Specific Environmental Release Categories (SPERCs) for the Application of Liquid and Powder Coatings and Printing Inks (ERCs 4, 5, 8a, 8c, 8d, 8f)

Background Document

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CEPE

European Council of the Paint, Printing Ink and Artists' Colours Industry

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Content

General Disclaimer 4

1. Purpose of the document 4

2. Scope 6

2.1 Uses of Coatings - General **7**

2.2 Product Types and Ingredients **7**

2.2.1 Liquid coatings and printing inks 7

2.2.2 Powder coatings 8

2.3 Application Technologies **9**

2.3.1 Spray application (also addressed as atomisation) 9

2.3.2 Non-spray applications 10

3 Emission Relevance of Operational Conditions **11**

3.1 Spraying 11

3.2 Non-spray Application 12

4 Application of Risk Reduction Measures 13

4.1 Risk reduction measures - spraying 14

4.2 Risk reduction measures – non-spraying 14

5 SPERC Information Sources 15

5.1 Justification of Use Rates 15

5.1.1. Refinement of $F_{prodregion}$ 16

5.1.2. Refinement of the Local Variation AF 16

5.2 Justification of Days Emitting **16**

5.3 Justification of Release Factors 16

5.3.1 Water and Soil 16

5.3.2 Waste 16

5.3.3 Summary of Release Factors 17

5.4 Justification of Risk Management Measures (RMM) **17**

6. Conservatism **18**

7 Applicability of SPERC 18

7.1 Tiered Assessment **18**

7.2 Regional Assessment **18**

8 References 19

Tables

Table 1 Overview on CEPE SPERCs in scope

Table 2 Overview on risk management measures - spray application

Table 3 Overview on risk management measures – non-spray application

Table 4 Summary of release factors for the SPERCs for application of coatings and printing inks

Figures

Figure 1 Overview on application technologies

Glossary: List of Acronyms and Abbreviations

ACEA	European Automobile Manufacturers' Association
AF	Assessment factor
BAT	Best available technologies
BCF	British Coatings Federation
BREF	Best available technologies reference document
C	Consumer use
CEPE	European Council of the Paint, Printing Ink and Artists' Colours Industry
DIY	Do-it-yourself
ECHA	European Chemicals Agency
ERC	Environmental release category
ESD	Emission scenario document
IED	Industrial emissions directive
IS	Use at industrial sites
OECD	Organisation for Economic Co-operation and Development
PC	Product category
PM	Particulate matter
PW	Widespread use by professional workers
REACH	Registration, evaluation, authorization and restriction of chemicals
RF	Release factor
RIVM	Rijksinstituut voor Volksgezondheid en Milieu
RMM	Risk management measure
SPERC	Specific environmental release category
STP	Sewage treatment plant
SU	Sector of use
UV	Ultra-violet radiation
VdL	Verband der deutschen Lack- und Druckfarbenindustrie
VOC	Volatile organic compounds
WWTP	Waste water treatment plant (at industrial site)

General Disclaimer

SPERCs are specific environmental release categories and are meant to specify generic emission scenario information (ERCs) (Reihlen et al. 2016). However, SPERCs still reflect emissions of a broad application area of a substance within an industry sector. For their purpose, SPERCs are conservative for use in lower tier REACH safety assessments and, therefore, their emission estimates are not intended to reflect all regulatory requirements that may relate to environmental emissions. These SPERCs might be further refined based on the provision of additional site-specific data.

1. Purpose of the Document

To carry out an environmental exposure assessment, the quantification of the rates of substances released to the environment is key. While the European Chemicals Agency's (ECHA) Guidance R.16 Environmental exposure assessment (ECHA 2016) provides a generic set of release factors (cf. Table R16-7 of the document), they are less meaningful for several industry sectors. Sector organizations, including CEPE, have refined the generic Environmental Release Categories (ERCs) by detailed analysis of the sector's specific typical operational conditions in order to build 'SPecific Environmental Release Categories' (SPERCs).

Thus, the CEPE SPERCs refine and specify emission scenario information (ERCs) for the use of substances throughout their life cycle (Reihlen et al. 2016) in coatings and printing inks industry.

The SPERCs described in this document are specific to the application of coatings and printing inks:

- Use of non-reactive processing aids at industrial site (no inclusion into or onto article) (ERC4);
- Use at industrial site leading to inclusion into/onto article (ERC5);
- Widespread use of non-reactive processing aid (no inclusion into or onto article, indoor) (ERC 8a);
- Widespread use resulting in inclusion into or onto articles (indoor) (ERC8c);
- Widespread use of non-reactive processing aid (no inclusion into or onto article, outdoor) (ERC8d);
- Wide-spread use resulting in inclusion into or onto articles (outdoor) (ERC8f).

Coatings and printing inks may contain reactive compounds as resins (e.g. melamine, acrylates), activators (e.g. diisocyanates, diamines), or reactive diluents (e.g. styrene, vinyl toluene) which contribute to the formation of films on articles after application. Out of these, only reactive diluents may be released to air to a certain extent in case of widespread use (typically less than 10 % of the applied compound). Thus, the use of reactive compounds should be assigned to ERCs 5, 8c and 8f respectively. Assignment to ERCs 6a, 6b, 6c, 6d, 8b or 8e would be misleading as these ERCs are designed for use as intermediates in the manufacturing of polymers at industrial sites.

As processes may have integrated risk management measures with impacts on the fate of volatile and non-volatile compounds, specific information is provided on exposure relevant operational conditions for product application (Ch. 3), on the application of risk management measures, including non-obligatory ones (Ch. 4), on the information sources, on the derivation method and justification of release factors, days emitting and indicative use rates (Ch.5).

