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# Environmental Permitting Guidance The Solvent Emissions Directive

For the Environmental Permitting (England and Wales)  
Regulations 2010

Updated March 2010

Version 3.0



Llywodraeth Cynulliad Cymru  
Welsh Assembly Government



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This document is available on the Defra website:

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Published by the Department for Environment, Food and Rural Affairs



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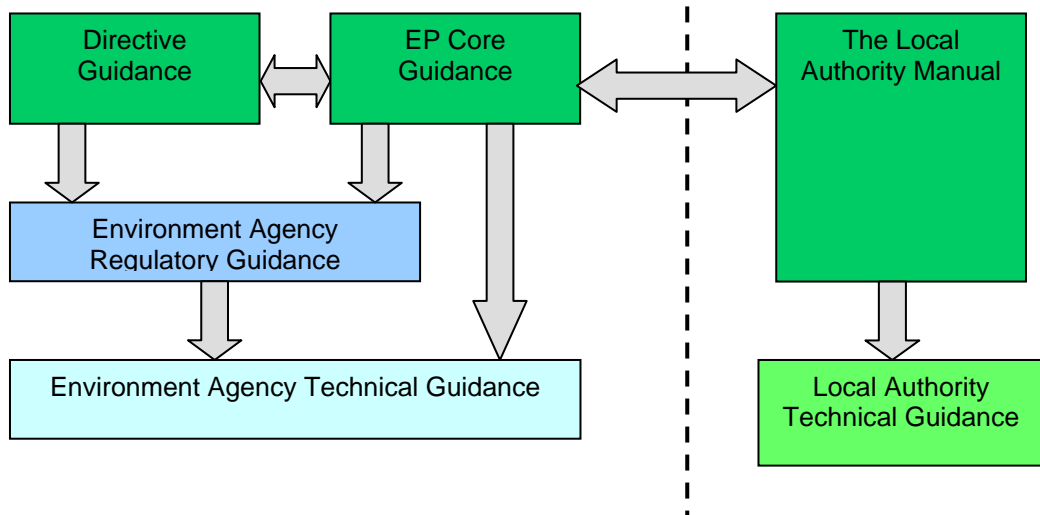
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# 1. Summary

## About this guidance

- 1.1. This guidance is aimed at helping readers understand the European Community (EC) Directive 1999/13/EC (as amended by Directive 2004/42/CE and Directive 2008/112/EC)) on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain activities and installations ('the Directive'), insofar as it relates to permitting in England and Wales.
- 1.2. This guidance is being published to help those regulating and operating Solvent Emissions Directive ('SED') installations, but it will also be of interest to others concerned with solvent emissions. The guidance sets out the views of the Secretary of State for Environment, Food and Rural Affairs (Defra) and the Welsh Assembly Government (WAG) on how the Directive should be applied and how particular terms should be interpreted. However, only the national or European Courts can give a definitive interpretation of the legislation.
- 1.3. This guidance is part of a series of documents which accompany the Environmental Permitting (England and Wales) Regulations 2010 (SI 2010 No.675) ('the Regulations')<sup>1</sup>.

Figure 1. Illustration of guidance relationships.



- 1.4. The series consists of the Environmental Permitting Core Guidance<sup>2</sup>, which describes the general permitting and compliance requirements, and guidance on each of the European directives implemented through the

<sup>1</sup> Available at : [www.defra.gov.uk/environment/policy/permits/guidance.htm](http://www.defra.gov.uk/environment/policy/permits/guidance.htm)

<sup>2</sup> *ibid.*

regime<sup>3</sup>. Separate guidance is available for local authority regulation under the regime<sup>4</sup>. This is illustrated in Figure 1.

- 1.5. This guidance should be read in conjunction with the Environmental Permitting Core Guidance.
- 1.6. Where the SED activity forms part of a Part A installation, reference should be made to the Guidance on Part A installations<sup>5</sup>.
- 1.7. For regulated facilities for which a Local Authority is the regulator, reference should be made to the General Guidance Manual<sup>6</sup>.
- 1.8. Technical guidance for Solvent Emissions Directive activities can be found on the Defra website in a series of Process Guidance notes<sup>7</sup>.
- 1.9. To ensure this guidance is current and up to date, from time to time this guidance will be updated. Where made, revisions can be found in the 'Revision of Guidance' section at the front of the document.
- 1.10. This guidance document is compliant with the Code of Practice on Guidance on Regulation<sup>8</sup>. If you feel this guidance breaches the code, or notice any inaccuracies within the guidance, please contact the EPP team at: [eppadministrator@defra.gsi.gov.uk](mailto:eppadministrator@defra.gsi.gov.uk)

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<sup>3</sup> [www.defra.gov.uk/environment/policy/permits/guidance.htm](http://www.defra.gov.uk/environment/policy/permits/guidance.htm)

<sup>4</sup> Available at

<http://www.defra.gov.uk/environment/quality/pollution/ppc/localauth/pubs/guidance/manuals.htm>

<sup>5</sup> Available at [www.defra.gov.uk/environment/policy/permits/guidance.htm](http://www.defra.gov.uk/environment/policy/permits/guidance.htm)

<sup>6</sup> Available at

[www.defra.gov.uk/environment/quality/pollution/ppc/localauth/pubs/guidance/manuals.htm](http://www.defra.gov.uk/environment/quality/pollution/ppc/localauth/pubs/guidance/manuals.htm)

<sup>7</sup> Available at

[www.defra.gov.uk/environment/quality/pollution/ppc/localauth/pubs/guidance/notes/index.htm](http://www.defra.gov.uk/environment/quality/pollution/ppc/localauth/pubs/guidance/notes/index.htm)

<sup>8</sup> See Environmental Permitting Guidance and Glossary Chapter 3:

[www.defra.gov.uk/environment/policy/permits/guidance.htm](http://www.defra.gov.uk/environment/policy/permits/guidance.htm)

## 2. Introduction

### The Solvent Emissions Directive

- 2.1. The purpose of the Solvent Emissions Directive is to prevent or reduce the direct and indirect effects of emissions of volatile organic compounds into the environment, mainly into air, and the potential risks to human health, by providing measures and procedures to be implemented for certain activities.
- 2.2. Schedule 14 to the Regulations (reproduced in this document as Annex 1) sets out the relevant permitting requirements from the Directive.
- 2.3. Chapter 3 provides guidance on the scope of the permitting element of the Directive. Chapter 4 describes the requirements of the Directive which will be delivered through environmental permits and sets out how the Regulations transpose the relevant parts of the Directive.
- 2.4. A copy of the Directive is provided in Annex 2.
- 2.5. A separate glossary of terms is available<sup>9</sup>. The glossary briefly explains the meaning of many words, phrases and acronyms used in the Regulations and directives.

