the Department of the Environment, Food and Rural Affairs (DEFRA) document *IPPC: A Practical Guide,* (see Ref. 4).

Installation based, NOT national emission limits

The "BAT" approach of IPPC is different from regulatory approaches based on fixed national emission limits (except where General Binding Rules have been issued by the Secretary of State). The legal instrument which ultimately defines BAT is the permit and this can only be issued at the installation level.

Indicative BAT standards

Indicative BAT standards (essentially for BAT but also covering other aspects) are laid out in national guidance (such as this) and should be applied unless there is strong justification for another course of action. It should be noted that BAT includes both the technical components of the installation given in Section 2 and the benchmark levels identified in Section 3. Departures from those standards, in either direction, can be justified at the local level taking into account the technical characteristics of the installation concerned, its geographical location and the local environmental conditions. Notwithstanding this, if there are any applicable mandatory EU emission limits, they must be met, although BAT may go further than them.

BAT and EQSs

The "BAT" approach is also different from, but complementary to, regulatory approaches based on Environmental Quality Standards (EQS). Essentially BAT requires measures to be taken to **prevent** or, where this is not practicable, to reduce emissions. That is, if emissions can be reduced further, or prevented altogether, at reasonable cost, then this should be done **irrespective** of whether any environmental quality standards are already being met. It requires us not to consider the environment as a recipient of pollutants and waste, which can be filled up to a given level, but to do all that is practicable to minimise the impact of industrial activities. The process considers what can be reasonably achieved within the installation first (this is covered by Sections 2 and 3 of this Guidance) and only then checks to ensure that the local environmental conditions are secure, (Section 4 of this Guidance and Ref. 6). The BAT approach is, in this respect, a more precautionary one, which may go beyond the requirements of Environmental Quality Standards.

Conversely, it is feasible that the application of what is BAT may lead to a situation in which an EQS is still threatened. The Regulations therefore allow for expenditure beyond BAT where necessary. However, this situation should arise very rarely assuming that the EQS is soundly based on an assessment of harm. The BAT assessment, which balances cost against benefit (or prevention of harm) should in most cases have come to the same conclusion about the expenditure which is appropriate to protect the environment.

Advice on the relationship of environmental quality standards and other standards and obligations is given in *IPPC: A Practical Guide,* (see Ref. 4) and in Section 3.

Assessing BAT at the sector level

The assessment of BAT takes place at a number of levels. At the European level, the EC issues a BAT reference document (BREF) for each sector. The BREF is the result of an **exchange of information** which member states should take into account when determining BAT, but which leaves flexibility to member states in its application. This UK Sector Guidance Note takes into account the information contained in the BREF and lays down the indicative standards and expectations in the UK. At this national level, techniques which are considered to be BAT should, first of all, represent an appropriate balance of costs and benefits for a typical, well-performing installation in that sector. Secondly, the techniques should normally be affordable without making the sector as a whole uncompetitive either on a European basis or worldwide.

Assessing BAT at the installation level

When assessing the applicability of the sectoral, indicative BAT standards at the installation level departures may be justified in either direction as described above. The most appropriate technique may depend upon local factors and, where the answer is not self evident, a local assessment of the costs and benefits of the available options may be needed to establish the best option. Individual company profitability is **not** considered.

In summary, departures may be justified on the grounds of the technical characteristics of the installation concerned, its geographical location and the local environmental conditions, but not on grounds of individual company profitability. Further information on this can be found in the Guide for Applicants, (see Refs. 4 and 5).

Costs may only be taken into account at the local level:

- where the BAT cost/benefit balance of an improvement only becomes favourable when the relevant item of plant is due for renewal/renovation anyway (e.g. BAT for the sector may be to change to a different design of furnace when a furnace comes up for rebuild). In effect, these are cases where BAT for the sector can be expressed in terms of local investment cycles.
- where a number of expensive improvements are needed, a phasing programme may be appropriate as long as it is not so long as to be seen as rewarding a poor performing installation, (see Ref. 6 for more details).

Innovation

The Regulators encourage the development and introduction of new and innovative techniques which meet the BAT criteria and are looking for continuous improvement in the overall environmental performance of the process as a part of progressive sustainable development. This Sector Guidance Note describes the appropriate indicative standards at the time of writing. However, Operators should keep up to date with the best available techniques relevant to the activity and this Note may not be cited in an attempt to delay the introduction of improved, available techniques. Furthermore, the technical characteristics of a particular installation may allow for opportunities not foreseen in the Guidance; as BAT is ultimately determined at the installation level (except in the case of GBRs) it is valid to consider these even where they go beyond the indicative standards.

New installations

The indicative requirements apply to both new and existing activities but it will be more difficult to justify departures from them in the case of new activities. For new installations, the indicative requirements should normally be in place before the commencement of operations. In some cases, such as where the requirement is for an audit of ongoing operations, this is not feasible and indicative upgrading timescales are given for such cases.

Existing installations - standards

For an existing activity, a less strict proposal (or an extended timescale) may, for example, be acceptable where the activity already operates to a standard that is very close to an indicative requirement (see Section 2 for further guidance)

Existing installations - timescales

Upgrading timescales will be set in the improvement programme of the Permit. Improvements fall into a number of categories:

- the many good practice requirements in Section 2, such as management systems, waste, water and energy audits, bunding, good housekeeping measures to prevent fugitive or accidental emissions, energy baseline measures, waste handling facilities and monitoring equipment;
- the larger, usually more capital intensive improvements
- longer term studies required for control, environmental impacts etc.

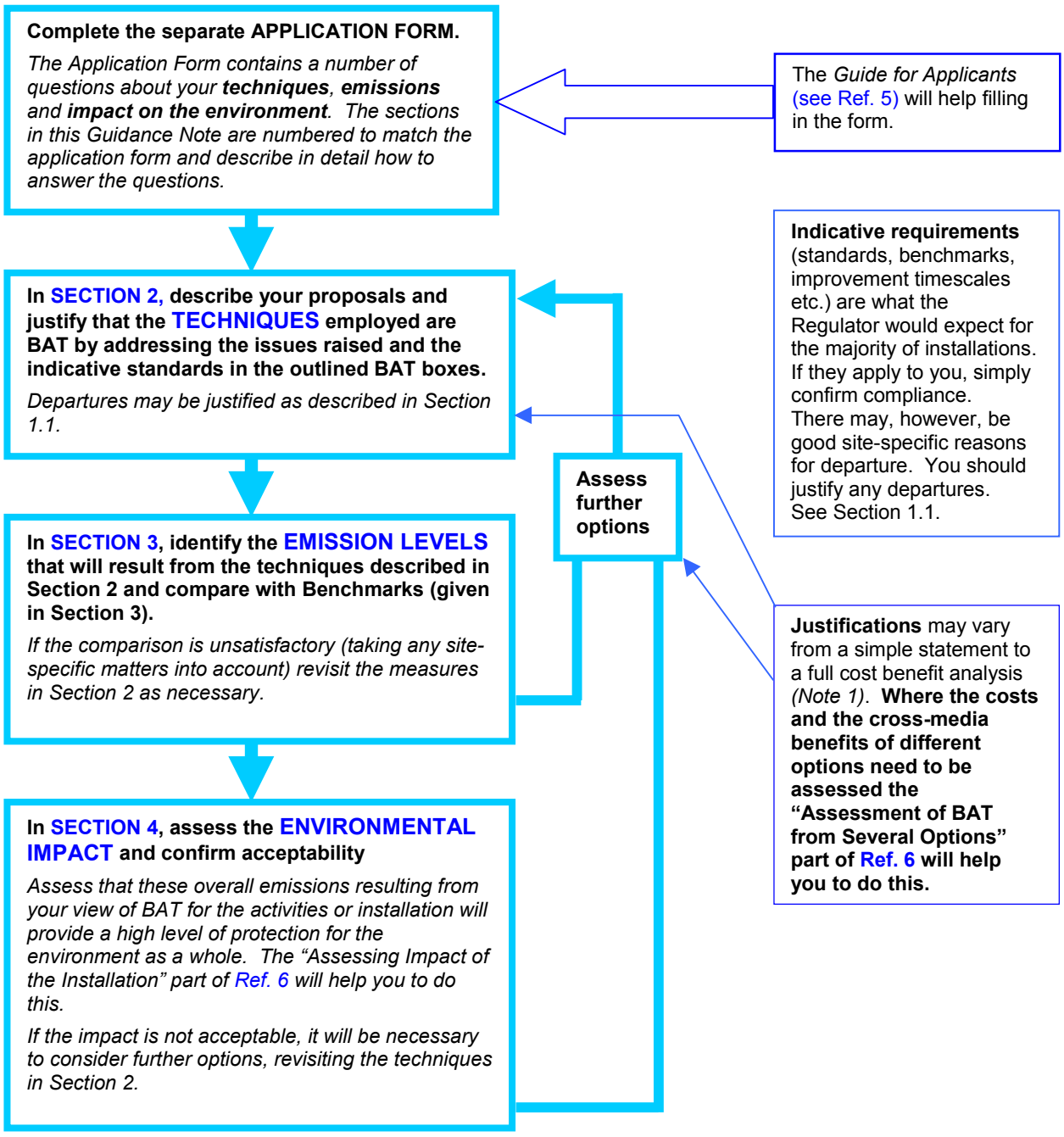
All improvements should be carried out at the earliest opportunity and to a programme approved by the Regulator.

Specific improvements should be carried out within the timescales given below and the whole programme of any other items should be completed at the latest within 3 years of the issue of the permit. Any longer timescales will need to be justified by the Operator in accordance with the principles above.

Improvement	**By whichever is the later of:**
Determine the releases of persistent organic pollutants to water and produce and action plan to reduce them	2 years from the issue of the Permit

The Applicant should include a proposed timetable covering all improvements for example the provision of an Inventory of materials used and a Waste Minimisation programme.

1.2 Making an Application



Note 1 The amount of detail needed to support the application should be sufficient to support the Applicant's contention that either the conditions of the guidance have been met or an alternative measure has been justified. The level of detail should be commensurate with the scale of the operation and its ability to cause pollution. An Applicant is not required to supply detail that could not reasonably be expected to contribute to a decision to issue a Permit.

Note 2 **For existing IPC or Waste Management Permit holders**, your response to each point in Sections 2, 3 or 4 may rely heavily on your previous application. The Regulator does not wish you to duplicate information as long as the previous information adequately addresses the issues. However, the more the information can be reorganised to demonstrate that all the issues have been adequate addressed the better. You will need to send us copies of any information referred to.

Note 3 The contents of the outlined BAT boxes in Sections 2, 3 and 4, and additional blank tables etc., are available electronically on the Environment Agency's Website, for the assistance of Applicants.

1.3 Installations Covered

This Note covers installations, described in Part A (Part A(1) in England and Wales) of Schedule 1 to the PPC Regulations (see Ref. 3) as follows.

6.4 Textile Treatment processes Part A1

b) Pre-treating (by operations such as washing, bleaching or mercerising) or dyeing fibres or textiles in plant with a treatment capacity of more than 10 tonnes per day.

c) Treating textiles if the activity may result in the release into water of any substance listed in paragraph 13 of Part 2 of the Schedule 1 to the Pollution Prevention and Control (England and Wales) Regulations 2000 SI 2000 No.1973 in a quantity which, in any period of 12 months, is greater than the background quantity by more than the amount specified in that paragraph in relation to that substance.

It should be stressed that the addition of 6.4 b) processes means that many processes originally not covered by IPC will now be covered by IPPC Regulations. 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. They include, as appropriate spinning, weaving and finishing processes.

Advice on the extent of the physical site which is contained within the installation, e.g. split sites, is given in *IPPC Part A(1) Installations: Guide for Applicants* (see Ref. 5). Operators are advised to discuss this issue with the Regulator prior to preparing their application.

This Guidance Note covers single and integrated processes to produce textiles and carpets using animal, vegetable, synthetic and mixtures of fibres. The process stages that are described in the BAT Reference Document mainly include: - Fibre Preparation; Pre-treatment before colouring; Dyeing and printing; Finishing and finally Washing.

This note covers all main fibre types: - natural fibres, man made fibres derived from natural polymers (viscose, cellulose etc), man made fibres derived from synthetic polymers together with blends of different fibres. The backing of carpets is also included as it is an intrinsic part of carpet manufacture and has the potential to pollute the environment.

Natural fibres	• Animal origin	Raw wool Silk Hair
	• Vegetable origin	Raw cotton Flax Jute
Natural polymers	• Vegetable origin	Viscose, cupro, lyocell Cellulose acetate Cellulose triacetate
Synthetic polymers	• Petrochemical origin	Polyester (PES) Polyamide (PA) Polyacrylonitrile (PAC) Polypropylene (PP) Elastane (EL)
Mineral fibres		Asbestos Glass fibre Metal fibres

Table 1 Different fibre types

Textile finishing operations can take place at different stages of the production process: not only the fibres, but also the yarn and the cloth can form the substrate for finishing. Textile finishing includes preparation, pre-treatment, bleaching, applying optical brighteners, colouring, top finishing, and finishing.

The following diagram shows the various stage involved and also the inputs and outputs from these stages.

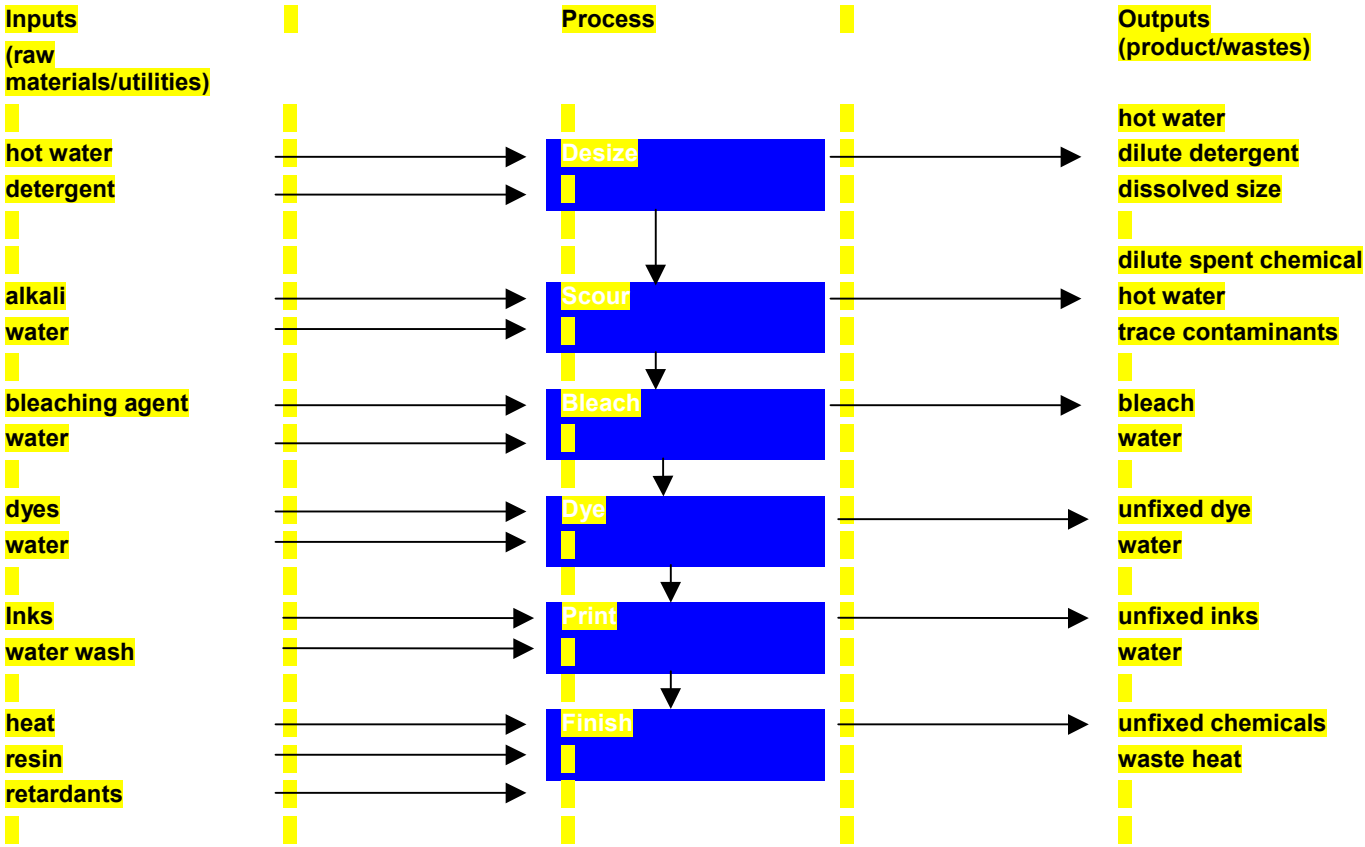


Figure 1: Input and outputs from various textile-processing stages

An example based on the production of carpets is shown below, **other textile production sequences follow similar routes.**

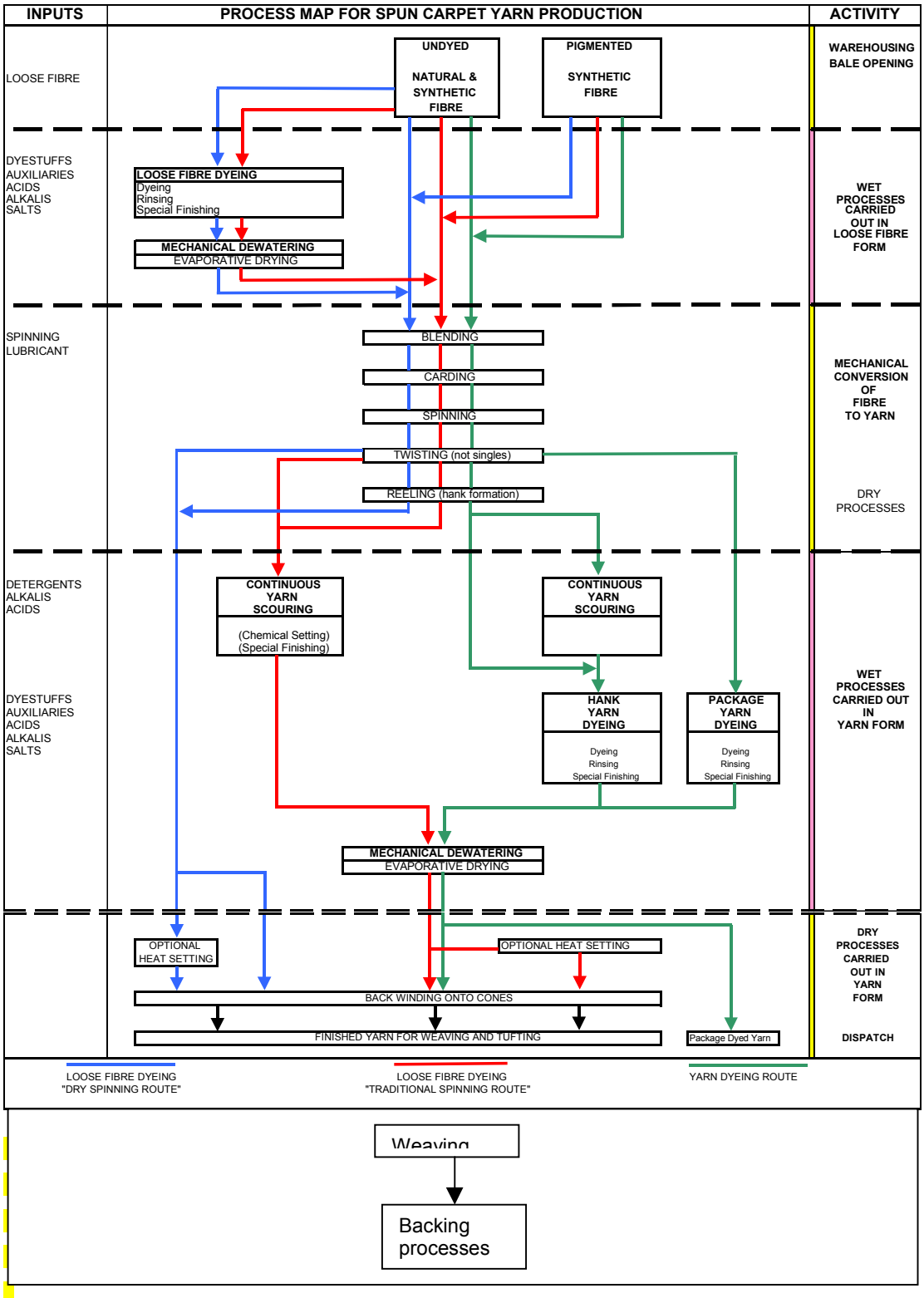


Figure 2 Example of the process stages for carpet manufacture

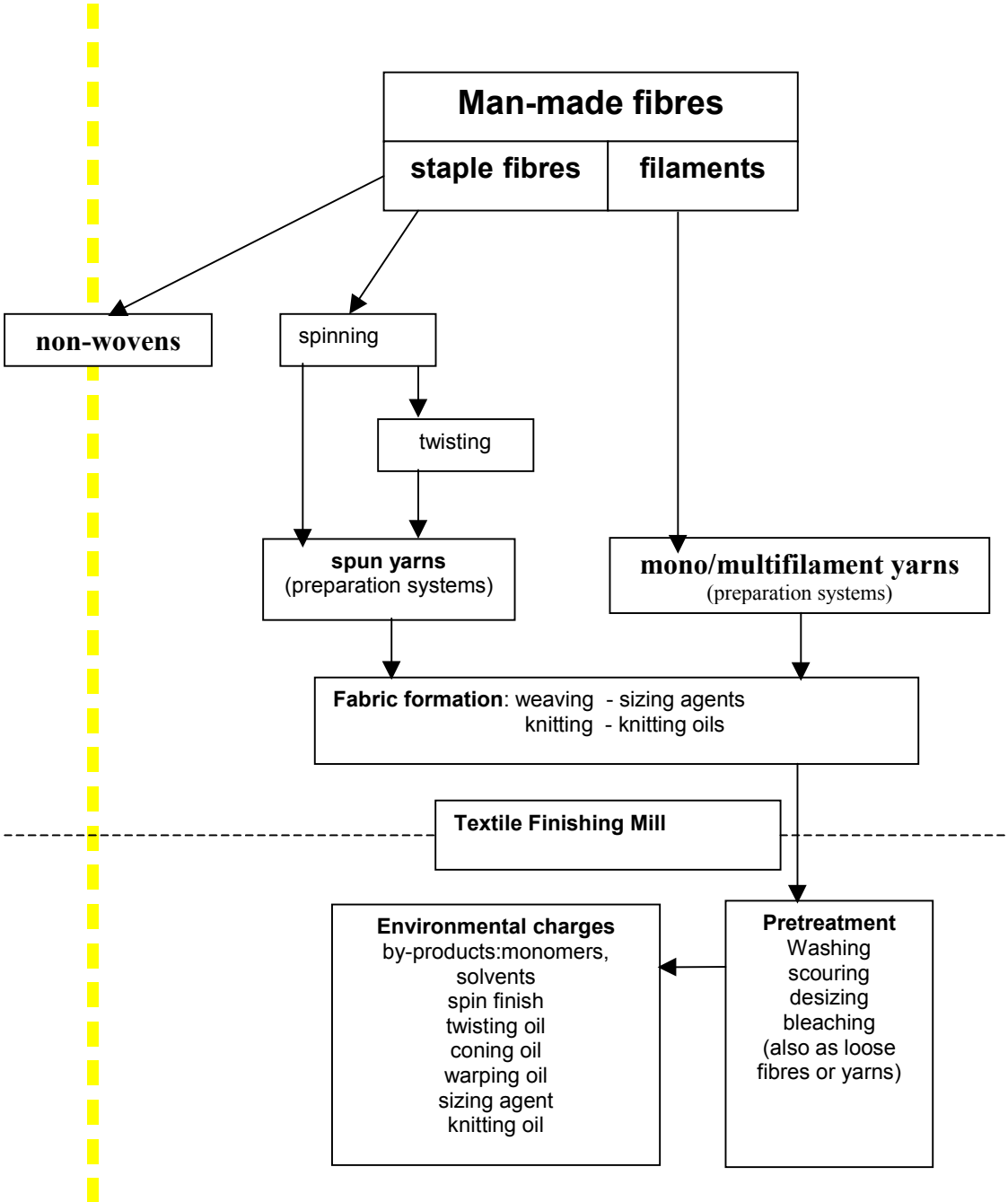


Figure 3: Example of the process stages for textile production

1.4 Review Periods

Permits can be reviewed or varied at any time. However, the PPC Regulations impose a requirement on Regulators to review Permits in certain specific circumstances such as where the pollution caused by the installation is of such significance that the existing emission limit values need to be revised or new limits set.

