Process Guidance Note 6/13(04)

Secretary of State's Guidance for Coil Coating

defra
Department for Environment
Food and Rural Affairs

SCOTTISH EXECUTIVE

Llywodraeth Cynulliad Cymru
Welsh Assembly Government

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

Environment
Agency

Contents

List of Figures

List of Tables

1 Introduction

1.1 This note is issued by the Secretary of State, the Welsh Assembly Government (WAG) and the Scottish Ministers ("the Government") to give guidance on the conditions appropriate for the control of emissions into the air from the following industrial sector:

Coil Coating processes / installations[1]. It supersedes guidance note “Coil Coating Processes” 6/13 (97) published in March 1997.

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

General guidance setting out LA-PPC policy and procedures is contained in the “General Guidance Manual on Policy and Procedures for A2 and Part B installations” available from **www.defra.gov.uk/environment/ppc/index.htm** referred to in this document as the “General Guidance Manual”. Other related guidance can be found in **Section 8** of this document.

1.3 This note is for use under both Local Air Pollution Control (LAPC) established by Part I of The Environmental Protection Act 1990, and Local Air Pollution Prevention and Control (LAPPC) established by the Pollution Prevention and Control Act 1999. It constitutes statutory guidance to regulators under regulation 37 of The Pollution Prevention and Control (England and Wales) Regulations 2000, SI 1973[3]. To the extent it provides guidance on techniques, it also constitutes statutory guidance to regulators under section 7(11) of the 1990 Act, and in any event regulators are expected to have regard to it. The note will be treated as one of the material considerations when determining any appeals made against a decision under either the 1990 or 1999 Acts. This note also includes mandatory requirements contained in the EU Solvent Emissions Directive (SED) as explained in paragraphs **1.12**, **1.13**, **1.14**, **1.15**, **1.16**, **1.17** and **1.18** below.

Who is affected

1.4 This guidance is for:

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

---

[1] The term "process(es)" is used in the remainder of the note to mean both "processes" under the Environmental Protection Act 1990 and "installations" under the Pollution Prevention and Control Act 1999.

[2] BATNEEC is the formulation used in the Environmental Protection Act 1990 and BAT is used in the Pollution Prevention and Control Act 1999. For the purpose of this guidance note, the two concepts are regarded as having essentially the same effect.

[3] In Scotland, section 24 of the Pollution Prevention and Control (Scotland) Regulations 2000.

Paragraphs that apply

Help in using this Guidance Note

1.5 **Section 3** of this note advises on which type of activities/processes it covers.

Solvent consumption

1.6 In **Section 1** of this note the distinction is made between organic solvent consumption of a PPC installation and organic solvent consumption of a SED activity. In the situation described in the following paragraph this affects which of the remaining parts of the note apply. (The rest of the note refers only to organic solvent consumption of the installation).

1.7 It is possible that in a very few cases the organic solvent consumption of the PPC installation could exceed the threshold in the PPC regulations, but the organic solvent consumption of the SED activity carried out at that installation is below the threshold where SED applies. This is because of the different methods of calculating consumption (See **Section 8** Definitions).

If an operator can show that these circumstances occur in a particular case, the requirements of the SED boxes within the note will not apply.

1.8 For those activities/processes covered, not all paragraphs of the note will apply in every case.

Table 1 sets out which paragraphs apply.

Table 1 applies in specific circumstances, as follows:

For activities (i)-(iii) below, use **Table 1**(coating activities) as a guide to the applicable paragraphs:

(i) where an article/substrate is being coated and the solvent consumption is 5 tonnes or more

(ii) where an article/substrate is being coated and the same article/substrate is being printed and the solvent consumption is 5 tonnes or more

(iii) where (i) or (ii) above are being undertaken together with an additional SED activity

1.9 In interpreting **Table 1**, the following are relevant:

"SED activity" is one that is covered by the SED - this will be determined by the description of the activity (see Annex I of the Directive in **Appendix 2** of this note) together with the organic solvent consumption (see Annex IIA of the Directive in **Appendix 2**, and the determination method in paragraph **5.10** of this note).

The definitions of the different types of "SED activity" can then be used to determine if "single SED activity" and "more than one SED activity" exist within the installation.

1.10 This note includes SED boxes. These are provided to specifically detail the additional requirements of the Directives for this particular sector. Where they apply, these are mandatory.

1.11 In **Section 5** and **Section 6**, arrows are used to indicate the matters which should be considered for inclusion as authorisation and permit conditions. It is important to note, however, that this should not be taken as a short cut for regulators to a proper determination of BATNEEC and BAT or to disregard the explanatory material which accompanies the arrows, and that in individual cases it may be justified to:

- include additional conditions
- include different conditions
- not include conditions relating to some of the matters indicated

In addition, conditions will need to be derived from other parts of the note, in particular to specify emission limits, compliance deadlines and mandatory requirements arising from directions or other legislation.

EU Solvent Emissions Directive

1.12 The note also (where appropriate) gives details of any mandatory provisions affecting emissions, which are in force at the time of publication. The main difference between this note and previous notes is the inclusion of requirements specified in EC Directive 1999/13/EC, from here on referred to as the Solvent Emissions Directive (SED).

1.13 The SED was adopted by the European Commission on 11 March 1999. Its aim is to reduce emissions of volatile organic compounds (VOC) from specified industrial processes. In order to achieve this in the UK, the Directive is being implemented through the Environmental Protection Act 1990 and the Pollution Prevention and Control Regulations 2000. As a result, the regulators have been directed through Directions from DEFRA to include the requirements of the Directive and the time scales by which these must be complied with (see ref. I).

Not all the processes/activities that this note applies to, are necessarily subject to the requirements of the Directive. It is only those Directive Installations, as defined in Annex I and IIA of the SED see (**Appendix 2**) that are subject to the requirements of the Directive.

1.14 In order to reduce VOC emissions from Directive Installations,

two compliance options are available, these are:

(i) meeting emission BAT limit values in waste gases and fugitive emission limit values; or

(ii) implementing a solvent reduction scheme to reduce emissions from the installation equal to those that would have been achieved by meeting the emission limit values

In addition, the Directive requires that, where an operator is using a substance or preparation which contains VOC and the nature or amount of VOC means that the substance or preparation is assigned one, or more, of the risk phrases R45, R46, R49, R60, R61.

(a) that substance or preparation must be changed so that the risk phrases no longer apply (e.g. by substituting the VOC), and/or

(b) emissions of VOC in question are controlled

Additional requirements also apply to the use of halogenated VOC assigned risk phrase R40.

1.15 This note relates to all releases to air from the activity/process, and for SED installations it relates to all VOC releases to all media. However, not all of the paragraphs apply. The type and way VOC are used will dictate which paragraphs of the note apply.

Table 1: Coating activities, operating conditions and relevant paragraphs

Installation	Paragraphs of Guidance Note which apply		
	Activities Applying Emission and Fugitive Limits	**Activities Applying Reduction Scheme Without Abatement**	**Activities Applying Reduction Scheme With Abatement**
Single SED activity. Solvent consumption of the coating activity more than 25 tonnes	**Existing installations** All of Sections, except: • 5.24 with regard to abated VOC releases • 5.5, 5.6, Table 5, 5.7 and 5.8 • SED Box 10 **For existing installations after 31 October 2007; and new or substantially changed installations** Table 4 **is also** excepted	**All Installations** All of Sections, except: • SED Box 1 • Table 4 • SED Boxes 5, 8, 9, and 10 Note: The following paragraphs only apply to releases of VOC which are designated risk phrase materials: • 5.20, 5.21, and 5.22	**All Installations** All of Sections, except: • SED Box 1 • Table 4 • 5.24 with regard to abated VOC releases • SED Boxes 5, 9, and 10
More than one SED activity. Solvent consumption of the coating activity more than 25 tonnes plus another SED activity	**Existing installations** All of Sections, except: • 5.24 with regard to abated VOC releases • 5.5, 5.6, Table 5, 5.7 and 5.8 **For existing installations after 31 October 2007; and new or substantially changed installations** Table 4 **is also** excepted	**All Installations** All of Sections, except: • SED Box 1 • Table 4 • SED Boxes 5, 8 and 9 Note: The following paragraphs only apply to releases of VOC which are designated risk phrase materials: • 5.20, 5.21, and 5.22	**All Installations** All of Sections, except: • SED Box 1 • Table 4 • 5.24 with regard to abated VOC releases • SED Boxes 5 and 9

Table 1: Coating activities, operating conditions and relevant paragraphs

Installation	**Paragraphs of Guidance Note which apply**		
	Activities Applying Emission and Fugitive Limits	**Activities Applying Reduction Scheme Without Abatement**	**Activities Applying Reduction Scheme With Abatement**
No SED activity. Solvent consumption of the coating activity less than 25 tonnes, solvent consumption of the coating installation more than 5 tonnes.	**All processes** All of Sections, except: - 1.10, 1.12, 1.13, 1.14, 1.16, 1.17, 1.18 and 1.28 - SED Boxes 1, 2, 3 and Table 2 SED requirements - 5.5, 5.6, Table 5, 5.7 and 5.8 - SED Boxes 4 - 10 - SED Box 11	**All processes** All of Sections, except: - 1.10, 1.12, 1.13, 1.14, 1.16, 1.17, 1.18 and 1.28 - SED Boxes 1, 2, 3 and Table 2 SED requirements - SED Boxes 4 - 10 - SED Box 11 Note: The following paragraphs only apply to releases of VOC which are designated risk phrase materials: - 5.20, 5.21, and 5.22	**All processes** Not available
Coating processes / activities where the solvent consumption of the installation is < 5 tonnes are not covered by this note. A SED activity is an activity falling within the scope of the Solvent Emission Directive (i.e. activity as defined in Annex I, and which exceeds the thresholds in Annex II of the Directive).			

SED Activities Direction

1.16 The Directions[4] came into force on 22 March 2002 in England and Wales and 1 March 2002 in Scotland. They were made for the purpose of implementing the EC Directive 1999/13/EC on the limitation of emissions of VOC due to the use of organic solvents in certain activities and installations (SED). These Directions relate to certain processes/activities subject to local regulatory control under Part 1 of the Environmental Protection Act 1990 and the Pollution Prevention and Control Act 1999, some of which are covered by this note. They direct regulators to include conditions in permits to give effect to the specified articles in the Directive. Regulators are required to comply with the Directions without discretion. Compliance by SED activities with the requirements of paragraphs 5.2, 5.4, 5.10, 5.12, 5.16, 5.17 and 5.18 of the note and SED Boxes 1-11 will ensure implementation of the Directive provisions. Section 6, Control techniques, details practical techniques that, at the time of writing, are considered to be BAT/ BATNEEC.

1.17 The previous PG note incorporated many of the aspects of the SED, hence in some cases minimal time and investment will be required to meet the Directive provisions.

Existing installations have until 31 October 2005 or 31 October 2007(depending on compliance route chosen)

---

[4] The Environmental Protection Act (Solvent Emissions Directive) (England) Direction 2002
Pollution Prevention and Control (Solvent Emissions Directive) (England and Wales) Direction 2002
The Environmental Protection Act (Solvent Emissions Directive) (Scotland) Direction 2002
Pollution Prevention and Control (Solvent Emissions Directive) (Scotland) Direction 2002

(Existing installations may choose to convert to the SED requirements at any time before the specified compliance date within the Direction.) However, the requirements for new abatement plant must be met straight away. In addition, emissions of designated risk phrase materials assigned certain risk phrases, (SED Box 6) are required to be controlled and in specific cases the compounds should be replaced with less harmful substances within the shortest possible time (see **Section 8**, Definitions). New or substantially changed installations need to meet all the requirements of the SED prior to operation.

1.18 The SED gives limited discretion to Member States to adopt different measures if the Directive requirements are demonstrated not to be technically and economically feasible. Any such alternative measures would need to be clearly justified and approved by the regulator. The operator must demonstrate to the satisfaction of the regulator that the best available technique is being used and that there are no significant risks to human health or the environment. Before the derogation is permitted for SED activities, the regulator must notify Defra and give full justification of each case where SED requirements, paragraphs **5.2**, **5.4**, **5.10**, **5.12**, **5.16**, **5.17** and **5.18** of the note and SED Boxes 1-11, are not applied. Defra's view at the time of publication of this guidance is that, while each case must be considered by regulators on its merits and each notification by regulators will be carefully examined by Defra, this guidance note has been written to reflect what is BAT for the sector as a whole, and it is not envisaged generally that there will be a need for different measures to be adopted for reasons of technical and economical feasibility.

Site Specific BAT / BATNEEC

1.19 All processes are subject to BAT/ BATNEEC. In general terms, what is BAT/ BATNEEC for one process in a sector is likely to be BAT/ BATNEEC for a comparable process; but in each case it is, in practice, for regulators (subject to appeal) to decide what is BAT/ BATNEEC for the individual process and the regulator should take into account variable factors (such as configuration, size and other individual characteristics of the process) and the locality (such as proximity of particularly sensitive receptors[5]). Ultimately, therefore, what constitutes BAT/ BATNEEC is site specific but this guidance note comprises guidance for the generality of processes in the sector and careful regard should be had to it, in order to maximise consistency of permits as appropriate.

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

- coil coating processes/activities
- their potential impact on the environment; and
- what constitutes BAT/BATNEEC for preventing and reducing air emissions

1.21 The note may be amended from time to time in order to keep abreast with developments in BAT/BATNEEC including improvements in techniques and new understanding of environmental impacts and risks. Such changes may be issued in a complete revision of this document, or in separate additional guidance notes which address specific issues. (It may not always be possible to issue amending guidance quickly enough to keep in absolute step with rapid changes, which is another circumstance where paragraph **1.19** above might apply.)

---

[5] Guidance on the relationship between BAT/BATNEEC and air quality objectives is contained in the General Guidance Manual on policy and procedures for A2 and B installations.

1.22 Steps will be taken to ensure that those who need to know about changes are informed. Operators (and their advisers) are, however, strongly advised to check with the regulator whether there have been any changes before relying on this note for the purposes of making an application under the 1990 or 1999 Acts or making any other decisions where BAT/ BATNEEC may be a consideration.

Consultation

1.23 This note has been produced in consultation with relevant trade bodies, representatives of regulators including members of the Industrial Pollution Liaison Committee, and other interested organisations.

Publication

1.24 This and the other published guidance in this series is available, free of charge, via Defra at **www.defra.gov.uk**. There are links to this site from the following web sites:

- Scottish Executive at **www.scotland.gov.uk**.
- Environment Agency at **www.environment-agency.gov.uk**.
- Scottish Environment Protection Agency at **www.sepa.org.uk**.

Printed copies of this and other PG notes are available from Defra Publications. They are priced separately and can be purchased in the following ways:

by writing to

Defra Publications, Admail 6000, London, SW1A 2XX.

Cheques or postal orders to cover the cost of priced items must be enclosed with your order, and should be made payable to 'Defra Publications'. See also the Defra Publications order form available from http://www.defra.gov.uk/corporate/publications/ordrform.htm.

or by telephoning

08459 556000 (calls charged at local rate) or +44 20 8957 5242 from outside the UK.

Debit and credit cards are accepted.

When ordering, always quote the title in full and the order code (PB XXXX) given. Further information on ordering can be found on the Defra website at **www.defra.gov.uk/corporate/publications/ordering.htm**

1.25 General guidance explaining LAPPC and setting out the policy and procedures, is contained in the “General Guidance Manual on Policy and Procedures for A2 and B Installations” available from **www.defra.gov.uk/environment/ppc/index.htm**, referred to in this document as the "General Guidance Manual.” This is designed for operators and members of the public, as well as for local authority regulators.