The SPERC factsheets covered by this document, which comprise a number of (sub-)SPERCs are:

CEPE SPERC Code	Type of ingredient	Application area
CEPE SPERC 4_liq_spr_in_voc_inc.v3	volatile ingredients	Application - industrial - spraying - indoor use - incineration
CEPE SPERC 4_liq_spr_in_voc.v3	volatile ingredients	Application - industrial - spraying - indoor use
CEPE SPERC 4_liq_spr_out_voc.v3	volatile ingredients	Application - industrial - spraying - outdoor use (shipyards)
CEPE SPERC 5_liq_spr_in_nv.v3	non-volatile ingredients	Application - industrial - spraying - indoor use
CEPE SPERC 5_liq_spr_out_nv.v3	non-volatile ingredients	Application - industrial - spraying - outdoor use (shipyards)
CEPE SPERC 5_pow_spr_in_nv.v3	non-volatile ingredients	Application - industrial - spraying - indoor use - powder
CEPE SPERC 4_liq_nsp_in_voc_inc.v3	volatile ingredients	Application - industrial – non-spray - indoor use - incineration
CEPE SPERC 4_liq_nsp_in_voc.v3	volatile ingredients	Application - industrial -non-spray - indoor use
CEPE SPERC 4_liq_nsp_in_voc_ec.v3	volatile ingredients	Application - industrial -non-spray (electrocoat) - indoor use
CEPE SPERC 5_liq_nsp_in_nv.v3	non-volatile ingredients	Application - industrial - non-spray - indoor use
CEPE SPERC 5_liq_nsp_in_nv_ec.v3	non-volatile ingredients	Application - industrial -non-spray (electrocoat) - indoor use
CEPE SPERC 5_pow_nsp_in_nv.v3	non-volatile ingredients	Application - industrial - non-spray - indoor use – powder
CEPE SpERC 8a_liq_nsp_in_voc_con.v3	volatile ingredients	Application – consumer brush/roller - indoor use
CEPE SpERC 8c_liq_nsp_in_nv_con.v3	non-volatile ingredients	Application - consumer - brush/roller - indoor use
CEPE SpERC8d_liq_nsp_out_voc_con.v3	volatile ingredients	Application - consumer - brush/roller - outdoor use
CEPE SpERC 8f_liq_nsp_out_nv_con.v3	non-volatile ingredients	Application - consumer - brush/roller - outdoor use

CEPE SpERC 8a_liq_nsp_in_voc_pro.v3	volatile ingredients	Application - professional - brush/roller - indoor use
CEPE SpERC 8c_liq_nsp_in_nv_pro.v3	non-volatile ingredients	Application - professional - brush/roller - indoor use
CEPE SpERC 8d_liq_nsp_out_voc_pro.v3	volatile ingredients	Application - professional - brush/roller - outdoor use
CEPE SpERC 8f_liq_nsp_out_nv_pro.v3	non-volatile ingredients	Application - professional - brush/roller - outdoor use
CEPE SpERC 8a_liq_spr_in_voc_pro.v3	volatile ingredients	Application - professional - spraying - indoor use
CEPE SpERC 8c_liq_spr_in_nv_pro.v3	non-volatile ingredients	Application - professional - spraying - indoor use
CEPE SpERC 8d_liq_spr_out_voc_pro.v3	volatile ingredients	Application - professional - spraying - outdoor use
CEPE SpERC 8f_liq_spr_out_nv_pro.v3	non-volatile ingredients	Application - professional - spraying - outdoor use

Table 1: Overview on CEPE SPERCs in scope

liq: liquid coating	pow: powder coating	spr: spray application	nsp: non-spray application
in: indoor	out: outdoor	voc: volatiles	nv: non-volatiles
con: consumer use	pro: professional use	inc: incineration	ec: electrocoat

In this context, the distinction between volatile and non-volatile ingredients is relevant.

For industrial uses covered by ERCs 4 and 5, this document refers to the definition of volatile organic compounds in the European Industrial Emissions directive (IED) which addresses organic compounds with a vapour pressure at standard conditions of 0.01 kPA or above as volatile (Dir. 2010/75/EU).

For widespread uses by professional workers and consumers covered by ERCs 8a, 8c, 8d and 8f it is more appropriate to refer to the so-called deco paint directive which takes the boiling temperature of 250°C as a threshold. Architectural paints and vehicle refinishing coatings are the most common products for widespread uses (Dir. 2004/42/EC).

2. Scope

The SPERCs in this area are valid for refinement of release factors for substances used in an industrial, professional or consumer setting in applying coatings, comprising solvent-borne, water-borne, liquid solvent-free and powder coatings and printing inks.

Short title:
Use at industrial sites (IS); various sectors of use (SU 5, 6a, 6b, 7, 11, 12, 13, 15, 16, 17, 18, 19)
Widespread use by professional workers (PW); various products (PC 9a, 9b, 18)
Consumer use (C); various products (PC 9a, 9b, 18)

This document does not include the industrial use of coatings (spray application) in installations with wet scrubbers for collection of overspray. A separate SPERC background document and factsheet is available from ACEA (data on release to water shared for information in annex 1).

A separate background document[1] is available for the formulation of coatings (ERC2).