In addition, Regulators are required to review the conditions of Permits "periodically". The Government stated in its third consultation paper (England, Wales and Scotland) on the implementation of IPPC, that the new sector-specific IPPC Sector Guidance Notes would provide guidance on appropriate review periods for each sector. These would take into consideration guidance on the relevant criteria, to be provided by the Government. Examples of the likely relevant criteria for setting these review periods are "the risk and level of environmental impacts associated with the sector" and "the cost to the Regulators and regulated industry of undertaking the reviews".

The Regulators consider that at the present time, having regard to those criteria, it is in fact appropriate to set indicative minimum review periods which differ only between those sectors which have been subject to integrated permitting (i.e. IPC or Waste Management Licensing), and those which have not. It is therefore proposed that Permit conditions should normally be reviewed on the following basis:

- for individual activities **NOT** previously subject to regulation under IPC or Waste Management Licensing, a review should normally be carried out within four years of the issue of the IPPC Permit;
- for individual activities previously subject to regulation under IPC or Waste Management Licensing, a review should normally be carried out within six years of the issue of the IPPC Permit.

This means that activities/installations not currently in IPC or Waste Management Licensing will be initially reviewed within four years and thereafter within six years.

An exception to this is where discharges of List I or List II substances have been permitted or where disposal or tipping for the purposes of disposal, of any matter which might lead to an indirect discharge of any substance on List I or II. In such cases the review must be carried out within four years.

This period will be kept under review and, if any of the above factors change significantly, may be shortened or extended.

1.5 Key Issues for each Sector

Substitution of environmentally non-friendly chemicals and avoidance of emissions

The use of more environmentally friendly chemicals and processes is a feature of developments in this sector. BAT is technique driven and therefore this approach to prevention of emissions and reduction in energy use is a key issue for this sector. An example is the case where dye exhaustion is poor and reductions in the amount of chemical and colour emitted is possible by increasing the affinity of the dye to the fabric by changing some auxiliary chemicals.

Wastewater

Water use is a major issue from the knock-on effects of high water use in terms of increased emissions. Releases of List I and List II substances is a particular issue for this sector. Persistent organic pollutants that are included in several action lists may be present in wool and cotton processing effluents. The current definitions for List I and II are given in Section 2.4. The discharge of AOX is a potential problem if chlorine is used during processes.

Bleaching and dyeing

A major problem has been the use of chlorine compounds in bleaching of fibres and fabrics, chlorine reacts with organic materials and produces some persistent organic compounds. There must be a strong justification for using chlorine-bleaches (see Section --). Similarly the emission of highly coloured effluents can cause significant colouring of controlled waters even after treatment in a sewage treatment works.

Water treatment (BOD and COD)

Most processors discharge via a municipal treatment works, in some cases Installations have their own wastewater treatment plant. In either case, confirmation that the more persistent substances are broken down remains an issue and the minimisation of BOD according to BAT criteria is a new requirement (see Sections -- and --). Residual colour in the effluents after treatment is also an issue for this sector. Currently several installations may be present in the catchment of a single sewage treatment works and persistent colouring of the final effluent is therefore possible unless additional treatment is carried out.

Heat, VOC recovery and visible plume suppression

An assessment of heat recovery and plume suppression may be needed (see Section --).

VOCs from coating and solvent scouring

The significance will vary considerably between installations (see Sections --, --, -- and,--).

Releases associated with energy use

The industry is a major energy user. There remain significant opportunities for reduction of emissions caused by energy use and choice of energy source (CO_2, SOx, NOx, etc. contributing in particular to global warming and acidification). The industry has entered into a Climate Change Agreement or Trading Agreement with the Government. The applicability of techniques and standards for IPPC is explained in Section 2.7.

Accident risk

Apart from the normal process and spillage risks, many older sites (especially those not regulated under IPC) will have unsecure drainage systems that will need attention (see Section 2.8).

Noise

There are noise sources that should be addressed (see Section 2.9).

Long distance and transboundary pollution

Persistent organic pollutants have been identified as potential long range pollutants.

Monitoring

The residual organic constituents of the effluent are generally not known in detail, so it is hard to monitor. Analysis of the constituents of the effluent will be a key issue and direct toxicity testing may be appropriate for processes that discharge to controlled waters (see Section 2.10).

Solid waste recovery, recycling and disposal

Sludge to land is a major issue. The Agencies' policy on this is reflected in this document. An assessment of the options for the recovery or disposal of wool grease and fibres from sludge is likely to

be needed (see Section 2.6). Solid waste is also produced in the form of packing materials, yarn, fabric and cones.

Site restoration

Many installations will have been operating on the same site for many years. There may well be ground contamination that could be confused with potential future contamination from the activities as they will be operated under IPPC. In such cases it will be necessary to assess the degree of contamination as a baseline for future operations.

1.6 Summary of Releases for each Sector

SUMMARY OF EMISSIONS from wool and woolblend dyeing and ancillary processes
(Emissions to air from on and off site combustion processes not included)

SOURCE OF RELEASE To Air: A To Land: L To Water: W Upper case – Primary source Lower case – Minor source	Dispatch, storage and handling of raw materials and intermediates	Storage and handling of chemical intermediates	Fibre and yarn Dyeing Processes	Yarn Scouring processes	Yarn setting processes	Bleaching processes	Insect Resist processes	Stain resist processes	Antistatic processes	Flameproofing processes	Wastewater management
Paper, board and wood packaging materials	L	L	-	-	-	-	-	-	-	-	-
Plastic wrapping, bags & drums. Cones	L	L	-	-	-	-	-	-	-	-	-
Chemical Oxygen Demand	-	-	W	W	W	w	w	w	w	-	-
Suspended solids	-	-	w	W	W	w	w	w	w	-	-
Sulphides	-	-	-	-	-	-	-	-	-	-	A
Anionic, non-ionic amphoteric & cationic surfactants	-	-	W	W	W	-	w	w	w	-	-
Biocides	-	-	W	W	W	-	-	-	-	-	-
Chromium	-	-	W	w	w	-	-	-	-	-	-
Cobalt	-	-	W	w	w	-	-	-	-	-	-
Copper	-	-	W	w	w	-	-	-	-	-	-
Other heavy metals	-	-	w	-	-	-	-	-	-	-	-
Sheep treatment pesticides	-	-	W	W	W	-	-	-	-	-	-
Permethrin & cyfluthrin	-	-	W	W	W	-	W	-	-	-	-
Sulcofuron	-	-	W	-	-	-	W	-	-	-	-
Zirconium	-	-	-	-	-	-	-	-	-	W	-
Fluorides	-	-	-	-	-	-	-	-	-	W	-
Organic & Inorganic Acids	-	-	W	w	w	w	w	w	w	w	-
Sulphates & sulphites	-	-	W	-	W	-	-	W	-	-	-
Formaldehyde								W			
Phosphates	-	-	W	-	-	W	-	-	-	-	-
Dyestuffs	-	-	W	w	w	-	-	-	-	-	-
Synthetic and natural lubricants	-	-	W	W	W	-	-	-	-	-	-

1.7 Overview of the Activities in this Sector

No. of UK Installations	
Commission Dyers	9
Yarn Spinning	30
Carpet Manufacture	87
Wool Scourers	7

Summary of the activities

This section provides a very brief description of the activities. Further detail can be found in the BREF.

The industry is a large user of water and energy. It also uses a range of fibres as raw materials and chemicals with the potential for significant releases to air, water and land.

The biggest pollution potential in this sector is wool scouring but other processes also have .the potential to release List I and II substances and high organic loads.

Textile finishing operations can take place at different stages of the production process: not only the fibres, but also the yarn and the cloth can form the substrate for finishing. Textile finishing includes preparation, pre-treatment, bleaching, applying optical brighteners, colouring, top finishing, and finishing.

The first treatment stage within the textile sector is the cleaning of the natural material: e.g. the cleaning and washing of raw greasy sheep's wool or cleaning of other fibres (cotton and flax). Contaminants, including persistent organic pollutants, present on the raw materials are removed and will pass to the wash and rinse waters. Many of these compounds are very difficult to remove in wastewater treatment systems and will be present in final effluents. The properties of many of these compounds including the ability to act as endocrine disrupters cause concern.

1.7.1 Main Processes used in the textile cycle

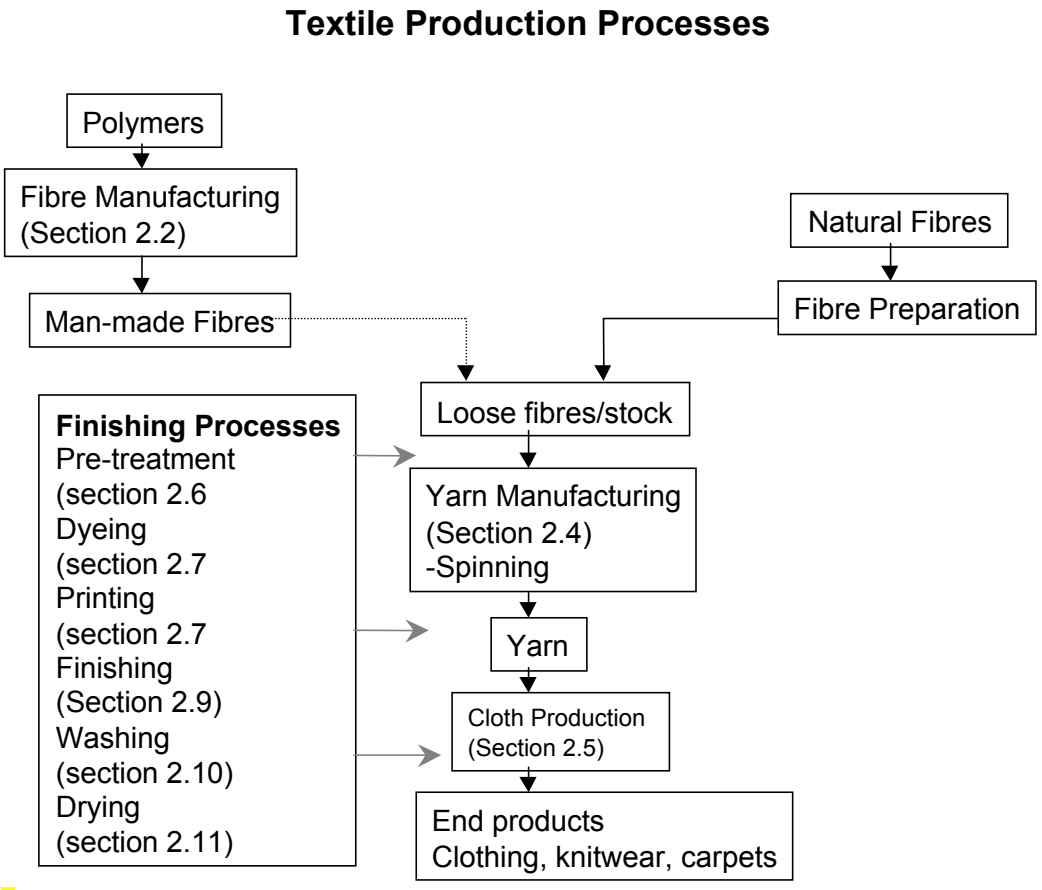


Figure 4 Summary of the Textile processes showing the Sections referred to in the BREF

Within the textile sector the following main processes are used: -

- pre-treatment of the fibres e.g. wool scouring
- production of the substrate, for example spinning, cloth production and manufacture of garments
- conditioning the fibre in the spinning mill or weaving mill
- preparation and/or pre-treatment associated with the colouring
- colouring or bleaching by pigments, dyeing, printing
- after treatment and/or top finishing
- make-up and/or stripping (carpets)
- manufacture of end products

In addition to wet processes, dry and mechanical processes are also used. These processes are reported in order to: -

(a) indicate what the wet and dry alternatives are, e.g.:
- chemical or thermal stabilisation of yarns or fabric;
- wet and dry spinning processes;
- wet and dry weaving processes;
- wet and dry texturing of yarns (= finishing yarn)

(b) indicate the effects of the mechanical and dry processes on the subsequent finishing operations and indicate the attendant environmental aspects.

(c) indicate that finishing processes can occur at different stages in the textile cycle.

Usually these operations will have an environmental aspect in themselves and they will influence the environmental impact of the finishing process.

The processes involved in this Sector can be wet, intermediate or dry processes, examples are given in the following table: -

Wet processes	**Intermediate processes**	**Dry processes**
Scouring of wool	Sizing	Picking, carding and combing
Scouring of cotton	Felting (non-woven fabric)	Spinning
De-sizing	Adhesive processes (including carpet backing)	Weaving
Bleaching	Functional finishing (e.g. flame retardancy, moth proofing etc)	Knitting
Mercerising	Printing	Tufting
Carbonising		Mechanical finishing
Milling		Stentering
Dyeing		Heat setting
Washing		Singeing

Table 2 Wet, Intermediate and Dry process stages

Although many of these processes are dry processes, a number of pollutants originate from impurities present on the raw materials or from the use of less environmentally friendly materials. Raw wool may contain residues of chemicals used as veterinary medicines, to protect sheep from ectoparasites such as lice, mites, blowfly etc. Although these are present in low concentrations, they have important implications for the discharge of raw wool scouring effluent and disposal of the sludges generated by the treatment of the effluent. Other chemicals may include insecticides, acaricides or insect growth regulators and these may be present on wool, cotton or other raw fibres.

The chemicals known to be present in raw wool include —

- organochlorine insecticides: hexachlorocyclohexane, dieldrin and DDT;
- organophosphorus insecticides: diazinon, propetamphos, chlorfenvinphos and dichlofenthion;
- synthetic pyrethroid insecticides: cypermethrin, deltamethrin, fenvalerate, flumethrin and cyhalothrin;
- insect growth regulators: cyromazine, dicyclanil, diflubenzuron and triflumuron.

Cotton and other natural raw materials can also contain pesticide residues. It is therefore important that the operator knows the source of his raw materials and the harmful substances that may potentially be present.

In addition to these substances oils, glues, chemicals (such as mothproofing and crease resist agents) and other additives used in the processes. Residual amounts of all of these substances can be released to water during the washing stages. Annexes I, and II to the BREF provide reviews of the Auxiliary Chemicals and Dyes used in the sector.

The dry processes can also influence emissions for example singeing produces a fume that is emitted to air and oils applied to assist the spinning process will transfer of into latter washing stages.

Sites will be encountered that specialise in only one of the processes, for example wool scouring or dyeing on a commission basis. Many more integrated plants exist where a number of processes are carried out.

1.8 Economic Aspects for each Sector

1.8.1 Cost information

Activity	Size	Capital (£M)	Operational (£M/y)	Comment
Counter current wool scouring system	3500 t/a greasy wool	0.075	Reduced	Payback 18 weeks if dirt removal and grease recovery loops also used
Evaporative treatment of wastewater	3500 t/a greasy wool 15000 t/a greasy wool	1.2 2.4		Payback 8.3 years Payback 1.5 years if dirt removal and grease recovery loops also used
Water storage		0.65 - 0.8 0.25 - 0.33		Source - BREF
Wool scouring dirt removal and grease recovery loop	3500 t/a greasy wool 15000 t/a greasy wool	0.25 0.50		Recovered grease can pay for the system. water consumption is reduced 4 to 6 litres per kg for medium mill and 6 litres per kg for small mills
Wastewater colour removal	40 million socks per year	0.200	0.136	Use of inorganic clays removes colour and allows reuse of water. Savings £54000/a after operating costs. Water consumption reduced by 60000m^3/a.
Enclosed jet dyer	2000 t/a knitted fabrics (170 t/a per machine).	0.135		Annual savings £84000. Water consumption reduced by 6013000m^3/a., energy consumptio reduced by 4700 kWh.
Primary effluent treatment		2.2 - 3	0.25-0.4	Source - BREF Includes pumping, clarifier, sludge dewatering, chemical dosing

Please Note, The Industry has been requested to provide information about the economic aspects of the Industry and this will be incorporated when it is available.

2 TECHNIQUES FOR POLLUTION CONTROL

BAT Boxes to help in preparing applications

This section summarises, in the outlined BAT boxes,

- what is required in the application
- the indicative BAT requirements (i.e. what is BAT in most circumstances) against which the application will be judged.

At the top of each BAT box is the question which is being addressed. It will be seen that these deal with the questions in the Application Form relating to environmental performance of the installation.

Although referred to as "BAT", the requirements also cover the other requirements of the PPC Regulations and requirements of other Regulations (such as the Waste Management Licensing Regulations (see Appendix 2 for equivalent legislation in Scotland and Northern Ireland) and the Groundwater Regulations insofar as they are relevant to an IPPC Permit).

Indicative BAT requirements

Where it has been possible for the Regulator to make a judgement on what will normally be BAT, the, indicative requirements are clear and prescriptive. In such cases:

- If you propose to comply with the indicative requirement, you need only describe how you will do so, if this is not obvious from the wording of the requirement itself.
- If you propose to depart from any indicative requirements, you should justify your proposal. Such departures may be stricter or less strict than the indicative requirements:
- Stricter proposals may be appropriate where:
  - new techniques have become available after the publication of the guidance;
  - the particular technical configuration at your installation makes higher standards practicable;
  - the local environment is particularly sensitive.
- Less strict proposals may be justified due to particular factors relating to your installation or the local environment. For example, you may operate to a standard that is very close to an indicative requirement, but using different plant or processes from that upon which the indicative requirement is based. In such a case it may impose a disproportionate cost to replace the old plant with the new techniques for only a small decrease in emissions.

In other cases, the main BAT candidates are identified, but the final choice can only be made on an installation-specific basis. In further cases, aspects of the installation may not be covered by the guidance at all.

Justifying proposals

Whether you are:

- justifying departures from clear indicative requirements;
- assessing options to determine which of those identified by guidance is best for a your site; or
- developing proposals for parts (or possibly all) of an installation that are not covered by guidance.

The costs and benefits of a range of options should be compared. However, the level of detail required depends on the environmental significance of the matter in question. In the more complex cases (e.g. where the options available would lead to significantly different environmental effects, or where the cost implications are a major factor) it will be necessary to develop proposals through a more detailed analysis of the costs and benefits of options. The methodology for such assessments is set out in the IPPC H1 "*Assessment of BAT and Environmental Impact for IPPC* (in preparation).

In many situations, however, it will not be necessary to carry out a detailed analysis of options. For example, where an indicative standard is inappropriate for obvious technical reasons, or where there are only minor additional emissions, it may be possible to justify a departure in just a few words.

Prevention is the priority.

In responding to the requirements the Operator should keep the following general principles in mind.

- As a first principle there should be evidence in the application that full consideration has been given to the possibility of **PREVENTING** the release of harmful substances. e.g by:
  - substituting materials or processes (see Section 2.2.1);
  - preventing releases of water altogether (see Section 2.2.3); or by
  - preventing waste emissions by reuse or recovery.
- Only where that is not practicable should the second principle be adopted of reducing emissions which may cause harm.

Further explanation of the requirements of Section 2 is given in Section B2 of the Guide for Applicants.
Techniques in green text (viewable on electronic versions) are additional to the BREF requirements.

2.1 Management Techniques

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. The Regulators strongly support the operation of environmental management systems (EMSs). An Operator with such a system will find it easier to complete not only this section but also the technical/regulatory requirements in the following sections. For information on how to establish an EMS Envirowise have produced a guide GG 137.

The Regulators recommend that the ISO 14001 standard is used as the basis for an environmental management system. Certification to this standard and/or registration under EMAS (EC Eco Management and Audit Scheme) (OJ L168, 10.7.93) are also strongly supported by the Regulator. Both certification and registration provide independent verification that the EMS conforms to an assessable standard. EMAS now incorporates ISO 14001 as the specification for the EMS element. For further details about ISO 14001 and EMAS contact British Standards Institute (BSI) and the Institute of Environmental Management and Assessment (IEMA) respectively.

The steps required in this and subsequent sections may help the Operator to make good any shortfalls in their management system. An effective EMS will help the Operator to maintain compliance with regulatory requirements and to manage other significant environmental impacts. While the requirements below are considered to be BAT for IPPC, they are the same techniques as required in a formal EMS and are also capable of delivering wider environmental benefits. However, it is information on their applicability to IPPC which is primarily required in this application.

Application Form Question 2.1

Provide details of your proposed management techniques.

With the Application the Operator should:

1. Describe their management system to demonstrate how it meets the ***"Requirements for an effective management system"*** below. The description should make clear who holds responsibility for each of the requirements. The second column explains where in the application the response to each requirement is best dealt with to avoid duplication. Copies of all procedures are not needed, but examples may be included in your application.

   If you are certified to ISO 14001 or registered under EMAS (or both), you may provide a statement derived from certification records/assessments to support your application.

   Further specific management procedures are dealt with under the appropriate section on the remainder of the document. It is recommended that you understand all the requirements of the application before completing this section, as many management issues are dealt with in other sections.

2. The type of management system employed will depend upon the scale and complexity of the operations undertaken. The Operator should demonstrate that the proposals are BAT, by confirming compliance with the indicative requirements below, or by justifying departures (as described in Section 1.2 and in the Guide for Applicants) or alternative measures.

Indicative BAT Requirements

BAT for management techniques

The Operator should have a management system in place for the activities which delivers the requirements given in column 1 below. The development of any aspects of the management system not already in place should be completed within the timescale given in Section 1.1.

