



REACH

User's Guide to Safety Data Sheets

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ExxonMobil

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INTRODUCTION

ExxonMobil continues to have a strong commitment to product safety. We are dedicated to minimizing adverse risks and impacts associated with the manufacture, use, and disposal of our products. These principles are outlined in our Product Safety Policy, which is available on the ExxonMobil Internet site: (<http://corporate.exxonmobil.com/en/company/about-us/guiding-principles/standards-of-business-conduct>).

During the development of and prior to marketing our products, we assess safety, health, and environmental (SHE) aspects as well as compliance with product safety legislation, both where the products are made and in their intended markets. Rigorous assessments required by government authorities are conducted and updated as new information becomes available to assure the safety of our products.

Through Safety Data Sheets (**SDS**), we provide this information to those who transport, use, and dispose of our products, including appropriate uses, potential health and environmental effects, personal protection and exposure controls, first aid measures, and disposal considerations. SDS' are prepared in our Product Stewardship Information Management Systems (PSIMS), which provides a common process and uses a single global computer system. SDS' are provided to our customers via an automatic system, the Internet or on an ad hoc basis. The latest revision of the SDS should always be consulted.

The User's Guide to Safety Data Sheets was first published in 1981 "in the interests of safety generally and as background information for our customers". This major revision is focused on Europe SDS and explains the significant regulatory changes resulting from both REACH Regulation (EC) No 1907/2006 and Classification, Labelling & Packaging (CLP) Regulation (EC) No 1272/2008, that implements the Globally Harmonized System in Europe.

As technical terms become widely used, they can acquire different meanings. The definitions given here are those used in ExxonMobil SDS' or in other ExxonMobil publications. Under all other circumstances, other authoritative and relevant sources should be consulted.

Please note that ExxonMobil Safety Data Sheets are compiled specifically for the named ExxonMobil products. Consequently they should not be used for products not produced by ExxonMobil. Throughout this User's Guide, terms and abbreviations defined in full in the Glossary are shown in bold face to allow easy cross-referencing. Other technical terms, names and examples of usage are shown in italics. We are always happy to answer questions related to our products and their safe handling. Our SDS' include the telephone numbers of our offices and email addresses where further information and assistance can be obtained.

USER'S GUIDE TO SAFETY DATA SHEETS

Safety Data Sheets (SDS) are prepared as a legally required, convenient and consistent method of conveying Health, Safety and Environmental information on the products sold by ExxonMobil. They meet the requirements of the REACH Annex II and include a wide variety of useful information. The format of the SDS follows a format defined in legislation.

Based on sound Product Stewardship practice, SDS are also supplied when not legally required.

Abbreviations and acronyms are often used within SDS'. The aim of this Guide is also to explain these in sufficient detail for the user to benefit as much as possible from the range of information provided.

Each SDS, for either a single product or a group of products, contains information organized under the 16 section headings required by REACH Annex II. For each of these sections there is a chapter in the guide to explain what information may be found in the section and links to the glossary which explains technical terms.

Section 1	<i>Identification of the substance/mixture and of the Company/undertaking</i>
Section 2	<i>Hazards identification</i>
Section 3	<i>Composition/information on ingredients</i>
Section 4	<i>First aid measures</i>
Section 5	<i>Fire-fighting measures</i>
Section 6	<i>Accidental release measures</i>
Section 7	<i>Handling and storage</i>
Section 8	<i>Exposure controls/personal protection</i>
Section 9	<i>Physical and chemical properties</i>
Section 10	<i>Stability and reactivity</i>
Section 11	<i>Toxicological information</i>
Section 12	<i>Ecological information</i>
Section 13	<i>Disposal considerations</i>
Section 14	<i>Transport information</i>
Section 15	<i>Regulatory information</i>
Section 16	<i>Other information</i>
Annex I	<i>Exposure Scenarios</i>
Annex II	<i>Derived No-Effect Level (DNEL): Frequently Asked Questions</i>
	<i>Glossary of Terms and Abbreviations</i>

Please note that some Safety Data Sheets that have been supplied prior to 1 June 2015 and which haven't been updated in accordance with the latest revision of REACH Annex II, may until 1 June 2017 still legally refer to previous versions of REACH Annex II and even in some cases additionally to the now obsolete Dangerous Substances / Preparations Directives.