2.1 Uses of Coatings - General

Decorative coatings (sometimes referred to as architectural coatings) are those applied to buildings and associated structures for decoration and protection. The sector is split into the following main categories:

- DIY Paints - these are the coatings found in shops and superstores for application by homeowners etc.
- Trade Paints - coatings that are supplied to the professional decorating sector and companies that carry out new build or refurbishment of buildings, not generally available to the general public
- Woodcare - term used to cover a wide range of products that decorate and protect wooden substrates. These include, for example, fence and shed paints, decking paints and varnishes, floor varnishes and wood stains
- Special effect paints and specialist finishes - a range of coatings that provide two-tone effects and special aesthetic finishes often requiring special application techniques.

Industrial coatings are paints or coatings defined by their protective, functional and aesthetic properties. Common uses of industrial coatings are corrosion control of steel or concrete, as well as degradation control of wooden substrates and plastics. Industrial coatings cover a very large range of diverse uses for coatings with many differing requirements and functions, for example: Aircraft and aerospace coatings; Automotive and Vehicle Refinishes; Can coatings; Coatings for plastics; Coil coatings; General Industrial coatings; High Performance coatings; Intumescent Coatings; Marine coatings; and Wood Finishes.

Printing inks are applied at industrial sites by several different non-spray processes such as flexography, gravure, offset, screen, letterpress and roller coating. Digital inks and toners are applied by non-impact methods such as ink-jet and photo-copying. Depending on the process, inks can be solvent-borne, water-borne, oleo-resinous or energy-curing (UV or electron beam) mixtures. The main uses of printing inks are for packaging and publications with other uses such as screen and textile printing.

2.2 Product Types and Ingredients

2.2.1 Liquid coatings and printing inks

Liquid coatings and inks comprise solvent-borne coatings and inks (25 to 85 % non-volatile content), water-borne coatings and inks (25 to 60 % non-volatile content), oleo-resinous coatings and inks (100%

[1] CEPE Background document on SpERCs for the formulation of liquid and powder coatings and printing inks, 2025

non-volatile content) or solvent-free liquid coatings and inks such as UV curing materials (100 % non-volatile content). For special purpose applications (e.g. wood stains, impregnation, adhesion promotion), the non-volatile content may be lower.

Coatings and inks contain solvents and other volatile organic compounds as processing aids which do not become part of coated objects. Water-borne paints and inks contain between 0.1 and 2 % of organic solvents; for water-borne industrial coatings, the content of organic solvents may range from 2 to 20 %. Coatings also contain liquid and solid compounds which are meant to form a durable solid coating (polymer matrix) on objects.

The major constituents of coatings and inks are binders, activators, pigments, extenders, and solvents including water. In addition, additives such as catalysts, initiators, UV absorbers, neutralizing compounds and sagging control agents are used as typical minor ingredients.

2.2.2 Powder coatings

Powder coatings may be described as 100% solid paint which comprises a homogeneous blend of polymers, pigments and additives produced in the form of a fine powder. The powder is applied, most commonly, by means of a spray gun that imparts an electrical charge on the powder particles and directs them towards the object to be coated. The object is then subjected to heat which causes the powder to melt and flow out to form a tough, coherent film.

There are three categories of coating powder:

- Thermoset coatings: typically particle sizes are in the range 15 - 50 micrometres
- Thermoplastic toners: commonly most particle sizes are in the range 5 – 20 micrometres
- Thermoplastic coatings: for electrostatic grade many particles are around 100 micrometres and for fluidised bed grades they are significantly larger.

Some powders (especially some thermoplastic powders) have mostly large particles and have no potential to emit particulate matter to the air.

Thermosetting powder coatings are available in various chemistries: epoxy, polyester, epoxy/polyester (hybrid), polyurethane and acrylic. These undergo a chemical change when heated and will not re-melt to a plastic state once cured.

Thermoplastic powder coating chemistries include nylon, polyolefins, polyvinylidene fluoride, polyamides, polyvinyl chloride and polyester.

