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Supplement to the methodology for risk evaluation of biocides

Environmental Emission Scenarios for Biocides used as Film Preservatives (Product type 7)

European Commission DG ENV / RIVM

January 2004

EUBEES

This report has been developed in the context of the EU project entitled "Gathering, review and development of environmental emission scenarios for biocides" (EUBEES 2).
The contents have been discussed and agreed by the EUBEES 2 working group, consisting of representatives of some Member States, CEFIC and Commission. The Commissions financial support of the project is gratefully acknowledged (Ref. B4-3040/2001/326154/MAR/C3).

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FOREWORD

The European Parliament and the Council adopted in 1998 the Directive 98/8/EC on the placing of biocidal products on the market (Biocidal Products Directive, BPD). The background for the directive is a need for harmonisation of the legislation of the Member States regarding this type of chemicals, which are intended for exerting a controlling effect on higher or lower organisms. The Directive requires an authorisation process for biocidal products containing active substances listed in positive lists (Annex I and IA). Active substances may be added to the positive lists after evaluation of the risks to workers handling biocides, risks to the general public and risks to the environment. The risk assessments are carried out for the life cycle of the biocide: risks during and resulting from the application, risks associated with (the use of) the treated product and risks resulting from the disposal of the biocide and the treated product.

For the environmental risk assessment the environmental exposure needs to be evaluated. Within the risk assessment of industrial chemicals, emission scenario documents have been developed for a number of Industrial Categories (IC) that are included in section IV of the Technical Guidance Document (EC 2003). For Product type 7 covering film preservatives, various applications and processes are expected to be similar to those for industrial chemicals. These emission scenario documents were checked on their suitability for use in the context of the BPD.

This report has been developed by Royal Haskoning, The Netherlands, in the context of the EU project entitled "Gathering, review and development of environmental emission scenarios for biocides" (EUBEES 2). The contents have been discussed and agreed by the EUBEES 2 working group, consisting of representatives of some Member States, CEFIC and the Commission. The Commissions financial support of the project is gratefully acknowledged (Ref. B4-3040/2001/ 326154/MAR/C3).

For quick reference a summary of the available scenarios is given in Section 4.

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1 INTRODUCTION

1.1 Background

In the Technical Guidance Document on risk assessment (EU-TGD, EC 2003) emission scenarios are described that can be used to evaluate the environmental emission of chemical substances. In this document the suitability of the emission scenarios for industrial chemicals is checked for use in the evaluation of biocidal products covered by Product type 7 (PT 7), Film preservatives, as distinguished in the Biocidal Products Directive (BPD).

Biocidal products of Product type 7 are used to preserve layers of materials such as paints and adhesives on a substrate during service life of these materials. Relevant applications are:

- Paints and coatings
- Plastics
- Glues and adhesives
- Fluids used in paper, textile and leather production

In the EU Technical Guidance Document various documents are available on Industrial Categories (IC) that relate to the categories covered by Product type 7. In addition, in projects in various EU member states environmental emission scenarios were developed for relevant industry categories with particular emphasis on the use of biocides. These have already been discussed in the EUBEES Working Group. It should be realised that the scenarios for the Industrial Categories in the TGD are 'living documents': the developments go on and updated versions are circulating in the EU member states and in the OECD. For the purpose of this document, the versions as published in the TGD (EC 2003) have been used.

According to Annex VI of the Biocidal Products Directive the risk assessment shall cover the proposed normal use of the biocidal product together with a 'realistic worst case scenario'. The methods of estimating the emission rate of Film preservatives to the primary receiving environmental compartments are described. The calculation of a realistic worst case PEC using environmental interactions, for example subsequent movement of emissions to secondary environmental compartments (e.g. from soil to ground water), is the result of fate and behaviour calculations and models and is therefore considered outside the scope of this document.

The report was discussed in the working group for the EU project "Gathering, review and development of environmental emission scenarios for biocides (EUBEES 2)".

1.2 Available scenario descriptions

PT 7 relates to the use of preservatives in films on a substrate. Table 1.1 presents the environmental emission scenarios available in the EU TGD (EC 2003) that may apply to PT 7. In addition, some documents are included that are under discussion within the member states.

Table 1.1. Available emission scenario documents

PT 7	**Available scenario documents**
Paints and coatings	EU – TGD (EC 2003): IC-14 Paints, laquers and varnishes industry. Assessment of the environmental release of chemicals from the paints, laquers and varnishes industry.
	OECD (PT8): Emission Scenario Document for Wood Preservatives, Part 1 to Part 4. (OECD 2003)
	OECD (PT21): Emission Scenario Document for Antifouling Products in OECD countries (draft, Van de Plassche and Van der Aa 2003)
	INERIS/F and EUBEES 2: PT-10 Emission scenario document for biocides used as masonry preservatives. (Migné 2002)
	EA/UK: National R&D Project P2-203: Development of emission scenario documents for use in environmental risk assessment. Coating materials industry: paints, lacquers and varnishes (EA-UK 2002)
Plastics	EA/UK: ESD – Additives used in the plastics industry (UK-BRE, 1998, 2001)
Glues and adhesives	RIVM/NL: Emission scenarios for all 23 PT (incl. PT 7) (Van der Poel and Bakker 2002) (waste stage)
Fluids used in paper, textile and leather production	EU – TGD (EC 2003): IC-12 Pulp, paper and board industry. Assessment of the environmental release of chemicals used in the pulp, paper and board industry. BPT-6,7&9 Biocides used as preservatives in paper coating and finishing. Assessment of the environmental release of biocides used in paper coating and finishing
Paper	
Textile	EU – TGD (EC 2003): IC-13 Textile processing industry. BPT-9 Biocides used as preservatives. Assessment of environmental release of chemicals from the textile finishing industry
	* UBA/Germany: Draft ESD – Textile finishing (Schäfer 2003)
Leather	EU – TGD (EC 2003): * IC-7 Leather processing industry. BPT-9 Biocides used as preservatives. Assessment of the environmental release of chemicals from the leather processing industry

