# Specific Environmental Release Categories (SpERCs) for the professional use of solvents and solvent-borne substances in high release lubricants, metalworking fluids, fuels, and low release lubricants

**Introduction**

Many solvent-containing products are suitable for routine use in a wide variety of professional applications. The professional use of these products requires the employment of trained personnel with the requisite knowledge and expertise needed to safely and sensibly operate under a range of work conditions. In this context, professional product applications are generally carried out by seasoned personnel who have undergone an apprenticeship or other similar intensive training program to acquaint them with functional skills and situational knowledge needed to perform a particular task safely. Automotive mechanics, painters, machinists, and construction/maintenance specialists are all examples of professional occupations that may use solvent-containing products on a regular basis.

The use of many professionally formulated products may result in the widespread release of substances into the environment (ECHA, 2016). Widespread uses of a product may either be indoors or outdoors and are characterized by small point-source releases at many different locations spread over a large area. Engineering controls to prevent or reduce the environmental release of product components are generally absent or ineffective when the uses are widespread. Administrative and procedural controls may be in place to minimize releases in professional operations where the task is repetitively performed on a regular schedule. These measures include rigorous training and adherence to operational guidelines that reduce the potential for environmental release by guarding against overuse and unabated emissions to air, water, and soil.

Professional product users are accustomed to the routine handling of a wide variety of solvent-containing coatings, cleaners, lubricants, and fluids. Specific techniques and practices for minimizing environmental release and reducing waste generation are routinely implemented by professional applicators who are accustomed to working with a product under a variety of circumstances. These include measures for the proper storage, cautious dispensing, and conscientious disposal of the product regardless of the task or work conditions.

The following guidance document provides a description of the logic and reasoning used to create four Specific Environmental Release Categories (SpERCs) covering the professional use of solvent-containing products. The air, water, and soil release factors associated with these SpERCs and sub-

SpERCs provide an alternative to the default release factors associated with the environmental release categories (ERCs) promulgated by ECHA. The following sections of this background document have been aligned with those of the SpERC Factsheet and provide additional descriptive details on the genesis and informational resources used to generate each SpERC.

**1. Title**

The enclosed background information corresponds with the information provided in the following four factsheets:

1. ESVOC SPERC 8.6c.v2 – Use in lubricants – high release
2. ESVOC SPERC 8.7c.v2 – Use in metalworking fluids/rolling oils
3. ESVOC SPERC 9.12b.v3 – Use in fuels
4. ESVOC SPERC 9.6b.v2 – Use in lubricants – low release

Since these newly released SpERC factsheets include some corrections and or modifications, the version number has been changed to reflect the updates.

**2. Scope**

The applicability domain for a particular SpERC includes an initial determination of the life cycle stage (LCS) that best describes the industrial operation involved and the intended use of the substance being evaluated. The relevant life cycle stages and their interrelationships are depicted in Figure 1 (ECHA, 2015). The four SpERCs highlighted in this guidance document are all associated with a single life cycle stage: widespread use by professional workers. This assignment is consistent with ECHA guidelines for distinguishing solvent uses in industrial applications versus their widespread use in professional or consumer applications.

Other use descriptors such as the sector of use (SU) and the chemical product category (PC) have been assigned in accordance with the naming conventions outlined by ECHA (ECHA, 2015). These have been summarized in Table 1 along with the use descriptions characterizing the four SpERCs. The terminology used to describe the individual applications is consistent with the list of standard phrases associated with the Generic Exposure Scenarios (GESs) that have been created to describe the exposures associated with the industrial production and use of solvents (ESIG/ESVOC, 2017). Use of standard phrases in these SpERC descriptions provides consistency and harmonization, and avoids confusion among potential SpERC users.