Section 1 IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1. PRODUCT IDENTIFIER

Section 1 identifies the product and the Company supplying the product.

Each product is either a **substance** or a **mixture**.

This distinction is essential to the understanding of information supplied in Section 3 "Composition/information on ingredients".

- The CLP Regulation as modified by ATPs, defines what is a "Hazardous Substance or Mixture".
- The Dangerous Preparations Directive 1999/45/EC, as amended, applied to "hazardous mixtures". 1)

The SDS shows a brief product description.

A REACH registration number will be provided for products that are substances and registered according to REACH.

1.2. RELEVANT IDENTIFIED USES OF THE SUBSTANCE OR MIXTURE AND USES ADVISED AGAINST

The intended, identified uses and uses advised against of the substance/mixture are indicated where applicable.

1.3. DETAILS OF THE SUPPLIER OF THE SAFETY DATA SHEET

To identify the Company/undertaking, the name, address and telephone numbers of appropriate ExxonMobil affiliates are given so the user can request further information.

The SDS also provides the e-mail address for a competent person responsible for the safety data sheet.

1.4. EMERGENCY TELEPHONE NUMBER

The emergency telephone number of the Company and/or relevant official advisory body is supplied here.

In some of the EU Member States, additional information may be required.

1) *In general, for substances; DSD information was shown in addition to the CLP information until 1 June 2015. For mixtures; information had to be shown according to the DPD until 1 June 2015 when it was replaced by CLP information.*

Section 2 HAZARDS IDENTIFICATION

Section 2 describes the hazards of the product and the appropriate warning information associated with those hazards. Hazard information on components in mixtures is provided in Section 3 "Composition/information on ingredients".

2.1. CLASSIFICATION OF SUBSTANCE OR MIXTURE

The nature of the hazards is described using **CLP Hazard Statements** (H Statements). The **Hazard Statements** are disclosed using both the code and the full text in this section.

See also 1) and 2)

2.2. LABEL ELEMENTS

Label elements, the elements appearing on the label, are also indicated in this section:

For **substances** this is the graphical reproduction of the full **hazard pictogram(s)**, **signal word(s)**, **hazard statement(s)** and **precautionary statement(s)** according to the **CLP** regulation.

See also 3)

2.3. OTHER HAZARDS

Other hazards are also given here including;

- if the product meets the criteria for **PBT** or **vPvB** in accordance with the REACH Annex XIII or
- if the product has any other hazards which do not result in classification, for example dustiness, suffocation, freezing, environmental effects etc.

More detailed information on hazards is provided in Section 9 "Physical and chemical properties", Section 10 "Stability and reactivity", Section 11 "Toxicological information" and Section 12 "Ecological information" of the SDS.

- 2) *In dual format SDS' the nature of the hazards is described using **DSD Risk Phrases** (R Phrases). The **R Phrases** are disclosed using both the code and the full text in this section.*
- 3) *In general, for substances; DSD classification was disclosed in addition to the CLP classification until 1 June 2015. For mixtures; classification had to be shown according to the DPD until 1 June 2015 when it was replaced by the CLP classification.*
- 4) *In general, for mixtures, the symbol(s), indication(s) of danger, R-phrase(s) and safety advice in accordance with DPD was disclosed until 1 June 2015 when it was replaced by the CLP requirements.*

Section 3 COMPOSITION/INFORMATION ON INGREDIENTS

Section 3 describes the chemical identity of the hazardous constituents or ingredient(s) of the substance or mixture respectively. There is no requirement to give the full composition.