* : Document has been submitted to OECD for discussion and further developments. In this document the version in the TGD (EC 2003) has been used.

A very short description of the relevant contents of these and some other documents that have been agreed or are under discussion within the member states, is given in Appendix 1. These should be considered as helpful documents but the EUBEES group does not give any recommendation on their use.

Within the context of the EUBEES 2 project, the aim was to check ESDs for industrial chemicals in the TGD for their suitability for biocidal products falling under PT7. For Fluids used in Paper, Textile and Leather this work has already been carried out by INERIS. Their documents were discussed and agreed in the EUBEES1 Working Group and have been integrated in the Technical Guidance Document version 2003 (EC 2003).

As a consequence, this document focuses on the one IC-document that has not yet been checked for its applicability for biocidal substances: IC-14 for Paints and Coatings.

1.3 Harmonised presentation

In this report, the emission scenarios are presented in text and Tables. In the Tables, the input and output data and calculations are specified, and units according to USES are used. The input and output data are divided into four groups:

S data Set — parameter must be present in the input data set for the calculations (no method has been implemented in the system to estimate this parameter; no default value is set, data either to be supplied by the notifier or available in the literature);

D Default — parameter has a standard value (most defaults can be changed by the user);

O Output — parameter is the output from another calculation (most output parameters can be overwritten by the user with alternative data);

P Pick list — parameter values to be chosen from a pick list with values.

2 FILM PRESERVATIVES: PAINTS AND COATINGS

2.1 Description of use area and processes for Paints and Coatings

Film preservatives are used for preservation of most types of topcoat paints in outdoor applications by the control of microbial (mainly fungal) deterioration of the paint film. Biocides used in priming wood-care products, for which the main function is a protection of the wood against microbial deterioration are included in Product type 8 - Wood preservatives. Likewise, coatings protecting marine vessels against fouling are included in PT 21 – Antifouling agents.

Paints and varnishes are applied for their decorative and/or protective function. The TGD, in IC-14, distinguishes paints and varnishes. They may be used as pastes or powders. After physical or chemical processes they form a thin adherent film on the surface of the substrate. The treated substrates are mainly metal surfaces (motor vehicles, metal frames, furniture), wooden surfaces (construction elements, toys, furniture, frames) and miscellaneous surfaces (concrete, road marking paints, anti-foulings). The field of use of paints and varnishes may be divided into two categories, i.e. paints for buildings and decoration (both professional and non-professional) and industrial use. Ingredients of paints and varnishes can be classified into 5 main categories: binder, solvent, pigment, colorants, fillers and additives. The latter category, which forms less than 3% in the formulation, include a.o. in-can and film preservatives (IC-14 in EC 2003).

In the UK an environmental emission scenario document was developed for coatings, as an update of the IC-14 description in the EU TGD. ‘Coatings’ is a term used to describe any material that may be applied as a thin continuous layer to a surface (INERIS 2000, cited in EA-UK 2002). The project was concerned specifically with the subset of coatings accounted for by paints, lacquers and varnishes. These products are applied to surfaces for both decorative (colour, gloss or optical effects) and protective purposes. The following definitions are given (EA-UK 2002):

- a *paint* is a pigmented material that, when applied as a liquid to a surface, forms, after a time, a dry adherent film;
- a *lacquer* is a coating which dries by evaporation of the solvent - a thin-bodied, quick-drying, coating material which forms a hard protective film;
- a *varnish* is a transparent coating material based essentially on resins and/or drying oil and solvent.

Not every literature source makes the same distinction of these products.

Water-based or latex paints are typically more prone to deterioration and need an anti-microbial or biocide to act as an in-can preservative. In-can microbial growth or degradation occurs most frequently from contaminants, bacteria and yeast in the raw materials. The same organic paint components act as the microbial food source, causing possible discoloration, gas generation, foul odours, coagulation, rheology changes and can corrosion. A broad spectrum of active substances is used to prevent problems during paint production or in the can during storage

The scheme for the life cycle stages is presented in figure 2.1. The stages of the life cycle of interest for an emission scenario are those of 'Biocide Formulation', the application of the paints during 'Industrial Use', 'Professional Use' and 'Private Use', 'Service Life' and 'Waste Treatment'.

