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EUSES : Guidance document on emission estimation

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SAMENVATTING

Sinds het begin van het milieubeleid in de Europese Unie in 1973 zijn inmiddels de principes van preventie en risico-reductie stevig verankerd in regelgeving door de Europese Commissie tezamen met het concept van risicobeoordeling en -beheer van stoffen (EC 1992a). Richtlijn 92/32/EEC (EC, 1992b) vereist een evaluatie van de potentiële gevaren en risico's van nieuwe kennisgegeven stoffen op basis van een basisdossier. De principes van de risicobeoordeling van nieuwe stoffen zijn neergelegd in de commissie richtlijn 93/67 EEC (EC, 1993a), die ondersteund wordt met een uitgebreid pakket Technical guidance Documents (TGDs) (EC, 1993b). De principes van de risicobeoordeling van bestaande stoffen zijn neergelegd in Regeling (EC) 1488/94 (EC, 1994a) die eveneens vergezeld gaat van pakket Technical guidance Documents (EC, 1994b). In 1995 is een geharmoniseerde serie TGDs voor zowel nieuwe als bestaande stoffen door de lidstaten van de Europese Unie aangenomen (EC, 1996a)

Dit rapport is geschreven om een leidraad te bieden bij het gebruik van de emissietabellen, de zogenaamde A en B-tabellen, uit het Technical Guidance Document (TGD) voor nieuwe en bestaande stoffen (EC, 1996a). Deze tabellen vormen als het ware een vangnet voor al die gevallen waarin bij de beoordeling van een stof:

- geen of onvoldoende specifieke gegevens beschikbaar zijn over concentraties in het milieu;
- geen of onvoldoende gegevens beschikbaar zijn over de emissies naar het milieu ten gevolge van processen gedurende de levenscyclus, zoals de productie, formulering en het gebruik;
- geen emissiescenario documenten beschikbaar zijn voor de specifieke toepassing van de stof.

De emissietabellen bevatten informatie over emissiefactoren (A-tabellen) en procesomvangen (B-tabellen). Met procesomvang wordt bedoeld de fractie van de stof die op de voornaamste ('grootste' emissie) bron van toepassing is en het aantal dagen dat emissies bij die bron optreden.

In dit rapport worden eerst aspecten van de levenscyclus, emissies en bronnen en emissieschatting behandeld. Vervolgens wordt de opzet van de emissietabellen besproken, waarbij ingegaan wordt op het onderscheid in productieniveau's en de categorieën die

gehanteerd worden (op basis van het TGD). Tot slot wordt voor een aantal (fictieve) stoffen op basis van de omschrijving van de functie van de stoffen aangegeven hoe zij gecategoriseerd worden en wat de uitkomsten volgens de emissietabellen zijn.

SUMMARY

The principles of prevention and risk reduction have been firmly established in many regulations of the European Commission (EC) and, along with these, the concepts of risk assessment and risk management of substances (EC 1992a). The first article of Directive 92/32/EEC (EC, 1992b) requires an evaluation of the potential hazards and risks of notified new substances on the basis of a specified data set. The principles for carrying out the risk assessment of new substances required by this Directive have been laid down in Commission Directive 93/67/EEC (EC, 1993a), which is supported by a detailed package of Technical Guidance Documents (TGDs) (EC, 1993b). The EC Council Regulation (EC) 793/93 (EC, 1993c) comprises the evaluation and control of the environmental risks of existing substances. The Regulation covers data-gathering, priority-setting, risk assessment process and proposals for risk reduction strategies where appropriate. The principles for this risk assessment have been laid down in Commission Regulation (EC) 1488/94 (EC, 1994a); this was also accompanied by a package of TGDs (EC, 1994b). In 1995 one harmonised set of TGDs for both new and existing substances was adopted by the EU Member States (EC, 1996a).

This report is a guidance document for the use of the emission tables (release scenarios) of the Technical Guidance Document (TGD) (EC, 1996a). These tables consist of two parts, the so-called A and B tables. The A tables contain emission factors for the release scenarios and the B tables supply estimates for the fraction of the substance applicable for the main emission source and the number of days the emission will occur at that source.
This report functions as the guidance document for using these emission tables (release scenarios) developed at the RIVM at the time. They will serve as a fall-back where no or insufficient data are available on concentrations in or releases to the environment.
Dealt with are, first, aspects of the life cycle of substances, emissions and sources which one can distinguish and the estimation of emissions. Second, the set-up of the tables is described and the distinction between production levels and the categories considered in the TGDs are focused on. Finally, a number of examples have been worked out for (fictitious) substances on how to interpret the tables according to the description of function and use.

1. INTRODUCTION

Quantitative risk assessment emerged as a science and as a basis for regulatory decision-making only about 20 years ago. Since the start in 1973 of the environmental policy in the former EC with the adoption of the first Five-year European Community Environmental Action Programme (EC, 1973), the principles of prevention and risk reduction have been firmly established in many regulations of the European Commission (EC) and with them the concepts of risk assessment and risk management of substances (EC 1992a). The first article of Directive 92/32/EEC (EC, 1992b) requires an evaluation of the potential hazards and risks of notified new substances on the basis of a specified data set; '*new substances*' are substances not on the EU market in the 10 years prior to 18 September 1981 and therefore not appearing in the European INventory of Existing Commercial chemical Substances (EINECS). This Directive also requires that principles be laid down for carrying out the risk assessment of new substances (see Commission Directive 93/67/EEC (EC, 1993a)) supported by Technical Guidance Documents (TGDs) (EC, 1993b). The EC Council Regulation (EC) 793/93 (EC, 1993c) comprises the evaluation and control of the environmental risks of existing substances. The Regulation covers data-gathering, priority-setting, risk assessment process and proposals for risk reduction strategies where appropriate. The principles for this risk assessment have been laid down in Commission Regulation (EC) 1488/94 (EC, 1994a); this was also accompanied by a package of TGDs (EC, 1994b). In 1995 one harmonised set of TGDs for both new and existing substances was adopted by the EU Member States (EC, 1996a).

The best results in hazard and risk assessment will be obtained with data based on measurements in all relevant environmental compartments. This kind of monitoring is hardly done and then only for some substances and in certain situations; this is mainly because of the lack of human/financial resources. Therefore, in most assessments of new and existing substances, estimates of the releases into the different environmental compartments have to be made.

According to the Technical Guidance Document (TGD) (EC, 1996a) releases of new and existing substances have to be estimated by order of preference from:

- specific information for the substance from e.g. producers, product registers or open literature;
- emission category documents for several industrial categories (use category documents);
- emission factors as included in the release tables of Appendix I of the TGD (also included as Appendix I in this report).

As stated above, information on actual exposure doses and concentrations is limited or even absent for many chemicals and concentrations generally vary significantly in time and space. The decision-support system EUSES (European Union System for the Evaluation of Substances) (EC, 1996b) predicts doses and environmental concentrations of a chemical in a two-step procedure. Firstly, releases to environmental compartments are predicted on the basis of the volume produced or imported, the use pattern and physico-chemical properties of the chemical concerned. Next, environmental concentrations and daily human intake doses are calculated using models, which take into account the transport and fate of the substance.

This report will provide guidance on the interpretation and use of the tables of Appendix I of the TGD (Appendix I) for the first step of the prediction procedure. These tables will serve as a 'fall-back' if detailed information as mentioned above (the two first bullets) is not available. In chapters 2, 3 and 4 the concept behind the tables, as well as their use and interpretation, and the background of underlying data will be elucidated.

2. LIFE CYCLE OF SUBSTANCES

Emission from sybthetic chemicals (i.e. substances produced intentionally) and their by-products can take place during any stage of the life cycle of the substance (Figure 2.1). In many cases one or more stages of the life cycle are non-relevant, e.g. either a substance may be produced outside the EU, but formulated and processed after being imported, or a substance is only used in industry and not by private persons. The level of relevance is specified in the EUSES input module.

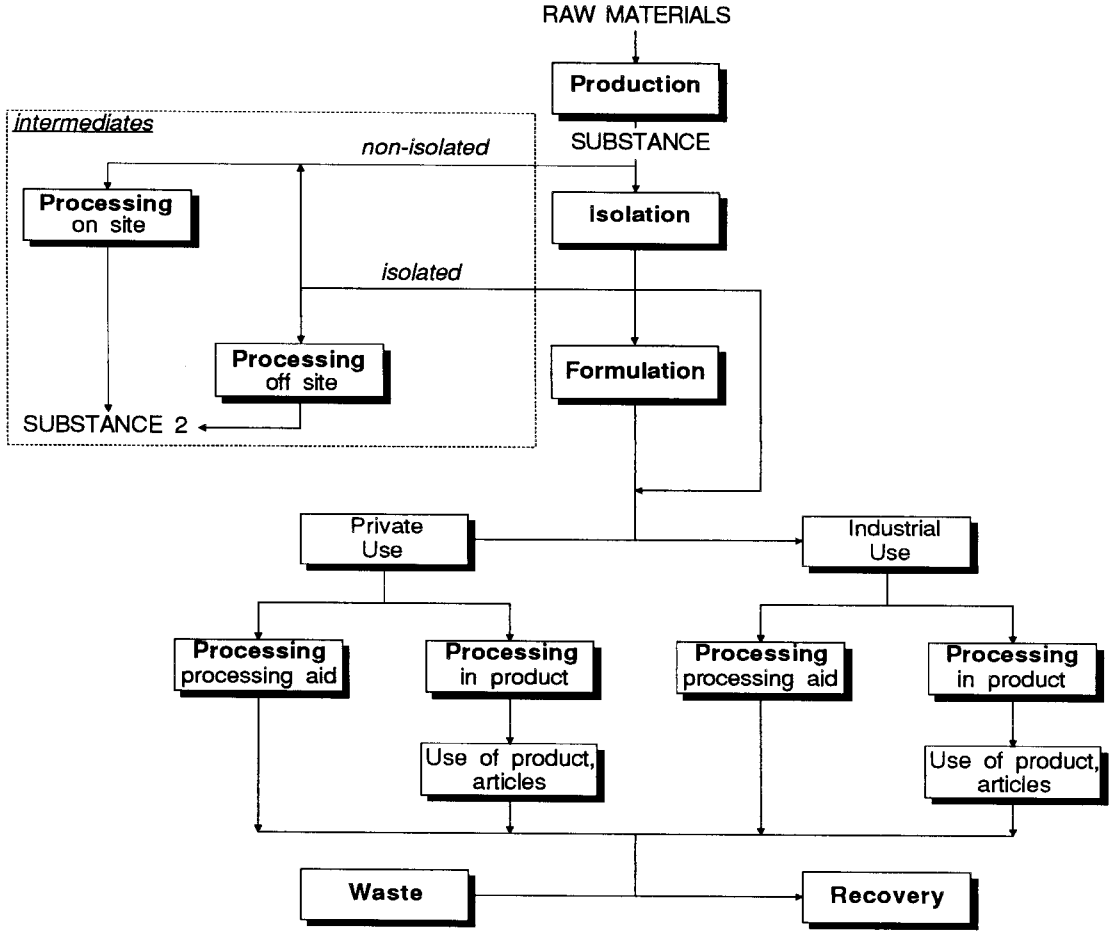

Figure 2.1 Possible stages in the life cycle of substances in which emissions may occur at any stage.

2.1. Production

The first stage of a chemical's life cycle is *production*. As can be seen in figure 2.1 a distinction is made between intermediates and all other substances (i.e. between chemicals that are formed and can be isolated at an intermediate step between starting material and the final product in a sequence of chemical processes and substances applied as such or in preparations). For both categories, the life cycle starts in the chemical or petrochemical industry. For intermediates three situations are distinguished. First, these chemicals may be processed (i.e. converted into the next substance) in the same reactor without isolation. Second, they may be isolated and processed at the same site, so that the emissions at the stages of production and processing (see below) occur at the same location. Third, they may be isolated and transported to another plant for processing, where the second location may be outside the area considered in the risk assessment.

2.2. Formulation

The next potential stage is *formulation*. Formulation is a process of mixing and blending in order to obtain a preparation which is used in the third stage of the life cycle. Some examples of formulation are the production of paint and photographic film, and the preparation of developers to be used in photographic baths.

2.3. Processing

Processing means that the substance - or the preparation containing the substance - is used or applied for a certain purpose. As can be seen in figure 2.1 the TGD distinguishes two situations, namely *private use* and *industrial use* for several reasons: (1) private use is more diffuse than industrial use and (2) emission reduction techniques are usually only applied in industry and not in households. A further distinction at this stage is made between the use of a substance as a processing aid and its function in a product. Processing aids are no longer needed after the process in which they were applied has been completed. An example of a processing aid is a mordant used in textile dyeing which serves to fix the dye to the fibres.

Processing aids are emitted during processing and/or released into waste water and become (hazardous) waste materials. It is possible that during processing the substance will be partially or completely degraded.
In other cases the substance becomes part of a product or closed system. Examples of this situation are plasticizers used in plastic articles and substances used in capacitors as a dielectric medium. In considering the example of the plasticizer, two phases can be recognized. First, there are emissions in the process of making the plastic articles. Second, during the time the articles are in use releases occur diffusely, due to migration and leaching or evaporation from the polymer matrix. This second phase may be regarded as a separate stage in the life cycle but is not yet covered by the EUSES emission tables.
In EUSES the *industrial use* stage is just called *processing*.

2.4. Waste treatment and recovery

The last stage of the life cycle is when chemicals end up in waste water and waste materials. Waste water is increasingly treated in sewage treatment plants (STPs). In most cases hazardous waste materials are incinerated, while non-combustible waste streams are landfilled at special sites, where they are (should be) isolated from contact with the environment. At incineration most of the waste substances will be destroyed or degraded. So far, emissions at landfilling and incineration sites are not considered in the emission tables.
Another option, namely *recovery*, is utilized for some of the waste materials. Two situations in recovery may occur. First, there is the recovery (recycling) of the substance itself, in which case emissions will be limited (e.g. the recovery of silver from photographic baths). Second, a product (or a certain substance) is recovered, in which the substance assessed is apparently of no interest or no longer of interest. In these cases emissions will be much higher, e.g. photochemicals remaining in spent photographic baths are released with waste water after recovery of the silver.

3. EMISSION AND SOURCES

3.1. Types of emissions and sources

Emissions from all stages of the life cycle may occur occasionally during short periods or continuously over the years, either fixed or with wide fluctuations. Emissions can be considered to be (see also Figure 3.1):

- *continuous*, with an (almost) constant rate flow over a prolonged period, for instance, at an oil refinery;
- *block*, with a rather constant flow rate over a limited period with regular intervals and no or low background emission;
- *peak*, characterized by relatively large amounts released in a short time with varying time intervals between peaks, and variations in peak height.

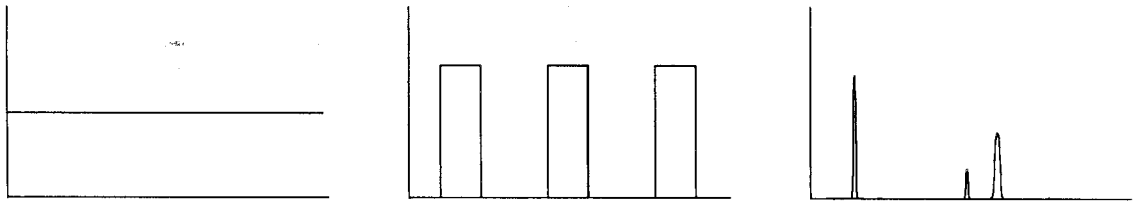

Figure 3.1 Types of emissions: (a) continuous, (b) block with constant flow rate and periodicity, (c) peak.

Emissions may come from single or multiple sources and sources may be stationary or mobile:

- *point*, either single or multiple sources which can be quantified by means of location and the amount of substance emitted per source and emission unit (e.g. amount per time unit). An example is a chemical plant, whereas a chemical factory with several plants is considered as one and the same point source;
- *diffuse*, large numbers of small point sources of the same type such as households. For the releases into waste water from households treated in STPs the emissions may be considered to come from a point source or an area source.
- *line*, consisting of large numbers of small, mostly mobile point sources of the same type, distributed fairly regular along certain paths, such as for instance a motorway with emissions from traffic.

3.2. Release estimation

As already stated in Chapter I, releases of a substance at different stages of its life cycle should be estimated by order of preference from:

1) specific information for the substance from e.g. producers, product registers or open literature;
2) emission scenario documents;
3) emission factors as included in the release (emission) tables in Appendix I.

1) specific information for the substance

Only for a limited number of substances and some specific processes are data available on releases and/or environmental concentrations. Monitoring is expensive and in many cases analysis is difficult to perform as there may be interactions and inaccuracies.

2) emission scenario documents

Emission scenario documents (Table 3.1) have been accepted by the EU for eight fields of application (EC, 1996a). Releases of substances for the specific applications covered can be estimated using these documents. As indicated in Table 3.1, the emission scenario documents often only deal with one compartment, one or two stages of the life cycle, and only for either the regional or local situation. For situations where no information is present in emission scenario documents, reference is made to the tables in Appendix I. The emission factors for intermediates produced and processed in the chemical industry have been implemented in the tables for generic emission scenarios of the TGD (Appendix I).

Table 3.1 List of emission scenario documents included in the Technical Guidance Document (EC, 1996a)

Industrial Category	Application/process	Remarks
3 Chemical industry; chemicals used in synthesis	Intermediates	Air, water compartments regional situation
5 Personal/domestic	Soaps, fabric washing, dish cleaning and surface cleaning substances	Regional situation for production and formulation
7 Leather processing industry	Leather processing (including dyeing)	Water compartment processing (dyes)
8 Metal extraction, refining and processing industry	Chemicals used in metalcutting and -forming fluids	Water compartment local situation for processing water-based fluids
10 Photographic industry	Photochemicals	Water compartment local situation for formulation (solid materials) and processing
12 Pulp, paper and board industry	Chemicals used in production and use of paper	Water compartment local situation for processing and (paper) recycling
13 Textile processing industry	Chemicals used in the textile finishing industry	Water compartment local situation for processing
14 Paints, lacquers and varnishes industry		Partly local situation formulation and processing

3) emission factors as included in the release (emission) tables of Appendix I

Due to the lack of information - especially for new substances - generalized approximations may be needed to be used for items such as:

- Emission factors for processes;
- Substance properties and process conditions (e.g. capacity of processes);
- Data from practice with respect to type of process concerned and formulations used.

For all *Industrial categories* (see 4.2.2) distinguished in the EC/OECD Harmonized Electronic Data Set (HEDSET), generic release (emission) scenarios have been developed as a 'fall-back'. These scenarios are presented in the tables of Appendix I (known as the A and B tables). The basis for the tables consist of expert judgment, but in several specific cases more precise estimations from use category studies were incorporated:

- Textile dyes (RIVM and UK Department of the Environment) (Ros, 1985; Hobbs, 1988a);
- Photochemicals (RIVM and UK Department of the Environment) (Ros ans Bogte, 1985; Hobbs, 1988b);
- Metalworking fluids and hydraulic fluids (RIVM) (Van der Poel and Ros, 1987);
- Paper chemicals (RIVM and Pira/ UK Department of the Environment) (Ros and Berns, 1988c; Cathie and Kirkpatrick, 1991);
- Paint and varnishes additives (INERIS/ Department of the Environment of France) (Prats, 1992);
- Plastics additives (UK Department of the Environment) (Jolly, 1994).

The set-up and mode of operation of the A and B tables are explained in Chapter 4.

4. RELEASE TABLES

4.1. Purpose and set-up of the release (emission) tables

4.1.1. Introduction

In risk assessment, several spatial scales are considered, including the *local* and *regional scales*, see Figure 4.1. The local scale considers the protection goals in the vicinity of one large point source of the substance. The regional scale assesses the risks to protection targets due to all releases in a larger region, see also the TGD (EC, 1996a).

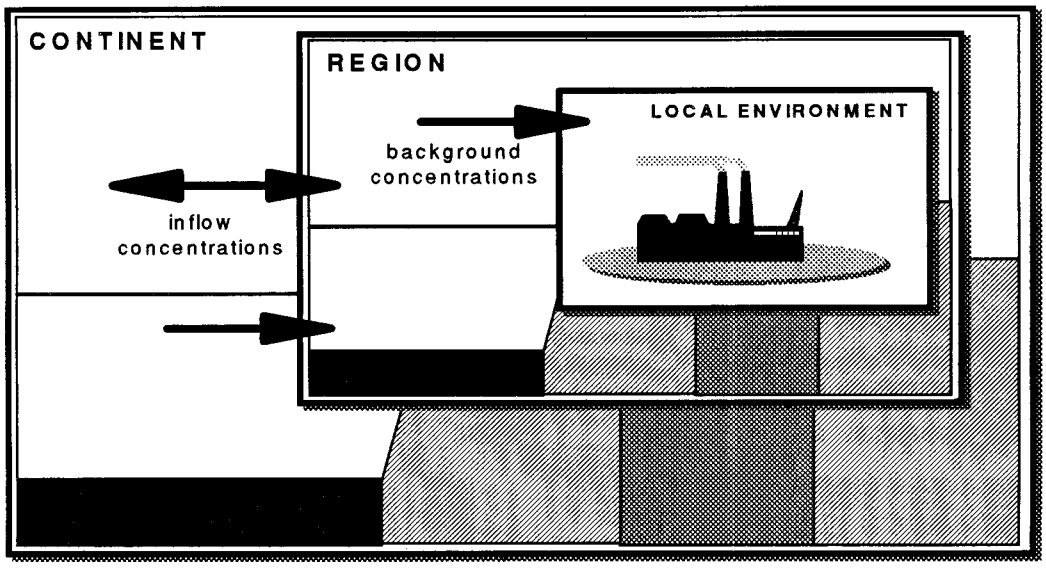

Figure 4.1 The relationships between the continental, regional, and local-scale exposure assessments.

Local emissions of industrial chemicals can be either continuous or discontinuous, the latter in the case of batch-processing of substances, for instance. Depending on the emission frequencies and durations, organisms with a relatively short life span may be exposed locally to high concentrations for a considerable length of their lifetime, even if average exposure levels are low. This will be relevant for STP micro-organisms and aquatic organisms, so for these organisms, the average exposure levels during emission episodes are assumed to be continuous. The releases of the substance from the main emission source (kg/day) have to be estimated to calculate the relevant concentration at the local scale. The A and B tables mentioned before are used for these estimations.

Emissions at the regional scale are regarded as diffuse and continuous, leading to steady-state environmental concentrations. For the calculations of the concentrations the 'average' releases over a whole year have to be estimated (kg/year). The A tables are used for these estimations. In most cases releases to water concern releases to waste water, which is often treated in a sewage treatment plant (STP). Only in specific cases do releases directly to surface water apply, e.g. emissions from traffic, which are discharged with rain water into watercourses in the areas where the sewer is not connected to an STP.

4.1.2. A tables

The A tables of Appendix I provide the estimated total release fractions of the 'volume' *(emission factors)* for the respective compartments and stages of the life cycle in relation to technical restraints, physico-chemical properties, etc. The 'volume' can be the *production volume* (i.e. the amount produced in the EU) or the *market volume* (i.e. the production volume plus the total amount imported in the EU minus the total amount exported from the EU). The market volume is excluding the amounts of the substance present in products imported/exported. At the stage of production, releases are calculated on the basis of the production volume; at the stage of formulation they are calculated on the basis of the market volume. At all the following stages the market volume is used after correction for the losses in the previous stages. The total amount released during all the relevant stages of the life cycle is averaged over the year and used for the calculation of the *Predicted Environmental Concentration* at the regional stage ($PEC_{regional}$).

4.1.3. B tables

The B tables of Appendix I are used for determining the relevant volume of the substance for the calculation of the releases from point sources at every relevant stage of the life cycle. This will lead to the PEC_{local}. The B tables provide estimates for the *fraction of the main source* and the *number of days* that releases occur. The *main source* is the largest emission source, i.e. the source where the largest fraction of the production or market volume of the substance is present (i.e. produced, formulated, etc., depending on the stage of the life cycle considered).

The *number of days* is the number of emission days per year that activities take place during which the substance will be released. New substances are usually produced at a relatively low initial level. Once a substance proves to be a success the production volume will increase and probably more companies (or more sites of the same company) will start production. Also the number of users will then increase (influencing the number of sources and hence the fraction of the main source). A relatively small number of mainly existing substances will be produced in high volumes -the so-called *high production volume chemicals* (HPVC), which are distinguished from the other substances, the *new substances* and ('other') *existing chemicals* (NSEC). The OECD list of HPVC contains about 1600 chemicals which are either produced in excess of 10,000 tonnes in any one member country or in two or more countries in excess of 1,000 tonnes in 1990. At the development of the release tables a substance was characterized as an HPVC at a default value which may be different for several industrial categories. This difference is based on the idea that one of the elements of an HPVC is the production period (production during most days taken over one year), whereas the scale of production will depend on the type of substance (a commonly used solvent may be produced in quantities of hundreds of tonnes per day at a large plant, whereas a pharmaceutical may need the whole year for the production of a few kilograms at a small plant). Distinction between HPVC and NSEC is only necessary for the stages of production and formulation. The EUSES user may override the default value on the basis of information from the producer.

4.1.4. Further remarks on the release tables

If a substance is formulated and the substance occurs at a (very) low concentration in the formulation, unrealistic values for the fraction of the main source and number of days for the stages of formulation and processing will be derived from the tables using the market volume as such. Therefore the program makes a correction in these cases in order to obtain more likely values by dividing the tonnage by the fraction of the substance in the formulated preparation. This corrected tonnage is used for entry in the B tables (not A tables where 'tonnage' is used as a parameter) for the relevant stages of the life cycle (formulation, processing, recovery). This correction is only needed in the B tables, not in the A tables (the volume is only used at the stages of production and formulation in the A tables for releases into waste water).

The effect of the correction is illustrated with the following example. Suppose a substance with a market volume of 1 tonne/year is applied as 0.1% in a formulation (fraction in the formulation 0.001) and Table B 2.1 of Appendix I applies. If no correction is made (i.e. the fraction of the substance in the formulation equals 1), the fraction of the main source will be 1. The number of emission days is calculated according to the formula of the Table B2.1 *fraction of the main source* * *tonnage* (market volume) = 2 days. Corrected to the actual fraction in the formulation of 0.001 leads to a tonnage of 1/0.001 = 1000 tonnes. The fraction of the main sources then becomes 0.4 and the number of emission days 300.

Both the A and B tables have been made for every (in principle relevant) stage of the life cycle for every *industrial category* (see section 4.2). In many cases the tables also make use of the *main category* and *use category* (see section 4.2).
When in the Table 'tonnage' is mentioned, this term refers to the appropriate volume of the substance (i.e. production volume or ['corrected'] market volume). In EUSES a default fraction (10%) of the total EU production volume and market volume is assumed for the regional scale. This can be overwritten if the regional volume is known. These regional volumes form the basis for determining the fraction of the main source.