3.1. SUBSTANCES

The identified ingredients are the main constituent of the substance and any impurity, stabilizing additive(s) or individual constituent(s) other than the main constituent that are classified and contribute to the classification of the substance.

Information provided:

- the substance name
- the **product identifier**
- REACH registration number when/if available
- concentration or concentration ranges
- classification according to **CLP** (and in the case of dual format SDS', also DSD)

The classifications, i.e. **symbols** of danger and **H Statements** (R Phrases according to DSD in the case of dual format SDS') and the **hazard class(es)** and **category code** with the **hazard statements** according to **CLP**, are given not only for the health hazards, but also for the physical-chemical and environmental hazards.

3.2. MIXTURES

Substances in mixtures meeting any of the below criteria are disclosed:

- (i) substances classified for health or environmental hazards
- (ii) substances for which there are Community workplace exposure limits, which are not already included in (i)
- (iii) substances that are **PBT** or **vPvB** according to the REACH Annex XIII criteria
- (iv) substances listed on the Candidate List of Substances of Very High Concern (**SVHC**), which are not already included in (i)

The concentration limit for triggering a substance to be disclosed in this section could vary from 0,1%-1% depending on the hazard, applicable concentrations limits defined in regulations, and/or if the final product is classified as hazardous or not.

Information provided:

- the substance name
- the product identifier
- REACH registration number when/if available
- concentration or concentration ranges
- classification according to **CLP** (and in the case of dual format SDS', also DSD)

The classifications of the identified **substances** (components), i.e. **symbols** of danger and **H Statements** (R Phrases according to DSD in the case of dual format SDS') and the **hazard class(es)** and **category code** with the **hazard statements** according to **CLP**, are given not only for the health hazards, but also for the physical-chemical and environmental hazards.

It should be noted that the list of hazard classes, hazard categories and concentration limits (including the cut-off values) may not be the same in CLP and DSD.

The full text of each hazard statement (and R-phrase) is listed in Section 16 "Other information".

Section 4 FIRST-AID MEASURES

The measures provided in this section are recommendations for immediate first aid treatment only. To be effective, first aid measures need to be applied quickly. Swift action can minimize harmful effects; delay can lead to unnecessary injury or complications. A detailed description of the recommended first aid measures can be found in a modern first aid manual.

4.1. DESCRIPTION OF FIRST AID MEASURES

First aid measures are provided for the following routes of exposure:

- **Inhalation** refers to the breathing in of airborne contaminants in the form of gas, fume, mist, vapor or dust. It is important to avoid exposing yourself or others to the contaminant. If a person has been overcome by overexposure to an airborne contaminant a potentially harmful concentration of contaminant is present. Rescuers should protect themselves by use of breathing apparatus or by ensuring there is adequate ventilation before approaching the scene to avoid becoming a casualty.
- **Skin contact**, which can lead to local irritation or in extreme cases burns from the direct action of the product on the skin, or systemic effects in tissues of the body far from the site of contact if the product penetrates the skin.
- **Eye contact**, the effects of which are usually confined to the eye itself, such as irritation or in extreme cases, burns. In a few instances systemic effects can occur if the material is absorbed through the eye.
- **Ingestion**, from swallowing the product and which can affect the digestive tract or cause systemic effects.

4.2. MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED

In this section the potential symptoms and effects of overexposure to the product are described. The onset of these symptoms can be immediate or delayed, only appearing over time.

4.3. INDICATION OF ANY IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED

This section is intended for use by medical practitioners. The services of a medical practitioner should be sought when it is stated to do so in the First Aid Measures section or if there is any doubt as to the effectiveness of the first aid treatment given or is recommended. If the medical practitioner requires further information, he/she should contact the Company. Details on how to contact the Company are provided in Section 1 of the SDS.