During the 'Product Formulation' stage an in-can preservative may be added to paints and coatings prior to storage in containers . Next, for a longer period the product is left on the shelf in the containers (Product Shelf Life). After application of the product, in industry, professionally or private, by non-professional consumers, the product will remain on the painted or coated surface for the remainder of it's service life. Waste treatments can be very variable; from disposal of excess product remaining in containers (i.e. a fraction which is not used), disposal of painted or coated articles via the normal routings of municipal waste, or stripping off the paint or coating from the material. Some articles (e.g. steel or aluminium) are recycled.

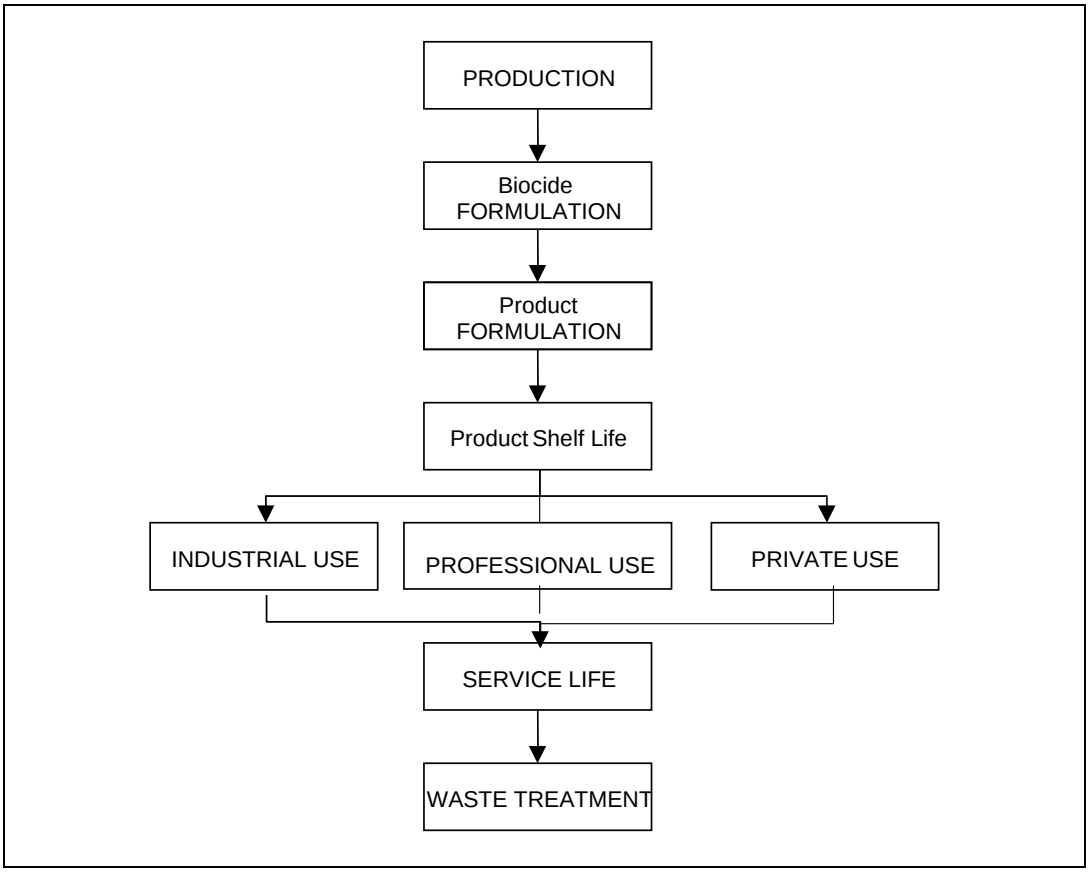

Figure 2.1 Life cycle scheme of paints and coatings (adapted from Van der Poel and Bakker 2002)

Within the Paints and Coatings the following categories may be distinguished:

- decorative coatings include both interior and exterior paints (solvent-borne or water-borne) and also architectural lacquers and wood and furniture varnishes;
- industrial coatings include products such as automotive finishes and refinishes; wood finishes of various kinds; can coatings; machinery coatings; and electrical insulation coating materials; and
- other types of coatings include industrial maintenance paints and marine coatings.

2.2 Description of types of substances used

A list of active substances currently notified for use as Film Preservatives according to the BPD can be found on the ECB Website: http://ecb.jrc.it/biocides/.
For PT7, approximately 100 substances have been notified.

Dry film preservatives that protect the surface coating from mold, mildew and algae growth are typically fungicides. The dominant fungal species can vary with environment, climate, and condition of the paint film. *Aureobasidium pullulans* is the most predominant fungus in U.S. exterior coatings. Optimum fungal growth conditions include a humid environment, a neutral to acidic environment with an organic food source. The main film preservatives used in all applications falling under PT7 are zinc pyrithione and iodopropynyl butyl carbamate (IPBC) (Baumann et al. 2000).