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<sup>9</sup> Available at [www.defra.gov.uk/environment/policy/permits/guidance.htm](http://www.defra.gov.uk/environment/policy/permits/guidance.htm)

## 3. Scope of the Directive

- 3.1. Article 1 of the Directive sets out its purpose and scope. Annex I to the Directive sets out those activities covered by the Directive. Annex IIA to the Directive lists the solvent consumption thresholds for each activity. Those activities listed in Annex I are within the scope of the Directive where they are operated above the thresholds listed in Annex IIA.
- 3.2. Schedule 14, paragraph 1 to the Regulations applies the relevant requirements of the Directive to any SED installation.
- 3.3. A 'SED installation' has the meaning given in Schedule 14, paragraph 2(1). It is defined as a stationary technical unit where one or more SED activities are carried on and also includes any location on the same site where any directly associated activities are carried on. The meanings of 'stationary technical unit' and 'directly associated activities' are explained in the Guidance on Part A installations.<sup>10</sup>
- 3.4. A 'SED activity' is defined in regulation 2 as an activity falling within Schedule 1, Part 2, section 7.
- 3.5. Schedule 1, Part 2, section 7 provides a list of activities derived from Annex I to the Directive with the solvent consumption thresholds from Annex IIA to the Directive. The SED activities are all listed as Part B activities.
- 3.6. However, a Part A(1) installation includes an installation where a Part A(1) activity is carried on with either a Part A(2) or Part B activity or with both a Part A(2) and a Part B activity (Schedule 1, Part 1, paragraph 1). An A(2) installation may include a Part B activity carried on with a Part A(2) activity. This means that a SED installation may be a Part B installation in its own right but can also form part of a Part A(1) or Part A(2) installation, depending upon the combination of activities in the individual installation.
- 3.7. The exemption for trivial releases into the air does not apply to SED activities (Schedule 1, Part 1, paragraph 6).

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<sup>10</sup> Available at [www.defra.gov.uk/environment/policy/permits/guidance.htm](http://www.defra.gov.uk/environment/policy/permits/guidance.htm)



## 4. Permitting Requirements

- 4.1. This chapter describes the Directive requirements that environmental permits must deliver and how the Regulations apply these requirements.
- 4.2. Schedule 14, paragraph 1 to the Regulations applies the requirements of the Schedule to all SED installations (see chapter 3 of this guidance).
- 4.3. Schedule 14, paragraph 3(1) to the Regulations requires the regulator to exercise its 'relevant functions' so as to comply with certain provisions of the Directive. A regulator exercises a relevant function when it determines an application for the grant of a permit, when it makes a regulator-initiated variation of permit conditions or when it exercises enforcement powers in relation to a permit (regulation 9 and see chapters 6, 7 and 11 of the Environmental Permitting Core Guidance).
- 4.4. The requirements set out in paragraph 4.3 above relate to:
- Substantial change (Article 4(4));
  - Emissions and reduction scheme (the permitting parts of Article 5);
  - European Guidance (Article 7(2));
  - Monitoring (Article 8(1) to 8(4));
  - Compliance (Article 9); and
  - Non-compliance (Article 10).
- 4.5. Because the SED installation can be, or be part of, a Part B, Part A(2) or Part A(1) installation (see [chapter 3](#) above) the regulator can be either the Local Authority or the Environment Agency (see chapter 4 of the Environmental Permitting Core Guidance).
- 4.6. The Regulations specify that the regulator is the competent authority for the purposes of the Directive (Schedule 14, paragraph 2(2)(f)).

### Substantial Change - Article 4(4)

- 4.7. Article 4(4) requires that 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, or as an existing installation (but only if total emissions from the whole installation do not exceed those that would have resulted had the substantially changed part been treated as a new installation) (paragraph 3(1)(a) of Schedule 14 to the Regulations).
- 4.8.** An installation that falls into the Directive following a substantial change must meet the relevant requirements of the Directive from the date the variation to the permit is granted.
- 4.9.** Where a SED installation is also subject to the IPPC Directive (Directive 2008/1/EC), the definition in that Directive applies (substantial change is defined in paragraph 5(5) of Part 1 of Schedule 5 to the Regulations). Otherwise, the SED definition applies (Article 2(4)).

## **Emissions and reduction schemes - Article 5**

- 4.10.** The regulator should impose permit conditions to ensure compliance with Article 5 paragraphs 2 to 12 (excluding the reporting requirement in the last sentence of paragraph 5(3) - paragraph 3(1)(b) of Schedule 14). The Environment Agency should ensure that any standard rules it develops (see chapter 7 on Standard Permits in the Environmental Permitting Core Guidance<sup>11</sup>) also ensure this compliance. In Article 5(1) the reference to general binding rules is to be ignored (paragraph 3(2) (a) of Schedule 14). In this context 'general binding rules' has the meaning given in Article 9 of the IPPC Directive (see the Guidance on Part A Installations).
- 4.11.** For volatile organic compounds (VOCs)<sup>12</sup> emissions there are two main compliance options:
- meeting a VOC emission limit value and fugitive emission limits and submitting annual or continuous monitoring results depending on the size of emissions (Article 5(2)(a) and Annex IIA); or
  - using a solvent reduction approach to achieve the results that would be obtained from meeting a mass emission limit (a 'reduction scheme' - Article 5(2)(b) and Annex IIB).

### **Emission limits**

- 4.12.** Annex IIA to the Directive sets out emission limit values for waste gases (point source emissions) and fugitive emission values (expressed as a percentage of solvent input).
- 4.13.** In some cases (notably the coatings manufacturing and pharmaceuticals sectors) there is also the option of meeting a mass emission limit (the total emission limit value mentioned in Article 5(2)(a)).

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<sup>11</sup> Available at: [www.defra.gov.uk/environment/policy/permits/guidance.htm](http://www.defra.gov.uk/environment/policy/permits/guidance.htm)

<sup>12</sup> Volatile organic compound is defined in paragraph 17 of article 2.

- 4.14. The regulator must impose the fugitive emission values as emission limits in the permit other than in specified circumstances (Article 5(3)(a)).
- 4.15. There are some limited exemptions from the controls of Annex IIA (Article 5(3)(b)). If this applies, a reduction scheme is to be used wherever possible.
- 4.16. For installations not using a reduction scheme any new abatement equipment must meet all the requirements of Annex IIA (Article 5(4)).