1.26 In addition to the General Guidance Manual referred to above, explanation or clarification of certain terms used in this sector guidance note may be found in a general guidance note issued under Part I of the Environmental Protection Act 1991: ‘Interpretation of terms used in process guidance notes’, known as General Guidance Note 4 - GG4 - published by HMSO in 1991. Where there is any conflict between GG4 and the guidance issued in this note or in the General Guidance Manual, the latter two documents should prevail, as should any subsequent guidance issued in relation to LAPPC.

Activities covered by Note

1.27 PG 6/13 (04) deals with coil coating. The note covers the application and curing of a continuous coating to coiled metal substrates (more details can be found in Process Description).

1.28 Directly associated and technically connected solvent processes/activities carried out within the same installation will form part of the activity and have to meet the provisions for that activity, unless defined as a separate activity within the SED (See **Appendix 2**). In which case they should be regarded as an additional activity within a single installation and the provisions of SED Box 10 apply.

Coating and coating manufacture together

1.29 If a coil coating activity covered by this note also operates a coating manufacturing activity within the same installation which is technically connected, that manufacturing activity should be regarded as part of the coil coating activity.

- if its' consumption is less than 100 tonnes of organic solvent per year.
- otherwise, If the coating manufacturing activity its' consumption is 100 tonnes or more of organic solvent per year it should be regarded as separate activity, as defined within the SED, within the installation and separate guidance on the requirements for control of that activity should be obtained from PG6/44 (04)

1.30 The Coating and Printing of Metal Packaging, Manufacture of Inks and Coatings and Powder Coating processes are covered by more specific guidance notes:

- PG6/7 (04) Printing and Coating of Metal Packaging
- PG6/44 (04) Manufacture of Coating Materials
- PG6/31 Powder Coating including Sheradizing

2 Timetable for compliance and reviews

Existing processes or activities

2.1 The previous guidance advised that upgrading to that standard should usually have been completed by 1 October 1997. Requirements still outstanding from any existing upgrading programme should be completed.

Upgrading to this note

2.2 The new provisions of this note, and the date(s) by which compliance with these provisions is expected, are listed in **Table 2** below together with the paragraph number where the provision is to be found. Compliance with the new provisions should normally be achieved by the dates shown. Authorisations and permits should be varied as necessary having regard to the changes and the timetable. The SED requirements and time scales are mandatory.

Table 2: Compliance timetable

Paragraph / Row	Provision	Compliance Date
SED Activities, Mandatory Provisions and Time scales		
SED Box 6	Replace, Control and Limit Designated Risk Phrases Materials R45, R46, R49, R60, R61	Shortest possible time
SED Box 6	Control and Limit Halogenated VOC with Risk Phrase R40	Shortest possible time
SED Box 1	Requirements on all new VOC abatement plant fitted after 1 April 2001 to existing installations not using the Reduction Scheme	Immediately
Paragraphs **5.5**, **5.6**, **Table 5**, **5.7** and **5.8**	Reduction Scheme requirements for SED Activities	31 October 2005
OR		
SED Box 5	New limits for emissions from contained releases and Fugitive Emission Value provisions	31 October 2007
All other SED requirements	To be complied with by 31 October 2007	31 October 2007
New Emission Limits, Monitoring and other Provisions		
Table 3	Limitation on sulphur in fuel burnt	Immediately
Table 3	New 500mg/Nm^3 limit for carbon monoxide (CO) from turbines, boilers and engines	1 December 2005
New Control Techniques		
Paragraph **6.6**	Light coloured painting of tanks containing VOC*	Within the normal programmed maintenance schedule of the tanks, but no later than 31 December 2013
Paragraph **6.7**	Provision of lockable tanker connections	No later than 31 October 2007

Table 2: Compliance timetable

Paragraph / Row	Provision	Compliance Date
Paragraph **6.9**	Emptying of coating pots prior to cleaning	
Paragraph **6.10**	Monitoring of consumption of organic solvents and materials containing organic solvents against product produced	
Paragraph **6.10**	Use of programmable scales	
Paragraph **6.11**	Use of self closing containers for storage of organic solvent and organic solvent contaminated materials	
	All other provisions	
All other provisions	To be complied with as soon as practicable	Normally within 12 months of the issue date of this note
* Here and elsewhere in this note, this includes tanks containing any organic solvent and organic solvent-borne coating materials, inks and adhesives.		

2.3 Replacement abatement plant should normally be designed to meet the appropriate standards specified for new processes/activities.(**Table 3** and **Table 4**).

SED Box 1 New VOC abatement plant

(article 5) All activities not using the Reduction Scheme

For installations not using the Reduction Scheme, any VOC abatement equipment installed after 1 April 2001 must meet the emission limit requirements for New Installations of SED Box 5 (but not the fugitive emission limits) and SED Box 6

Relaxation of conditions

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

New processes or activities

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

SED Box 2 New Installations

(article 3) All Activities

For new installations the permit must have regard to the full standards of the Directive as from 1 April 2001.

Substantially changed processes or activities

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

SED Box 3 Substantially changed installations

(articles 2,4 & 9) All Activities

For substantially changed (as defined in Article 2 of SED (**Appendix 2**) installations the permit must have regard to the full standards of the Directive as from the first day of April 2001.

Where an installation:

- undergoes a substantial change; or
- comes within the scope of this Directive for the first time following a substantial change

that part of the installation which undergoes the substantial change shall be treated as new installation.

However, if the following condition is met, then the change should not be considered substantial and an application for a non-substantial variation should be made.

The total mass emission of VOC from the SED installation after the substantial change is less than:

- the total mass emission of the installation prior to the change (which would have been described as substantial); PLUS
- the calculated additional mass emission of the change part (which would have been described as substantial) of the installation if it had complied with the appropriate 31 October 2007 VOC requirements (i.e. those requirements being either emission and fugitive limits, or total emission limits, or the reduction scheme, as appropriate).

When determining a substantial change for SED installations, consideration must be given to the fact that:

- an increase in VOC emissions is required above the percentages set out below (SED Box 3); and
- that increase in emissions must have resulted from a change in nominal capacity of the installation

Under the SED a substantial change means:

For all installations a change of the nominal capacity leading to an increase of emissions of VOC of more than 10%. Any change that may have, in the opinion of the competent authority, significant negative effects on human health or the environment is also a substantial change.

Following a substantial change, compliance must be re-verified.

Permit reviews

Reviewing permits

2.7 Under LAPC the requirement is to review conditions in authorisations at least every four years. (Section 6(6) Environmental Protection Act 1990).

2.8 Under LAPPC the legislation requires permits to be reviewed periodically but does not specify a frequency. It is considered for this sector that a frequency of once every six years ought normally to be sufficient for the purposes of Regulation 15(1) Pollution Prevention and Control Regulations 2000.

More frequent review may be necessary in individual cases for the reasons given in Regulation 15(2). Further guidance on permit reviews is contained in the “General Guidance Manual on Policy and Procedures for A2 and B Installations” available from **www.defra.gov.uk/environment/ppc/index.htm** to be referred to in this document as the "General Guidance Manual.” Regulators should use any opportunities to determine the variations to authorisations/permits necessitated by paragraph **2.3** above in conjunction with these reviews.

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

3 Process description

Regulations

3.1 Coil Coating Processes/Installations are prescribed for:

- **LAPC** under section 6.5 of Schedule 1 to the Environmental Protection (Prescribed Processes and Substances) Regulations 1991, SI 472 (as amended).
- **LAPPC** under section 6.4 Part B of Schedule 1 of the Pollution Prevention and Control (England and Wales) Regulations 2000 SI 1973.[6]
- **Installations with organic solvent consumption capacity over 150kg/hr, or greater than 200 tonnes/annum are subject to Local Authority Integrated Pollution Prevention and Control, LA-IPPC, for which separate guidance will be issued**

3.2 This note refers to coil coating processes, where coiled steel, stainless steel, coated steel, copper alloys or aluminium strip is coated with either a film forming or laminate coating in a continuous process:

In the rest of **this section only** “process” should be understood to describe the various stages involved in the coating operations. It does not necessarily have the same meaning as elsewhere in this note.

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

3.4 Coatings applied as a liquid may include plastisols, organosaols, vinyls, acrylics, alkyds, polyesters, silicone polyesters and fluorocarbons. They are applied embossed or smooth, in thicknesses of between 5 and 250 microns. This may be applied to a variety of coiled metal substrate, e.g. Steel, Aluminium, Brass, Stainless Steel. A typical coil coating operation is made up of the following operations:

- entry end
- cleaning section
- pre-treatment
- coating
- post treatment
- exit end

3.5 Entry End

The entry end consists of machinery, which uncoils the strip and prepares it for the continuous coating operation. Coils are all measured to ensure compliance with width and gauge requirements then any leading end damaged or out of specification material is trimmed and discarded, any damaged or out of specification trailing end material is similarly trimmed off and discarded.

The leading edge of the incoming strip is welded or stitched to the tail end of the outgoing strip thus presenting a continuous length of material to the process section. Accumulators at the entry and exit end of the line allow sufficient stop time for joining and separating the strip without stopping the coating operation

The strip may be levelled to ensure good shape prior to coating.

---

[6] In Scotland, section 6.3 Part B of Schedule I of the Pollution Prevention and Control (Scotland) Regulations 2000 (SSI 2000/323).

3.6 Cleaning Section

It is essential that the surface of the coil is free from impurities such as grease, oil, carbon or abraded iron fines to ensure that the entire surface is exposed to the coating product and strong adherence is achieved. Prior to painting, the strip is cleaned and degreased normally in an alkali cleaning section followed by hot and cold water rinses. This may be multi stage employing more than one bath or have electrolytic cleaning system to ensure an absolute level of cleanliness.

3.7 Pre-treatment

The strip is dried and treated with a conversion coat to improve paint adhesion and to ensure enhanced corrosion resistance. The conversion coat normally applied is a chromate but others are available. Modern chromate solutions are applied using chemical roller coating machine, although other methods such as dipping or spraying may be used, in all cases coating is followed by oven stoving. This dry in place method of application removes the need for any additional treatment or rinsing.

For some specialist products, after cleaning surface treatment of the coil may be carried out in the form of graining and anodising to develop the required surface properties required of the final product.

3.8 Coating

The coating process can comprise of a number of stages and be carried out by a number of different coating techniques i.e. roller coating, slot coating. Although the method of application and the type of coating may vary the general principles of operation of the coating machine are similar for all applications. As an example the coating of coil strip with a primer and finish coat on both sides is given . The strip passes through a roller coater machine, which applies a primer paint coat to both sides of the strip. The coaters are normally housed in enclosures to minimise the egress of organic solvent vapours to the bay atmosphere. The coater houses are ventilated by fan extraction to the outside of the building with a flow rate designed to maintain satisfactory working conditions at all times for the operators within the coater house.

After application of the prime paint, the strip passes to an oven provided with convection heating by air recirculation to achieve the peak metal temperatures required for the curing of the paint. The oven is heated by recovered heat. After curing, the strip passes through a water spray quench tank and is dried by an air blower.

The strip continues through a second, finish coating stage, which is similar to the prime coating process and after curing is again quenched and dried. However, for PVC plastic coated strip, the strip passes through an embossing roll, which imprints a pattern into the paint surface immediately prior to quenching.

Organic solvent and other organic fumes arising in the curing oven are extracted by a fan. The extraction system is designed to maintain a mass flow and pressure balance which will prevent escape of fumes and will ensure that the level of organic vapour does not exceed 25% of the lower explosion limit (LEL).

The fumes pass to abatement equipment, normally a thermal oxidiser (incinerator) designed to reduce the VOC and other organic's to minimal levels before being discharged to atmosphere

The thermal oxidation systems used are designed to be thermally efficient utilising regenerative bed technology or recuperative technology or have secondary heat recovery attached.

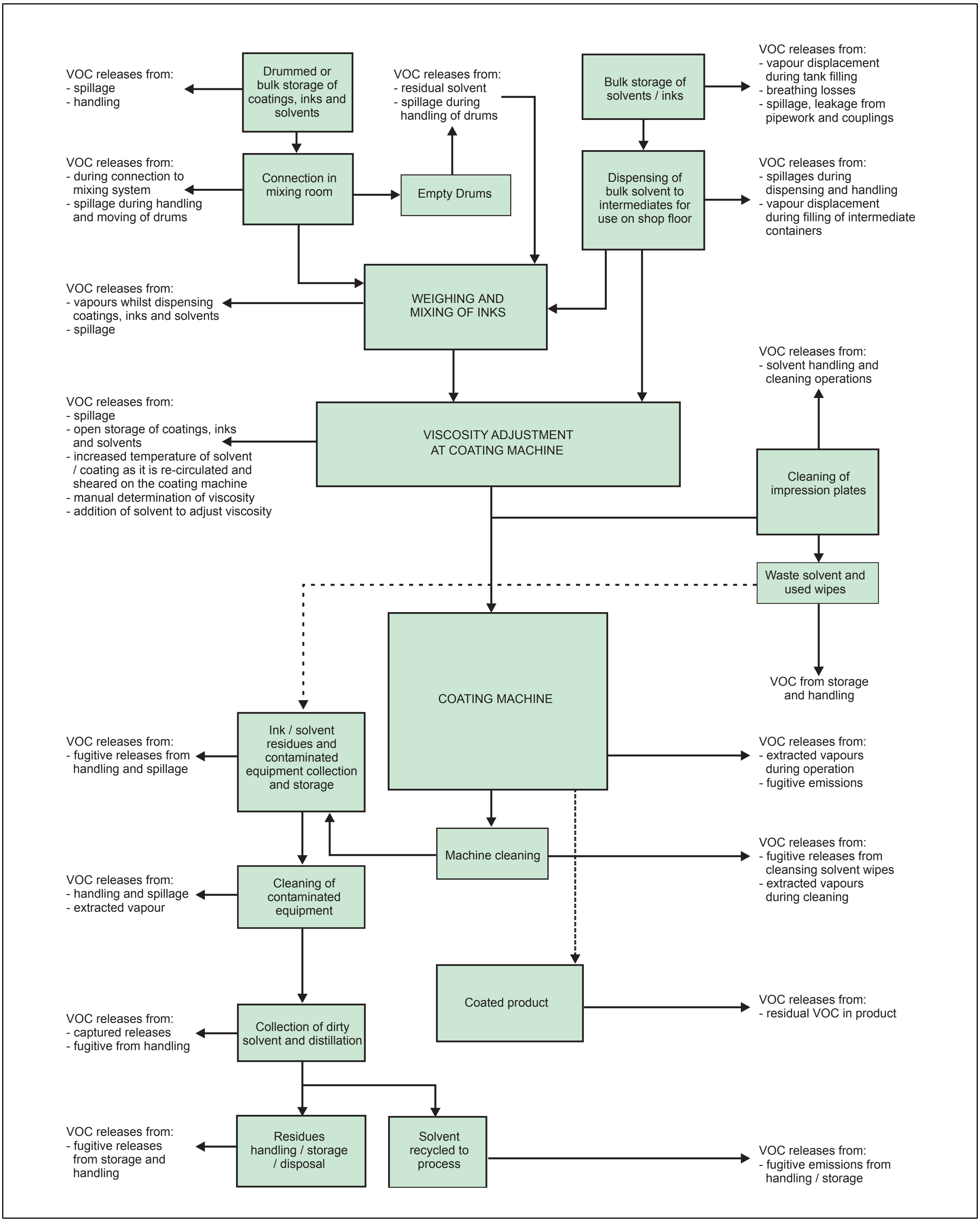
3.9 Post treatments.

Post treatments such as wax coating, paper coating or a strippable film may be applied, dependent on customer requirements.

3.10 Exit End

The finished product is normally inspected and is coiled on a coiler, on high production rate units there may be two coilers, coils are cut to size or weight according to Customer requirements. For some specialist applications the coils may be converted on site to sheet prior to dispatch to the customer.