Typical fungicides used in the paint industry for dry film preservation include chlorothalonil, IPBC, octyl isothiazalone, zinc pyrithione, heterocyclic N,S-compounds and N-haloalkylthiocompounds. Mold and mildew control is typically the focus of paint formulation preservative programs, though algae growth can be a significant problem as well. Algal growth requires high humidity, a neutral to alkaline environment, and light, to allow for photosynthetic processes. To facilitate growth, algae also need minerals, which they can find on masonry surfaces. But most fungicides used as dry film preservatives are not good algaecides. Dry film algae protection is a growing trend in the paint industry. One dry film fungicide particularly suited to both fungal and algae protection is zinc pyrithione, also known as zinc 2-pyridinethiol-n-oxide. An important characteristic of this substance is its low solubility in water which makes it suitable for use in outdoor products that require protection against micro organisms, because it will not easily leach out of a paint film. Another relevant characteristics is the gradual UV degradation of the substance in a paint film and therefore, efficacy in direct sunlight can be expected for years. It is also stable at high temperatures Another concern for fungicides in latex paints is alkaline stability (Baumann et al. 2000).

IPBC is an industrial fungicide used in architectural coatings and construction applications (i.e. paints, stains, adhesives, caulks, and sealants), textiles, as well as plastic product applications to prevent dry film fungal growth (Baumann et al. 2000).

Other active substances listed for use in Paints and Coatings are propiconazole, carbendazim, dichlorfluanide, dibutylcresol, folpet (Lassen et al. 2001).

Used quantities of substances

The use of zinc pyrithione in a latex paint normally will be in the range of 0.1% to 0.5 % of active material on wet paint weight. This range will generally cover the needs of various paints for controlling mildew used in different geographic regions. Zinc pyrithone fulfils a standard test that predicts that paint will remain free of algae for six years with 0.075% a.i. (Baumann et al. 2000).

In coating applications, 0.3 – 0.5 % of IPBC (active material) in relation to the weight of the total formulation will protect against mildew growth. Where climates are ideal for mildew growth, up to 1,0 % of the active component should be used (Baumann et al. 2000).

Examples of paint film preservatives and their recommended use level [%] (Rossmoore 1995 in Baumann et al. 2000):

IPBC	0.1 – 0.5
2-n-Octyl-4-isothiazolin-3-one	0.1 – 0.3
Diiodomethyl-p-tolylsulphone	0.2 – 0.7
N-(Trimethylthio) phthalimide	1 – 3

According to Arch Chemicals (2000 in Baumann et al. 2000) film preservatives in paint products have a level with a maximum of 0,5 % by weight of the total formulation. This level increases to 1 % by weight in some climates with ideal growth for mildew.

2.3 Information on the scale or size of the application and use area

For The Netherlands the amount of active biocidal substances in painting products reached about 220 tonnes in 1991 (National Institute of Public Health and Environmental Protection Bilthoven, in Baumann, 2000). For the quantities of Coatings the default values have been generated for the region 'The Netherlands'. For waterborne paints the default value has been set at 210 ktons.yr^{-1} (VVVF, 1996; 1997).

In the UK document on the development of ESD for coatings and applications (EA-UK 2002) an overview of sales volume and sales value of coatings in the EU (1999) and UK (2000) is given. In 2000 around 613 million litres were sold in the UK coatings market. Over half of these sales were accounted for by the decorative paints market (350 million litres). It is noted that the UK represents circa 14% of the total EU market.

2.4 Identification of the potential points of release in the application and use area

Points of release are during product formulation, paint application (use), service life and the waste treatment stage (see figure 2.1). Recycling may be a potential stage for some painted articles (e.g. steel or aluminium) but has not been investigated yet (Van der Poel and Bakker 2002).

The various documents describing emission scenarios that could be used for Paints and Coatings include the emission from different life cycle stages and to different compartments. The final receiving compartments taken into account in the various documents are indicated in table 2.1.

Table 2.1 Receiving compartments in the different emission scenario documents

Paints and coatings	Fresh surface water	Marine surface water	Air indoor and outdoor	Soil	Solid Waste	Waste water
IC14 (Paints, laquers and varnishes industry)						
Formulation			+	+	+	+
Application			+	+	+	+
Elimination				+	+	
EA-UK 2002						
Application			**+**		**+**	**+**
In service				**+**		
End-of-life					**+**	
BPT10 (Masonry preservatives)						
Application (prof. appl.)				+		+
Service life				+		
PT 8 (Wood preservatives)						
Industrial treatment				+	+	
In-situ treatment	+			+		
Treated wood in service	+	+		+		

'+'=relevant

3 EMISSION SCENARIOS FOR FILM PRESERVATIVES IN PAINTS AND COATINGS

3.1 Available scenarios

The EU TGD includes a scenario for IC-14 describing the releases of chemicals in paints and varnishes to the environment during application and disposal. Recently, an Environmental Emission Scenario Document was developed for the “Coating Materials Industry: Paints, Lacquers and Varnishes”. The purpose of this document is to replace the section IC-14 in the TGD. The report considered the information in the TGD IC-14 out of date (EA-UK 2002).

It should be noted that within the EUBEES Working Group an ESD was developed for Product type 10 – Masonry Preservatives. This document covers the release of preservatives from masonry or construction material during treatment and service life (Migné 2002).

In the OECD a scenario document was developed for the emission during application and service life of Wood Preservatives, PT 8 (OECD 2003).

3.2 Update of ESD for environmental risk assessment in Coating Materials Industry: Paints, Laquers and Varnishes

The EA-UK (2002) document will be subject to further revision. The intention is to combine the report with a French report on emissions from the manufacturing of coatings, so the emissions from the whole life cycle of a chemical used in the coating industry are considered. The combined document will then be subject to consultation in the EU and it is intended that a document describing not just the UK, but also the EU situation, will be agreed on and included in a future version of the EU Technical Guidance document (EA-UK 2002).