The intermediate results of EUSES can be overwritten, as it is possible that specific information is available for one of the relevant data (e.g. number of days, emission factor to waste water, the release in kg/day, or even the concentration in the influent of the STP) for one or more stages of the life cycle.
In cases of diffuse releases, e.g. a very large number of very small sources, no PEC_{local} can be calculated as it is not relevant, e.g. with emissions from households to the air. For releases from households to waste water, however, the receiving STP is considered as a point source, assuming a more or less equal usage by populations and a usage rather evenly spread over the week. The fraction of the substance regarded as released with waste water to the 'average' STP can be calculated as: average number of inhabitants connected to the STP (10,000) / average number of inhabitants in a region ($20*10^6$) = 0.0005. Assuming that the distribution of the consumption of the substance (or preparation or product containing the substance) is not even over the STPs and the week, a safety factor of 4 has been used for a reasonable worst case estimation. This results in fraction of the main source of 0.002 for these situations.

4.2. Categories

In the data of the HEDSET information is specified for every substance for three types of categories distinguished by the EU (for an overview see Table 4.1):

1. Main category (4);
2. Industrial category (16);
3. Use (or Function) category (55).

This set of categories help to supply information on the use pattern of a substance needed for a proper estimation of the emissions.

In the following sections an explanation on the categories will be given.

4.2.1. Main category (MC)

The HEDSET distinguishes four main categories (MCs) (see also Table 4.1);

I Use in closed systems;

II Use resulting in inclusion into or onto a matrix;

III Non-dispersive use;

IV Wide dispersive use.

The MCs were intended originally to provide a general impression of the relevance of the exposure during the whole life cycle. In the context of environmental risk assessment they are often used to characterize release scenarios for the estimation of emissions to the environment at individual stages of the life cycle, i.e. at production, formulation and processing. They can therefore be allocated to release fractions which are used as default values where specific information is lacking.

Table 4.1 Categories considered in the HEDSET

MAIN CATEGORIES	
I Use in closed systems	- non-isolated intermediates
	- isolated intermediates stored on site
	- isolated intermediates with controlled transport
II Use resulting in inclusion into or onto a matrix	
III Non-dispersive use	
IV Wide dispersive use	

INDUSTRIAL CATEGORIES	
1 Agricultural industry	9 Mineral oil and fuel industry
2 Chemical industry: basic chemicals	10 Photographic industry
3 Chemical industry: chemicals used in synthesis	11 Polymers industry
4 Electrical/electronic industry	12 Pulp, paper and board industry
5 Personal/domestic	13 Textile processing industry
6 Public domain	14 Paints, lacquers and varnishes industry
7 Leather processing industry	16 Engineering industries: civil and mechanical
8 Metal extraction, refining and processing industry	15/0Others

USE CATEGORIES	
1 Absorbents and adsorbents	31 Impregnation agents
2 Adhesive, binding agents	32 Insulating materials
3 Aerosol propellants	33 Intermediates (monomers; pre-polymers)
4 Anti-condensation agents	34 Laboratory chemicals
5 Anti-freezing agents	35 Lubricants and additives
6 Anti-set-off and anti-adhesive agents	36 Odour agents
7 Anti-static agents	37 Oxidizing agents
8 Bleaching agents	38 Plant protection products, agricultural
9 Cleaning/washing agents and additives (detergents; soaps; dry cleaning solvents; optical brighteners in detergents)	30 Hydraulic fluids and additives
	39 Biocides, non-agricultural (disinfectants; preservative products; pest control products; specialist biocides)
10 Colouring agents (dyestuffs; pigments; colour forming agents; fluorescent brighteners)	40 pH-regulating agents
	41 Pharmaceuticals (veterinary medicines)
11 Complexing agents	42 Photochemicals (desensitizers; developers; fixing agents; photosensitive agents; sensitizers; anti-fogging agents; light stabilizers; intensifiers)
12 Conductive agents (electrolytes; electrode materials)	
13 Construction materials and additives	
14 Corrosion inhibitors	
15 Cosmetics	43 Process regulators (accelerators; activators; catalysts, inhibitors; siccatives; anti-siccatives; cross-linking agents; initiators; photo-initiators; etc.)
16 Dust binding agents	
17 Electroplating agents	
18 Explosives (blasting agents; detonators; incendiaries)	44 Reducing agents
19 Fertilisers	45 Reprographic agents (toners for photocopying machines; toner additives)
20 Fillers	
21 Fixing agents	46 Semiconductors (photovoltaic agents)
22 Flame retardants and fire preventing agents	47 Softeners (coalescing agents; bates in leather tech nology; devulcanizing agents; emollients; swelling agents; water softeners; plasticisers)
23 Flotation agents	
24 Flux agents for casting	
25 Foaming agents(chemical/physical blowing agents; frothers)	48 Solvents
26 Food/feedstuff additives	49 Stabilisers
27 Fuels (gasoline; kerosene; gas oil; fuel oil; petroleum gas; non-mineral oil)	50 Surface-active agents
	51 Tanning agents
28 Fuel additives (anti-fouling agents; anti-knock agents; deposit modifiers; fuel oxidizers)	52 Viscosity adjustors (pour-point depressants; thickeners; thixotropic agents; turbulence supressors)
29 Heat transferring agents (cooling agents; heating agents) index improvers)	53 Vulcanising agents
	54 Welding and soldering agents
30 Hydraulic fluids and additives	55/0 Others

MC I 'Use in closed systems'

This MC refers to the stage of production and processing. At the stage of production a substance should be assigned only to this category if it remains within a reactor or is transferred from vessel to vessel through closed pipework. The HEDSET distinguishes between three subcategories for intermediates (see section 2.1).

For the stage of processing this MC refers to substances that are used in closed systems, e.g. the application of a substance in a transformer or the circulation circuit of refrigerators.

MC II 'Use resulting in inclusion into or onto a matrix'

Use consisting of inclusion into or onto matrices means all processes where chemicals are incorporated into products or articles from which they (normally) will not be released into the environment. This is applicable to the stage of formulation, e.g. when a substance is included in the emulsion layer of a photographic film. It also may refer to the stage of processing e.g. when a paint additive ends up in the finished coating layer.

MC III 'Non-dispersive use'

Non-dispersive use refers to chemicals which are used in such way that only certain groups of workers, with knowledge of the process, come into contact with these chemicals. This means that the use of these chemicals is related to the number (and size) of the emission sources. So, this MC indicates industrial use at a limited number of sites (where emission reduction measures may be common practice).

MC IV 'Wide dispersive use'

The term wide dispersive use should be used for a wide range of activities, particularly when end users come into contact with the products. This means a large number of small point sources like households or line sources like traffic.

Although the HEDSET allows for one entry of the MC only for all stages of the life cycle, the approach of MCs is used in EUSES in many cases for several stages of the life cycle. As can be seen from Table 4.2 the interpretation is often different.

Table 4.2 Interpretation of main category (MC) for relevant stages of the life cycle

MC	Stage of the life cycle	Interpretation
Ia	Production	Non-isolated intermediates (Industrial category 3 or 9 & Use category 33, see Table 4.1)
Ib	Production	Isolated intermediates stored on site, or substances other than intermediates produced in a continuous production process
Ib	Formulation	Dedicated equipment and (very) little cleaning operations
Ic	Production	Isolated intermediates stored off site, or substances other than intermediates produced in dedicated equipment
Ic	Formulation	Dedicated equipment and frequent cleaning operations
II	Formulation	Inclusion into or onto a matrix
II	Processing	Inclusion into or onto a matrix
III	Production	Multi-purpose equipment
III	Formulation	Multi-purpose equipment
III	Processing	Non-dispersive use (industrial point sources), or processing of intermediates in multi-purpose equipment
IV	Processing	wide dispersive use (many small point sources or diffuse releases; normally no emission reduction measures)

4.2.2. Industrial category (IC)

The Industrial categories (ICs), see Table 4.1, specify the branch of industry where considerable emissions occur during application of the substance as such, or during application and use of preparations and products containing the substance. The ICs also comprise two categories which are not 'industrial', i.e. personal and domestic use and use in the public domain. When the application of a substance cannot be allocated to one of the specific ICs the IC 0 (or 15) 'Others' is chosen, e.g. substances used in window cleaners for motor cars and lorries.

A major fraction of the emissions of a substance may occur under another category than the one to which the substance has been originally allocated: e.g. substances used in paints or any other kind of coating will be allocated to IC 14 'Paints, lacquers and varnishes industry'. Although local emissions of solvents may be considerable at one point source (the paint factory), during the stage of formulation (paint production), most of the solvent will be emitted during the application of the paint product. The application could be classified into several ICs depending on the type of paint. In the case of a do-it-yourself paint it would belong to IC 5 'Personal/domestic', in the case of motor car repair or professional house painting it would be IC 15/0 'Others', and in the case of motor car production IC 16 'Engineering industry: civil and mechanical'. This has been solved to some extent in the release tables by considering do-it-yourself application, and construction and maintenance in IC 14 'Paints, lacquers and varnishes industry', respectively.

Confusion may also arise when a substance is applied in a certain branch of industry whilst the character and function indicate another. An example is a curing agent for an epoxy resin used for embedding electronic components. On the one hand the substance is applied in the 'Electrical/electronic industry' (Industrial category 4), whereas on the other the processing of epoxy resins belongs to Industrial category 11 'Polymers. As processing of polymers in EUSES is dealt with in polymers industry, the release estimates are found in IC 11 and not in IC 4.

4.2.3 Use (or function) category (UC)

Use or function categories (UCs) specify the specific function, action or purpose of the substance. The 55 UCs (Table 4.1) have a varying level of detail. For substances used in photography, for example, there is in principle only one category: UC = 42 'Photochemicals', whereas the notifier may describe it as a developer or as an intensifier; from the description supplied by the notifier it usually will be clear that the substance will be used in photographic industry. In the TGD (EC, 1996a). (see Appendix II) where the UCs - named function categories there - are defined, many of such specific functions are mentioned under 'subcategories'. Depending on the specific function of the photochemical, emissions can vary to a large extent, e.g. the majority of a substance used to influence crystal growth of silver compounds during the production of films is released with waste water, while other substances used in this process will hardly be released at all. In the release scenario where photochemicals are treated, i.e. in IC = 10 'Photographic industry' specific information can be supplied.
On the other hand, there is no such general UC as 'Plastics additives' and many other specific UCs for this type of substances are also missing, e.g. anti-oxidants. Exceptions are categories like UC = 47 'Softeners' (= Plasticizers) and UC = 49 'Stabilizers' (heat- and UV-stabilizers).
Appendix III and IV have been added to this report for the user with problems in selecting the UC for the best possible entry to the release tables.
Appendix III gives the complete definition list of the Chemical Use Standard Encoding System (ChemUSES) (EPA, 1980), with the corresponding UCs of EUSES. Appendix IV gives a listing for every UC of functions according to ChemUSES (EPA, 1980).

A screening has been carried out for all industrial categories on the validity and probability that a use category occurs (Appendix V). Several situations are considered:

1. Valid IC-UC combinations which are distinguished in the release scenarios of the A and B tables concerned;
2. Valid IC-UC combinations which are not specifically distinguished in the release scenarios of the A and B tables;
3. Valid IC-UC combinations which do not seem to be likely but which will be treated as if UC = 55/0; in this version of EUSES (1.00) the program will select the same values from the A and B tables as in the previous case.

4. Invalid IC-UC combinations; since these conditions are not signaled by EUSES 1.00 (so they will be treated by the program as the IC-UC combinations of the previous situation), the assessor needs to address this problem manually.

4.2.4 Remarks on industrial categories

This subsection defines the scope of the ICs and presents a few short remarks on the ICs in relation to the A and B tables. The definition is based on the examples specified in the HEDSET for substances classified in the appropriate ICs. A table is presented for every IC in which for every possible stage of the life cycle the MCs which can be chosen or which are used automatically by the program on account of the choice made for the UC are marked (with 'X'). If an MC can not be chosen or if no MC is needed a dot (.) has been placed in the table.

1. Agricultural industry

The agricultural industry deals with the activities in growing crops (vegetables, grains, etc.) and raising cattle (for dairy products, meat and wool). It also comprises all allied activities such as pest control (application of pesticides, veterinary medicines), manuring, etc. There are no emission scenario and use category documents for this IC. Emissions due to the application (stage of processing) of pesticides are beyond the scope of the TGD. Several UCs are distinguished in the release scenario of the A tables, e.g. UC = 19 Fertilizers and UC = 41 Pharmaceuticals. Following is a table of the MCs for the possible stages of the life cycle which may be chosen or which are used by EUSES bacause of the UC chosen (for interpretation of the MC see Table 4.2):

Stage	Main Category					
	Ia	Ib	Ic	II	III	IV
Production	.	X	X	.	X	.
Formulation	.	X	X	.	X	.
Processing	.	.	.	.	.	.

The HEDSET considers two different ICs, basic chemicals and chemicals used in synthesis for the chemical industry (the industry where substances are produced through chemical reactions).

2. Chemical industry: basic chemicals

The raw materials for the chemical industry come from the petrochemical industry (IC 9 'Mineral oil and fuel industry'), from plant or animal materials, or coal and other lifeless materials such as ores. IC 2 is dedicated to *basic chemicals*, where the definition for the use of the release estimation tables is based on the examples given in the HEDSET. Basic chemicals are substances used generally throughout all branches of the chemical industry and usually in considerable amounts. Important basic chemicals are solvents (UC 48) and pH-regulating agents (UC 40) (acids, alkalis).

There are no emission scenario and use category documents for this IC. If a basic chemical is formulated A and B tables have been provided. Recovery is not considered as a feasible emission stage; emissions of chemicals such as catalysts are included in the emissions at the stage of processing. No distinction between UCs has been made in the emission tables so far; however, apart from UC = 48 'Solvents' most chemicals will have to be classified as UC = 40 'pH-regulating agents', UC = 55/0 'Others', and probably UC = 43 'Process regulators'. Following is a table of the MCs for the possible stages of the life cycle which may be chosen or which are used by EUSES because of the UC chosen (for interpretation of the MC see Table 4.2):

Stage	Main Category					
	Ia	Ib	Ic	II	III	IV
Production	.	X	X	.	X	.
Formulation	.	X	X	.	X	.
Processing	.	.	.	.	.	.

3. Chemical industry: chemicals used in synthesis

Chemicals used in synthesis based on the examples given in the are substances either regulating the chemical reaction process (e.g. catalysts) or being used as an intermediate (i.e. chemicals that are formed and can be isolated at an intermediate step between starting material

and the final product in a sequence of chemical processes). The HEDSET includes monomers in intermediates; this is only valid in the release estimation tables for the stage of production. The tables of IC 11 'Polymers industry' are used for the processing stage (see also subsection 4.2.5).

Apart from UC = 33 'Intermediates' most chemicals in this IC will have to be classified as UC = 43 'Process regulators' or UC = 55/0 'Others'. Formulation may be applicable for some chemicals, whilst recovery is unlikely. Following is a table of the MCs for the possible stages of the life cycle which may be chosen or which are used by EUSES because of the UC chosen (for interpretation of the MC see Table 4.2):

Stage	Main Category					
	Ia	Ib	Ic	II	III	IV
Production (UC ≠ 33)	.	X	X	.	X	.
Production (UC = 33)	X	X	X	.	.	.
Formulation (UC ≠ 33)	.	X	X	.	X	.
Processing	.	X	X	.	X	.

4. Electrical/electronic industry

In the electrical/electronic industry a wide range of products is manufactured. It comprises both the manufacture of components like resistors, transistors, capacitors, diodes, lamps, etc. and televisions, radios, computers (PCs as well as mainframes), radar installations, complete telephone exchanges, etc. Constituent processes may take place in the manufacturing processes. The main constituent processes are metalplating, polymer processing, and paint application. The emissions of substances used in these separate processes are ***not*** covered in IC 4, but in the following ICs:

IC 8. 'Metal extraction, refining and processing industry': electroplating and other metal processing (e.g. use of metalworking fluids);

IC 11. 'Polymers industry': polymer processing (moulding of thermoplastics and curing of prepolymers e.g. for the embedding of electronic components);

IC 14. 'Paints, lacquers and varnishes industry': application of coating products by all means like spraying, curtain coating, etc.

There are no emission scenario and use category documents for IC 4. There are many different applications, however, in this IC, which may be characteristic and specific to it, e.g. the

production of printed circuit boards, semiconductors and the application of dielectric fluids in transformers and capacitors. Following is a table of the MCs for the possible stages of the life cycle which may be chosen or which are used by EUSES because of the UC chosen (for interpretation of the MC see Table 4.2):

Stage	Main Category					
	Ia	Ib	Ic	II	III	IV
Production	.	X	X	.	X	.
Formulation	.	X	X	.	X	.
Processing	.	.	.	X	X	.

5. Personal/domestic

This IC covers the use and application of substances in the household for maintenance and care of the house, furniture, kitchenware, gardens, etc. and personal care (hygiene, make-up, etc.). Chemicals used in this IC will in many cases be present in formulations, e.g. in cleaners (soaps, detergents, laundry soaps, etc.), cosmetics, and products for the care of leather, textile and cars. Emissions will be very diffuse and only for waste water are the emissions to an STP regarded as a point source (see section 4.1). The release scenario in the A tables considers 18 specific UCs. It is assumed that emissions take place during the whole year.

The application of substances for some specific purposes is covered in the following ICs at the stage of private use:

IC = 9 'Mineral oil and fuel industry': fuels and fuel additives;

IC = 10 'Photographic industry': photochemcials;

IC = 14 'Paints, lacquers and varnishes industry': paint products.

Following is a table of the MCs for the possible stages of the life cycle which may be chosen or which are used by EUSES because of the UC chosen (for interpretation of the MC see Table 4.2):

Stage	Main Category					
	Ia	Ib	Ic	II	III	IV
Production	.	X	X	.	X	.
Formulation	.	X	X	.	X	.
Private use	.	.	.	.	.	.

6. Public domain

This IC covers application and use of substances in a variety of places by skilled workers, such as offices, public buildings, waiting rooms, various workshops like garages, professional cleaning and maintenance of buildings, streets, parks, etc. Most chemicals in this IC will also be present in formulations: e.g. in 'cleaners' (UC = 9 'Cleaning and washing agents and disinfectants'), non-agricultural biocides (UC = 39 'Biocides, non-agricultural') and products for the maintenance of roads, buildings, etc. Different numbers of emission days are used for the UCs distinguished. The emissions in this IC still will be diffuse, but the number of days emissions occur are expected to be different for the UCs distinguished (many products will be used only during working days or even during a short time period). In the release scenarios in the A and B tables, UCs 9 and 39 have been distinguished as well as UC = 55/0 'Others'. Following is a table of the MCs for the possible stages of the life cycle which may be chosen or which are used by EUSES because of the UC chosen (for interpretation of the MC see Table 4.2):

Stage	Main Category					
	Ia	Ib	Ic	II	III	IV
Production	.	X	X	.	X	.
Formulation	.	X	X	.	X	.
Processing	.	.	.	.	.	.

7. Leather processing industry

The leather processing industry is considered as the industry where leather is made out of raw hides and dyed, and where products are made out of leather (e.g. shoe manufacture).
An emission scenario document exists for this IC focuses on leather dyeing (UC 10 'Colouring agents'). In the A and B tables a general scenario is presented with default values for common functions of chemicals like tanning (UC = 51 'Tanning agents'). The release scenarios of the A and B tables make no distinction between UCs, only between MC = 2 and 3. Leather care such as for shoes belongs to IC = 5 'Personal/domestic'.Following is a table of the MCs for the possible stages of the life cycle which may be chosen or which are used by EUSES because of the UC chosen (for interpretation of the MC see Table 4.2):

Stage	Main Category					
	Ia	Ib	Ic	II	III	IV
Production (UC ≠ 10)	.	X	X	.	X	.
Production (UC = 10)	.	.	.	.	.	.
Formulation	.	X	X	.	X	.
Processing	.	.	.	X	X	.

8. Metal extraction, refining and processing industry

This IC covers the extraction of metals from the ores, the manufacture of primary/secondary steel and non-ferro metals ('pure' metals as well as alloys), and the manifold of metalworking processes ('shaping') like cutting, drilling, rolling, etc. There are emission scenario and use category documents for one aspect of the processes in this IC, namely, the application of metalworking fluids. The first is only for water-based fluids and the local situation. On the basis of the use category document the release scenarios in the A and B tables distinguish the main function of (substances used in) metalworking fluids, being cooling and lubrication: UC = 29 'Heat transferring agents' and UC = 35 'Lubricants and additives'. Following is a table of the MCs for the possible stages of the life cycle which may be chosen or which are used by EUSES because of the UC chosen (for interpretation of the MC see Table 4.2):

Stage	Main Category					
	Ia	Ib	Ic	II	III	IV
Production	.	X	X	.	X	.
Formulation (UC ≠ 29 & 35)	.	X	X	.	X	.
Formulation (UC = 29 / 35)	.	.	.	.	.	.
Processing	.	.	.	X	X	.

9. Mineral oil and fuel industry

The mineral oil and fuel industry belongs to the so-called *petrochemical* industry which processes crude mineral oil. By means of physical and chemical processes (e.g. separation by means of distillation, cracking and platforming) a wide range of hydrocarbons are produced to serve as raw materials for the chemical industry and (often after adding a series of additives) fuels for heating and combustion engines.

There are no emission or use category documents for this IC. General release scenario tables are used in the A and B tables and do not make a distinction between UC = 27 'Fuels', UC =

28 'Fuel additives' and UC == 35 'Lubricants and additives' or any other UCs. Following is a table of the MCs for the possible stages of the life cycle which may be chosen or which are used by EUSES because of the UC chosen (for interpretation of the MC see Table 4.2):

Stage	Main Category					
	Ia	Ib	Ic	II	III	IV
Production	.	X	X	.	X	.
Formulation	.	X	X	.	X	.
Processing	.	.	.	.	.	.
Private use	.	.	.	.	.	.

10 Photographic industry

The photographic industry is the industry where photographic materials are manufactured ('solid' materials like films and photographic 'papers', but also preparations - either in a solid or a liquid form - for film and paper processing baths. The processing of films and photographic paper also belongs to the photographic industry, including professional processing in so-called printshops. The treatment of films and photographic paper by the public at large is considered the stage of private use.

There are both emission scenario and use category documents for this IC. As the first scenario only covers waste water and the local situation specific release scenarios are found in the release scenarios of the A and B tables. The only specific UC in the scenarios is UC = 42 'Photochemicals'. Following is a table of the MCs for the possible stages of the life cycle which may be chosen or which are used by EUSES because of the UC chosen (for interpretation of the MC see Table 4.2):

Stage	Main Category					
	Ia	Ib	Ic	II	III	IV
Production	.	X	X	.	X	.
Formulation ('aqueous solutions')	.	X	X	.	X	.
Formulation ('solid materials')	.	.	.	.	.	.
Processing	.	.	.	X	X	.
Private use	.	.	.	.	.	.
Recovery	.	.	.	.	.	.

11. Polymers industry

In this report and in EUSES, the polymers industry comprises the branch of the chemical industry where 'plastics' (thermoplastics) are chemically produced and industries where processing of thermoplastics and prepolymers takes place through a wide range of techniques (see below). These processes are all dealt with in IC 11 and not in branches of industry where polymers are produced (chemical industry) or processed (IC 4, 16 and 0).

On the basis of the available use category document and expert judgment general release scenarios have been provided in the A and B tables. First, there are tables for polymerization processes, i.e. the processing stage of substances which are converted into polymers by polymerization reactions, polyadditions, polycondensations, etc. This has been done in order to be able to treat them separately from substances produced in the 'chemical industry' (in principle they may be regarded as intermediates processed). Several types of functions, UCs and two polymerization processes (polymerization reactions and others like polyadditions and polycondensations) are distinguished. Second, there are tables for the processing of polymers, i.e. 'shaping' by all kinds of processes such as e.g. injection molding, blowing, and extrusion. Though processing of polymers may occur in several ICs, e.g. IC = 4 'Electrical/electronic industry' and IC = 16 'Engineering industries: civil and mechanical', only one release scenario was introduced in the present IC. Several types of functions, UCs and thermoplastics and thermosetting resins are distinguished in the scenario. Following is a table of the MCs for the possible stages of the life cycle which may be chosen or which are used by EUSES because of the UC chosen (for interpretation of the MC see Table 4.2):

Stage	Main Category					
	Ia	Ib	Ic	II	III	IV
Production	.	X	X	.	X	.
Formulation	.	X	X	.	X	.
Processing ('polymerization')	.	.	.	.	.	.
Processing	.	.	.	.	.	.
Recovery	NOT CONSIDERED YET					

12. Pulp, paper and board industry

Strictly speaking, only the production of pulp, paper and cardboard out of wood or waste paper belongs to this IC. As the HEDSET categorization does not specifically distinguish reprographic industry this important activity has been separated from the general category 0 'Others'.

There are both emission scenario and use category documents for this IC. The emission scenario document deals with waste water and the local situation. The release scenarios in the A and B tables comprise (a) printing and allied processes, and (b) the production of pulp, paper and board (including paper dyeing) for the stage of processing. The stage of recovery (paper recycling) is also considered in the tables.

Two UCs are specifically considered, i.e. UC 10 'Colouring agents' used as pigments in inks and as dyes for paper mass colouring and UC 20 and 31 ('Fillers' and 'Impregnation agents') both used in paper production and UC 45 'Reprographic agents', which is a 'collection' of all kinds of purposes and functions of substances in the printing and allied processes. Following is a table of the MCs for the possible stages of the life cycle which may be chosen or which are used by EUSES because of the UC chosen (for interpretation of the MC see Table 4.2):

Stage	Main Category					
	Ia	Ib	Ic	II	III	IV
Production (UC ≠ 10)	.	X	X	.	X	.
Production (UC = 10)	.	.	.	.	.	.
Formulation	.	X	X	.	X	.
Recovery	.	.	.	.	.	.

13. Textile processing industry

This IC covers treatment of fibres ('cleaning', spinning, dyeing, etc.), weaving, and finishing (e.g. impregnation, coating, etc.). There are both emission scenario and use category documents for this IC. The release scenarios in the A and B tables are specific for IC = 10 'Colouring agents' and general for other relevant UCs. Following is a table of the MCs for the possible stages of the life cycle which may be chosen or which are used by EUSES because of the UC chosen (for interpretation of the MC see Table 4.2):

Stage	Main Category					
	Ia	Ib	Ic	II	III	IV
Production (UC ≠ 10)	.	X	X	.	X	.
Production (UC = 10)	.	.	.	.	.	.
Formulation	.	X	X	.	X	.
Processing	.	.	.	.	.	.
Private use (**only** UC = 10)	.	.	.	.	.	.