#### **Reduction schemes**

- 4.17. 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.
- 4.18. The role of the regulator does not extend to reporting to the Commission on progress in achieving emission reductions (Schedule 14, paragraph 3(2)(c)).
- 4.19. The reduction scheme approach is not to be employed where certain risk phrase compounds are used (see the section on **Risk categories** below).
- 4.20. Annex IIB provides a methodology for reduction schemes (paragraph 2 of Annex IIB).
- 4.21. Compliance with the reduction scheme is achieved if the annual actual solvent emission determined from the solvent management plan (see chapter 11 on compliance in the Environmental Permitting Core Guidance) is less than or equal to the target emission (Annex IIB 2(ii) (d)).
- 4.22. Regulators should seek prior notification of any proposal to introduce such systems, through their permitting systems, which should include reasons why lower organic solvent systems are not considered technically appropriate or practicable.

#### **Two or more activities**

- 4.23. At installations where two or more of the activities in Annex I of the Directive are carried out, each of which exceeds the threshold in Annex IIA, each activity must (Article 5(5) and Annex III):
- as regards to designated risk phrase materials(see the section on **Risk categories** below), meet the requirements for each activity individually;
  - 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) above been applied.
- 4.24. When applying point (ii) above, the solvent management plan should 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 Directive been met for each activity separately.

### **Risk categories**

- 4.25.** In addition to the requirements set out in the sections on Emission limits and Reduction schemes above, the requirements of the emission limits and conditions for certain designated risk phrase materials must also be met (Article 5 paragraph 12).
- 4.26.** The requirements in Article 5 paragraphs 6, 7 and 8 relate to volatile organic compounds (VOCs) which are identified as possessing particular hazardous properties (certain 'risk phrases').
- 4.27.** A preparation which contains substances assigned the risk phrases, but which itself is not assigned or does not carry the risk phrases, is not a designated risk phrase material.
- 4.28.** Article 5(6) requires that VOCs with the relevant risk phrase (R45, R46, R49, R60 and R61) are replaced as far as possible (taking into account guidance under Article 7(1) of the Directive - see paragraphs 4.36 and 4.37 below) by less harmful substances or preparations within the shortest possible time.
- 4.29.** 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<sup>3</sup> for the mass sum of the individual compounds must be applied in the permit.
- 4.30.** Article 5(8) applies an emission limit on halogenated VOCs with the risk phrase R40. This limit applies where the sum of the mass flows of all the discharges of all the compounds causing the risk phrase labelling R40 is greater or equal to 100 g/h. Where this is the case, a limit value of 20 mg/Nm<sup>3</sup> for the mass sum of the individual compounds must be applied in the permit.
- 4.31.** The discharge of VOCs referred to in Article 5 paragraphs 6 and 8 shall be controlled under contained conditions (defined in Article 2(30)) as far as technically and economically feasible to safeguard public health and the environment.
- 4.32.** Substances or preparations or halogenated VOCs which become assigned as designated risk phrase materials must apply the replace, control and limit requirements above, within the shortest possible time from the date at which they become designated risk phrase materials (Article 5(9)). In determining the shortest possible time, the operator will need to justify their timetables taking account of the following four factors contained within the Directive:
- 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.
- 4.33.** Without prejudice to the above, as a general principle the substitution should be no later than 6 years from the date of assignment/reclassification.

#### **Start-up and shut-down**

- 4.34.** 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. Regulators should ensure that all appropriate precautions are taken to minimise emissions during start-up and shutdown (Article 5(10)).

#### **Existing installations**

- 4.35.** Installations which existed before the Directive was brought into force (1 April 2001, see Article 2 (2)) and which meet the emission limit values in Article 5(11) do not have to meet the emission limits in Annex IIA until 2013. For these abatement plant the higher emission figure in Article 5 may be used until 1 April 2013 only if the total emissions<sup>13</sup> of the whole installation do not exceed what would have resulted had Annex IIA been fully complied with.

### **European Guidance - Article 7(2)**

- 4.36.** In accordance with Article 7(1) the Commission shall publish guidance on the use of organic substances.
- 4.37.** The regulator should ensure that any such guidance published by the Commission is taken into account during permitting and compliance work (Schedule 14, paragraph 3(1)(c)). The Environment Agency should take the guidance into account when developing standard rules (see chapter 8 of the Environmental Permitting Core Guidance) but the reference to general binding rules should be ignored (Schedule 14, paragraph 3(2)(b)).

### **Monitoring - Article 8**

- 4.38.** Article 8 of the Directive sets out requirements for monitoring (Schedule 14, paragraph 3(1)(d)).
- 4.39.** The regulator should include permit conditions requiring the operator to submit to it specified monitoring data at least once a year (Article 8(1)). The regulator can specify the form in which this data is provided. The permit conditions should also ensure that the monitoring data is available on the request of the regulator.

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<sup>13</sup> Total emissions are fugitive emissions added to the contained (point source) emissions (article 2(11)).

- 4.40. The regulator should require continuous monitoring where the average emission, following abatement, is more than 10 kg/h of total organic carbon (Article 8(2)). Continuous monitoring is also required where the regulator considers it is necessary to demonstrate compliance with VOC emission limits.
- 4.41. Where it does not consider that continuous monitoring is necessary, the regulator should require periodic measurements. For periodic measurements of VOC at least three readings must be obtained during each measurement exercise (Article 8(3)).
- 4.42. Where periodic monitoring is required, the frequency may be varied. Where there is consistent compliance with emission limits, regulators may consider reducing the frequency specified in the environmental permit.
- 4.43. 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.
- 4.44. Where emission limit values for VOCs are consistently met without the use of abatement equipment, the monitoring requirement for those pollutants should be dispensed with (Article 8(4)).

## Compliance - Article 9

- 4.45. Article 9 requires that compliance with the Directive is demonstrated to the regulator (Schedule 14, paragraph 3(1)(e)). The regulator should use permit conditions to ensure this.

### **Solvent management plan**

- 4.46. Annex III to the Directive provides guidance on solvent management plans used to demonstrate compliance (Article 9(1)).
- 4.47. The solvent management plan serves the following purposes:
- verification of compliance as specified in Article 9(1);
  - identification of future reduction options; and
  - enabling of the provision of information on solvent consumption, solvent emissions and compliance with the Directive to the public.
- 4.48. Every installation must have a solvent management plan to demonstrate compliance with the Directive's requirements.
- 4.49. 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.

### **Compliance with emission limit values**

- 4.50. The regulator should not permit the introduction of dilution air to achieve emission concentration limits. 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 (Article 9(1)).