2.3 Application Technologies

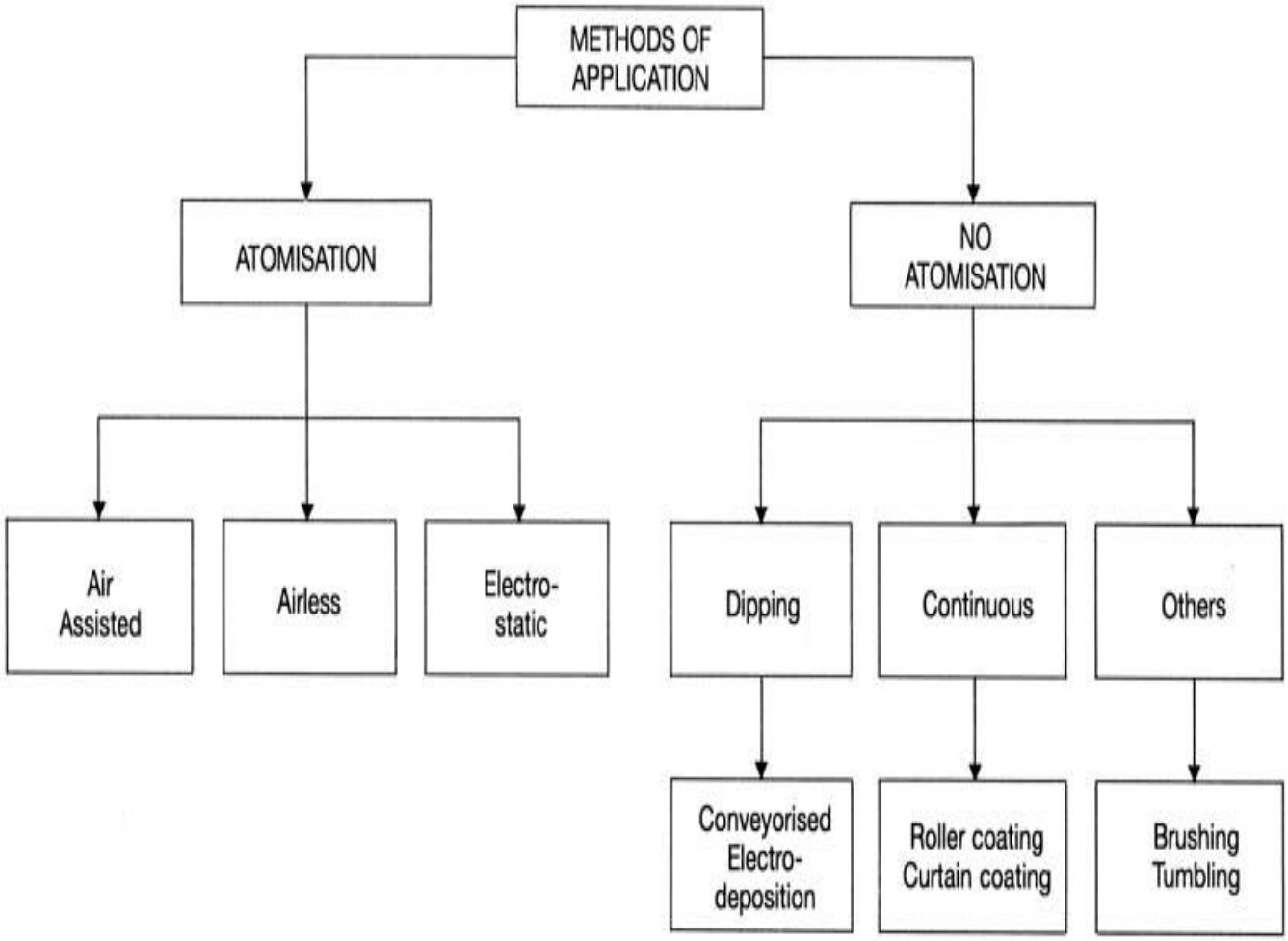

Fig. 1: Overview on application technologies

2.3.1 Spray application (also addressed as atomisation)

Spray coatings are used, when complex three-dimensional objects need to be coated with a protective, functional or decorative layer and when other coating technologies (e.g. pre-coated substrates, rolling, brushing, dipping, adhesive films) are not suitable for technical or economic reasons.

2.3.1.1 Industrial spraying application

Spraying of coatings at industrial sites may occur manually or automatically, by means of spray-guns or high-rotation bells, with or without support of pressurized air, with or without electrostatic charging, continuously or discontinuously.

Due to limited transfer efficiency of spraying techniques, a part (10 to 50 %) of the constituents is not deposited on objects, but forms so-called overspray. Per coating job, transfer efficiency may typically range between 50 and 90 % depending on geometrical and electrostatic substrate properties, atomisation technology and desired effect formation. In special cases, e.g. for complex vehicle bumpers with corns and holes, transfer efficiency may be lower.

Retention of overspray by process-integrated risk management measures is standard. This is achieved by either dry filtering systems, dry precipitation systems or by wet scrubbers. Techniques other than the use of a wet scrubber do not have the potential transfer to a waste water stream.

2.3.1.2 Spraying powder coatings

Powder coatings are typically fed as a powder/air mixture from a feed hopper to the spray gun, which imparts an electrostatic charge on each powder particle by the application of a high voltage. The charged powder particles are attracted to the earthed workpiece to be coated and are deposited onto any conductive object within the spray area. However, some of the particles do not deposit on the workpiece and the so-called overspray is recovered to the feed hopper for re-use, which can result in recovery efficiencies of up to 99%. The coated workpiece is then conveyed to the curing oven.

Another method of charging in some spray gun designs is Tribo Charging. Tribo Charging does not use high voltage, but instead uses the principal of high velocity friction to give the powder particles a static charge.

2.3.1.3 Non-industrial spraying application

For widespread use by professional workers, spray application is common in areas like:

- vehicle refinish and wood coating in near-industrial settings indoor,
- coating of constructions and large objects (e.g. boats in marinas) outdoor,
- repair of small defects outside of dedicated areas without technical controls.

There are very limited activities involving professional spraying in the building sector.

Outdoor spraying with aerosol cans (graffiti etc.) is not covered by this SPERC.

2.3.2 Non-spray applications

Application by non-spray methods is very efficient for transferring product to the substrate.

2.3.2.1 Industrial non-spray application

There are some methods of application not dependent on atomisation and often referred to as “Non-spray ” methods. These include:

- dipping, including electrodeposition
- roller coating in which a train of rollers conveys the paint from a feed duct or tray to the surface, which is to be coated. There may be a series of individual sheets or thin boards or a continuous metal strip
- curtain coating (or flood coating) in which flat sheets pass through a falling film or curtain of liquid paint
- most printing processes
- powder coatings applied by dipping into a fluidised bed of powder.

2.3.2.2 Non-industrial non-spray application

There are miscellaneous methods which include the use of paint brush and paint roller, which dominate the do-it-yourself and professional decorator field.