14. Paints, lacquers and varnishes industry

Apart from the manufacture of coating products (stage of formulation) like paints, this report and EUSES also consider application of these products as belonging to this IC. This has been done since otherwise many release scenarios would have to be introduced in many other ICs: e.g. IC 5 'Personal/domestic' for private use, IC 6 'Public domain' for professional application by house painters and in (small) workshops, and many industrial applications like in IC 16 'Engineering industries: civil and mechanical' at manufacturing motor cars, constructions, etc. and IC 8 'Metal extraction, refining and processing' industry'.

There is an emission scenario on paint manufacture and application (stages of formulation and processing, respectively) and a use category document for paint manufacture. The A and B tables have releases scenarios for both water-based and solvent-based coatings systems and distinguish eight specific UCs and both industrial (stage of processing) and private use. The stage of formulation concerns the manufacture of the coating products. Following is a table of the MCs for the possible stages of the life cycle which may be chosen or which are used by EUSES because of the UC chosen (for interpretation of the MC see Table 4.2):

Stage	Main Category					
	Ia	Ib	Ic	II	III	IV
Production	.	X	X	.	X	.
Formulation	.	X	X	.	X	.
Processing	.	.	.	.	.	.
Private use	.	.	.	.	.	.

16. Engineering industries: civil and mechanical

Belonging to this IC are such industrial activities as wood processing industries (e.g. wooden furniture), motor car manufacture, building industry, etc.. There are no emission or use category documents for this IC. In many of these activities, processes such as coating application take place; these processes are dealt with in the IC to which the specific process belongs (coating application: IC = 14 'Paints, lacquers and varnishes industry'). For the present IC the same general release scenarios as for IC = 15 'Others' are used in the A and B tables. Following is a table of the MCs for the possible stages of the life cycle which may be chosen or which are used by EUSES because of the UC chosen (for interpretation of the MC see Table 4.2):

Stage	Main Category					
	Ia	Ib	Ic	II	III	IV
Production	.	X	X	.	X	.
Formulation	.	X	X	.	X	.
Processing	.	.	.	X	X	X

0/15. Others

All processes and activities which cannot be placed in one of the previous ICs belong to this IC. An example is the food processing industry. General release scenarios are used in the A and B tables. Table of the MCs for the possible stages of the life cycle which may be chosen or which are used by EUSES on account of the UC chosen (for interpretation of the MC see Table 4.2):

Stage	Main Category					
	Ia	Ib	Ic	II	III	IV
Production	.	X	X	.	X	.
Formulation	.	X	X	.	X	.
Processing	.	.	.	X	X	X

4.2.5 Relationship between industrial categories

All chemicals originate in fact, from IC 2 & 3 'chemical industry' and go from there to one of the other ICs (or remain in chemical industry). A special position is taken by substances such as monomers, and cross-linking and curing agents. These substances are basic chemicals (raw materials) for IC 11 'Polymers industry' for the production of *polymers* by polymerization reactions and other reactions like polyaddition and polycondensation. Despite the fact that this may be seen as the stage of production in IC 3 (UC 33 'Intermediates') they have been introduced in the emission tables of IC 11 'Polymers industry' as UC 43 'Process regulators'. Besides the production of polymers we also have to deal in this IC with the processing of the polymers (thermoplastics) and prepolymers (prepolymers are macromolecular substances such as polyester and epoxy resins. These are transformed in thermosetting resins with the aid of curing agents, such as initiators - mainly organic peroxides - and cross-linking agents - mainly the monomer styrene - for polyesters, and curing agents like amines for epoxy resins). The processing stage of (pre)polymers is the phase I which they are shaped into the desired form for use as all kinds of articles and parts of objects. Figure 4.2 shows this in a scheme. This scheme also shows the position of various substances with their respective functions in the chemical (IC 2 & 3) and polymers industries. The releases in both IC 5 'Personal/domestic' and IC 6 'Public domain' have a diffuse character. IC 5 covers the use of chemicals in households and IC 6 the use in offices, public buildings, parks, railway stations, in the street, etc. The main differences will be found in the amounts (e.g. because of the size of the building) and the number of days that emissions occur.

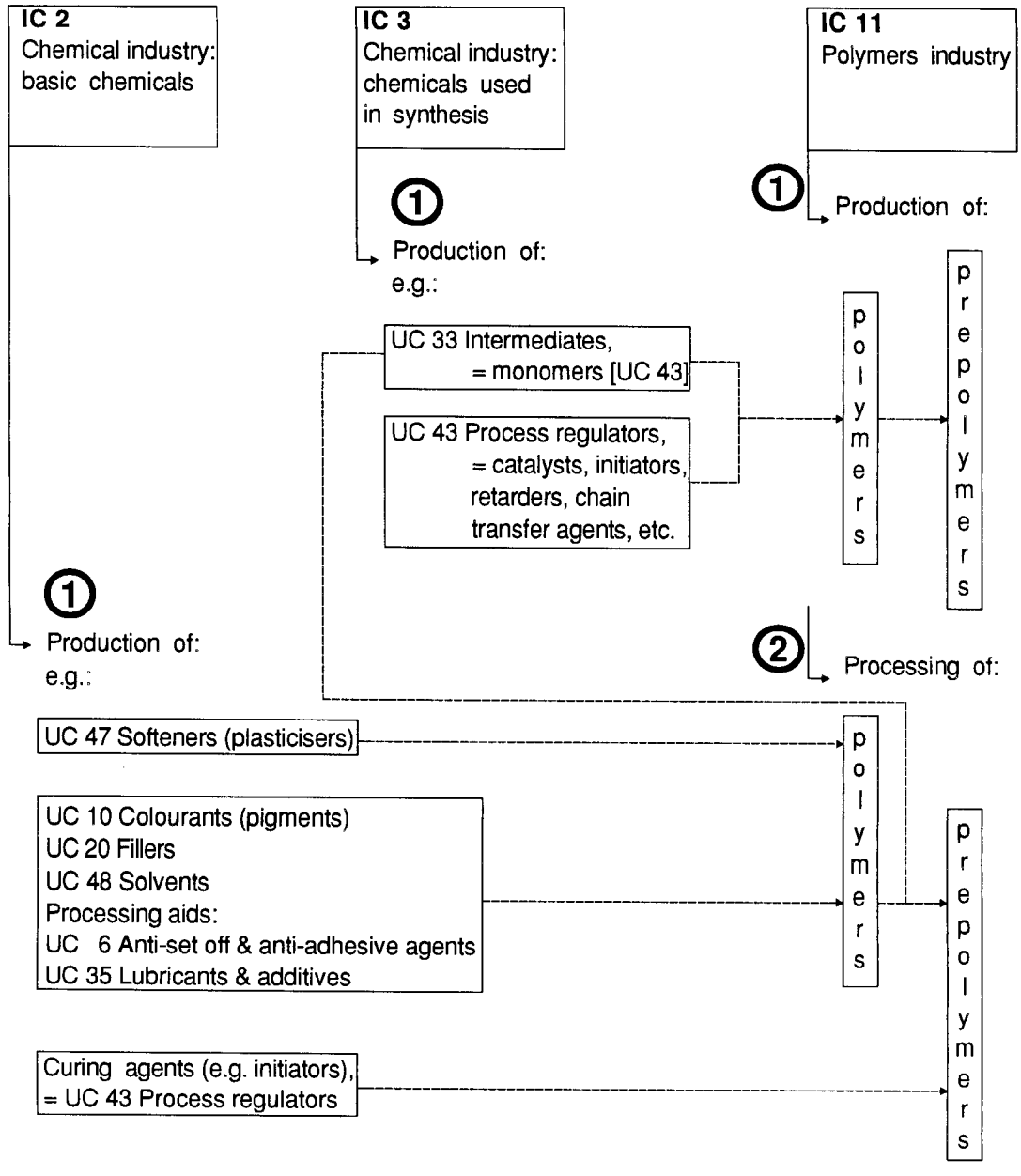

Figure 4.2 *Scheme of the position of substances with various functions for the production and processing of polymers in the industrial categories concerned (① = stage of production, ② = stage of processing).*

5. EXAMPLES

In this chapter examples of the interpretation and use of the emission tables have been worked out for fictitious substances for descriptions of usage and/or application. The following examples have been worked out:

1. Bleaching agent for household use;
2. Additive for metalworking fluids;
3. Additive for a toner used in printing processes;
4. Intermediate for a pharmaceutical;
5. Bleaching agent used photography I;
6. Bleaching agent used photography II;
7. Chemical used in the manufacture of a polymer I;
8. Chemical used in the manufacture of a polymer II;
9. Dyestuff for textile.

Example 1

Available data for input:

Function: The substance is a bleaching agent for general use e.g. in households. The substance is used in aqueous solutions containing odourants and thickening agents.

Production: The substance is a high production volume chemical produced in the EU in special plants at the level of 50,000 tonnes/year.

Properties: The only relevant physico-chemical properties for the emission tables in this example is the vapour pressure (2 Pa.).

Interpretation of input data and deduction of other data needed:

Stages L.C.: From the input data it can be seen that the relevant stages of the life cycle will be *production, formulation, processing* (in case of ICs ≠ 5) and *private use* (IC = 5). There will be no recovery of the substance. The fact that formulation is a relevant stage follows from the data input 'Function' that the substance is used in a solution containing other ingredients obviously added by the manufacturer.

Categories: From the function description it appears that the substance will be applied in IC 5 'Personal/domestic use, though application in offices, shops, waiting rooms,

public buildings, etc. may also occur (IC 6 'Public domain'). As households are mentioned specifically as an example, attention will be focused on IC 5 here.
The UC according to the TGD (Appendix II) is number 8 'Bleaching agents' (No. 132 of the EPA Function list, Appendix III).
The notifier states that production takes place at 'special plants', leading to the choice of MC Ic (see Table 4.2). As no information on formulation has been supplied, MC III is assumed for that stage.

Volumes: From the input data 'Production' the regional production volume is assumed to amount the default 10 %, being 5000 tonnes. As the description from the notifier states that the substance is used in solutions without specification of the concentration, no correction should be made (worst-case assumption) to the tonnage for a better estimate of the number of emission days.

Production: According to the information from the notifier, the substance is an HPVC so Table B1.6 (Appendix I for IC 5) is applicable to the determination of the fraction of the main source and the number of emission days (this table will be chosen automatically by EUSES at a regional production volume ≥ 7000 tonnes/year). The regional production volume is by default 0.1 * production volume EU = 5000 tonnes/year. The fraction of the main source is 1 and the number of emission days 300.
Table A1.1 (according to Appendix I for IC 5) gives the emission factors for air, waste water and industrial soil, respectively 0.00001 (MC Ic, vapour pressure 1-10 Pa), 0.003 (≥1000 tonnes) and 0.0001.

Formulation: For the stage of formulation Table B2.3 (Appendix I for IC 5) gives the fraction of the main source 0.8 and the number of emission days 300. It should be noted that no correction has been made for the content of this agent in the preparation as no details were given.(reasonable to make this worst-case assumption as the contribution may be substantial).
The emission factors in Table A2.1 (Appendix I for IC 5) are for air, waste water and air respectively 0.0025 (MC 3, vapour pressure < Pa), 0.003 (≥1000 tonnes) and 0.0001.

Processing: This stage of the life cycle is not applicable (see before).

Private use: As explained at the end of section 4.1 the STP may be regarded as a point source for emissions to waste water for emissions from households. Table B4.1 (Appendix I for IC 5) gives 0.002 as the fraction of the main source and 365for the number of emission days.

In Table A4.1 (Appendix I for IC 5) UC 8 'Bleaching agents' for household products are considered explicitly. The emission factors for air, waste water and soil are 0, 0.95 and 0.01 respectively.

Recovery: This stage of the life cycle is not applicable (see before).

Example 2

Available data for input:

Function: The substance is an anti-seize agent added as a dope to mineral oils used in processes like metal rolling and cutting, and, in future, probably also applied to motor oils. It will impart anti-wear and extreme pressure properties to the lubricants and provide oxidative stability.

Production: The substance is produced outside the EU, imported into the EU at 750 tonnes/year and sold to one customer in the country of import after formulation.

Properties: One of the relevant physico-chemical properties for the emission tables in this example is the vapour pressure (5 Pa.).

Interpretation of input data and deduction of other data needed:

Stages L.C.: As the substance is added to mineral oils, the stage of formulation as well as the stage of processing, are relevant.

Categories: As the substance is used in metalworking fluids IC 8 'Metal extraction, refining and processing' applies.

The EPA Function list (Appendix III) specifies *anti-seize agents* (no. 119) as 'substances added to lubricants to inhibit seizing of a metal part as it moves against a metal surface', so they may be regarded as *lubricant additives*, UC 35 according to Annex II (Appendix I). As can be seen in the emission table for IC 8 (Appendix I, Table A3.7) two UCs apply to substances used in metalworking fluids, namely UC 29 'Heat transferring agents' and UC 35 'lubricant additives'. In this case it is not necessary to pay more attention to the information from the notifier: 'it will impart anti-wear and extreme pressure properties to the lubricants and provides oxidative stability' (e.g. UC 49 'Stabilizers').

As the notifier gives no details on formulation MC III is assumed (worst case, see Table 4.2). For processing the MC is not relevant for the releases of UCs 29 and 35 (only for other processes in IC 8).

Volumes: The regional tonnage used for the emission tables equals the tonnage for the EU and thus overrules the default value of 10 % (this should be corrected manually in using the EUSES program)

Production: This stage of the life cycle is not applicable (see input data). It may be assumed that the substance is an NSEC (not a high production volume chemical) as no information on the production process has been supplied and formulation is related to a relatively small amount (<2500 tonnes/year, see Appendix I for IC 8 at production).

Formulation: As the substance in the formulation (metalworking fluid) is used by one user it may be assumed that there is also only one formulator. According to Table B2.4 (Appendix I for IC 8) the fraction of the main source should be 0.75 and the number of emission days 0.2 * fraction of the main source * tonnage = 0.2 * 0.75 * 750 = 113 (rounding off to an integer after adding 0.5). As no information on the content of the substance in the metalworking fluid has been specified by the notifier the number of days from the table is used (worst-case assumption).

The emission factors for air, waste water and industrial soil are 0.00001 (vapour pressure 1-10 Pa), 0.002 and 0.00001, respectively (Appendix I for IC 8). Note that the MC is not of relevance in this table as emission factors based on a use category document can be used.

Processing: Also for this stage there is one source applied (input information) and no correction on the tonnage is made because of lack of information on the concentration in the metalworking fluid. This means that the fraction of the main source from Table B3.5 (Appendix I for IC 8) 0.8 ('Else') will be set to 1 according to the specific information. The number of days is not influenced by not correcting for the number of emission days and is always 300.

In the table for the emission factors, Table A3.7 (Appendix I for IC 8) we need to use the logarithm of the Henry coefficient, which automatically is calculated by EUSES from the vapour pressure, water solubility and molecular weight. From the data input 'Function' it is apparent that the type of fluid is 'pure oils' and not 'water based'. The emission factors are 0.0002 (log Henry <2) or 0.002 (log Henry ≥2) for air, 0.185 (pure oils) for waste water, and 0.0001 for industrial soil.

Private use: This stage of the life cycle is not applicable.

Recovery: This stage of the life cycle is not applicable.

Example 3

Available data for input:

Function: The substance is a conducting agent for toner in copying and printing equipment.

Production: The substance is produced outside the EU and imported into the EU at the maximum level of 5 tonnes/year.

Formulation: The substance is formulated at one specific plant in the region considered. The fraction in the resulting preparation (toner) will be 0.001 The toner is sold completely within the EU.

Properties: The only relevant physico-chemical property for the emission tables in this example is the vapour pressure: 0.0001 Pa.

Interpretation of input data and deduction of other data needed:

Stages L.C.: From the input data it is clear that relevant stages of the life cycle will be *formulation* and *processing*. Though printers are more and more in use in households, the stage of private use is not (yet) considered in EUSES. The emissions will be very diffuse there and the overall emissions will be equal to those in offices. The substance as such or the toner are not recovered, but there will be releases during recycling of printed paper. This means that the stage of *recovery* also has to be taken into account.

Categories: From the function description it is clear that the substance will be applied in IC 12 'Pulp, paper and board industry'.

The UC is more difficult to establish with both the Function categories of the TGD (Appendix II) and the EPA function list (Appendix III). Only the TGD has a category meeting the term '*conducting agent*' at UC 12 'conductive agent' (materials used to conduct electrical current; sub-categories: electrolytes, electrode materials). As the substance is an agent used in *toners* for a specific purpose, the description does not meet the terms of Appendices II and III, respectively UC 10 Colouring agents' (sub-category pigments, including toners) and ChemUSES No. 225 'Toners'. As all kinds of preparations used in printing and copying like toners are usually referred to as *reprographic agents* (UC 45), this is the proper term as can be seen at the list of synonyms (Appendix IV). In the A tables for IC 12 at the stage of processing

this UC is mentioned explicitly in the table for *printing and allied processes* (Table A3.12).

There is no information from the notifier on the equipment used for formulation; it is, however, apparent that formulation does not lead to inclusion into or onto a matrix (the toner is a finely divided powder or a solution) and the use of *multi-purpose* equipment is assumed, leading to the choice of MC = 3 (see Table 4.2). As the ingredients of reprographic agents such as this one will be incorporated in the toner on the printed paper, the MC is 2 (MC 2 is the only MC considered for both reprographic agents and colouring agents) for the stage of processing (see Table 4.2). For the stage of recovery no MC is needed (see Table 4.2).

Volumes: From the input data 'Production' the regional volume (tonnage) after import appears to equal the volume for the EU (EUSES takes as a default a fraction of 0.1 for the regional production volume). After formulation the toner is sold throughout the EU, so that the market volume for the region will be the default fraction of 0.1 of the EU volume. Please note that version 2.0 of EUSES can**not** handle this situation and two separate runs for this substance will have to be made: one for formulation and a regional volume of 5 tonnes/year (EU volume 50 tonnes/year) followed by one for EU volume 5 tonnes/year (regional tonnage 0.5 tonnes/year) for the stages of processing and recovery.

Production: This stage of the life cycle is not applicable (see input data).

Formulation: From the input data 'Production' and 'Formulation' the regional tonnage for this stage appears to be 5 and the fraction of the main source is 1. Table B2.8 (Appendix I) has to be used for the determination of the fraction of the main source and the number of emission days for UC 45, however, the following points have to be considered:

- The tonnage should be corrected for the fraction in the preparation (as mentioned in section 4.1);
- The exact number of sources is known from the notification.

The corrected tonnage is: 5 / 0.001 = 5000, so the number of days according to the table is 300, while the fraction of the main source is 1 (instead of the table value of 0.4).

For the emission factors Table A2.1 (Appendix I) has to be used. As the notifier gives no specifications on the formulation process it is assumed that multi-purpose equipment is used (MC 3). The emission factors for air, waste water and industrial soil are then respectively: 0.0025 (MC 3, vapour pressure <10), 0.003 (corrected tonnage ≥1000) and 0.0001.

Processing The toner is used in copying machines and printers so emissions may be very diffuse. The standard scenario of the B tables considers for both the paper production and the printing processes ,however, only three situations: one company, large companies and small companies. So, obviously the choice must be made for small companies (in fact for 'printing and allied processes' these small companies may be considered as large offices with a lot of copying machines and printers where the toner using the substance considered is applied).

As previously mentioned, the fraction of the substance (toner) applied in the region is 0.1. According to Table B3.10 for the corrected volume, i.e. 5000 tonnes of toner,

the fraction of the main source is 0.05 and the number of emission days: 0.5 * fraction of the main source * tonnage = 0.5 * 0.05 * 5000 = 125 days (rounding off to an integer after adding 0.5). It should be noted that for these estimations no corrections are made for the losses in the previous stage of the life cycle!

Private use: This stage of the life cycle is not applicable (see before).

Recovery From the relevant B table (Table B5.2) it appears that the fraction of the main source - for the corrected volume of 5000 tonnes - is 0.3 and the number of emission days 250.

The emission factors for this stage are found in Table A5.2. From the notification input data ('Function') it appears that the type of paper on which the substance (toner) is used will be for copies going to archives and the public at large (letters, bills, forms, etc.). Hence the choice can be made for *other, or > 1 application*, leading to an emission factor for waste water of 0.2 (the emission factors for air and industrial soil are in all cases equal to zero).

Example 4

Available data for input:

Function: The substance is made from a starting material by a sulphonation reaction as a basic material in the production of an active ingredient for pharmaceutical preparations.

Production: The substance is stored on site and exported in two lots per year to a customer outside the EU and not imported into the EU. The production capacity of the plant is 4000 tonnes/year.

Properties: The only relevant physico-chemical property for the emission tables in this example is the vapour pressure: 0.5 Pa.

Interpretation of input data and deduction of other data needed:

Stages L.C.: As the total production is exported from the EU the only relevant stage of the life cycle is production.

Categories: As this substance is used in synthesis in the pharmaceutical or chemical industry it should be categorized as IC 3 'Chemical industry: chemicals used in synthesis'.

From the input data 'Function' it is apparent that we have to deal with a so-called intermediate UC 33 (Appendix II).

Since the information from the notifier states that the substance is stored on site until it is transported (in two lots), we will have to choose MC Ib 'Isolated intermediates stored on-site' (Table 4.2).

Production: As the notifier has not specified the substance as an HPVC and the default value for HPVCs amounts to 7000 tonnes/year the appropriate table for this example has to be Table B1.2 (Appendix I for IC 3). The table values for the fraction of the main source and the number of emission days are 0.6 and 300, respectively. The value for the fraction of the main source should be overwritten with the value of 1 as it may be deducted from the input information from the notifier that there exists only one producer.

The emission factors come from Table A1.2 (UC 33) and are for air, water and industrial soil 0 (MC Ib, vapour pressure <1 Pa), 0.003 (≥1000 tonnes/year) and 0.00001 (MC Ib), respectively.

Example 5

Available data for input:

Function: The substance is used as a bleaching agent in colour photography.

Production: The substance is produced and used in the EU at a level of about 6500 tonnes/year.

Processing: The substance is a component of the powdered preparation made up at the site where it will be used, e.g. print shops, in the bleach-fix bath of the EP-2 process.

Properties: The only relevant physico-chemical property for the emission tables in this example is the vapour pressure: 0.05 Pa.

As the emission scenario document on the photographic industry does not cover all aspects (e.g. the air compartment) the standard tables of EUSES may be used.

A second example for a substance like this one will be worked out (Example 6)t.

Interpretation of input data and deduction of other data needed:

Stages L.C.: For this substance it may be expected that all stages of the life cycle will be relevant. From the data input 'Processing' it becomes clear that the substance is part of a formulation. In photographic processes silver is recovered; at this stage emissions of components of the photographic solutions applied will be released with waste water. Private use is only applicable for widely used photochemicals e.g. in print shops (see Table B3.8, Appendix I for IC 10).

Categories: The substance apparently belongs to IC 10 'Photographic industry'.
As no information has been supplied on the production and formulation processes, the choice for both will be MC 3 (default). Also for processing, the MC will be 3 (the substance is used in aqueous solutions. For the other stages of the life cycle the MC is of no interest.
On first thought, one might choose UC 8 'Bleaching agents' from the TGD list of Function categories (Appendix II), but from the information it will be clear that the proper choice has to be UC 42 'Photochemicals' because of the use in bleach-fix baths.

Production: For the photographic industry substances are treated as HPVCs above 4000 tonnes/year, so Table B1.4 (Appendix I for IC 10) applies to the fraction of the

main source and number of emission days. The fraction of the main source according to this table is 0.8 (5000-25,000 tonnes) and the number of emission days amounts to 300.

For the emission factors at production according to Appendix I (for IC 10) the general table applies (Table A1.1). This yields, for this example, the emission factors 0.00001 (MC 3, vapour pressure <1) for air, 0.003 (≥1000 tonnes/year) for waste water and 0.0001 for industrial soil.

Formulation: Table B2.3 has to be applied for this stage (Appendix I for IC 10) and the results are: fraction of the main source 0.8 and number of emission days 300. It should be noted that no correction has been made for the content of this agent in the preparation as no details were given (reasonable to make this worst-case assumption as the contribution may be substantial).

As the formulation concerns a preparation used in photographic baths, Table A2.1 (Appendix I for IC 10) must be applied. The emission factors derived from this table are 0.0025 (MC 3, vapour pressure<10) for air, 0.003 (≥1000 tonnes/year) for waste water and 0.0001 for industrial soil.

Processing For this stage it can be difficult to judge whether the substance will be applied in either large or small companies. As the input data give an example of application in print shops, 'small companies' is a valid choice. The fraction of the main source is then 0.05 and the number of emission days 300 (Table B3.8, Appendix I for IC 10).

Table A3.9 applies for the emission factors (Appendix I for IC 10). The emission factors are then 0.000035 (MC 3, vapour pressure <1) for air, 0.8 (MC 3, Aqueous solutions: else) and 0.00025 (MC 3, Else).

Private use: At this stage the STP is regarded as a point source for assessment in the local situation, with a fraction of 0.002 (see section 4.1). Table B4.2 (Appendix I for IC 10) presents the fraction of the main source, which is calculated as the fraction 0.002 * the fraction used by the public at large (f private use) and the number of emission days. In this example the values are: fraction of the main source $5*10^{-6}$ (≥5000 tonnes/year) and the number of emission days 200.

It should be mentioned that though the contribution in the emissions will be very low compared with the professional use, this calculation may theoretically

be of use where professional users have to apply a purification technique before release to the sewer. Households will not have any waste-water treatment before discharge of their waste water.
The emission factors come from Table A4.3 (Appendix I for IC 10): zero for both air and soil, 0.4 for waste water.

Recovery: For 'small companies' Table B5.1 (Appendix I for IC 10) gives 0.2 for the fraction of the main source and 300 for the number of emission days.
The emission factors according to Table A5.1 (Appendix I for IC 10) are 0.000005 for air, 0.2 for waste water and zero for soil.

Example 6

Available data for input:

Function: The substance is used as a bleaching agent in processing colour reversal materials in the photographic industry.

Production: The substance is produced outside the EU and used at our film processing laboratories in the EU at a level of about 6500 tonnes/year.

Processing: The bleach baths are freshly prepared at the film processing laboratories in the amounts directly needed.

Properties: The only relevant physico-chemical property for the emission tables in this example is the vapour pressure: 0.05 Pa.

As the emission scenario document on the photographic industry does not cover all aspects (e.g. the compartment air) the EUSES standard tables may be used.

This second example has, like the previous one, been worked out to show several small differences which occur because of the input data interpretation. These data are nearly the same (properties and function).

Interpretation of input data and deduction of other data needed:

Stages L.C.: As the substance is produced outside the EU and the fact that the substance is applied more or less directly at film processing laboratories, production and formulation are not applicable. From the data input 'Function' it appears that the processing stage takes place at sites of one company ruling out private use. The substance also may be released at the stage of (silver) recovery.

Categories: Since the processing stage concerns application in aqueous solutions, the MC is 3. The MC is not of interest for the stage of recovery.
As in the previous example IC 10 'Photographic industry' is of concern here.
We also have to deal with UC 42 'Photochemcials' in this example.

Production: This stage is not applicable.

Formulation: This stage is not applicable.