Figure 3.1: Potential VOC releases from a coil coating operation



4 Potential releases

Pollutants and sources

4.1 The key emissions from these processes/activities that constitute pollution for the purposes of Part I of the Environmental Protection Act 1990 or the Pollution Prevention and Control Regulations 2000 and therefore warrant control are those consisting of:

VOC, carbon monoxide, oxides of nitrogen, fluoride, isocyanates and ozone

4.2 The following parts of the process/activity may give rise to releases of VOC

- handling, loading and mixing processes involving organic solvents and organic solvent borne coatings
- all cleaning operations using organic solvent borne cleaning fluids
- handling and storage of waste organic solvents and organic solvent contaminated wastes
- coating and drying processes

4.3 The following parts of the process/activity may give rise to releases of carbon monoxide and nitrogen oxides

- oxidation of extracted gases
- combustion of extracted gases in turbines, reciprocating engines, or boilers

4.4 The following parts of the process/activity may give rise to releases of fluoride

- coating and drying processes involving coatings containing fluoride

4.5 The following parts of the process/activity may give rise to releases of isocyanates

- handling, loading and mixing processes involving coatings containing isocyanate
- handling and storage of isocyanate contaminated wastes
- coating and drying processes involving coatings containing isocyanate

4.6 The following parts of the process/activity may give rise to releases of ozone

- corona discharges
- UV curing lamps

5 Emission limits, monitoring and other provisions

Non-VOC provisions

5.1 All processes/activities should comply with the emission limits and provisions with regard to non-VOC releases in **Table 3**.

Compliance overview

5.2 For VOC two compliance options are available for all processes/activities.

- Reduction Scheme
- Emission and Fugitive Limits

Non SED activities/processes should apply the provisions of:

- Reduction Scheme; or
- Emission Limits in **Table 4**

Prior to 31 October 2007 existing SED installations should apply the provisions of:

- Reduction Scheme; or
- Emission Limits in **Table 4**

In addition to the above, the requirements of the emission limits and conditions for certain designated risk phrase materials (SED Box 6) must be met.

New and substantially changed SED installations, and by the 31 October 2007 existing SED installations should apply the provisions of:

- Reduction Scheme; or
- Emission and Fugitive Limits SED Box 5

In addition to the above, the requirements of the emission limits and conditions for certain designated risk phrase materials (SED Box 6) must be met.

5.3 The Reduction Scheme is the preferred method of preventing and minimising emissions of VOC, using non-abatement techniques such as:

- water borne coatings (low organic solvent content)
- higher solids content coatings
- powder coatings
- organic solvent free liquid coatings
- radiation cured coatings (for example, ultra violet and electron beam)

SED Box 4 VOC compliance

(article 5) All Activities

All installations must comply with either:

(a) The emission limit in waste gases and the fugitive emission values in SED Box 5 and the emission limits for designated risk phrase materials in SED Box 6

Or

(b) The requirements of the Reduction Scheme (**5.5**, **5.6**, **Table 5**, **5.7** and **5.8**) and the emission limits for designated risk phrase materials in SED Box 6

An operator can choose to transfer all or part of their activities designated for control under the SED prior to the compliance date.

5.4 The provisions described in this Section are achievable using best available techniques described in **Section 6**.

- The reference conditions for limits in **Section 5** are: 273.15K, 101.3kPa, without correction for water vapour content, unless stated otherwise.

Non VOC Emission Limits

Table 3: Non VOC emission limits, monitoring and other provisions

All processes / activities					
Row	**Substance**	**Source**	**Emission limits / provisions**	**Type of monitoring**	**Monitoring frequency**
1	Carbon monoxide	From oxidation plant	100 mg/Nm^3 as 15 minute mean for contained sources	**Catalytic oxidiser** Monitoring and recording See paragraphs 5.20, 5.21 and 5.22.	Continuous
				Plus	Plus
				Manual extractive testing See paragraphs 5.22, 5.23, 5.24 and 5.25.	Annual
		From turbines, reciprocating engines or boilers used as VOC abatement equipment	500 mg/Nm^3 at 5% oxygen dry gas, as 15 minute mean for contained sources	**All other types of abatement** Manual extractive testing See paragraphs 5.22, 5.23, 5.24 and 5.25.	Annual
2	Oxides of Nitrogen (measured as nitrogen dioxide)	From oxidation plant	100 mg/Nm^3 as 15 minute mean for contained sources	Manual extractive testing. See paragraphs 5.22, 5.23, 5.24 and 5.25.	Annual
		From oxidation plant where solvents containing nitrogen are used	300 mg/Nm^3 as 15 minute mean for contained sources		
		From turbines, reciprocating engines or boilers used as VOC abatement equipment	500 mg/Nm^3 as 15 minute mean for contained sources		
3	Fluoride	All processes / activities using fluoride containing coatings	5 mg/Nm^3 expressed as Hydrogen Fluoride (HF) as 15 minute mean for contained sources	Manual extractive testing. See paragraphs 5.22, 5.23, 5.24 and 5.25.	Annual
4	Isocyanates	All processes / activities using isocyanates	0.1 mg/Nm^3 as a 15 minute mean for contained sources excluding particulate and expressed as NCO	Manual extractive testing See paragraphs 5.22, 5.23, 5.24 and 5.25.	Annual

Table 3: Non VOC emission limits, monitoring and other provisions

All processes / activities					
Row	**Substance**	**Source**	**Emission limits / provisions**	**Type of monitoring**	**Monitoring frequency**
5	Sulphur dioxide	All processes / activities	1% wt/wt sulphur in fuel	Certification by supplier using test method ASTM D86 distillation.	Every delivery
		All processes/ activities using gas oil as defined in the Sulphur Content of Certain Liquid Fuels Directive (1999/32/EC).	0.2% wt/wt sulphur in fuel (before 1/01/2008) 0.1% wt/wt sulphur in fuel (from 1/01/2008)		

VOC Emission Limits

Table 4: VOC emission limits, monitoring and other provisions

All Processes/activities not using the Reduction Scheme				
Row	**VOC**	**Emission limits / provision**	**Type of monitoring**	**Monitoring frequency**
1	**All processes/ activities** Except where the mass emission of VOC from an individual source is less than 1 kg in any 8 hour period	VOC expressed as total carbon excluding particulate matter 50 mg/Nm^3 as 15 minute mean for contained sources	Abated releases monitoring and recording See paragraphs 5.20, 5.21 and 5.22. Plus Annual manual extractive testing See paragraphs 5.22, 5.23, 5.24 and 5.25. Non abated releases Annual manual extractive testing See paragraphs 5.22, 5.23, 5.24, 5.25 and 5.26.	Abated releases Continuous monitoring Plus Annual manual extractive. Non abated releases Annual manual extractive
2	**Non-methane VOC** From turbines, reciprocating engines or boilers used as VOC abatement equipment	VOC expressed as total carbon excluding particulate matter 150 mg/Nm^3 as 15 minute mean for contained sources		
3	The emission limit values for VOC in Rows 1 and 2 above do not apply where the coating applied contains less than 200 grams of VOC per kilogram of solid when determined in accordance with Appendix 3 of this note.			

VOC Contained and Fugitive Emission Limits

SED Box 5 Contained and Fugitive Emission Limits and Requirements (articles 5,8,9 & Annex IIA)				
	For all activities not using Reduction Scheme			
Row	**VOC in waste gases**	**Emission Limits / Requirement**	**Fugitive Emission Values**	**Monitoring**
1	Coating Installations Solvent consumption 25 tonnes or more	VOC expressed as total mass of organic carbon		Abated releases Continuous monitoring and recording See paragraphs 5.20, 5.21, 5.22 and SED Box 8 Plus Annual manual extractive testing See paragraphs 5.22, 5.23, 5.24, 5.25, 5.26 and SED Box 8 Non abated releases Annual manual extractive testing See paragraphs 5.22, 5.23, 5.24, 5.25, 5.26 and SED Box 8 Fugitive Emissions See SED Box 9
	Waste gases from oxidation plant used as abatement	50 mg Carbon/Nm^3	25% of solvent input	
	Waste gases from turbines reciprocating engines or boilers used as abatement plant	Until 1 April 2013 but See SED Box 5, Note 1 150 mg Carbon/Nm^3		
		100mg Carbon/Nm^3		
	Waste gases from abatement techniques which allow recovery and re-use of recovered solvents	150 mg Carbon/Nm^3		
	Any other Waste gases	50mg Carbon/Nm^3		
Note 1 For abatement plant existing prior to 1 April 2001, the higher contained emission figure may be used until 1 April 2013 If: • the total emissions of the whole installation (Fugitive + contained emission) does not exceed the total emission allowed after 1 April 2013 (Fugitive + contained emission after 1 April 2013).				

Reduction Scheme

Solvent Reduction Scheme

5.5 An operator may choose to use the Reduction Scheme for an installation to achieve emission reductions to a **"Target Emission"** equivalent to those, which would have been achieved if the concentration emission limits, had been applied.

The following scheme shall operate for installations for which a constant solid content of product can be assumed and used to define the reference point for emission reductions.

The operator shall forward an emission reduction plan, which includes in particular:
- decreases in the average solvent content of the total input; and/or
- increased efficiency in the use of solids

to achieve a reduction of the total emissions from the installation.

5.6 The Target Emission for an installation is calculated as follows;

(a) The Total Mass of Solids in the quantity of coating consumed in a year is determined.
  - solids are all materials in coatings that become solid as a result of curing, polymerisation, or the evaporation of the water or solvent
  - all ingredients other than water and organic solvents should be assumed to form part of the solid coating

(b) **Table 5** Target Emission Values must then be used to determine the Target Emission.

The non-volatile content of the coating, as supplied, will usually be available from the supplier. This may be quoted in g/l or in % mass by weight. In cases of doubt, the reference standard for the determination of non-volatile % mass by weight is BS EN ISO 3251 (also numbered BS 3900: B18). The test conditions may need to be adjusted for the particular conditions of use or when assessing chemically or radiation cured coatings, where otherwise volatile components react to form part of the dry solid coating.

Table 5: Target Emission Values

Installation		**Target Emission all Existing Installations at 1/12/98**	**Target Emission all Existing Installations by 31/10/2005** **And Target Emission all New and Substantially changed Installations until 31/10/2004**	**Target Emission all existing Installations from 31/10/2007** **And Target Emission all New and Substantially changed Installations from 31/10/2004**
Coil coating Activity	5 tonnes or more solvent consumption	For existing installations: Total Mass of Solids x 0.45 For new installations: Total Mass of Solids x 0.23		For existing installations: Total Mass of Solids x 0.3 For new installations: Total Mass of Solids x 0.15

Compliance with Reduction Scheme

5.7 Compliance with Reduction Scheme is achieved if the annual actual solvent emission determined from the Solvent Management Plan is less than or equal to the Target Emission.

- Where the annual actual solvent emission is:

annual actual solvent emission = I_1-O_8-O_7-O_6 (-O_5 if abatement has been used)

(see Definitions below)

5.8 The flexibility inherent in this compliance route should not be taken to encourage
- the replacement of a low or no organic solvent coating system with a conventional high organic solvent coating system, or
- the introduction of such a conventional high organic solvent coating system into a process/activity or
- the introduction of such a conventional high organic solvent coating system onto a product where it was not in use before, or
- the introduction of high solids formulations which have no beneficial effect on the product but increase the solids used, except where a reduction in the overall VOC emissions can be demonstrated.

Regulators should seek prior notification of any proposal to introduce such systems, which should include reasons why lower organic solvent systems are not considered technically appropriate or practicable.

Determination of Solvent Consumption

5.9 Construction of inventories of materials consumed and disposed of may involve the identification of individual organic solvents, or solids. This may give rise to an issue of commercial confidentiality. Information supplied must be placed on the public register, unless exclusion has been granted on the grounds of commercial confidentiality or national security. (Further guidance can be found in chapter 8 of the General Guidance Manual on policy and procedures for A2 and B installations)

5.10 A determination of the organic solvent consumption, the total mass of organic solvent Inputs minus any solvents sent for reuse/recovery off-site, should be made and submitted to the regulator annually, preferably to coincide with the operators stocktaking requirements, in the form of a mass balance in order to determine the annual actual consumption of organic solvent (C):

Where: $C = I_1 - O_8$

I_1 Total quantity of organic solvents, or their quantity in preparations purchased which are used as input into the process/activity.

A calculation of the purchased organic solvent Input (I_1) to the process/activity, is carried out by recording:

(i) The mass of organic solvent contained in coatings, diluents and cleaners in the initial stock (IS) at the start of the accounting period; plus

(ii) The mass of organic solvent contained in coatings, diluents and cleaners in the purchased stock (PS) during the accounting period.

(iii) Minus the mass of organic solvent contained in coatings, diluents and cleaners in the final stock (FS) at the end of the accounting period.

Total Organic Solvent Input (I_1) = IS + PS – FS

Solvent Management Plan

Solvent Management Plan

5.11 The Solvent Management Plan provides definitions and calculations to demonstrate compliance with the VOC requirements of this note. The use of the standard definitions and calculations also ensures consistency of VOC compliance across installations with an industrial sector.

5.12 The definitions provided must be used in all calculations relating to the Solvent Management Plan (SMP) (**Figure 5.1**).

- for SED installations using the emission and fugitive limits, the SMP should be used for determining the fugitive emissions (SED Box 9). Once completed, it need not be done until the equipment is modified
- for process/activities using the reduction scheme, the SMP should be used to determine the actual emissions annually (paragraph **5.7**)

Definitions:

The following definitions provide a framework for the mass balance calculations used in determining compliance.

Inputs of Organic Solvent in the time frame over which the mass balance is being calculated (I)

I_1 The quantity of organic solvents, or their quantity in preparations purchased which are used as input into the process/activity (including organic solvents used in the cleaning of equipment, but not those used for the cleaning of the products).

I_2 The quantity of organic solvents or their quantity in preparations recovered and reused as solvent input into the process/activity. (The recycled solvent is counted every time it is used to carry out the activity.)

Outputs of Organic Solvents in the time frame over which the mass balance is being calculated (O)

O_1 Emissions in waste gases.

O_2 Organic solvents lost in water, if appropriate taking into account waste water treatment when calculating O_5.

O_3 The quantity of organic solvents which remains as contamination or residue in products output from the process/activity.

O_4 Uncaptured emissions of organic solvents to air. This includes the general ventilation of rooms, where air is released to the outside environment via windows, doors, vents and similar openings.

O_5 Organic solvents and/or organic compounds lost due to chemical or physical reactions. (including for example those which are destroyed, e.g. by thermal oxidation or other waste gas or waste water treatments, or captured, e.g. by adsorption, as long as they are not counted under O_6, O_7 or O_8).