Figure 1. ECHA identified life cycle stages and their interrelationship

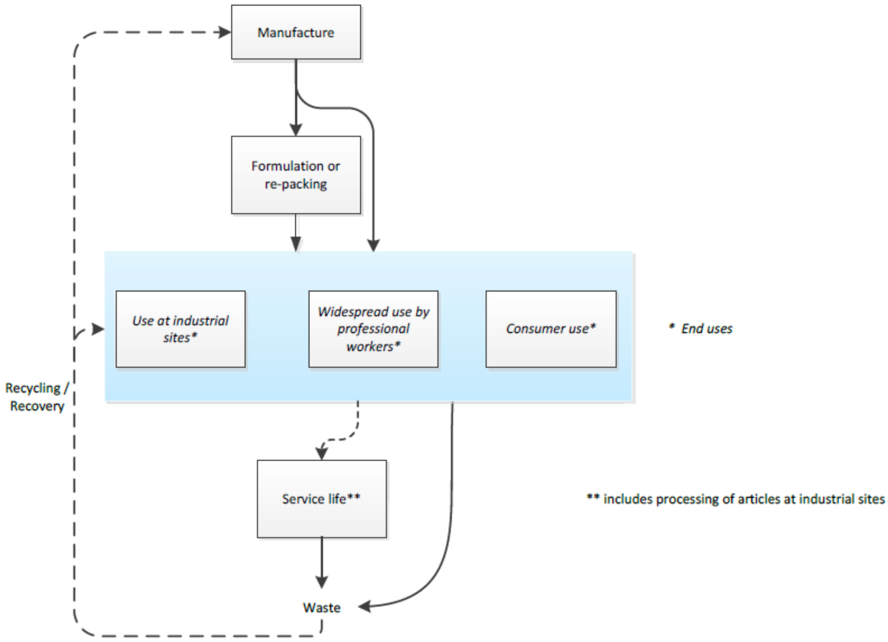

Table 1. SpERC background information

| SpERC Code | Title | Life Cycle Stage (LCS) | Sector of Use (SU) | Chemical Products Category (PC) | Use Description |
|---|---|---|---|---|---|
| ESVOC SPERC 8.6c.v2 | Use in lubricants - high release | Widespread use by professional workers | SU17 General manufacturing | PC24 Lubricants, greases, release products | Covers the use of formulated lubricants in open systems including transfer operations, application, operation of engines and similar articles, reworking on reject articles, equipment maintenance and disposal of waste oil. |
| ESVOC SPERC 8.7c.v2 | Use in metal working fluids/rolling oils | Widespread use by professional workers | SU15 Manufacturing of fabricated metal products, except machinery equipment | PC25 Metal working fluids | Covers the use in formulated MWFs including transfer operations, open and contained cutting/machining activities, automated and manual application of corrosion protections, draining and working on contaminated/ reject articles, and disposal of waste oils. |
| ESVOC SPERC 9.12b.v3 | Use in fuels | Widespread use by professional workers | SU8 Manufacture of bulk large-scale chemicals (including petroleum products) | PC13 Fuels | Covers the use as a fuel (or fuel additive) and includes activities associated with its transfer, use, equipment maintenance and handling of waste and consumer uses in liquid fuels. |
| ESVOC SPERC 9.6b.v2 | Use in lubricants – low release | Widespread use by professional workers | SU17 General manufacturing | PC24 Lubricants, greases, release products | Covers the professional and consumer use of formulated lubricants in closed or contained systems including transfer operations, application, operation of engines and similar articles, reworking on reject articles, equipment maintenance and disposal of waste oil. |

## 3. Operational conditions

The operating conditions for a particular professional application define a set of procedures and use conditions that limit the potential for environmental release. The professional use of solvent-containing products in small businesses are not associated with a specific group of mandatory requirements or constraints to minimize the likelihood of an environmental release. There are, however, recommended procedures that are typically implemented as standards of practice to reduce the potential for air, water, and soil release.

### 3.1. Conditions of use

The four SpERCs described in this background document are associated with indoor and outdoor professional operations typically undertaken by experts with detailed knowledge of the best handling practices for the products in use. The widespread use of these products can occur at various locations employing skilled and appropriately trained personnel. Construction sites, automotive maintenance facilities, custodial cleaning services, parts machining, and trucking/transport operations exemplify the types of small businesses where professional product use may occur (ECHA, 2015).