Processing: Only the fraction of the main source is different as the choice has to be made for 'large companies' (the substance is applied in specialized film processing laboratories): 0.333 instead of 0.05 (Table B3.8).

Private use: This stage is not applicable.

Recovery: At this stage too, the only difference to be found is the fraction of the main source, which is 0.333 instead of 0.2 (Table B5.1).

Example 7

Available data for input:

Function: The substance is used as a comonomer in the synthesis of a latex.

Production: The substance is produced outside the EU and imported into the EU at a rate of 500 tonnes/year. The substance is marketed as a 20% aqueous solution.

Properties: The relevant physico-chemical properties for the emission tables in this example are the vapour pressure (25 Pa) and solubility (300,000 mg/l).

Interpretation of input data and deduction of other data needed:

Stages L.C.: The stage of production is not relevant. As it is not clear from the data input 'Function' whether the substance is imported as a solution, formulation is considered to be a relevant stage. The next stage of interest is processing i.e. the stage where the latex is produced by a polymerization reaction. Recovery is not a likely stage.

Volumes: The regional volume is the default value of 10% of 500 tonnes/year: 50 tonnes/year. The correction of the volume in consideration of content in the preparation - 20% - for the number of emission days is 50 / 0.2 = 250 tonnes/year.

Categories: For formulation, MC 3 should be chosen as no information has been given at all. For the stage of processing the MC is not relevant (Table A3.10 of Appendix I for IC 11).

The substance concerned obviously belongs to IC 11 'Polymers industry'. Substances called 'comonomer' are in fact just monomers (the term *comonomer* means that the polymer macromolecule, the copolymer, will comprises two or more different monomer elements) and belong according to the TGD (Appendix II) to UC 33 'Intermediates'. In the emission tables for IC 11, monomers are attributed, however, UC 43 'Process regulators' (see also Figure 4.2).

Production: This stage is not applicable.

Formulation: Table B2.8 (Appendix I for IC 11) should be used as it is not stated by the notifier that the substance belongs to the HPVC. The fraction of the main source is 0.8 and the number of emission days 0.8 * 250 = 200.

The emission factors from Table A2.1 (Appendix I for IC 11) are 0.005 (MC 3, vapour pressure 10-100 Pa) for air, 0.02 (<1000 tonnes/year) for waste water, and 0.0001 for soil.

Processing: According to Table B3.9 (Appendix I for IC 11) the fraction of the main source is 0.25 and the number of emission days 0.4 * 0.25 * 250 = 25 using the corrected volume of 250 tonnes/year.

As this processing step involves the production of a polymer by polymerization, Table A3.10 (Appendix I for IC 11) applies. The 'type' of substance for the polymerization process is 'I' as the substance is a monomer. As the substance is sold in an aqueous solution it is very likely that a 'wet' polymerization process is concerned. The emission factors according to Table A3.10 are: 0.001 (10-100 Pa) for air, 0.01 (solubility ≥1000 mg/l) for waste water, and zero for soil.

Private use: This stage is not applicable.

Recovery: This stage is not applicable.

Example 8

The same substance as above is given here, only this time the function and form in which it is marketed are different.

Available data for input:

Function: The substance is used as a monomer for thermosetting resins for embedding components used in the electronic industry.

Production: The substance is produced outside the EU and imported into the EU at a level of 500 tonnes/year.

Properties: The only relevant physico-chemical property for the emission tables in this example is the vapour pressure: 25 Pa.

Interpretation of input data and deduction of other data needed:

Stages L.C.: The stage of production is not relevant, nor is the stage of formulation this time. So the only stage of the life cycle concerned is processing.

Categories: Though the function description suggests that the substance belongs to IC 4 'Electrical/electronic industry', the process of producing thermosets belongs to IC 11 'Polymers industry'.

The MC in IC 11 is not of relevance.

The substance is a monomer and has UC 43 'Process regulators' in IC 11 (see remarks in the previous example).

Production: This stage is not applicable.

Formulation: This stage is not applicable.

Processing: Also in this example Table B3.9 (Appendix I for IC 11) gives the fraction of the main source and the number of emission days. The fraction of the main source is the same (0.25) but the number of emission days is different because no correction on the volume had to be made: 0.4 * 0.25 * 50 = 5 days.

Table A3.11 applies to the emission factors in this example because we are now dealing with polymer processing. The category of polymer processing is 'B' as the substance is used for processing thermosetting resins (prepolymers). The type of chemical is 'V' as the substance is a monomer (cross-linking agent) with UC 43 'Process regulators'. The emission factors derived from Table A3.11 are 0.075 (vapour pressure <100) for air, 0.00005 for waste water and 0.00001 for industrial soil.

Private use: This stage is not applicable.

Recovery: This stage is not applicable.

Example 9

Although there is an emission scenario document in the TGD for textile dyes, an example is given here because this document does not comprise all aspects (e.g. production).

Available data for input:

Function: The substance will be used as a dyestuff for batch dyeing of polyamid fibres and wool.

Production: The substance is produced in the EU at a maximum of 6 tonnes/year.

Properties: The solubility is 250,000 mg/l.

Note: no specification on the type of dye has been given, implying that it is 'unknown'; the structural formula is assumed here to show acid groups!

Interpretation of input data and deduction of other data needed:

Stages L.C.: The relevant stages are production and processing. The stage of private use can not be excluded (see 'Private use' below).

Categories: The substance is used for dyeing fibres like polyamide and wool and hence belongs to the IC 13 'Textile processing industry'.

Dyestuffs belong to UC 10 'Colouring agents' according to the TGD (Appendix II).

Production: As a low volume of the substance is produced, Table B1.2 (Appendix I for IC 13) applies. The fraction of the main source is (regional tonnage 10 % by default, i.e. 0.1 * 6 = 0.6 tonnes year) 1 (<10 tonnes/year) and the number of emission days 1 * 0.6 = 1 day (rounding off after adding 0.5).

Table A1.3 (Appendix I for IC 13) should be used for the emission factors. This results in emission factors: 0.0008 for air, 0.05 (solubility 100,000 - 500,000 mg/l) for waste water and 0.0001 for industrial soil.

Formulation: This stage is not applicable.

Processing: For UC 10 'Colouring agents', Table B3.11 (Appendix I for IC 13) applies and the resulting values are 0.9 for the fraction of the main source and 10 * 0.9 * 0.6 = 5 for the number of emission days (rounding off after adding 0.5).

Table A3.14 applies and the emission factor for air in this case (batch dyeing) is 0.0007. For waste water the value of the emission factor is calculated as:

Emission factor = E.1 + E.2, where E.1 = A / (1 + K * B)

From the table for 'unknown, acid groups' (see Note at 'Properties' above) it follows that K = 90, A = 1, B = 0.1, and E.2 = 0.01.

So for waste water the emission factor is calculated to be 1 / (1 + 90 * 0.1) + 0.01 = 0.11.

The emission factor for industrial soil is 0.005.

Private use: From Table B4.3 (Appendix I for IC 13) it follows that although the dyestuff may be used by the public at large (dye for batch dyeing in industry) it is not expected to happen: the fraction of the main source is zero.

Recovery: This stage is not applicable.

Using the tables for currentsubstances in the field, difficulties at times will likely occur in the interpretation of the information in establishing the proper categories. It will be necessary in these cases to request industry to supply the additional information needed.

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APPENDIX I

A tables: Emission factors for all (relevant) stages of the life cycle for all industrial categories

Many tables are applied to more than one category, but are given only once (at the first occurrence). For other categories, reference is made to the number of those tables. It should be noted that only for a limited number of industrial categories and specific applications (use categories) studies have been performed (resulting in so-called use-category documents) to provide a solid basis for the estimates.

IC = 1: AGRICULTURAL INDUSTRY

PRODUCTION **Table A1.1**

Compartment	Conditions Sol. (mg/l)	Vap. (Pa)	Emission factors All MC's	MC=1b	MC=1c	MC=3 (1)
Air		<1		0	0	0.00001
		1-10		0	0.00001	0.0001
		10-100		0.00001	0.0001	0.001
		100-1,000		0.0001	0.001	0.01
		1,000-10,000		0.001	0.005	0.05
		≥10,000		0.005	0.01	0.05
	T (tonnes/year)					
Waste water	<1,000		0.02			
	≥1,000		0.003			
Soil			0.0001			

(1) Default

FORMULATION **Table A2.1**

Compartment	Conditions Sol. (mg/l)	Vap. (Pa)	Emission factors All MC's	MC=1b	MC=1c	MC=3 (1)
Air		<10		0.0005	0.001	0.0025
		10-100		0.001	0.0025	0.005
		100-1,000		0.0025	0.005	0.01
		≥1,000		0.005	0.01	0.025
		T (tonnes/year)				
Waste water		<1,000	0.02			
		≥1,000	0.003			
Soil			0.0001			

(1) Default

PROCESSING **Table A3.1**

UCs	Description	Emission factors to: Air	Surface water	Industrial soil
Default other UCs than specified below		0.1	0.1	0*
3	areosol propellants	1	0	0
9, 10, 36	cleaning/washing agents and additives + colourants + odour agents	0	0.1	0.4
19	fertilizers	0	0.05	0*
26	food/feedstuff additives	0	0	0.05
50	surfactants	0.05	0.1	0*
41	pharmaceuticals (external application)	0	0	0.1
41	pharmaceuticals (internal application)	0	0	0
48	solvents	1	0	0
38, 39	pesticides + biocides	0	0	0*

* It should be noted that direct emission to agricultural soil, as well as processing of pesticides (UC=38) and biocides (UC=39), is outside the scope of EUSES.

PRIVATE USE **Not applicable**

RECOVERY **Not applicable**

IC=2: CHEMICAL INDUSTRY: BASIC CHEMICALS

PRODUCTION **Table A1.1**

FORMULATION **Table A2.1**

PROCESSING **Table A3.2**

Conditions		Emission factors		
Sol. (mg/l)	Vap. (Pa)	Air	Waste water	Soil
<100	<100	0.65	0.25	0.0005
	100-1,000	0.8	0.1	0.0025
	≥1,000	0.95	0.05	0.001
100-1,000	<100	0.4	0.5	0.005
	100-1,000	0.55	0.35	0.002
	≥1,000	0.65	0.25	0.001
1,000-10,000	<100	0.25	0.65	0.005
	100-1,000	0.35	0.55	0.002
	≥1,000	0.5	0.4	0.001
≥10,000	<100	0.05	0.85	0.005
	100-1,000	0.1	0.8	0.002
	≥1,000	0.25	0.65	0.001

PRIVATE USE **Not applicable**

RECOVERY **Not applicable**
(Emissions at recovery of chemicals such as catalysts are included in the emissions at processing)

IC = 3: CHEMICAL INDUSTRY: CHEMICALS USED IN SYNTHESIS

PRODUCTION **Table A1.1 for UC ≠ 33 (intermediates)**
Table A1.2 for UC = 33 (intermediates)

Compartment	Conditions		Emission factors			
	Sol. (mg/l)	Vap. (Pa)	All MC's	MC=1a	MC=1b	MC=1c
Air		<1		0	0	0
		1-10		0	0	0.00001
		10-100		0	0.00001	0.0001
		100-1,000		0.00001	0.0001	0.001
		1,000-10,000		0.0001	0.001	0.01
		≥10,000		0.001	0.01	0.025
	T (tonnes/year)					
Waste water	<1,000		0.02			
	≥1,000		0.003			
Soil				0	0.00001	0.0001

FORMULATION **Table A2.1**

PROCESSING **Table A3.3**

Compartment	Conditions Sol. (mg/l)	Vap. (Pa)	Emission factors All MC's	MC = 1b	MC = 1c	MC = 3 (1)
Air		<1		0	0	0.00001
		1-10		0	0	0.0001
		10-100		0	0.00001	0.001
		100-1,000		0.00001	0.0001	0.01
		1,000-10,000		0.0001	0.001	0.025
		≥10,000		0.001	0.005	0.05
	T (tonnes/year)		All MC's	MC = 1b	MC = 1c	MC = 3 (1)
Waste water	<1,000		0.02			
	≥1,000		0.007	0.0005		
Soil			0.0001			

(1) Default

Remark: The releases at processing for use category 33 (intermediates) should be added to the releases at production **unless** the notifier states that the substance is processed elsewhere

PRIVATE USE **Not applicable**

RECOVERY **Not applicable**

IC = 4: ELECTRICAL/ELECTRONIC INDUSTRY

PRODUCTION **Table A1.1**

FORMULATION **Table A2.1**

PROCESSING **Table A3.4**

Compartment	Conditions Sol. (mg/l)	Vap. (Pa)	Emission factors MC = 2	MC = 3 (1)
Air		<100	0.0005	0.0005
		≥100	0.0005	0.001
Waste water			0.0001	0.005
Soil			0.0001	0.01

(1) Default

PRIVATE USE **Not applicable**

RECOVERY **Not applicable**

IC = 5: PERSONAL /DOMESTIC

PRODUCTION **Table A1.1**

FORMULATION **Table A2.1**

PROCESSING **Not applicable**

PRIVATE USE **Table A4.1**

Compartment	Conditions Use category	Sol. (mg/l)	Vap. (Pa)	Emission factors
Air	2, 7, 8, 9, 10, 11, 41, 47, 50			0
	3			1
	5			0.0005
	26		<5,000	0
			≥5,000	0.01
	35		<5,000	0
			≥5,000	0.05
	36		<100	0.05
			100-2,500	0.2
			2,500-10,000	0.5
			≥10,000	0.9
	38 (herbicides)			0.01
	(pesticides, garden)			0.05
	(pesticides, pets)		<100	0.05
			100-5,000	0.1
			≥5,000	0.8
	48, 55	<10	<10	0.005
			10-100	0.015
			100-1,000	0.15
			1,000-10,000	0.4
			≥10,000	0.6
		10-100	<10	0.0015
			10-100	0.075
			100-1,000	0.125
			1,000-10,000	0.25
			≥10,000	0.4
		100-1,000	<10	0.0015
			10-100	0.025
			100-1,000	0.1
			1,000-10,000	0.15
			≥10,000	0.225
		≥1,000	<10	0.00075
			10-100	0.03
			100-1,000	0.075
			1,000-10,000	0.125
			≥10,000	0.175
Surface water	5, 35 (car products)			0.0005
Waste water	2	<25		0
		≥25		0.005
	3, 5, 19, 35			0
	7			0.01
	8 (household products)			0.95
	(cosmetics)			0.8
	9, 50			0.99
	10 (cleaning products)			1
	(cosmetics)			0.8
	(else)			0.5
	11			0.8
	26			0.025

PRIVATE USE **Table A4.1 (continued)**

Compartment	Conditions Use category	Sol. (mg/l)	Vap. (Pa)	Emission factors
Waste water (continued)	36 (cosmetics)		<2,500	0.8
			2,500-10,000	0.5
			≥10,000	0.1
	(cleaning products, etc.)		<100	0.9
			100-2,500	0.8
			2,500-10,000	0.5
			≥10,000	0.1
	(else)		<100	0.5
			100-2,500	0.3
			2,500-10,000	0.2
			≥10,000	0.05
	38 (herbicides)			0
	(pesticides, garden)			0
	(pesticides, pets)			0.1
	41 (external)			0.25
	(oral)			0.05
	47			0.9
	48, 55	<10		0.1
		10-100		0.2
		100-1,000		0.4
		≥1,000		0.6
Soil	2			0.0001
	3, 36, 41			0
	5			0.0005
	7			0.001
	8 (household products)			0.01
	(cosmetics)			0.001
	9, 47, 50			0.01
	10 (cleaning products)			0.002
	(cosmetics)			0.0001
	(else)			0.01
	11			0.0001
	19			1
	26, 35			0.002
	38 (garden: herbicides, pesticides)			0.9
	(pesticides, pets)		<100	0.05
			100-5,000	0.01
			≥5,000	0.002
	48, 55		<10	0.2
			10-100	0.1
			100-1,000	0.05
			1,000-10,000	0.005
			≥10,000	0.002

RECOVERY **Not applicable**

IC = 6: PUBLIC DOMAIN

PRODUCTION **Table A1.1**

FORMULATION **Table A2.1**

PROCESSING **Table A3.5**

Conditions Use categories		Emission factors Air	Waste water	Soil
9	(cleaning/washing agents)	0.0025	0.9	0.05
39	(pesticides, non-agricultural)	0.1	0.05	0.8
All	other	0.05	0.45	0.45

PRIVATE USE **Not applicable**

RECOVERY **Not applicable**

IC = 7: LEATHER PROCESSING INDUSTRY

PRODUCTION **Table A1.1 for UC ≠ 10 (colourants)**
Table A1.3 for UC = 10 (colourants)

Compartment	Conditions Sol. (mg/l)	Vap. (Pa)	Emission factors
Air			0.0008
Waste water	<2,000		0.015
	2,000-10,000		0.02
	10,000-100,000		0.03
	100,000-500,000		0.05
	≥500,000		0.06
Soil			0.0001

FORMULATION **Table A2.1**

PROCESSING **Table A3.6**

Compartment	Conditions Sol. (mg/l)	Vap. (Pa)	Emission factors All MC's	MC = 2	MC = 3 (1)
Air	<100	<100	0.001		
	<100	≥100	0.01		
	≥100		0		
Waste water	<100			0.05	0.9
	100-1,000			0.15	0.99
	≥1,000			0.25	0.99
Soil			0.01		

(1) Default

PRIVATE USE **Not applicable**

RECOVERY **Not applicable**

IC = 8: METAL EXTRACTION, REFINING AND PROCESSING INDUSTRY

PRODUCTION **Table A1.1**

FORMULATION **Table A2.1 for UC ≠ 29 & 35**
Table A2.2 for UC = 29 & 35

Compartment	Conditions Sol. (mg/l)	Vap. (Pa)	Emission factors
Air		<1	0.00005
		1-10	0.00001
		10-100	0.0005
		100-1,000	0.0025
		≥1,000	0.025
Waste water			0.002
Soil			0.00001

(1) Default

PROCESSING **Table A3.7**

Compartment	Conditions UC≠29&35	Sol. (mg/l)	Emission factors MC = 2	MC = 3 (1)
Air			0	0.25
Waste water		<100	0.05	0.5
		100-1,000	0.1	0.5
		≥1,000	0.25	0.5
Soil			0	0.05

Compartment	Conditions UC=29&35	log Henry	Emission factors
Air		<2	0.0002
		≥2	0.002
Waste water	Pure oils		0.185
	Water based + unknown		0.316
Soil			0.0001

(1) Default
UC 29 = heat transferring agents, UC 35 = lubricants and additives; both are used in metalworking fluids

PRIVATE USE **Not applicable**

RECOVERY **Not applicable**

IC = 9: MINERAL OIL AND FUEL INDUSTRY

PRODUCTION **Table A1.1**

FORMULATION **Table A2.1**

PROCESSING **Table A3.8**

Compartment	Conditions Sol. (mg/l)	Vap. (Pa)	Emission factors
Air		<1	0.0001
		1-10	0.0005
		10-100	0.001
		100-1,000	0.005
		≥1,000	0.01
Waste water			0.0005
Soil			0.001

PRIVATE USE **Table A4.2**

Compartment	Conditions	Vap. (Pa)	Emission factors
Air		<10	0.005
		10-100	0.015
		100-1,000	0.15
		1,000-10,000	0.4
		≥10,000	0.6
Waste water			0.0005
Surface water			0.0001
Soil			0.0001

RECOVERY **Not applicable**

IC = 10: PHOTOGRAPHIC INDUSTRY

PRODUCTION **Table A1.1**

FORMULATION **Table A2.1 default for formulations to be used in photographic baths (aqueous solutions)**
Table A2.3 for UC=42, and other UCs in the manufacture of solid materials

Compartment	Conditions	Vap. (Pa)	Emission factors
Air	Control of crystal growth		0
	Other functions	<1	0.0001
		1-10	0.001
		10-100	0.3
		100-1,000	0.7
		≥1,000	0.99
Waste water	Control of crystal growth		0.99
	Other functions		0.002
Soil			0.00025

(1) Default

PROCESSING **Table A3.9**

Compartment	Conditions	Vap. (Pa)	Emission factors MC=2	MC=3 (1)
Air	Solid materials (e.g. films)		0	
	Else	<1		0.000035
		1-10		0.00025
		10-100		0.0075
		100-1,000		0.025
		≥1,000		0.075
Waste water	Solid materials (e.g. fims)		0	
	Aqueous solutions:			
	- coupler of dye			0.15
	- else			0.8
Soil	Solid materials (e.g. fims)		0	
	Else			0.00025

(1) Default

PRIVATE USE **Table A4.3**

Conditions UC=42 (photochemicals), for aqueous solutions only!	Emission factors Air	Waste water	Soil
	0	0.4	0

RECOVERY **Table A5.1**

Compartment	Conditions UC=42 (photochemicals), for aqueous solutions only!	Vap. (Pa)	Emission factors
Air		<1	0.000005
		1-10	0.000025
		10-100	0.00075
		100-1,000	0.0025
		≥1,000	0.01
Waste water			0.2
Soil			0

IC = 11: POLYMERS INDUSTRY

PRODUCTION **Table A1.1**

FORMULATION **Table A2.1**

PROCESSING **Table A3.10 for polymerization processes**

In the polymer industry polymers are produced by:

A) Polymerization reactions: A.1) "Wet" (e.g. emulsion polymerization)

A.2) "Dry" (e.g. gas phase polymerization)

B) Other (e.g. polyadditions, polycondensations)

The Use category (HEDSET) for all types of chemicals is: 43 Process regulators, which can be subdivided into:

Type	Type of function
I	Monomers (UC 43 Process regulators)
II	Catalysts (UC 43 Process regulators)
III	Initiators, Inhibitors, Retarders, Chain transfer agents (UC 43 Process regulators), Vulcanizing agents (UC 53 Vulcanizing agents), etc.

N.B. 1. In principle this might be considered as stage 1. Production!
2. As no good information is available Process types "A.1" and "B" have been considered to have the same emission factors

PROCESSING **Table A3.10 for polymerization processes (continued)**

Compartment	Conditions	Emission factors					
		Type I		Type II		Type III	
	Vap. (Pa)	"Wet"	"Dry"	"Wet"	"Dry"	"Wet"	"Dry"
Air	<1	0.00001	0.00001	0	0	0	0
	1-10	0.0001	0.0001	0	0	0	0
	10-100	0.001	0.001	0	0	0	0
	100-1,000	0.01	0.01	0.0005	0.0005	0	0
	1,000-10,000	0.05	0.05	0.001	0.001	0.0005	0.0005
	≥10,000	0.05	0.05	0.01	0.01	0.001	0.001
	Sol. (mg/l)						
Waste water	<10	0.00001	0	0.005	0	0.0005	0
	10-100	0.0001	0	0.01	0	0.001	0
	100-1,000	0.001	0	0.025	0	0.0025	0
	≥1,000	0.01	0	0.05	0	0.005	0
	Vap. (Pa)						
Soil	<5,000	0	0	0.00050.0005		0.00025	0.00025
	≥5,000	0	0	0	0	0	0

PROCESSING **Table A3.11 for polymer processing**

Processing of polymers ("shaping" by all kind of techniques) occurs in many Industrial categories

Two categories of polymer processing are distinguished:

A Processing of thermoplastics

B Processing of thermosetting resins (prepolymers)

For the emission factors the following types of chemicals used are considered:

I	(A, B)	Additives	UC 7 (Anti-static agents), 22 (Flame retardants), 49 (Stabilizers) & 55 Others (e.g. antioxidants)
		Pigments	UC 10 (Colourants)
		Fillers	UC 20
II	(A)	Plasticizers	UC 47 (softeners)
III	(A, B)	Solvents	UC 48
IV	(A, B)	Processing aids	UC 6 (Anti-set off and anti-adhesive agents) & 35 (lubricants and additives)
V	(B)	Curing agents	UC 43 (Process regulators, e.g. initiators)
		Cross-linking agents	UC 43 (Process regulators: monomers)

PROCESSING **Table A3.11 for polymer processing**

Compartment	Conditions Vap. (Pa)	Boiling point (°C)	Emission factors A	B	Type of chemicals
Air	<1	<300/unknown	0.001	0	I
		≥300	0.0005	0	
	1-100	<300/unknown	0.0025	0	
		≥300	0.001	0	
	≥100	<300/unknown	0.01	0	
		≥300	0.005	0	
		<400/unknown	0.01		II
		≥400	0.005		
	<100		0.1	0.1	III
	100-1,000		0.25	0.25	
	1,000-10,000		0.5	0.5	
	≥10,000		0.75	0.75	
	<1	<300/unknown	0.01	0	IV
		≥300	0.005	0	
	1-100	<300/unknown	0.025	0	
		≥300	0.01	0	
	≥100	<300/unknown	0.1	0	
		≥300	0.05	0	
	<100			0.075	V
	100-1,000			0.15	
	1,000-10,000			0.25	
	≥10,000			0.35	
Waste water			0.0005	0.0005	I
			0.001	0	II
			0	0	III
			0.0005	0.0005	IV
				0.00005	V
Soil			0.0001	0.0001	I
			0.0005	0	II
			0.00001	0.00001	III
			0.001	0.001	IV
				0.00001	V

PRIVATE USE **Not applicable**

RECOVERY **Not considered yet**

IC = 12: PULP, PAPER AND BOARD INDUSTRY

PRODUCTION **Table A1.1 for UC ≠ 10 (colourants)**
Table A1.3 for UC = 10 (colourants)

FORMULATION **Table A2.1 for UC ≠ 45 (reprographic agents)**
Table A2.1 for UC = 45 (reprographic agents)

PROCESSING **Table A3.12 for printing and allied processes**

Compartment	Conditions		Emission factors		
	Use categories	Sol (mg/l)	Vap. (Pa)	MC = 2	MC = 3 (1)
Air	Default		<100	0	0.01
			100-1,000	0.05	0.2
			1,000-10,000	0.25	0.5
			≥10,000	0.5	0.75
	10 & 45			0	
	48		<100		0.05
			100-1,000		0.3
			1,000-10,000		0.65
			≥10,000		0.85
Waste water	Default	<100		0.0001	0.01
		100-1,000		0.005	0.05
		≥1,000		0.001	0.1
	9				0.9
	10 & 45			0.0005	
	48		<100		0.0005
			100-1,000		0.001
			≥1,000		0.005
Soil	All		<100	0.0015	0.0015
			100-1,000	0.0001	0.0001
			1,000-10,000	0.00001	0.00001
			≥10,000	0	0

(1) Default

PROCESSING **Table A3.12 for pulp, paper and board production**

Compartment	Conditions		Emission factors		
	Use category	Sol. (mg/l)	Vap. (Pa)	MC=2	MC=3 (1)
Air	All	<100	<100	0	0.0001
			100-1,000	0.00001	0.001
			≥1,000	0.0001	0.01
		100-1,000	<100	0	0.00001
			100-1,000	0	0.0001
			≥1,000	0.00001	0.001
		≥1,000	<100	0	0
			100-1,000	0	0.0001
			≥1,000	0	0.001