Section 5 FIRE-FIGHTING MEASURES

Fire-fighting measures depend greatly on the circumstances of each fire and should be under the control of the most senior competent individual present at the incident. This section provides general guidance on fire-fighting and on extinguishing agents to assist such personnel.

5.1. EXTINGUISHING MEDIA

Information is provided on both appropriate and inappropriate extinguishing media for a particular situation involving the substance or mixture.

Throughout these fire-fighting measures, reference is made to **foam** and to **alcohol type foam** as extinguishing agents. These two distinct types of **foam** are defined and used as follows:

- **foam** (used alone), refers to *Chemical, protein or mechanical type foams*. These are widely used to fight fires, in particular those involving non-polar hydrocarbon compounds; they tend to be broken down quickly by polar water-soluble hydrocarbon compounds.
- **alcohol-resistant foam** refers to a specialized protein-type foam concentrate, containing **substances** which give it a greater stability when used on polar hydrocarbon compounds, e.g. alcohols and esters. These concentrates are generally formulated to be used in proportions of 5% or more by volume of water.

5.2. SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE

Advice is provided on any protective actions to be taken during fire-fighting, such as "keep containers cool with water spray", and on any special protective equipment for firefighters, such as boots, overalls, gloves, eye and face protection and breathing apparatus.

5.3. ADVICE FOR FIRE-FIGHTERS

Recommendations are provided on the appropriate response to spills, leaks, or releases of substances or mixtures, to prevent or minimize any adverse effects on persons, property or the environment. In cases where the spill volume has a significant impact on the hazard, these recommendations distinguish between the responses to large and small spills. If the procedures for containment and recovery indicate that different practices are required, these are indicated.

Where hazardous combustion products are likely to be released by the fire or by the fire-fighting measures, the precautions to be observed by fire-fighters are also detailed.

Where hazardous by-products are likely to be released by the fire or by the fire-fighting methods, the precautions to be observed by fire-fighters are detailed.

FLAMMABILITY PROPERTIES

Information on flammability properties including Flash point, Flammability limits and Auto-ignition temperature are provided in this section as an aid to fire-fighters.

Section 6 ACCIDENTAL RELEASE MEASURES

Recommendations on the appropriate response to spills, leaks, or releases, to prevent or minimise any adverse effects on persons, property and the environment are described. These recommendations distinguish between responses to large and small spills, in cases where the spill volume has a significant impact on the risk. If the procedures for containment and recovery indicate that different practices are required, these are indicated.

The procedures to be followed to ensure the successful containment and clean-up of spills depend greatly on the volume and the local circumstances of the spill. The methods adopted in each case should take these individual circumstances into account. General procedures, which can be modified or adapted to suit local situations on land or at sea, are provided in this section.

The disposal of accidentally released material or of materials used to contain it is governed in most cases by local and national legislation. Before disposing of any material, a knowledgeable person should be consulted. It is essential that users are aware of the **regulations** that apply in their operating areas, that they identify suitable experts from whom assistance can be obtained, both before and at the time of any accidental release, and that they develop disposal techniques that comply with all relevant regulations.

6.1. PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Detailed procedures are described for both emergency responders and non-emergency personnel:

6.1.1. For non-emergency personnel:

Specific advice is provided related to accidental spills and release of the substance or mixture. This advice covers many areas including:- the wearing of suitable personal protective equipment (referred to under Section 8); removal of ignition sources; provision of sufficient ventilation; dust control; emergency evacuation procedures; consultation with experts.

6.1.2. For emergency responders:

Advice is provided so that suitable fabric is selected for personal protective clothing.

6.2. ENVIRONMENTAL PRECAUTIONS

Advice is provided on any environmental precautions that should be taken relating to accidental spills and release of the substance or mixture.

6.3 METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP

- 6.3.1. Appropriate advice is provided on how to contain a spill with reference to binding, capping or other appropriate techniques.
- 6.3.2. Appropriate advice is provided on how to clean-up a spill with reference to appropriate clean-up equipment, techniques and procedures.
- 6.3.3. Other relevant information including advice on inappropriate containment or clean-up techniques is also provided.