- 4.51.** The regulator should ensure that compliance is verified following a substantial change (Article 9(2)).
- 4.52.** Where continuous monitoring is carried out to demonstrate compliance with VOC emission limits, these limits shall be considered to be complied with if (Article 9(3)):
- the averages over 24 hours of normal operation do not exceed the emission limit values; and
  - none of the hourly averages exceeds the emission limit values by more than a factor of 1.5<sup>14</sup>.
- 4.53.** For periodic measurements, VOC emission limit values shall be considered to be complied with if, in one monitoring exercise (Article 9(4)):
- the average of all the readings (minimum of three) does not exceed the emission limit values; and
  - none of the hourly averages exceeds the emission limit value by more than a factor of 1.5<sup>15</sup>.
- 4.54.** Article 9(5) requires that compliance with the emission limits for those VOCs with particular risk phrases (Article 5 (7) and (8)) shall be verified on the basis of the sum of the mass concentrations of the individual volatile organic compounds 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.

### **Non-compliance - Article 10**

- 4.55.** The regulator should impose permit conditions to ensure that it is informed of any non-compliance with the requirements of the Directive (Schedule 14, paragraph 3(1)(f), Article 10).
- 4.56.** 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.
- 4.57.** 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.

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<sup>14</sup> the hourly average of the 30-minute means value may be used to demonstrate compliance

<sup>15</sup> *ibid*

**4.58.** In cases of non-compliance causing immediate danger to human health, operation of the activity must be suspended (Article 10(b)). The regulator can include permit conditions requiring the operator to stop the activity where there is an immediate danger to human health. The regulator can also use a suspension notice under regulation 37. All of the following criteria must 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.



# Annex 1 - Schedule 14 to the Environmental Permitting Regulations

## SCHEDULE 14 SED installations

Regulation 35(2)(h)

### Application

1. This Schedule applies in relation to every SED installation.

### Interpretation

- 2.—(1) In this Schedule—

“directly associated activity”, in relation to a SED activity, means an operation which—

- (a) has a technical connection with the SED activity,
- (b) is carried on on the same site as the SED activity, and
- (c) could have an effect on a discharge of volatile organic compounds into the environment;

“SED installation” means—

- (a) a stationary technical unit where one or more SED activities are carried on, and
- (b) any other location on the same site where any other directly associated activities are carried on; and

“the Solvent Emissions Directive” means Council Directive 1999/13/EC on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain activities and installations<sup>(a)</sup>.

- (2) When interpreting the Solvent Emissions Directive for the purposes of this Schedule—

- (a) an expression that is defined in Section 7 of Part 2 of Schedule 1 has the meaning given in that Section;
- (b) except where also defined in that Section or in this paragraph, an expression that is defined in Part 1 of these Regulations has the meaning given in that Part;
- (c) “authorisation” means environmental permit;
- (d) “emission” has the meaning given in the Solvent Emissions Directive;
- (e) “installation” means SED installation;
- (f) the competent authority is the regulator.

### Exercise of relevant functions

- 3.—(1) The regulator must exercise its relevant functions so as to ensure compliance with the following provisions of the Solvent Emissions Directive—

- (a) Article 4(4);
- (b) Article 5, except for the last sentence of 5(3), and 5(13);
- (c) Article 7(2);
- (d) Article 8(1) to (4);

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(a) OJ No L 85, 29.3.1999, p 1, as last amended by Directive 2008/112/EC of the European Parliament and of the Council (OJ No L 345, 23.12.2008, p 72). There is 1 relevant corrigendum, OJ No L 240, 10.9.1999, p 24.

- (e) Article 9;
  - (f) Article 10.
- (2) When interpreting the Solvent Emissions Directive for the purposes of this paragraph—
- (a) in Article 5(1), ignore the words “either” and “or by general binding rules”;
  - (b) in Article 7(2), ignore the words “and during the formulation of general binding rules”;  
and
  - (c) in point 1 of Annex IIB, ignore the last sentence.

## **Annex 2- The Solvent Emissions Directive**

This document is meant purely as a documentation tool and the institutions do not assume any liability for its contents

► **B**

**COUNCIL DIRECTIVE 1999/13/EC  
of 11 March 1999**

**on the limitation of emissions of volatile organic compounds due to the use of organic solvents in  
certain activities and installations**

(OJ L 85, 29.3.1999, p. 1)

Amended by:

	Official Journal		
	No	page	date
► <b><u>M1</u></b> Regulation (EC) No 1882/2003 of the European Parliament and of the Council of 29 September 2003	L 284	1	31.10.2003
► <b><u>M2</u></b> Directive 2004/42/CE of the European Parliament and of the Council of 21 April 2004	L 143	87	30.4.2004

Corrected by:

- **C1** Corrigendum, OJ L 188, 21.7.1999, p. 54 (1999/13/EC)
- **C2** Corrigendum, OJ L 240, 10.9.1999, p. 24 (1999/13/EC)



**COUNCIL DIRECTIVE 1999/13/EC**  
**of 11 March 1999**

**on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain activities and installations**

THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 130s(1) thereof,

Having regard to the proposal from the Commission <sup>(1)</sup>,

Having regard to the opinion of the Economic and Social Committee <sup>(2)</sup>,

Acting in accordance with the procedure laid down in Article 189c of the Treaty <sup>(3)</sup>,

- (1) Whereas the European Community action programme on the environment approved by the Council and the representatives of the Governments of the Member States meeting within the Council by resolutions of 22 November 1973 <sup>(4)</sup>, 17 May 1977 <sup>(5)</sup>, 7 February 1983 <sup>(6)</sup>, 19 October 1987 <sup>(7)</sup> and 1 February 1993 <sup>(8)</sup> stresses the importance of the prevention and reduction of air pollution;
- (2) Whereas in particular the resolution of 19 October 1987 emphasises the importance of Community action to concentrate, *inter alia*, on implementation of appropriate standards in order to ensure a high level of public health and environmental protection;
- (3) Whereas the European Community and its Member States are parties to the Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution concerning the control of emissions of volatile organic compounds in order to reduce their transboundary fluxes and the fluxes of the resulting secondary photochemical oxidant products so as to protect human health and the environment from adverse effects;
- (4) Whereas pollution due to volatile organic compounds in one Member State often influences the air and water of other Member States; whereas, in accordance with Article 130r of the Treaty, action at Community level is necessary;
- (5) Whereas, because of their characteristics, the use of organic solvents in certain activities and installations gives rise to emissions of organic compounds into the air which can be harmful for public health and/or contributes to the local and transboundary formation of photochemical oxidants in the boundary layer of the troposphere which cause damage to natural resources of vital environmental and economic importance and, under certain exposure conditions, has harmful effects on human health;
- (6) Whereas the high incidence of high tropospheric ozone concentrations in recent years has triggered widespread concern regarding the impact on public health and the environment;

<sup>(1)</sup> OJ C 99, 26.3.1997, p. 32.