PROCESSING **Table A3.12 for pulp, paper and board production (continued)**

Compartment	Conditions		Emission factors		
	Use category	Sol. (mg/l)	Vap. (Pa)	MC=2	MC=3 (1)
Waste water	Default	<100	<100	0.85	0.85
			100-500	0.75	0.75
			≥500	0.5	0.5
		100-1,000	<100	0.875	0.875
			100-500	0.85	0.85
			≥500	0.75	0.75
		1,000-10,000	<100	0.9	0.9
			100-500	0.875	0.875
			≥500	0.85	0.85
		≥10,000	-	0.95	0.95
	10:				
	- Basic dye, anion			0.023	0.023
	- Direct dye			0.04	0.04
	- Direct dye, kation			0.055	0.055
	- Direct dye, anion/kation			0.028	0.028
	- Acid dye, kation/unknown			0.079	0.079
	- Brightener			0.064	0.064
	20 & 31			0.05	0.05
Soil	All		<100	0.0015	0.0015
			100-1,000	0.0001	0.0001
			1,000-10,000	0.00001	0.00001
			≥10,000	0	0

(1) Default

PRIVATE USE **Not applicable**

RECOVERY **Table A5.2**

Compartment	Conditions	Emission factors
Air		0
Waste water	Use category = 10 (Colourants)	0.1
	Use category 45, for paper type:	
	- graphic	0.2
	- cardboard	0.01
	- newspaper	0.15
	- sanitary	0.01
	- packing	0.1
	- archives	0.05
	- other, or >1 application	0.2
Soil		0

IC = 13: TEXTILE PROCESSING INDUSTRY

PRODUCTION **Table A1.1 for UC ≠ 10 (colourants)**
Table A1.3 for UC = 10 (colourants)

FORMULATION **Table A2.1**

PROCESSING **Table A3.14**

Compartment	Conditions Sol. (mg/l)	Vap. (Pa)	Emission factors UC≠10	UC = 10
Air	<100	<100	0.05	
		100-1,000	0.15	
		≥1,000	0.4	
	100-1,000	<100	0.025	
		100-1,000	0.05	
		≥1,000	0.15	
	1,000-10,000	<100	0.01	
		100-1,000	0.025	
		≥1,000	0.05	
	≥10,000	<100	0.005	
		100-1,000	0.01	
		≥1,000	0.025	
	Conditions			
	Batch dyeing			0.0007
	Continuous dyeing:			
	- thermosol/unknown			0.05
	- other			0.0025
	- printing			0.0025

Compartment	Conditions Sol. (mg/l)	Vap. (Pa)	Emission factors UC≠10
Waste water	<100	<100	0.85
		100-1,000	0.75
		≥1,000	0.5
	100-1,000	<100	0.875
		100-1,000	0.85
		≥1,000	0.75
	1,000-10,000	<100	0.9
		100-1,000	0.875
		≥1,000	0.85
	≥10,000	-	0.95

WASTE WATER for UC = 10 (colourants):
Emission factor (EF) = Emission factor dyeing proces (E.1) + Emission factor "handling, washing out and cleaning" (E.2)
E.1 = A / (1 + K * B) B = 1 / liquor ratio (liquor ratio: default = 10 kg fibres / 1 l solution)
A = constant
K = equilibrium constant

Compartment	Conditions Type of dye	(UC = 10) Type of dyeing	K	A	B	E.2
Waste water	Disperse	Continuous	115	5	1	0.055
		Printing	115	2	0.5	0.12
	Direct	Batch	73	1	0.1 (1)	0.01
	Reactive - wool	Batch	190	1	0.1 (1)	0.01
	Reactive - cotton	Batch	23	1	0.1 (1)	0.01
	Reactive - general	Batch	57	1	0.1 (1)	0.01
	Vat	Continuous	190	5	1	0.055

PROCESSING **Table A3.14 (continued)**

Compartment	Conditions Type of dye	(UC = 10) Type of dyeing	K	A	B	E.2
Waste water (continued)	Vat (continued)	Printing	190	2	0.5	0.12
	Sulfur	Continuous	40	5	1	0.055
		Printing	40	2	0.5	0.12
	Acid - one SO3	Batch	90	1	0.1 (1)	0.01
	Acid - > 1 SO3	Batch	190	1	0.1 (1)	0.01
	Basic	Batch	990	1	0.1 (1)	0.01
	Azoic (naphtole)	Continuous	30	5	1	0.055
		Printing	30	2	0.5	0.12
	Metal complex	Batch	150	1	0.1 (1)	0.01
	Pigment	Continuous	5000	5	1	0.055
		Printing	5000	2	0.5	0.12
	Unknown, low solubility	Continuous	190	5	1	0.055
		Printing	190	2	0.5	0.12
	Unknown, acid groups	Batch	90	1	0.1 (1)	0.01

Compartment	Conditions Sol. (mg/l)	Vap. (Pa)	Emission factors UC<>10	UC=10
Soil				0.005
	<100	<100	0.005	
		100-500	0.0025	
		≥500	0.001	
	≥100	<100	0.005	
		100-500	0.002	
		≥500	0.001	

(1) Default

PRIVATE USE **Table A4.4**

Compartment	Conditions Sol. (mg/l)	Emission factors UC≠10	UC=10 (1)
Air			0
Waste water	<250		0.1
	250-1,000		0.15
	1,000-5,000		0.2
	≥5,000		0.3
Soil			0

(1) For UC = 10 (Colourants) only, i.e. types used normally by industry for batch dyeing

5. RECOVERY **Not applicable**

IC = 14: PAINTS, LACQUERS AND VARNISHES INDUSTRY

PRODUCTION **Table A1.1**

FORMULATION **Table A2.1**

PROCESSING **Table A3.15**

Compartment	Conditions Use category	Vap. (Pa)	Emission factors Water based	Solvent based
Air	3			1
	10, 14, 20		0	0
	50		0	
	47, 52, 55	<10	0	0
		10-500	0	0.001
		500-5,000	0.01	0.05
		≥5,000	0.05	0.15
	48		0.8	0.9
		Sol. (mg/l)		
Waste water	3			0
	10, 14, 20		0.005	0.001
	50	<10	0.005	
		10-100	0.01	
		≥100	0.05	
	47, 52, 55	<10	0.005	0.001
		10-100	0.01	0.005
		≥100	0.05	0.01
	48		0.1	0.02
Soil	3			0
	10, 14, 20		0.005	0.005
	50		0.005	
	47, 52, 55		0.005	0.005
	48		0.001	0.001

PRIVATE USE **Table A4.5**

Compartment	Conditions Use category	Vap. (Pa)	Emission factors Water based	Solvent based
Air	3			1
	10, 14, 20		0	0
	50		0	
	47, 52, 55	<10	0	0
		10-500	0	0.001
		500-5,000	0.01	0.05
		≥5,000	0.05	0.15
	48		0.8	0.95
		Sol. (mg/l)		
Waste water	3			0
	10, 14, 20		0.005	0.001
	50	<10	0.005	
		10-100	0.01	
		≥100	0.05	
	47, 52, 55	<10	0.005	0.001
		10-100	0.01	0.005
		≥100	0.05	0.01
	48		0.15	0.04

PRIVATE USE **Table A4.5 (continued)**

Compartment	Conditions Use category	Vap. (Pa)	Emission factors Water based	Solvent based
Soil	10, 14, 20		0.005	0.005
	50		0.005	
	47, 52, 55		0.005	0.005
	48		0.01	0.01

RECOVERY **Not applicable**

IC = 16: ENGINEERING INDUSTRY: CIVIL AND MECHANICAL

PRODUCTION **Table A1.1**

FORMULATION **Table A2.1**

PROCESSING **Table A3.16**

Compartment	Conditions Sol. (mg/l)	Vap. (Pa)	Emission factors MC=2	MC=3 (1)	MC =4
Air	<100	<10	0.0001	0.001	0.01
		10-100	0.001	0.01	0.1
		100-1,000	0.01	0.1	0.25
		1,000-10,000	0.1	0.5	0.7
		≥10,000	0.5	0.75	0.9
	100-1000	<10	0.00001	0.0001	0.001
		10-100	0.0001	0.001	0.05
		100-1,000	0.001	0.05	0.1
		1,000-10,000	0.05	0.1	0.5
		≥10,000	0.25	0.5	0.75
	≥1,000	<10	0	0.00001	0.0001
		10-100	0.00001	0.0001	0.001
		100-1,000	0.0001	0.001	0.01
		1,000-10,000	0.001	0.01	0.1
		≥10,000	0.01	0.1	0.5
Waste water	<100	<10	0.01	0.1	0.5
		10-100	0.001	0.01	0.1
		100-1,000	0.0001	0.001	0.01
		1,000-10,000	0.00001	0.0001	0.001
		≥10,000	0	0.00001	0.0001
	100-1000	<10	0.25	0.5	0.75
		10-100	0.05	0.1	0.5
		100-1,000	0.001	0.01	0.1
		1,000-10,000	0.0001	0.001	0.05
		≥10,000	0.00001	0.0001	0.001
	≥1,000	<10	0.5	0.75	0.9
		10-100	0.1	0.5	0.7
		100-1,000	0.01	0.1	0.25
		1,000-10,000	0.001	0.01	0.1
		≥10,000	0.0001	0.001	0.01

PROCESSING **Table A3.16 (continued)**

Compartment	Conditions Sol. (mg/l)	Vap. (Pa)	Emission factors MC=2	MC=3 (1)	MC =4
Soil	<100	<10	0.005	0.01	0.05
		10-100	0.001	0.005	0.01
		100-1,000	0.0005	0.001	0.005
		1,000-10,000	0	0.0005	0.001
		≥10,000	0	0	0.0005
	100-1000	<10	0.001	0.005	0.01
		10-100	0.0005	0.001	0.005
		100-1,000	0	0.0005	0.001
		1,000-10,000	0	0	0.0005
		≥10,000	0	0	0.0001
	≥1,000	<10	0.0005	0.001	0.005
		10-100	0	0.0005	0.001
		100-1,000	0	0	0.0005
		1,000-10,000	0	0	0.0001
		≥10,000	0	0	0

(1) Default

4. PRIVATE USE **Table A3.16**

RECOVERY **Not applicable**

IC = 0: OTHERS

PRODUCTION **Table A1.1**

FORMULATION **Table A2.1**

PROCESSING **Table A3.16**

B tables: Estimates the fraction of the main source and the number of days for emissions for all (relevant) stages of the life cycle for all industrial categories

Many tables are applied for more than one category, but are given only once (at the first occurrence). For other categories, reference is made to the number of those tables. Restraints for tonnages and/or UCs are related to the IC where the table is presented. Furthermore it should be noted that only for a limited number of industrial categories and specific applications (use category) studies have been performed (resulting in so-called use-category documents) to provide a solid basis for the estimates.

Types of substances and levels of production and use

New substances are usually produced at a rather low level. For existing substances high production-volume chemicals (HPVC) will also have to be considered. Non-HPVCs will be indicated in the tables with NSEC (New Substances and Existing Chemicals). In 1990 the OECD list of HPVCs contained about 1600 chemicals which are either produced in excess of 10,000 tonnes in any one member country or in two or more countries in excess of 1,000 tonnes. For the B-tables, default values have been introduced for every industrial category, above which a chemical is considered to be an HPVC (unless the chemical is considered as an HPVC by the notifier). If the (production) volume of a substance is rather high (HPVC), it may be unrealistic to use the standard size for the STP. A correction may be made in a more refined stage of the assessment.

It should be noted that the regional production or market volume is used as input for the emission tables.

IC = 1: AGRICULTURAL INDUSTRY

PRODUCTION **Table B1.1 for new substances and existing substances other than HPVC for UC ≠ 38 & 41**

T (tonnes/year)	f main source	No. of days
<1,000	1	0.1f*T
1,000-2,000	0.9	0.1f*T
2,000-4.000	0.75	0.1f*T
≥4,000	0.7	300

PRODUCTION **Table B1.2 for new substances and existing substances other than HPVC for UC = 38 & 41**

T (tonnes/year)	f main source	No. of days
<10	1	f*T
10-50	0.9	f*T
50-100	0.8	0.6667f*T
100-1,000	0.75	0.4f*T
1,000-2,500	0.6	0.2f*T
≥2,500	0.6	300

PRODUCTION **Table B1.3 for HPVC (default ≠10,000) for UC ≠ 38 & 41**

T (tonnes/year)	f main source	No. of days
<25,000	1	300
25,000-100,000	0.75	300
≥100,000	0.6	300

PRODUCTION	Table B1.4 for HPVC (default ≥3,500) for UC = 38 & 41	
<5,000	1	300
5,000-25,000	0.8	300
25,000-100,000	0.6	300
≥100,000	0.4	300

FORMULATION	Table B2.1 for new substances and existing substances other than HPVC	
T (tonnes/year)	f main source	No. of days
<100	1	2f*T
100-500	0.6	f*T
500-1,000	0.6	0.5f*T
≥1,000	0.4	300

FORMULATION	Table B2.2 for HPVC for UC ≠ 38 & 41	
T (tonnes/year)	f main source	No. of days
<15,000	1	300
15,000-50,000	0.75	300
≥50,000	0.6	300

FORMULATION	Table B2.3 for HPVC for UC = 38 & 41	
T (tonnes/year)	f main source	No. of days
<3,500	1	300
3,500-10,000	0.8	300
10,000-25,000	0.7	300
25,000-50,000	0.6	300
≥50,000	0.4	300

PROCESSING	Table B3.1				
T (tonnes/year)	f main source	No. of days for use categories:			
		3,19,39,48,50	41	9,10,36	26
<10	0.05	2	10	50	300
10-100	0.01	2	10	50	300
100-1,000	0.005	2	10	50	300
1,000-10,000	0.001	2	10	50	300
10,000-50,000	0.0005	2	10	50	300
≥50,000	0.00001	2	10	50	300

PRIVATE USE **Not applicable**

RECOVERY **Not applicable**

IC = 2: Chemical industry: basic chemicals

PRODUCTION	Table B1.1 for NSEC Table B1.5 for HPVC (default ≥10,000)	
T (tonnes/year)	f main source	No. of days
<25,000	1	300
25,000-100,000	0.75	300
100,000-500,000	0.6	300
≥500,000	0.5	300

FORMULATION **Table B2.4 for NSEC**
If applicable!

T (tonnes/year)	f main source	No. of days
<10	1	2f*T
10-50	0.9	f*T
50-500	0.8	0.4f*T
500-2,000	0.75	0.2f*T
³2,000	0.65	300

FORMULATION **Table B2.5 for HPVC**
If applicable!

T (tonnes/year)	f main source	No. of days
<25,000	1	300
25,000-50,000	0.75	300
≥50,000	0.4	300

PROCESSING **Table B3.2**

T (tonnes/year)	f main source	No. of days
<10	0.8	2f*T
10-50	0.65	f*T
50-500	0.5	0.4f*T
500-2,000	0.4	0.25f*T
2,000-5,000	0.3	0.2f*T
5,000-25,000	0.25	300
25,000-75,000	0.2	300
≥75,000	0.15	300

PRIVATE USE **Not applicable**

RECOVERY **Not applicable**

IC = 3: Chemical industry: chemicals used in synthesis

PRODUCTION **Table B1.2 for NSEC**
Table B1.6 for HPVC (default ≥7,000)

T (tonnes/year)	f main source	No. of days
<10,000	1	300
10,000-50,000	0.75	300
50,000-250,000	0.6	300
≥250,000	0.5	300

FORMULATION **Table B2.4 for NSEC**
Table B2.3 for HPVC
If applicable!

PROCESSING **Table B3.2**

PRIVATE USE **Not applicable**

RECOVERY **Not applicable**

IC = 4: Electrical/electronic industry

PRODUCTION **Table B1.7 for NSEC**

T (tonnes/year)	f main source	No. of days
<100	1	0.1f*T
100-1,000	0.9	0.1f*T
1,000-2,500	0.8	0.1f*T
≥2,500	0.75	300

PRODUCTION **Table B1.6 for HPVC (default ≥7,000)**

FORMULATION **Table B2.4 for NSEC**
Table B2.3 for HPVC

PROCESSING **Table B3.2**

PRIVATE USE **Not applicable**

RECOVERY **Not applicable**

IC = 5: Personal/domestic

PRODUCTION **Table B1.7 for NSEC**
Table B1.6 for HPVC (default ≥7,000)

FORMULATION **Table B2.1 for NSEC**
Table B2.3 for HPVC

PROCESSING **Not applicable**

PRIVATE USE **Table B4.1**
Only for waste water!

T (tonnes/year)	f main source	No. of days:
	0.002	365

RECOVERY **Not applicable**

IC = 6: Public domain

PRODUCTION **Table B1.7 for NSEC**
Table B1.6 for HPVC (default ≥7,000)

FORMULATION **Table B2.1 for NSEC**
Table B2.3 for HPVC

PROCESSING **Table B3.3**
Only for waste water!

T (tonnes/year)	f main source	No. of days for use categories:		
		9	39	Else
	0.002	200	15	50

PRIVATE USE **Not applicable**

RECOVERY **Not applicable**

IC = 7: Leather processing industry

PRODUCTION **Table B1.8 for NSEC for UC ≠ 6, 9 10 & 31**

T (tonnes/year)	f main source	No. of days
<1,000	1	0.1f*T
1,000-4,000	0.9	0.1f*T
≥4,000	0.75	300

PRODUCTION **Table B1.9 for NSEC for UC = 6, 9 10 & 31**

T (tonnes/year)	f main source	No. of days
<10	1	f*T
10-50	0.9	f*T
50-500	0.5	f*T
500-1,500	0.2	f*T
≥1,500	0.2	300

PRODUCTION **Table B1.4 for HPVC (default ≥5,000) for UC ≠ 6, 9 10 & 31**
Table B1.4 for HPVC (default ≥2,500) for UC = 6, 9 10 & 31

FORMULATION **Table B2.4 for NSEC**
Table B2.3 for HPVC for UC ≠ 6, 9, 10 & 31
Table B2.6 for HPVC for UC = 6, 9, 10 & 31

T (tonnes/year)	f main source	No. of days
<100,000	1	300
100,000-250,000	0.7	300
≥250,000	0.4	300

PROCESSING **Table B3.4**

T (tonnes/year)	f main source	No. of days
<10	0.8	2f*T
10-50	0.75	2f*T
50-500	0.6	f*T
500-1,500	0.5	0.4f*T
1,500-5,000	0.35	300
5,000-25,000	0.2	300
≥25,000	0.1	300

PRIVATE USE **Not applicable**

RECOVERY **Not applicable**

IC = 8: Metal extraction, refining and processing industry

PRODUCTION **Table B1.2 for NSEC for UC ≠ 29 & 35**
Table B1.10 for NSEC for UC = 29 & 35

T (tonnes/year)	f main source	No. of days
<10	1	f*T
10-50	0.9	f*T
50-500	0.8	0.6667f*T
500-1,500	0.5	0.4f*T
≥1,500	0.5	300

PRODUCTION **Table B1.6 for HPVC (default ≥7,000) for UC ≠ 29 & 35**
Table B1.4 for HPVC (default ≥2,500) for UC = 29 & 35

FORMULATION **Table B2.4 for NSEC**
Table B2.3 for HPVC

PROCESSING **Table B3.5 for UC = 29 & 35**

T (tonnes/year)	No. of days	f main source: Field of application	
		Primary steelworks	Else
<1,000	300	1	0.8
1,000-5,000	300	0.9	0.5
5,000-50,000	300	0.75	0.3
≥50,000	300	0.6	0.2

PROCESSING **Table B3.6 for UC ≠ 29 & 35**

T (tonnes/year)	f main source	No. of days
<10	1	2f*T
10-50	1	0.5f*T
50-500	0.9	0.4f*T
500-2,000	0.8	0.1875f*T
2,000-10,000	0.7	300
10,000-50,000	0.6	300
≥50,000	0.5	300

PRIVATE USE **Not applicable**

RECOVERY **Not applicable**

IC = 9: Mineral oil and fuel industry

PRODUCTION **Table B1.1 for NSEC for UC = 27**
Table B1.2 for NSEC for UC = 28 and others ≠ 27
Table B1.4 for HPVC (default ≥3,000) for UC = 28 and others ≠ 27
Table B1.11 for HPVC (default ≥25,000) for UC = 27

T (tonnes/year)	f main source	No. of days
<100,000	1	300
100,000-500,000	0.75	300
≥500,000	0.5	300

FORMULATION **Table B2.7 for NSEC for UC = 27**

T (tonnes/year)	f main source	No. of days
<1,000	1	100
1,000-2,000	0.8	200
≥2,000	0.6	300

FORMULATION **Table B2.8 for NSEC for UC = 28 and others ≠ 27**

T (tonnes/year)	f main source	No. of days
<5	1	20
5-50	1	60
50-100	1	2f*T
100-500	0.8	f*T
500-1,000	0.6	0.5f*T
≥1,000	0.4	300

FORMULATION **Table B2.6 for HPVC for UC = 27**
Table B2.6 for HPVC for UC = 28

PROCESSING **Table B3.7**

T (tonnes/year)	f main source	No. of days
<50	0.5	350
50-500	0.4	350
500-5,000	0.3	350
5,000-25,000	0.2	350
25000-100,000	0.05	350
≥100,000	0.02	350

PRIVATE USE **Table 4.1**
Only for waste water!

RECOVERY **Not applicable**

IC = 10: Photographic industry

PRODUCTION **Table B1.4 for HPVC (default ≥4,000)**
Table B1.12 for NSEC

T (tonnes/year)	f main source	No. of days
<5	1	f*T
5-50	1	0.5f*T
50-250	0.75	0.4f*T
250-3,000	0.5	0.2f*T
≥3,000	0.5	300

FORMULATION **Table B2.8 for NSEC**
Table B2.3 for HPVC

PROCESSING **Table B3.8**

Company size	f main source	No. of days
One company	1	300 (No private use)
Large companies	0.333	300 (No private use)
Small companies	0.05	300

PRIVATE USE **Table B4.2**

Only for waste water!

Only if company size at processing is small companies (otherwise f main source is zero)

f main source = 0.002 * f private use

T (tonnes/year)	f private use	f main source	No. of days:
<10	0	0	200
10-50	0.00002	4.10^{-8}	200
50-500	0.0001	2.10^{-7}	200
500-5,000	0.0005	1.10^{-6}	200
≥5,000	0.0025	5.10^{-6}	200

RECOVERY **Table B5.1**

T (tonnes/year)	f main source	No. of days	One company
<10	1	150	(No private use)
≥10	1	300	

T (tonnes/year)	f main source	No. of days	Large companies
<30	0.333	150	
≥30	0.333	300	

T (tonnes/year)	f main source	No. of days	Small companies
<200	0.2	150	
≥200	0.2	300	

IC = 11: Polymers industry

PRODUCTION **Table B1.9 for NSEC for UC ≠ 20, 47 & 43 (monomers, cross-linking agents & curing agents)**
Table B1.13 for NSEC for UC = 20, 47 & 43 (monomers, cross-linking agents & curing agents; not: initiators, retarders & inhibitors)

T (tonnes/year)	f main source	No. of days
<50	0.9	0.4f*T
50-500	0.75	0.2F*T
500-5,000	0.6	0.1f*T
5,000-25,000	0.75	200
≥25,000	0.5	300

PRODUCTION **Table B1.4 for HPVC (default ≥ 3,000) for UC ≠ 20, 47 & 43 (monomers, cross-linking agents & curing agents)**

PRODUCTION **Table B1.14 (default ≥ 60,000) for HPVC for UC = 20, 47 & 43 (monomers, cross-linking agents & curing agents; not: initiators, retarders & inhibitors)**

T (tonnes/year)	f main source	No. of days
<100,000	1	300
100,000-250,000	0.65	300
≥250,000	0.4	300

FORMULATION **Table B2.8 for NSEC**
Table B2.3 for HPVC for UC ≠ 20, 47 & 43 (monomers, cross-linking agents & curing agents)
Table B2.9 for HPVC for UC = 20, 47 & 43 (monomers, cross-linking agents & curing agents; not: initiators, retarders & inhibitors)

T (tonnes/year)	f main source	No. of days
<25,000	1	300
25,000-50,000	0.75	300
≥50,000	0.4	300

PROCESSING **Table B3.9**

T (tonnes/year)	f main source	No. of days
<10	0.5	2f*T
10-50	0.35	f*T
50-500	0.25	0.4f*T
500-5,000	0.15	0.4f*T
5,000-25,000	0.1	300
≥25,000	0.05	300

PRIVATE USE **Not applicable**

RECOVERY **Not considered yet**

IC = 12: Pulp, paper and board industry

PRODUCTION **Table B1.8 for NSEC for UC ≠ 10 & 45**
Table B1.9 for NSEC for UC = 10 & 45
Table B1.4 for HPVC (default ≥4,500) for UC ≠ 10 & 45
Table B1.4 for HPVC (default ≥2,500) for UC = 10 & 45

FORMULATION **Table B2.1 for NSEC for UC ≠ 10 & 45**
Table B2.8 for NSEC for UC = 10 & 45
Table B2.3 for HPVC

PROCESSING **Table B3.10**

T (tonnes/year)	f main source	No. of days
One company		
<10	1	2f*T
10-50	1	f*T
50-500	1	0.4f*T
≥500	1	300
Large companies		
<100	0.333	2f*T
100-250	0.333	f*T
250-600	0.333	0.5f*T
≥600	0.333	300
Small companies		
<200	0.05	2f*T
200-1,000	0.05	f*T
1,000-6,000	0.05	0.5f*T
6,000-25,000	0.05	300
≥25,000	0.02	300

PRIVATE USE **Not considered yet**

RECOVERY **Table B5.2**

T (tonnes/year)	f main source	No. of days
<100	0.5	150
100-1,000	0.4	200
1,000-10,000	0.3	250
10,000-100,000	0.2	300
≥100,000	0.1	300

IC =13: Textile processing industry

PRODUCTION **Table B1.2 for NSEC**
Table B1.6 for HPVC (default ≥7,000)

FORMULATION **Table B2.3 for HPVC**
Table B2.8 for NSEC

PROCESSING **Table B3.11 for UC = 10**

T (tonnes/year)	f main source	No. of days
<10	0.9	10f*T
10-20	0.75	10f*T
20-100	0.6	5f*T
100-1,000	0.4	300
1,000-10,000	0.2	300
≥10,000	0.1	300

PROCESSING **Table B3.12 for UC ≠ 10**

T (tonnes/year)	f main source	No. of days
<10	0.75	5f*T
10-100	0.4	5f*T
100-750	0.4	f*T
750-3,000	0.2	0.5f*T
3,000-25,000	0.2	300
≥25,000	0.1	300

PRIVATE USE **Table B4.3**
Only for waste water!
Only for UC = 10 (and only for types of dyes used for batch dyeing by industry) for all other UCs, the f main source is zero

f main source = 0.002 * f private use

T (tonnes/year)	f private use	f main source	No. of days:
<50	0	0	
50-500	0.000004	8.10^{-9}	300
≥500	0.00002	4.10^{-8}	300

RECOVERY **Not applicable**

IC = 14: Paints, lacquers and varnishes industry

PRODUCTION **Table B1.2 for NSEC**
Table B1.6 for HPVC (default ≥7,000)

FORMULATION **Table B2.8 for NSEC**
Table B2.3 for HPVC

PROCESSING **Table B3.13**

T (tonnes/year)	f main source	No. of days
<10	0.9	20f*T
10-50	0.6	6.667f*T
50-300	0.3	3.333f*T
300-5,000	0.15	300
5,000-25,000	0.1	300
≥25,000	0.05	300

PRIVATE USE **Table B4.4**
Only for waste water!
Only for paints classified as 'do-it-yourself'

f main source = 0.002 * f private use

T (tonnes/year)	f private use	f main source	No. of days:
<500	1	0.002	150
≥500	1	0.002	300

PRIVATE USE **Table B4.5**
Only for waste water!
Only for paints classified as 'constructions, maintenance', etc.

f main source = 0.002 * f private use

T (tonnes/year)	f private use	f main source	No. of days:
<50	0	0	
50-500	0.00002	4.10^{-8}	200
500-2,500	0.0004	8.10^{-7}	300
2,500-10,000	0.002	4.10^{-6}	300
10,000-50,000	0.01	2.10^{-5}	300
≥50,000	0.05	1.10^{-4}	300

RECOVERY **Not applicable**

IC = 16: Engineering industry: civil and mechanical

PRODUCTION **Table B1.2 for NSEC**
Table B1.6 for HPVC (default ≥7,000)

FORMULATION **Table B2.8 for NSEC**
Table B2.3 for HPVC

PROCESSING **Table B3.14**

T (tonnes/year)	f main source	No. of days
<10	1	2f*T
10-50	0.9	f*T
50-500	0.8	0.4f*T
500-2,000	0.75	0.2f*T
2,000-5,000	0.6	0.1f*T
5,000-25,000	0.5	300
≥25,000	0.3	300

PRIVATE USE **Table B4.5**

RECOVERY **Not applicable**

IC = 0 (Others)

PRODUCTION **Table B1.2 for NSEC**
Table B1.6 for HPVC (default ≥7,000)

FORMULATION **Table B2.8 for NSEC**
Table B2.3 for HPVC

PROCESSING **Table B3.14**

PRIVATE USE **Table B4.5**

RECOVERY **Table B5.3**

T (tonnes/year)	f main source	No. of days
<100	0.5	150
100-1,000	0.3	150
1,000-10,000	0.2	150
≥10,000	0.2	150

APPENDIX II

FUNCTION CATEGORIES according to the Technical Guidance Document (EC, 1996)

1 Absorbents and adsorbents

Materials used to absorb or adsorb gases or liquids: filter materials/media; molecular sieves; silica gel, etc..