Requirement for an effective management system	How delivered for IPPC
1. **Clear management structure and allocated responsibilities** for environmental performance, in particular meeting the aspects of the IPPC Permit	Describe in this section who has allocated responsibilities
2. **Identification, assessment and management of significant environmental impacts**	By responding to the requirements in Section 4.1 in the application
3. **Compliance with legal and other requirements applicable to activities impacting on the environment**	Compliance with the Permit satisfies this requirement

Cont.

4. **Establishing an environmental policy and setting objectives and targets** to prevent pollution, meet legal requirements and continually improve environmental performance	The Applicant should make proposals in response to each of Sections 2.2 to 2.12. These proposals may be incorporated within the Permit improvement programme
5. **Environmental improvement programmes to implement policy objectives and targets**	
6. **Establish operational controls to prevent and minimise significant environmental impacts**	By responding to the requirements in Sections 2.2 to 2.7, 2.11 and 2.12 in the application
7. **Preventative maintenance programmes for relevant plant and equipment** – method of recording and reviews	Describe system here. List procedures in Section 2.3
8. **Emergency planning and accident prevention**	By responding to the requirements in Section 2.8 in the application
9. **Monitoring and measuring performance** Identify key indicators of environmental performance and efficiency of the Installation. Establish and maintain a programme to measure and monitor indicators to enable review and improvement of performance. Further information is contained in the Envirowise guide GG 137.	Describe in this Section
10. **Monitoring and control systems**: • metering of dyes and other chemicals in the colour kitchen • to ensure that the installation functions as intended; • to detect faults and unintended operations; • to detect slow changes in plant performance to trigger preventative maintenance	By responding to the requirements in Section 2.10 in the application
11. **Training** Provision of adequate procedures and training for all relevant staff (including contractors and those purchasing equipment and materials), which should include: • a clear statement of the skills and competencies required for each job; • awareness of the regulatory implications of the Permit for the activity and their work activities; • awareness of all potential environmental effects from operation under normal and abnormal circumstances; • prevention of accidental emissions and action to be taken when accidental emissions occur; • implementation and maintenance of training records; Expertise required depends on the activities being carried out. However, both technical and managerial staff upon whom the installation's compliance depends need sufficient qualifications, training and experience for their roles. This may be assessed against any industry sector standards or codes of practice	To be described in this Section confirming that training for each of the areas covered by Sections 2.2 to 2.3 and 2.5 to 2.10 are covered
12. **Communication and reporting of incidents of actual or potential non-compliance and complaints** Actions taken in response, and about proposed changes to operations	Describe in this Section
13. **Auditing** Regular, (preferably) independent, audits to check that all activities are being carried out in conformity with these requirements. All of these requirements should be audited internally at least once per year	Describe in this Section

Cont.

14. **Corrective action to analyse faults and prevent recurrence** Define responsibility and authority for handling and investigating non-conformance, taking action to mitigate any impacts caused and for initiating and completing corrective and preventive action Recording, investigating, taking corrective action and preventing recurrence, in response to environmental complaints and incidents	Describe in this Section how this is dealt with for each of Sections 2.2 to 2.3 and 2.5 to 2.10 as appropriate
15. **Reviewing and Reporting Environmental Performance** Senior management review environmental performance and ensure appropriate action taken where necessary to ensure that policy commitments are met and that policy remains relevant. Internal review of progress of the Management Programmes at least annually. Incorporate environmental issues in all other relevant aspects of the business, insofar as they are required by IPPC, in particular: • the control of process change on the installation; • design and review of new facilities, engineering and other capital projects; • capital approval; • the allocation of resources; • planning and scheduling; • incorporation of environmental aspects into normal operating procedures; • purchasing policy; • accounting for environmental costs against the process involved rather than as overheads. Report on environmental performance, based on the results of management reviews (annual or linked to the audit cycle), for: • information required by the Regulator; and • effectiveness of the management system against objectives and targets, and future planned improvements. Report externally preferably via public environmental statement	Describe in this Section Describe in this Section This will become a Permit requirement Describe in this Section Describe in this Section
16. **Managing documentation and records** List the core elements of the EMS (policies, responsibilities, procedures etc) and links to related documentation in order to be able to control, locate and update documentation. Describe how environmental records and results of audits and reviews are identified, maintained and stored	Describe in this Section

Selection of raw materials

2.2 Materials Inputs

This section covers the use of **raw materials, packaging and water** and the techniques for both minimising their use and minimising their impact by selection. (The choice of fuels is covered under Section 2.7.3, Energy).

As a general principle, the Operator will need to demonstrate the measures taken to:

Reduce
Substitute
Understand

- **reduce** the use of chemicals and other materials (Section 2.2.2);
- **substitute** less harmful materials or those which can be more readily abated and when abated lead to substances which in themselves are more readily dealt with;
- **understand** the fate of by-products and contaminants and their environmental impact (Section 4).

Further information about using a Mass Balance is contained in the Envirowise guide GG 237.

2.2.1 Raw materials selection

This section looks at the **selection and substitution** of raw materials used while Section 2.2.2 describes the techniques to **minimise** their use. Further information is contained in the Envirowise guide GG 62.

Summary of materials in use

A proportion of virtually all of the raw materials and chemicals used will end up as a waste or in the final effluent, even if much reduced by treatment. In the aquatic environment, even where evidence suggests little acute toxicity to man or other species, there is usually little knowledge regarding chronic or synergistic effects. Because of the wide variety of chemicals used there will always be a risk of harmful effects which may not be expected or immediately apparent. Annexes I and II to the BREF give overviews on Auxiliary chemicals, dyes and wet processing machinery. Section 4.3 provides a number of techniques that are successful.

BREF section 4.3

It should be recognised that the process of selecting raw materials can present an opportunity to control emissions at source. In this regard it is suggested that operators closely examine the range of possible raw material recipes available to them.

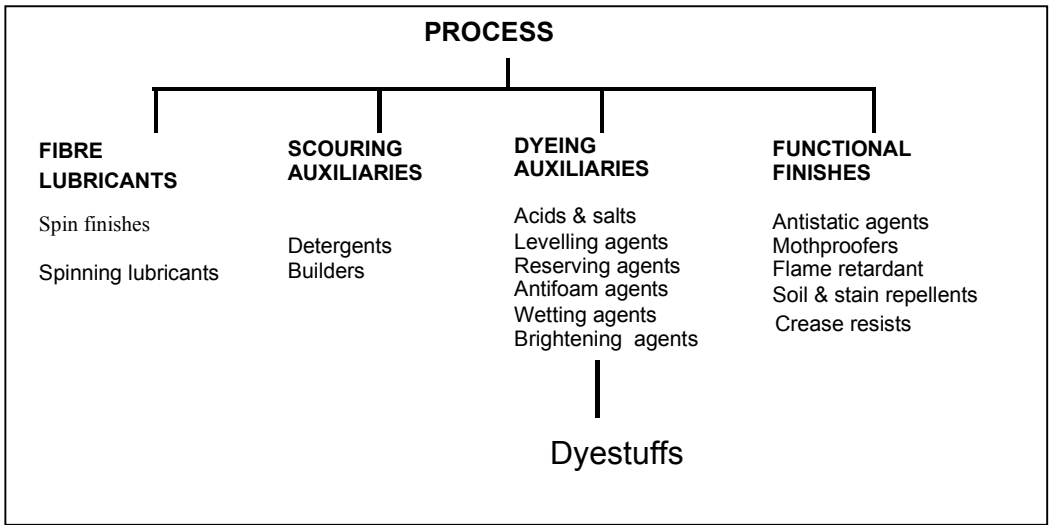
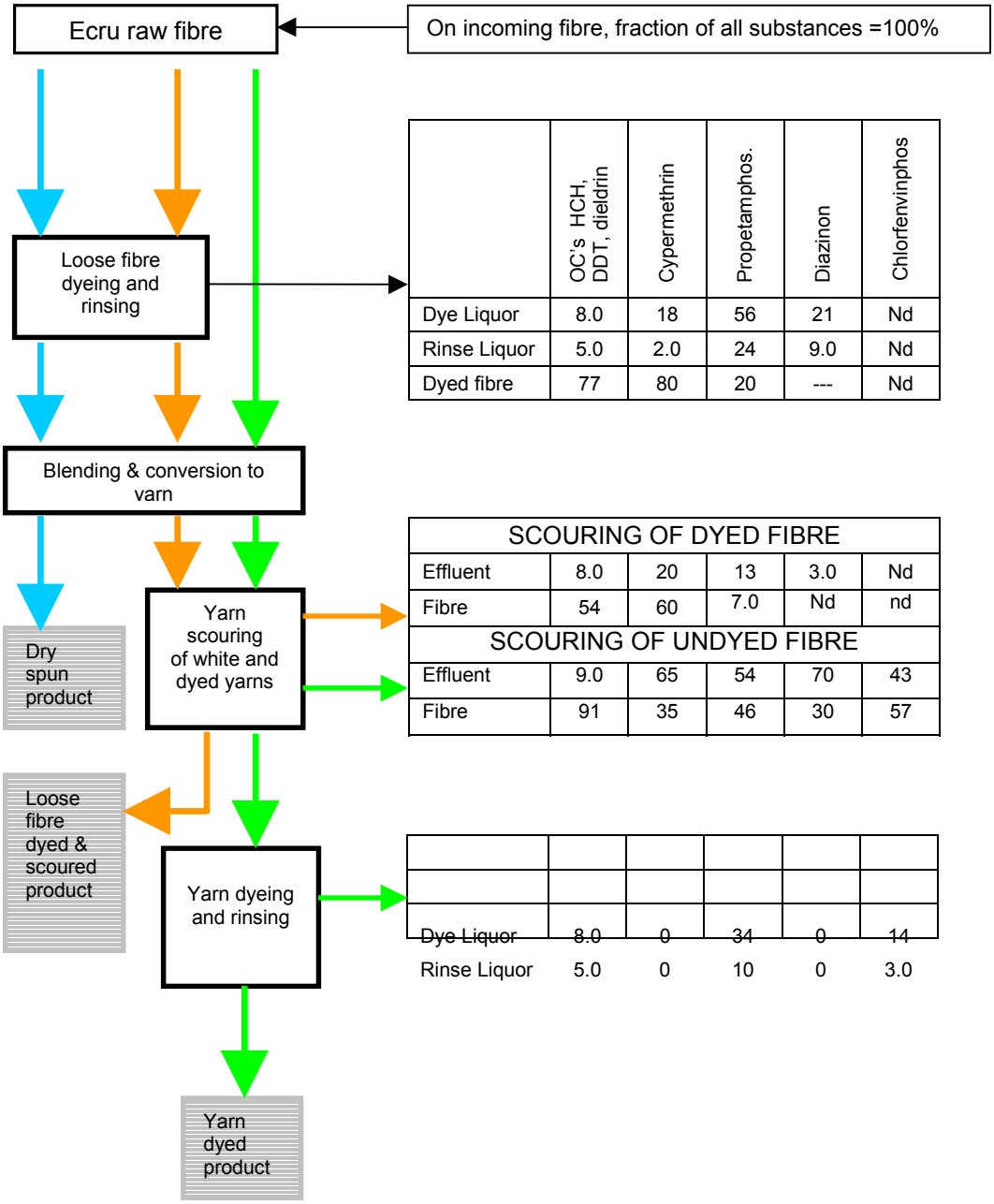


Figure 5 Auxiliary chemicals used in the Textile sector

The presence of chemicals in all of the process stages means that they can be released during subsequent processes such as washing. The following diagram shows the fate of some of the persistent organic pollutants.



	OC's HCH, DDT, dieldrin	Cypermethrin	Propetamphos.	Diazinon	Chlorfenvinphos
Dye Liquor	8.0	18	56	21	Nd
Rinse Liquor	5.0	2.0	24	9.0	Nd
Dyed fibre	77	80	20	---	Nd

SCOURING OF DYED FIBRE					
Effluent	8.0	20	13	3.0	Nd
Fibre	54	60	7.0	Nd	nd
SCOURING OF UNDYED FIBRE					
Effluent	9.0	65	54	70	43
Fibre	91	35	46	30	57

~~Dye Liquor~~	~~8.0~~	~~0~~	~~34~~	~~0~~	~~14~~
Rinse Liquor	5.0	0	10	0	3.0

Figure 6 Fate of some persistent organic pollutants during processing

Figures show the % going via the route specified

		LOOSE FIBRE DYEHOUSES						
		Site A	Site B	Site C	Site D	Site E	Site F	Site G
Total weight of fibre dyed (tonnes/annum)		**3780**	**3200**	**3600**	**320**	**2170**	**470**	**705**
INORGANIC and ORGANIC ACIDS, BASES & SALTS	Sodium Acetate	234	---	---	---	---	---	---
	Sodium Carbonate	75	100	---	---	---	2,924	---
	Sodium Bicarbonate	171	100	---	---	---	---	---
	Sodium Sulphate (anhyd.)	1063	---	---	---	---	---	---
	Sodium Chloride	56,890	42,000	16,750	---	---	---	---
	Ammonium Sulphate	13,155	18,000	7,000	10,000	20,592	---	2,000
	Sodium Metabisulphite	14	---	---	---	---	---	---
	Na or K Dichromate	3,334	1,500	25	---	---	---	340
	Sodium Hydrosulphite	134	100	---	---	---	---	---
	Formic Acid (as 100%)	15,953	18,700	---	---		3,103	---
	Acetic Acid (as 100%)	41,632	---	36,000	9,504	12,891	6,752	17,000
	Citric Acid	432	100	---	250	---	---	---
	Sodium Hydroxide (as NaOH)	---	3,600	3,660	---	---	---	---
	Hydrogen Peroxide (35%)	15	3,500	---	---	---	---	---
	Sodium Hypochlorite (15%)	101	500	200	---	478	---	540
	Ammonia (as .880)	4376	4000	4,087	3,324	---	---	170
DYEING AUXILIARIES	Detergents	263	100	---	---	---	---	3,350
	Dispersants	306	100	540	---	---	---	---
	Sequesterants	211	100	---	240	---	1,479	---
	Antifoam	---	10,000	1,600	---	---	2,380	1,400
	Penetrating & Deairating Agents	5,574	7,500	2,800	---	8,474	---	2,675
	Polyamide Reserving Agents	511	---	---	---	---	---	---
	Levelling Agents	21,462	18,750	9,140	4,010	19,211	2,939	7,990
	Dyebath Brightening agents	2	150	1,400	---	156	3,625	3,100
	Propriatory acid donors	10,500	14,000	---	---	---	---	---
FUNCTIONAL FINISHES	"First Fade" suppressants	102	750	---	---	3,978	---	---
	Softeners	15	---	300	---	---	---	300
	Antistatic agents	---	100	---	380	---	---	---
	Soil-stain Repellents	12	15,000	---	---	---	---	---
	Permethrin based mothproofer	712	2,500	---	---	---	---	---
	Sulcofuron based mothproofer	---	---	---	---	---	434	---
	Zirconium based flameproof	675	500	---	---	---	---	---

Table 3 Typical range of Auxiliary Chemicals and their usage

Selection of raw materials

Application Form Question 2.2 (part 1)

Identify the raw and auxiliary materials, other substances and water that you propose to use.

With the Application the Operator should:

1. supply a list of the materials or common combinations of materials used, which have the potential for significant environmental impact, including:
   - the chemical composition of the materials where relevant;
   - the quantities used,
   - the fate of the material or combination (i.e. approximate percentages to each media and to the product),
   - environmental impact where known (e.g. degradability, bioaccumulation potential, toxicity to relevant species).
   - any reasonably practicable alternative raw materials which may have a lower environmental impact including, but not be limited to, any alternatives described in BAT Requirement 5 below (the substitution principle).

   A suitable template is included in the electronic version of this document.

   Generic information about materials, and grouping information of those of a similar type, is normally adequate rather than listing every commercial alternative used. A common sense approach to the level of detail should be used; ensuring that any material could have a significant effect of the environment is included. Product data sheets should be available on-site.

2. justify (e.g. on the basis of impact on product quality), the continued use of any combination of substances for which there is a less hazardous alternative and that the proposed raw material section is therefore BAT;

3. for existing activities, identify shortfalls in the above information, e.g. the environmental impact of certain substances, which the Operator believes require longer term studies to establish.

Indicative BAT Requirements

BAT for selection BREF section 4.3

1. The Operator should:
   - complete any longer-term studies (Item 3 above),
   - carry out any substitutions identified,

   as improvement conditions to a timescale to be approved by the Regulator.

2. The Operator should maintain a detailed inventory of raw materials used on-site.

3. The Operator should have procedures for the regular review of new developments in raw materials and the implementation of any suitable ones which are less hazardous.

4. The Operator should have quality assurance procedures for the control of the content of raw materials.

5. The following raw material substitutions should be applied where appropriate:

Selection of raw materials

Raw material	Selection techniques
Natural raw fibres (including wool, cotton flax etc	• **Supplies of natural raw fibres should not contain harmful substances** at concentrations above background level.
Dyes and pigments	• Dyes and auxiliary chemicals that are not either biodegradable or inorganic should be identified and their use justified. • Dyes with solid pigments should only be used where they can be abated by clarification. • The affinity (K), liquor ratio (L) and exhaustion (E) of the dyeing process should be optimised. E =K/(K+L)
Dyeing Auxilliaries	•
Sizing Agents	•
Levellers and optical brighteners	• The most retentive type should be used,
Fuels	• See Section 2.7.3
	•
Lubricants	• Lubricants should be biodegradable where possible
	•
Detergents/ surfactants	• Only chemicals with high biodegradability and known degradation products should be used. • Alkylphenolethoxylates should be avoided.
Biocides	• Biocide use should be minimised by other complementary techniques. Biosensors can be used for monitoring.
Chemicals for bleaching	• Hydrogen peroxide based systems have a lower environmental impact • Elemental chlorine should not be used. • Any use of sodium hypochlorite for decolourising should be justified. • Where chlorine-containing bleaches are justifiably used; the emissions of relevant chlorinated organic materials that are formed by the reaction of chlorine with organic material (e.g. chloroform, PCP and residual chlorine) are quantified.
Finishing Auxiliaries	•
	•
NaOH	• Only “low mercury” NaOH should be used.
	•
Sequestering Agents	• DTPA should be used in preference to EDTA or NTA because of its superior degradability(#)
Defoamers	• Only fully biodegradable products with known, safe degradation products should be used.
Solvents	• Wherever possible, coatings using organic solvents should be replaced by aqueous versions.

Use of raw materials

2.2.2 Waste minimisation (minimising the use of raw materials)

Principles

The prevention and minimisation of waste and emissions to the environment is a general principle of IPPC. Operators will be expected to consider the application of waste minimisation techniques so that, wherever practicable, all types of wastes and emissions are prevented or reduced to a minimum. The steps below will also help to ensure the prudent use of natural resources.

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".

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

In the context of waste minimisation and this Guidance, **waste** relates to the inefficient use of raw materials and other substances at an installation. A consequence of waste minimisation will be the reduction of gaseous, liquid and solid emissions.

Key operational features of waste minimisation will be:

- the ongoing identification and implementation of waste prevention opportunities;
- the active participation and commitment of staff at all levels including, e.g. staff suggestion schemes;
- monitoring of materials usage and reporting against key performance measures.

For the primary inputs to waste activities e.g. the waste to landfill, the requirements of this section may have been met "upstream" of the installation. However, there may still be arisings which are relevant.

Further information is contained in the Envirowise guides GG 86, 84, 42, 79; GS25 and GG 38C.

Application Form Question 2.2 (part 2)

Identify the raw and auxiliary materials, other substances and water that you propose to use.

With the Application the Operator should:

1. identify, from a knowledge of the plant, the main opportunities for waste minimisation and supply information on waste minimisation audits and exercises and the improvements made or planned.

Indicative BAT Requirements

BAT for waste minimisation

1. A regular waste minimisation audit should be carried out. Where one has not been carried out recently, an initial comprehensive audit should be carried out at the earliest opportunity within the improvement programme. New plants will need to have been operating for some time before an audit will be meaningful. Further audits should be at least as frequent as the IPPC Permit reviews. The audit should be carried out as follows:

   The Operator should analyse the use of raw materials, assess the opportunities for reductions and provide an action plan for improvements using the following three essential steps:
   i) process mapping;
   ii) raw materials mass balance;
   iii) action plan.
   Further information is contained in the Envirowise guide ET 184.

   The use and fate of raw materials and other materials, including reactants, intermediates, by-products, solvents and other support materials, such as inerting agents, fuels, catalysts and abatement agents, should be mapped onto a process flow diagram (see Ref. 8) using data from the raw materials inventory (see Section 2.2.1) 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.

   Using this information, opportunities for improved efficiency, changes in process and waste reduction should be generated and assessed, and an action plan prepared for the implementation of improvements to a timescale approved by the Regulator.

Water use

2.2.3 Water use

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.

Reasons for reducing water use

Reducing water use may be a valid environmental (or economic) aim in itself, perhaps because of local supply constraints. In addition, 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, in particular:

- 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 off to another party;
- associated benefits within the process such as reduction of 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 will reveal where reductions can be made. Further information is contained in the Envirowise guide GG 152.

Advice on cost-effective measures for minimising water can be found in other ENVIROWISE publications (see Ref. 9) particularly EG98 (which gives more benchmark figures), GG26, GC110, GG67.

	Loose fibre dyehouses			Yarn dyehouses		
	Site A	Site B	Site C	Site H	Site K	Site L
Process(s) operated	Fibre dyeing & drying	Fibre dyeing & drying	Fibre dyeing & drying	Scouring, hank dyeing & drying	Scouring, hank dyeing & drying	Package dyeing & Drying
Total fibre processed (tonnes/annum	3780	3200	3619	1937	4538	1013
Total water consumption ('000 m^3/annum)	132.0	91.9	193.4	42.6	239.1	18.1
Specific water consumption **(m^3/tonne textile product)**	**34.9**	**28.7**	**53.5**	**22.0**	**52.7**	**17.9**

Table 4 Water use at some carpet manufacturing installations

Application Form Question 2.2 (part 3)

Identify the raw and auxiliary materials, other substances and <u>water</u> that you propose to use.

With the Application the Operator should:

1. supply information on water consumption and comparison with any available benchmarks;
2. supply a diagram of the water circuits with indicative flows;
3. describe the current or proposed position with regard to the indicative BAT requirements below, or any other tchniques which are pertinent to the installation;
4. demonstrate that the proposals are BAT, by confirming compliance with the indicative requirements, by justifying departures (as described in Section 1.2 and in the Guide for Applicants) or alternative measures;
5. describe, in particular, any water audits already conducted and the improvements made or planned.

Cont.