3 Emission Relevance of Operational Conditions

3.1 Spraying

3.1.1 Industrial spraying application

Volatile compounds are considered to be released to air in the vast majority of cases. Abatement for manual spray booth exhaust air is rarely used because it would require an external device for increasing concentration and reducing air volume after optimized filtration (adsorber wheel). Thus, abatement only captures between 5 (in case of wet-on-wet application) and 35 % of releases, i.e. from oven exhaust air. In automated spray booths, however, recirculation of outlet air has become state of the art during the last fifteen years as this is a preferred solution for the minimization of energy use. Recirculation and optimized filtration lead to increased solvent concentration and reduced exhaust air volume which enables subsequent abatement. Transfer of volatiles to waste has only minor relevance.

Only industrial spraying at ship-yards may have some relevance for a potential transfer of overspray to surface water resp. marine water (volatiles and non-volatiles) and to soil (non-volatiles).

Almost all released volatile compounds assigned to an aquatic hazard are photochemically reactive and (easily) biodegradable, so there is no relevant impact on humans via environment, neither to soil or groundwater via deposition or precipitation.

Non-volatile compounds of the coating overspray are retained by various dry filter techniques or by scrubbers.

3.1.2 Non-industrial spraying application

Widespread professional activities like vehicle refinish and wood coating take place in near-industrial settings indoor. Technical controls are installed, also because they are relevant in order to ensure high quality of appearance without dust impact.

For the coating of constructions and other large objects outdoor, as well as for preparatory activities like sanding or blasting, use of flexible and mobile enclosure (canopies) has evolved as a standard, especially to avoid release to surface water. The ground at the application site is typically covered by impermeable sheets in order to avoid that spills and droplets reach the soil underneath.

Marinas have introduced a specific concept of marina discipline which reflects the experience from dock discipline as introduced at (industrial) shipyards.

For the repeated repair of small defects outside of installations, mobile exhaust filters are available.

For indoor spray application in buildings, it is assumed that most of the overspray paint is deposited inside of rooms (e.g. on coverings) and that only a minor part is released to outdoor air.

3.1.3 Industrial powder coatings spraying application

Oversprayed powder is collected by a reclaim system which separates the air from the powder. The most common primary filter methods are: filter belts, bag filters, cartridge filters, cyclones. There are no volatile components and minor emissions to air of non-volatile materials, after filtration. Due to reclamation of overspray, there is limited emission as waste, unless frequent colour changes lead to material discharges.

Emission to soil is not expected.

3.2 Non-spray Application

3.2.1 Industrial non-spray application

Volatile compounds are considered to be released to air in the vast majority of cases. Abatement for oven exhaust air captures between 50 and 95% of releases. The higher values are typical for coil coating, wire enameling, coating of brake fluid tubes, or rotational printing. Lower values may apply for dip coating when the exhaust air from dipping tanks is not connected to abatement. Abatement has a high efficiency above 95%. Transfer of volatiles to waste has only minor relevance.

Only electrodeposition coatings may have some relevance for the release of volatiles and non-volatiles to waste water due to the withdrawal of anolyte and ultrafiltrate from the process as a corrective action. Dumping of ultrafiltrate has been drastically reduced during the last 30 years and is meanwhile technically avoidable in most cases.

Wet sanding is no longer recommended in most cases and has been replaced by dry sanding with integrated exhaust.

Almost all released volatile compounds assigned to an aquatic hazard are photochemically reactive and easily biodegradable, so there is no relevant impact on humans via environment, neither to soil or groundwater via deposition or precipitation.

Emission to soil is not expected.

3.2.2 Non-industrial non-spray application

In non-industrial application e.g. by brush/roller, almost all of the volatile compounds are considered to be released to air. Non-volatile components are not emitted to air. A small amount of volatile and non-volatile component will be lost in washing in domestic sinks, discharged, via the public sewer, to municipal sewage treatment plant. Despite droplets falling to the ground in the vicinity of the application area, there is no vast release to soil. Unused paint may be re-used, recycled or discharged as municipal waste.

For road marking materials, release to water and soil is a potential issue for the products' service life. There is no specific aspect to be considered for the application stage.

3.2.3 Industrial non-spray application of powder coatings

Powder coatings for fluidized bed application have relatively large particle sizes and, therefore, have low dustiness. Powder particles which may be released during the fluidized bed process are collected by a reclaim system. The most common primary filter methods are: filter belts, bag filters, cartridge filters, cyclones. There are no volatile components and minor emissions of non-volatile materials to air. Due to efficiency of application, there is limited emission as waste. Emission to soil is not expected.

4 Application of Risk Reduction Measures

Volatile compounds are released from coatings in spray-booths, flash-off zone and drying ovens, and furthermore as diffuse emissions. For installations using volatile solvents above applicable thresholds, final release to environmental air depends on the requirement to comply with the Industrial Emissions Directive 2010/75/EC (IED) and its national or local implementation. For large installation with solvent consumption above 200 tonnes per year, best practice is given in the Best Available techniques reference document (BREF) on Surface Treatment Using Solvents (BREF 2020).

Abatement of volatile organic compounds is not considered as an obligatory RMM in this SPERC, as in practice the range of site-specific requirements varies between no abatement and full abatement of exhaust air from spray-booths and ovens in larger users.

For widespread use by professional workers, final release to environmental air depends on the compliant coating VOC limit to comply with the so-called deco-paint directive (Directive on the limitation of emissions of volatile organic compounds due to the use of organic solvents in decorative paints and varnishes and vehicle refinishing products) (Dir. 2004/42/EC).

On-pack information gives advice to avoid release to water or uncontrolled waste stream. For professional users, training is provided which aims to reduce release to water, including tutorials (BCF 2022).