<sup>(2)</sup> OJ C 287, 22.9.1997, p. 55.

<sup>(3)</sup> Opinion of the European Parliament of 14 January 1998 (OJ C 34, 2.2.1998, p. 75), Council Common Position of 16 June 1998 (OJ C 248, 7.8.1998, p. 1) and Decision of the European Parliament of 21 October 1998 (OJ C 341, 9.11.1998, p. 70).

<sup>(4)</sup> OJ C 112, 20.12.1973, p. 1.

<sup>(5)</sup> OJ C 139, 13.6.1977, p. 1.

<sup>(6)</sup> OJ C 46, 17.2.1983, p. 1.

<sup>(7)</sup> OJ C 328, 7.12.1987, p. 1.

<sup>(8)</sup> OJ C 138, 1.2.1993, p. 1.

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- (7) Whereas, therefore, preventive action is required to protect public health and the environment against the consequences of particularly harmful emissions from the use of organic solvents and to guarantee citizens the right to a clean and healthy environment;
- (8) Whereas emissions of organic compounds can be avoided or reduced in many activities and installations because potentially less harmful substitutes are available or will become available within the coming years; whereas, where appropriate substitutes are not available, other technical measures should be taken to reduce emissions into the environment as much as economically and technically feasible;
- (9) Whereas the use of organic solvents and the emissions of organic compounds which have the most serious effects on public health should be reduced as much as technically feasible;
- (10) Whereas installations and processes which fall under this Directive should at least be registered if they are not subject to authorisation under Community or national legislation;
- (11) Whereas existing installations and activities should, where appropriate, be adapted so that within an appropriate period they meet the requirements established for new installations and activities; whereas that period should be consistent with the timetable for compliance of Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control <sup>(1)</sup>;
- (12) Whereas the relevant parts of existing installations which undergo substantial change must, as a matter of principle, meet the new installation standards for the substantially changed equipment;
- (13) Whereas organic solvents are used by many different types of installations and activities so that, in addition to general requirements, specific requirements should be defined and, at the same time, thresholds for the size of the installations or activities which have to comply with this Directive;
- (14) Whereas a high level of environmental protection requires the setting and achievement of emission limits for organic compounds and appropriate operating conditions, in accordance with the principle of best available techniques, for certain installations and activities using organic solvents within the Community;
- (15) Whereas in some cases Member States may exempt operators from complying with the emission limit values because other measures, such as the use of low-solvent or solvent-free products or techniques, provide alternative means of achieving equivalent emission reductions;
- (16) Whereas emission-limiting measures adopted before the entry into force of this Directive should be taken into account in an appropriate way;
- (17) Whereas alternative approaches to reduction may allow the objectives of this Directive to be achieved more effectively than by implementing uniform emission limit values; whereas, therefore, Member States may exempt existing installations from compliance with the emission limits if they implement a national plan, which will, within the timetable for implementation of this Directive, lead to an at least equal reduction in emissions of organic compounds from these activities and installations;
- (18) Whereas existing installations falling under Directive 96/61/EC which are covered by a national plan can under no circumstances be exempted from the provisions of that Directive, including Article 9(4) thereof;

<sup>(1)</sup> OJ L 257, 10.10.1996, p. 26.

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- (19) Whereas in many cases small and medium-sized, new and existing installations may be allowed to comply with somewhat less stringent requirements to maintain their competitiveness;
- (20) Whereas for dry cleaning a zero threshold is appropriate, subject to specified exemptions;
- (21) Whereas monitoring of emissions is required, including the application of measurement techniques, to assess the mass concentrations or the quantity of the pollutants whose release into the environment is permitted;
- (22) Whereas operators should reduce emissions of organic solvents, including fugitive emissions, and of organic compounds; whereas a solvent management plan is an important tool to verify this; whereas, although guidance may be given, the solvent management plan is not developed to the stage where a Community methodology can be established;
- (23) Whereas Member States have to establish a procedure to be followed and measures to be taken where emission limitations are exceeded;
- (24) Whereas the Commission and the Member States should collaborate in order to ensure that information on the implementation of this Directive and on the progress of substitution options is exchanged,

HAS ADOPTED THIS DIRECTIVE:

*Article 1*

**Purpose and scope**

The purpose of this Directive is to prevent or reduce the direct and indirect effects of emissions of volatile organic compounds 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 IIA.

*Article 2*

**Definitions**

For the purposes of this Directive:

1. installation shall mean a stationary technical unit where one or more activities falling within the scope defined in Article 1 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;
2. existing installation shall mean an installation in operation or, in accordance with legislation existing before the date on which this Directive is brought into effect, an installation which is authorised or registered or, in the view of the competent authority, the subject of a full request for authorisation, provided that the installation is put into operation no later than one year after the date on which this Directive is brought into effect;
3. small installation shall mean an installation which falls within the lower threshold band of items 1, 3, 4, 5, 8, 10, 13, 16 or 17 of Annex IIA or for the other activities of Annex IIA which have a solvent consumption of less than 10 tonnes/year;
4. substantial change
  - for an installation falling within the scope of Directive 96/61/EC, shall have the definition specified in that Directive,
  - for a small installation, shall mean a change of the nominal capacity leading to an increase of emissions of volatile organic compounds of more than 25 %. Any change that may have, in the opinion of the competent authority, significant negative

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- effects on human health or the environment is also a substantial change,
- for all other installations, shall mean a change of the nominal capacity leading to an increase of emissions of volatile organic compounds 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;
5. 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;
  6. 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;
  7. authorisation shall mean a written decision by which the competent authority grants permission to operate all or part of an installation;
  8. registration shall mean a procedure, specified in a legal act, involving at least notification to the competent authority by the operator of the intention to operate an installation or activity falling within the scope of this Directive;
  9. emissions shall mean any discharge of volatile organic compounds from an installation into the environment;
  10. fugitive emissions shall mean any emissions not in waste gases of volatile organic compounds into air, soil and water as well as, unless otherwise stated in Annex IIA, solvents contained in any products. They include uncaptured emissions released to the outside environment via windows, doors, vents and similar openings;
  11. waste gases shall mean the final gaseous discharge containing volatile organic compounds or other pollutants, from a stack or abatement equipment into air. The volumetric flow rates shall be expressed in m<sup>3</sup>/h at standard conditions;
  12. total emissions shall mean the sum of fugitive emissions and emissions in waste gases;
  13. emission limit values shall mean the mass of volatile organic compounds, expressed in terms of certain specific parameters, concentration, percentage and/or level of an emission, calculated at standard conditions, N, which may not be exceeded during one or more periods of time;
  14. 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;
  15. preparations shall mean mixtures or solutions composed of two or more substances;
  16. organic compound shall mean 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;
  17. 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 this Directive, the fraction of creosote which exceeds this value of vapour pressure at 293,15 K shall be considered as a VOC;
  18. organic solvent shall mean 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;