Water use

BAT for water efficiency

Indicative BAT Requirements

1. A regular review of water use (water efficiency audit) should be carried out. Where one has not been carried out recently, an initial comprehensive audit should be carried out at the earliest opportunity within the improvement programme. New plants will need to have been operating for some time before an audit will be meaningful. Further audits should be at least as frequent as the IPPC Permit reviews. The audit should be carried out as follows:
   - The Operator should produce flow diagrams and water mass balances for the activities.
   - Water efficiency objectives should be established by comparison with sector guidance or, where not available, national benchmarks (see Ref. 10). In justifying any departures from these (see Section 1.2), or where benchmarks are not available, the techniques described below and those in the existing sector guidance should be taken into account. The constraints on reducing water use beyond a certain level should be identified by each Operator, as this is usually installation-specific.
   - Water pinch techniques should be used in the more complex situations, particularly on chemical plant, to identify the opportunities for maximising reuse and minimising use of water (see ENVIROWISE publications, Ref. 9).
   - Using this information, opportunities for reduction in water use should be generated and assessed and an action plan prepared for the implementation of improvements to a timescale approved by the Regulator.

BAT (cont)

2. The following general principles should be applied in sequence to reduce emissions to water:
   - water-efficient techniques should be used at source where possible;
   - water should be recycled within the process from which it issues, by 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;
   - in particular, uncontaminated roof and surface water, which cannot be used, should be discharged separately.

3. Measures should be implemented to minimise contamination risk of process or surface water (see Section 2.3.6).

4. To identify the scope for substituting water from recycled sources, the water quality requirements associated with each use should be identified. Less contaminated water streams, e.g. cooling waters, should be kept separate where there is scope for reuse, possibly after some form of treatment.

5. Ultimately wastewater will need some form of treatment (see Section 2.3.4). However, in many applications, the best conventional effluent treatment produces a good water quality which may be usable in the process directly or when mixed with fresh water. While treated effluent quality can vary, it can be recycled selectively when the quality is adequate, reverting to discharge when the quality falls below that which the system can tolerate. The Operator should identify where treated water from the effluent treatment plant could be used and justify where it is not.

   IThe cost technology continues to reduce. They can be applied to individual process streams or to the final effluent from the effluent treatment plant. Ultimately, they could completely replace the ETP plant, leading to much reduced effluent volume. There remains, however, a concentrated effluent stream but, where this is sufficiently small, and particularly where waste heat is available for further treatment by evaporation, a zero effluent system could be produced. Where appropriate, the Operator should assess the costs and benefits of providing such treatment. Reviews are contained in the Envirowise guides GG 109, 37, 54 and in the Biowise Guide to Anaerobic Digestion.

6. Water used in cleaning and washing down should be minimised by:
   - vacuuming, scraping or mopping in preference to hosing down;
   - evaluating the scope for reusing wash water;
   - trigger controls on all hoses, hand lances and washing equipment.

Cont.

Water use

BREF Sections:

7. Fresh water should only be used for:
   - dilution of chemicals (note that some such as fillers can be diluted with clarified water);
   - vacuum pump sealing (note, below, that this can be much reduced or even eliminated);
   - to make up for evaporative losses (this can be reduced by heat recovery on the machine);
   - for high pressure showers (generally those with pressures greater than 1000 - 2000 kPa);
8. Fresh water consumption should be directly measured and recorded regularly - ideally on a daily basis.

2.3 The Main Activities and Abatement

(includes **"directly associated activities"** in accordance with the PPC Regulations)

Application Form Question 2.3

Describe the proposed installation activities and the proposed techniques and measures to prevent and reduce waste arisings and emissions of substances and heat (including during periods of start-up or shut-down, momentary stoppage, leak or malfunction).

With the Application the Operator should:

1. provide adequate **process descriptions** of the activities and the abatement and control equipment for all of the activities such that the Regulator can understand the process in sufficient detail to assess the Operator's proposals and, in particular, to assess opportunities for further improvements. This should include:
   - process flow sheet diagrams (schematics);
   - diagrams of the main plant items where they have environmental relevance; e.g. landfill liner design, incinerator furnace design, abatement plant design etc.;
   - control system philosophy and how the control system incorporates environmental monitoring information;
   - annual production, mass and energy balance information;
   - venting and emergency relief provisions;
   - summary of extant operating and maintenance procedures;
   - a description of how protection is provided during abnormal operating conditions such as momentary stoppages, start-up, and shut-down for as long as is necessary to ensure compliance with release limits in Permits;
   - additionally, for some applications it may be appropriate to supply piping and instrumentation diagrams for systems containing potentially polluting substances.

   If there is uncertainty, the degree of detail required should be established in pre-application discussions.
2. describe the current or proposed position for all of the indicative BAT requirements for each subsection of 2.3, or any others which are pertinent to the installation;
3. identify shortfalls in the above information which the Operator believes require longer term studies to establish.
4. demonstrate that the proposals are BAT, by confirming compliance with the indicative requirements, by justifying departures (as described in Section 1.2 and in the Guide for Applicants) or alternative measures;

In assessing the integrated impacts of proposals and balancing the impacts of different techniques it should be noted that energy should be taken into account whether or not there is a Climate Change Agreement or Trading Agreement in place (see Section 2.7.3).

Indicative BAT Requirements

See each subsection of this Section 2.3.

2.3.1 Pretreatment of fibres

2.3.1.1 Wool Scouring

Process **Raw wool** contains dirt, sweat (suint), grease and pesticides. These are removed by de-dusting to shake out dirt and aqueous washing (scouring) in a series of bowls to remove grease and dirt.

Water The wastewater contains dirt, emulsified grease, detergents and persistent organic pollutants. The wastewater requires treatment to reduce COD and remove solid material. Normally treatment using aerobic processes requires a preliminary coagulation/flocculation stage to be effective at removing COD. Grease can be removed for reuse. The persistent organic pollutants from the veterinary treatment of the sheep are difficult to remove and current practice is to avoid sources of wool that contain these materials (mainly the former Soviet Union, the Middle East and some South American countries. The UK Wool Textile Industry keeps a Pesticide Database to avoid wool from contaminated sources. N.B. At the time of writing Australia has been declared by EU as a Low Residue Area.

Land There is a small potential for the run-off of pesticides from open storage areas.

Air Air pollution is generally not a main issue but wool scouring process can be a significant source of odour from fugitive emissions. Some processes may use hot cracking of the wastewater with sulphuric acid to recover grease and other processes use incineration to deal with greasy wastes. Both can have an impact on air.

Waste Grease and sludge are produced by the scouring process. Grease is regarded as a by-product and can be sold to lanolin manufacturers if the pesticide levels are low. Acid cracked grease has no value. Sludges from the phsico-chemical treatment of the wastewater also contains grease, dirt and pesticides and has been disposed of by incineration, pyrolysis, brick manufacture and composting. Landfill is probably the most common disposal method.

Energy Scouring is carried out at 55 to 70 °C and involves a drying stage. There is therefore potential for energy recovery by preheating the liquors.

Accidents Not significant

Noise Mechanical handling and delivery vehicles may be a source of noise.

Application Form Question 2.3 (cont.) — Wool scouring

With the Application the Operator should:

1. supply the general application requirements for Section 2.3 listed on page 29 for this aspect of the activities;

Indicative BAT Requirements

The main control issues are:

- Raw wool should be free of list I substances
- Water efficiency techniques should be employed - see diagram below, at least one site has achieved an effluent free wool scouring process --..
- Waste should be recovered - see Section 2.6.

:

BAT

BREF Sections: 2.13.1, 2.3.2, 2.3.2, 2.6.1, 2.6.2

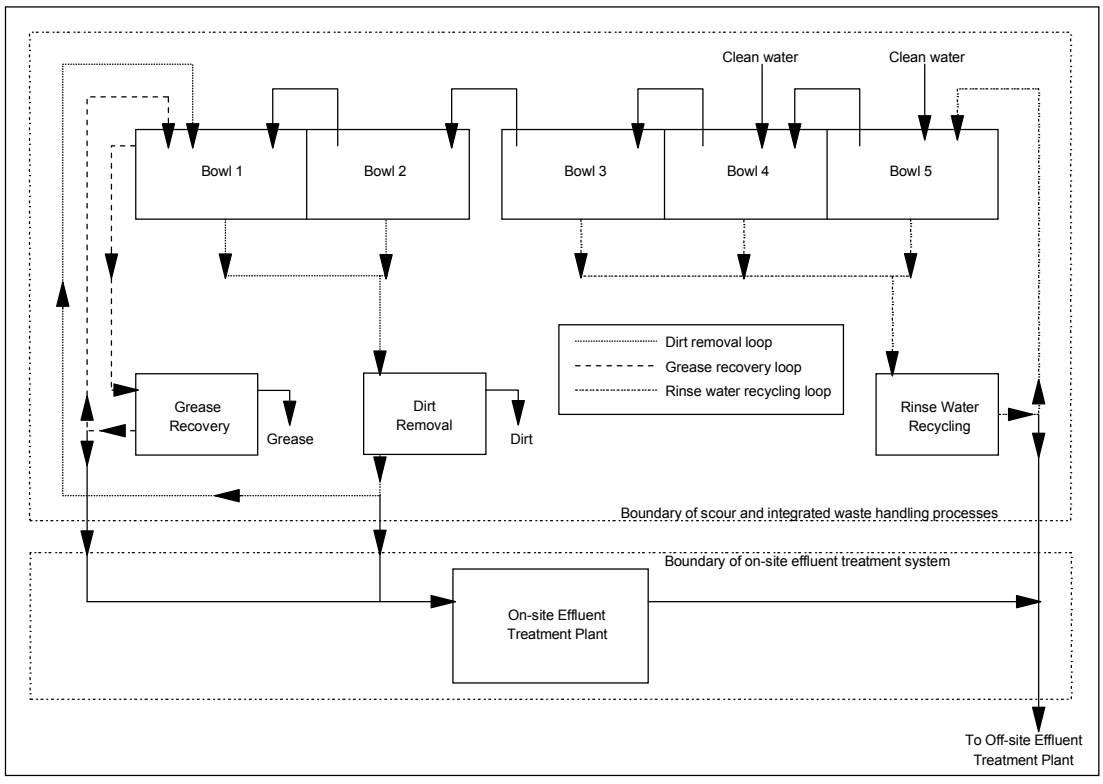


Figure 7 A scour line with counter current rinsing, integrated waste handling and effluent treatment plant

2.3.1.2 Cotton and flax

Process **Raw cotton is cleaner than wool but still** contains dirt and might contain pesticides. Cotton is sorted and cleaned in "openers". Flax is normally retted after cropping and only requires mechanical treatment before spinning.

Water During the he pre-treatment stage pesticides on the fibres and oils added prior to spinning are released during the washing and treatment stages and is the most significant source of pollutants.

Land Not significant

Air Air pollution is not a main issue but some processes may produce dust during the mechanical treatment processes.

Waste Not significant

Energy Not significant

Accidents Not significant

Noise Mechanical handling and delivery vehicles may be a source of noise.

2.3.2 Dyeing and finishing processes

2.3.2.1 Dyeing

Process Fibres,. yarn and cloth are dyed or printed using a variety of processes(see BREF 2.8 and 2.11). Blending and metering of dyes and auxiliary chemicals can achieve reductions in environmental impact and reduce costs.

Water Oils added prior to spinning can be released during the latter washing and treatment stages. The wastewater from the dyeing processes contains residual colour, COD and may also contain persistent organic pollutants. The wastewater requires treatment to reduce COD and remove solid material. Flow balancing and management of batches can reduce the impact of colour but other treatment including filtration through clay or carbon may be needed. Colour conditions have been applied to the effluents from a number of sewage treatment works.

Land There are no significant issues.

Air Emissions of dust from the colour kitchen used to blend pigments etc and from stentoring can be an issue. Steam plumes can be a source of local impact.

Waste Waste packaging might be an issue

Energy Dyeing is often carried out at high temperatures and involves a drying stage. There is therefore potential for energy recovery by preheating the liquors.

Accidents Not significant

Noise Mechanical handling and delivery vehicles may be a source of noise.

2.3.2.2 Scouring of woven yarn

Process Scouring is carried before or after dyeing to remove materials that are used to improve weaving or spinning processes. For example starch (or synthetic agents) are used weave aids.

Water The wastewater contains dirt, emulsified oils, detergents and starch. The wastewater requires treatment to reduce BOD and remove solid material. Normally treatment using aerobic processes requires a preliminary coagulation/flocculation stage to be effective at removing COD. Persistent organic pollutants may be present in the wastewater even though other washing and scouring stages may have been carried out. They arise from the veterinary treatment of sheep, from the herbicides and preserving agents used on cotton. These pollutants are difficult to remove and current practice is to avoid sources of wool or cotton or from some mothproofing agents added during the final scouring process. Sources of raw materials that contain persistent organic pollutants should be avoided.

Land Not significant.

Air Air pollution is generally not a main issue.

Waste The scour baths need to be cleaned periodically to remove settled dirt. Landfill is probably the most common disposal method.

Energy Scouring is carried out at 55 to 70 °C and involves a drying stage. There is therefore potential for energy recovery by preheating the liquors.

Accidents Not significant

Noise Mechanical handling and delivery vehicles may be a source of noise.

2.3.2.3 Finishing treatments

Process Fibres, yarns and cloth undergo a number of treatment stages to prepare the fabric for use. The processes include the application of mothproofing, flame retardancy, waterproofing and anti-static agents. These processes are reported in Chapter 2.9 of the BREF.

Water The continuous processes used generally do not involve a washing stage and therefore spillages and contamination of equipment is the main source of emissions. Phosphor-

organic flame retardant is the exception to this. Batch process involve washdown stages.

Land There is a small potential for the run-off of pesticides from open storage areas.

Air Air pollution in the form of VOCs and odour maybe a problem from heat singeing and heat setting in stentering processes.

Waste Not significant

Energy Stenters are high energy users.

Accidents Not significant

Noise Mechanical handling and delivery vehicles may be a source of noise.

BAT

BREF Sections: 2.9, 2.10,

2.3.2.4 Washing processes

Process Fibres, yarns and cloth undergo a number of washing stages to prepare the fabric for use. These processes are reported in Chapter 2.10 of the BREF.

Water The washing processes use different detergents and surfactants that can have an environmental impact and the careful choice of materials can be used to minimise this. The processes also remove additional quantities of pesticides and oils that may be present on the raw material or are added to assist spinning and this needs to assessed on a site by site basis.

Land Not significant

Air Air pollution is not a main issue.

Waste Not significant

Energy Not significant

Accidents Not significant

Noise Mechanical handling and delivery vehicles may be a source of noise.

2.3.2.5 Carpet backing

Process **Several types of coating are applied to the backing of carpets to improve stability, insulating properties and elasticity**. These processes are reported in Chapter 2.12 of the BREF.

Water The processes use different materials such as Latex, polyurethane, glues and polyolefins that can have an environmental impact and the careful choice of materials is used to minimise this.

Land Not significant

Air Air pollution from solvents, other odorous materials and dust are the main issues.

Waste Polyurethane residues may be significant and waste latex/backing materials can also be significant.

BAT

- BREF Sections: 2.12

Energy Not significant

Accidents Not significant

Noise Mechanical handling and delivery vehicles may be a source of noise.

Application Form Question 2.3 (cont.)

Other processes

With the Application the Operator should:

2. supply the general application requirements for Section 2.3 listed on page 30 for this aspect of the activities;

Indicative BAT Requirements

The main control issues are:

- The carryover of list I substances
- The use of energy recovery techniques should be addressed
- Water efficiency techniques should be employed - see diagram above --..
- Waste should be recovered - see Section 2.6.

2.3.3

Abatement to air

Control of point source emissions to air

Sources

The nature and source of the emissions expected from each activity is given in previous sections and will be confirmed in detail in the Operator's response to Section 3.1. In general they comprise:

•

The main sources of air emission in textile sector are:

- boilers and steam generators;
- stenters for thermal setting, drying and finishing steps
- coating processes
- singeing
- solvent washing units (including carbonising)
- colour kitchens

Cross-sectoral guidance on abatement techniques for point source emissions to air can be found in Ref. 11.

Application Form Question 2.3 (cont.) — Control of Point Source Emissions to Air

With the Application the Operator should:

1. supply the general application requirements for Section 2.3 on page 30 for control and abatement equipment; and in addition
2. describe measures taken to increase the reliability with which the required control and abatement performance is delivered.
3. where VOCs are released, the identification of the main chemical constituents of the emissions and assessment of the fate of these chemicals in the environment. These steps will be carried out as in response to Sections 3.1 and 4.1 but need to be understood here in order to demonstrate that the controls are adequate.
4. Describe the main pollution prevention methods for reducing air emissions such as:

- Minimise solvent use;
- identification of sources and quantification of emissions;
- improve solvent based operations;
- heat setting operations optimisation and control;
- volatile chemicals correct management;
- optimisation of heat generators;
- substitution or minimisation of highly polluting chemicals;
- implementation of the emission factor concept (see chapter 4.3.1.4).

Indicative BAT Requirements

1. The Operator should complete any detailed studies required into abatement or control options (see item 3 in Section 2.3) as an improvement condition to a timescale to be agreed with the Regulator but in any case within the timescale given in Section 1.1;
2. ***Steam plume elimination.*** Releases from wet scrubber vents should be hot enough to avoid visible plume formation in the vicinity of the vent. This is to prevent the condensation or adsorption of environmentally harmful substances by the condensing water vapour. Exhaust gases from a wet scrubber can be heated by the use of 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 Applicant may be able to demonstrate that the BAT criteria have nonetheless been met.

Effluent treatment

2.3.4 Abatement of point source emissions to surface water and sewer

The nature and source of the emissions expected from each activity is given in previous sections and will be confirmed in detail in the Operator's response to Section 3.1. In general, wastewater can arise from the process activity, from storm water, from cooling water, from accidental emissions of raw materials, products or waste materials, and from fire-fighting. In addition to the BREF and the techniques below, guidance on cost-effective effluent treatment techniques can be found in ENVIROWISE Guides GG 109, 37 and 54 (Ref. 9). Case studies are given in Biowise case studies.

Summary of the activities

The nature and source of the effluent from each activity is given in the preceding sections of 2.3. In general, in addition to the substances that give rise to the COD of the effluent, the raw materials contain persistent organic pollutants, some of which are poorly biodegradable, and which can be particularly toxic.

A wide variety of chemicals are also used in textile processes and the effluent will be a complex mixture of substances. The impact of these both individually and synergistically needs to be assessed. Biosensors have been used in the Industry. Direct Toxicity Assessment (DTA) is an appropriate method of assessing this in combination with "whole sample" monitoring techniques - see Section 2.10.

While most pesticides and other persistent substances have been detected in releases from UK installations in recent years, those most frequently recorded in significant amounts are Cypermethrin, PCP, lindane, mercury and cadmium. Although concentrations tend to be low the very significant volumes of water involved mean that loadings can be high.

Wastewater treatment changes the nature and distribution of these substances, with some ending up in a sludge form, others being emitted to atmosphere and some remaining in the wastewater discharge Grease will also be present if it has not been removed efficiently. At least one wool scourer has achieved an "effluent free" process.

Most textile processes discharge to sewage treatment works but may have some form of pre-treatment plant prior to discharge. In many parts of the country there are concentrations of installations and local sewage treatment works may treat the effluents from several installations. This can give rise to problems of highly coloured effluent and the current trend is for further treatment to remove colour at the dyehouse.

Effluent treatment

Application Form Question 2.3 (cont.) → Effluent Treatment

With the Application the Operator should:

1. supply the general application requirements for Section 2.3 on page 30 to prevent or reduce point source emissions to water and land; and in addition,
2. include, where appropriate, off site treatment in the description of the wastewater treatment system for the activity;
3. provide, where effluent is discharged, a justification for not cleaning the effluent to a level at which it can be reused (e.g. by ultrafiltration where appropriate);
4. describe measures taken to increase the reliability with which the required control and abatement performance is delivered (there may be a biological plant susceptible bulking or poisoning – what measures ensure reliability?, heavy metals are measured only occasionally – what techniques ensure that they are controlled all the time? etc.);
5. identify the main chemical constituents of the treated effluent (including the make-up of the COD) and assessment of the fate of these chemicals in the environment. These steps will be carried out as in response to Sections 3.1 and 4.1 but need to be understood here in order to demonstrate that the controls are adequate. This applies whether treatment is on- or off-site;
6. identify the toxicity of the treated effluent (see Section 2.10). Until the Regulator's toxicity guidance is available, this should, unless already in hand, normally be carried out as part of an improvement programme;
7. where there are harmful substances or levels of residual toxicity, identify the causes of the toxicity and the techniques proposed to reduce the potential impacts;
8. consider of whether the effluent flow is sufficient to fall within the requirements of the Urban Waste Water Treatment Directive.

Indicative BAT Requirements

BAT for effluent

1. The Operator should complete any detailed studies required into abatement or control options (see item 3 in Section 2.3) as an improvement condition to a timescale to be agreed with the Regulator but in any case within the timescale given in Section 1.1;
2. The following general principles should be applied in sequence to control emissions to water:
   - water use should be minimised and wastewater reused or recycled (see Section 2.2.3);
   - contamination risk of process or surface water should be minimised (see Section 2.3.6);
   - ultimately, surplus water is likely to need treatment to meet the requirements of BAT (and statutory and non-statutory objectives). Generally, effluent streams should be kept separate as treatment will be more efficient. However, the properties of dissimilar waste streams should be used where possible to avoid adding further chemicals, e.g. neutralising waste acid and alkaline streams. Also, biological treatment can occasionally be inhibited by concentrated streams, while dilution, by mixing streams, can assist treatment;
   - systems should be engineered to avoid effluent by-passing the treatment plant.
3. All emissions should be controlled, as a minimum, to avoid a breach of water quality standards (see Sections 3.2 and 4.1) but noting that where BAT can deliver prevention or reduction at reasonable cost it should do so (see Section 1.1). Calculations and/or modelling to demonstrate this will be carried out in response to Section 4.1.
4. With regard to BOD, the nature of the receiving water should be taken into account. 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. Guidance on treatment of persistent substances can be found in References (see Ref. 12).

Cont.

Effluent treatment

5. Where effluent is treated off-site at a sewage treatment works, the above factors apply in particular demonstrating that:
   - the treatment provided at the sewage treatment works is as good as would be achieved if the emission was treated on-site, based on reduction of load (not concentration) of each substance to the receiving water;
   - the probability of sewer bypass, via storm/emergency overflows or at intermediate sewage pumping stations, is acceptably low;
   - action plans in the event of bypass, e.g. knowing when bypass is occurring, rescheduling activities such as cleaning or even shutting down when bypass is occurring;
   - a suitable monitoring programme is in place for emissions to sewer, taking into consideration the potential inhibition of any downstream biological processes and actions plan for any such event.

General

The operator should consider the effect of shutdowns and weekend breaks on wastewater treatment process.

Handling

6. Buffer storage or balancing tanks should normally be provided to even out the concentrations where there is a release of stronger, highly coloured or alkaline wastewaters.

7. If no balancing is provided, the Operator should show how peak loads are handled without overloading the capacity of the wastewater treatment plant.