The report is divided in several chapters each considering a coating type (e.g. decorative paints or automotive coating and finishing). Only for decorative paints it is indicated that film preservatives are used. The report describes emission estimates during application, service life and disposal. Figure 3.1 shows the flow diagram for decorative paints. In this diagram a distinction is made between volatile and solid ingredients. Volatile Organic Compounds (VOC) are defined as organic chemicals and petrochemicals that emit vapours while evaporating. In paints, VOC generally refers to the solvent portion of the paint which, when it evaporates, results in the formation of paint film on the substrate to which it was applied. Naturally the characteristics of the preservative influences the fate of the biocide in the process during the life cycle stages. Normally the preservative in the paint should be present in the solid phase as it is intended to preserve the film during service life (coated product).

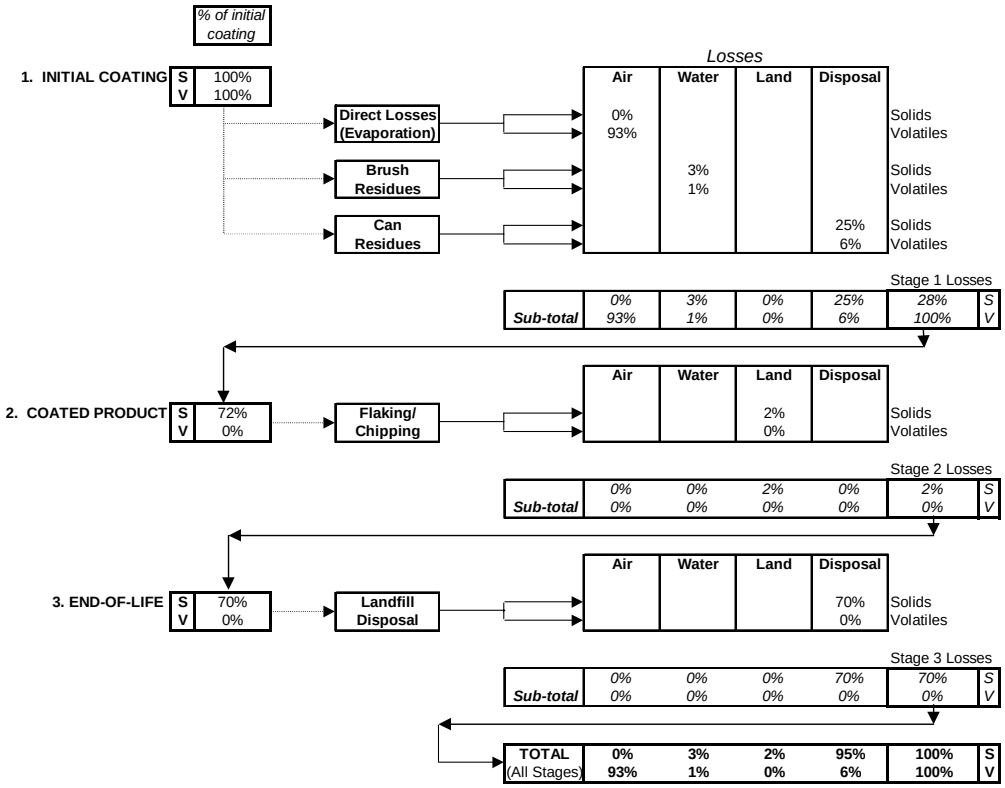

Figure 3.1 Emissions estimates for general public use of decorative paints (EA-UK 2002). The ratio S/V is to be specified for each paint

For use by the general public, it is assumed that an estimated 25% of the initial coating will be left unused in paint cans, whereas 75% of the initial coating is actually used.

The solids and volatiles have different fates:

- 3% of the initial solid fraction will be lost as brush residues and then end up in the sewer whereas the remaining 72% of the initial solid fraction will be deposited on the coated product. On the other hand, 1% of the initial volatile fraction will be lost as brush residues, while during application, 93% of the initial volatile fraction will be lost to the atmosphere;
- 2% (of the initial solid fraction) of the coating will be lost during the useful life of the coating product; and
- the entirety of the coating remaining on the product at the end of its life (essentially 70% of the initial solid fraction) will be disposed of, usually to landfill[1].

For professional painters, comparable assumptions and emission estimates are presented (with deviating values).

[1] Typically, the general public will dispose of used paint cans to the domestic waste stream (where they will be landfilled or incinerated). However, in order to reduce the amount of wasted paints - 25% of total paint is typically wasted – in several countries schemes for controlled treatment of excess/waste are in place

The basis for revision of the existing estimates in IC-14 has been extensive consultation with industry representatives, especially large companies in this sector. A step by step approach was taken in revising the existing data from the TGD and current practices and most realistic scenarios were taken into account in the new estimates. The estimates have been separated into professional and non-professional painting. This compares to the TGD IC-14 estimates that consider emissions based upon the types of paint product applied. The estimates in the TGD are essentially the same for all types of paints in terms of the paint application step. Instead, the new estimates may be used in conjunction with the typical compositions of decorative paints (volatiles / non-volatile, water soluble / non-volatile non soluble) to calculate the emissions of solid and volatiles for different types of decorative paints with different compositions (solids/volatiles ratio).