Several use conditions characterize the professional use of a product in a widespread manner. These include i) the potential use and handling at a large number of broadly found sites whose distribution density is roughly proportional to the number of local inhabitants; ii) unimpeded usage that does not need to conform with local, regional, or national permitting requirements; iii) basic and simplified pollution control equipment for controlling environmental release; iv) tasks and workflows that limit the product use volumes and the overall emissions potential; and v) access to a municipal sanitary sewer system capable of handling any extraneous waste streams from the site.

A sanitary drainage system connected to a standard municipal wastewater treatment facility (WWTP) is presumed to exist when these solvent-containing products are used in widespread applications. A standard municipal facility uses both mechanical and biological treatment stages and has an effluent discharge rate of 2,000 $m^3$/day, which is equivalent to a wastewater generation rate of 200 L/person/day for a community with 10,000 inhabitants (ECHA, 2016). At the regional scale, ECHA assumes that 80% of the generated wastewater is funnelled through a standard municipal WWTP, with the remaining 20% released directly to surface waters. Further, stormwater drainage systems are not connected to a standard WWTP and the effluents are discharge untreated to local surface waters. The sludge resulting from the municipal wastewater treatment is also recognized to be suitable for direct application to agricultural soil.

Rigorous containment is not a necessary prerequisite for the application of these SpERCs to an environmental exposure analysis. The European Chemical Agency (ECHA) has outlined the technical and operational requirements necessary to demonstrate that a volatile organic compound (VOC) has been rigorously contained and these conditions are not applicable to the regional widespread use of a product in a professional setting (ECHA, 2010).

### 3.2. Waste handling and disposal

Every effort should be made to minimize the generation of waste at every point in a products' life cycle including professional uses. This necessitates the implementation of sensible waste minimization practices that stress the importance of recycling and/or reuse at the professional level. Many professional operations institute waste avoidance and minimization practices that are aimed at reducing the environmental impact of the products being handled. These include regular training sessions that focus on a range of topics such as waste reduction, recycling, and reuse. In addition to training, other management practices include the creation of standard operating procedures for the labelling, collection, storage and disposal of unused or spent products.

Under most circumstances, the residual waste generated during the professional use of a solvent-containing product is handled as a liquid or solid hazardous waste (EEA, 2016). Small and medium sized enterprises often put into place environmental management plans that describe an employee's responsibilities for ensuring the conscientious processing of both hazardous and non-hazardous wastes (EC, 2012). Available guidance for small businesses provide a detailed blueprint for storing, transporting, and disposing the hazardous waste generated by professional users (CIPS, 2007, Editions Ruffec, 2003). An important aspect of these plans is the need to reduce, recycle, and reuse any accumulated hazardous to the extent possible. Regardless of their degree of implementation, all waste handling practices must conform with the provisions cited in all applicable waste directives issued by local, regional, and national authorities.

## 4. Obligatory risk management measures onsite

There are few obligatory risk management measures associated with the widespread professional use of a solvent-containing product. All discharges to a local sanitary sewer system need to be treated at a municipal WWTP capable biologically degrading wastewater contaminants before surface water release. The operating conditions for this facility are expected to conform with the standard default specifications outlined by ECHA (ECHA, 2016). This includes meeting or exceeding effluent discharge rate for a standard municipal WWTP and the creation of sludge that is suitable for release onto agricultural land.

There are, however, a number of voluntary initiatives that may be undertaken to control environmental releases during the professional use of a product. These include the institution of several different types of technical and administrative programs that are described in more detail below.

### 4.1. Optional risk management measures limiting release to air

Pollution prevention initiatives provide a reasonable and cost-effective means of reducing the atmospheric release of volatile substances during the use or application of professional products. These initiatives usually take the form of chemical management plans that describe a set of standard operating procedures (SOPs) to be used when a product is being handled in a professional setting (EEA, 1998). These SOPs can cover a range of topics from product procurement to disposal and contain a precise description of the procedures to be followed when handling a product under actual field conditions.