BREF Sections 6.3.9, 6.3.11

Primary treatment

8. The Operator should justify the choice and performance of the plant against the following factors:
   - The objective of this stage is the removal of grease and particulate solids. Settlement and dissolved air flotation systems are used. The preferred solution will depend on the specific location and wastewater characteristics.
   - Settlement systems can produce well-clarified waters, but can suffer from operating difficulties (floating solids and odour), particularly when treating stronger, warmer wastewaters. High-rate settlement units such as lamella clarifiers are used for treating specific streams such as coating wastewaters. Chemical pre-treatment (e.g. polyelectrolytes, inorganic coagulants and bentonite) is often practised to enhance the removal of colloidal solids and/or to increase settlement velocities.
   - Flue gases from other processes can be used to adjust the pH of alkaline effluents.

9. The Operator should justify the choice and performance of the plant against the following factors.
   - The objective of this stage is the removal of biodegradable materials (BOD) which can be achieved by genuine degradation or by adherence of the pollutants to the sludge. The latter mechanism will also remove non-biodegradable materials such as heavy metals. in this sector the BOD/COD ratio might be unusual because of the presence of resistant organic species.
   - Dioxins, furans and DDT would be expected to bind to the biomass and fibre sludge almost totally. Hexachlorobutadiene, hexachlorobenzene, aldrin, dieldrin, endrin, PCBs, trichlorobenzene and heavy metals will also be partially removed by this mechanism (mercury 40-50%, cadmium 95% and copper, chromium, lead and zinc 75-95%).
   - Evidence suggests that biological treatment can remove 40% of chlorinated organic materials (70 -90% of chlorinated phenolics, including pentachlorophenol, in particular), by genuine biodegradation.

Cont

Effluent treatment

BREF Sections .

The basic alternatives are aerobic and anaerobic biological systems. There are many designs of each.

Aerobic plant is the most common biological plant, by far - plants can use air, oxygen or a combination. The use of oxygen improves control and performance and can be retrofitted to existing plants however, it would normally be preferable, on the grounds of minimising energy consumption, to size a plant to use air.

High rate biological towers can be used to reduce the BOD giving an effluent suitable for further treatment at a sewage treatment works.

The consequences of a breakdown of an activated sludge wastewater treatment plant by bulking (overproduction of filamentous bacteria) for example should be understood for the particular mill. For example the carry-over of fibre will take all the substances which are fibre substantive with it, such as cadmium and other heavy metals and many organic materials.

10. There should be specific procedures for nutrient and other chemical dosing which ensure that the optimum balance of added nutrients is maintained, minimising both releases of nutrients and the occurrence of bulking.

11. The Operator should have procedures in place to deal with bulking when it occurs including reducing load if necessary.

12. The Operator should confirm whether pesticides are present and whether colour removal is practised or planned.

BREF Section:

Anaerobic treatment should be used where the conditions permit as it will break down more ring compounds, is more effective in the removal of the chlorate which is formed in the production of chlorine dioxide, avoids problems with bulking filamentous bacteria, produces lower quantities of sludge and produces methane which should be captured and used as an energy source. It is appropriate when the incoming organic concentrations and the temperature are high, say BOD > 2000 mg/l and 35°C. Most effluent from modern plant is of adequate temperature, and where it is not, the energy recovered from the anaerobic off-gases could be used to raise it.

13. The design should maximise methane production for collection and burning for energy production, noting the need to take account of other emissions such as SO_2 and NOx..

14. An anaerobic system should be followed by an aerobic system as the latter achieves lower absolute release levels, will remove hydrogen sulphide and ensure that the final effluent is well aerated to assist in the breakdown of the remaining BOD. The energy gained from the anaerobic plant can be equivalent to that consumed by the aerobic plant.

15. The methanogenic bacteria should be protected from chlorinated and sulphur compounds, pH and temperature fluctuations and the plant made more robust by a pre-acidification stage in which other bacteria will predominate and break down many of the substances which cause the problems.

16. After a biological plant, solids removal should be provided. This can be by secondary clarifier but, where space permits, systems with the benefit of large, post-treatment lagoons gain excellent protection against bulking or other problems. This should be designed in where space permits.

Cont.

Effluent treatment

Tertiary treatment

17. Irrespective of the type of treatment provided, all Operators should assess the possibility of recycling the treated wastewater in a partially or fully closed system taking the following factors into account:

- Membrane or possibly evaporative plant could obviate the need for conventional abatement plant, and by generating all the fresh water needs from the recycled water, an effluent-free system can be created with fresh water make-up required only to balance evaporative losses. Studies show the lifetime costs to be similar to that of conventional biological abatement however, there are very few effluent-free plants operating.
- Colour removal using inorganic clays has been reported as a successful technique for some dyes. The treatment allows water reuse and removal of colour in the final wastewater. The energy content of the recycled water is also reused.

Fugitives

2.3.5 Control of fugitive emissions to air

On many installations fugitive, or diffuse, emissions may be more significant than point source emissions. In this sector fugitive emissions are associated with odours particularly from wool scourers and from VOCs used in various process stages. Common examples of the sources of fugitive emissions are:

- open vessels (e.g. the effluent treatment plant);
- storage areas (e.g. bays, stockpiles, lagoons etc.);
- the loading and unloading of transport containers;
- transferring material from one vessel to another (e.g. reactors, silos);
- 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.

Application Form Question 2.3 (cont.) — Fugitive emissions to air

With the Application the Operator should:

1. supply the general application requirements for Section 2.3 on page 29 for control of fugitive emissions to air; and in addition,

2. identify, and where possible, quantify significant fugitive emissions to air from all relevant sources, including those below, estimating the proportion of total emissions which are attributable to fugitive releases for each substance; these steps will be carried out as in response to Section 3.1 but need to be understood here in order to demonstrate that the controls are adequate.

- singeing (dust) - wastewater treatment (odour)	- bleaching vessels (chlorine or sulphur compounds) - solvent washing (VOCs) - other

Indicative BAT Requirements

1. The Operator should complete any detailed studies required into abatement or control options (see item 3 in Section 2.3) as an improvement condition to a timescale to be agreed with the Regulator but in any case within the timescale given in Section 1.1.

2. Where there are opportunities for reductions, the Permit may require the updated inventory of fugitive emissions to be submitted on a regular basis.

3. ***Dust*** - The following general techniques should be employed where appropriate:
   - covering of skips and vessels;
   - avoidance of outdoor or uncovered stockpiles (where possible);
   - where unavoidable, use of sprays, binders, stockpile management techniques, windbreaks etc.;
   - wheel and road cleaning (avoiding transfer of pollution to water and wind blow);
   - closed conveyors, pneumatic conveying (noting the higher energy needs), minimising drops;
   - regular housekeeping.

4. **VOCs**
   - 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 to suitable abatement plant.

Cont.

- Vent systems should be chosen to minimise breathing emissions (e.g. pressure/vacuum valves) and, where relevant, should be fitted with knock-out pots and appropriate abatement equipment.
- ***Odour -*** See Section 2.3.7.

Fugitives

2.3.6 Control of fugitive emissions to surface water, sewer and groundwater

Application Form Question 2.3 (cont.) — Fugitive Emissions to Water

With the Application the Operator should:

1. supply the general application requirements for Section 2.3 on page 29 for control of fugitive emissions to water; and in addition,
2. identify, and where possible, quantify significant fugitive emissions to water from all relevant sources, estimating the proportion of total emissions which are attributable to fugitive releases for each substance; These steps will be carried out as in response to Section 3.1 but need to be understood here in order to demonstrate that the controls are adequate.

Indicative BAT Requirements

1. Where there are opportunities for reductions, the Permit may require the updated inventory of fugitive emissions to be submitted on a regular basis.
2. ***Subsurface structures – the Operator should:***
   - establish and record the routing of all installation drains and subsurface pipework;
   - identify all subsurface sumps and storage vessels;
   - engineer systems to ensure leakages from pipes etc are minimised and where these occur, can be readily detected, particularly where hazardous (e.g. listed) substances are involved;
   - provide in particular, secondary containment and/or leakage detection for such subsurface pipework, sumps and storage vessels;
   - establish an inspection and maintenance programme for all subsurface structures, e.g. pressure tests, leak tests, material thickness checks etc.
3. ***Surfacing – the Operator should:***
   - describe the design(#),and condition of the surfacing of all operational areas;
   - have an inspection and maintenance programme of impervious surfaces and containment kerbs;
   - justify where operational areas have not been equipped with:
     - an impervious surface;
     - spill containment kerbs;
     - sealed construction joints;
     - connection to a sealed drainage system.

   (# Relevant information may include as appropriate: capacities; thicknesses; falls; material; permeability; strength/reinforcement; resistance to chemical attack; inspection and maintenance procedures; and quality assurance procedures.)
4. ***Bunds***
   All tanks containing liquids whose spillage could be harmful to the environment should be bunded. For further information on bund sizing and design, see Ref. 12. Bunds should:
   - be impermeable and resistant to the stored materials;
   - have no outlet (i.e. no drains or taps) and drain to a blind collection point;
   - have pipework routed within bunded areas with no penetration of contained surfaces;
   - be designed to catch leaks from tanks or fittings;
   - have a capacity which is the greater of 110% of the largest tank or 25% of the total tankage;
   - be subject to regular visual inspection and any contents pumped out or otherwise removed under manual control after checking for contamination;
   - where not frequently inspected, be fitted with a high-level probe and an alarm as appropriate;
   - have fill points within the bund where possible or otherwise provide adequate containment;
   - have a routine programmed inspection of bunds, (normally visual but extending to water testing where structural integrity is in doubt).

Odour

2.3.7 Odour

Application Form Question 2.3 (cont.) — Odour control

With the Application the Operator should:

1. supply the general application requirements for Section 2.3 on page 30 for odour control; and in addition, where odour could potentially be a problem, the Operator should:

2. ***categorise the emissions as follows:***

   a. ***a high level release which is expected to be acknowledged in the Permit*** – i.e. there will be an allowed release from the process (e.g. An odorous release from a stack or high level scrubber) and an element of BAT is adequate dispersion between source and receptor to prevent odour nuisance. The release will be allowed under the Permit but it is acknowledged that, under certain conditions, the plume may ground causing odour problems. Conditions in Permits are likely to be based on the actions to take when such events occur.

   b. ***release should be preventable*** – i.e. releases can normally be contained within the site boundary by using BAT such as containment, good practice or odour abatement.

   c. ***release is not preventable under all circumstances*** e.g. from a landfill or uncovered effluent treatment plant but potential problems are controlled by a programme of good practice measures;

3. for each relevant category, demonstrate that there will not be an odour problem from the emissions under normal conditions (see odour guidance).

4. for each relevant category, identify the actions to be taken in the event of abnormal events or conditions which might lead to odour, or potential odour problems (see odour guidance).

5. describe the current or proposed position with regard to any techniques given below or in Ref. 23.

Indicative BAT Requirements

1. The requirements for odour control will be sector specific and dependant upon the sources and nature of the potential odour. In general terms:
   - where odour can be contained, for example within buildings, the Operator should ensure that the maintenance of the containment and the management of the operations are such as to prevent its release at all times;
   - Where odour releases are permitted, (see examples above):
     - for new installations or significant changes, the releases should be modelled to demonstrate a low frequency of ground level concentrations above the odour threshold (or other threshold of acceptability). For occasions where weather conditions or other incidents are liable, in the view of the Regulator, to cause exceedances of the threshold of acceptability, the Operator should take appropriate and timely action, including shutting down the operations, to prevent annoyance,
     - for existing installations, the same principle applies, except that where experience shows there to be no odour problem such modelling and actions will not be necessary.

2. For complex installations, for example where there are a number of potential sources of odorous releases or where there is an extensive programme of improvements to bring odour under control, an odour management plan should be maintained. The Regulator may incorporate the odour management plan in the Permit.

Groundwater

2.4 Emissions to Groundwater

Groundwater protection legislation

The Groundwater Regulations for the UK came into force on 1 April 1999. An IPPC Permit will be subject to the following requirements under these Regulations.

i. It shall not be granted at all if it would permit the direct discharge of a List I substance (Regulation 4(1)) (except in limited circumstances – see note 1 below).

ii. If the Permit allows the disposal of a List I substance or any other activity which might lead to an indirect discharge (see note 2 below) of a List I substance then **prior investigation** (as defined in Regulation 7) is required and the Permit shall not be granted if this reveals that indirect discharges of List I substances would occur and in any event conditions to secure prevention of such discharges must be imposed (Regulation 4(2) and (3)).

iii. In the case of List II substances, Permits allowing direct discharges or possible indirect discharges cannot be granted unless there has been a prior investigation and conditions must be imposed to prevent groundwater pollution (Regulation 5).

iv. The Regulations contain further detailed provisions covering **surveillance** of groundwater (Regulation 8); conditions required when direct discharges are permitted (Regulation 9); when indirect discharges are permitted (Regulation 10); and review periods and compliance (Regulation 11).

The principles, powers and responsibilities for groundwater protection in England and Wales, together with the Agency's policies in this regard, are outlined in the Environment Agency's document "*Policy and Practice for the Protection of Groundwater*"(PPPG) (see Ref. 24). This outlines the concepts of vulnerability and risk and the likely acceptability from the Agency's viewpoint of certain activities within groundwater protection zones.

A **Prior investigation** of the potential effect on groundwater of on-site disposal activities or discharges to groundwater. Such investigations will vary from case to case, but the Regulator is likely to require a map of the proposed disposal area; a description of the underlying geology, hydrogeology and soil type, including the depth of saturated zone and quality of groundwater; the proximity of the site to any surface waters and abstraction points, and the relationship between ground and surface waters; the composition and volume of waste to be disposed of; and the rate of planned disposal.

B **Surveillance** - this will also vary from case to case, but will include monitoring of groundwater quality and ensuring the necessary precautions to prevent groundwater pollution are being undertaken.

Note 1 The Regulations state that, subject to certain conditions, the discharges of List I substances to groundwater may be authorised if the groundwater is "permanently unsuitable for other uses". Advice must be sought from the Regulator where this is being considered as a justification for such discharges.

Note 2 List I and List II refer to the list in the Groundwater Regulations and should not be confused with the similar lists in the Dangerous Substances Directive.

Application Form Question 2.4

Identify if there may be a discharge of any List I or List II substances and if any are identified, explain how the requirements of the Groundwater Regulations 1998 have been addressed.

With the Application the Operator should:

Meeting the requirements of the Groundwater Regulations

1. confirm that there are no direct or indirect emissions to groundwater of List I or List II substances from the installation, or

2. where there are such releases, provide the information and surveillance arrangements described in A and B above.

Under these Regulations the Permit may not be granted if the situation is not satisfactory, therefore, with the application, the Operator should supply information on list I and list II substances and if necessary, prior investigation and surveillance information:

Groundwater

List I and List II substances

List I

1.-(1) Subject to sub-paragraph (2) below, a substance is in list I if it belongs to one of the following families or groups of substances-

(a) organohalogen compounds and substances which may form such compounds in the aquatic environment;

(b) organophosphorus compounds;

(c) organotin compounds;

(d) substances which possess carcinogenic, mutagenic or teratogenic properties in or via the aquatic environment (including substances which have those properties which would otherwise be in list II);

(e) mercury and its compounds;

(f) cadmium and its compounds;

(g) mineral oils and hydrocarbons;

(h) cyanides.

2. A substance is not in list I if it has been determined by the Regulator to be inappropriate to list I on the basis of a low risk of toxicity, persistence and bioaccumulation.

List II

1.-(1) A substance is in list II if it could have a harmful effect on groundwater and it belongs to one of the families or groups of substances:

(a) the following metalloids and metals and their compounds:

Zinc	Tin	Copper
Barium	Nickel	Beryllium
Chromium	Boron	Lead
Uranium	Selenium	Vanadium
Arsenic	Cobalt	Antimony
Thallium	Molybdenum	Tellurium
Titanium	Silver	

(b) biocides and their derivatives not appearing in list I;

(c) substances which have a deleterious effect on the taste or odour of groundwater, and compounds liable to cause the formation of such substances in such water and to render it unfit for human consumption;

(d) toxic or persistent organic compounds of silicon, and substances which may cause the formation of such compounds in water, excluding those which are biologically harmless or are rapidly converted in water into harmless substances;

(e) inorganic compounds of phosphorus and elemental phosphorus;

(f) fluorides;

(g) ammonia and nitrites

(2) A substance is also in list II if-

(a) it belongs to one of the families or groups of substances set out in paragraph 1(1) above;

(b) it has been determined by the Regulator to be inappropriate to list I under paragraph 1(2); and

(c) it has been determined by the Regulator to be appropriate to list II having regard to toxicity, persistence and bioaccumulation.

3.-(1) The Secretary of State may review any decision of the Regulator in relation to the exercise of its powers under paragraph 1(2) or 2 (2).

3.-(2) The Secretary of State shall notify the Regulator of his decision following a review under sub-paragraph (1) above and it shall be the duty of the Regulator to give effect to that decision.

4.- The Regulator shall from time to time publish a summary of the effect of its determinations under this Schedule in such manner as it considers appropriate and shall make copies of any such summary available to the public free of charge.

2.5 Waste Handling

The normal nature and source of the waste from each activity is given in Section 2.3 and will be confirmed in detail in the Operator's response to Section 3.1. In general the waste streams comprise:

- sludges comprising mainly fibres, grease and the ETP (Section 2.3.4);
- grease;
- reject fibres from cleaning stages, trimmings, offcuts and miscellaneous trash;
- boiler plant ash (some of which may be special waste);
- chemical containers and general inert industrial waste and waste packaging or cones.

Application Form Question 2.5

Characterise and quantify each waste stream and describe the proposed measures for waste management storage and handling.

With the Application the Operator should:

1. identify and quantify the waste streams;
2. identify the current or proposed handling arrangements;
3. describe the current or proposed position with regard to the techniques below or any others which are pertinent to the installation;
4. demonstrate that the proposals are BAT, by confirming compliance with the indicative requirements, by justifying departures (as described in Section 1.2 and in the Guide for Applicants) or alternative measures.

Indicative BAT Requirements

1. A system should be maintained to record the quantity, nature, origin and where relevant, the destination, frequency of collection, mode of transport and treatment method of any waste which is disposed of or recovered.
2. Waste should be addressed through a waste minimisation programme according to the waste hierarchy – eliminate, minimise, reduce, recycle and disposal. Ref 8a and *b give further details. Wherever practicable, waste should be segregated and the disposal route identified which should be as close to the point of production as possible.
3. Records should be maintained of any waste that is sent off-site (Duty of Care).
4. Storage areas should be located away from watercourses and sensitive boundaries e.g. adjacent to areas of public use and protected against vandalism.
5. Storage areas should be clearly marked and signed and containers should be clearly labelled.
6. The maximum storage capacity of storage areas should be stated and not exceeded. The maximum storage period for containers should be specified.
7. Appropriate storage facilities should be provided for special requirements such as for substances that are flammable, sensitive to heat or light etc., and incompatible waste types should be kept separate.
8. Containers should be stored with lids, caps and valves secured and in place. This also applies to emptied containers.
9. Storage containers, drums etc. should be regularly inspected.
10. Procedures should be in place to deal with damaged or leaking containers.
11. All appropriate steps to prevent emissions (e.g. liquids, dust, VOCs and odour) from storage or handling should be taken (see Sections 2.3.5, 2.3.6 and 2.3.7).

2.6 Waste Recovery or Disposal

The Regulations require the Regulator, in setting Permit conditions, to take account of certain general principles including that the installation in question should be operated in such a way that "waste production is avoided in accordance with Council Directive 75/442/EEC on waste; and where waste is produced it is recovered, or where this is technically or economically impossible it is disposed of, while avoiding or reducing the impact on the environment". The objectives of the National Waste Strategies should also be considered.

In order to meet this requirement the Regulator needs Operators to provide the information below.

Application Form Question 2.6

Describe how each waste stream is proposed to be recovered or disposed of. If you propose any disposal, explain why recovery is technically and economically impossible and describe the measures planned to avoid or reduce any impact on the environment.

With the Application the Operator should:

1. describe, in respect of each waste stream produced by the installation, whether the waste in question is to be recovered or disposed of, and if a disposal option is planned, to justify why recovery is "technically and economically impossible" together with "the measures planned to avoid or reduce any impact on the environment";
2. include in the description, the Operator's view as to whether waste disposal is likely to be restricted by the implementation of the Landfill Directive;
3. describe the current or proposed position with regard to the techniques below or any others which are pertinent to the installation;
4. demonstrate that the proposals are BAT, by confirming compliance with the indicative requirements, by justifying departures (as described in Section 1.2 and in the Guide for Applicants) or alternative measures;

Indicative BAT Requirements

1. Unless agreed with the Regulator to be inappropriate, the Operator should provide a detailed assessment identifying the best practicable environmental options for waste disposal. For existing activities, this may be carried out as an improvement condition to a timescale to be approved by the Regulator.
   - use of the wool treatment sludge or sludge from effluent treatment plants in insulating building block or bricks (no current UK outlet but proven on a commercial scale in the US) Operators should be encouraged to work with the insulating block companies;
   - Recovery of grease from wool
   - recycling within the process or, at least, within the industry,
   - steam, may provide the most energy-efficient method of drying the sludge rapidly.);
   - the impact of burning rejects/sludges on the boiler's energy balance should be assessed;
   - a new plant should be demonstrably as good as a modern, well run fluidised bed combustor in terms of flexibility in handling a variable feedstock, efficiency and emissions to atmosphere;
   - residual ash from the energy recovery boiler should also be re-used;
   - the plant should meet the standards in the appropriate combustion guidance.
2. Where energy recovery is not appropriate the Operator should:
   - assess the amount of wastes generated by nearby mills or other industrial/commercial enterprises and consider the possibility for a central treatment plant;
   - consider energy recovery via an off-site plant such as a cement kiln.
3. Where landfill is the only option it should be noted that, particularly when high in fillers, sludge does not readily de-water and can cause serious problems in landfill sites.

2.7 Energy

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 requirements in sections 2.7.1 and 2.7.2 below and is a participant to a Climate Change Agreement (CCA) or Trading Agreement with the government

or

- the Operator meets the basic energy requirements in sections 2.7.1 and 2.7.2 below and the further sector-specific energy requirements in section 2.7.3 below.

Note that even where a Climate Change Agreement or Trading Agreement is in place, this does not preclude the consideration of energy efficiency as part of an integrated assessment of Best Available Techniques in which it may be balanced against other emissions.

Further guidance is given in the Energy Efficiency Guidance Note (Ref. 14). Further details are also given in Envirowise Guides GPG148 and GPG168.

	Loose fibre dyehouses			Yarn dyehouses		
	Site A	Site B	Site C	Site H	Site K	Site L
Process(s) operated	Fibre dyeing & drying	Fibre dyeing & drying	Fibre dyeing & drying	Scouring, hank dyeing & drying	Scouring, hank dyeing & drying	Package dyeing & Drying
Total fibre processed (tonnes/annum	3780	3200	3619	1937	4538	1013
Electricity ('000 kWh/annum)	750	518	627	580	772	592
Fuel ('000 kWh/annum)	11000	13275	15097	12179	22509	2755
Total Energy (GJ/annum)	42299	49649	56603	45928	83807	2131
Specific Energy Consumption **(GJ/tonne textile product)**	**11.18**	**15.52**	**15.64**	**23.27**	**18.47**	**11.9**

Table 5 Energy use at some carpet manufacturing installations

2.7.1 Basic energy requirements (1)

Application Form Question 2.7 (part 1)

Provide a breakdown of the energy consumption and generation by source and the associated environmental emissions.