In addition, for the estimates provided here, it has been assumed that a certain amount of the volatile fraction of paints will be lost to disposal (i.e. will be landfilled, from disposal of partly-used cans).

This approach describes the emission as factors of the use volumes. Emission sources or environmental compartments are not defined. Calculations of the chemical concentrations in the receiving environmental compartments are not possible.

3.2.1 Formulation of biocide containing paints

The EA-UK 2002 document is concerned mainly with emissions during the application and in-service use of coatings and also covers disposal of the coated product or removed coating. The formulation of biocide containing paints is not included. For this life cycle stage the current IC-14 document in the TGD presents emission factors during the formulation of paints and coatings for specific fields of application of the (EC 2003).

3.2.2 Emission scenario for application, service life and disposal

The emission of a preservative in a decorative paint from private use may be estimated using the percentages (or fractions) in the flow scheme in figure 3.1, see table 3.1. The table includes the fractions for the volatile as well as for the solid components in the paints. However, the preservative is usually a liquid which remains in the dry film after evaporation of the solvent or water. Thus only the fractions for the solids are relevant.

A similar scenario can be written for professional use, with different values for the fractions to the various compartments (table 3.2). These scenario descriptions were derived from the tables and diagrams in EA-UK 2002.

Table 3.1 Emission from decorative paints for private use

Variable/parameter	Unit	Symbol	Value [1]	S/D/O/P
Input				
Quantity of paints used containing preservative	[kg. yr^{-1}]	TONNAGE		S
Film preserving agent in the product	[-]	$F_{a.i.}$	[2]	S
Fraction to air during application	[-]	$F_{air, appl}$	0.93 (V)	S
Fraction to water during application	[-]	$F_{water, appl}$	0.03 (S) 0.01 (V)	S
Fraction to disposal during application	[-]	$F_{disp, appl}$	0.25 (S) 0.06 (V)	S
Fraction to soil from film during service life	[-]	$F_{soil, use}$	0.02 (S)	S
Fraction to disposal at waste stage	[-]	$F_{disp., waste}$	0.70 (S)	S
Output				
Total Emission to air	[$kg.yr^{-1}$]	E_{air}		O
Total Emission to waste water	[$kg.yr^{-1}$]	E_{water}		O
Total Emission to soil	[$kg.yr^{-1}$]	E_{soil}		O
Total Emission to waste disposal	[$kg.yr^{-1}$]	$E_{waste\ disposal}$		O
Calculations				
$E_{air} = TONNAGE * F_{a.i.} * F_{air, appl}$				
$E_{water} = TONNAGE * F_{a.i.} * F_{water, appl}$				
$E_{land} = TONNAGE * F_{a.i.} * F_{land, use}$				
$E_{waste\ disposal} = TONNAGE * F_{a.i.} * (F_{disp, appl} + F_{disp, waste})$				

[1] S: solids, V: volatiles

[2] ranges from 0.0015 to 0.01 for decorative paints

Table 3.2 Emission from decorative paints for professional use

Variable/parameter	Unit	Symbol	Value [1]	S/D/O/P
Input				
Quantity of paints used containing preservative	[kg. yr^{-1}]	TONNAGE		S
Film preserving agent in the product	[-]	$F_{a.i.}$	[2]	S
Fraction to air during application	[-]	$F_{air, appl}$	0.98 (V)	S
Fraction to disposal during application	[-]	$F_{disp, appl}$	0.07 (S) 0.02 (V)	S
Fraction to soil from film during service life	[-]	$F_{soil, use}$	0.03 (S)	S
Fraction to disposal at waste stage	[-]	$F_{disp, waste}$	0.90 (S)	S

Variable/parameter	Unit	Symbol	Value [1)]	S/D/O/P
Output				
Total Emission to air	[kg.yr^{-1}]	E_{air}		O
Total Emission to waste water	[kg.yr^{-1}]	E_{water}		O
Total Emission to soil	[kg.yr^{-1}]	E_{soil}		O
Total Emission to waste disposal	[kg.yr^{-1}]	$E_{waste\ disposal}$		O
Calculations				
E_{air} = TONNAGE * $F_{a.i.}$ * $F_{air,\ appl}$				
E_{water} = TONNAGE * $F_{a.i.}$ * 0				
E_{land} = TONNAGE * $F_{a.i.}$ * $F_{land,\ use}$				
$E_{waste\ disposal}$ = TONNAGE * $F_{a.i.}$ * ($F_{disp,\ appl}$ + $F_{disp,\ waste}$)				

1) S: solids, V: volatiles

2) ranges from 0.0015 to 0.01 for decorative paints

The calculations in table 3.1 and 3.2 in fact present the emission on the regional scale as a fraction of the regional tonnage. The local scale can be modelled starting from the STP. The regional emission from private use to wastewater can be converted to the local scale using the emission factors in the B-tables of the TGD (EC 2003):
Elocal = 0.002 * TONNAGEregional or 0.002 * Eregional.