Sound practices for reducing the widespread atmospheric release of a substance include specific storage, handling, and spill containment strategies (USEPA, 2016). Storage examples include the correct handling of damaged containers susceptible to spillage, the proper closure and sealing of containers following use, and the use of drip pans or trays to contain any spills that may occur during storage. Similar examples describe basic handling procedures to circumvent the unintended release of volatile constituents. These include procedures for the onsite transport, transfer, and container storage of products and wastes. SOPs may also be created that govern spill prevention and remediation. These are particularly effective at minimizing the impact of an accidental release on the levels of air, water, and soil contamination that may ensue. **Optional risk management measures limiting release to water**

Wastewaters generated in the course of products' professional use need to be treated in a biological wastewater treatment plant that is capable of biodegrading any water-soluble substances discharged to the local sanitary sewer system. The primary source of treatable wastewater results from the cleaning of containers, tanks, and transfer equipment. Small releases may also result from unintentional spills and leaks, which need to be guarded against at all junctures.

Special attention should be given to the professional use and application of water immiscible products such as lubricants and fuels. Facilities such garages, service stations, and car washes can develop a drainage plan that maps the type of nearby drains along with their location and eventual discharge (NIEA, 2017). Contaminated water should not be released to the storm sewers used collect rainwater for direct release to local surface waters. Before release to an identified sanitary sewer, wastewater may be pretreated using an oil-water separator to remove any undissolved hydrocarbons. Other cleanup practices that may reduce the generation of wastewater include the recovery of any unused material in transfer lines rather than washing it down the drain, the application of dry cleaning practices for leaks and spills rather than area hosing with water, and the washing of floors, equipment, and surfaces only when need rather than on a regular schedule (NSEL, 2003).

### 4.3. Optional risk management measures limiting release to soil

Many of the same pollution prevention practices exercised to reduce releases to air and water will also be effective in containing emissions to soil. Procedures and protocols for housekeeping and spill removal are perhaps the most effective at reducing any releases to soil (GTZ, 2008). The creation and wide dissemination of a spill plan is a highly effective pollution prevention initiative. Ideally, the plan would include a detailed description for handling accidental releases rapidly and in an efficient manner. The location and correct use of spill kits can also provide an added benefit as does the storage of products in dedicated spaces that have a floor made of impervious concrete. Aside from these discretionary measures, there are no mandatory risk management measures for controlling the soil release potential.

## 5. Exposure assessment input

The SpERCs described in this background document are associated with a specific set of use conditions that have been directly adopted from ECHAs appraisal of the factors influencing the widespread dispersive use of a substance on a professional scale (ECHA, 2016). The derived default values are associated with the conditions that presumably exist within a “standard town” occupied by 10,000 inhabitants and serviced by a municipal WWTP with an effluent flow rate of 2000 $m^3$/day, which corresponds to a wastewater generation rate of 200 L/day/person for those residing in the “standard town”. The number of individuals living in the “standard town” assumes that it is positioned within a densely populated “standard region” of Western Europe with 20 million inhabitants living within a land area measuring 200 km x 200 km (10% of the European land mass). The following paragraphs describe the underlying reasoning used to assign a numerical value to the parameters affecting the emissions resulting from the widespread professional use of solvent-containing products.

### 5.1. Substance use rate

The regional use tonnage for a professionally used substance contained in a product formulation is dependent on several key parameters that dictate the extent and magnitude of a product's use at the regional scale. Since product formulations may vary widely in composition, the assignment of a single definitive annual use amount is both impractical and potentially misleading. Consequently, the use tonnage will be highly dependent on the product formulation and regional sales distribution. Registrants using these professional SpERCs are, therefore, in the best position to define the regional use rate based on detailed knowledge of their product portfolio, product compositions, and product market penetration. Specification of multiple putative regional tonnages based on available knowledge of the product types available to professional users is not a tenable option given the ambiguities it creates (OKOPOL, 2014)

The following equation describes the calculation of a daily use rate of substance in a "standard town" using ECHA recognized default parameters. This calculation is applicable once an annual use rate is supplied by the registrant.