The requirements of this section are basic, low cost, energy standards which apply whether or not a Climate Change Agreement or Trading Agreement is in force for the installation.

With the Application the Operator should:

1. **provide the following Energy consumption information:**

   Energy consumption information should be provided in terms of delivered energy and also, in the case of electricity, converted to primary energy consumption. For the public electricity supply, a conversion factor of 2.6 should be used. Where applicable, the use of factors derived from on-site heat and/or power generation, or from direct (non-grid) suppliers should be used. In the latter cases, the Applicant shall provide details of such factors. Where energy is exported from the installation, the Applicant should also provide this information. An example of the format in which this information should be presented is given in Table 2.1 below. The Operator should also supplement this with energy flow information (e.g. "Sankey" diagrams or energy balances) showing how the energy is used throughout the process.

   (Note that the Permit will require energy consumption information to be submitted annually)

Table 2.1 - Example breakdown of delivered and primary energy consumption

Energy source	Energy consumption		
	Delivered, MWh	Primary, MWh	% of total
Electricity*			
Gas			
Oil			
Other (Operator to specify)			

* specify source.

2. **provide the following Specific Energy Consumption information**

   The Operator should define and calculate the specific energy consumption of the activity (or activities) based on primary energy consumption for the products or raw material inputs which most closely match the main purpose or production capacity of the installation. The Operator should provide a comparison of Specific Energy Consumption against any relevant benchmarks available for the sector.

3. **provide associated environmental emissions**

   This is dealt with in the Operator's response to Section 3.1.

2.7.2 Basic energy requirements (2)

Application Form Question 2.7 (part 2)

Describe the proposed measures for improvement of energy efficiency.

The requirements of this section are basic, low cost, energy standards which apply whether or not Climate Change Agreement or Trading Agreement is in force for the installation.

With the Application the Operator should:

1. describe the current or proposed position with regard to the **basic, low cost energy requirements** below, and provide justifications for not using any of the techniques described;

2. provide an energy efficiency plan which appraises the costs and benefits of different energy options as described below.

Basic Energy Requirements

1. ***Operating, maintenance and housekeeping measures*** should be in place in the following areas, according to the checklists provided in Appendix 2 of the IPPC Energy Efficiency Guidance Note, where relevant:
   - air conditioning, process refrigeration and cooling systems (leaks, seals, temperature control, evaporator/condenser maintenance);
   - operation of motors and drives;
   - compressed gas systems (leaks, procedures for use);
   - steam distribution systems (leaks, traps, insulation);
   - space heating and hot water systems;
   - lubrication to avoid high friction losses;
   - boiler maintenance e.g. optimising excess air;
   - other maintenance relevant to the activities within the installation.
2. ***Basic, low cost, physical techniques*** should be in place to avoid gross inefficiencies; to include insulation, containment methods, (e.g. seals and self-closing doors) and avoidance of unnecessary discharge of heated water or air (e.g. by fitting simple control systems).
3. ***Building services energy efficiency techniques*** should be in place to deliver the requirements of the Building Services Section of the Energy Efficiency Guidance Note. For energy-intensive industries these issues may be of minor impact and should not distract effort ***from*** the major energy issues. They should nonetheless find a place in the programme, particularly where they constitute more than 5% of the total energy consumption.
4. ***Provide an energy efficiency plan*** which:
   - identifies all techniques relevant to the installation, including those listed below and in Section 2.7.3;
   - identifies the extent to which these have been employed;
   - prioritises the applicable techniques according to the appraisal method provided in the Energy Efficiency Guidance Note which includes advice on appropriate discount rates, plant life etc.;
   - identifies any techniques that could lead to other adverse environmental impacts, thereby requiring further assessment (e.g. according to methodology, see Ref. 6).

   Where other appraisal methodologies have been used, state the method, and provide evidence that appropriate discount rates, asset life and expenditure (£/t) criteria have been employed.

   This should be submitted in a summary format similar to the example below, together with supporting information from any appraisal procedure carried out. The plan is required to ensure that the Operator has considered all relevant techniques. **However, where a Climate Change Agreement or Trading Agreement is in place the Regulator will only enforce implementation of those measures in categories 1-3 above**.

Cont.

Table 2.2 - Example Format for Energy Efficiency Measures

Energy efficiency option	NPV £k	CO_2 savings (tonnes)		NPV/CO_2 saved £/tonne	Priority* for implementation
		annual	lifetime		
7MW CHP plant	1,372	13,500	135,000	10	high
High efficiency motor	0.5	2	14	35	medium
Compressed air	n/a	5	n/a	n/a	immediate

* Indicative only, based on cost/benefit appraisal:

Where a Climate Change Agreement or Trading Agreement is in place, the Energy Efficiency Plan should be submitted as an improvement condition to a timescale to be agreed with the Regulator but in any case within the timescale given in Section 1.1.

5. ***Energy management techniques*** should be in place, according to the requirements of Section 2.1 noting, in particular, the need for monitoring of energy flows and targeting of areas for reductions.

Indicative BAT Requirements

BAT for energy

1. ***Operating, maintenance and housekeeping measures*** should be in place, according to the checklists provided in Appendix 3 of the Energy Efficiency Guidance Note, in the following areas as applicable:
   - air conditioning, process refrigeration and cooling systems (leaks, seals, temperature control, evaporator/condenser maintenance);
   - operation of motors and drives;
   - compressed gas systems (leaks, procedures for use);
   - steam distribution systems (leaks, traps, insulation);
   - space heating and hot water systems;
   - lubrication to avoid high friction losses;
   - boiler maintenance e.g. optimising excess air;
   - other maintenance relevant to the activities within the installation.
2. ***Basic, low cost, physical techniques*** should be in place to avoid gross inefficiencies; to include insulation, containment methods, (e.g. seals and self-closing doors) and avoidance of unnecessary discharge of heated water or air (e.g. by fitting simple control systems).
3. ***Building services*** energy efficiency techniques should be in place to deliver the requirements of the Building Services Section of the Energy Efficiency Guidance Note. For energy-intensive industries these issues may be of minor impact and should not distract effort ***from*** the major energy issues. They should nonetheless find a place in the programme, particularly where they constitute more than 5% of the total energy consumption.
4. ***Energy management techniques*** should be in place, according to the requirements of Section 2.1 noting, in particular, the need for monitoring of energy flows and targeting of areas for reductions.
5. An energy monitoring strategy should be in place and targets used to improve energy efficiency.

2.7.3 Further energy efficiency requirements

Application Form Question 2.7 (part 3)

Describe the proposed measures for improvement of energy efficiency……(only where the installation is <u>not</u> the subject of a Climate Change Agreement or Trading Agreement).

Where there is no Climate Change Agreement or Trading Agreement in place, the Operator should demonstrate the degree to which the further energy efficiency measures identified in the implementation plan, including those below, have been taken into consideration for this sector and justify where they have not.

With the Application the Operator should:

1. identify which of the measures below are applicable to the activities, and include them in the appraisal for the energy efficiency plan in section 2.7.2.
2. describe the current or proposed position with regard to the techniques below, or any others which are pertinent to the installation;
3. demonstrate that the proposals are BAT, by confirming compliance with the indicative requirements, by justifying departures (as described in Section 1.2 and in the Guide for Applicants) or alternative measures;

Indicative BAT Requirements

BAT for energy

BREF Sections:

The following techniques should be implemented where they are judged to be BAT based on a cost/benefit appraisal according to the methodology provided in Appendix 4 of the Energy Efficiency Guidance note (Ref. 14).

1. **Energy efficiency techniques**

   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.

   The following techniques are applicable in this sector. Further information will be found in (Ref. 14).

   - heat recovery from different parts of the processes e.g. from the dye liquors;
   - high efficiency dewatering techniques to minimise drying energy;
   - minimisation of water use and closed circulating water systems;
   - good insulation;
   - plant layout to reduce pumping distances;
   - phase optimisation of electronic control motors;
   - using spent cooling water (which is raised in temperature) in order to recover the heat;
   - belt conveying instead of pneumatic (although this must be balanced against higher potential for fugitive releases);
   - optimised efficiency measures for combustion plant e.g. air/feedwater preheating, excess air etc.;
   - continuous processing instead of batch processes.

2. **Energy supply techniques**
   - use of CHP (the CHP club can be contacted on 0800 585794);
   - recovery of energy from waste;
   - use of less polluting fuels.

Cont.

BAT for energy (cont,)

Irrespective of whether a Climate Change Agreement or Trading Agreement is in place, where there are other BAT considerations involved, such as:

- the choice of fuel impacts upon emissions other than carbon e.g. sulphur in fuel;
- where the potential minimisation of waste emissions by recovery of energy from waste conflicts with energy efficiency requirements;
- the Operator should provide justification that the proposed or current situation represents BAT.

Where there is an on-site combustion plant other guidance is also relevant. For plants greater than 50MW, Operators should consult the IPPC guidance on power generation (reference S2 1.01 and supplement S31.01) and the Operators of plant of 20-50MW should consult the Local Authority Air Pollution Control guidance. On IPPC installations this guidance will be generally applicable to plant under 20MW also. For incineration plant S2.501 Waste Incineration should be consulted.

2.8 Accidents and their Consequences

Guidance

IPPC requires as a general principle that necessary measures should be taken to prevent accidents which may have environmental consequences, and to limit those consequences. This section covers general areas of any installation operations which have the potential for accidental emission.

Some installations will also be subject to the Control of Major Accident Hazards Regulations 1999 (COMAH) (see Appendix 2 for equivalent legislation in Scotland and Northern Ireland). There is an element of overlap between IPPC and COMAH and it is recognised that some systems and information for both regimes may be interchangeable.

The COMAH regime applies to major hazards. For accident aspects covered by COMAH, reference should be made to any reports already held by the Regulator. However, the accident provisions under IPPC may fall beneath the threshold for major accident classification under COMAH and therefore consideration should be given to smaller accidents and incidents as well. Guidance (see Ref. 19), prepared in support of the COMAH Regulations may also be of help to IPPC Operators (whether or not they are covered by the COMAH regime), in considering ways to reduce the risks and consequences of accident.

General management requirements are covered in Section 2.1. For accident management, there are three particular components:

- **identification of the hazards** 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.

Application Form Question 2.8

Describe your documented system that you proposed to be used to identify, assess and minimise the environmental risks and hazards of accidents and their consequences.

With the Application the Operator should:

1. provide the accident management plan described in the indicative BAT requirements below describing the current or proposed position with regard to the techniques listed below or any others which are pertinent to the installation;
2. demonstrate that the proposals are BAT, by confirming compliance with the indicative requirements, by justifying departures (as described in Section 1.2 and in the Guide for Applicants) or alternative measures;
3. identify any issues which may be critical.

Indicative BAT Requirements

BAT for control of accidents

1. A structured accident management plan should be submitted to the Regulator which should:
   - ***a.*** ***identify the hazards*** to the environment posed by the installation. 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 vessels);
     - overfilling of vessels;
     - failure of plant and/or equipment (e.g. over-pressure of vessels and pipework, blocked drains);
     - failure of containment (e.g. bund and/or overfilling of drainage sumps);
     - 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.

Cont.

BAT for control of accidents (cont.)

b. ***Assess the risks*** - having identified the hazards, the process of assessing the risks can be viewed as addressing six basic questions:

1. what is the estimated probability of their occurrence? (Source frequency);
2. what gets out and how much? (Risk evaluation of the event);
3. where does it get to? (Predictions for the emission – what are the pathways and receptors?);
4. what are the consequences? (Consequence assessment – the effects on the receptors);
5. what are the overall risks? (Determination of the overall risk and its significance to the environment);
6. what can prevent or reduce the risk? (Risk management – measures to prevent accidents and/or reduce their environmental consequences).

The depth and type of assessment will depend on the characteristics of the installation and its location. The main factors which should be taken into account are:

- the scale and nature of the accident hazard presented by the installation and the activities;
- the risks to areas of population and the environment (receptors);
- the nature of the installation and complexity or otherwise of the activities and the relative difficulty in deciding and justifying the adequacy of the risk control techniques.

c. ***identify the techniques necessary to reduce the risks including:***

c1. the following techniques, which are relevant to most installations:

- an inventory should be maintained of substances, present or likely to be present, which could have environmental consequences if they escape. It should not be forgotten that many apparently innocuous substances can be environmentally damaging if they escape (e.g. a tanker of milk spilled into a watercourse could destroy its ecosystem). The Permit will require the Regulator to be notified of any changes to the inventory;
- procedures should be in place for checking raw materials and wastes to ensure compatibility with other substances with which they may accidentally come into contact;
- adequate storage arrangements for raw materials, products and wastes should be provided;
- to ensure that control is maintained in emergency situations, consideration should be given to process design alarms, trips and other control aspects, e.g. automatic systems based on microprocessor control and passing valve control, tank level readings such as ultrasonic gauges, high-level warnings and process interlocks and process parameters;
- preventative techniques, such as suitable barriers to prevent damage to equipment from the movement of vehicles, should be included as appropriate;
- appropriate containment should be provided, e.g. bunds and catchpots, building containment;
- techniques and procedures should be implemented to prevent overfilling of storage tanks (liquid or powder), e.g. level measurement, independent high-level alarms, high-level cut-off, and batch metering;
- installation security systems to prevent unauthorised access should be provided as appropriate and should include maintenance arrangements where necessary;
- there should be an installation log/diary to record all incidents, near-misses, changes to procedures, abnormal events and findings of maintenance inspections;
- procedures should be established to identify, respond to and learn from such incidents;
- the roles and responsibilities of personnel involved in accident management should be identified;

Cont.

BAT for control of accidents (cont.)

- clear guidance should be available on how each accident scenario should be managed, e.g. containment or dispersion, to extinguish fires or let them burn;
- procedures should be in place to avoid incidents occurring as a result of poor communication among operations staff during shift changes and maintenance or other engineering work;
- safe shutdown procedures should be in place;
- communication routes should be established with relevant authorities and emergency services both before and in the event of an accident. Post-accident procedures should include the assessment of harm caused and steps needed to redress this;
- appropriate control techniques should be in place to limit the consequences of an accident, such as oil spillage equipment, isolation of drains, alerting of relevant authorities and evacuation procedures;
- personnel training requirements should be identified and provided;
- the systems for the prevention of fugitive emissions are generally relevant (Sections 2.3.5 and 2.3.6) and in addition, for drainage systems:
  - procedures should be in place to ensure that the composition of the contents of a bund sump, or sump connected to a drainage system, are checked before treatment or disposal;
  - drainage sumps should be equipped with a high-level alarm or sensor with automatic pump to storage (not to discharge); there should be a system in place to ensure that sump levels are kept to a minimum at all times;
  - high-level alarms etc. should not be routinely used as the primary method of level control;
  -

c2. the following plus any other specific techniques identified as necessary to minimise the risks as identified in 1 and 2 above

- adequate redundancy or standby plant should be provided with maintenance and testing to the same standards as the main plant;
- process waters, site drainage waters, emergency firewater, chemically contaminated waters and spillages of chemicals should, where appropriate, be contained and where necessary, routed to the effluent system, with provision to contain surges and storm-water flows, and treated before emission to controlled waters or sewer. Sufficient storage should be provided to ensure that this could be achieved. There should also be spill contingency procedures to minimise the risk of accidental emission of raw materials, products and waste materials and to prevent their entry into water. Any emergency firewater collection system should also take account of the additional firewater flows or fire-fighting foams. Emergency storage lagoons may be needed to prevent contaminated firewater reaching controlled waters (see Refs. 15 and 16);
- consideration should be given to the possibility of containment or abatement for accidental emissions from vents and safety relief valves/bursting discs. Where this may be inadvisable on safety grounds, attention should be focused on reducing the probability of the emission;

2.9 Noise and Vibration

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

The PPC Regulations require installations to be operated in such a way that *"all the appropriate preventative measures are taken against pollution, in particular through the application of BAT*". The definition of pollution includes *"emissions which may be harmful to human health or the quality of the environment, cause offence to human senses or impair or interfere with amenities and other legitimate uses of the environment".* BAT is therefore likely to be similar, in practice, to the requirements of the statutory nuisance legislation, which requires the use of "best practicable means" to prevent or minimise noise nuisance.

In the case of noise, "offence to any human senses" can normally be judged by the likelihood of complaints, but in some cases it may be possible to reduce noise emissions still further at reasonable costs, and this may exceptionally therefore be BAT for noise emissions.

For advice on how noise and/or vibration related limits and conditions will be determined see *"IPPC Noise – Part 1 Regulation and Permitting",* (see Ref. 20).

Application Form Question 2.9

Describe the main sources of noise and vibration (including infrequent sources); the nearest noise-sensitive locations and relevant environmental surveys which have been undertaken; and the proposed techniques and measures for the control of noise.

Information needed to determine BAT for noise and vibration

With the Application the Operator should:

1. provide the following information for ***each main source of noise and vibration*** that fall within the IPPC installation:
   - the source and its location on a scaled plan of the site;
   - whether continuous/ intermittent, fixed or mobile;
   - the hours of operation;
   - its description, (e.g. clatter, whine, hiss, screech, hum, bangs, clicks, thumps or tonal elements);
   - its contribution to overall site noise emission (categorise each as high, medium or low unless supporting data is available).

   A common sense approach needs to be adopted in determining which sources to include. The ones which need to be considered are those which may have environmental nuisance impact; e.g. a small unit could cause an occupational noise issue in an enclosed space but would be unlikely to cause an environmental issue. Conversely a large unit or a number of smaller units enclosed within a building could, for example, cause a nuisance if doors are left open. It must also be remembered that noise, which is not particularly noticeable during the day, may become more noticeable at night.

2. provide the information required in (1) for each source plus its times of operation for ***Infrequent sources of noise and vibration,*** not listed above that fall within the IPPC installation: (such as infrequently operated/ seasonal operations, cleaning/maintenance activities, on-site deliveries/collections/transport or out-of-hours activities, emergency generators or pumps and alarm testing),

3. identify ***the nearest noise-sensitive sites*** (typically dwellings, parkland and open spaces – schools, hospitals and commercial premises may be, depending upon the activities undertaken there) and any other points/boundary where conditions have been applied by Local Authority officers or as part of a planning consent, relating to:
   (a) the local environment:
      - provide an accurate map or scaled plan showing grid reference, nature of the receiving site, distance and direction from site boundary;

   (b) conditions/limits imposed which relate to other locations (i.e. boundary fence or surrogate for nearest sensitive receptor):
      - any planning conditions imposed by the Local Authority;
      - other conditions imposed by agreements, e.g. limits on operating times, technologies etc;
      - any requirements of any legal notices etc.

Cont.

Information needed to determine BAT for noise and vibration (cont.)

(c) the noise environment:

- background noise level, if known (day/night/evening) $L_{A,90,T}$;
- specific noise level (day/evening/night) $L_{A\ eq,T}$; and/or
- ambient noise level (day/evening/night) $L_{A\ eq,T}$, as appropriate;
- vibration data which may be expressed in terms of the peak particle velocity (ppv) in mm s^{-1} or the vibration dose value (VDV) in m $s^{-1.75}$.

For noise these are given the meaning as defined in BS4142:1997 "Method for rating industrial noise affecting mixed residential and industrial areas", and to which reference should be made for a full description. For vibration, the appropriate standard is BS6472:1992 "Evaluation of human exposure to vibration in buildings1 to 80 Hz". In very general terms "background" is taken to be the equivalent continuous A-weighted noise remaining when the source under investigation is not operational averaged over a representative time period, T. The "ambient" level is the equivalent continuous A-weighted combination of all noise sources far and distant, including the source under investigation and "specific noise" is the equivalent continuous A-weighted noise level produced by the source under investigation as measured at a selected assessment point. Both are averaged over a time period, T. BS4142 gives advice on the appropriate reference periods. "Worst case" situations and impulsive or tonal noise should be accounted for separately and not "averaged out" over the measurement period.

4. provide ***details of any environmental noise measurement surveys,*** modelling or any other noise measurements undertaken relevant to the environmental impact of the site, identifying:
   - the purpose/context of the survey;
   - the locations where measurements were taken;
   - the source(s) investigated or identified;
   - the outcomes.
5. identify any specific local issues and proposals for improvements.
6. describe the current or proposed position with regard to the techniques below, any in Ref. 20 or any others which are pertinent to the installation
7. demonstrate that the proposals are BAT, by confirming compliance with the indicative requirements, by justifying departures (as described in Section 1.2 and in the Guide for Applicants) or alternative measures.

Indicative BAT Requirements

1. The Operator should employ basic good practice measures for the control of noise, including adequate maintenance of any parts of plant or equipment whose deterioration may give rise to increases in noise (eg maintenance of bearings, air handling plant, the building fabric as well as specific noise attenuation measures associated with plant, equipment or machinery).
2. In addition the Operator should employ such other noise control techniques to ensure that the noise from the installation does not give rise to reasonable cause for annoyance, in the view of the Regulator and, in particular should justify where either Rating Levels ($L_{Aeq,T}$) from the installation exceed the numerical value of the Background Sound Level ($L_{A90,T}$), or the absolute levels of 50dB L_{Aeq} by day or 45 by night are exceeded. Reasons why these levels may be exceeded in certain circumstances are given in Ref. 20.
3. In some circumstances "creeping background" see Ref. 20 may be an issue. Where this has been identified in pre-application discussions or in previous discussions with the Local Authority, the Operator should employ such noise control techniques as are considered to be appropriate to minimise problems of to an acceptable level within the BAT criteria.
4. Noise surveys, measurement, investigation (which can involve detailed assessment of sound power levels for individual items of plant) or modelling may be necessary for either new or existing installations depending upon the potential for noise problems. Operators may have a noise management plan as part of their management system. More information on such techniques is given in Part 2 of Ref. 20.

2.10 Monitoring

This section describes 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.

Application Form Question 2.10

Describe the proposed measures for monitoring emissions, including any environmental monitoring, and the frequency, measurement methodology and evaluation procedure proposed.

With the Application the Operator should:

1. describe the current or proposed position with regard to the monitoring requirements below or any others which are pertinent to the installation for "Emissions monitoring", "Environmental monitoring", "Process monitoring" (where environmentally relevant) and "Monitoring standards" employed;
2. provide, in particular, the information described in requirement 13 below;
3. provide justifications for not using any of the monitoring requirements described;
4. Identify shortfalls in the above information which the Operator believes require longer term studies to establish.

Emissions monitoring

The following monitoring parameters and frequency are normally appropriate in this sector. Generally, monitoring should be undertaken during commissioning, start-up, normal operation and shut-down unless the Regulator agrees that it would be inappropriate to do so.