2 Adhesives, binding agents

Materials which are applied to two surfaces causing them to adhere: dispersion-based adhesives; hotmelt; resins for polymer-based hardening adhesives; solvent based adhesives.

3 Aerosol propellants

Compressed or liquefied gases within which substances are dissolved or suspended and expelled from a container upon discharge of the internal pressure through expansion of the gas.

4 Anti-condensation agents

Substances used to avoid condensation on surfaces and in the atmosphere: anti-dim agents; condensation removers.

5 Anti-freezing agents

Substances used to prevent and remove ice formation: anti-freeze liquids; de-icing agents.

6 Anti-set-off and anti-adhesive agents

Substances used to prevent set-off and adhesion: spraying powder and anti-set-off additives for printing; oils and waxes for laths and shuttering; casting slip etc..

7 Anti-static agents

Substances used to prevent or reduce the tendency to accumulate electrostatic charges: anti-static additives; substances for sur-face treatment against static electricity.

8 Bleaching agents

Substances used to whiten or decolourise materials.

Not: cosmetics; photographic breaches; optical brighteners.

9 Cleaning/washing agents and additives

Substances used to remove dirt or impurities from surfaces.

Sub-categories'. detergents. soaps; dry cleaning solvents; optical brighteners in detergents.

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10 Colouring agents

Substances used to impart their colour to other materials.

Sub-categories. dyestuffs; pigments (including toners); colour forming agents; fluorescent brighteners.

Not: cosmetics; food colours; photo-chemicals;. optical brighteners used exclusively in detergents; reprographic agents.

11 Complexing agents

Substances used to combine with other substances (mainly metal ions) to form complexes.

12 Conductive agents

Materials used to conduct electrical current.

Sub-categories: electrolytes; electrode materials.

13 Construction materials and additives

Substances used in building materials and constructional articles: wall construction materials; road surface materials; ceramic, metal, plastic and wooden construction mateials.

14 Corrosion inhibitors

Substances used to prevent corrosion: corrosion inhibiting additives; rust preventives.

15 Cosmetics

Substances used as components of cosmetic and toiletry formulations.

16 Dust binding agents

Substances used to control finely divided solid particles of powdered or ground materials to reduce their discharge into the air.

17 Electroplating agents

Substances used as a source for a layer of metal deposited on another surface, or that aid such a deposition.

18 Explosives

Substances or mixtures that are characterised by chemical stability but that may be made to undergo chemical change, rapidly producing a large quantity of energy and gas accompanied by bursting or expansion.

Sub-categories: blasting agents; detonators; incendiaries.

19 Fertilisers

Substances used to supply chemical elements needed for plant nutrition.

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20 Fillers

Relatively inert, and normally non-fibrous, finely divided substances added to elastomers, plastics, paints, ceramics etc., usually to extend volume which may improve desired properties such as whiteness, lubricity, density or tensile strength.

21 Fixing agents

Substances used to interact with a dye on fibres to improve fastness.

22 Flame retardants and fire preventing- agents

Substances incorporated into, or applied to the surface of, materials to slow down or prevent combustion

23 Flotation agents

Substances used to concentrate and obtain minerals from ores: flotation oil; flotation depressants.

24 Flux agents for casting

Substances used to promote the fusing of minerals or prevent oxide formation.

25 Foaming agents

Substances used to form a foam or cellular structure in a plastic or rubber material: physically by expansion of compressed gases or vaporisation of liquid, or chemically by decomposition evolving a gas.

Sub-categories. chemical or physical blowing agents; frothers.

26 Food/feedstuff additives

Substances used in food or animal feedstuffs to produce or enhance taste, odour or colour or to improve conservation.

27 Fuels

Substances used to evolve energy in a controlled combustion reaction.

Sub-categories-. gasoline; kerosine; gas oil; fuel oil; petroleum gas; non-mineral oil.

28 Fuel additives

Substances added to fuels.

Sub-categories: anti-fouling agents; antiknock agents; deposit modifiers; fuel oxidizers.

29 Heat transferring agents

Substances used to transmit or to remove heat from a material.

Sub-categories: cooling agents; heating agents.

30 Hydraulic fluids and additives
Fluids used for transmitting pressure.

31 Impregnation agents
Substances used to admix with solid materials, which retain their original form: impregnating agents for leather, paper, textile and wood.

Not: flame retardants; conserving agents; biocides.

32 Insulating materials
Agents used to prevent or inhibit the flow of electrical current, heat or light or the transmission of sound.

33 Intermediates
Substances used for synthesis ofother chemicals.

Sub-categories: monomers; pre-polymers.

34 Laboratory chemicals
Substances used in laboratories for analytical purposes.

35 Lubricants and additives
Substances entrained between two surfaces and thereby used to reduce friction: oils;. fats; waxes; friction reducing additives.

36 Odour agents
Substances used to produce, enhance or mask odour.

Not:food additives; cosmetics.

37 Oxidizing agents
Substances that give up oxygen easily, remove hydrogen from other substances, or accept electrons in chemical reactions, and are used for such purposes.

38 Plant protection products, agricultural
Active ingredients and preparations containing one or more active ingredients, intended to protect plants or plant products against harmful organisms or prevent the action of such organisms, influence the life processes of plants, preserve plant products, destroy undesirable plants or destroy parts of plants.

Not: nutrients; fertilisers.

39 Biocides, non-agricultural
Active substances and preparations containing one or more active substances, intended to destroy, deter, render harmless, prevent the action of or otherwise exert a controlling effect on any organism which has an unwanted presence for man, or a detrimental effect

for man, his activities or the products he uses or produces. or for animals or for the environment.

sub-categories: disinfectants, preservative products, pest control products, specialist biocides.

Not: plant protection products, veterinary products.

40 pH-regulation agents
Substances used to alter or stabilise the hydrogen ion concentration (pH): acids; alkalis; buffers.

41 Pharmaceuticals
Substances used as active ingredients in medicinal preparations,

Sub-category: veterinary medicines.

42 Photochemicals
Substances used to create a permanent photographic image.

Sub-categories: desensitisers; developers; fixing agents; photosensitive agpnts; sensitisers; anti-fogging agents; light stabilisers; intensifiers.

43 Process regulators
Substances used to regulate the speed of a (chemical) process

Sub-categories: accelerators; activators; catalysts; inhibitors; siccatives; anti-siccatives; cross-linking agents; initiators; photo-initiators etc..

44 Reducing agents
Substances used to remove oxygen, hydrogenate or, in general, act as electron donors in chemical reactions.

45 Reprographic agents
Substances used to reproduce a permanent image. Sub-categories: toner for photocopying machines; toner additives.

46 Semiconductors
Substances having resistivities that are between those of insulators and metals, and are usually changeable by light, heat or electrical or magnetic field, or generate electromotive force upon the incidence of radiant energy.

Sub-categories: semiconductors; photovoltaic agents.

47 Softeners

Substances used for softening materials to improve feel, to facilitate @nishing processes or to impart flexibility or workability.

Sub-categories: coalescing agents; bates (leather technology); devulcaru'sing agents; emollients; swelling agents; water softeners; plasticisers.

48 Solvents

Substances used to dissolve, thin, dilute and extract. extraction agents. solvents and thinners for paints, lacquers, adhes'ves and other maten'als.

49 Stabilisers

Substances used to prevent or slow down spontaneous changes in, and aging of, materials.

Sub-categories: antioxidants; heat stabilisers; light stabilisers; scavengers; charge stabilisers.

50 Surface-active agents

Substances used to lower the surface and/or interfacial tension of liquids and promote cleaning, wetting, dispersion etc. .

51 Tanning agents

Substances used for treating hides and skins.

52 Viscosity adjustors

Substances used to modify the flow characteristics of other substances, or mixtures, to which they are added.

Sub-categories: pour point depressants; thickeners; thixotropic agents; turbulence supressors, viscosity index improvers.

53 Vulcanising agents

Substances added to rubber to aid and hasten vulcanisation: vulcanising accelerators and vulcanising assistants.

54 Welding, and soldering agents

Materials used for welding and soldering; electrodes; flux; powdered metal; wire etc..

55/0 Others

Substances whose technical functions are not described elsewhere

Note: The function category "Others", previously numbered 55, is now numbered 0 (zero).

APPENDIX III

Function list of ChemUSES (EPA, 1980) with definitions in alphabetical order and related UC

104 Abherents UC 6
A general term for substances that reduce or prevent adhesion between two surfaces.

204 Ablatives UC 0/55
Substances that are applied to a substrate (e.g., metal) to protect it from heat by dissipating the heat through the process of erosion, melting, or vapourization . of the material.

105 Abrasives UC 0/55
A general term for substances used for grinding, cleaning, cutting, polishing, or wearing down the surfaces of a solid substance.

131 Absorbents UC1
Substances that assimilate a gas or liquid by various means, such as capillary, osmotic, solvent, or chemical reaction.

321 Accelerators UC 43
Substances that increase the rate of a chemical reaction, usually acting in conjunction with a catalyst or curing agent.

214 Acidulants (foods and beverages) UC 26
Acids used in foods or beverages to impart or enhance taste, prevent browning, aid in controlling microorganisms, etc.

254 Acoustical insulating materials UC 32
Substances that conduct sound poorly, thus impeding the transmission and reflection of sound.

46 Activators (chemical processes) UC 43
Substances that render a material or a system reactive (e.g., catalysts for polymerization or metallic oxides for vulcanization reactions).

163 Activators (ore processing) UC 23
Substances added to minerals that have been depressed in a flotation step to increase their susceptibility to subsequent flotation.

196 Activators (luminescence) UC 0/55
Substances, added as impurities to phosphors, that cause or enhance absorption of electromagnetic radiation, resulting in emission at a longer wave length, usually visible.

239 Activators (enzymes) UC 43
Substances added to stimulate the production of enzymes from proenzymes (e.g., amylase from barley).

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110 Adhesion promoters UC 43
Substances used to modify the properties of surfaces to improve their bonding characteristics.

302 Adhesives UC 2
Substances used, commonly in thin layers, for bonding one surface to another.

60 Adsorbents UC 1
Substances that hold or concentrate the atoms, ions, or molecules of liquids, gases, or dissolved substances upon their surfaces.

354 Aerating agents UC 0/55
Substances that facilitate the impregnation or saturation of a substance (usually a liquid) with air or other gases.

178 Aerosol propellents UC 3
Compressed or liquified gases within which substances are dissolved or suspended and expelled from a container upon discharge of the internal pressure through the valve of the container and expansion of the gas.

47 Air entraining agents UC 0/55
Substances, such as natural wood resins, fats, sulfonated compounds, and oils, that promote air entrapment in materials (e.g., in concrete).

287 Algicides UC 39
Substances used to destroy or control algae.

376 Alloying agents UC 0/55
Substances incorporated into metals, usually by fusing, to form intimate mixtures having improved properties.

238 Analytical and product testing agents UC 34
Substances used in the analysis or quality control testing of materials (e.g., chemicals, metals, and biological materials).

166 Animal repellents UC 38, 39
Substances that drive animals away from the area of application.

63 Antiblocking agents (polymer technology) UC 6
Substances added to polymer formulations to reduce adhesion of the surfaces of derived products to each other or to other materials (e.g., through a slight roughening of that surface).

188 Anticaking agents UC 6
Substances that prevent granular or particulate materials from sticking or caking during transfer, storage, or use.

277 Anticracking agents (rubber technology) UC 49
Substances added to rubber to prevent cracking (e.g., sun checking) of the finished product.

90 Anticratering agents (surface coatings) UC 43
Substances that, when added to paint or coating formulations, prevent formation of small bowl-shaped depressions ("fish eyes" or "alligatoring") in the dried film.

48 Anticreasing agents (textile technology) UC 0/55
Substances that impart wrinkle resistance to a fabric.

291 Anticrock agents (dye technology) UC 21
Substances that prevent the colour from rubbing off textiles.

4 Antifelting agents (textile technology) UC 43
Substances applied to textile fibers to prevent their "felting" or forming a mat during processing.

41 Antifloating agents UC 50
Substances with surface active properties that wet floating or suspended particles, allowing them to disperse or precipitate.

152 Antiflooding agents (surface coatings) UC 52
Substances that prevent the concentration of pigments at the surface of a paint film.

99 Antifogging agents (imaging systems) UC 42
Substances used in image forming systems to reduce the formation of "non-image" density.

234 Antifogging agents (moisture condensation) UC 4, 50
Substances used to prevent the condensation of small droplets of moisture on glass or other material, by lowering the surface tension and causing the water to spread in a continuous phase.

1 Antifouling agents (surface coating technology) UC 39
Substances used in marine paints to inhibit growth of barnacles and other organisms.

329 Antifouling agents (petroleum products) UC 28
Substances added to petroleum products to prevent the formation of sludge deposits.

77 Antifreezes UC 5
Substances added to liquids to lower the freezing point.

12 Antifume agents (textile technology) UC 49
Substances that prevent deterioration of textiles by atmospheric fumes, particularly those caused by combustion or those with an acid character.

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129 Antihydrolysis agents (polymer technology) UC 49
Substances added to polymeric materials (e.g., rubber, polyurethane, fibers) to prevent breakdown of the polymeric chain by hydrolysis.

76 Anti-knock agents (fuels) UC 28
Substances added to fuels to prevent premature ignition in internal combustion engines.

120 Antilivering agents (surface coatings) UC 49
Substances that inhibit the solidification of paints, lacquers, and varnishes during aging.

230 Antioxidants UC 14, 49
Substances that check or retard reactions caused by oxygen or peroxides.

168 Antiozonants UC 49
Substances used to retard or prevent deterioration caused by ozone.

301 Antiperspirants UC 15
Substances used to inhibit secretion of sweat.

218 Antipilling agents (textile technology) UC 0/55
Substances added to textiles during processing or finishing that reduce the tendency of the fibers to "ball up" (pill).

282 Antiplasticizers (polymer technology) UC 49
Substances added to plastic formulations to prevent softening or an increase in flexibility of the plastic.

177 Antiprecipitants UC 11
Substances used to prevent precipitation of inorganic ions or compounds by inhibiting crystal formation, dispersing finely divided particulate matter, or combining with them by forming complexes.

293 Antiredeposition agents UC 9
Substances used in laundry and drycleaning products to prevent redeposition of soil.

160 Antisagging agents (surface coatings) UC 49
Substances added to paints and coatings to prevent the downward movement of a paint film between application and setting.

64 Antiscaling agents (metals) UC 14
Substances that prevent scale, a thin layer of metal oxides, from forming on metal surfaces.

119 Antiseize agents (lubricants) UC 35
Substances added to lubricants to inhibit seizing of a metal part as it moves against a metal surface.

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68 Antisettling agents UC 49
Substances added to formulations (e.g., paints, adhesives, plastic emulsions) to preserve the dispersed state of the formulation.

350 Antiskid agents UC 0/55
Substances incorporated into or applied to the surface of a substrate to prevent slippage (e.g., by increasing surface roughage).

343 Antiskinning agents UC 49
Substances added to a liquid to prevent or retard oxidation or polymerization that results in the formation of a "skin" on the liquid's surface, either during storage in a container or on exposure to air.

352 Antislip finishing agents (textile technology) UC 0/55
Substances applied to textile fibers or yarns to prevent slippage during weaving.

206 Antistaining agents UC 43
Substances used in a manufacturing or processing step to impart stain resistance to or eliminate staining of the finished product.

328 Antistatic agents UC 7
Substances used with textiles, plastics, elastomers or other materials to reduce the tendency to accumulate electrostatic charges either by being inherently conductive or by absorbing moisture from air.

347 Antistripping agents (asphalt) UC 21
Additives used in asphaltic binders to prevent the separation of binder from aggregate.

194 Antiwebbing agents (latex technology) UC 43
Substances added to latex formulations used for dipping operations that prevent the formation of thin free-standing sheets when the form is removed from the latex.

333 Bactericides UC 38
Substances used to destroy bacteria.

268 Barrier coating agents UC 21
Substances that, when applied to a permeable surface, prevent the migration of materials.

269 Bates (leather technology) UC 47
Substances used in the leather industry to remove dehairing chemicals from skins and to make them flaccid prior to tanning.

143 Binders UC 2
Cohesive substances (such as resins or cements) used to hold particulate or fibrous materials together or to provide adhesion of such materials to a surface.

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108 Biocides UC 38, 39
A general term for substances used to destroy or control unwanted microorganisms such as fungi, bacteria, and algae.

6 Blasting abrasives UC 0/55
Substances entrained in a high velocity stream used to clean, cut, or finish surfaces.

132 Bleaching agents UC 8
Substances that whiten or decolourize materials by oxidation or reduction.

304 Bleaching assistants UC 8
Substances used in a bleach bath to promote penetration by the bleach and improve bleaching action.

5 Bloom agents (fluorescence enhancement) UC 10
Substances added to materials (e.g., petroleum products, varnish, and rosin oil) to enhance fluorescence.

88 Bloom inhibitors (surface coatings) UC 49
Substances that prevent the migration of an ingredient of a mixture to the surface.

358 Blowing agents (polymer technology) UC 25
A general term for substances added to other materials to produce a foam or a cellular structure by the evolution or the expansion of gases.

70 Bluing agents UC 0/55
Substances that whiten substrates by masking the yellow cast.

180 Boil-off assistants (textile technology) UC 9
Substances that aid in removing soil, which results from processing, from textile products during scouring or boiling.

101 Brazing agents (metals) UC 54
Substances used in the irreversible joining of metals by a nonferrous alloy at high temperatures.

220 Bright dips (metal treating) UC 17, 0
Substances in which metals are immersed and may be anodized to produce a bright clean surface by making use of the solution potential of the metal surface in a liquid bath (usually for brightening aluminum, brass, or stainless steel surfaces).

353 Brighteners (electroplating) UC 17
Substances added to an electroplating bath to yield a smoother, brighter, electroplated surface.

281 Builders (soap and detergent technology) UC 43
A general term for substances used with soap or other surfactants to upgrade or protect cleaning efficiency.

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222 Carbonizing agents (textile technology) UC 43
Substances that promote the destruction of cellulosic materials during the processing of wool.

164 Carriers (chemical processing) UC 43
Substances (e.g., an inert gas diluent) that carry another material through a chemical reaction.

324 Case-hardening agents (metal treating) UC 13
Substances used in the manufacture of steel to produce a case-hardened surface by absorbing carbon or nitrogen into the alloy (e.g., from a molten bath (cyaniding) or in contact with ammonia (gas nitriding)).

170 Catalysts UC 43
Substances that alter the rate of a chemical reaction but are in their original state at the completion of the reaction.

19 Catalyst supports UC 13
Inert substances used to support a catalyst in a reaction system.

31 Chain extenders (Polymer technology) UC 43
Substances that, in effect, increase the length of a molecular chain by suppressing chain terminating reactions.

113 Chain terminators (polymer technology) UC 43
Substances that react with the end of a growinig polymer chain, stopping growth.

141 Chain transfer agents (polymer technology) UC 43
Substances that terminate the growth of a molecular chain and form a new radical that can act as the initiator for a new chain.

122 Chelating agents UC 34, 42, 43
Substances that combine by coordinate bonding wich a central atom (usually metal) to form one or more cyclic structures.

133 Chemical blowing agents (polymer technology) UC 25
Substances that decompose when heated, evolving a gas that forms a foam or cellular structure (e.g., in a plastic or rubber mass).

93 Chemical raw materials UC 0/55
A general term for chemical substances used as starting materials for chemical reactions.

298 Clarifiers UC 0/55
A general term for substances that remove turbidity from solutions by modes other than filtration.

242 Cleaners UC 9
A general term for substances that remove soil or impurities from a surface.

260 Cloud point depressants UC 0/55
Substances that depress the temperature at which solids begin to separate from a liquid, such as paraffin wax separating trom a solution of petroleum oil.

114 Coagulants UC 43
Substances that induce the aggregation of semisolid particles into coherent clots, curds, or masses (e.g., precipitation of casein from milk).

278 Coalescents UC 43
Substances that induce the union of small droplets of a liquid to form larger unit liquid volumes.

357 Coalescing agents (surface coatings) UC 43
Substances added to paints and coatings to promote film formation by temporary plasticization or softening of the vehicle.

130 Coating agents UC 0/55
Substances that form a continuous film over a substrate.

283 Collectors (ore processing) UC 0/55
Substances that adsorb on the surface of mineral particles to provide a water repellent film that improves adherence of the mineral to air bubbles.

86 Colouring agents UC 10
A general term for substances that produce colour by selectively absorbing or reflecting light.

124 Complexing agents UC 11
A general term for substances that combine with other chemicals, usually reversibly and by coordinate bonding, to form complex compositions (e.g coordination compounds, inclusion complexes, and double salts).

355 Concrete additives UC 13
A general term for substances added to concrete mixtures to improve processing characteristics or final properties.

72 Coolants UC 29
Fluids that, usually without undergoing a phase change, are used to remove heat from materials or exothermic reactions.

323 Corrosion inhibitors UC 14
Substances used to prevent or retard the gradual destruction of a metal or alloy because of reaction with its environment (such as oxidation, electrolysis, solvent action, or reaction with other chemical agents).

167 Cosmetic ingredients UC 15
A general term for substances used as components in cosmetic and toiletry formulations.

APPENDIX III

123 Coupling agents (polymers) UC 2
Substances that strengthen the bond between the reinforcement and the resin matrix of a composite material.

174 Coupling agents (dyes) UC 10
Substances that react with chemicals, such as diazo compounds, to produce dyes.

335 Coupling agents (solutions) UC 0/55
Substances that facilitate the solution of partially soluble solutes in solvents.

315 Crabbing assistants (textile technology) UC 43
Substances that assist in the textile finishing process that sets warp and weft threads.

228 Crosslinking agents (polymer technology) UC 43
Substances that promote or regulate the formation of structural links between polymer chains or between polymer molecules and other substances.

215 Culture nutrients UC 0/55
Substances that provide food or energy for the cultured growth of microorganisms.

226 Curing agents (concrete) UC 43
Substances used to control the rate of cure of mortar or concrete.

369 Curing agents (polymer technology) UC 43
Substances used to change the properties of polymers, especially thermosetting plastics or elastomers, usually by increasing the molecular weight (e.g., by crosslinking, condensation, or addition).

18 Currying agents (leather technology) UC 43
Substances that promote the loading (or penetration) of leather with oils or greases.

366 De-inkers (paper technology) UC 43
Substances used to remove inks, colouring materials, and fillers from paper.

81 Deaerating agents UC 0/55
Substances used to remove dissolved or entrained gases, (e.g., the use of nitrogen to purge oxygen from solutions).

236 Deasphalting agents UC 43
Substances used to remove traces of asphalt from petroleum streams during petroleum processing.

309 Deblooming agents UC 0/55
Substances added to a material, especially petroleum products, to reduce or eliminate fluorescence of the material.

85 Dechlorinating agents UC 0/55
Substances used to remove residual or free chlorine or hypochlorite from materials (i.e. from textiles, wood pulp, water supplies, stack gases).

APPENDIX III

97 Decontaminants UC 38, 39
A general term for substances used to remove or destroy hazardous materials or germs.

342 Defoamers UC 43
Substances used to reduce or eliminate frothing or foaming in a treatment or process.

229 Degreasers UC 48
Substances used to remove grease, usually by solvent action or emulsification.

365 Degumming agents (textile technology) UC 43
Substances used to dissolve and remove gum-like substances from natural fibers, (e.g., sericin, a glue-like substance, from silk).

137 Dehairing agents (leather technology) UC 43
Substances used to remove hair, epidermis, and certain soluble proteins from hides.

213 Dehumidifiers UC 1
Substances used to remove water vapour from gases such as air, (e.g., by absorption or hydrate formation).

73 Dehydrating agents UC 0/55, 34
Substances used to remove chemically bound or otherwise associated water lzrom a substance by chem41cal, catalytic, or other means.

74 Deicers UC 5
Substances used to remove ice from, or prevent its accumulation on, a surface or in a liquid (e.g., preventing ice formation in fuel lines or carburetors)

107 Deionizers UC 0/55, 34
Substances used to purify water by removal of both anions and cations.

84 Delignification agents (wood pulping) UC 43
Substances that solubilize lignin in wood and facilitate the separation of cellulosic materials.