In case of industrial spray application (and in near-industrial settings) of liquid coatings, non-volatile compounds from the overspray are retained from air by filters or scrubbers with high efficiency. In many cases, wet scrubbers have been replaced by new dry scrubber systems during the last fifteen years as these are performing with improved efficiency and thus ease the recirculation of outlet air. For the application of RMMs in these SPERCs, an efficiency of 99% is proposed.

Local exhaust ventilation, integrated extraction in tools and mobile filter units are filtering collected air before recirculation or release to the outside. The typical efficiency of general dust filters (level F 7 to F 9) is 90% for respirable dust (PM10) and 75% for fine dust (PM2.5). There may be higher efficiencies required for toxic compounds (VDMA 2018).

For large objects like ships, flexible housings made of foils or nets are considered as state of the art in order to control releases to areas outside of the dock. Since the year 2000, all sites are dedicated to the so-called Dock Cleaning Management Discipline. Similar provisions are in place in case of outdoor spray application of coatings by professional workers (e.g. coating of constructions, e.g. bridges). This helps to minimize releases to soil and surface water.

For the industrial spray application of powder coatings, recovery systems are in place which allow the recycling of overspray powder in most cases. Typical material losses are limited to 1 % (when using filters) respectively 5 % (when using cyclones). Exhaust air volumes containing non-reclaimed particles are filtered before release to the outdoor air (VDI 2015).

These CEPE SPERCs only cover dry filtration. Wet scrubbers are described by ACEA SPERCs. Overspray collected on dry-back filters and equipment washings will be sent to waste.

On-site waste water treatment is considered for effluents from electrodeposition plants. Cathodic electrodeposition requires withdrawal of released and superfluous organic acid from the dipping tank via membranes. This so-called anolyte liquid is neutralized and released to waste water. Ultrafiltrate is used

as a rinsing fluid. In addition, withdrawal of ultrafiltrate may be useful in case of contaminations inside the dipping tank (due to transfer of compounds from pretreatment, microbiological activity, paint film quality issues) Ultrafiltrate typically contains around 1 % of volatile organic solvents and 0.2 to 0.5 % of non-volatiles. The latter require precipitation, flocculation and filtration of non-volatile compounds in dumped ultrafiltrate, and anolyte neutralization, before release of treated effluents.

Other potential releases to effluent water from cleaning of brushes and rollers are described in chapter 5.

4.1 Risk Reduction Measures - Spraying

	Air	Waste water	Soil	Waste
	Efficiency			
CEPE SPERC 4_liq_spr_in_voc_inc.v3	95% (only meant for captured VOCs)	Not applicable	No impact	No impact
CEPE SPERC 4_liq_spr_in_voc.v3	None	Not applicable	No impact	No impact
CEPE SPERC 4_liq_spr_out_voc.v3	None	Not applicable	No impact	No impact
CEPE SPERC 5_liq_spr_in_nv.v3	99% Filtration	Not applicable	No impact	Spray-booth filters
CEPE SPERC 5_liq_spr_out_nv.v3	Protective sheets, mobile enclosure	Surface water, marine water	Potential impact	Dry overspray
CEPE SPERC 5_pow_nsp_in_nv.v3	95% Cyclone plus 99% filter	Not applicable	No impact	Spray-booth filters loaded
CEPE SpERC 8a_liq_spr_in_voc_pro.v3	None	Not applicable	No impact	No impact
CEPE SpERC 8c_liq_spr_in_nv_pro.v3	95% Filtration	Not applicable	No impact	Spray-booth filters loaded
CEPE SpERC8d_liq_spr_out_voc_pro.v3	None	Not applicable	No impact	No impact
CEPE SpERC 8f_liq_spr_out_nv_pro.v3	Protective sheets, mobile enclosure	Surface water, potentially	Potential impact	Dry overspray

Table 2: Overview on risk management measures - spray application

4.2 Risk Reduction Measures – Non-spraying

	Air	Waste water	Soil	Waste
	Efficiency			
CEPE SPERC 4_liq_nsp_in_voc_inc.v3	95% (only meant for captured VOCs)	Not applicable	No impact	No impact
CEPE SPERC 4_liq_nsp_in_voc.v3	None	Not applicable	No impact	No impact
CEPE SPERC 4_liq_nsp_in_voc_ec.v3	95% (only meant for captured VOCs)	Anolyte, ultrafil-trate withdrawal	No impact	No impact
CEPE SPERC 5_liq_nsp_in_nv.v3	Not applicable	Not applicable	No impact	Residues
CEPE SPERC 5_liq_nsp_in_nv_ec.v3	Not applicable	Treated ultrafil-trate withdrawal	No impact	Residues Sludge
CEPE SPERC 5_pow_nsp_in_nv.v3	Not applicable	Not applicable	No impact	Residues
CEPE SpERC 8a_liq_nsp_in_voc_con.v3	None	Brush/roller cleaning	No impact	Residues

CEPE SpERC 8c_liq_nsp_in_nv_con.v3	None	Brush/roller cleaning	No impact	Residues
CEPE SpERC8d_liq_nsp_out_voc_con.v3	None	Brush/roller cleaning	No impact	Residues
CEPE SpERC 8f_liq_nsp_out_nv_con.v3	None	Brush/roller cleaning	Potential impact	Residues
CEPE SpERC 8a_liq_nsp_in_voc_pro.v3	None	Brush/roller cleaning	No impact	No impact
CEPE SpERC 8c_liq_nsp_in_nv_pro.v3	None	Brush/roller cleaning	No impact	Residues
CEPE SpERC 8d_liq_nsp_out_voc_pro.v3	None	Brush/roller cleaning	No impact	No impact
CEPE SpERC 8f_liq_nsp_out_nv_pro.v3	None	Brush/roller cleaning	Protective sheets	Residues

Table 3: Overview on risk management measures – non-spray application

5 SPERC Information Sources

The OECD Emission Scenario Document (ESD) for coatings contains a number of assumptions on release factors. In context with this SPERC, whilst the coating ESD focuses on emissions to air, figures for substance release to water (and soil) are also included. The ESD has been supplemented by industry knowledge which leads to changes for coil coating (no release to water), reduced release figures for marine coating and for outdoor spraying by professional workers, and the inclusion of a separate sub-SPERC for electrodeposition coating.