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

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

Monitoring and reporting of emissions to water and sewer

1. Monitoring of process effluents released to controlled waters should include at least:

Parameter	**Monitoring frequency**
Flow rate	Continuous and integrated daily flow rate
pH	Continuous
Temperature	Continuous
COD/BOD	Flow weighted sample or composite samples, weekly analysis, reported as flow weighted monthly averages
TOC	Continuous
Turbidity	Continuous
Dissolved oxygen	Continuous

***NB** - other parameters specifically limited in the Permit should be monitored. The appropriateness of the above frequencies will vary depending upon the sensitivity of the receiving water and should be proportionate to the scale of the operations.*

BOD and COD should be established annually as an annual average.

2. In addition, the Operator should have a fuller analysis carried out covering a broad spectrum of substances to establish that all relevant substances have been taken into account when setting the release limits. This should cover the substances listed in Schedule 5 of the Regulations unless it is agreed with the Regulator that they are not applicable. This should normally be done at least annually.

Cont.

Emmisions monitoring (cont.)

3. Any substances found to be of concern, or any other individual substances to which the local environment may be susceptible and upon which the operations may impact, should also be monitored more regularly. This would particularly apply to the common pesticides and heavy metals. Using composite samples is the technique most likely to be appropriate where the concentration does not vary excessively.

4. In some sectors there may be releases of substances which are more difficult to measure and whose capacity for harm is uncertain, particularly when in combination with other substances. "Whole effluent toxicity" monitoring techniques can therefore be appropriate to provide direct measurements of harm, e.g. direct toxicity assessment. Some guidance on toxicity testing is available (Ref. 21) and Direct Toxicity Assessment is an appropriate method.

Monitoring and reporting of emissions to air

5. Continuous monitoring would be expected where the releases are significant and where it is needed to maintain good control of the process or abatement plant;

6. Gas flow should be measured, or otherwise determined, to relate concentrations to mass releases;

7. To relate measurements to reference conditions, the following will need to be determined and recorded:
   - temperature and pressure;
   - oxygen, where the emissions are the result of a combustion process;
   - water vapour content, where the emissions are the result of a combustion process or any other wet gas stream. It would not be needed where the water vapour content is unable to exceed 3% v/v or where the measuring technique measures the other pollutants without removing the water.

8. Where appropriate, periodic visual and olfactory assessment of releases should be undertaken to ensure that all final releases to air should be essentially colourless, free from persistent trailing mist or fume and free from droplets.

Monitoring and reporting of waste emissions

9. For waste emissions the following should be monitored and recorded:
   - the physical and chemical composition of the waste;
   - its hazard characteristics;
   - handling precautions and substances with which it cannot be mixed;
   - where waste is disposed of directly to land, for example sludge spreading or an on-site landfill, a programme of monitoring should be established that takes into account the materials, potential contaminants and potential pathways from the land to groundwater surface water or the food chain.

Environmental monitoring (beyond the installation)

Environmental monitoring

10. The Operator should consider the need for environmental monitoring to assess the effects of emissions to controlled water, groundwater, air or land or emissions of noise or odour.

    Environmental monitoring may be required, e.g. 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;
    - there is a need to validate modelling work.

Cont.

Environmental monitoring (cont.)

The need should be considered for:

- groundwater, where it should be designed to characterise both quality and flow and take into account short and long-term variations in both. Monitoring will need to take place both up-gradient and down-gradient of the site;
- surface water, where consideration will be needed for sampling, analysis and reporting for upstream and downstream quality of the controlled water;
- air, including odour;
- land contamination, including vegetation, and agricultural products;
- assessment of health impacts;
- noise.

Where environmental monitoring is needed the following should be considered in drawing up proposals:

- determinands to be monitored, standard reference methods, sampling protocols;
- monitoring strategy, selection of monitoring points, optimisation of monitoring approach;
- determination of background levels contributed by other sources;
- uncertainty for the employed methodologies and the resultant overall uncertainty of measurement;
- quality assurance (QA) and quality control (QC) protocols, equipment calibration and maintenance, sample storage and chain of custody/audit trail;
- reporting procedures, data storage, interpretation and review of results, reporting format for the provision of information for the Regulator.

Guidance on air quality monitoring strategies and methodologies can be found in Technical Guidance Notes M8 and M9 (see Ref. 21), for noise (see Ref. 20) and for odour (see Ref. 23).

Monitoring of process variables

Monitoring process variables

11. Some process variables will have potential environmental impact and these should be identified and monitored as appropriate. Examples might be:
    - raw materials monitoring for contaminants where contaminants are likely and there is inadequate supplier information (see Section 2.2.1);
    - plant efficiency where it has an environmental relevance;
    - energy consumption across the plant and at individual points of use in accordance with the energy plan. Frequency – normally continuous and recorded;
    - fresh water use across the activities and at individual points of use should be monitored as part of the water efficiency plan (see Section 2.2.3). Frequency – continuous and recorded.

Monitoring standards (Standard Reference Methods)

Equipment standards

Equipment standards MCERTS

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. Performance standards have been published for continuous emissions monitoring systems (CEMs), and other MCERTS standards are under development to cover manual stack emissions monitoring, portable emissions monitoring equipment, ambient air quality monitors, water monitoring instrumentation, data acquisition and Operators' own arrangements, such as for installation, calibration and maintenance of monitoring equipment, position of sampling ports and provision of safe access for manual stack monitoring.

12. As far as possible, 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. Where the monitoring arrangements are not in accordance with MCERTS requirements, the Operator should provide justification and describe the monitoring provisions in detail. See Environment Agency Website (Ref. 21) for listing of MCERTS equipment

Cont.

Monitoring standards (cont.)

13. The following should be described in the application indicating which monitoring provisions comply with MCERTS requirements or for which other arrangements have been made:
    - monitoring methods and procedures (selection of Standard Reference Methods);
    - justification for continuous monitoring or spot sampling;
    - reference conditions and averaging periods;
    - measurement uncertainty of the proposed methods and the resultant overall uncertainty;
    - criteria for the assessment of non-compliance with Permit limits and details of monitoring strategy aimed at demonstration of compliance;
    - reporting procedures and data storage of monitoring results, record keeping and reporting intervals for the provision of information to the Regulator;
    - procedures for monitoring during start-up and shut-down and abnormal process conditions;
    - drift correction calibration intervals and methods;
    - the accreditation held by samplers and laboratories or details of the people used and the training/competencies.

Standards for sampling and analysis

BREF: Monitoring REF document in preparation.

Sampling and analysis standards

14. The analytical methods given in Appendix 1 should be used. In the event of other substances needing to be monitored, standards should be used in the following order of priority:
    - Comité Européen de Normalisation (CEN);
    - British Standards Institution (BSI);
    - International Standardisation Organisation (ISO);
    - Others
        - United States Environmental Protection Agency (US EPA);
        - American Society for Testing and Materials (ASTM);
        - Deutches Institute für Normung (DIN);
        - Verein Deutcher Ingenieure (VDI);
        - Association Française de Normalisation (AFNOR).

Further guidance on standards for monitoring gaseous releases relevant to IPC/IPPC is given in the Technical Guidance Note 4 (Monitoring) (see Ref. 21). A series of updated Guidance Notes covering this subject is currently in preparation. This guidance specifies manual methods of sampling and analysis which will also be suitable for calibration of continuous emission monitoring instruments. Further guidance relevant to water and waste is available from the publications of the Standing Committee of Analysts.

If in doubt the Operator should consult the Regulator.

2.11 De-commissioning

The IPPC application requires the preparation of a site report whose purpose, as described in more detail in Refs. 4 and 5 is to provide a point of reference against which later determinations can be made of whether there has been any deterioration of the site and information on the vulnerability of the site.

Application Form Question 2.11

Describe the proposed measures, upon definitive cessation of activities, to avoid any pollution risk and return the site of operation to a satisfactory state (including, where appropriate, measures relating to the design and construction of the installation).

With the Application the Operator should:

1. supply the site report;
2. describe the current or proposed position with regard to the techniques below or any others which are pertinent to the installation;
3. for existing activities, identify shortfalls in the above information which the Operator believes require longer term studies to establish.

Indicative BAT Requirements

BAT for decommissioning

1. **Operations during the IPPC Permit**

   Operations during the life of the IPPC Permit should not lead to any deterioration of the site if the requirements of the other sections of this and the specific sector notes are adhered to. Should any instances arise which have, or might have, impacted on the state of the site the Operator should record them along with any further investigation or ameliorating work carried out. This will ensure that there is a coherent record of the state of the site throughout the period of the IPPC Permit. This is as important for the protection of the Operator as it is for the protection of the environment. Any changes to this record should be submitted to the Regulator.

2. **Steps to be taken at the design and build stage of the activities**

   Care should be taken at the design stage to minimise risks during decommissioning. For existing installations, where potential problems are identified, a programme of improvements should be put in place to a timescale agreed with the Regulator. Designs should ensure that:

   - underground tanks and pipework are avoided where possible (unless protected by secondary containment or a suitable monitoring programme);
   - there is provision for the draining and clean-out of vessels and pipework prior to dismantling;
   - lagoons and landfills are designed with a view to their eventual clean-up or surrender;
   - insulation is provided which is readily dismantled without dust or hazard;
   - materials used are recyclable (having regard for operational or other environmental objectives).

3. **The site closure plan**

   A site closure plan should be maintained to demonstrate that, in its current state, the installation can be decommissioned to avoid any pollution risk and return the site of operation to a satisfactory state. The plan should be kept updated as material changes occur. Common sense should be used in the level of detail, since the circumstances at closure will affect the final plans. However, even at an early stage, the closure plan should include:

   - either the removal or the flushing out of pipelines and vessels where appropriate and their complete emptying of any potentially harmful contents;
   - plans of all underground pipes and vessels;
   - the method and resource necessary for the clearing of lagoons;
   - the method of ensuring that any on-site landfills can meet the equivalent of surrender conditions;
   - the removal of asbestos or other potentially harmful materials unless agreed that it is reasonable to leave such liabilities to future owners;

Cont.

BAT for decommissioning (cont.)

- methods of dismantling buildings and other structures, see Ref. 25 which gives guidance on the protection of surface and groundwater at construction and demolition-sites;
- testing of the soil to ascertain the degree of any pollution caused by the activities and the need for any remediation to return the site to a satisfactory state as defined by the initial site report.

(Note that radioactive sources are not covered by this legislation, but decommissioning plans should be co-ordinated with responsibilities under the Radioactive Substances Act 1993.)

For existing activities, the site closure plan may, if agreed with the Regulator, be submitted as an improvement condition.

2.12 Installation Wide Issues

In some cases it is possible that actions which benefit the environmental performance of the overall installation will increase the emissions from one Permit holder's activities. For example, taking treated effluent as a raw water supply will probably slightly increase emissions from that activity but could dramatically cut the total emissions from the whole installation.

Application Form Question 2.12

Where you are not the only Operator of the installation, describe the proposed techniques and measures (including those to be taken jointly by yourself and other Operators) for ensuring the satisfactory operation of the whole installation.

With the Application the Operator should:

1. where there are a number of separate Permits for the installation (particularly where there are different Operators), **identify** any installation wide issues and opportunities for further interactions between the Permit holders whereby the performance of the overall installation may be improved; and in particular
2. describe the current or proposed position with regard to the techniques below, or any others which are pertinent to the installation;

BAT across the whole installation

Indicative BAT Requirements

The possibilities will be both sector and site-specific, and include:

1. communication procedures between the various Permit holders; in particular those needed to ensure that the risk of environmental incidents is minimised;
2. benefiting from the economies of scale to justify the installation of a CHP plant;
3. the combining of combustible wastes to justify a combined waste-to-energy/CHP plant;
4. the waste from one activity being a possible feedstock for another;
5. the treated effluent from one activity being of adequate quality to be the raw water feed for another activity;
6. the combining of effluent to justify a combined or upgraded effluent treatment plant;
7. the avoidance of accidents from one activity which may have a detrimental knock-on effect on the neighbouring activity;
8. land contamination from one activity affecting another – or the possibility that one Operator owns the land on which the other is situated.

3 EMISSION BENCHMARKS

3.1 Emissions Inventory and Benchmark Comparison

Application Form Question 3.1

Describe the nature, quantities and sources of foreseeable emissions into each medium (which will result from the techniques proposed in Section 2).

With the Application the Operator should:

1. provide a table of significant emissions of substances (except noise, vibration, odour or heat which are covered in their respective sections) that will result from the proposals in Section 2 and should include, preferably in order of significance:
   - substance (where the substance is a mixture, e.g. VOCs or COD, separate identification of the main constituents or inclusion of an improvement proposal to identify them);
   - source, including height, location and efflux velocity;
   - media to which it is released;
   - any relevant EQS or other obligations;
   - benchmark;
   - proposed emissions normal/max expressed, as appropriate (see Section 3.2), for:
     - mass/unit time;
     - concentration;
     - annual mass emissions.
   - statistical basis (average, percentile etc.);
   - notes covering the confidence in the ability to meet the benchmark values;
   - if intermittent, the appropriate frequencies;
   - plant loads at which the data is applicable;
   - whether measured or calculated (the method of calculation should be provided).

   The response should clearly state whether the emissions are current emission rates or those planned following improvements, and should cover emissions under both normal and abnormal conditions for:
   - point source emissions to surface water, groundwater and sewer;
   - waste emissions (refer to Sections 2.5 and 2.6 – Waste Management);
   - point source emissions to air;
   - significant fugitive emissions to all media, identifying the proportion of each substance released which is due to fugitives rather than point source releases;
   - abnormal emissions from emergency relief vents, flares etc.;
   - indirect and direct emission of carbon dioxide associated with energy consumed or generated.

   Emissions of carbon dioxide associated with energy use should be broken down by energy type and, in the case of electricity, by source e.g. public supply, direct supply or on site generation. Where energy is generated on site, or from a direct (non-public) supplier, the Operator should specify and use the appropriate factor. Standard factors for carbon dioxide emissions are provided in the Energy Efficiency Guidance Note.

   Where VOCs are released, the main chemical constituents of the emissions should be identified. The assessment of the impact of these chemicals in the environment will be carried out as in response to Section 4.1.

   For waste, emissions relate to any wastes removed from the installation, or disposed of at the installation under the conditions of the Permit, e.g. landfill. Each waste should have its composition determined and the amounts expressed in terms of cubic metres or tonnes per month.

   A suitable table on which to record this information is provided in the electronic version of this Guidance Note.

2. compare the emissions with the benchmark values given in the remainder of this Section;

3. where the benchmarks are not met, revisit the responses made in Section 2 as appropriate (see Section 1.2) and make proposals for improvements or justify not doing so.

3.2 The Emission Benchmarks

Introduction to emission benchmarks

Guidance is given below on release concentrations or mass release rates achievable for key substances using the best combination of techniques. These BAT-based benchmarks are not mandatory release limits and reference should be made to Section 1 and the *Guide for Applicants* regarding their use.

3.2.1 Emissions to air associated with the use of BAT

The emissions quoted below are as daily averages based upon continuous monitoring during the period of operation. Standard conditions of 273 K and 101.3 kPa for the dry gas apply with no correction applied for the oxygen content of the emission. Care should always be taken to convert benchmark and proposed releases to the same reference conditions for comparison. To convert measured values to reference conditions, see Technical Guidance Note M2 (Ref. **Error! Reference source not found.**) for more information

Limits in Permits may be set for mean or median values over long or short periods. The periods and limits selected should reflect:

- the manner in which the emission may impact upon the environment;
- likely variations which will arise during operation within BAT;
- possible failure modes and their consequences;
- the capabilities of the monitoring and testing system employed.

Where emissions are expressed in terms of concentrations and where continuous monitors are employed, it is recommended that limits are defined such that:

- not more than one calendar monthly average during any rolling twelvemonth period shall exceed the benchmark value by more than 10%;
- not more than one half hour period* during any rolling 24 hour period shall exceed the benchmark value by more than 50%.

* for the purpose of this limit half hourly periods commence on the hour and the half hour.

Where spot tests are employed:

- the half hour limit above shall be applied over the period of the test;
- the mean of three consecutive tests taken during a calendar year shall not exceed the benchmark value by more than 10%.

3.2.2 Emissions to water associated with the use of BAT

Wastewater treatment systems can maximise the removal of metals using precipitation, sedimentation and filtration. The reagents used for precipitation will be defined by the mix of metals present, and may include hydroxide, sulphide or a combination of both. Concentrated effluents should be pre treated before discharge into the final effluent treatment system, and techniques such as reverse osmosis systems may need to be employed. Water discharges should be kept to a minimum by using closed cycle cooling systems and by maximising the reuse of treated process water.

Where automatic sampling systems are employed, limits may be defined such that:

- not more than 5% of samples shall exceed the benchmark value.

Where spot samples are taken:

- no spot sample shall exceed the benchmark value by more than 50%.

Examples of emissions to water associated with the use of BAT:

3.2.3 Standards and obligations

In addition to meeting the requirements of BAT, there are other national and international standards and obligations which must either be safeguarded through the IPPC Permit or, at least, taken into account in setting Permit conditions. This is particularly the case for any EC based EQSs.

EC based EQ standards

IPPC: A Practical Guide (see Ref. 4) explains how these should be taken into account and contains an annex listing the relevant standards. See Appendix 2 for equivalent legislation in Scotland and Northern Ireland). They can be summarised as follows.

Air Quality

- Statutory Instrument 1989 No 317, Clean Air, The Air Quality Standards Regulations 1989.
- Statutory Instrument 1997 No 3043, Environmental Protection, The Air Quality Regulations 1997.

Water Quality

- Directive 76/464/EEC on Pollution Caused by Dangerous Substances Discharged to Water contains two lists of substances. List I relates to the most dangerous, and standards are set out in various daughter Directives. List II substances must also be controlled. Annual mean concentration limits for receiving waters for List I substances can be found in SI 1989/2286 and SI 1992/337 the Surface Water (Dangerous Substances Classification) Regulations. Values for List II substances are contained in SI 1997/2560 and SI 1998/389. Daughter Directives cover EQS values for mercury, cadmium, hexachlorocyclohexane, DDT, carbon tetrachloride, pentachlorophenol, aldrin, dieldrin, endrin, isodrin, hexachlorobenzene, hexachlorobutadiene, chloroform,1,2-dichloroethane, trichloroethane, perchloroethane and trichlorobenzene.
- Other waters with specific uses have water quality concentration limits for certain substances. These are covered by the following Regulations:
  - SI 1991/1597 Bathing Waters (Classification) Regulations;
  - SI 1992/1331 and Direction 1997 Surface Waters (Fishlife) (Classification) Regulations;
  - SI 1997/1332 Surface Waters (Shellfish) (Classification) Regulations;
  - SI 1996/3001 The Surface Waters (Abstraction and Drinking Water) (Classification) Regulations.

Future likely changes include:

- Some air and water quality standards may be replaced by new standards in the near future.
- The (Draft) Solvents Directive on the limitation of emissions of VOCs due to the use of organic solvents in certain activities and installations.

Other standards and obligations

Those most applicable to this sector are:

- Hazardous Waste Incineration Directive;
- Waste Incineration Directive;
- Large Combustion Plant Directive;
- Reducing Emissions of VOCs and Levels of Ground Level Ozone: a UK Strategy;
- Water Quality Objectives – assigned water quality objectives to inland rivers and water courses (ref. Surface (Rivers Ecosystem) Classification);
- The UNECE convention on long-range transboundary air pollution;
- The Montreal Protocol;
- The Habitats Directive (see Section 4.3).

3.2.4 Units for benchmarks and setting limits in Permits

Releases can be expressed in terms of:

- "**concentration**" (e.g. mg/l or mg/m^3) which is a useful day-to-day measure of the effectiveness of any abatement plant and is usually measurable and enforceable The total flow must be measured/controlled as well;
- "**specific mass release**" (e.g. kg/ tproduct or input or other appropriate parameter) which is a measure of the overall environmental performance of the plant (including the abatement plant) compared with similar plants elsewhere;
- "**absolute mass release**" (e.g. kg/hr, t/yr) which relates directly to environmental impact.

When endeavouring to reduce the environmental impact of an installation, its performance against each of these levels should be considered, as appropriate to the circumstances, in assessing where improvements can best be made.

When setting limits in Permits the most appropriate measure will depend on the purpose of the limit. It may also be appropriate to use surrogate parameters which reflect optimum environmental performance of plant as the routine measurement, supported by less frequent check-analyses on the final concentration. Examples of surrogate measures would be the continuous measurement of conductivity (after ion-exchange treatment) or total carbon (before a guard-column in activated carbon treatment) to indicate when regeneration or replacement is required.

3.2.5 Statistical basis for benchmarks and limits in Permits

Conditions in Permits can be set with percentile, mean or median values over yearly, monthly or daily periods, which reflect probable variation in performance. In addition absolute maxima can be set.

Where there are known failure modes, which will occur even when applying BAT, limits in Permits may be specifically disapplied but with commensurate requirements to notify the Regulator and to take specific remedial action.

For Water: UK benchmarks or limits are most frequently 95 percentile concentrations or absolute concentrations, (with flow limited on a daily average or maximum basis).

For Air: benchmarks or limits are most frequently expressed as daily averages or, typically 95% of hourly averages.

3.2.6 Reference conditions for releases to air

The reference conditions of substances in releases to air from point sources are: temperature 273 K (0° C), pressure 101.3 kPa (1 atmosphere), no correction for water vapour or oxygen.

The reference conditions for combustion or incineration processes are as given in the appropriate guidance note.

These reference conditions relate to the benchmark release levels given in this Note and care should always be taken to convert benchmark and proposed releases to the same reference conditions for comparison. The Permit may employ different reference conditions if they are more suitable for the process in question.

To convert measured values to reference conditions, see Technical Guidance Note M2 (Ref. 21) for more information.

3.3 VOCs

The term “volatile organic compounds” includes all organic compounds released to air in the gas phase.

Other applicable standards and obligations

(Extracts from standards are quoted for ease of reference. The relevant standards should be consulted for the definitive requirements)

The “Solvents Directive” - The EC Directive on the limitation of emissions of VOCs due to the use of organic solvents in certain activities and installations is likely to be adopted soon.

“Reducing Emissions of VOCs and Levels of Ground Level Ozone: A UK Strategy” was published by the Department of the Environment in October 1993. It sets out how the Government expects to meet its obligations under the UNECE VOCs Protocol to reduce its emissions by 30% (based on 1988 levels) by 1999, including the reductions projected for the major industrial sectors. Waste Treatment included in the “other miscellaneous industries” sector with no specific reduction targets stated.

The UNECE convention on long-range transboundary air pollution - Negotiations are now under way which could lead to a requirement further to reduce emissions of VOCs.

Benchmark emission values

Emission	**Activity**	**Threshold annual use of solvent**	**Benchmark value** as toluene mg/m^3	**Basis for the Benchmark**
Solvents (various) see Solvent Directive 1999/13/EC	coating and degreasing	2 – 10 tonnes > 10 tonnes	20 mg/m^3 20 mg/m^3	15% fugitive emission 10% fugitive emission Fugitive emission expressed as % of use.
High Risk Extremely hazardous to health, such as benzene, vinyl chloride and 1,2 - dichloroethane	various		2 –5 mg/m^3	Parity with previous UK Guidance Notes

Compliance with the Solvent Directive 1999/13/EC is required including the use of a solvent management plan. A reduction scheme may be used instead of emission limits.