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19. halogenated organic solvents shall mean an organic solvent which contains at least one atom of bromine, chlorine, fluorine or iodine per molecule;
20. coatings shall mean 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;
21. adhesives shall mean 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;
22. ink shall mean 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;
23. varnish shall mean a transparent coating;
24. consumption shall mean the total input of organic solvents into an installation per calendar year, or any other 12-month period, less any VOCs that are recovered for reuse;
25. input shall mean 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;
26. reuse of organic solvents shall mean 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;
27. mass flow shall mean the quantity of VOCs released, in unit of mass/hour;
28. 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;
29. normal operations shall mean all periods of operation of an installation or activity except start-up and shut-down operations and maintenance of equipment;
30. contained conditions shall mean conditions under which an installation is operated such that the VOCs 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;
31. standard conditions shall mean a temperature of 273,15 K and a pressure of 101,3 kPa;
32. average over 24 hours shall mean the arithmetic average of all valid readings taken during the 24-hour period of normal operation;
33. start-up and shut-down operations shall mean 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.

*Article 3***Obligations applying to new installations**

Member States shall adopt the necessary measures to ensure that:

1. all new installations comply with Articles 5, 8 and 9;
2. all new installations not covered by Directive 96/61/EC are registered or undergo authorisation before being put into operation.

▼B*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**

1. Member States shall take the appropriate measures, either by specification in the conditions of the authorisation or by general binding rules to ensure that paragraphs 2 to 12 are complied with.
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.

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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 <sup>(1)</sup>, 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<sup>3</sup> 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<sup>3</sup> 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<sup>3</sup> in the case of incineration,
- 150 mg C/Nm<sup>3</sup> 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.

13. Where a risk assessment is carried out in accordance with Council Regulation (EEC) No 793/93 <sup>(2)</sup> and Commission Regulation (EC) No 1488/94 <sup>(3)</sup> or Council Directive 67/548/EEC and Commission Directive 93/67/EEC <sup>(4)</sup> of any of the substances causing the labelling

<sup>(1)</sup> OJ 196, 16.8.1967, p. 1. Directive as last amended by Commission Directive 98/98/EC (OJ L 355, 30.12.1998, p. 1).

<sup>(2)</sup> OJ L 84, 5.4.1993, p. 1.

<sup>(3)</sup> OJ L 161, 29.6.1994, p. 3.

<sup>(4)</sup> OJ L 227, 8.9.1993, p. 9.

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R40, R60 or R61 which are controlled under this Directive, the Commission shall consider the conclusions of the risk assessment and shall take the necessary measures as appropriate.

*Article 6***National plans**

1. Without prejudice to Directive 96/61/EC, Member States may define and implement national plans for reducing emissions from the activities and industrial installations covered by Article 1, excluding activities 4 and 11 of Annex IIA. None of the other activities may be excluded from the scope of this Directive by means of a national plan. These plans shall result in a reduction of the annual emissions of VOCs from existing installations covered by this Directive by at least the same amount and within the same time frame as would have been achieved by applying the emission limits under Article 5(2) and (3) and Annex II, during the validity period of the national plan. The national plan, if necessary updated, will be resubmitted to the Commission every three years.

A Member State which defines and implements national plans may exempt existing installations from implementation of the emission limit values laid down in Article 5(2) and (3) and Annex II. A national plan may under no circumstances exempt an existing installation from the provisions laid down in Directive 96/61/EC.

2. A national plan shall include a list of the measures taken or to be taken to ensure that the aim specified in paragraph 1 will be achieved, including details of the proposed plan monitoring mechanism. It shall also include binding interim reduction targets against which progress towards the aim can be measured. It shall be compatible with the relevant existing Community legislation, including the relevant provisions of this Directive, and shall include:

- an identification of the activity or activities to which the plan applies,
- the reduction in emissions to be achieved by those activities which corresponds to that which would have been achieved by applying the emission limits as specified in paragraph 1,
- the number of installations affected by the plan and their total emissions and the total emission of each of the activities.

The plan shall also include a full description of the range of instruments through which its requirements will be achieved, evidence that these instruments will be enforceable and details of the means by which compliance with the plan will be demonstrated.

3. The Member State shall submit the plan to the Commission. The plan must be accompanied by supporting documentation sufficient to verify that the aim of paragraph 1 will be achieved, including any documentation specifically requested by the Commission. Existing installations undergoing a substantial change shall remain within the scope of the national plan, provided that they were part of this plan before undergoing such substantial change.

4. The Member State shall designate a national authority for the collection and evaluation of the information required by paragraph 3 and for the implementation of the national plan.

5. (a) The Commission shall inform the committee referred to in Article 13 of the criteria for assessing national plans, one year after the entry into force of this Directive at the latest.

- (b) If the Commission, in considering the plan, the resubmitted plan, or in considering the progress reports submitted by the Member State under Article 11, is not satisfied that the objectives of the plan will be achieved within the prescribed period, it shall inform the Member State and the committee referred to in Article 13 of its opinion and of the reasons for reaching such an opinion. It shall do so within six months of receipt of the plan or report. The Member State shall then notify the Commission and inform the committee, within three months, of the

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corrective measures it will take in order to ensure that the objectives are achieved.

6. If the Commission decides within six months of the notification of the corrective measures that those measures are insufficient to ensure that the objective of the plan is achieved within the prescribed period, the Member State shall be obliged to satisfy the requirements of Article 5(2) and (3) and Annex II within the period specified in this Directive in the case of existing installations. The Commission shall inform the committee referred to in Article 13 of its decision.

*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 questions 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 costs 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. Following the exchange of information, the Commission shall publish guidance for each activity.

2. Member States shall ensure that the guidance referred to in paragraph 1 is taken into account during authorisation and during the formulation of general binding rules.

*Article 8***Monitoring**

1. Member States shall introduce an obligation for the operator of an installation covered by this Directive to supply the competent authority once a year or on request with data that enables the competent authority to verify compliance with this Directive.

2. Member States shall ensure that channels to which abatement equipment is connected, and which at the final point of discharge emit more than an average of 10 kg/h of total organic carbon, are monitored continuously for compliance.

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.

4. Measurements are not required in the case where end-of-pipe abatement equipment is not needed to comply with this Directive.

5. The Commission shall organise an exchange of information on the use of solvent management plans in Member States based on the data for the implementation of this Directive in the three years following the date referred to in Article 15.