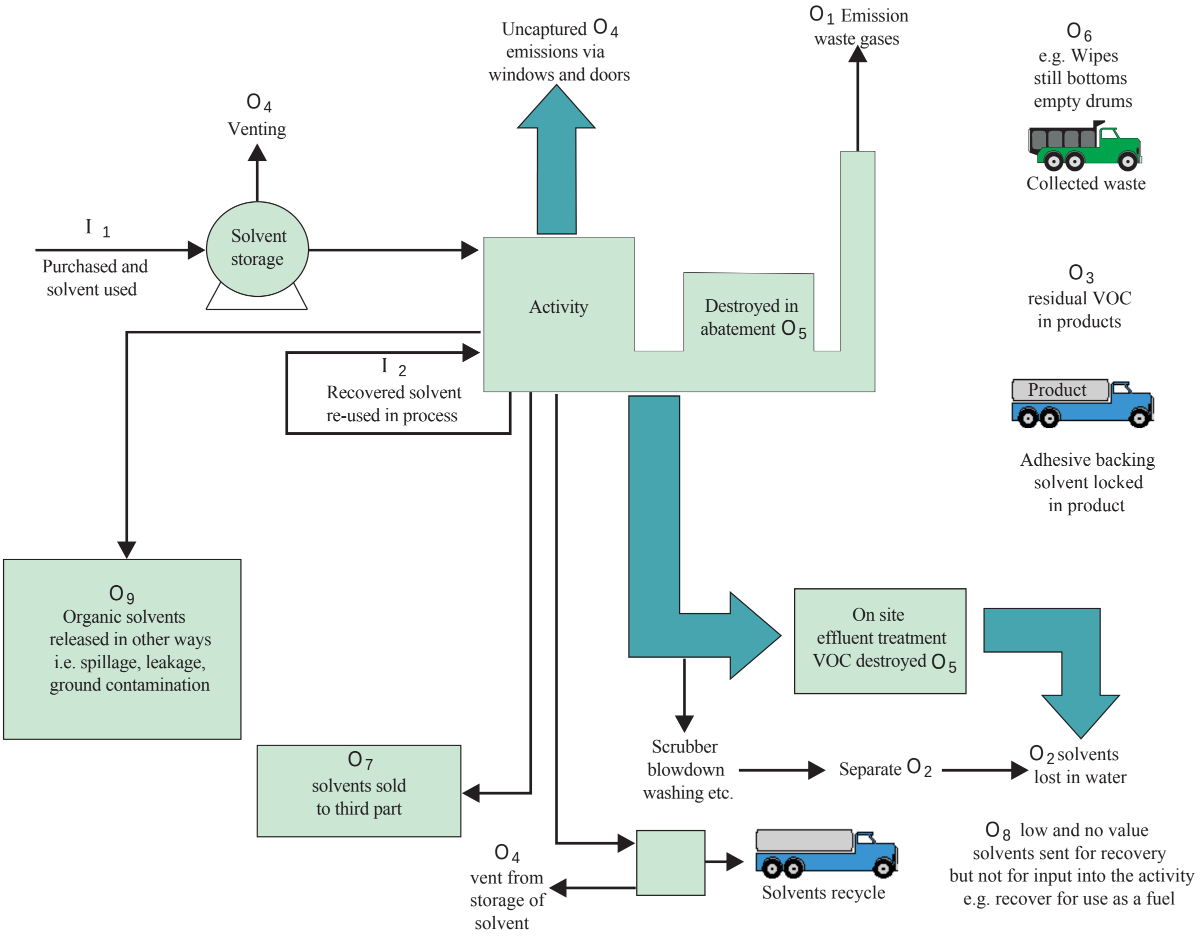
O_6 Organic solvents contained in collected waste.

O_7 Organic solvents, or organic solvents contained in preparations, which are sold or are intended to be sold as a commercially valuable product.

O_8 Organic solvents contained in preparations recovered for reuse but not as input into the process/activity, as long as not counted under O_7.

O_9 Organic solvents released in other ways.

Figure 5.1: Solvent Management Plan Inputs and Outputs



Solvent management plan

Consumption = $I_1 - O_8$

Actual solvent emission = $I_1 - O_5 - O_6 - O_7 - O_8$

Fugitive emission (F) = $I_1 - O_1 - O_5 - O_6 - O_7 - O_8$

or F = $O_2 + O_3 + O_4 + O_9$

Solvent Emission Directive (SED) activities

Fugitive emission value = $\frac{F}{I_1 \quad I_2}$ X 100%

Total emission = O_1 + Fugitive emission (F)

SED Box 6 SED requirements for Designated Risk Phrase Materials

(articles 5,7,8,9)

All Activities using Designated Risk Phrase Materials

Designated Risk Phrase Materials used in SED installations must be either replaced, controlled and or limited, as set out below.

All SED Installations.

i.e. existing, new and substantially changed

Row	**Designated Risk Phrase Materials with risk phrases R45, R46, R49, R60, R61**	
1	Requirements • Replace as far as possible (taking into account guidance under article 7(1) of the SED. See **Appendix 2**) by less harmful substances or preparations	Monitoring / timescales • Existing installations must comply within the shortest possible time • New and substantially changed installations must comply from 1 April 2001
	• Control under contained conditions as far as technically and economically feasible to safeguard public health and the environment. Normally, in accordance with the guidance provided within **Section 6** of the note	• Existing installations must comply by 31 October 2007 • New and substantially changed installations must comply from 1 April 2001
	• Limit -where the sum of the mass flows of all the discharges of all the compounds causing the risk phrase labelling is greater or equal to 10 g/h, a limit value of 2 mg/Nm^3 for the mass sum of the individual compounds must apply	Annual manual extractive testing See paragraphs **5.22**, **5.23**, **5.24**, **5.25**, **5.26** and SED Box 8 • Existing installations must comply by 31 October 2007 • New and substantially changed installations must comply from 1 April 2001
	Halogenated VOC with risk phrase R40	
2	Requirements • Control under contained conditions as far as technically and economically feasible to safeguard public health and the environment. Normally, in accordance with the guidance provided within **Section 6** of the note	Monitoring / timescales • Existing installations must comply by 31 October 2007 • New and substantially changed installations must comply from 1 April 2001
	• Limit -where the sum of the mass flows of all the discharges of all the compounds causing the risk phrase labelling is greater or equal to 100 g/h, a limit value of 20 mg/Nm^3 for the mass sum of the individual compounds must apply	Annual manual extractive testing See paragraphs **5.22**, **5.23**, **5.24**, **5.25**, **5.26** and SED Box 8 • Existing installations must comply by 31 October 2007 • New and substantially changed installations must comply from 1 April 2001

N.B. Substances or preparations or halogenated VOC which have been assigned as designated risk phrase materials, since 29 March 1999, or which are assigned as designated risk phrase materials in future must apply the replace, control and limit requirements, above within the shortest possible time from the date at which substances or preparations or halogenated VOC became/become designated risk phrase materials.

In determining the Shortest Possible Time, the operator will need to justify their timetables taking account of the following four factors contained within the SED:

- fitness for use;
- potential effects on human health;
- potential effects on the environment; and
- the economic consequences, in particular the costs and the benefits of the options available

For details of risk phrases see references i and j

Other Provisions

Monitoring, investigation and recording

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

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

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

- The process operator should provide a list of key abatement plant and should have a written plan for dealing with its failure, in order to minimise any adverse effects.
- The operator should notify the regulator at least 7 days before any periodic monitoring exercise to determine compliance with emission limit values. The operator should state the provisional time and date of monitoring, pollutants to be tested and the methods to be used.
- The results of non-continuous emission testing should be forwarded to the regulator within 8 weeks of the completion of the sampling.
- Adverse results from any monitoring activity (both continuous and non-continuous) should be investigated by the operator as soon as the monitoring data has been obtained/received. The operator should:
  - identify the cause and take corrective action
  - record as much detail as possible regarding the cause and extent of the problem, and the action taken by the operator to rectify the situation
  - re-test to demonstrate compliance as soon as possible; and
  - notify the regulator

Visible and odorous emissions

5.15 Visible and odorous emissions should be limited and monitored as follows. Abnormal emissions require action as described in the “Abnormal events” paragraph below.

- Emissions from combustion processes should in normal operation be free from visible smoke and in any case should not exceed the equivalent of Ringelmann Shade 1 as described in British Standard BS 2742:1969.
- All releases to air, other than condensed water vapour, should be free from persistent visible emissions.
- All emissions to air should be free from droplets.
- There should be no offensive odour beyond the site boundary, as perceived by the regulator.

Abnormal events

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

- In the case of abnormal emissions, malfunction or breakdown leading to abnormal emissions the operator must:
  - investigate immediately and undertake corrective action
  - adjust the process or activity to minimise those emissions; and
  - promptly record the events and actions taken

- The regulator must be informed without delay:
  - if there is an emission that is likely to have an effect on the local community
  - in the event of the failure of key abatement plant, for example, bio scrubber, thermal oxidiser units

SED Box 7 Non compliance causing immediate danger

(article 10) All Activities

In cases of non-compliance causing immediate danger to human health, operation of the activity must be suspended.

All of following criteria should be taken into account:

- the toxicity of the substances being released
- the amount released
- the location of the installation; and
- the sensitivity of the receptors

Start up and Shut down

5.17 Higher emissions may occur during start-up and shut-down of a process. These emissions can be reduced, by minimising, where possible, the number of start-ups and shut-downs and having adequate procedures in place for start-up, shut-down and emergency shut-downs.

- All appropriate precautions must be taken to minimise emissions during start-up and shutdown.

Efficient capture of emissions

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

- The introduction of dilution air to achieve emission concentration limits must not be permitted.
- Dilution air may be added for waste gas cooling or improved dispersion where justified, but this must not be considered when determining the mass concentration of the pollutant in the waste gases.

Continuous indicative monitoring

5.19 Continuous indicative monitoring can be used as a management tool. In conjunction with continuous recording it identifies any trends in emissions; for example, that emissions are gradually increasing, which may indicate a need for maintenance. It can also be used with or without continuous recording to trigger an alarm when there is a sudden increase in emissions; for example, if abatement plant fails. For a given concentration of pollutant, the output level varies with the instrument. It should be noted that not all monitors provide a linear response to an increase in pollutant. The monitor should be set up to provide a baseline output when the plant is known to be operating under the best possible conditions; i.e. such that emissions are fully compliant with the requirements. The instrument manufacturer should be able to set an output level, which corresponds, to around 75% of the emission limit, to trigger alarms. Thus the alarms are activated in response to this significant increase in pollutant loading above the baseline, so that warning of the changed state is given before an unacceptable emission occurs.

Continuous monitoring VOC abated releases

5.20 Where continuous monitoring and recording is required to demonstrate compliance with the VOC requirements of the note. For existing VOC abatement equipment surrogate measurements for VOC are acceptable. Where new VOC abatement equipment is installed, or existing VOC abatement equipment is modified, or the operating conditions are changed, VOC monitoring should be carried out once more to demonstrate that the surrogate measurements are adequate to ensure compliance.

- Thermal oxidisers must have continuous monitoring and recording for VOC expressed as total carbon excluding particulate matter. After sufficient monitoring data has been collected to clearly demonstrate adequate VOC destruction continuous monitoring of temperature may be used as a surrogate measurement.
- Catalytic oxidisers must have continuous monitoring and recording for VOC expressed as total carbon excluding particulate matter. After sufficient monitoring data has been collected to clearly demonstrate adequate VOC destruction continuous monitoring of carbon monoxide and temperature may be used as a surrogate measurement.(It may be possible to wave the requirement for carbon monoxide monitoring, if the operator can demonstrate to the regulator that the catalytic oxidiser is designed in such a way that it can not exceed the carbon monoxide limit (see Non VOC Emission Limits))
- Bio scrubbers and reactors must have continuous monitoring and recording for VOC expressed as total carbon excluding particulate matter. After sufficient monitoring data has been collected to clearly demonstrate adequate VOC destruction continuous monitoring of the flow and pH of the re-circulating water, fan suction, exhaust temperature and pressure drop across the packing, coupled with daily monitoring of the nutrient may be used as a surrogate measurement.
- Turbines, reciprocating engines, boilers or any other form of VOC abatement equipment must have continuous monitoring and recording for VOC expressed as total carbon excluding particulate matter.

5.21 Where continuous monitoring is required, it should be carried out as follows:

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

Calibration and compliance monitoring

5.22 Calibration and compliance monitoring should meet the following requirements as appropriate.

No result should exceed the emission concentration limits specified, except where either:

(a) data is obtained over at least 5 sampling hours in increments of 15-minutes or less; or

(b) at least 20 results are obtained where sampling time increments of more than 15-minute are involved; AND in the case of (a) or (b)

(c) no daily mean of all 15-minute mean emission concentrations should exceed the specified emission concentration limits during normal operation (excluding start-up and shut-down); and

(d) no 15-minute mean emission concentration should exceed twice the specified emission concentration limits during normal operation (excluding start-up and shut-down).

SED Box 8 VOC Monitoring

(article 9)

All Activities Using

(1) Emission and Fugitive Limits; or

(2) Abatement with the Reduction Scheme

For periodic measurements of VOC at least three readings must be obtained during each measurement exercise.

VOC emission limit values shall be considered to be complied with if, in one monitoring exercise:

(a) the average of all the readings does not exceed the emission limit values, and

(b) none of the hourly averages exceeds the emission limit value by more than a factor of 1.5*.

Where continuous monitoring is carried out to demonstrate compliance with VOC emission limits:

(a) none of the averages over 24 hours of normal operation exceeds the emission limit values, and

(b) none of the hourly averages exceeds the emission limit values by more than a factor of 1.5.*

*the hourly average of the 15-minute means value may be used to demonstrate compliance

Calibration and compliance monitoring test methods

5.23 Calibration and compliance monitoring for all substances should be carried out using methods below or methods which can be demonstrated to be equivalent to those stated.

- Stationary source emissions – Determination of the mass concentration of total gaseous organic carbon in flue gases from organic solvent using processes- Continuous flame ionisation detector method. EN 13526.
- Stationary source emissions – Determination of mass concentration of individual gaseous organic compounds EN 13649.
- Emissions monitoring of nitrogen dioxide should be carried out in accordance with ISO 10849.
- Emissions monitoring of carbon monoxide should be carried out in accordance with ISO 12039.
- Emission monitoring of isocyanates should be carried out in accordance with HSE occupational method MDHS 25/3 or Draft EPA method 207-1.
- Where an appropriate CEN or ISO monitoring standard is available for monitoring stack emissions of fluoride this should be used. Otherwise a method approved by the regulator should be used.

Varying of monitoring frequency

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

(a) the variability of monitoring results, for example, results which range from 15 – 45 mg/Nm^3, against an emission limit of 50 mg/Nm^3 might not qualify for a reduction in monitoring.

(b) the margin between the results and the emission limit, for example, results which range from 45 - 50 mg/Nm^3 when the limit is 50 mg/Nm^3 might not qualify for a reduction in monitoring.

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

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

Monitoring of unabated releases

5.26 Where emission limit values for VOC are consistently met without the use of abatement equipment, the monitoring requirement for those pollutants should be dispensed with subject to the “Varying of monitoring frequency” paragraphs above.

Sampling provisions

5.27 Care is needed in the design and location of sampling systems in order to obtain representative samples.

- The operator should ensure that adequate facilities for sampling are provided on vents or ducts.
- Sampling points on new plant should be designed to comply with the British or equivalent standards.

SED Fugitive emissions

SED Box 9 Determining Fugitive Emissions

(Annex III)

Activities Not Using the Reduction Scheme

Determining fugitive emissions using the Solvent Management Plan

To demonstrate compliance with fugitive emission values in SED Box 5 the operator must determine the fugitive emissions (F) from the installation using the following:

$F = I_1 - O_1 - O_5 - O_6 - O_7 - O_8$

Or

$F = O_2 + O_3 + O_4 + O_9$

This quantity can be determined by direct measurement of the quantities. Alternatively, an equivalent calculation can be made by other means, for instance by using the capture efficiency of the process.

The Fugitive Emission value as a percentage of the Solvent Input (I) is determined by

Fugitive Emission Value = 100 x F/I

Where the Solvent Input $(I) = I_1 + I_2$ (determined as part of the Solvent Management Plan)

Fugitive emission values must be determined for each installation, and must be repeated when any equipment modification is carried out.

Two or more SED activities within the same installation

SED Box 10 All Installations with Two or More Activities

(Article 5 and Annex III)

Installations with two or more activities

Installations where two or more of the activities in Annex I of the Solvents Emissions Directive are carried out, each of which exceeds the threshold in Annex IIA of the Solvents Emissions Directive must:

(1) as regards to Designated Risk Phrase Materials, meet the requirements specified in SED Box 6, for each activity individually;

(2) as regards all other substances, either:

  (i) meet the requirements for each activity individually; or

  (ii) have total emissions not exceeding those that would have resulted had point (i) been applied.