102 Delustrants (textile technology) UC 31
Substances used to reduce or eliminate the gloss or sheen on textile fibers, yarns, and fabrics.

232 Demulsifiers UC 0/55
Substances used to destroy (break) an emulsion or to prevent its formation.

200 Denaturants UC 0/55
Substances used to deprive substances of their natural properties (e.g., to render ethyl alcohol unfit for human consumption or to modify properties of proteins).

APPENDIX III

52 Deodorants UC 36
Substances used to remove, repress, or suppress the formation of undesirable odors.

30 Depolymerization agents UC 43
Substances used to reduce a polymer's degree of polymerization.

183 Deposit modifiers (fuels) UC 28
Substances that change the amount or character of deposits in combustion chambers.

367 Depressants (ore processing) UC 43
Substances that assist in the separation of minerals when the floatabilities of the minerals to be separated are quite similar for any given promoter.

49 Descaling agents (metals) UC 0/55
Substances that remove scale (e.g., coatings or crusts of oxides) from the surface of metals in reducing, oxidizing, or electrolytic processes.

198 Desensitizers (explosives) UC 18
Substances that reduce the sensitivity of an explosive to heat or impact.

299 Desensitizers (photography) UC 42
Substances used in the manufacture of a photographic emulsion that reduce its sensitivity to light or other radiation.

292 Desizing agents UC 43
Substances used to assist in removal of sizes (e.g., removal of starch from textiles).

300 Detackifiers UC 6
Substances that remove or reduce the adhesive properties of materials.

173 Detergents UC 9
Surfactants other than soap used as cleaning agents or as components of formulated cleaning products.

179 Detonators UC 18
Substances that initiate explosives and are activated by such means as flame, spark, or friction (e.g., explosives in blasting caps).

182 Developers (image formation) UC 42
Substances used to make visible an exposed, latent photographic image.

231 Devulcanizing agents (rubber technology) UC 47
Substances used to soften rubber during a reclaiming process by reducing the degree of crosslinking.

205 Dewatering aids UC 0/55
Substances used (e.g., in mining) that reduce the moisture content of filter cake.

APPENDIX III

82 Dewaxing solvents (petroleum technology) UC 48
Substances used during petroleum refining processes to remove petroleum wax from refinery streams, especially to separate waxes from oils.

356 Discharge printing agents (textile technology) UC 0/55
Substances capable of destroying a dye or mordant in a fabric to produce a colourless image upon a coloured background.

140 Disinfectants UC 39
Substances used nonmedicinally to destroy or inhibit microorganisms.

259 Dispersants UC 43
Substances added to a suspending medium to promote and stabilize the uniform dispersion of extremely fine solid particles, often of colloidal size.

38 Drainage aids (paper technology) UC 0/55
Substances that cause a more rapid removal of water from pulp in papermaking.

317 Driers UC 43
Substances that accelerate or control the drying or hardening of formulations such as paints, varnishes, lacquers, inks, or sealants.

44 Drilling mud additives (petroleum production) UC 0/55
A general term for substances added to drilling muds to increase the density, reduce viscosity, counteract contaminants, reduce filtrate loss, stabilize shale and clay, and emulsify components of the mud.

322 Dry strength additives (paper technology) UC 0/55
Substances used to improve the strength of paper products.

26 Dust control agents UC 16
Substances used to control finely divided solid particles of powdered or ground materials to reduce their discharge into the air.

233 Dusting agents (rubber technology) UC 6
Substances that are dusted on the surface of rubber objects to reduce their surface tack.

150 Dye carriers UC 43
Substances that increase dye penetration into textile products during processing.

255 Dye leveling agents UC 43
Substances used to promote the even dyeing of textiles or paper.

307 Dye retardants UC 43
Substances added to a dye bath to slow the rate of dyeing and to prevent rapid exhaustion of the dye.

APPENDIX III

211 Dye retention aids UC 43
Substances added to a dye bath to ensure that the dye is retained on the fabric.

39 Dye stripping agents UC 0/55
Substances used to remove dyes from fabrics so that they can be redyed.

267 Dyes UC 10
Substances, usually soluble or dispersible, that add a colour to materials by impregnation of or by absorption into the material.

28 Elasticizers UC 47
Substances that make a product more elastic (e.g., an additive that contributes elasticity to a resin).

161 Electrical conductive agents UC 12
Substances that will conduct electricity.

311 Electrical insulating materials UC 32
Substances that conduct electrical energy poorly, thus acting as a barrier to electrical conduction.

89 Electroconductive coating agents UC 7
Coating substances that render otherwise nonconductive films electroconductive.

383 Electrode materials UC 12
Substances that are used in conductive circuits as components (e.g., terminals or plates of batteries, electrolytic cells, or arc welding equipment) that establish contact with a nonmetallic part of the circuit.

245 Electrolytes UC 12
Substances that can provide ionic conductivity when fused or in solution.

100 Electron emission agents UC 0/55
Substances applied to solids (e.g., electrodes) to promote the emission of electrons.

340 Eluting agents UC 0/55
Substances used to desorb material from an adsorbent (e.g., removal of minerals from ion exchange agents).

372 Embalming agents UC 0/55, 39
Substances used for the preservation of dead bodies, usually human.

361 Embrittlement inhibitors UC 13
Substances that prevent or inhibit the loss of ductility of a metal.

265 Emollients UC 47
Substances used to make skin soft or supple (e.g., in hand soaps).

APPENDIX III

159 Emulsifiers UC 49
Substances that promote the formation and stability of a suspension of fine particles of a liquid in another liquid.

186 Encapsulating agents UC 0/55
Substances used to surround or encase solid or liquid matter to isolate it.

57 Enhanced oil recovery agents (petroleum production) UC 0/55
A general term for substances that facilitate the recovery of petroleum from wells, as in secondary or tertiary recovery.

308 Entraining agents UC 0/55
Additives that form an azeotrope with one component of a liquid mixture to aid in otherwise difficult separations by distillation.

341 Enzyme inhibitors UC 43
Substances that inhibit the catalytic activity of enzymes.

157 Enzymes UC 43
Proteins that accelerate or catalyze the chemical processes converting substrate to product (e.g., enzymes that convert starch to ethyl alcohol).

319 Etching agents UC 0/55
Substances used to solubilize, and thus remove, the surface layer of a material, usually unprotected or reactive areas of metal or glass (e.g., as used in metallography, or in manufacture of printing plates or printed circuits).

336 Evaporation control agents UC 0/55
Substances added to a liquid to reduce evaporation at the liquid surface.

363 Explosion inhibitors UC 18
Substances used to reduce the explosion potential of flammable materials.

158 Explosives UC 18
Substances or mixtures that are characterized by chemical stability but that may be made to undergo rapid chemical change without an outside source of oxygen, rapidly producing a large quantity of energy accompanied by bursting or expansion.

373 Extraction agents UC 34, 48
Substances used to dissolve and facilitate the separation of, usually from mixtures, desired components or unwanted impurities.

66 Feed additives (animal nutrition) UC 26
Substances (e.g., amino acids or minerals) added to animal feed to improve nutrition and health.

34 Fertilizers UC 19
Substances added to soil to supply chemical elements needed for plant nutrition.

APPENDIX III

207 Fiber-forming compounds UC 0/55
Substances that are capable of being spun or extruded to make a fiber (e.g., polyester resins, glass).

212 Fillers (patching) UC 20
Substances used to fill holes or indentations in wood, plaster, roads, or other surfaces, usually before applying a coating such as paint or varnish.

351 Fillers (augmentation) UC 20
Relatively inert and normally nonfibrous, finely divided substances added to elastomers, plastics, paints, ceramics, etc., usually to extend volume and reduce costs but which may improve desired properties, such as whiteness, lubricity, density, or tensile strength (moderately).

363 Filtration aids UC 0/55
Substances used to prevent clogging of filters by removing particles that would otherwise not pass through the filter.

284 Finishing agents (textile technology) UC 43
A general term for substances used to impart specific properties to textiles.

25 Fire extinguishing agents UC 22
Substances that, when applied to a fire, will smother it.

295 Fixatives (Photography) UC 42
Substances that remove unexposed radiation-sensitive salts from developed photographic film and paper.

112 Fixing agents (textile technology) UC 21
Substances that react with a dye on a fiber to improve fastness (e.g., diazonium compounds used for aftertreatment of direct dyeings).

134 Fixing agents (fragrances) UC 21
Substances that reduce the volatility of fragrances in perfumes.

332 Flame retardants UC 22
Substances incorporated into or applied to the surface of materials to slow down or to prevent combustion.

56 Flatting agents (surface coatings) UC 0/55
Substances added to paints, varnishes, or other coatings to disperse incident light rays, thus reducing the gloss of the dried film and producing a matte finish.

79 Flavours and fragrances UC 0/55, 36
Substances used to impart desired flavour and aroma characteristics to foods, cosmetics, confections, tobacco, pharmaceuticals, etc.

190 Flocculating agents UC 23

Substances that induce the aggregation of suspended solid particles into small clumps or tufts (e.g., aggregation of ore particles during flotation processes).

297 Flotation agents (ore processing) UC 23

A general term for substances used in the concentration of ores by flotation processess.

142 Fluid loss additives (petroleum production) UC 0/55

Substances, often a component of drilling muds or fluids, that prevent loss of fluid into the rock formation during petroleum drilling.

20 Fluorescent agents UC 10

Substances, such as optical brighteners, that emit visible light as a direct consequence of the absorption of shorter wave length radiation such as ultraviolet light. The emission of radiation ceases when the stimulating radiation is discontinued.

22 Fluxing agents UC 54

Substances used to remove oxides from and to clean the surfaces of metals, or to promote the fusion of metals or minerals.

145 Food additives UC 26

A general term for substances added to foods to improve potability, nutrition, preservation, or convenience.

337 Formation aids (paper technology) UC 43

Substances added to paper puld stock to promote the uniform formation of paper on the Fourdrinier machine.

94 Frothers UC 25

Substances that, when added to an agitated or aerated liquid, will promote the formation and stability of a foam or froth.

306 Fuel additives UC 28

A general term for substances added to fuels to enhance their combustion properties, stability, etc.

331 Fuel oxidizers UC 37

Substances that provide the oxygen necessary for the combustion of fuel when oxygen is not normally present (e.g., in the propulsion systems of space vehicles) or that are used to ensure complete combustion of fuel to prevent smoke formation.

247 Fuels UC 27

Substances that evolve energy in a controlled combustion reaction.

117 Fulling agents (textile technology) UC 43

Substances used to promote the compacting or shrinking of woolens in the fulling process.

32 Fume suppressants (electroplating) UC 17
Substances used to suppress the formation of fumes resulting from electroplating operations.

270 Fumigants UC 39
Substances used in the gaseous phase to inhibit or kill destructive organisms in harvested crops, food products, and other materials, process and transportation equipment, structures, and soil.

313 Functional fluids UC 0/55, 5, 12, 29, 30, 35
A general term for liquids or gases used for one or more operational properties (such as heat transfer, dielectric, hydraulic, lubricant, etc.).

362 Fungicides UC 38, 39
Substances used to control or destroy fungi.

221 Gelling agents UC 52
Substances that cause liquids to setup into jelly-like semisolids.

193 Greaseproofing agents UC 0/55, 31
Oil repellent substances applied to a substrate (e.g., paper) to prevent penetration of the surface by oil or grease.

184 Grinding, lapping, sanding and polishing abrasives UC 0/55
Granular substances that may be attached to substrates such as cloth, paper, plastics, wood, and iron, bonded into a three-dimensional object or applied in a loose, granular, or powdered form to grind, clean, polish, or wear down metal, glass, wood, plastics, stone, or other materials.

314 Heat insulating materials UC 32
Substances that conduct heat poorly, thus acting as a barrier to heat conduction.

87 Heat stabilizers UC 49
Substances that prevent or retard the degradation of a material by heat.

199 Heat transfer agents UC 29
A general term for substances used to transmit heat to or remove heat from another material, either directly or indirectly.

275 Herbicides UC 38
Substances used to control or destroy unwanted vegetation such as weeds, grasses, or woody plants.

192 Hormones UC 43
Substances produced in animals or plants that regulate the activity of certain organs or control processes in other parts of the organism.

APPENDIX III

318 Humectants UC 43
Hygroscopic substances (e.g., glycerol) used to maintain a desired moisture level in a material.

246 Humidity indicators UC 0/55
Substances that undergo changes in observable properties to indicate changes in water vapour pressure (humidity).

65 Hydraulic fluids UC 30
Noncorrosive fluids of low viscosity used to transmit force.

210 Hydrotropic agents UC 0/55
Substances used in aqueous media to increase the solubility of sparingly soluble substances (e.g., surfactants).

181 Impact modifiers (polymer technology) UC 13
Substances added to polymeric materials to increase their resistance to impact.

380 Incandescent agents UC 0/55
Substances that are used to emit light at high temperatures; e.g., light bulb filaments.

27 Incendiaries UC 18
Substances that ignite spontaneously upon impact, bursting, or contact.

69 Indicators UC 0/55, 34
A general term for substances that aid in the detection or determination of condition or composition of other substances, usually by visual means.

103 Initiators (chemical technology) UC 43
Substances that cause chemical reactions to start and are themselves chemically changed (e.g., organic peroxides used in polymerization reactions).

146 Inorganic intermediates UC 33
Inorganic chemicals that are formed and can be isolated at an intermediate step between starting material and the final product in a sequence of chemical processes.

155 Insect attractants UC 38, 39
Substances that are used to attract insects.

348 Insect repellents UC 38, 39
Substances that drive away insects from the point of application.

330 Insecticides UC 38, 39
Substances used to control insect life harmful to man.

162 Insulating materials UC 32
A general term for substances that poorly conduct various forms of energy (e.g., heat, electricity), thereby acting as a barrier to its transmission.

APPENDIX III

286 Intensifiers (photography) UC 42
Substances used in photography to increase the density of an image in a film plate or paper.

359 Intensifiers (printing) UC 43
Substances used in printing to increase the density of the tone, colour, or image.

148 Internal lubricating agents UC 35
Substances added to polymers prior to processing to reduce friction, improve flow characteristics, or improve wetting properties.

2 Ion exchange agents UC 0/55
Substances used for the reversible interchange of ions (or sometimes inorganic complexes) with an aqueous phase (e.g., zeolites, ion exchange resins, or liquid ion exchangers).

171 Kier boilinig assistants (textile technology) UC 43
Substances used to aid the removal of natural fats and other impurities from cotton or flax materials.

91 Lachrymators UC 0/55
Substances that irritate the eyes, causing tearing.

248 Lakes (colouring) UC 10
Insoluble colourants produced by the reaction of a dye with a mordant (metallic compound).

33 Latex compounding agents UC 0/55
A general category for substances used in compounding latexes.

172 Laundry sours UC 40
Substances used in laundry or textile operations to neutralize residual alkalinity or decompose residual hypochlorite.

53 Leaching agents UC 0/55
Substances that dissolve and separate a solid from a mixture with an insoluble solid.

156 Leather processing agents UC 0/55
A general term for substances used in the conversion of skins to leather or in posttanning treatments of leather.

285 Light stabilizers UC 49
Substances that inhibit the degradation by light of materials such as dyes and polymers.

APPENDIX III

370 Liquid crystals UC 0/55
Organic compounds that exist in a transition state between solid and liquid forms and with physical properties (e.g., phase transition in a narrow temperacure range) that are often utilized for display purposes.

195 Lubricant additives UC 35
A general term for substances added to lubricants to improve their properties, such as stability, lubricity , or detergency.

364 Lubricating agents UC 35
Substances that reduce the friction developed (and the wear) between adjacent solid surfaces, at least one or which is in motion, such as the moving parts of a machine or piece of equipment, promote the flow of dry materials, as in making plastics, or prevent build-up in grooved compactors.

381 Luminescent agents UC 0/55, 10
A general term for substances that emit visible or invisible radiation upon absorption of energy in the form of photons, charged particles, or chemical change.

379 Magnetic agents UC 0/55
Substances used for their magnetic or magnetizable properties, e.g., in transformer cores or on magnetic tape.

67 Mar proofing agents (surface coatings) UC 0/55
Substances that, when added to coatings compositions, increase the ability of the coating to resist mechanical damage.

375 Materials for shaping UC 0/55
A general term for substances, e.g., metals, waxes or glasses, that can be shaped by a forming process such as moulding, blowing, extruding, rolling, drawing, or cutting.

235 Mercerizing assistants (textile technology) UC 43
Substances used in the treatment of cellulosic yarns, or fabrics with alkali for improving luster and dye receptivity.

289 Metal conditioners UC 0/55
Substances , used to prepare metal surfaces for coating, electroplating, or passivating a chemically active metal surface.

95 Metal strippers UC 0/55
Substances used to remove plated metals from a base metal (e.g., gold plating from copper).

37 Metal treating agents UC 0/55
A general term for substances used to treat metal or in metal working.

327 Milling aids UC 0/55
Substances used to assist in reducing, materials to fine particulate matter during grinding.

APPENDIX III

360 Modifiers (ore processing) UC 23

A general term for substances that enhance the separation of minerals by causing the particle to accept or reject the collector during ore flotation.

115 Monomers (polymer technology) UC 43

Simple, low molecular weight substances possessing a structure that is capable of reacting with itself or with other reactive chemicals to form a polymer.

Note: *According to Annex II this kind of substances should have UC 33; in the release scenarios of the A-tables UC 43 is used however!*

227 Mordants (textile technology) UC 21

Substances, usually a metallic salt or an acid, that fix a dye in or on a substance (e.g., a textile fiber) by combining with the dye to form an insoluble component.

251 Nematocides UC 38

Substances that destroy or control nematodes and are usually applied to the soil.

24 Nucleating agents UC 43

Substances that induce mixtures such as liquids, supersaturated solutions, saturated vapors, and polymers to form crystals or droplets, or that modif, crystal grain structure, as in metals.

237 Obscuring agents (chemical smokes) UC 0/55

Substances that form a smoke screen and restrict visibility upon dispersal.

339 Odourants UC 36

Substances used to impart an odour or to mask an unwanted odour.

197 Oil repellents UC 0/55, 31

Substances applied to substrates such as textiles to prevent oil wetting.

346 Oiliness agents UC 35

Substances that retard the gumming of vegetable oils while promoting lubrication.

128 Opacifiers UC 10

Substances used in products to make them nontransparent; they may also enhance luster, control texture, stabilize colour, or promote craze resistance.

62 Optical quenchers UC 0/55

Substances used to neutralize the effect of optical brighteners.

290 Organic intermediates UC 33

Organic chemicals that are formed and can be isolated at an intermediate step between starting material and the final product in a sequence of chemical processes.

382 Osmotic membranes UC 0/55

Substances commonly used in thin sections, e.g., sheets or hollow fiber., for selective permeation of ions or molecules.

APPENDIX III

325 Oxidation-reduction indicators UC 34
Substances used for visual detection of the degree of oxidation or reduction in chemical reactions.

149 Oxidizers UC 37
Substances that give up oxygen easily, remove hydrogen from other compounds, or accept electrons in chemical reactions.

320 Paint and varnish removers UC 48
Substances used to remove paints or varnishes from surfaces.

17 Papermaking agents UC 0/55
A general term for substances used in paper manufacture.

144 Parting agents (moulding) UC 6
Substances, usually applied to a mould, that reduce adhesion between the mould and the moulded piece, facilitating its removal from the mould.

139 Pearlizing agents UC 10
Substances that impart a shiny, opalescent appearance to materials such as plastics and paints.

249 Penetrants UC 31
Substances used to increase the speed and ease of permeation of a solid by a liquid.

96 Peptizing agents (colloids) UC 43
Substances that promote colloid dispersion, and stabilize hydrophobic colloid solutions (e.g., electrolytes that provide ions that are adsorbed on the particle surfaces).

253 Pesticides UC 38, 39
A general term for substances used to kill or control pests, such as insects, weeds, plant pathogens, rodents, etc.

266 pH control agents UC 40
Substances used to change or maintain acidity or basicity.

191 pH indicators UC 40
Substances used for visual detection of acidity or basicity of solutions.

55 Phosphatizing agents (metals) UC 0/55
Substances, used in metal treating, that react with a substrate metal to form a protective insoluble coat of metal phosphate (e.g., to protect a metal surface before applying paint).

203 Phosphorescent agents UC 0/55
Substances that continue to emit light after removal of a visible light or other exciting source.

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344 Photosensitive agents UC 0/55, 42
A general term for substances that absorb electromagnetic radiation (e.g., visible light), resulting in emission of light, dissociation, discolouration, or other chemical reaction, or in energy transfer.

378 Photovoltaic agents UC 46
Substances that generate electromotive force (voltage) upon the incidence of radiant energy (e.g., solar cells).

50 Physical blowing agents (polymer technology) UC 25
Compressed gases that expand when pressure is reduced, liquids that vaporize or soluble solids that leach out to form a foam or cellular structure (e.g., in a plastic or rubber mass).

59 Pickling agents (metal technology) UC 0/55
Substances, usually acids, used to remove oxides from metal surfaces by an immersion process.

217 Pickling inhibitors (metal treating) UC 0/55
Substances added to materials used as acid pickling agents to retard or prevent the chemical action of the acid on the base metal.

125 Pigments UC 10
Substances, usually insoluble and finely dispersed, most commonly used for optical effects (e.g., colouring, whitening, opacifying).

75 Pitch control agents (wood pulping) UC 43
Substances that prevent the agglomeration of resin particles in wood pulping operations.

251 Plant growth regulators UC 43
Substances, not indigenous to plants, that control the rate of growth or maturation of plants, especially fruits and vegetables.

185 Plasticizers (polymer technology) UC 47
Substances that impart flexibility or workability to a polymer.

176 Plastics additives UC 0/55, 43
A general term for substances added to protect plastics or to modify their properties for processing or use.

224 Plastics for shaping UC 0/55
Polymeric substances that can be shaped by a forming process, such as moulding, extruding, or drawing.

169 Plating agents UC 17
Substances used as the source for a layer of metal deposited on another surface, or that aid in such deposition.

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8 Poison gas decontaminants UC 0/55
Substances used to remove or decompose poison gas.

3 Polymer strippers UC 0/55
Substances used to remove polymeric coating materials from surfaces (e.g., photoresists from printed circuit boards).

121 Polymerization additives UC 43
A general category for chemicals used to effect or to control polymerization processes.

209 Polymerization inhibitors UC 43
Substances that stop or retard polymerization.

111 Pore forming agents UC 0/55
Organic substances added to a pasty mass of inorganic substances that, upon combustion, will leave a porous structure.

262 Pour point depr essants (lubricants) UC 52
Substances, added to lubricating oils, that reduce the temperature at which the oils will flow.

78 Pre-spotting agents (drycleaning and laundering) UC 9
Substances used prior to drycleaning or laundering of textiles to loosen or dissolve soil.

151 Precipitating agents UC
Substances that cause solids to settle from solution or suspension, usually by chemical action.

43 Prepolymers (polymer technology) UC 33
Polymeric substances of relatively low molecular weight that can be mixed with additives and hardened by further polymerization during or after a forming or coating process.

Note: *In Industrial category 11 'Polymers industry' UC 33 is not mentioned explicitly!*

118 Preservatives UC 39
A general term for substances used to protect products from degradation by decay, discolouration, spoilage, insect attack, oxidation, etc.

21 Prevulcanization inhibitors (rubber technology) UC 43
Substances that prevent scorch and premature vulcanization of rubber prior to reaching vulcanization temperatures.

106 Protective agents (textile processing) UC 0/55
Substances used to protect wool and silk during wet processing.

APPENDIX III

216 Quenchers (metallurgy) UC 29
Substances used for the rapid cooling of steel from elevated temperatures, generally by immersion in a liquid.

45 Radioactivity decontaminants UC 0/55
Substances used to remove radioactive substances from surfaces, liquids, gases, or the environment.

16 Reaction media UC 48
Substances that act as vehicles for chemical reactions and that do not enter into the reaction themselves.

374 Reagents UC 0/55, 34
A general term for substances used in detection or analysis of other substances, or in chemical reactions for preparing or modifying other substances.

244 Reducers (chemical technology) UC 44
Substances,that remove oxygen, that hydrogenate, or, in general, that act as electron donors in a chemical reaction.

153 Refining agents (non-petroleum) UC 43
A general term for substances used to remove impurities during purification processes.

219 Refractive index modifiers UC 0/55
Substances used to change the refractive index of other materials.

241 Refractories UC 0/55
Substances, usually nonmetallic, that can withstand the high temperatures or action of corrosive solids, liquids, or gases at high temperatures.

208 Refrigerants UC 29
Substances that are used for chilling or maintaining a low temperature, usually by evaporation in a closed loop, requiring compression for liquefaction.

250 Reinforcing agents UC 13
Substances (usually inert, fibrous materials) used to improve physical properties, such as tensile strength, hardness, abrasion resistance, and tear resistance of materials such as rubber and plastics.

223 Repulping aids (paper technology) UC 43
Substances that facilitate the mechanical disintegration of reclaimed paper to form a pulp.

154 Resists (imaging systems) UC 0/55
Substances applied as a protective layer to selected areas of a surface to retard or prevent printing, dyeing, or etching of those areas of the surface.

APPENDIX III

136 Retarders (chemical processes) UC 43
Substances that reduce the rate at which a chemical reaction takes place (e.g., additives for rubber stock to prevent premature cure).

296 Retention aids (paper technology) UC 43
Substances used to improve the retention of fillers and fibers in the manufacture of paper products.

9 Rinse aids UC 0/55
Substances added to a wash bath to remove traces of materials such as soap, contaminants, and residues (e.g., as used in automatic dishwashers).

71 Ripening agents (crops) UC 0/55
Substances that promote full development or maturation of fruits and vegetables.

264 Rodenticides UC 39
Substances used to kill rodents.

338 -Rubber compounding agents UC 43
A general term for substances added to rubber and other elastomeric materials to facilitate processing, enhance their properties, or inhibit deterioration.

187 Rubber for shaping UC 0/55
Elastomeric substances capable of being shaped by a forming process such as moulding, dipping, or casting.

201 Rubber reclaiming agents UC 0/55
A general term for substances used to prepare rubber for reuse.

189 Rubbing fastness agents (textile technology) UC 31
Substances added to textiles to improve their resistance to abrasion.

276 Rust inhibitors UC 0/55
Substances used to prevent the formation of iron oxides on ferrous metals and alloys.

11 Rust removers UC 0/55
Substances used to remove oxidized iron (rust) from the surface of metals.

51 Scavengers UC 43
Substances added to a process or product to consume, neutralize, or inactivate small amounts of by-products, degradation products, impurities, etc.

274 Scouring agents (textile technology) UC 9
Substances used to remove the natural oils and fats and other impurities from raw wool or wool fabrics, to remove lubricants, sizes or tints from textile products, or to clean fabrics before dyeing.