For the determination of release rates to water from cleaning of brushes and rollers after non-industrial application of water-borne paints, a study on behalf of German sector organization VdL is available. For four typical application tools, the residual amount of paint on/in the tool after application was determined by weighing. The exercise was repeated 10 times for each tool. With regard to typically applied paint volumes, residues represent less than 1 % (VdL 2017).

Private consumers who apply paints only from time to time (not more than 6 days per year) are likely to clean brushes and rollers at a domestic sink and to release volatile and non-volatile compounds to a municipal sewer.

Professional users on the other hand are supposed to keep brushes and rollers wet (e.g. in so-called brush pots) for continuation of work the next day or to clean tools by using special equipment. So, release rates are assessed to be significantly lower (RIVM 2021).

5.1 Justification of Use Rates

The default procedure for the estimation of tonnages for widespread uses is given in the ERCs contained within R.16.2.2.1.2 of ECHA Guidance document R16 (ECHA 2016). Herein the default 'fraction of EU tonnage used in region' ($F_{prodregion}$) is 0.1, or 10%. The default 'fraction of regional tonnage used locally' ($F_{mainsource}$) is 0.002, or 0.2%. This default is calculated by the following equation:

$$F_{mainsource} = \frac{Population\ connected\ average\ sized\ STP}{Population\ in\ hypothetical\ region} \times AF.$$

Where the population connected to an average sized STP is 10,000 and the population in a hypothetical region is 20,000,000. In addition, a default assessment factor (AF) of 4 is applied to take account of potential local variations in widespread uses in time and space.

5.1.1. Refinement of $F_{prodregion}$

Within all CEPE SPERCs defined under ERC 8a, 8c, 8d and 8f, the fraction of European Union (EU) tonnage used in a region is set to 0.04 (4 %) as opposed to the default of 0.1 (10 %) set within ECHA Guidance R.16 (ECHA 2016). This revision is based on empirical data for population density. According to Price et al. (Price et al. 2010) it is assumed that use and releases in wide-spread uses of consumer products are roughly proportional to population density in a region. EU27 plus United Kingdom, Iceland, Norway, Switzerland and Liechtenstein have a total population of around 540 million. Only two regions out of more than 100 (around London/UK and a transboundary region around der Belgian/German border) have slightly more than 20 million inhabitants. No region has more than 4% of the total population to be taken into account. For widespread uses, there are no specific use patterns known which might justify further variation or refinement. Therefore, for the widespread uses by professional workers and by consumers, the regional tonnage is 4% instead of 10% per default.

5.1.2. Refinement of the Local Variation AF

In the context of these SPERCs, CEPE does not propose to overwrite this default assessment factor.

5.2 Justification of Days Emitting

The justification of the emission days is a reasonable worst-case value for large industrial sites, operating at 300 days a year.

The days emitting for each SPERC related to widespread uses are set to 365 as per ECHA Guidance document R16, chapter R.16.2.2.1.2, 'Estimation of tonnage for widespread uses'. For widespread uses, the assumption is that products could be used by consumers all year round, 365 days a year.

This is not meant for the individual DIY painter who is supposed to carry out work only for 6 days per year.

5.3 Justification of Release Factors

5.3.1 Water and Soil

For all indoor activities, release to soil is not expected. A minor release to soil and surface water may occur at ship-yards, marinas and in context with coating of constructions.

A release to waste water is considered for effluents from electrocoat installations and for the cleaning of brushes and rollers.

5.3.2 Waste

All compounds that are filtered, withdrawn or precipitated are handled as waste. In addition, a certain amount of waste is generated by residues of non-consumed paints in containers. For consumers, this may result in up to 25% product that is not consumed. For professional users, these residues are by far less.

5.3.3 Summary of Release Factors

Based on information provided in preceding chapters, CEPE concludes the following release factors as appropriate.