When applying 2 (ii) above, the Solvent Management Plan should be done to determine total emissions from all activities concerned. That figure must then be compared with the total emissions from the installation that would have resulted had the requirements of Annex II of the SED been met for each activity separately.

6 Control techniques

Summary of Best Available Techniques

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

Table 6: Summary of Control Techniques

Release source	Substance	Control techniques
Storage and handling of organic solvents and materials containing organic solvents	VOC	Use of low organic solvent coatings materials
		Use of low volatility organic solvent cleaning solutions
		Use of enclosed mixing and storage vessels
		Siting of storage tanks, Back venting deliveries if needed
		Capture, or capture and disposal or capture and destruction
Flue Gas	Sulphur oxides	Limit sulphur in fuel
	Nitrogen oxides	Low NOx burners
	Carbon monoxide	Good combustion
	Hydrogen fluoride	Limit fluoride content in coatings
	VOC	Efficient thermal oxidation
UV lamps and Corona discharges	Ozone	Dispersion
Preparation and use of isocyanate coating coatings	isocyanate	As for VOC

Non VOC Releases Control Techniques

Sulphur dioxide

6.2 In combustion processes the most significant release of sulphur dioxide occurs as a result of the sulphur content of the fuel burnt and should be addressed by using low sulphur fuel as specified in **Table 3**.

Nitrogen oxides

6.3 In combustion processes nitrogen oxides can be formed as a result of the combustion of nitrogen in the fuel or the formation of thermal nitrogen oxides from nitrogen in the air used for combustion.

- Where necessary, the nitrogen content of the fuel and other material being burnt should be controlled.
- Where necessary, Low NOx burners should be installed.

Ozone

6.4 Where ozone is emitted from equipment and is currently only vented to the external atmosphere it should in future be ducted to stacks to ensure adequate dispersion.

- This is in relation to significant releases i.e. uv and corona discharges. Emissions of ozone should be dispersed in accordance in the provisions of paragraph **6.14**.

VOC Control Techniques

VOC and odour control storage

6.5 Odour may arise from the receipt, handling and storage of organic solvents and organic solvent containing liquids. Careful siting of storage and mixing tanks, particularly in relation to new and replacement tanks, and controlled handling of odorous liquids may help prevent offensive emissions off-site. In addition:

- Bulk storage tanks for organic solvents and organic solvent-containing liquids should wherever practicable be back vented to the delivery tank during filling. Where this is impracticable, displaced air vents should be sited in such a way as to prevent the arising of offensive odour beyond the site boundary.
- All potentially odorous waste materials should be stored in suitable closed containers or bulk storage vessels, where appropriate vented to suitable abatement plant.

6.6 Breathing losses from bulk storage tanks can be minimised by fitting pressure vacuum relief valves. The vapour pressure within the bulk storage can also be minimised by reducing the solar absorbency of the storage tank.

- The exterior of bulk storage tanks for organic solvent storage should normally be light coloured.
- If necessary, emissions from fixed organic solvent storage tanks should be vented to suitable arrestment equipment to meet the emission limits in **Section 5**.
- All new static bulk organic solvent storage tanks containing organic solvent with a composite vapour pressure that is likely to exceed 0.4kPa at 20^{o}C (293K) should be fitted with pressure vacuum relief valves. Pressure vacuum relief valves should be examined at regular intervals for signs of contamination, incorrect seating and be cleaned and/or corrected as required. The normal minimum examination frequency should be once every six months, but less frequent examination may be justified having regard for the tank contents and the potential emissions as a result of valve failure.

6.7 Both major and minor spillage of organic solvent from bulk storage tanks can arise as a result of a number of scenarios such as: overfilling of tanks, incorrect draining of filling lines, operator error or vandalism.

- Delivery connections to bulk storage tanks should be located within a bunded area.
- Where the operator can not demonstrate to the satisfaction of the regulation that suitable management controls and training with regard to bulk storage deliveries of organic solvents and organic solvent containing materials are in place, along with adequate on-site security, then connections to bulk storage tanks should be fixed and locked when not in use.
- All fixed storage tanks should be fitted with high-level alarms or volume indicators to warn of overfilling. Where practicable the filling systems should be interlocked to the alarm system to prevent overfilling.
- Bunding should [7]
  - completely surround the bulk liquid storage tanks
  - be impervious and resistant to the liquids in storage; and
  - be capable of holding 110% of the capacity of the largest storage tank.

---

[7] In certain circumstances, the specification of bunds may be controlled by other regulations. Conditions in permits should not conflict with the requirements of those regulations. A code of practice on the use and storage of solvents is currently being drawn up and will be published on the Defra website (www.defra.gov.uk/environment/water/ground/solvents/index) Where the code, when published, contains anything more stringent as regards bunding, account should be taken of it.

VOC control handling

6.8 The receipt, handling, use and storage of organic solvents and organic solvent containing liquids will give rise to fugitive releases of VOC.

- Coatings containing VOC should be stored in closed storage containers.
- All measures should be taken to minimise VOC emissions during mixing, i.e. the use of covered or closed mixing vessels.
- Emissions from the emptying of mixing vessels and transfer of materials should be adequately contained, preferably by the use of closed transfer systems. This may be achieved by the use of closed mobile containers, containers with close-fitting lids, or, preferably, closed containers with pipeline delivery.
- All coatings containing VOC should be transferred from storage containers to coating heads via enclosed pipeline systems, or within zones which are vented to suitable abatement equipment (if necessary) to meet the requirements of **Section 5**.
- Where coatings which meet the requirements of **Table 4** Row 3, or coatings which are free from organic solvent are applied to a substrate, where necessary suitable abatement equipment should be used to meet the visible and odour requirements of **Section 5**.
- Exhaust ventilation from coating application zones should be vented to suitable abatement equipment plant to (if necessary) to meet the requirements of **Section 5**.

VOC control cleaning

6.9 Cleaning operations will give rise to fugitive releases of VOC.

- Cleaning operations involving organic solvents should be periodically reviewed, normally at least once every two years, to identify opportunities for reducing VOC emissions (e.g. cleaning steps that can be eliminated or alternative cleaning methods). The regulator should be provided with a report on the conclusions of the review.
- Application of cleaning solvents should be:
- from a contained device or automatic system when applied directly on to machine rollers; and
- dispensed by piston type dispenser or similar contained device, when used on wipes.
- When organic solvent is used on wipes:
    - pre-impregnated wipes should be held within an enclosed container prior to use
    - where practicable no organic solvent cleaning fluids or significantly less volatile organic solvents cleaning fluids should be used (with or without the addition of mechanical, chemical or thermal enhancements).
- Where practicable, fixed equipment should be cleaned in-situ, and such equipment should, where practicable, be kept enclosed whilst cleaning is carried out.
- Where equipment is cleaned off-line (such as screens, plates, drums, rollers and coating trays) cleaning should be carried out using enclosed cleaning systems, wherever possible. Enclosed cleaning systems should be sealed to prevent emissions whilst in operation, except during purging at the end of the cleaning cycle. If this is not practicable emissions should be contained and vented to abatement plant where necessary
- Residual coating materials contained in parts of the application equipment should be removed prior to cleaning.

VOC control operational

6.10 Organic solvent losses can be identified and minimised by operational controls and good operational practice.

- Programmable scales should be used during the mixing and preparation of coatings to reduce organic solvent usage.
- A programme to monitor and record the consumption of coatings/ organic solvent against product produced should be used to minimise the amount of excess organic solvent / coating used.
- In direct fired curing and drying ovens temperatures should be controlled to minimise the emissions of high boiling point breakdown products from the coating by controlling the temperature within the oven thermostatically.

VOC control waste

6.11 Waste contaminated with VOC may give rise to both odorous and fugitive emissions.

- All reasonably practicable efforts should be made to minimise the amount of residual organic solvent bearing material left in drums and other containers after use. All organic solvent contaminated waste should be stored in closed containers.
- Prior to disposal, empty drums and containers contaminated with organic solvent should be closed to minimise emissions from residues during storage prior to disposal and labelled, so that all that handle them are aware of their contents and hazardous properties.
- Nominally empty drums or drums containing waste contaminated with VOC awaiting disposal should be stored in accordance with the requirements for full or new containers.
- Prior to disposal used wipes and other items contaminated with organic solvent should be placed in a suitably labelled metal bin fitted with a self-closing lid.

Note: from a health and safety point of view it is advised thatbins should be emptied at least daily, as they not only present a fire hazard, they may also undergo spontaneous combustion.

- for materials that may undergo spontaneous combustion special bins that allow air to circulate beneath and around them to aid cooling are advised or other bins specifically designed for this purpose.

General Control Techniques

Dust and spillage control

6.12 Adequate provision to contain liquid and solid spillage is needed. Closed containers can prevent wind whipping of dusty, dry waste materials such as materials collected during combustion chamber cleaning or arising from particulate abatement plant:

- dusty wastes should be stored in closed containers and handled in a manner that avoids emissions
- dry sweeping of dusty materials should not normally be permitted unless there are environmental or health and safety risks in using alternative techniques
- suitable organic solvent containment and spillage equipment should be readily available in all organic solvent handling areas
- a high standard of housekeeping should be maintained.

Air quality

Ambient air quality management

6.13 In areas where air quality standards or objectives are being breached or are in serious risk of breach and it is clear from the detailed review and assessment work under Local Air Quality Management that the Part B process itself is a significant contributor to the problem, it may be necessary to impose tighter emission limits. If the air quality standard that is in danger of being exceeded is not an EC Directive requirement, then industry is not expected to go beyond BAT to meet it. Decisions should be taken in the context of a local authority's Local Air Quality Management action plan. For example, where a Part B process is only responsible to a very small extent for an air quality problem, the authority should not unduly penalise the operator of the process by requiring disproportionate emissions reductions. More guidance on this is provided in paragraph 360 of the Air Quality Strategy which gives the following advice:

"The approach from local authorities to tackling air quality should be an integrated one, involving all strands of local authority activity which impact on air quality and underpinned by a series of principles in which local authorities should aim to secure improvements in the most cost-effective manner, with regard to local environmental needs while avoiding unnecessary regulation. Their approach should seek an appropriate balance between controls on emissions from domestic, industrial and transport sources and draw on a combination and interaction of public, private and voluntary effort."

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

Dispersion and dilution from stack

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

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

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

Stacks, vents and process exhausts

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

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

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

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

6.17 The dispersion from all stacks and vents can be impaired by low exit velocity at the point of discharge, or deflection of the discharge.

- Stacks and ductwork should be cleaned to prevent accumulation of materials, as part of the routine maintenance programme.
- A minimum discharge velocity should be required in order to prevent the discharged plume being affected by aerodynamic down wash.
- Stacks or vents should not be fitted with any restriction at the final opening such as a plate, cap or cowl, with the exception of a cone which may be necessary to increase the exit velocity of the emissions.

Management

Management techniques

6.18 Important elements for effective control of emissions include:

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

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

Appropriate management systems

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

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

Training

6.20 Staff at all levels need the necessary training and instruction in their duties relating to control of the process/activity and emissions to air. In order to minimise risk of emissions, particular emphasis should be given to control procedures during start-up, shut down and abnormal conditions. Training may often sensibly be addressed in the EMS referred to in paragraph above.

- Training of all staff with responsibility for operating the process/activity should include:
  - awareness of their responsibilities under the authorisation / Permit; in particular how to deal with conditions likely to give rise to VOC emissions, such as in the event of spillage
  - minimising emissions on start up and shut down
  - action to minimise emissions during abnormal conditions.
- The operator should maintain a statement of training requirements for each operational post and keep a record of the training received by each person whose actions may have an impact on the environment. These documents should be made available to the regulator on request.

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

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

7 Summary of changes

Reasons for the main changes are summarised below.

Table 7: Summary of changes

Change	Reason	Comment
1. Introduction		
Introduced as new paragraphs	Meet provisions of SED	
Introduced as new paragraphs	Help using guidance	
Introduced new table	Provide guidance to activities covered by SED and which paragraphs of note that apply to those activities	
2. Timetable for compliance and reviews		
Introduction of timetable for SED requirements	Mandatory provisions under SED	
Limitation of the sulphur content of fuels	Mandatory	
New limit 500mg/ Nm^3 limit for CO from turbines, boilers and engines	BAT	
Light reflective coating of tanks	BAT	
Provision of lockable tanker connections	BAT	
Use of self closing containers for storage of solvent and solvent contaminated materials	BAT	
Emptying of coating pots prior to cleaning	BAT	
Monitoring of consumption of organic solvents and organic solvent containing materials against product produced	BAT	
Use of programmable scales	BAT	
Introduction of SED Boxes	Mandatory provisions under SED	
3. Process Description		
Introduction of LA-IPPC details	Extra Guidance to operators	
4. Potential Releases		
Introduction of Ozone as potential release from activity	Ozone releases have been shown to give rise to potential problems if not adequately dispersed	
5. Emission limits, monitoring and other provisions		
Introduction of non-VOC provision	Provides Guidance on use of section 5	
Introduction of compliance option paragraphs	Provides VOC compliance options	
Introduction of SED Boxes	Mandatory provisions under SED	
Change of reference conditions	Reference conditions changed to meet the mandatory of SED	
Reduction of CO limit	BAT	Provide consistent BAT across all solvent notes
Limitation of sulphur in fuels	Mandatory	

Table 7: Summary of changes

Change	Reason	Comment
Introduction of emission and fugitive limits for SED activities new and substantially changed and after 1/10/2007	Mandatory	
Modification of Solvent reduction scheme to meet SED requirements	Consistency with SED requirements	
Modification of Solvent management plan to meet SED requirements	Consistency with SED requirements	
Introduction of provisions for certain risk phrase compounds	Mandatory	
Relocation of Start-up Shut-down provisions	Ensure compliance with SED	
Relocation of efficient capture provisions	Ensure compliance with SED	
Introduction of indicative monitoring paragraph	Additional guidance	
Modification to compliance provisions for surrogate monitoring techniques and the introduction of bio- systems as abatement	Provide level compliance provisions across different abatement techniques	
Introduction of reduction of monitoring provisions	Ensure compliance with SED	
Modification of provisions to new standard BS ISO 9096	New standard introduced	
6. Control Techniques		
Introduction of limit on sulphur in fuels	Mandatory	
Introduction of control techniques for NO_X	BAT	
Introduction of control techniques for ozone	BAT	
Introduction of control techniques for VOC breathing losses	BAT	
Introduction of control techniques for VOC from spillage associated with bulk storage	BAT	
Locked filling connections within bund	BAT	
Introduction of control techniques for VOC during cleaning	BAT	
Emptying of coating pots prior to cleaning	BAT	
Introduction of operational control techniques for VOC	BAT	
Use of programmable scales	BAT	
Monitoring of consumption of organic solvents and organic solvent containing materials	BAT	
Modification of control technique for storage of organic solvent contaminated wastes	BAT	
Storage of empty drums	BAT	
Storage of contaminated wipes	BAT	
Modification of dispersion provisions to new Template	Layout/drafting	
Modification of vent provisions to new Template	Layout/drafting	
Introduction of EMS	Layout/drafting	

8. Definitions and further information		
Definitions modified to meet LAPPC and SED	Consistency with SED requirements	
Appendix 2		
Introduction of copy of relevant SED abstracts	Consistency with SED requirements	

8 Definitions and further information

In this section, definitions are arranged alphabetically in this list and within the SED Box.