263 Scroōping agents (textile technology) UC 0/55
Substances that impart a stiff or harsh feel to textiles, particularly silk.

APPENDIX III

42 Sealants UC 0/55. 31
Substances used as coatings or void or joint fillers, primarily to stop passage of matter(e.g., leakage).

202 Semiconductors (electronics technology) UC 46
Substances having resistivities that are between those of insulators and metals, and are usually changeable by light, heat or electrical or magnetic field.

303 Sensitizers (photochemistry) UC 42
Substances that absorb electromagnetic radiation (e.g., visible light) and transfer energy to other materials, making them susceptible to chemical change (e.g., activation of photographic emulsions).

10 Sequestering agents UC 11
Substances that combine in an aqueous solution with metallic ions to form a water soluble combination in which the ions are substantially inactive.

261 Shrinkage controllers (textile technology) UC 0/55
Substances added to textiles to reduce contraction resulting from washing or laundering.

98 Sizes UC 0/55, 31
Substances applied to substrates such as fabric, yarn, paper products, or plaster to increase abrasive resistance, stiffness, strength, smoothness, or reduce absorption.

126 Slime control agents (ore processing) UC 0/55
Substances used in ore flotation to prevent small particles of the desired mineral ("fines") from adhering to the bulk gangue (or waste) material.

116 Slime preventatives (paper technology) UC 39
Substances used to control microorganisms occurring in pulpwood.

312 Slip agents (plastic technology) UC 35
Substances added to plastics that exude to the surface and act as lubricants, thus improving slip characteristics.

14 Soaping-off assistants (textile technology) UC 9
Substances used to facilitate the removal of unattached dye, dye assistants, or soap after dyeing.

29 Softeners UC 47
Substances used for softening materials (e.g., textiles, paper, gums) to improve feel, to facilitate finishing processes, or to impart flexibility or workability.

305 Soil conditioners UC 0/55
Substances added to topsoil to promote growth by changing characteristics such as soil structure, pH, drainage, or anion exchange capacity.

APPENDIX III

294 Soil release agents UC 9
Substances applied to textiles to promote the removal of dirt.

7 Soil retardants (textile technology) UC 6
Substances applied to textiles to inhibit the attachment of dirt to the fabric.

326 Solubilizing agents UC 43
Substances that promote the dissolution of sparingly soluble substances in a solvent.

271 Solvents UC 48
Substances capable of dissolving another substance (solute) to form a uniformly dispersed mixture (solution) at the molecular or ionic level.

92 Spreaders (plant applications) UC 2
Substances used to promote the uniform coating and adhesion of agricultural chemicals (except fertilizers) onto plant surfaces.

54 Stabilizers UC 49
A general term for substances used as ingredients in formulated products to maintain desired physical. and chemical properties.

83 Stains (microscopy) UC 10
Substances used to impart colour to preparations for microscopic examination.

163 Stickers UC 2
Substances that enable applied substances, such as pesticides, to stick or remain on plant surfaces.

61 Strippers UC 0/55
A general term for substances used to remove unwanted materials (e.g., coatings) from surfaces.

371 Surface coating additives UC 0/55, 10, 20, 43
A general term for substances added to protective or surface coatings such as paints, lacquers, and varnishes, to aid in the compounding or to improve the qualities of the coating (e.g., spreadability, drying, mar resistance, colour).

109 Surfactants UC 50
A general term for substances used to lower the surface and/or interfacial tension of liquids and promote cleaning, wetting, dispersion, etc.

80 Sweeteners (taste) UC 26
Substances used to impart a sweet taste to food or other products that are ingested or used in the mouth.

138 Sweeteners (petroleum technology) UC 28
Substances used in natural gas processing or petroleum refinery processes to remove sulfide-containing chemicals and to improve the odour of the product.

APPENDIX III

127 Swelling agents UC 20
Substances added to a material that cause it to increase in volume and become softer (e.g., a low molecular weight liquid absorbed by rubber).

280 Tackifiers UC 2
Substances applied to a surface or added to a compound to increase the tack of a deposited adhesive film.

316 Tanning agents (leather technology) UC 51
Substances used to treat hides and skins to preserve them and to raise the shrink temperature.

40 Tar removers UC 0/55
Substances used to remove tar from a material.

345 Tarnish inhibitors UC 0/55
Substances that prevent or retard the discolouration of a metal surface due to the formation of a thin film of oxide, sulfide, etc.

13 Tarnish removers UC 0/55
Substances that remove the discoloration of a metal surface due to the formation of a thin film of oxide, sulfide, etc.

279 Textile specialties UC 0/55
A general term for substances used in the processing of natural and synthetic fibers, yarns, and fabrics (e.g., in their formation, bleaching, dyeing, finishing, decoration and modification).

272 Thickeners UC 52
Substances that form a solid or semisolid dispersion of a fluid lubricant or increase che viscosity of paints, coatings, etc.

334 Thixotropic agents UC 52
Substances that form a colloidal system that exhibits a reversible reduction in viscosity upon mechanical working and that may be used, for example, to prevent running of paints.

225 Toners (colouring) UC 45
Organic pigments that have no inorganic base and are used normally in an organic vehicle.

256 Transmission fluids UC 30
Noncorrosive fluids used as a fluid coupling to transmit power between an engine or motor drive and driven equipment.

240 Turbulence suppressors UC 52
Subscances that reduce friction heat losses (i.e., drag) in fluids in i motion and between a fluid and a conduit surface.

36 Ultraviolet absorbers UC 49
Substances added to materials (such as plastics and paints) to protect against the degradative effects of ultraviolet radiation.

257 Vat printing assistants (textile technology) UC 0/55
Substances used to carry the dye in vat dye printing of fabrics.

135 Viscosity adjusters UC 52
Substances that, when added to another substance or mixture, will modify its flow characteristics.

15 Viscosity index improvers UC 52
Substances used in lubricating and automotive oils to reduce the effect of temperature on their viscosity.

288 Vulcanizing agents (rubber technology) UC 53
Substances used in the vulcanization of rubber to convert rubber hydrocarbon from a thermoplastic to a thermoset.

349 Water-reducing agents (concrete technology) UC 13
Substances added to concrete mixtures to. allow a reduction in water-cement ratio at a given workability.

258 Water repellents UC 31
Substances used to treat various substrates (e.g., textiles, leather or paper) to make them resistant to wetting by water.

147 Water softeners UC 47
A general term for substances that remove or inactivate water hardness minerals, principally calcium and magnesium.

23 Waterproofing agents UC 31
Substances used to make materials impervious to penetration by water.

273 Wax strippers UC 0/55
Substances used to remove wax from surfaces (e.g., floor polish or wax from linoleum).

58 Weighting agents (textile technology) UC 20
Substances added to yarn or fabric to increase their weight or to act as a filling agent.

310 Weighting agents (petroleum technology) UC 43
Substances that possess high specific gravities and are used to control pressures during petroleum drilling.

35 Well treating agents (petroleum production) UC 0/55
A general term for substances used in the production of oil or gas from underground reservoirs or producing wells.

APPENDIX III

175 Wet strength additives (paper technology) UC 0/55

Substances used to increase the strength of wet paper and paperboard products.

243 Wetting agents UC 50

Surfactants that, when added to water, cause it to penetrate more easily into, or to spread over the surface of, another material by reducing the surface tension of water.

377 X-ray absorbents UC 0/55

Substances used to block or attenuate X-rays, e.g., for shielding or medical diagnosis.

APPENDIX IV

List of synonyms for functions according to ChemUSES (EPA, 1980)

No.	USE CATEGORY	No.	Function (ChemUSES)
1	Absorbents and adsorbents	131	Absorbents
		60	Adsorbents
		213	Dehumidifiers
		318	Humectants
2	Adhesive, binding agents	302	Adhesives
		143	Binders
		123	Coupling agents (polymers)
		92	Spreaders
		165	Stickers
		280	Tackifiers
3	Aerosol propellants	178	Aerosol propellents
4	Anti-condensation agents	234	Antifogging agents)
5	Anti-freezing agents	77	Antifreezes
		74	Deicers
		313	Functional fluids
6	Anti-set-off and anti-adhesive agents	104	Abherents
		63	Antiblocking agents
		188	Anticaking agents
		300	Detackifiers
		233	Dusting agents
		144	Parting agents
		7	Soil retardants
7	Anti-static agents	328	Antistatic agents
		89	Electroconductive coating agents
8	Bleaching agents	304	Bleaching assistants
		132	Bleaching agents
9	Cleaning/washing agents and additives	293	Antiredeposition agents
		180	Boil-off assistants
		242	Cleaners
		173	Detergents
		78	Pre-spotting agents
		274	Scouring agents
		14	Soaping-off assistants
		294	Soil release agents

APPENDIX IV

No.	USE CATEGORY	No.	Function (ChemUSES)
10	Colouring agents (continued)	86	Colouring agents
		174	Coupling agents (dyes)
		20	Fluorescent agents
		248	Lakes
		381	Luminiscent agents
		235	Mercerizing assistants
		128	Opacifiers
		139	Pearlizing agents
		125	Pigments
		83	Stains
		371	Surface coating additives
11	Complexing agents	177	Antiprecipitants
		124	Complexing agents
		10	Sequestering agents
12	Conductive agents	161	Electrical conductive agents
		383	Electrode materials
		245	Electrolytes
		313	Functional fluids
13	Construction materials and additives	324	Case-hardening agents
		19	Catalysts supports
		355	Concrete additives
		361	Embrittlement inhibitors
		13	Impact modifiers
		375	Materials for shaping
		250	Reinforcing agents
		349	Water-reducing agents
14	Corrosion inhibitors	230	Antioxidants
		64	Antiscaling agents
		323	Corrosion inhibitors
15	Cosmetics	301	Antiperspirants
		167	Cosmetic ingredients
16	Dust binding agents	26	Dust control agents
17	Electroplating agents	17	Bright dips
		353	Brighteners
		32	Fume suppressants
		169	Plating agents

APPENDIX IV

No.	USE CATEGORY	No.	Function (ChemUSES)
18	Explosives	198	Desensitizers
		179	Detonators
		363	Explosion inhibitors
		158	Explosives
		27	Incendiaries
19	Fertilizers	34	Fertilizers
20	Fillers	351	Fillers (augmentation)
		212	Fillers (patching)
		371	Surface coating additives
		127	Swelling agents
		58	Weighting agents (textile technology)
21	Fixing agents	291	Anticrock agents
		347	Antistripping agents
		268	Barrier coating agents
		134	Fixing agents (fragrances)
		112	Fixing agents (textile technology)
		227	Mordants
22	Flame retardants and fire preventing agents	25	Fire extinguishing agents
		332	Flame retardants
23	Flotation agents	163	Activators (ore processing)
		190	Flocculating agents
		297	Flotation agents
		360	Modifiers
24	Flux agents for casting		
25	Foaming agents	358	Blowing agents
		133	Chemical blowing agents
		94	Frothers
		50	Physical blowing agents
26	Food/feedstuff additives	214	Acidulants
		66	Feed additives
		145	Food additives
		80	Sweeteners (taste)
27	Fuels	247	Fuels
28	Fuel additives	329	Antifouling agents
		76	Antiknock agents
		183	Deposit modifiers
		306	Fuel additives
		138	Sweeteners (petroleum technology)

APPENDIX IV

No.	USE CATEGORY	No.	Function (ChemUSES)
29	Heat transferring agents	72	Coolants
		313	Functional fluids
		199	Heat transfer agents
		216	Quenchers
		208	Refrigerants
30	Hydraulic fluids and additives	313	Functional fluids
		65	Hydraulic fluids
		256	Transmission fluids
31	Impregnation agents	102	Delustrants
		193	Greaseproofing agents
		197	Oil repellents
		249	Penetrants
		189	Rubbing fastness agents
		42	Sealants
		98	Sizes
		258	Water repellents
		23	Waterproofing agents
32	Insulating materials	254	Acoustical insulating material
		311	Electrical insulating material
		314	Heat insulating materials
		162	Insulating materials
33	Intermediates	146	Inorganic intermediates
		(115	Monomers)[1)]
		290	Organic intermediates
		43	Prepolymers[1)]
34	Laboratory chemicals	238	Analytical and product testing
		122	Chelating agents
		107	Deionizers
		373	Extraction agents
		69	Indicators
		325	Oxidation-reduction indicators
		374	Reagents

[1)] According to Annex II this kind of substances should have UC 33; in the release scenarios of the A-tables UC 43 is used however for monomers while no UC is used in the scenarios for prepolymers!

APPENDIX IV

No.	USE CATEGORY	No.	Function (ChemUSES)
35	Lubricants and additives	119	Antiseize agents
		313	Functional fluids
		148	Internal lubricating agents
		195	Lubricant additives
		364	Lubricating agents
		346	Oiliness agents
		249	Penetrants
		312	Slip agents
36	Odour agents	52	Deodorants
		79	Flavors and fragrances
		339	Odorants
37	Oxidizing agents	331	Fuel oxidizers
		149	Oxidizers
38	Plant protection products, agricultural	166	Animal repellents
		333	Bactericides
		108	Biocides
		97	Decontaminats
		372	Embalming agents
		362	Fungicides
		275	Herbicides
		155	Insect attractants
		348	Insect repellents
		330	Insecticides
		252	Nematocides
		253	Pesticides
		264	Rodenticides
39	Biocides, non-agricultural	287	Algicides
		1	Antifouling agents
		108	Biocides
		39	Decontaminants
		140	Disinfectants
		372	Embalming agents
		270	Fumigants
		362	Fungicides
		155	Insect attractants
		348	Insect repellents
		330	Insecticides
		118	Preservatives
		264	Rodenticides
		116	Slime preventatives
40	PH-regulating agents	172	Laundry sours
		266	pH control agents
		191	pH indicators

APPENDIX IV

No.	USE CATEGORY	No.	Function (ChemUSES)
41	Pharmaceuticals		
42	Photochemicals	99	Antifogging agents (imaging systems)
		122	Chelating agents
		299	Desensitizers (photography)
		182	Developers
		295	Fixatives
		286	Intensifiers (photography)
		285	Light stabilizers
		344	Photosensitive agents
		303	Sensitizers
43	Process regulators	321	Accelerators
		46	Activators (chemical processes)
		239	Activators (enzymes)
		110	Adhesion promoters
		4	Antifelting agents
		352	Antislip finishing agents
		206	Antistaining agents
		194	Antiwebbing agents
		281	Builders
		222	Carbonizing agents
		164	Carriers
		19	Catalyst supports
		170	Catalysts
		31	Chain extenders
		113	Chain terminators
		141	Chain transfer agents
		122	Chelating agents
		114	Coagulants
		278	Coalescents
		357	Coalescing agents
		315	Crabbing assistants
		228	Crosslinking agents
		226	Curing agents (concrete)
		369	Curing agents (polymer technology)
		18	Currying agents
		236	Deasphalting agents
		342	Defoamers
		365	Degumming agents
		137	Dehairing agents
		73	Dehydrating agents
		366	De-inkers
		84	Delignification agents
		30	Depolymerization agents
		367	Depressants
		292	Desizing agents
		259	Dispersants

APPENDIX IV

No.	USE CATEGORY	No.	Function (ChemUSES)
43	Process regulators (continued)	317	Driers
		150	Dye carriers
		255	Dye leveling agents
		307	Dye retardants
		211	Dye retention aids
		341	Enzyme inhibitors
		157	Enzymes
		284	Finishing agents
		337	Formation aids
		331	Fuel oxidizers
		117	Fulling agents
		192	Hormones
		103	Initiators
		359	Intensifiers (printing)
		171	Kier boiling assistants
		235	Mercerizing assistants
		115	Monomers[1)]
		24	Nucleating agents
		96	Peptizing agents
		75	Pitch control agents
		251	Plant growth regulators
		176	Plastics additives
		121	Polymerization additives
		209	Polymerization inhibitors
		21	Prevulcanization inhibitors
		153	Refining agents
		223	Repulping aids
		136	Retarders
		296	Retention aids
		338	Rubber compounding agents
		51	Scavengers
		326	Solubilizing agents
		371	Surface coating additives
		310	Weighting agents (petroleum technology)
44	Reducing agents	244	Reducers
45	Reprographic agents	225	Toners
46	Semiconductors	202	Semiconductors
		378	Photovoltaic agents

[1)] According to Annex II this kind of substances should have UC 33; in the release scenarios of the A-tables UC 43 is used however for monomers.

APPENDIX IV

No.	USE CATEGORY	No.	Function (ChemUSES)
47	Softeners	269	Bates
		231	Devulcanizing agents
		28	Elasticizers
		265	Emollients
		185	Plasticizers
		29	Softeners
		147	Water softeners
48	Solvents	229	Degreasers
		82	Dewaxing solvents
		373	Extraction agents
		320	Paint and varnish removers
		16	Reaction media
		271	Solvents
49	Stabilizers	277	Anticracking agents
		12	Antifume agents
		129	Antihydrolysis agents
		168	Antiozonants
		230	Antioxidants
		120	Antilivering agents
		282	Antiplasticizers
		160	Antisagging agents
		68	Antisettling agents
		88	Bloom inhibitors
		159	Emulsifiers
		87	Heat stabilizers
		285	Light stabilizers
		54	Stabilizers
		36	Ultraviolet absorbers
50	Surface-active agents	41	Antifloating agents
		234	Antifogging agents
		109	Surfactants
		243	Wetting agents
51	Tanning agents	316	Tanning agents
52	Viscosity adjustors	152	Antiflooding agents
		120	Antilivering agents
		343	Antiskinning agents
		221	Gelling agents
		262	Pour point depressants
		272	Thickeners
		334	Thixotropic agents
		240	Turbulence suppressors
		135	Viscosity adjustors
		15	Viscosity index improvers

APPENDIX IV

No.	USE CATEGORY	No.	Function (ChemUSES)
53	Vulcanizing agents	288	Vulcanizing agents
54	Welding and soldering agents	101	Brazing agents
		22	Fluxing agents
0/55	Other	204	Ablatives
		105	Abrasives
		196	Activators (luminiscence)
		354	Aerating agents
		47	Air entraining agents
		376	Alloying agents
		90	Anticratering agents
		48	Anticreasing agents
		218	Antipilling agents
		350	Antiskid agents
		6	Blasting abrasives
		70	Bluing agents
		220	Bright dips
		93	Chemical raw materials
		298	Clarifiers
		260	Cloud point depressants
		130	Coating agents
		283	Collectors
		335	Coupling agents (solutions)
		215	Culture nutrients
		81	Deaerating agents
		309	Deblooming agents
		85	Dechlorinating agents
		73	Dehydrating agents
		107	Deionizers
		232	Demulsifiers
		200	Denaturants
		49	Descaling agents
		198	Desensitizers (explosives)
		205	Dewatering aids
		356	Discharge printing agents
		38	Drainage aids
		44	Drilling mud additives
		322	Dry strength additives
		39	Dye stripping agents
		100	Electron emission agents
		340	Eluting agents
		372	Embalming agents
		186	Encapsulating agents
		57	Enhanced oil recovery agents
		308	Entraining agents
		319	Etching agents
		336	Evaporation control agents

APPENDIX IV

No.	USE CATEGORY
0/55	Other (continued)

No.	Function (ChemUSES)
373	Extraction agents
207	Fiber-forming compounds
368	Filtration aids
56	Flatting agents
79	Flavors and fragrances
142	Fluid loss additives
313	Functional fluids
193	Greaseproofing agents
184	"Grinding, lapping, sanding and"
210	Hydrotropic agents
380	Incandescent agents
69	Indicators
2	Ion exchange agents
91	Lachrymators
33	Latex compounding agents
53	Leaching agents
156	Leather processing agents
370	Liquid crystals
381	Luminiscent agents
379	Magnetic agents
67	Mar proofing agents
375	Materials for shaping
289	Metal conditioners
95	Metal strippers
37	Metal treating agents
327	Milling aids
237	Obscuring agents
197	Oil repellents
62	Optical quenchers
382	Osmotic membranes
17	Papermaking agents
55	Phosphatizing agents
203	Phosphorescent agents
344	Photosensitive agents
59	Pickling agents
217	Pickling inhibitors
176	Plastics additives
224	Plastics for shaping
169	Plating agents
8	Poison gas decontaminants
3	Polymer strippers
111	Pore forming agents
151	Precipitating agents
106	Protective agents
45	Radioactivity decontaminants
374	Reagents
219	Refractive index modifiers
241	Refractories

APPENDIX IV

No.	USE CATEGORY
0/55	Other (continued)

No.	Function (ChemUSES)
154	Resists
71	Ripening agents
187	Rubber for shaping
201	Rubber reclaiming agents
189	Rubbing fastness agents
276	Rust inhibitors
11	Rust removers
263	Scrooping agents
42	Sealants
261	Shrinkage controllers
126	Slime control agents
305	Soil conditioners
61	Strippers
371	Surface coating additives
40	Tar removers
345	Tarnish inhibitors
13	Tarnish removers
279	Textile specialities
257	Vat printing assistants
273	Wax strippers
35	Well treating agents
175	Wet strength additives
377	X-ray absorbents

Matrix of valid and non-valid combinations of Industrial category (IC) (horizontal) and Use category (UC) (vertical)

X = Valid combination (distinguished in release scenario concerned)
V = Combination is valid (not specifically distinguished in relevant release scenario)
? = The combination does not seem to be likely, but will be treated as if UC = 0
- = Invalid combination (not signalled by EUSES; treated as UC = 0)

UC\IC	1	2	3	4	5	6	7	8
1	?	V	V	-	?	?	?	-
2	?	?	?	V	X	V	?	-
3	X	?	?	-	X	?	-	-
4	?	V	V	-	?	?	-	-
5	?	V	V	-	X	?	-	?
6	?	V	V	?	V	V	X	?
7	?	V	V	V	X	?	-	-
8	?	V	V	?	X	?	V	-
9	X	?	?	V	X	X	X	V
10	X	?	?	V	X	?	X	?
11	?	?	?	-	X	-	-	-
12	?	V	V	V	-	-	-	?
13	?	-	-	-	?	?	-	?
14	?	?	?	?	X	?	-	V
15	?	-	-	-	V	-	-	-
16	?	-	-	?	-	?	-	-
17	?	-	-	V	-	-	-	V
18	?	-	-	-	-	-	-	-
19	X	?	?	-	X	V	-	-
20	?	?	?	-	-	-	-	-
21	?	?	?	?	-	-	?	-
22	?	-	-	V	?	?	-	-
23	?	-	-	-	-	-	-	V
24	?	-	-	?	-	-	-	V
25	?	-	-	-	-	-	-	-
26	X	-	-	-	X	-	-	-
27	?	-	-	-	V	V	-	?
28	?	-	-	-	V	V	-	?
29	?	?	?	V	?	?	-	X
30	V	-	-	-	?	?	-	?
31	?	-	-	V	?	?	X	-
32	?	?	?	V	V	V	-	-

Table 4.3 Continued for IC = 1-8 from UC = 33

UC \ IC	1	2	3	4	5	6	7	8
33	-	-	X	-	-	-	-	-
34	-	V	V	-	?	-	-	-
35	V	-	-	?	X	V	-	X
36	X	-	-	-	X	?	-	?
37	?	V	V	-	?	?	-	?
38	X	-	-	-	X	X	-	-
39	X	-	-	-	V	V	V	V
40	?	V	V	-	?	?	?	?
41	X	-	-	-	X	-	-	-
42	?	-	-	V	-	-	-	-
43	?	V	V	?	?	?	-	?
44	?	V	V	?	?	?	-	?
45	?	-	-	-	?	?	-	-
46	?	-	-	V	-	-	-	-
47	?	-	-	?	X	?	-	-
48	X	V	V	V	X	V	?	V
49	?	V	V	?	?	-	-	?
50	X	V	V	V	X	V	?	V
51	?	V	V	-	-	-	V	-
52	?	-	-	-	-	-	-	-
53	?	-	-	-	-	-	-	-
54	?	-	-	V	-	-	-	V
55/0	X	V	V	V	X	X	V	V

Table 4.3 Continued for IC = 9-15/0 and UC = 1-32

UC\IC	9	10	11	12	13	14	16	15/0
1	-	-	-	-	?	-	V	V
2	-	-	-	V	-	-	V	V
3	-	-	-	-	-	X	-	V
4	-	-	-	-	-	V	-	V
5	V	-	-	-	-	?	-	V
6	-	-	X	V	V	-	?	V
7	V	-	X	-	V	-	?	V
8	-	V	-	-	V	-	-	V
9	-	-	V	X	V	-	?	V
10	V	V	X	X	X	X	?	V
11	-	-	-	-	-	-	-	V
12	-	-	V	-	-	-	-	V
13	-	-	-	-	-	-	V	V
14	-	-	-	-	-	X	-	V
15	-	-	-	-	-	-	-	V
16	-	-	-	-	-	-	-	V
17	-	-	?	-	-	-	-	V
18	-	-	-	-	-	-	-	V
19	-	-	-	-	-	-	-	V
20	-	-	X	X	-	X	-	V
21	-	-	-	-	-	-	-	V
22	-	-	X	?	V	-	V	V
23	-	-	-	V	-	-	-	V
24	-	-	V	-	-	-	-	V
25	-	-	V	-	-	-	-	V
26	-	-	-	-	-	-	-	V
27	X	-	-	-	-	-	-	V
28	X	-	-	-	-	-	-	V
29	-	-	-	-	-	-	-	V
30	-	-	-	-	-	-	-	V
31	-	-	-	X	V	-	-	V
32	-	-	-	-	-	-	V	V
33	X	-	V[1)]	-	-	-	-	V
34	-	-	-	-	-	-	-	V
35	-	-	X	-	-	-	-	V
36	-	-	-	-	-	-	-	V
37	-	?	-	-	-	V	-	V
38	-	-	-	-	-	?	-	V
39	-	?	?	V	-	-	V	V
40	-	-	-	-	-	-	-	V

Table 4.3 Continued for IC = 9-15/0 from UC = 41

UC\IC	9	10	11	12	13	14	16	15/0
41	-	-	-	-	-	V	-	V
42	-	X	-	-	-	-	-	V
43	-	?	X	-	-	-	-	V
44	-	-	-	-	-	-	-	V
45	-	-	-	X	-	-	-	V
46	-	-	-	-	-	-	-	V
47	-	-	X	-	-	X	-	V
48	-	-	X	X	V	X	V	V
49	V	-	X	-	-	?	-	V
50	-	?	?	-	V	X	-	V
51	-	-	-	-	-	-	-	V
52	V	-	-	-	-	X	-	V
53	-	-	X	-	-	-	-	V
54	-	-	-	-	-	-	-	V
55/0	V	?	X	X	V	X	V	V

[1] Though UC = 33 (intermediates) is not specifically mentioned in the release scenario of the A-tables 'prepolymers' such as polyester resins are meant (processing, i.e. shaping processes). Substances such as monomers and cross-linking agents are in principle intermediates, but in the release scenarios of the A-tables they are recognized as UC = 43.