CEPE SPERC	Release to			
	Air	Waste water	Soil	Waste
CEPE SPERC 4_liq_spr_in_voc_inc.v3	0.1-0.7	0	0	0.01
CEPE SPERC 4_liq_spr_in_voc.v3	0.99	0	0	0.01
CEPE SPERC 4_liq_spr_out_voc.v3	0.99	0	0	0.01
CEPE SPERC 5_liq_spr_in_nv.v3	0.005	0	0	0.1-0.5
CEPE SPERC 5_liq_spr_out_nv.v3	0.05	0-0.01	0.01	0.1-0.3
CEPE SPERC 5_pow_spr_in_nv.v3	0.0002	0	0	0.05-0-3
CEPE SpERC 8a_liq_spr_in_voc_pro.v3	0.99	0	0	0.01
CEPE SpERC 8c_liq_spr_in_nv_pro.v3	0.01	0	0	0.1-0.3
CEPE SpERC8d_liq_spr_out_voc_pro.v3	0.99	0	0	0.01
CEPE SpERC 8f_liq_spr_out_nv_pro.v3	0.05	0-0.01	0.01	0.1-0.3
CEPE SPERC 4_liq_nsp_in_voc_inc.v3	0.05-0.5	0	0	0.01
CEPE SPERC 4_liq_nsp_in_voc.v3	0.99	0	0	0.01
CEPE SPERC 4_liq_nsp_in_voc_ec.v3	(0.05-)0.99	0.02	0	0.01
CEPE SPERC 5_liq_nsp_in_nv.v3	0	0	0	0.01
CEPE SPERC 5_liq_nsp_in_nv_ec.v3	0	0.002	0	0.02
CEPE SPERC 5_pow_nsp_in_nv.v3	0	0	0	0.01
CEPE SpERC 8a_liq_nsp_in_voc_con.v3	0.75-0.9	0.01	0	0.1-0.25
CEPE SpERC 8c_liq_nsp_in_nv_con.v3	0	0.01	0	0.1-0.25
CEPE SpERC8d_liq_nsp_out_voc_con.v3	0.75-0.9	0.01	0	0.1-0.25
CEPE SpERC 8f_liq_nsp_out_nv_con.v3	0	0.01	0.01	0.1-0.25
CEPE SpERC 8a_liq_nsp_in_voc_pro.v3	0.95-0.99	0.002	0	0.01-0.05
CEPE SpERC 8c_liq_nsp_in_nv_pro.v3	0	0.002	0	0.01-0.05
CEPE SpERC 8d_liq_nsp_out_voc_pro.v3	0.95-0.99	0.002	0	0.01-0.05
CEPE SpERC 8f_liq_nsp_out_nv_pro.v3	0	0.002	0.01	0.01-0.05

Table 4: Summary of release factors for the SPERCs for application of coatings and printing inks

5.4 Justification of Risk Management Measures (RMM)

RMMs are understood as on-site measures for the reduction of releases to an environmental compartment. Specific on-site waste water treatment is only considered for effluents from electrocoat installations (cf. chapter 4). Where expected otherwise, effluent water from use of products in scope is supposed to undergo waste water treatment at municipal sewage treatment plants (STPs). The efficiency of STPs is not in scope of SPERCs.

6. Conservatism

The conservatism in the emission estimation of the SPERCs is ensured by assuming a worst-case release factors. The estimates are based on data from the OECD ESD on coatings and paints (OECD 2009). This OECD ESD is based on two reference documents from 2000 and 2002. The latest information, which was included in the derivation of the release factors dates from 2003. Hence, the release factors used in the SPERCs for the industrial application of coatings reflect technology that is more than twenty years old. Given the need for continuous efficiency gains in industrial processes and the concurrent technological advancement it is fair to assume that processes have become more efficient with consequent lower emissions to air, water, and waste. With regard to overall emissions of volatile substances, there have been significant improvements on low VOC products, which have often been adopted voluntarily or to meet industry green standards.

Also, for the widespread uses, VOC content of products has been continuously reduced. And there is increased awareness about release to water which resulted in a change of habits to a certain extent.

7 Applicability of SPERC

7.1 Tiered Assessment

Due to this set of characteristics, we consider the coating SPERCs suitable for use in standardized, lower tier REACH assessments of the vast majority of their ingredient substances. Their envisaged use is for risk assessors to distinguish trivial substances and emission situations from problematic ones based on standardized emission estimates. Based on this distinction, additional efforts can be focused on assessments of situations beyond the defined scope.

7.2 Regional Assessment

As there is very limited regional variation in the widespread use of coatings and printing inks, SPERCs may be applicable for emission estimation of the widespread use of these products across the EU.

8 References

BCF 2022
BCF How to: Guide to cleaning your paint brushes and rollers - YouTube

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Directive on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain paints and varnishes and vehicle refinishing products

Dir. 2010/75/EU
Directive on industrial emissions (integrated pollution prevention and control)

ECHA 2016
Guidance on Information Requirements and Chemical Safety Assessment. Chapter R.16: Environmental exposure assessment.

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Emission Scenario Documents on Coating Industry (Paints, Laquers and Varnishes), Paris 2009

Price et al. 2010
Price, O. R., G. O. Hughes, N. L. Roche, and P. J. Mason. 2010. Improving emissions estimates of home and personal care products ingredients for use in EU risk assessments. Integr Environ Assess Manag 6:677-684.

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RIVM 2021
Paints and microplastics – Exploring recent developments to minimize the use and release of microplastics in the Dutch paint value chain; RIVM report 3023-0037

VDI 2015
VDI-Richtlinie 3457. Emissionsminderung Pulverlackierung (Emission control powder coating)

VdL 2017
Working group report from Dörken. Auswaschmengen bei Werkzeugnutzung (Releases from tool washing)

VDMA 2018
VDMA (Association of German installation and machine manufacturers). Din EN ISO 16890:2017 – Ein Schritt zu mehr Praxisnähe (One step closer to practicbility). Frankfurt/Main 2018

Annex (for information only)

Release factors to water for spray-booths with wet scrubber, as determined by ACEA

Spray coating including purge loss	Safe usage M(sperc)	SB or WB/ Water solubility	Transfer to process waste water	Release after on-site WWTP	Release after municipal STP
	ACEA 4.1.a.v4	SB/>10 mg/l	0.002	1.00	0.25
	ACEA 4.1.b.v4	SB/≤10 mg/l	0.0002	1.00	0.25
	ACEA 4.1.c.v4	WB/>10 mg/l	0.05	1.00	0.25
	ACEA 5.1.a.v4	≤100 mg/l	0.00001	0.10	1.00

SB: Solvent-borne coatings WB: Water-borne coatings