$$Daily\ use\ \left(\frac{tonnes}{day}\right) = \frac{annual\ use\ \left(\frac{tonnes}{year}\right)\ x\ adjustment\ factor\ x\ regional\ fraction\ used\ locally\ x\ annual\ fraction\ used\ regionally}{emission\ days\ \left(\frac{days}{year}\right)} \quad (1)$$

The assessment factor of 4 used in this calculation adjusts for any spatial and temporal variability in the professional use of a substance within a region. The application of this factor accounts for any localized spikes in the usage rate within a confined geographical area or narrow span of time. The regional fraction used locally is proportional to the ratio of the number of inhabitants living in the "standard town" and the "standard region". This equates to a default value of 0.0005 or 0.05% assuming a "standard town" population of 10,000 and a "standard region" with 20 million residents. According to convention, the fraction of the annual EU tonnage used regionally has been assigned a default value of 0.1 or 10%. The preceding derivation outlined above describes the standard approach for determining the daily use rate using available default parameters along with the registrants' estimate of the annual tonnage associated with the production of particular professional product.

### 5.2. Days emitting

The number of emission days for each of the SpERCs described in this guidance document has been set at the ECHA default value of 365 days/year (ECHA, 2016). Since the substances described in these SpERCs may see widespread continuous use over a large geographical domain, the use frequency has been maximized to reflect the broad regional usage of these professional products.

### 5.3. Release factors

The magnitude of an environmental emission following the professional use of a volatile solvent may be impacted by its volatility (OECD, 2011). Since this physical property can vary over a wide range for many commercial products, a single emission factor does not always suitably describe the environmental release potential. This property prompted the identification of individual emission factors for products that broadly varied in composition and methods of application. The differentiation allows solvent-containing products with a high volatilization potential to be distinguished from those with a low to intermediate capability. When deemed appropriate, several vapor pressure categories were identified along with a single water solubility category to define multiple sub-SpERCs. This was the case for three of the four widespread professional uses described in this background document.

***a) Release factor to air***

Several different approaches were used to establish air release factors for the four SpERCs highlighted below. In some cases, a worst-case default approach was taken to ensure adequate precaution when suitably verified information was unavailable. In other instances, the factors were extracted from an authoritative resource once the information was appropriately vetted. Table 2 provides a listing of the vapor pressure categories and emission factors applicable to the four SpERCs.

The air release factors for high release lubricants and metalworking fluids have been taken from published release factors established for a range of products and applications. These values have been posted in the A-Tables of Appendix 1 in the Technical Guidance Document (TGD) on Risk Assessment Part II (EC, 2003). A total of 17 Industrial Categories (ICs) have been established for categorizing the use sectors for a wide range of products and processes (OECD, 2003). The air release factors for the high release lubricant and metalworking fluid SpERCs have been aligned with the mineral oil and fuel industry category (IC 9), which includes a wide range of volatile hydrocarbons used for heating, lubrication, and power generation. Separate release tables have been created for each IC depending on the life cycle stage under consideration. The private use stage, which considers the widespread consumer use and application of a commercial product, was in closest alignment with the professional use of high release lubricants and metalworking fluids. This assignment allowed the appropriate table of compiled release factors to be identified (Table A4.2) and cited.