3.4 Emissions to Water

Most textile processes discharge wastewater to sewage treatment works and limit values for several pollutants will be set by the sewerage undertaker. For harmful substances that are not removed effectively during sewage treatment, limits should be included in the permit. Current practice for limits that are set for the first time for processes that come under IPC is based on the guidance given in the National Discharge Consents Manual. The emission data that is available is analysed statistically and the maximum value is set at 2 times the 95 %ile of the measured values. The limit can be progressively lowered as improvements using prevention techniques (i.e. avoiding sources of persistent organic pollutants) bring about reductions.

4 IMPACT

4.1 Assessment of the Impact of Emissions on the Environment

The Operator should assess that the emissions resulting from the proposals for the activities/installation will provide a high level of protection for the environment as a whole, in particular having regard to EQSs etc, revisiting the techniques in Section 2 as necessary (see Section 1.2).

Application Form Question 4.1

Provide an assessment of the potential significant environmental effects (including transboundary effects) of the foreseeable emissions.

With the Application the Operator should:

1. provide a description, including maps as appropriate, of the receiving environment to identify the receptors of pollution. The extent of the area may cover the local, national and international (e.g. transboundary effects) environment as appropriate.

2. identify important receptors which may include: areas of human population including noise or odour-sensitive areas, flora and fauna (i.e. Habitat Directive sites, special areas of conservation, Sites of Special Scientific Interest (SSSI or in Northern Ireland, ASSI) or other sensitive areas), soil, water, i.e. groundwater (water below the surface of the ground in the saturation zone and in direct contact with the ground and subsoil) and watercourses (e.g. ditches, streams, brooks, rivers), air including the upper atmosphere, landscape, material assets and the cultural heritage.

3. identify the pathways by which the receptors will be exposed (where not self evident).

4. carry out an assessment of the potential impact of the total emissions from the activities on these receptors. Ref. 6 provides a systematic method for doing this and will also identify where modelling needs to be carried out, to air or water, to improve the understanding of the dispersion of the emissions. The assessment will include comparison (see IPPC A Practical Guide (Ref. 4) and Section 3.2) with:
   - community EQS levels;
   - other statutory obligations;
   - non-statutory obligations;
   - environmental action levels (EALs) and the other environmental and regulatory parameters defined in Ref. 6.

   in particular, it will be necessary to demonstrate that an appropriate assessment of vent and chimney heights has been made to ensure that there is adequate dispersion of the minimised emission(s) to avoid exceeding local ground-level pollution thresholds and limit national and transboundary pollution impacts. This should be based on the most sensitive receptor, be it human health, soil or terrestrial ecosystems.

   where appropriate the Operator should also recognise the chimney or vent as an emergency emission point and understand the likely behaviour. Process upsets or equipment failure giving rise to abnormally high emission levels over short periods should be assessed. Even if the Applicant can demonstrate a very low probability of occurrence, the height of the chimney or vent should nevertheless be set to avoid any significant risk to health. The impact of fugitive emissions can also be assessed in many cases.

   consider whether the responses to Sections 2 and 3 and this assessment adequately demonstrate that the necessary measures have been taken against pollution, in particular by the application of BAT, and that no significant pollution will be caused. Where there is uncertainty about this, the measures in Section 2 should be revisited as appropriate to make further improvements.

5. where the same pollutants are being emitted by more than one permitted activity on the installation the Operator should assess the impact both with and without the neighbouring emissions.

4.2 The Waste Management Licensing Regulations

Application Form Question 4.2

Explain how the information provided in other parts of the application also demonstrates that the requirements of the relevant objectives of the Waste Management Licensing Regulations 1994 have been addressed, or provide additional information in this respect.

In relation to activities involving the disposal or recovery of waste, the Regulators are required to exercise their functions for the purpose of achieving the relevant objectives as set out in Schedule 4 of the Waste Management Licensing Regulations 1994. (For the equivalent Regulations in Scotland, see Appendix 2. In Northern Ireland there are no equivalent regulations at the time of writing. Contact EHS for further information.)

The relevant objectives, contained in paragraph 4, Schedule 4 of the Waste Management Licensing Regulations 1994 *(SI 1994/1056 as amended)* are extensive, but will only require attention for activities which involve the recovery or disposal of waste. Paragraph 4 (1) is as follows:

a) "ensuring the waste is recovered or disposed of without endangering human health and without using process or methods which could harm the environment and in particular without:

risk to water, air, soil, plants or animals; or

causing nuisance through noise or odours; or

adversely affecting the countryside or places of special interest;

b) implementing, as far as material, any plan made under the plan-making provisions".

The application of BAT is likely to already address risks to water, air, soil, plants or animals, odour nuisance and some aspects of effects on the countryside. It will, however, be necessary for the Operator to briefly consider each of these objectives individually and provide a comment on how they are being addressed by the proposals. It is also necessary to ensure that any places of special concern which could be affected, such as SSSIs, are identified and commented upon although, again, these may have been addressed in the assessment for BAT, in which case a cross-reference may suffice.

Operators should identify any development plans made by the local planning authority, including any waste local plan, and comment on the extent to which the proposals accord with the contents of any such plan (see Section 2.6).

4.3 The Habitats Regulations

Application Form Question 4.3

Provide an assessment of whether the installation is likely to have a significant effect on a European site in the UK and if it is, provide an assessment of the implications of the installation for that site, for the purposes of the Conservation (Natural Habitats etc) Regulations 1994 (SI 1994/2716).

Your response should cover all relevant issues pertinent to your installation, including those below. In doing so you should justify your proposals against any indicative requirements stated.

An application for an IPPC Permit will be regarded as a new plan or project for the purposes of the Habitats Regulations (for the equivalent Regulations in Scotland and Northern Ireland see Appendix 2). Therefore, Operators should provide an initial assessment of whether the installation is likely to have a significant effect on any European site in the UK (either alone or in combination with other relevant plans or projects) and, if so, an initial assessment of the implications of the installation for any such site. The application of BAT is likely to have gone some way towards addressing the potential impact of the installation on European sites and putting into place techniques to avoid any significant effects. The Operator should provide a description of how the BAT assessment has specifically taken these matters into account, bearing in mind the conservation objectives of any such site.

European sites are defined in Regulation 10 of the Habitats Regulations to include Special Areas of Conservation (SACs); sites of community importance (sites that have been selected as candidate SACs by member states and adopted by the European Commission but which are not yet formally classified); and Special Protection Areas (SPAs). It is also Government policy (set out in PPG 9 on nature conservation) that potential SPAs and candidate SACs should be considered to be European sites for the purposes of Regulation 10.

Information on the location of European Sites and their conservation objectives is available from

- English Nature (01733 455000), http://www.english-nature.org.uk
- Countryside Council for Wales (01248 385620), http://www.ccw.gov.uk
- Scottish Natural Heritage (0131 447 4784), http://www.snh.org.uk
- Joint Nature Conservation Committee (01733 866852), http://www.jncc.gov.uk
- Environment and Heritage Service, Northern Ireland, http://www.ehsni.gov.uk

The Regulator will need to consider the Operator's initial assessment. If it concludes that the installation is likely to have a significant effect on a European site, then the Regulator will need to carry out an “appropriate assessment” of the implications of the installation in view of that site's conservation objectives. The Regulations impose a duty on the Regulator to carry out these assessments so it cannot rely on the Operator's initial assessments. Therefore the Regulator must be provided with any relevant information upon which the Operator’s assessment is based.

Note that in many cases the impact of the Habitats Regulations will have been considered at the planning application stage, in which case the Regulator should be advised of the details.

REFERENCES

For a full list of available Technical Guidance see Appendix A of the *Guide for Applicants* or visit 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 web site http://www.sepa.org, or the NIEHS web site www.ehsni.gov.uk**.** Most titles will also be available in hard copy from The Stationery Office (TSO). Some existing titles are not yet available on the Website but can be obtained from TSO.

1. IPPC Reference Document on Best Available Techniques in the Textile Industry European Commission http://eippcb.jrc.es
2. The Pollution Prevention and Control Act (1999) (www.legislation.hmso.gov.uk).
3. The Pollution Prevention and Control Regulations (SI 1973 2000) (www.legislation.hmso.gov.uk).
4. IPPC: A Practical Guide (for England and Wales) (or equivalents in Scotland and Northern Ireland) (www.environment.defra.gov.uk).
5. IPPC Part A(1) Installations: Guide for Applicants (includes Preparation of a Site Report in a Permit Application) (EA Website).
6. Assessment methodologies:

- E1 BPEO Assessment Methodology for IPC
- IPPC Environmental Assessments for BAT (in preparation as H1) ***Note to authors - check***

7. Management system references:

- Sector specific

8. Waste minimisation support references:

- Environment Agency web site. Waste minimisation information accessible via: www.environment-agency.gov.uk/epns
- Waste Minimisation – an environmental good practice guide for industry (helps industry to minimise waste and achieve national environmental goals). Available free to companies who intend to undertake a waste reduction programme (tel 0345 33 77 00)
- Profiting from Pollution Prevention – 3Es methodology (emissions, efficiency, economics). Video and A4 guide aimed at process industries. Available from Environment Agency, North East region (tel 0113 244 0191, ask for regional PIR)
- Waste Minimisation Interactive Tools (WIMIT). Produced in association with Envirowise and the BOC Foundation (a software tool designed for small and medium businesses.). Available free from The Environmental Helpline (tel 0800 585794)
- ENVIROWISE. A joint DTI/DEFRA programme, with over 200 separate case studies, good practice guides, leaflets, flyers, software tools and videos covering 12 industry sectors, packaging, solvents and the generic areas of waste minimisation and cleaner technology. ENVIROWISE is accessible via a FREE and confidential helpline (tel 0800 585794) or via the web site www.envirowise.org.uk/
- ENVIROWISE, Increased Profit Through Improved Materials Additions: Management/Technical Guide, GG194/195
- Waste Management Information Bureau. The UK's national referral centre for help on the full range of waste management issues. It produces a database called Waste Info, which is available for online searching and on CD-ROM. Short enquiries are free (tel 01235 463162)
- Institution of Chemical Engineers Training Package E07 – Waste Minimisation. Basic course which contains guide, video, slides, OHPs etc. (tel 01788 578214)

9. Water efficiency references:

- ENVIROWISE, Simple measures restrict water costs, GC22
- ENVIROWISE, Effluent costs eliminated by water treatment, GC24
- ENVIROWISE, Saving money through waste minimisation: Reducing water use, GG26
- ENVIROWISE Helpline 0800 585794

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

- BREF on Waste Water and Waste Gas Treatment.
- A1 Guidance on effective flaring in the gas, petroleum etc industries, 1993, ISBN 0-11-752916-8
- A2 Pollution abatement technology for the reduction of solvent vapour emissions, 1994, £5.00, 0-11-752925-7
- A3 Pollution abatement technology for particulate and trace gas removal, 1994, £5.00, 0-11-752983-4
- Landfill gas flaring
- Part B PG1/3 Boilers and Furnaces 20-50 MW net thermal input (ISBN 0-11-753146-4-7)
- Part B PG1/4 Gas Turbines 20-50 MW net thermal input (ISBN 0-11-753147-2)

12. Releases to water references:
    - BREF on Waste Water and Waste Gas Treatment
- A4 Effluent Treatment Techniques, TGN A4, Environment Agency, ISBN 0-11-310127-9 (EA website)
- Environment Agency, Pollution Prevention Guidance Note – Above-ground oil storage tanks, PPG 2, gives information on tanks and bunding which have general relevance beyond just oil (EA website)

REFERENCES

- Mason, P. A, Amies, H. J, Sangarapillai, G. Rose, Construction of bunds for oil storage tanks, Construction Industry Research and Information Association (CIRIA), Report 163, 1997, CIRIA, 6 Storey's Gate, Westminster, London SW1P 3AU. Abbreviated versions are also available for masonry and concrete bunds (www.ciria.org.uk online purchase)

13. Dispersion Methodology Guide D1 (EA website - summary only)
14. IPPC Energy Efficiency Guidance Note (the consultation version, available on the website should be used until the final version is published)
15. BS 5908: Code of Practice for Fire Precautions in the Chemical and Allied Industries
16. Environment Agency, Pollution Prevention Guidance Note – Pollution prevention measures for the control of spillages and fire-fighting run-off, PPG 18, gives information on sizing firewater containment systems (EA website)
17. Investigation of the criteria for, and guidance on, the landspreading of industrial wastes – final report to the DEFRA, the Environment Agency and MAFF, May 1998
18. Agency guidance on the exemption 7 activity (proposed)
19. COMAH guides

- A Guide to the Control of Major Accident Hazards Regulations 1999, Health and Safety Executive (HSE) Books L111, 1999, ISBN 0 07176 1604 5
- Preparing Safety Reports: Control of Major Accident Hazards Regulations 1999, HSE Books HS(G)190, 1999
- Emergency Planning for Major Accidents: Control of Major Accident Hazards Regulations 1999, HSE Books HS(G)191, 1999
- Guidance on the Environmental Risk Assessment Aspects of COMAH Safety Reports, Environment Agency, 1999 (EA website)
- Guidance on the Interpretation of Major Accidents to the Environment for the Purposes of the COMAH Regulations, DEFRA, 1999, ISBN 753501 X, available from the Stationery Office

20. Assessment and Control of Environmental Noise and Vibration from Industrial Activities (joint Regulator's guidance in preparation)
21. Monitoring Guidance (EA website)

- M1 Sampling facility requirements for the monitoring of particulates in gaseous releases to atmosphere, March 1993, £5.00, ISBN 0-11-752777-7
- M2 Monitoring emissions of pollutants at source January 1994, £10.00, ISBN 0-11-752922-2
- M3 Standards for IPC Monitoring Part 1: Standards, organisations and the measurement infrastructure, August 1995, £11.00, ISBN 0-11-753133-2
- M4 Standards for IPC Monitoring Part 2 : Standards in support of IPC Monitoring, revised 1998
- MCERTS approved equipment link via http://www.environment-agency.gov.uk/epns "Guidance for Business and Industry";
- Direct Toxicity Assessment for Effluent Control: Technical Guidance (2000), UKWIR 00/TX/02/07.

22. The Categorisation of Volatile Organic Compounds, DOE Research Report No DOE/HMIP/RR/95/009 (EA website)
23. Odour Assessment and Control – Guidance for Regulators and Industry (joint agencies guidance in preparation)
24. "Policy and Practice for the Protection of Groundwater" (PPPG) (EA website)
25. Working at Construction and Demolition-sites (PPG 6) (EA website)

DEFINITIONS

BAT	Best Available Techniques – see *IPPC A Practical Guide* or the Regulations for further definition
BAT Criteria	The criteria to be taken into account when assessing BAT, given in Schedule 2 of the PPC Regulations
BOD	Biological Oxygen Demand
BREF	BAT Reference Document
CEM	Continuous Emissions Monitoring
CHP	Combined heat and power plant
COD	Chemical Oxygen Demand
EMS	Environmental Management System
ETP	Effluent treatment plant
ITEQ	International Toxicity Equivalents
MCERTS	Monitoring Certification Scheme
NIEHS	Northern Ireland Environment and Heritage Service
SAC	Special Areas of Conservation
SECp	Specific Energy consumption
SEPA	Scottish Environment Protection Agency
SPA	Special Protection Area
TSS	Suspended solids
TOC	Total Organic Carbon
VOC	Volatile organic compounds

Note to authors ***add as appropriate for your sector***

APPENDIX 1 - SOME COMMON MONITORING AND SAMPLING METHODS

Table A1.1: Measurement methods for common substances to water

Determinand	Method	Detection limit Uncertainty	Valid for range mg/l	Standard
Suspended solids	Filtration through glass fibre filters	1 mg/l 20%	10-40	ISO 11929:1997 EN872 Determination of suspended solids
COD	Oxidation with di-chromate	12 mg/l 20%	50-400	ISO 6060: 1989 Water Quality- Determination of chemical oxygen demand
BOD_5	Seeding with microorganisms and measurement of oxygen content	2 mg/l 20%	5-30	ISO 5815: 1989 Water Quality Determination of BOD after 5 days, dilution and seeding method **EN 1899 (BOD 2Parts)**
AOX	Adsorption on activated carbon and combustion	-- 20%	0.4 – 1.0	ISO 9562: 1998 EN1485 – Determination of adsorbable organically bound halogens.
Tot P				BS 6068: Section 2.28 1997 Determination of phosphorus –ammonium molybdate spectrometric method
Tot N				BS 6068: Section 2.62 1998 – Determination of nitrogen Part 1 Method using oxidative digestion with peroxydisulphate BS EN ISO 11905
pH				SCA The measurement of electric conductivity and the determination of pH ISBN 0117514284
Turbidity				SCA Colour and turbidity of waters 1981 ISBN 0117519553 **EN 27027:1999**
Flow rate	Mechanical ultrasonic or electromagnetic gauges			SCA Estimation of Flow and Load ISBN 011752364X
Temperature				
TOC				SCA The Instrumental Determination of Total Organic Carbon and Related Determinants 1995 ISNB 0117529796 **EN 1484:1997**
Fatty Acids				Determination of Volatile Fatty Acids in Sewage Sludge 1979 ISBN 0117514624
Metals				BS 6068: Section 2.60 1998 – Determination of 33 elements by inductively coupled plasma atomic emission spectroscopy
Chlorine				BS6068: Section 2.27 1990 – Method for the determination of total chlorine: iodometric titration method
Chloroform Bromoform				BS 6068: Section 2.58 Determination of highly volatile halogenetaed hydrocarbons – Gas chromatographic methods
Dispersants Surfactants Anionic Cationic Non-ionic				SCA Analysis of Surfactants in Waters, Wastewaters and Sludges ISBN 01176058 **EN 903:1993 (Used for anionic surfactants)**
Pentachloro-Phenol				BS5666 Part 6 1983 – Wood preservative and treated timber quantitative analysis of wood preservatives containing pentachlorophenol **EN 12673:1997 (used for chlorophenol and polychlorinated phenols)**
Formaldehyde				SCA The determination of formaldehyde, other volatile aldehydes and alcohols in water
Phosphates and Nitrates				BS 6068: Section 2.53 1997 Determination of dissolved ions by liquid chromatography
Sulphites and sulphates				BS 6068: Section 2.53 1997 Determination of dissolved ions by liquid chromatography
Ammonia				BS 6068: Section 2.11 1987 – Method for the determination of ammonium: automated spectrometric method
Grease and oils	IR absorption	0.06 mg/kg		SCA The determination of hydrocarbon oils in waters by solvent extraction IR absorption and gravimetry ISBN 011751 7283

Table A1.2: Measurement methods for air emissions

Determinand	Method	Av'ging time Detection limit Uncertainty	Compliance criterion	Standard
Formaldehyde	Impingement In 2,4 dinitro-phenyl-Hydrazine HPLC	1 hour 1 mg/m^3 30%	Two samples taken. Each result below limit after subtraction of measurement uncertainty	NIOSH
Ammonia	Ion Chromato-graphy	1 hour 0.5mg/m^3 25%		US EPA Method 26
VOCs Speciated	Adsorption Thermal Desorption GCMS	1 hour 0.1 mg/m^3 30%		BS EN 1076:Workplace atmospheres. Pumped sorbent tubes for the determination of gases and vapours. Requirements and test methods.
Chloroform	Absorption on activated carbon solvent extraction. GC analysis	1 hour 1 mg/m^3 20%		MDHS 28 Chlorinated hydrocarbon solvent vapours in air (modified)
Oxides of Sulphur	UV fluoresence automatic analyser	1 hour 1 ppm 10%	95% of hourly averages over a year below specified limit	ISO 7935 (BS6069 Section 4.4) Stationary source emissions-determination of mass concentrations of sulphur dioxide CEN Standard in preparation
	Wet sampling train Ion chromatography	1 hour 1 mg/m^3 25%	Two samples taken. Each result below limit after subtraction of measurement uncertainty	ISO 7934 (BS6069 Section 4.1) Method for the determination of the mass concentration of sulphur dioxide-hydrogen peroxide/barium perchlorate method

Measurement uncertainty is defined as total expanded uncertainty at 95% confidence limit calculated in accordance with the Guide to the Expression of Uncertainty in Measurement, ISBN 92-67-10188-9, 1st Ed., Geneva, Switzerland, ISO 1993.

See also Monitoring Guidance (Ref. 21).

APPENDIX 2 - EQUIVALENT LEGISLATION IN SCOTLAND & NORTHERN IRELAND

The legislation referred to in the text is that for England and Wales. The following are the equivalents for Scotland and Northern Ireland.

Table A.2.1 - Equivalent Legislation

England and Wales	*Scotland*	*Northern Ireland*
PPC Regulations (England and Wales) 2000	PPC (Scotland) Regulations 2000; SI 200/323	
Waste Management Licensing Regulations SI:1994 1056	Waste Management Licensing Regulations SI:1994 1056	No NI equivalent
The Water Resources Act 1991	COPA 1974 (S30A-30E equiv to Part III WRA91) Natural Heritage (Scotland) Act 1991(Part II equiv to Part I WRA91)	The Water (NI) Order 1999
SI 1989 No 317: Clean Air, The Air Quality Standards Regulations 1989	SI 1989/317: Clean Air, The Air Quality Standards Regulations 1989	The Air Quality Standards Regulations (Northern Ireland) 1990. Statutory Rules of Northern Ireland 1990 No 145
SI 1997 No 3043: Environmental Protection, The Air Quality Regulations 1997	SSI 2000/97 The Air Quality (Scotland) Regs	No NI equivalent
SI 1989 No 2286 and 1998 No 389 the Surface Water (Dangerous Substances Classification) Regulations. (Values for List II substances are contained in SI 1997/2560 and SI 1998/389)	SI 1990/126 Surface Water (Dangerous Substances) (Classification) (Scotland) Regs	Surface Waters (Dangerous Substances) (Classification) Regulations 1998. Statutory Rules of Northern Ireland 1998 No 397 SI1991/1597:
SI 1991/1597: Bathing Waters (Classification) Regs.	SI 1991/1609 Bathing Waters (Classification) (Scotland) Regs	The Quality of Bathing Water Regulations (NI) 1993
SI 1992/1331 and Direction 1997 Surface Waters (Fishlife) (Classification) Regs.	SI 1997/2471 Surface Waters (Fishlife) (Classification) Regs	The Surface Water (Fishlife) (Classification) Regulations (NI) 1997
SI1997/1332 Surface Waters (Shellfish) (Classification) Regs.	SI 1997/2470 Surface Waters (Shellfish) (Classification) Regs	The Surface Water (Shellfish) (Classification) Regulations (NI) 1997
SI1994/2716 Conservation (Natural Habitats etc) Regulations 1994	SI 1994/2716 Conservation (Natural Habitats etc) Regs	Conservation (Natural Habitats etc) Regulations (Northern Ireland) 1995
Control of Major Accident Hazards Regulations 1999 (COMAH)	SI 1999/743 Control of Major Accident Hazards Regs	Control of Major Accident Hazard Regulations (Northern Ireland) 2000