*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).

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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 volatile organic compounds 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.

*Article 11***Information systems and reporting**

1. At intervals of three years, Member States shall send information to the Commission on the implementation of this Directive in the form of a report. The report shall be drawn up on the basis of a questionnaire or outline drafted by the Commission in accordance with the procedure laid down in Article 6 of Directive 91/692/EEC <sup>(1)</sup>. The questionnaire or outline shall be sent to the Member States six months before the start of the period covered by the report. The report shall be made to the Commission within nine months of the end of the three-year period covered by it. Member States shall publish the reports produced at the same time as they are transmitted to the Commission, subject to the restrictions laid down in Article 3(2) and (3) of Directive 90/313/EEC <sup>(2)</sup>. The first report shall cover the period of the first three years after the date referred to in Article 15.

2. The information submitted under paragraph 1 shall, in particular, include sufficient representative data to demonstrate that the requirements of Article 5 and as the case may be, the requirements of Article 6 have been complied with.

3. The Commission shall draw up a report on the implementation of this Directive on the basis of the data provided by the Member States

<sup>(1)</sup> OJ L 377, 31.12.1991, p. 48.

<sup>(2)</sup> OJ L 158, 23.6.1990, p. 56.

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at the latest five years after the first reports are submitted by the Member States. The Commission shall submit this report to the European Parliament and the Council, accompanied by proposals if necessary.

*Article 12***Public access to information**

1. Without prejudice to Directive 90/313/EEC, Member States shall take the necessary measures to ensure that at least applications for authorisation for new installations or for substantial changes of those installations requiring a permit under Directive 96/61/EC are made available for an appropriate period of time to the public, to enable it to comment on them before the competent authority reaches a decision. Without prejudice to Directive 96/61/EC, no obligation to reformat the information for the public is implied.

The decision of the competent authority, including at least a copy of the authorisation, and any subsequent updates, must also be made available to the public.

The general binding rules applicable for installations and the list of registered and authorised activities shall be made available to the public.

2. The results of emission-monitoring as required under the authorisation or registration conditions referred to in Articles 8 and 9 and held by the competent authority must be made available to the public.

3. Paragraphs 1 and 2 shall apply, subject to the restrictions regarding grounds for refusal by public authorities to provide information, including commercial and industrial confidentiality, laid down in Article 3(2) and (3) of Directive 90/313/EEC.

**▼M1***Article 13*

1. The Commission shall be assisted by a committee.
2. Where reference is made to this Article, Articles 3 and 7 of Decision 1999/468/EC <sup>(1)</sup> shall apply, having regard to the provisions of Article 8 thereof.
3. The Committee shall adopt its rules of procedure.

**▼B***Article 14***Sanctions**

Member States shall determine the sanctions applicable to breaches of the national provisions adopted pursuant to this Directive and shall take all necessary measures for their implementation. The sanctions determined must be effective, proportionate and dissuasive. Member States shall notify these provisions to the Commission at the latest by the date mentioned in Article 15, and shall notify any subsequent modification of them as soon as possible.

*Article 15***Transposition**

1. Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive **►C2** not later than 1 April 2001. **◄** They shall forthwith inform the Commission thereof.

<sup>(1)</sup> Council Decision 1999/468/EC of 28 June 1999 laying down the procedures for the exercise of implementing powers conferred on the Commission (OJ L 184, 17.7.1999, p. 23).

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When Member States adopt these measures, they shall contain a reference to this Directive or shall be accompanied by such a reference on the occasion of their official publication. The methods of making such a reference shall be laid down by the Member States.

2. Member States shall communicate to the Commission the text of the main provisions of national law which they adopt in the field covered by this Directive.

*Article 16***Entry into force**

This Directive shall enter into force on the day of its publication in the *Official Journal of the European Communities*.

*Article 17***Addressees**

This Directive is addressed to the Member States.





*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 <sup>(1)</sup>, 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.

<sup>(1)</sup> OJ L 42, 23.2.1970, p. 1. Directive as last amended by Directive 97/27/EC (OJ L 233, 25.8.1997, p. 1).

**▼B***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 non-printing 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:

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- 
- 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

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— 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.

## ANNEX II A

## I. 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 <sup>3</sup> )	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	100	30 <sup>(1)</sup>				<sup>(1)</sup> Solvent residue in finished product is not to be considered as part of fugitive emissions.
		> 25	20	30 <sup>(1)</sup>				
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	100	25				<sup>(1)</sup> Threshold for rotary screen printing on textile and on cardboard.
		> 25	100	20				
		> 30 <sup>(1)</sup>	100	20				
4	Surface cleaning <sup>(1)</sup> (> 1)	1—5	20 <sup>(2)</sup>	15				<sup>(1)</sup> Using compounds specified in Article 5(6) and (8). <sup>(2)</sup> Limit refers to mass of compounds in mg/Nm <sup>3</sup> , and not to total carbon.
		> 5	20 <sup>(2)</sup>	10				
5	Other surface cleaning (> 2)	2—10	75 <sup>(1)</sup>	20 <sup>(1)</sup>				<sup>(1)</sup> Installations which 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.
		> 10	75 <sup>(1)</sup>	15 <sup>(1)</sup>				



	Activity (solvent consumption threshold in tonnes/year)	Threshold (solvent consumption threshold in tonnes/ year)	Emission limit values in waste gases (mg C/Nm <sup>3</sup> )	Fugitive emission values (percentage of solvent input)		Total emission limit values		Special provisions
				New	Existing	New	Existing	
6	Vehicle coating (< 15) and vehicle refinishing	> 0,5	50 <sup>(1)</sup>	25				<sup>(1)</sup> Compliance in accordance with Article 9(3) should be demonstrated based on 15 minute average measurements.
7	Coil coating (> 25)		50 <sup>(1)</sup>	5	10			<sup>(1)</sup> For installations which use techniques which allow reuse of recovered solvents, the emission limit shall be 150.
8	Other coating, including metal, plastic, textile <sup>(2)</sup> , fabric, film and paper coating (> 5)	5—15	100 <sup>(1)</sup> <sup>(4)</sup>	► C2 25 <sup>(4)</sup> ▼				<sup>(1)</sup> Emission limit value applies to coating application and drying processes operated under contained conditions. <sup>(2)</sup> The first emission limit value applies to drying processes, the second to coating application processes. <sup>(3)</sup> 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. <sup>(4)</sup> 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). <sup>(5)</sup> Rotary screen printing on textile is covered by activity No 3.
		> 15	50/75 <sup>(2)</sup> <sup>(4)</sup>	20 <sup>(4)</sup>				