Activity	see “Process”
Adhesive	means any preparation, including all the organic solvents or preparations containing organic solvents necessary for its proper application, which is used to adhere separate parts of a product
Application of continuous film of coating.	means the application of a film of coating to the surface of a substrate by continuous methods such as dipping, spraying, air knife coating, application by roller etc, where no repeated pattern of breaks in the coating occur
Authorisation	the written authority to operate a process prescribed for LAPC – (will be replaced by permit under LAPPC)
Authorised person	under Section 108 of the Environment Act 1995, “authorised person” has replaced the term “Inspector”
BAT	explained in Defra General Guidance Manual on policy and procedures for A2 and B installations
BATNEEC	explained in Defra General Guidance Manual on policy and procedures for A2 and B installations
CO	means carbon monoxide
Coating	means any preparation, including all the organic solvents or preparations containing organic solvents necessary for its proper application, which is used to provide a decorative, protective or other functional effect on a surface
Coating activity	means coating activity in which a single or multiple application of continuous film of a coating is applied. If the coating activity includes a step in which the same article is printed by whatever technique is used, that printing step is considered part of the coating activity
Consumption	means the total input of organic solvents into an installation in the last calendar year, or previous 12-month period, less any VOC that are recovered for reuse
Consumption of the installation	means the solvent consumption of the installation determined by the total input of organic solvents into an installation, which includes all directly associated activities less any VOC that are recovered for reuse in the last calendar year, or previous 12-month period
Consumption of the activity (only applies to SED activities)	means the solvent consumption of the activity determined by the total input of organic solvents into an activity, which includes all directly associated activities (e.g. storage and handling of solvent and solvent containing materials and solvent containing wastes), but excludes all other SED activities (e.g. surface cleaning) less any VOC that are recovered for reuse in the last calendar year, or previous 12-month period
Contained conditions	means conditions under which an installation is operated such that the VOC released from the activity are collected and discharged in a controlled way either via a stack or abatement equipment and are therefore not entirely fugitive

Designated risk phrase materials	means a halogenated VOC assigned or which needs to carry the risk phrase R40 or substances or preparations* which because of their content of VOC are assigned or need to carry the risk phrases R45, R46, R49, R60, R61. *Note: a preparation may contain substances which are assigned one of the risk phrases R45, R46, R49, R60 or R61, but the preparation itself would not be assigned that risk phrase, as the proportion of the risk phrase material is below the relevant classification threshold in the final preparation for the preparation as a whole to carry the risk phrase.
EMS	means Environmental Management System
Existing process	should be taken to have the following meaning (which is based on paragraph 14 of Schedule 3 to SI 1991 /472): • a process which was being carried on at some time in the 12 months immediately preceding the first day of the month following publication of this guidance note • a process which is to be carried on at a works, plant or factory or by means of mobile plant which was under construction or in the course of manufacture or in the course of commission on the first day of the month following publication of this guidance note, or the construction or supply of which was the subject of a contract entered into before that date
Ink	means a preparation, including all the organic solvents or preparations containing organic solvents necessary for its proper application, which is used in a printing activity to impress text or images on to a surface
Input	means the quantity of organic solvents and their quantity in preparations used when carrying out an activity, including the solvents recycled inside and outside the installation, and which are counted every time they are used to carry out the activity
Installation	shall have the same meaning as in Appendix 3 of the Manual. generally for the purposes of this note the term installation should be taken to have the same meaning as “process” for the purposes of LAPC
Installation under LAPC	means process
Installation in relation to SED	means the same as LAPPC except that it refers only to the parts of the installation which have an effect on emissions of VOC
LAPC	explained in the Introduction section of this guidance
LAPPC	explained in the Introduction section of this guidance
Local enforcing authority	is replaced by the word ‘regulator’ in LAPPC
N	means normal conditions of 273.15K, 101.3kPa
New process	not an existing process
NO_x	means any oxide of nitrogen
Organic solvent	means any VOC which is used alone or in combination with other agents, and without undergoing a chemical change, to dissolve raw materials, products or waste materials, or is used as a cleaning agent to dissolve contaminants, or as a dissolver, or as a dispersion medium, or as a viscosity adjuster, or as a surface tension adjuster, or a plasticiser, or as a preservative

Organic compound	means any compound containing at least the element carbon and one or more of hydrogen, halogens, oxygen, sulphur, phosphorus, silicon or nitrogen, with the exception of carbon oxides and inorganic carbonates and bicarbonates
Oxidation	means either thermal oxidation or catalytic oxidation
Oxidation plant	means thermal or catalytic incineration plant
Permit	the written permission to operate an installation prescribed for LAPPC – (the replacement for authorisation under LAPC)
Previous guidance	Process Guidance Note 6/13 (97)
Printing activity	means any reproduction activity of text and/or images in which, with the use of an image carrier, ink is transferred onto whatever type of surface. Associated varnishing, coating, laminating techniques and cleaning of the equipment are included as part of the activity
Process	the term "process(es)" means both "processes" under the Environmental Protection Act 1990 and "installations" and "activities" under the Pollution Prevention and Control Act 1999 and the Solvent Emissions Directive 1999/13/EC
Process/activity under LAPC	means process
Process/activity under LAPPC	means activity
Process/activity under SED	means the same as under LAPPC except that it refers only to the parts of the activity which have an effect on emissions of VOC
Regulator	replaces the phrase 'local enforcing authority' from LAPC
Reuse of organic solvents	means the use of organic solvents recovered from an installation for any technical or commercial purpose and including use as a fuel but excluding the final disposal of such recovered organic solvent as waste
Risk Phrase	means the same as in Directive 67/548/EEC R40 - limited evidence of a carcinogenic effect R45 - may cause cancer R46 - may cause heritable genetic damage R49 - may cause cancer by inhalation R60 - may impair fertility R61 - may cause harm to the unborn child
SED	Solvent Emission Directive
Shortest possible time	shall have the same meaning as in DEFRA Guidance on the Implementation of Solvent Emissions Directive (1999/13/EC) March 2002 or any subsequent guidance that supersedes it
SMP	means Solvent Management Plan as described in Annex III of the SED
Start-up and shutdown operations	means operations whilst bringing an activity, an equipment item or a tank into or out of service or into or out of an idling state. Regularly oscillating activity phases are not to be considered as start-ups and shut-downs
Site boundary	shall have the same meaning as GG4

Substantial change	For SED-defined activities see SED Box 3. For non-SED processes explained in Defra General Guidance Manual on policy and procedures for A2 and B installations
Surface cleaning	Any activity except dry cleaning using organic solvents to remove contamination from the surface of material including degreasing
Technically connected	shall have the same meaning as in Integrated Pollution Prevention and Control, A Practical Guide (Pages 69-71)
This guidance	Process Guidance Note 6/13(04)
Varnish	means a transparent coating
VOC	Volatile Organic Compounds
Volatile Organic Compound (VOC)	shall mean any organic compound having at 293,15 K a vapour pressure of 0,01 kPa or more, or having a corresponding volatility under the particular conditions of use. For the purpose of the Solvents Directive, the fraction of creosote which exceeds this value of vapour pressure at 293,15 K shall be considered as a VOC

SED Box 11 Definitions SED Activities

(article 2) All Activities

Average over 24 hours	shall mean the arithmetic average of all valid readings taken during the 24-hour period of normal operation;
Competent Authority	shall mean the authority or authorities or bodies responsible under the legal provisions of the Member States for carrying out the obligations arising from this Directive;
Emission limit value	shall mean the mass of VOCs, expressed in terms of certain specific parameters, concentration, percentage and/or level of an emission, calculated at standard conditions, which may not be exceeded during one or more periods of time;
Emission	shall mean any discharge of VOCs from an installation into the environment;
Existing installation	shall mean an installation in operation or, in accordance with legislation existing before1 April 2001, an installation which is authorised or registered or, in the view of the regulator, the subject of a full request for authorisation, provided that the installation is put into operation no later than one year after 1 April 2001
Fugitive emissions	shall mean any emissions not in waste gases of VOCs into air, soil and water as well as, unless otherwise stated in Annex IIA of the Solvent Emissions Directive, solvents contained in any products. They include uncaptured emissions released to the outside environment via windows, doors, vents and similar openings;
Halogenated organic solvent	shall mean an organic solvent which contains at least one atom of bromine, chlorine, fluorine or iodine. per molecule;
Installation	shall mean a stationary technical unit where one or more activities falling within the scope defined in Article 1 of the Solvents Directive are carried out, and any other directly associated activities which have a technical connection with the activities carried out on that site and which could have an effect on emissions;
Mass flow	shall mean the quantity of VOCs released in unit of mass/hour;

SED Box 11 Definitions SED Activities

(article 2) All Activities

New installation	shall mean an installation which is not existing;
Nominal capacity	shall mean the maximum mass input of organic solvents by an installation averaged over one day, if the installation is operated under conditions of normal operation at its design output;
Normal operation	shall mean all periods of operation of an installation or activity except start-up and shut-down operations and maintenance of equipment;
Operator	shall mean any natural or legal person who operates or controls the installation or, where this is provided for in national legislation, to whom decisive economic power over the technical functioning of the installation has been delegated;
Preparation	shall mean mixtures or solutions composed of two or more substances;
Standard conditions	shall mean a temperature of 273,15 K and a pressure of 101,3 kPa;
Substances	shall mean any chemical element and its compounds, as they occur in the natural state or as produced by industry, whether in solid or liquid or gaseous form;
Total emissions	shall mean the sum of fugitive emissions and emissions in waste gases;
Waste gases	shall mean the final gaseous discharge containing VOCs or other pollutants, from a stack or abatement equipment into air. The volumetric flow rates shall be expressed in Nm^3/h at standard conditions.

Health and safety

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

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

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

- emission limits under the Environmental Protection Act 1990 or Pollution Prevention and Control Act 1999 relate to the concentration of pollutant released into the air from prescribed activities
- exposure limits under health and safety legislation relate to the concentration of pollutant in the air breathed by workers
- these limits may differ since they are set according to different criteria. It will normally be quite appropriate to have different standards for the same pollutant, but in some cases they may be in conflict (for example, where air discharged from a process is breathed by workers). In such cases, the tighter limit should be applied to prevent a relaxation of control

EMS additional information

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

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

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

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

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

References

(a) General Guidance Note 1 (GG1). "Introduction to Part I of the Act" (The Stationery Office, ISBN 0 11 752423) includes general guidance on the interpretation of "best available techniques not entailing excessive cost", and the requirements of Articles 4, 12 and 13 of EC Directive 84/360/EEC

(b) General Guidance Note 4 (GG4). "Secretary of State's Guidance – Interpretation of terms used in Process Guidance Notes" April 1991

(c) DOE/WO Additional Guidance AQ17(94), issued to local authorities by the Air and Environment Quality Division of the DEFRA and by the Welsh Office, provides further advice on the assessment of odour. The Scottish equivalent of AQ17(94) is SN 11(94)

(d) Current air quality objectives are specified in:
  - The Air Quality (England) Regulations 2000 SI 928
  - The Air Quality (Wales) Regulations 2000 SI 1940
  - The Air Quality (Scotland) Regulations SI 97

(e) HMIP Technical Guidance Note M2: "Monitoring Emissions of Pollutants at Source", published by The Stationary Office, ISBN 0-11-752922-2

(f) HMIP Technical Guidance Note M1: "Sampling Facility Requirements for the monitoring of particulates in gaseous releases to atmosphere", published by The Stationery Office, ISBN 0-11-752777-7

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

(h) See LAPPC Guide by DEFRA for further explanation (to be prepared)

(i) The Chemical (Hazard Information and Packaging of Supply) Regulations 2002 SI 3247

(j) Approved Guide to the classification and labelling of dangerous substances and preparations dangerous for supply (Third Edition)

(k) Integrated Pollution Prevention and Control. A Practical Guide. Edition 1. DETR August 2000

(l) DEFRA Guidance on the Implementation of the Solvent Emissions Directive (1999/13/EC), March 2002

(m) Envirowise (formerly known as ETBP publications)

- ETBPP GG71: Cost Effective Reduction of Fugitive Solvent Emissions
- ETBPP GG203: Monitoring VOC Emissions Choosing the Best Option
- ETBPP GC34: Emission -Free Mixing Creates A Stir
- ETBPP GG12: Solvent Capture for Recovery and Re-use for Solvent Laden Gas Streams
- ETBPP FP9: Efficient Emission Free Mixing
- ETBPP GG100: Solvent Capture and Recovery In Practice
- ETBPP GG124: Solvent Management in Practice
- ETBPP GG114: Reduce Cost by Tracking Solvents
- ETBPP GG13: Cost Effective Solvent Management
- ETBPP GG28: Good Housekeeping Measures for Solvents
- ETBPP GG163: Cost Effective Ink Management for Printers
- ETBPP GG231: Cost effective Management of Cleaning Materials for Printers
- ETBPP GG52: Cost Effective Paint and Powder Coating: Coating Materials

Web addresses

The final consultation drafts and final published versions of all guidance notes in this series can be found on **www.defra.gov.uk/environment/index.htm**.

Welsh Assembly Government web-site **www.wales.gov.uk**.

Local Authority Unit of the Environment Agency for England and Wales. **www.environment-agency.gov.uk**.

Scottish Environment Protection Agency (SEPA) **www.sepa.org.uk**.

Energy saving and environmental management measures can increase industry profits. Envirowise (formerly ETBPP) show how at **www.envirowise.gov.uk** (or freephone 0800 585794).

Appendix 1: Extract from LAPPC Regulations

DEFINITION OF COATING PROCESSES IN SCHEDULE 1 TO THE POLLUTION PREVENTION AND CONTROL REGULATIONS 2000, SI 1973 as amended. See also Section 7 of Schedule 1 to the PPC Regulations as inserted by the Solvent Emissions (England and Wales) Regulations 2004, SI 107.*

(The processes for local air pollution prevention and control are listed under “Part B”. The “Part A1” processes are for national regulatory control. The “Part A2” processes are subject to local authority integrated pollution prevention and control.)

Section 6.4 - Coating Activities, Printing and Textile Treatments

Part A(1)

(a) Applying or removing a coating material containing any tributyltin compound or triphenyltin compound, if carried out at a shipyard or boatyard where vessels of a length of 25 metres or more can be built, maintained or repaired.

(b) Pre-treating (by operations such as washing, bleaching or mercerization) 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 this Schedule in a quantity which, in any period of 12 months, is greater than the background quantity by more than the amount specified in that paragraph in relation to that substance.

Part A(2)

(a) Unless falling within Part A(1) of this Section, surface treating substances, objects or products using organic solvents, in particular for dressing, printing, coating, degreasing, waterproofing, sizing, painting, cleaning or impregnating, in plant with a consumption capacity of more than 150 kg per hour or more than 200 tonnes per year.

Part B

(a) Unless falling within Part A(1) or A(2) of this Section or paragraph (c) of Part A(2) of Section 2.1, any process (other than for the repainting or re-spraying of or of parts of aircraft or road or railway vehicles) for applying to a substrate, or drying or curing after such application, printing ink or paint or any other coating material as, or in the course of, a manufacturing activity, where the process may result in the release into the air of particulate matter or of any VOC and is likely to involve the use in any period of 12 months of -

- (i) 20 tonnes or more of printing ink, paint or other coating material which is applied in solid form;
- (ii) 20 tonnes or more of any metal coating which is sprayed on in molten form;
- (iii) 25 tonnes or more of organic solvents in respect of any cold set web offset printing activity or any sheet fed offset litho printing activity; or
- (iv) 5 tonnes or more of organic solvents in respect of any activity not mentioned in sub-paragraph (iii).

(b) Unless falling within Part A(2) of this Section, repainting or re-spraying road vehicles or parts of them if the activity may result in the release into the air of particulate matter or of any VOC and the carrying on of the activity is likely to involve the use of 1 tonne or more of organic solvents in any period of 12 months.