Three commercial fuels were used to delineate the air emissions resulting for the professional use of fuels. Gasoline (VP = 4100-160,000 Pa @ 37.8 °C/100 °F), diesel (VP = 500-<5000 Pa @ 37.8 °C/100 °F), and kerosene, (VP = <1000-3700 Pa @ 37.8 °C/100 °F) were used to characterize the air emission for high, medium, and low vapor pressure fuels, respectively (CONCAWE, 2010). A study using the USEPAs Motor Vehicle Simulator (MOVES) model described the hydrocarbon emission factors for gasoline-fueled Class 6 medium heavy-duty vocational vehicles placed on the road from 1990 to 2020 (ANL, 2015). Vocational vehicles included dump, garbage and box trucks used to professionally transport materials or equipment. For vocational vehicles from the 2000 model year, the lifetime average VOC emissions from the engine exhaust and fuel evaporation were estimated to be 1.061 and 0.644 g/mi, respectively. The evaporative releases included the VOC emissions associated with vapor venting, permeation, and fuel leaks. The average fuel efficiency value for 2002 gasoline-powered Class 6 vehicles was noted to be 7.5 mi/gal. Adjusting for a gasoline density of 2.83 kg/gal, a total air emission factor of 0.5% was determined (Aqua-Calc, 2019b). A similar determination was performed for year 2000 diesel-powered Class 6 medium heavy-duty vocational trucks. The exhaust and evaporative emissions from these vehicles were predicted to produce a lifetime average VOC release of 1.262 and 0.022 g/mi, respectively. Using an average 2002 fuel efficiency value of 8.2 mi/gal and a diesel density value of 3.22 kg/gal, an air release factor of 0.3% was determined to exist for the professional use of diesel fuels (Aqua-Calc, 2019a).

The factor for kerosene was based on the hydrocarbon emissions associated with the use of Jet A fuel, a type of refined kerosene (EASA, 2019). A database maintained by the European Union Aviation Safety Agency lists the hydrocarbon exhaust emissions associated with airplane take-offs, climb-outs, approaches, and idling conditions. Emission values were determined for over 600 different engine types that included models that were both out of service and out of production. After removing those engine types no longer in service and totalling the factors for all four use conditions, an average emission factor of 6.6 g/kg or 0.66% was obtained for the 516 jet engines tested. This value was rounded downward to 0.6% since some of the engines with emission factors greater than 10%, although still in service, did not use the latest technologies for limiting emissions by controlling fuel flow.

An examination of the air emission factors for gasoline (0.5%), diesel (0.3%), and kerosene (0.6%) reveals that the values are reasonably similar. Consequently, a single emission factor was deemed to be appropriate for all professional fuels regardless volatility. Taking into consideration the relative volumes of use of each fuel, an overall air emission factor of 0.5% was derived.

The air factor for low release lubricants used in closed systems have not been differentiated according to vapor pressure since discharges to the environment are restricted by the containment that the enclosure supplies. Consequently, a single air release factor was assigned regardless of the products' vapor pressure. The value corresponds to ECHAs default assignment for the two ERC (Environmental Release Category) descriptors that are applicable to lubricants with a low release potential. The value of 5.0% corresponds to the
the wide dispersive use of functional fluids indoors and outdoors (ERC 9a and ERC 9b). (ECHA, 2016).

Table 2. SpERC air release factors

| Vapour pressure (Pa) | SpERC air release factor (%) | | | |
|---|---|---|---|---|
| | lubricants – high release | metalworking fluids | fuels | lubricants – low release |
| >10000 | 60 | 60 | See text | See text |
| 1000-10000 | 40 | 40 | | |
| 100-1000 | 15 | 15 | | |
| 10-100 | 1.5 | 1.5 | | |
| <10 | 0.5 | 0.5 | | |

NA – not applicable

### b) Release factor to water

Several sources of information were used to identify a water release factor for the professional widespread use of lubricants, metal working fluids, and fuels. These sources are individually highlighted in Table 3 along with the applicable value. In some cases, a definitive factor could not be determined after scrutinizing the information contained existing reviews and technical reports. The absence of information was offset using expert professional judgement and industry sector knowledge acquired by a variety of means including networking activities, trade association meetings, and social media interactions.

The water release factor for the high and low release lubricant SpERC and the metalworking fluid SpERC were aligned with a published accounting of the environmental fate of a low release lubricant in automotive applications (OECD, 2004). An examination of crankcase oil use in the United Kingdom found that 1.0% or 4,000 tonnes/year of this lubricant can be released to water as a result of leakages from the engine crankcase, which houses the lubricating oil in a pressurized enclosure. Using expert advice and the recommendations of knowledgeable specialists, the water release factor for high release lubricants and metalworking fluids was established using a read-across approach that was anchored to the available information for low release lubricants. An adjustment factor of 5 was applied to the low release lubricant water release factor to obtain a factor of 5.0% for high release lubricants and metalworking fluids. The adjustment factor accounts for the larger spills, leaks, and loses that can occur with these professional applications.