	Activity (solvent consumption threshold in tonnes/year)	Threshold (solvent consumption threshold in tonnes/ year)	Emission limit values in waste gases (mg C/Nm <sup>3</sup> )	Fugitive emission values (percentage of solvent input)		Total emission limit values		Special provisions
				New	Existing	New	Existing	
9	Winding wire coating ( $> 5$ )					10 g/kg <sup>(1)</sup> 5 g/kg <sup>(2)</sup>	<p><sup>(1)</sup> Applies for installations where average diameter of wire <math>\leq 0,1</math> mm.</p> <p><sup>(2)</sup> Applies for all other installations.</p>	
10	Coating of wooden surfaces ( $> 15$ )	15—25  $> 25$	100 <sup>(1)</sup>  50/75 <sup>(2)</sup>	25  20			<p><sup>(1)</sup> Emission limit applies to coating application and drying processes operated under contained conditions.</p> <p><sup>(2)</sup> The first value applies to drying processes, the second to coating application processes.</p>	
11	Dry cleaning					20 g/kg <sup>(1)</sup> <sup>(2)</sup> <sup>(3)</sup>	<p><sup>(1)</sup> Expressed in mass of solvent emitted per kilogram of product cleaned and dried.</p> <p><sup>(2)</sup> The emission limit in Article 5(8) does not apply for this sector.</p> <p><sup>(3)</sup> 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 2 000 permanent inhabitants where the use of advanced technology equipment is not economically feasible.</p>	
12	Wood impregnation ( $> 25$ )		100 <sup>(1)</sup>	45		11 kg/m <sup>3</sup>	<p><sup>(1)</sup> Does not apply for impregnation with creosote.</p>	

	Activity (solvent consumption threshold in tonnes/year)	Threshold (solvent consumption threshold in tonnes/ year)	Emission limit values in waste gases (mg C/Nm <sup>3</sup> )	Fugitive emission values (percentage of solvent input)		Total emission limit values		Special provisions
				New	Existing	New	Existing	
13	Coating of leather (> 10)	10—25 > 25 > 10 <sup>(1)</sup>					85 g/m <sup>2</sup> 75 g/m <sup>2</sup> 150 g/m <sup>2</sup>	Emission limits are expressed in grams of solvent emitted per m <sup>2</sup> of product produced.  ( <sup>1</sup> ) 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 <sup>2</sup>	
16	Adhesive coating (> 5)	5—15 > 15	50 <sup>(1)</sup> 50 <sup>(1)</sup>	25 20				( <sup>1</sup> ) If techniques are used which allow reuse of recovered solvent, the emission limit value in waste gases shall be 150.
17	Manufacture of coating preparations, varnishes, inks and adhesives (> 100)	100—1 000 > 1 000	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 <sup>(1)</sup>	25 <sup>(2)</sup>			25 % of solvent input	( <sup>1</sup> ) If techniques are used which allow reuse of recovered solvent, the emission limit value in waste gases shall be 150.  ( <sup>2</sup> ) The fugitive emission value does not include solvent sold as part of products or preparations in a sealed container.

	Activity (solvent consumption threshold in tonnes/year)	Threshold (solvent consumption threshold in tonnes/ year)	Emission limit values in waste gases (mg C/Nm <sup>3</sup> )	Fugitive emission values (percentage of solvent input)		Total emission limit values		Special provisions
				New	Existing	New	Existing	
19	Vegetable oil and animal fat extraction and vegetable oil refining activities (> 10)					Animal fat: 1,5 kg/tonne Castor: 3 kg/tonne Rape seed: 1 kg/tonne Sunflower seed: 1 kg/tonne Soya beans (normal crush): 0,8 kg/tonne Soya beans (white flakes): 1,2 kg/tonne Other seeds and other vegetable matter: 3 kg/tonne <sup>(1)</sup> 1,5 kg/tonne <sup>(2)</sup> 4 kg/tonne <sup>(3)</sup>	<p><sup>(1)</sup> 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.</p> <p><sup>(2)</sup> Applies to all fractionation processes excluding de-gumming (the removal of gums from the oil).</p> <p><sup>(3)</sup> Applies to de-gumming.</p>	
20	Manufacturing of pharmaceutical products (> 50)		20 <sup>(1)</sup>	5 <sup>(2)</sup>	15 <sup>(2)</sup>	5 % of solvent input  15 % of solvent input	<p><sup>(1)</sup> If techniques are used which allow reuse of recovered solvent, the emission limit value in waste gases shall be 150.</p> <p><sup>(2)</sup> The fugitive emission limit value does not include solvent sold as part of products or preparations in a sealed container.</p>	



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## 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<sup>2</sup> 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 <sup>2</sup> or 1,3 kg/ body + 33 g/m <sup>2</sup>	60 g/m <sup>2</sup> or 1,9 kg/ body + 41 g/m <sup>2</sup>
	≤ 5 000 monocoque or > 3 500 chassis-built	90 g/m <sup>2</sup> or 1,5 kg/ body + 70 g/m <sup>2</sup>	90 g/m <sup>2</sup> or 1,5 kg/ body + 70 g/m <sup>2</sup>
		Total emission limit (g/m <sup>2</sup> )	
Coating of new truck cabins (> 15)	≤ 5 000	65	85
	> 5 000	55	75
Coating of new vans and trucks (> 15)	≤ 2 500	90	120
	> 2 500	70	90
Coating of new buses (> 15)	≤ 2 000	210	290
	> 2 000	150	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.



## 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 31.10.2005	Target emission × 1,5
By 31.10.2004	By 31.10.2007	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 volatile organic compounds 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

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- (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 II A,
  - (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.



*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):

- I1 The 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.
- I2 The 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):

- O1 Emissions in waste gases.
- O2 Organic solvents lost in water, if appropriate taking into account waste water treatment when calculating O5.
- O3 The quantity of organic solvents which remains as contamination or residue in products output from the process.
- O4 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.
- O5 Organic solvents and/or organic compounds lost due to chemical or physical reactions (including for example those which are destroyed, e.g. by incineration or other waste gas or waste water treatments, or captured, e.g. by adsorption, as long as they are not counted under O6, O7 or O8).
- O6 Organic solvents contained in collected waste.
- O7 Organic solvents, or organic solvents contained in preparations, which are sold or are intended to be sold as a commercially valuable product.
- O8 Organic solvents contained in preparations recovered for reuse but not as input into the process, as long as not counted under O7.
- O9 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:

$$C = I1 - O8$$

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.

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- (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:

$$E = F + O1$$

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:

$$F = I1 - O1 - O5 - O6 - O7 - O8$$

or

$$F = O2 + O3 + O4 + O9$$

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:

$$I = I1 + I2$$

(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.