(c) Repainting or re-spraying aircraft or railway vehicles or parts of them if the activity may result in the release into the air of particulate matter or of any VOC and the carrying out of the activity is likely to involve the use in any period of 12 months of -

(i) 20 tonnes or more of any paint or other coating material which is applied in solid form;

(ii) 20 tonnes or more of any metal coatings which are sprayed on in molten form; or

(iii) 5 tonnes or more of organic solvents.

Interpretation of Part B

1. In this Part –

“aircraft” includes gliders and missiles;

“coating material” means paint, printing ink, varnish, lacquer, dye, any metal oxide coating, any adhesive coating, any elastomer coating, any metal or plastic coating and any other coating material.

2.The amount of organic solvents used in an activity shall be calculated as -

(a) the total input of organic solvents into the process, including both solvents contained in coating materials and solvents used for cleaning or other purposes; less

(b) any organic solvents that are removed from the process for re-use or for recovery for re-use.

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

Appendix 2: Extract from Solvent Emissions Directive (SED)

Extracts from the Solvent Emissions Directive 1999/13/EC

Article 1- Purpose and scope

The purpose of this Directive is to prevent or reduce the direct and indirect effects of emissions of VOCs into the environment, mainly into air, and the potential risks to human health, by providing measures and procedures to be implemented for the activities defined in Annex I, in so far as they are operated above the solvent consumption thresholds listed in Annex II A.

Article 4 - Obligations applying to existing installations

Without prejudice to Directive 96/61/EC, Member States shall adopt the necessary measures to ensure that:

(1) existing installations comply with Articles 5, 8 and 9 no later than 31 October 2007;
(2) all existing installations must have been registered or authorised by 31 October 2007 at the latest;
(3) those installations to be authorised or registered using the reduction scheme of Annex IIB notify this to the competent authorities by 31 October 2005 at the latest;
(4) where an installation:
   - undergoes a substantial change, or
   - comes within the scope of this Directive for the first time following a substantial change,

that part of the installation which undergoes the substantial change shall be treated either as a new installation or as an existing installation, provided that the total emissions of the whole installation do not exceed those that would have resulted had the substantially changed part been treated as a new installation.

Article 5 - Requirements

2. All installations shall comply with:

(a) either the emission limit values in waste gases and the fugitive emission values, or the total emission limit values, and other requirements laid down in Annex IIA;

Or

(b) the requirements of the reduction scheme specified in Annex IIB

3. (a) For fugitive emissions, Member States shall apply fugitive emission values to installations as an emission limit value. However, where it is demonstrated to the satisfaction of the competent authority that for an individual installation this value is not technically and economically feasible, the competent authority can make an exception for such an individual installation provided that significant risks to human health or the environment are not to be expected. For each derogation, the operator must demonstrate to the satisfaction of the competent authority that the best available technique is being used;

(b) Activities which cannot be operated under contained conditions may be exempted from the controls of Annex IIA, when this possibility is explicitly mentioned in that Annex. The reduction scheme of Annex IIB is then to be used, unless it is demonstrated to the satisfaction of the competent authority that this option is not technically and economically feasible. In this case, the operator must demonstrate to the satisfaction of the competent authority that the best available technique is being used.

Member States shall report to the Commission on the derogation concerning paragraphs (a) and (b) in accordance with Article 11.

4. For installations not using the reduction scheme, any abatement equipment installed after the date on which this Directive is brought into effect shall meet all the requirements of Annex IIA.

5. Installations where two or more activities are carried out, each of which exceeds the thresholds in Annex IIA shall:

(a) as regards the substances specified in paragraphs 6, 7 and 8, meet the requirements of those paragraphs for each activity individually;
(b) as regards all other substances, either:
  (i) meet the requirements of paragraph 2 for each activity individually; or
  (ii) have total emissions not exceeding those that would have resulted had point (i) been applied

6. Substances or preparations which, because of their content of VOCs classified as carcinogens, mutagens, or toxic to reproduction under Directive 67/548/EEC (1), are assigned or need to carry the risk phrases R45, R46, R49, R60, R61, shall be replaced, as far as possible and by taking into account the guidance as mentioned in Article 7(1), by less harmful substances or preparations within the shortest possible time.

7. For discharges of the VOCs referred to in paragraph 6, where the mass flow of the sum of the compounds causing the labelling referred to in that paragraph is greater than, or equal to, 10 g/h, an emission limit value of 2 mg/Nm^3 shall be complied with. The emission limit value refers to the mass sum of the individual compounds.

8. For discharges of halogenated VOCs which are assigned the risk phrase R40, where the mass flow of the sum of the compounds causing the labelling R40 is greater than, or equal to, 100 g/h, an emission limit value of 20 mg/Nm^3 shall be complied with. The emission limit value refers to the mass sum of the individual compounds.

The discharge of VOCs referred to in paragraphs 6 and 8 shall be controlled as emissions from an installation under contained conditions as far as technically and economically feasible to safeguard public health and the environment.

9. Discharges of those VOCs which, after the entry into force of this Directive, are assigned or need to carry one of the risk phrases mentioned in paragraphs 6 and 8, shall have to comply with the emission limit values mentioned in paragraphs 7 and 8 respectively, within the shortest possible time.

10. All appropriate precautions shall be taken to minimise emissions during start-up and shut-down.

11. Existing installations which operate existing abatement equipment and comply with the following emission limit values:

- 50 mg C/Nm^3 in the case of incineration,
- 150 mg C/Nm^3 in the case of any other abatement equipment,

shall be exempt from the waste gases emission limit values in the table in Annex IIA for a period of 12 years after the date referred to in Article 15, provided the total emissions of the whole installation do not exceed those that would have resulted had all the requirements of the table been met.

12. Neither the reduction scheme nor the application of paragraph 11 nor Article 6 exempt installations discharging substances specified in paragraphs 6, 7 and 8 from fulfilling the requirements of those paragraphs.

Article 7 - Substitution

1. The commission shall ensure that an exchange of information between Member States and the activities concerned on the use of organic substances and their potential substitutes takes place. It shall consider the question of :

- fitness for use,
- potential effects on human health and occupational exposure in particular;
- potential effects on the environment, and
- the economic consequences, in particular, the cost and benefits of the options available, with a view to providing guidance on the use of substances and techniques which have the least potential effects on air, water, soil, ecosystems and human health.

Article 8 - Monitoring

3. In the other cases, Member States shall ensure that either continuous or periodic measurements are carried out. For periodic measurements at least three readings shall be obtained during each measurement exercise.

Article 9 - Compliance with emission limit values

1. Compliance with the following shall be demonstrated to the satisfaction of the competent authority:

- emission limit values in waste gases, fugitive emission values and total emission limit values,
- the requirements of the reduction scheme under Annex IIB,
- the provisions of Article 5 (3)

Guidance is provided in Annex III on solvent management plans serving to demonstrate compliance with these parameters.

Gas volumes may be added to the waste gas for cooling or dilution purposes where technically justified but shall not be considered when determining the mass concentration of the pollutant in the waste gas.

2. Following a substantial change, compliance shall be reverified.

3. In the case of continuous measurements the emission limit values shall be considered to-be complied with if:

(a) none of the averages over 24 hours of normal operation exceeds the emission limit values, and
(b) none of the hourly averages exceeds the emission limit values by more than a factor of 1,5.

4. In the case of periodic measurements the emission limit values shall be considered to be complied with if, in one monitoring exercise:

(a) the average of all the readings does not exceed the emission limit values, and
(b) none of the hourly averages exceeds the emission limit value by more than a factor of 1,5.

5. Compliance with the provisions of Article 5(7) and (8) shall be verified on the basis of the sum of the mass concentrations of the individual VOCs concerned. For all other cases, compliance shall be verified on the basis of the total mass of organic carbon emitted unless otherwise specified in Annex IIA.

Article 10 - Non-compliance

Member States shall take appropriate measures to ensure that, if it is found that the requirements of this Directive have been breached:

(a) the operator informs the competent authority and takes measures to ensure that compliance is restored within the shortest possible time;

(b) in cases of non-compliance causing immediate danger to human health and as long as compliance is not restored under the conditions of paragraph (a), operation of the activity is suspended.

SED - ANNEX I

Scope

This Annex contains the categories of activity referred to in Article 1. When operated above the thresholds listed in Annex IIA, the activities mentioned in this Annex fall within the scope of the Directive. In each case the activity includes the cleaning of the equipment but not the cleaning of products unless specified otherwise.

Adhesive coating

- Any activity in which an adhesive is applied to a surface, with the exception of adhesive coating and laminating associated with printing activities.

Coating activity

- Any activity in which a single or multiple application of a continuous film of a coating is applied to:
- Vehicles as listed below:
  - new cars, defined as vehicles of category M1 in Directive 70/156/EEC, and of category N1 in so far as they are coated at the same installation as M1 vehicles,
  - truck cabins, defined as the housing for the driver, and all integrated housing for the technical equipment, of vehicles of categories N2 and N3 in Directive 70/156/EEC,
  - vans and trucks, defined as vehicles of categories N1, N2 and N3 in Directive 70/156/EEC, but not including truck cabins,
  - buses, defined as vehicles of categories M2 and M3 in Directive 70/156/EEC,
- trailers, defined in categories O1, O2, O3 and O4 in Directive 70/156/EEC,
- metallic and plastic surfaces including surfaces of airplanes, ships, trains, etc.,
- wooden surfaces,
- textile, fabric, film and paper surfaces,
- leather.

It does not include the coating of substrate with metals by electrophoretic and chemical spraying techniques. If the coating activity includes a step in which the same article is printed by whatever technique used, that printing step is considered part of the coating activity. However, printing activities operated as a separate activity are not included, but may be covered by the Directive if the printing activity falls within the scope thereof.

Coil coating

- Any activity where coiled steel, stainless steel, coated steel, copper alloys or aluminium strip is coated with either a film forming or laminate coating in a continuous process.

Dry cleaning

- Any industrial or commercial activity using VOCs in an installation to clean garments, furnishing and similar consumer goods with the exception of the manual removal of stains and spots in the textile and clothing industry.

Footwear manufacture

- Any activity of producing complete footwear or parts thereof.

Manufacturing of coating preparations, varnishes, inks and adhesives

- The manufacture of the above final products, and of intermediates where carried out at the same site, by mixing of pigments, resins and adhesive materials with organic solvent or other carrier, including dispersion and predispersion activities, viscosity and tint adjustments and operations for filling the final product into its container.

Manufacturing of pharmaceutical products

- The chemical synthesis, fermentation, extraction, formulation and finishing of pharmaceutical products and where carried out at the same site, the manufacture of intermediate products.

Printing

- Any reproduction activity of text and/or images in which, with the use of an image carrier, ink is transferred onto whatever type of surface. It includes associated varnishing, coating and laminating techniques. However, only the following sub-processes are subject to the Directive:
- Flexography - a printing activity using an image carrier of rubber or elastic photopolymers on which the printing areas are above the non-printing areas, using liquid inks which dry through evaporation,
- Heatset web offset - a web-fed printing activity using an image carrier in which the printing and non-printing area are in the same plane, where web-fed means that the material to be printed is fed to the machine from a reel as distinct from separate sheets. The non-printing area is treated to attract water and thus reject ink. The printing area is treated to receive and transmit ink to the surface to be printed. Evaporation takes place in an oven where hot air is used to heat the printed material,
- Laminating associated to a printing activity -the adhering together of two or more flexible materials to produce laminates,
- Publication rotogravure - a rotogravure printing activity used for printing paper for magazines, brochures, catalogues or similar products, using toluene-based inks,
- Rotogravure - a printing activity using a cylindrical image carrier in which the printing area is below the non-printing area, using liquid inks which dry through evaporation. The recesses are filled with ink and the surplus is cleaned off the non-printing area before the surface to be printed contacts the cylinder and lifts the ink from the recesses,
- Rotary screen printing - a web-fed printing activity in which the ink is passed onto the surface to be printed by forcing it through a porous image carrier, in which the printing area is open and the nonprinting area is sealed off, using liquid inks which dry only through evaporation. Web-fed means that the material to be printed is fed to the machine from a reel as distinct from separate sheets,
- Varnishing - an activity by which a varnish or an adhesive coating for the purpose of later sealing the packaging material is applied to a flexible material.

Rubber conversion

- Any activity of mixing, milling, blending, calendering, extrusion and vulcanisation of natural or synthetic rubber and any ancillary operations for converting natural or synthetic rubber into a finished product.

Surface cleaning

- Any activity except dry cleaning using organic solvents to remove contamination from the surface of material including degreasing. A cleaning activity consisting of more than one step before or after any other activity shall be considered as one surface cleaning activity. This activity does not refer to the cleaning of the equipment but to the cleaning of the surface of products.

Vegetable oil and animal fat extraction and vegetable oil refining activities

- Any activity to extract vegetable oil from seeds and other vegetable matter, the processing of dry residues to produce animal feed, the purification of fats and vegetable oils derived from seeds, vegetable matter and/or animal matter.

Vehicle refinishing

- Any industrial or commercial coating activity and associated degreasing activities performing:
- The coating of road vehicles as defined in Directive 70/156/EEC, or part of them, carried out as part of vehicle repair, conservation or decoration outside of manufacturing installations, or
- The original coating of road vehicles as defined in Directive 70/156/EEC or part of them with refinishing-type materials, where this is carried out away from the original manufacturing line, or
- The coating of trailers (including semi-trailers) (category O).

Winding wire coating

- Any coating activity of metallic conductors used for winding the coils in transformers and motors, etc.

Wood impregnation

- Any activity giving a loading of preservative in timber.

Wood and plastic lamination

- Any activity to adhere together wood and/or plastic to produce laminated products.

SED - ANNEX IIA

Table 8: Thresholds and emission controls

Activity (solvent consumption threshold in tonnes /year)		Threshold (solvent consumption threshold in tonnes/ year)	Emission limit values in waste gases (mg C/Nm^3)	Fugitive emission values (percentage of solvent input)		Total emission limit values		Special provisions
				New	Existing	New	Existing	
1	Heatset web offset printing (>15)	15 - 25 >25	100 20	30 (1) 30 (1)				(1)Solvent residue in finished product is not to be considered as part of fugitive emissions.
2	Publication rotogravure (>25)		75	10	15			
3	Other rotogravure, flexography, rotary screen printing, laminating or varnishing units (>15) rotary screen printing on textile/cardboard (>30)	15 - 25 >25 >30 (1)	100 100 100	25 20 20				(1) Threshold for rotary screen printing on textile and on cardboard.
4	Surface cleaning (1) (>1)	1 - 5 >5	20 (2) 15 (2)	15 10				(1) Using compounds specified in Article 5 (6) and (8). (2) Limit refers to mass of compounds in mg/Nm^3, and not to total carbon.
5	Other surface cleaning (>2)	2 - 10 >10	75 (1) 75 (1)	20 (1) 15 (1)				(1) Installations that demonstrate to the competent authority that the average organic solvent content of all cleaning material used does not exceed 30% by weight are exempt from application of these values.
6	Vehicle coating (<15) and vehicle refinishing	>0.5	50 (1)	25				(1) Compliance in accordance with Article 9 (3) should be demonstrated based on 15 minute average measurements
7	Coil coating (>25)		50 (1)	5	10			(1) For installations which use techniques which allow reuse of recovered solvents, the emission limit shall be 150.