The water and soil release of hydrocarbons accompanying professional fuel use were estimated using measurements of fuel spillage for the refuelling of automobiles at service stations equipped with conventional dispensing nozzles without any vapor recovery capabilities. A California study conducted from 1989-1990 examined the volume of gasoline spilled during the refuelling of vehicles at 21 service stations (Morgester, et al., 1992). The survey indicated that an average of 0.00061 lb/gal of liquid gasoline was lost during the refuelling process. This equates to a release of 0.01% after applying a density correction factor of 6.25 lb/gal. Based on laboratory experiments, a separate study reported that 50% of the gasoline spilled at service stations evaporated to air (Hilpert and Breysse, 2014). These data indicate that 0.005% of the gasoline delivered at service stations will distribute between water and soil. The distribution ratio between these two compartments was predicted using a Level III multimedia fugacity model available within the USEPAs EPI Suite (v 4.1) software package. The results showed that showed that a vast majority of the spilled gasoline not evaporating remains in the soil compartment with only a small portion distributing to water (Card, et al., 2017). The model estimated soil release rate of 40 mg/hr yielded a soil to water distribution ratio of about 290:1. Applying these results to the gasoline spill fraction that did not evaporate yielded water and soil emission factors of 0.00002% and 0.005%. These release fractions were adjusted upward to account for the larger tank capacities and refuelling durations for medium heavy-duty vocational vehicles. Assuming a 5-fold difference in the refuelling time and spill volume for professional versus private vehicles, the water and soil release factors for professional fuel use are estimated to be 0.0001% and 0.025%, respectively (Ford, 2016).

Table 3. SpERC water release factors

| Assignments | SpERC title | | | |
|---|---|---|---|---|
| | **lubricants -high release** | **metalworking fluids** | **fuels** | **lubricants - low release** |
| ERC | 8a<br>8b | 8a<br>8d | 9a<br>9b | 9a<br>9b |
| Water release factor (%) | 5.0 | 5.0 | 0.0001 | 1.0 |
| Source | (OECD, 2004) | (OECD, 2004) | (Card, et al., 2017) | (OECD, 2004) |

### *c) Release Factor - soil*

The SpERC-related soil release factors have been largely compiled from same sources used to derive the water release factors. As shown in Table 4, the soil factors are comparable to the factors shown in Table 3 and are supported by the same set of information resources. The soil release values have all been conservatively estimated with the understanding that some release to soil may occur during equipment upsets. These include the spillages that may accompany the transfer or delivery of materials and the development of leaks in the devices, equipment, and machinery used to apply or utilize a professional product on a broad scale.

Table 4. SpERC soil release factors

| Assignments | SpERC title | | | |
|---|---|---|---|---|
| | **lubricants -high release** | **metalworking fluids** | **fuels** | **lubricants - low release** |
| Soil release factor (%) | 5.0 | 5.0 | 0.025 | 1.0 |
| Source | (OECD, 2004) | (OECD, 2004) | (Card, et al., 2017) | (OECD, 2004) |

As noted above for the water release factors, soil factor for low release lubricants was anchored to the use crankcase fluids in automobiles (OECD, 2004). Likewise, the soil factor for high release lubricants and metalworking fluids was tied to the listed value for low release lubricants following the application of an adjustment factor of 5 to account for the containment disparities that are perceived to exist. Finally, the soil release factor for the professional use of hydrocarbon fuels takes into account fuel spillage and the distribution of the unevaporated portion between the water and soil compartments.

### d) *Release Factor – waste*

A thorough and detailed analysis accompanied the assignment of waste release factors for the four SpERCs outlined in this background document. Although a substantial amount of information is available documenting the total amount of different waste types associated with the various different professional operations, these data are often in a form that prevents the determination of a normalized release fraction as a function of the use volume. Life cycle studies often provide useful statistics on waste generation in different professional use sectors; however, these studies need to be individually examined to determine their relevance to a particular SpERC code.