4 CONCLUSION

For industrial and private use an update of the emission scenario document for IC-14 Paint and coatings is in preparation ("Development of Emission scenario Documents for Use in Environmental Risk assessment: Coating Materials Industry: Paints, Lacquers and Varnishes", EA-UK 2002). This document is expected to replace the current IC-14 in the TGD. It describes the emission of preservatives during the application, service life on the coated product and at the end-of-life to air, water, soil and disposal, see table 4.1. However, no specifications are given of the receiving environment. This implies that the resulting emission is to be imported into EUSES and enables calculation of the regional concentrations in various air, water and soil. For the exposure to biocides this seems not to be the most relevant contribution.

For reasons explained in section 3.2.2, for preservatives only the fate of the solid components is relevant.

Table 4.1 Regional emission of biocides from decorative paints for private and professional use

Variable/parameter	Unit	Symbol	Value [1]		S/D/O/P
Input			private	profess.	
Regional use volume of paints used containing preservative	[kg. yr^{-1}]	$TONNAGE_{reg.}$			S
Film preserving agent in the product	[-]	$F_{a.i.}$	[2]		S
Fraction to water during application	[-]	$F_{water, appl}$	0.03 (S)	0.0 (S)	D
Fraction to disposal during application	[-]	$F_{disp, appl}$	0.25 (S)	0.07 (S)	D
Fraction to soil from film during service life	[-]	$F_{soil, use}$	0.02 (S)	0.03 (S)	D
Fraction to disposal at waste stage	[-]	$F_{disp., waste}$	0.70 (S)	0.90 (S)	D
Output					
Total regional emission to air	[kg.yr^{-1}]	$Ereg_{air}$			O
Total regional emission to waste water	[kg.yr^{-1}]	$Ereg_{water}$			O
Total regional emission to soil (land)	[kg.yr^{-1}]	$Ereg_{soil}$			O
Total regional emission to waste disposal	[kg.yr^{-1}]	$Ereg_{waste\ disposal}$			O
Calculations					
$Ereg_{air} = TONNAGE_{reg} * F_{a.i.} * F_{air, appl}$					
$Ereg_{waste\ water} = TONNAGE_{reg} * F_{a.i.} * F_{water, appl}$					
$Ereg_{land} = TONNAGE_{reg} * F_{a.i.} * F_{land, use}$					
$Ereg_{waste\ disposal} = TONNAGE_{reg} * F_{a.i.} * (F_{disp, appl} + F_{disp, waste})$					

[1] S: solids

[2] ranges from 0.0015 to 0.01 for decorative paints

The current draft as it is does not include a scenario for local emissions from private use. The local scale can be modelled from the STP. The regional emission from private use to wastewater can be converted to the local scale using the emission factors in the B-tables of the TGD (EC 2003):

Elocal = 0.002 * TONNAGEregional or 0.002 * Eregional.

In contrast, the ESD developed for Wood preservatives (BPT-8) and Masonry Preservatives (BPT-10) both estimate the local concentrations near the treated objects in water and soil. Regional concentrations are not obtained. These scenarios were developed especially for estimating the emission of biocides from comparable applications as for Paints, lacquers and varnishes.
For the applicability of the various scenarios in these documents the assessor should check the various defaults (e.g., the fraction lost during painting, the number of treatments and their duration, leaching data) on a case by case basis. In this respect the some of the information in the EA-UK document (2002) may be useful.

A summary of the emission scenarios available for the different life cycle stages and the various compartments is presented in table 4.2.

Table 4.2. Summary of the available environmental emission scenarios

Life cycle stage	**Fresh water**	**Marine water**	**Air**	**Soil**	**Solid waste**	**Waste water**
Formulation of coating			IC-14	IC-14	IC-14	IC-14
Paint application – private use	BPT8 local (EA-UK) [1)]	(EA-UK) [1)]	EA-UK regional	BPT8 local EA-UK regional	EA-UK regional	EA-UK regional
Paint application – professional	BPT8 local		EA-UK regional	BPT8 local BPT10 local EA-UK regional	EA-UK regional	BPT10 local
Paint application – industrial				BPT8	BPT8	
Service life of coating	BPT8	BPT8		BPT8 BPT10 EA-UK regional		
Disposal of coating				IC-14	IC-14	

[1)] The current draft of the EA-UK emission scenario document gives only regional emissions but these can be converted to local emissions as indicated in the text. These calculations will also give local emissions to surface waters, as indicated with the parentheses.

Warning: It should be kept in mind that all emission scenarios will develop over time and therefore the reader should always refer to the latest version of the original documents (e.g, the EU Technical Guidance Document) to find out whether adaptations have been introduced.

5 REFERENCES

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IC-13 Textile processing industry &
BPT-9 Biocides used as preservatives in the textile wet processing
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Appendix 1: Available sources of information for PT 7

AVAILABLE SOURCES OF INFORMATION FOR PT 7

1) EU TGD IC 14

This document contains information on:
- the use of paints and varnishes,
- the components in paints and varnishes,
- the concentration of in-can preservatives in paints and varnishes,
- the releases of chemicals in paints and varnishes to the environment during application of paints and the disposal of painted goods.

Next to this tables are provided, where release fractions for different kinds of paints and varnishes and for different life cycle stages are given. The paints are divided in:
- volatile,
- non-volatile and water soluble,
- and non-volatile and non water soluble components.