Table 8: Thresholds and emission controls

Activity (solvent consumption threshold in tonnes /year)		Threshold (solvent consumption threshold in tonnes/ year)	Emission limit values in waste gases (mg C/Nm^3)	Fugitive emission values (percentage of solvent input)		Total emission limit values		Special provisions
				New	Existing	New	Existing	
8	Other coating, including metal, plastic, textile (5) fabric, film and paper coating (> 5)	5-15 > 15	100 (1) (4) 50/75 (2) (3) (4)	25 (4) 20 (4)				(1) Emission limit value applies to coating application and drying processes operated under contained conditions. (2) The first emission limit value applies to drying processes, the second to coating application processes. (3) For textile coating installations which use techniques which allow reuse of recovered solvents, the emission limit applied to coating application and drying processes taken together shall be 150. (4) Coating activities which cannot be applied under contained conditions (such as shipbuilding, aircraft painting) may be exempted from these values, in accordance with Article 5 (3) (b). (5) Rotary screen printing on textile is covered by activity No. 3
9	Wire winding coating (>5)					10 g/kg (1) 5 g/kg (2)		(1) Applies for installations where average diameter of wire [0.1mm. (2) Applies for all other installations.
10	Coating of wooden surfaces (>15)	15 - 25 >25	100 (1) 50/75 (2)	25 20				(1) Emission limit applies to coating application and drying processes operated under contained conditions. (2) The first value applies to drying processes, the second to coating application processes.

Table 8: Thresholds and emission controls

Activity (solvent consumption threshold in tonnes /year)		Threshold (solvent consumption threshold in tonnes/ year)	Emission limit values in waste gases (mg C/Nm^3)	Fugitive emission values (percentage of solvent input)		Total emission limit values		Special provisions
				New	Existing	New	Existing	
11	Dry cleaning					20 g/kg (1) (2) (3)		(1) Expressed in mass of solvent emitted per kilogram of product cleaned and dried. (2) The emission limit in Article 5(8) does not apply for this sector. (3) The following exemption refers only to Greece: the total emission limit value does not apply for a period of 12 years after the date on which this Directive is brought into effect, to existing installations located in remote areas and/or islands, with a population of no more than 2000 inhabitants where the use of advanced technology equipment is not economically feasible
12	Wood impregnation (>25)		100 (1)	45		11 kg/m^3		(1) Does not apply for impregnation with creosote
13	Coating of leather (>10)	10 - 25 >25 (>10) (1)				85 g/m^2 75 g/m^2 150 g/m^2		Emission limits are expressed in grams of solvent emitted per m^2 of product produced. (1) For leather coating activities in furnishing and particular leather goods used as small consumer goods like bags, belts, wallets etc.
14	Footwear manufacture (>5)					25 g per pair		Total emission limit values are expressed in grams of solvent emitted per pair of complete footwear produced.
15	Wood and plastic lamination (>5)					30 g/m^2		
16	Adhesive coating (>5)	5 - 15 >15	50 (1) 50 (1)	25 20				(1) If techniques are used which allow reuse of recovered solvent, the emission limit value in waste gases shall be 150.

Table 8: Thresholds and emission controls

Activity (solvent consumption threshold in tonnes /year)		Threshold (solvent consumption threshold in tonnes/ year)	Emission limit values in waste gases (mg C/Nm^3)	Fugitive emission values (percentage of solvent input)		Total emission limit values		Special provisions
				New	Existing	New	Existing	
17	Manufacture of coating preparations, varnishes, inks and adhesives (>100)	100 - 1000 >1000	150 150	5 3		5% of solvent input 3% of solvent input		The fugitive emission value does not include solvent sold as part of a coatings preparation in a sealed container.
18	Rubber conversion (>15)		20 (1)	25 (2)		25% of solvent input		(1) If techniques are used which allow reuse of recovered solvent, the emission limit value in waste gases shall be 150. (2) The fugitive emission value does not include solvent sold as part of products or preparations in a sealed container.
19	Vegetable oil and animal fat extraction and vegetable oil refining activities (>10)					Animal fat: 1,5 kg/tonne Castor: 3kg/tonne Rape seed: 1kg/tonne Sunflower seed: 1kg/tonne Soya beans (normal crush): 0,8kg/tonne Soya beans (white flakes): 1,2kg/tonne Other seeds and other vegetable matter: 3kg/tonne (1) 1,5kg/tonne (2) 4kg/tonne (3)		(1) Total emission limit values for installations processing individual batches of seeds and other vegetable matter should be set by the competent authority on a case-by-case basis, applying the best available techniques. (2) Applies to all fractionation processes excluding de-gumming (the removal of gums from the oil). (3) Applies to de-gumming
20	Manufacturing of pharmaceutical products (>50)		20 (1)	5 (2)	15 (2)	5% of solvent input	15% of solvent input	(1) If techniques are used which allow reuse of recovered solvent, the emission limit value in waste gases shall be 150. (2) The fugitive emission value does not include solvent sold as part of products or preparations in a sealed container.

II. THE VEHICLE COATING INDUSTRY

The total emission limit values are expressed in terms of grams of solvent emitted in relation to the surface area of product in square metres and in kilograms of solvent emitted in relation to the car body.

The surface area of any product dealt with in the table below is defined as follows:

- the surface area calculated from the total electrophoretic coating area, and the surface area of any parts that might be added in successive phases of the coating process which are coated with the same coatings as those used for the product in question, or the total surface area of the product coated in the installation.

The surface of the electrophoretic coating area is calculated using the formula:

$$\frac{2 \times \text{total weight of product shell}}{\text{average thickness of metal sheet} \times \text{density of metal sheet}}$$

This method shall also be applied for other coated parts made out of sheets.

Computer aided design or other equivalent methods shall be used to calculate the surface area of the other parts added, or the total surface area coated in the installation.

The total emission limit value in the table below refers to all process stages carried out at the same installation from electrophoretic coating, or any other kind of coating process, through to the final wax and polish of topcoating inclusive, as well as solvent used in cleaning of process equipment, including spray booths and other fixed equipment, both during and outside of production time. The total emission limit value is expressed as the mass sum of organic compounds per m^2 of the total surface area of coated product and as the mass sum of organic compounds per car body.

Activity (solvent consumption threshold in tonnes/year)	**Production threshold (refers to annual production of coated item)**	**Total emission limit value**	
		New	**Existing**
Coating of new cars (> 15)	> 5 000	45 g/m^2 1,3 kg/body + 33 g/m^2	60 g/m^2 or 1,9 kg/body + 41 g/m^2
	< or equal to 5 000 monocoque or > 3 500 chassis-built	1,5 kg/body or +70 g/m^2	90 g/m^2 or 1,5 kg/body + 70g/m^2
		Total emission limit (g/m^2)	
Coating of new truck cabins (> 15)	< or equal to 5000 > 5 000	65 55	85 75
Coating of new vans and trucks (> 15)	< or equal to 2500 >2500	90 70	120 90
Coating of new buses (> 15)	< or equal to 2000 >2000	210 150	290 225

Vehicle coating installations below the solvent consumption thresholds in the table above shall meet the requirements for the vehicle refinishing sector in Annex IIA.

SED - ANNEX IIB

REDUCTION SCHEME

1. Principles

The purpose of the reduction scheme is to allow the operator the possibility to achieve by other means emission reductions, equivalent to those achieved if the emission limit values were to be applied. To that end the operator may use any reduction scheme, specially designed for his installation, provided that in the end an equivalent emission reduction is achieved. Member States shall report according to Article 11 of the Directive to the Commission about the progress in achieving the same emission reduction, including the experience from the application of the reduction scheme.

2. Practice

in the case of applying coatings, varnishes, adhesives or inks, the following scheme can be used. Where the following method is inappropriate the competent authority may allow an operator to apply any alternative exemption scheme which it is satisfied fulfils the principles outlined here. The design of the scheme takes into account the following facts:

(i) where substitutes containing little or no solvent are still under development, a time extension must be given to the operator to implement his emission reduction plans;

(ii) the reference point for emission reductions should correspond as closely as possible to the emissions which would have resulted had no reduction action been taken.

The following scheme shall operate for installations for which a constant solid content of product can be assumed and used to define the reference point for emission reductions:

(i) the operator shall forward an emission reduction plan which includes in particular decreases in the average solvent content of the total input and/or increased efficiency in the use of solids to achieve a reduction of the total emissions from the installation to a given percentage of the annual reference emissions, termed the target emission. This must be done on the following time frame:

Time Period		**Maximum allowed total annual emissions**
New installations	**Existing installations**	
By 31.10.2001 By 31.10.2004	By 31.10.2005 By 31.10.2007	Target emission x 1,5 Target emission

(ii) The annual reference emission is calculated as follows:

(a) The total mass of solids in the quantity of coating and/or ink, varnish or adhesive consumed in a year is determined. Solids are all materials in coatings, inks, varnishes and adhesives that become solid once the water or the VOCs are evaporated.

(b) The annual reference emissions are calculated by multiplying the mass determined in (a) by the appropriate factor listed in the table below. Competent authorities may adjust these factors for individual installations to reflect documented increased efficiency in the use of solids.

Activity	**Multiplication factor for use in item (ii)(b)**
Rotogravure printing; flexography printing; laminating as part of a printing activity; varnishing as part of a printing activity; wood coating; coating of textiles, fabric film or paper; adhesive coating	4
Coil coating, vehicle refinishing	3
Food contact coating, aerospace coatings	2,33
Other coatings and rotary screen printing	1,5

(c) The target emission is equal to the annual reference emission multiplied by a percentage equal to:
  - (the fugitive emission value + 15), for installations falling within item 6 and the lower threshold band of items 8 and 10 of Annex IIA,
  - (the fugitive emission value + 5) for all other installations.

(d) Compliance is achieved if the actual solvent emission determined from the solvent management plan is less than or equal to the target emission.

SED - ANNEX III

SOLVENT MANAGEMENT PLAN

1. Introduction

This Annex provides guidance on carrying out a solvent management plan. It identifies the principles to be applied (item 2) and provides a framework for the mass balance (item 3) and an indication of the requirements for verification of compliance (item 4).

2. Principles

The solvent management plan serves the following purposes:
(i) verification of compliance as specified in Article 9(1);
(ii) identification of future reduction options;
(iii) enabling of the provision of information on solvent consumption, solvent emissions and compliance with the Directive to the public.

3. Definitions

The following definitions provide a framework for the mass balance exercise.

Inputs of organic solvents (I):

I_1The quantity of organic solvents or their quantity in preparations. purchased which are used as input into the process in the time frame over which the mass balance is being calculated.

I_2The quantity of organic solvents or their quantity in preparations recovered and reused as solvent input into the process. (The recycled solvent is counted every time it is used to carry out the activity.)

Outputs of organic solvents (O):

O_1Emissions in waste gases.

O_2 Organic solvents lost in water, if appropriate taking into account waste water treatment when calculating O_5.

O_3 The quantity of organic solvents which remains as contamination or residue in products output from the process.

O_4 Uncaptured emissions of organic solvents to air. This includes the general ventilation of rooms, where air is released to the outside environment via windows, doors, vents and similar openings.

O_5 Organic solvents and/or organic compounds lost due to chemical or physical reactions. (including for example those which are destroyed, e.g. by thermal oxidation or other waste gas or waste water treatments, or captured, e.g. by adsorption, as long as they are not counted under O_6, O_7 or O_8).

O_6 Organic solvents contained in collected waste.

O_7 Organic solvents, or organic solvents contained in preparations, which are sold or are intended to be sold as a commercially valuable product.

O_8 Organic solvents contained in preparations 'recovered for reuse but not as input into the process, as long as not counted under O_7.

O_9 Organic solvents released in other ways.

4. Guidance on use of the solvent management plan for verification of compliance

The use made of the solvent management plan will be determined by the particular requirement which is to be verified, as follows:

(i) Verification of compliance with the reduction option in Annex IIB, with a total emission limit value expressed in solvent emissions per unit product, or otherwise stated in Annex IIA.

(a) For all activities using Annex IIB the solvent management plan should be done annually to determine consumption (C). Consumption can be calculated according to the following equation:

$C=I_1-O_8$

A parallel exercise should also be undertaken to determine solids used in coating in order to derive the annual reference emission and the target emission each year.

(b) For assessing compliance with a total emission limit value expressed in solvent emissions per unit product or otherwise stated in Annex IIA, the solvent management plan should be done annually to determine emissions (E). Emissions can be calculated according to the following equation:

$E=F+O_1$

where F is the fugitive emission as defined in section (ii)(a). The emission figure should then be divided by the relevant product parameter.

(c) For assessing compliance with the requirements of Article 5(5)(b)(ii), the solvent management plan should be done annually to determine total emissions from all activities concerned, and that figure should then be compared with the total emissions that would have resulted had the requirements of Annex II been met for each activity separately.

(ii) Determination of fugitive emissions for comparison with fugitive emission values in Annex IIA:

(a) Methodology

The fugitive emission can be calculated according to the following equation:

$F = I_1-O_1-O_5-O_6-O_7-O_8$

or

$F = O_2+O_3+O_4+O_9$

This quantity can be determined by direct measurement of the quantities. Alternatively, an equivalent calculation can be made by other means, for instance by using the capture efficiency of the process.

The fugitive emission value is expressed as a proportion of the input, which can be calculated according to the following equation:

$I=I_1+I_2$

(b)Frequency

Determination of fugitive emissions can be done by a short but comprehensive set of measurements. It need not be done again until the equipment is modified.

Appendix 3: Method of measurement of VOC and solid content of coatings

1. This Appendix includes general guidance on a method of measuring volatile organic compound and solids contents of coatings as applied to demonstrate that the volatile organic compound content is less than the figures specified in **Table 4** of this note.

2. It will normally prove very difficult to calculate volatile organic compound content of coatings from coating formulation data. Coating formulation information may be used to establish water content of paint (although this can not make allowance for condensation reactions which produce water in the resin system during stoving) and for total solids content. It is preferable to determine solids content by measurement, as detailed below, rather than from calculation based on coating formulation.

3. The test method should be based upon the following:

(i) prepare the coating to achieve a formulation typical of the coating applied in the particular process concerned (this may involve the addition of organic solvents or water for viscosity adjustment),

(ii) the sample should be thoroughly mixed,

(iii) the sample should first be weighed into a syringe or weighting bottle (WA) and sufficient material should be weighed depending upon the anticipated volatile content of the coating for example, assuming a balance accuracy of 0.1 mg, it should be sufficient to use 500mg of coating,

(iv) precondition an aluminium foil dish (typically about 60mm in diameter) in an oven at 383K +/- 5K (110°C +/- 5°C) for 30 minutes and cool and store in a desiccator prior to use,

(v) weigh the foil dish (WC) and discharge the syringe contents into the dish,

(vi) place the dish into a preheated forced draught oven for 60 minutes at 383K +/- 5K (110°C +/- 5°C),

(vii) determine the weight of coating applied by re-weighing the syringe after discharge to correct for any residual coating in the syringe (WB),

(viii) remove dish from oven and place immediately into a desiccator to cool and weigh to 0.11119 (WD).

4. The volatile content of the coating is:

(WA - WB) (WD - WC) mg………………………..(1)

5. The total solids content of the coating is:

(WD - WC) mg (2)

6. It is necessary to make allowance for the weight of water if present (Ww). This can be derived either from formulation data or by determining water content by analysis, for example gas chromatography.

7. The coating volatile organic compound content in accordance with **Table 4** of the note can therefore be calculated as follows:

$$\frac{[(WA - WB) - (WD - WC) - WW]}{(WD - WC)} \times 1000$$

8. In some circumstances it may be necessary to make minor amendments to the above method taking account of coating characteristics. For example, the temperature of the test oven may need to be increased to reflect the typical stoving temperature that the coating will

be raised to in the process oven, but the temperature should be not less than that specified in Clause 3 vi) of this Appendix. The 60 minute period given in Clause 3 vi) may need to be reduced to coincide with any shorter curing schedule used.

9. The method in this Appendix may not be suitable for determining the solids and volatile organic compounds contents of air drying, UV or chemically cured coatings where the coatings are not cured by heat in an oven. In these circumstances, the solids and volatile organic compounds contents should be determined by simulating the actual coating curing method.