In this context, waste refers to solvent-containing substances and materials that have no further use and need to be disposed of in a conscientious manner (Inglezakis and Zorpas, 2011). Professional operations are capable of generating hazardous wastes as a result of spill clean-up, routine maintenance, and equipment repairs. Waste volumes are dramatically affected by recovery and reuse practices that take advantage of any residual value following recycling. In many cases, the amount of waste generated is directly related to the degree of compliance with any agreed upon recovery and reuse programs.

Two of the four waste release factors cited in Table 5 have been derived from published life cycle assessments (LCAs) that inventoried the emissions and wastes generated during the use of a formulated professional product. The cited values may be supplanted if the actual hazardous waste generation factor is known for the operation described in the SpERC. To guarantee that an adequate margin of protection has been built into the determination, an adjustment factor of 10 has occasionally been applied when the reported value was judged to be unrepresentative of the entire range of potential use conditions within a particular operation.

Table 5. SpERC waste release factors and their literature source

| Assignments | SpERC title | | | |
|---|---|---|---|---|
| | **lubricants - high release** | **metalworking fluids** | **fuels** | **lubricants - low release** |
| Release factor (%) | 35 | 20 | 2 | 35 |
| Source | (Vold, et al., 1995) | (OECD, 2004) | (Morales, et al., 2015) | (Vold, et al., 1995) |

1. Use of lubricants – high release

The waste release factor was taken from an LCA of used lubricating oil collected at recovery stations located in Norway (Vold, et al., 1995). The estimated amount of unrecovered lubricating oil considered to be waste was approximately 350 kg per 1000 kg of the lubricating oil put to use. The waste fraction of 35% was nearly identical for used lubricating oils that were either re-refined or combusted for energy recovery. An adjustment factor of has not been applied to this value since it provides a reasonable worst-case estimate of the waste production that can accompany the widespread professional use of lubricating products.

2. Use of metalworking fluids

The quoted value was derived from an Emissions Scenario Document (ESD) that examined the generation of chemical waste during the use of neat cutting oils composed of mineral oil formulations used in specialized metal machining operations (OECD, 2004). The waste factor represents the drag-out fluid loss that occurs when a finished part is retrieved from the machining equipment. A waste generation factor of 2% was estimated to occur in both large and small operations where the metal chips or swarf was either automatically reprocessed or manually recovered. An uncertainty factor of 10 has been applied to this value to account for any mishandling or incidental loss that can accompany the wide dispersive use of these oils in smaller operations where there is a greater potential for waste production.

3. Use of fuels

The waste factor for the SpERC covering the professional use of fuels was adapted from an examination of gasoline use in passenger cars (Morales, et al., 2015). The evaluation revealed that 2.1 ml of hazardous waste was incinerated per km driven. At the stated fuel mileage of 150 ml/km, a waste release factor of 1.4% was derived. To ensure broad representation across a range of use conditions, this value which was rounded upward to 2%. An uncertainty factor has not been applied to this value since the waste associated with professional fuel use is expected to be comparable to losses observed during everyday consumer use.

4. Use of lubricants – low release

The waste release factor was taken from an LCA of used lubricating oil collected at recovery stations located in Norway (Vold, et al., 1995). The estimated amount of unrecovered lubricating oil considered to be waste was approximately 350 kg per 1000 kg of the lubricating oil put to use. The waste fraction of 35% was nearly identical for used lubricating oils that were either re-refined or combusted for energy recovery. An adjustment factor of has not been applied to this value since it provides a reasonable worst-case estimate of the waste production that can accompany the widespread professional use of lubricating products.

## 6. Scaling Principles

Scaling provides a means for downstream users (DUs) to confirm whether their combination of OCs and RMMs yield use conditions that are in overall agreement with those specified in a SpERC (ECHA, 2014). These adjustments are only applicable to industrial uses and cannot be employed with other life cycle stages where widespread uses take place.

## 7. References

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