The information for these tables comes from several companies in various European countries (CEPE, 1993).

Actual emission scenarios are not provided in this document.

2) UK Emission Scenario Document – additives used in the plastics industry, July 2001 (EA-UK).

This document is based on a Use category Document on Plastics Additives, produced in 1998 by BRE for Chemicals Assessment Unit of the Environment Agency (UK). The technical content has been modified from the original document to take account of developments in the assessment of a number of plastics additives under the EU Existing Substances Regulation, and as a result of comments received from the OECD Task Force on Environmental Exposure Assessment.
The document provides an overview of the polymer lifecycle and conversion processes and contains models for the estimation of quantities of additives lost to the environment during manufacture, use and disposal.

3) Tissier & Migne, 2001, INERIS

Tissier & Migne, 2001 contains an emission scenario for products from PTs 6, 7 and 9 in papermaking processes. In this scenario releases from different stages of the papermaking process are taken into account.
Next to the scenario description information is provided about:
- the paper industry and papermaking processes;
- biocides used in papermaking processes;
- expected release routes;
- data and estimates concerning production, process parameters, water consumption and waste water treatment in France, Germany and the EU in general.

4) Tissier & Chesnais, 2001, INERIS

Tissier & Chesnais, 2001 contains an emission scenario for products from PT 9 used in the leather industry. In this scenario releases from the most important steps (according to the scenario description) of processing hides and skins are taken into account.
Next to the scenario description information is provided about:

- the leather industry and the processing of hides and skins;
- biocides used in the leather industry;
- expected release routes;
- data and estimates concerning production, process parameters, water consumption and waste water treatment in several EU countries.

According to Van der Poel and Bakker (2001) this document is not applicable for PT7.

5) Tissier & et al., 2001, INERIS

Tissier et al., 2001 contains an emission scenario for products from PTs 9 and 18 used in the textile processing industry. In this scenario releases from different stages of the textile processing are taken into account.
This scenario is meant for biocides that are applied on textile. The production phase of textile is not taken into account here.
Synthetic fibres are made of polymers and have a specific preparation. For biocides added during the formulation of this polymers (the production phase of synthetic textile), the releases are treated in the scenario for plastic additives (BRE, 1998).

Next to the scenario description information is provided about:
- the textile industry and the processing of textile;
- biocides used in the textile industry;
- expected release routes;
- data and estimates concerning production, process parameters, water consumption and waste water treatment in several EU countries.

According to Van der Poel and Bakker (2001) this document is not applicable for PT7.

6) Baumann et al. 2000, p.6 (Institute for Environmental Research (INFU), University of Dortmund, UBA Berlin: Gathering and review of Environmental Emission Scenarios for biocides (2000))

This document contains information on:
- the use of film preservatives used in the different kinds of products of PT7,
- and expected emission routes.

In many cases the same substance is the active substance in-can as well as in the film. That indicates, that there is a strong correlation to PT 6. The only life cycle stage, that is covered by an emission scenario in this document, is the waste treatment stage. The emission scenario for a landfill (Van der Poel, 1999) is given (see also Baumann et al. 2000 PT6).

7) Van der Poel and Bakker 2001, RIVM report 601 450 009

This document is divided in sections for the different kinds of products in PT6 (for example glues and adhesives). Life cycle schemes are given.
Further is described for:
- paints and coatings: product types 6 and 7 overlap for paints and coatings. Therefore the same ESDs can be used as for PT 6;
- plastics: plastics are polymerised materials and, therefore overlap with PT 9: Fibre, leather, rubber and polymerised materials preservatives.

- glues and adhesives: the only life cycle stage that is covered by an emission scenario is the waste treatment stage. This is the general emission scenario for a landfill.

paper and cardboard: it's questionable whether film preservatives are used for paper (and cardboard). However it seems possible that coatings on paper have to be preserved. The scenarios described seem to be derived from Tissier and Migne 2001.

8) OECD ESD on textile finishing industry. Draft. Revision by Thomas Schäfer (incl. comments of TEGEWA, 5 november 2002) Version 24 January 2003. UBA Germany.
The document describes the European textile industry and the main processes in the textile industry. Also the textile auxiliaries, basic chemicals and biocides are described. Furthermore release estimation per process is given, branch specific parameters and emission calculations.

9) Emission Scenario Document Photographic Industry IC-10. Assessment of the environmental release of photo chemicals. UBA Berlin, Germany.
The document describes the life cycle of photo chemicals, the photographic processes and the European market. It mentions the use of fungicides in photographic materials and may be released at production, processing and disposal. The document presents a simple scenario for the release at processing.

10) Supplement to the methodology for risk evaluation of biocides: Emission scenario document for biocides used as masonry preservatives (product type 10). INERIS, Migné 2002.
Emission scenario document also relevant for film preservatives used as outdoor paints or coatings. Agreed by EUBEES 2 Working Group and CA Meeting on the Biocidal Products Directive. INERIS-DRC-02-25582-ECOT-VMi-no. 02DR0270.doc.

11*) Emission Scenario Document for Wood Preservatives. Part 1 to 4. OECD 2003.*
Emission scenarios for the application and service life of wood preservatives. Includes the aspect of time and leaching. May be also relevant for the application and service life of outdoor paints and coatings.