6.4 REFERENCE TO OTHER SECTIONS

Information is also given when special precautions are required to safeguard personnel engaged in spill control, either directly or by cross-referencing to Section 8, "*Exposure controls/personal protection*" and Section 13 "*Disposal Considerations*".

Section 7 HANDLING AND STORAGE

7.1 PRECAUTIONS FOR SAFE HANDLING

Recommendations are given for safe handling techniques of products and safe and optimal storage. The precautions for safe handling may include the temperature at which the product should be stored, transported or transferred. A statement about the potential electrostatic accumulation risk is also included.

To assist an employer in devising suitable working procedures and organizational measures, in accordance with the Health and Safety Directive² general information on handling and storage is provided. It takes into account the information provided in the first part of this section. Further information may include containment, local and general ventilation, measures to prevent aerosol and dust generation and fire, and measures required to protect the environment. It may also describe the use of filters or scrubbers on exhaust ventilation, specific measures for use in a closed area, measures to prevent spillages, etc., and any specific requirements or rules relating to the substance or mixture,

7.2 CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES

Provides general guidance concerning materials and coatings that are suitable or unsuitable for storage and transfer operations. This is primarily to reduce any risks present, as materials that are not compatible may cause leaks, chemical reactions or fires, or have an effect on product quality. When choosing an appropriate polymeric material, factors such as the contact time of the product may influence compatibility. Consequently, the total storage design should be tested before longer term use.

7.3 SPECIFIC END USES

Conditions and precautions to be taken for safe handling and storage are reported here, taking into account the information provided in the first part of this section and the physical/chemical properties of the product. Further information is also contained in Section 8 and, for classified materials, within the Exposure Scenarios contained within the Annex.

Section 8 EXPOSURE CONTROLS/ PERSONAL PROTECTION

The recommendations and data in Section 8 are aimed at achieving good **industrial hygiene and environmental control** practices at work. These deal primarily with risks for man and the environment arising from emissions of **dusts, fumes**, gases, vapors, **mists** and liquids. This section provides the **exposure** limit values that are applicable in the EU, or more specifically in the Member State where the product is marketed, and the related exposure control measures that are recommended.

Overall Comment on Section 8

The nature of the precautions given in this section of the SDS needs special emphasis. **In particular, the precautions given apply only to the material as originally supplied.** Mixing product with other materials, or product decomposition, may alter the precautions.

The health and safety and environmental implications of any proposed mixture must be fully considered by the user before mixing any two or more products together.

8.1. CONTROL PARAMETERS

Two sets of exposure control values are given. Firstly, there are those values that have been developed as a consequence of REACH requirements and which can address both health and environmental risks. Second, there are OELs set by national and international bodies and which address worker exposures. These OELs can also include national biological limit values (BLV), together with ACGIH Biological Exposure Limits (BELs) where these are advised at the national level.

Occupational Exposure Limits (OELs)

Current OELs are listed. They include those set by national and international bodies as well as those recommended by ExxonMobil after professional consideration of all relevant data.

A number of institutions and countries define OELs:

The European Union (EU) publishes OELs under the names Indicative Limit Value (ILV) or Binding Limit Value (BLV).

These values can be found in relevant EU Indicative Limit Value Directives that are published on a regular basis. Member States have an obligation to ensure the ILVs are implemented in national health and safety regulations. Examples of national OELs include:

Denmark	- Grænseværdier
Finland	- HTP-arvot
France	- <i>Valeurs Limites d'Exposition Professionnelle (VLEP)</i>
Germany	- <i>Maximale Arbeitsplatzkonzentrationen (MAK)</i> and <i>Technische Richtkonzentration (TRK)</i>
Italy	- <i>Massima Concentrazione Consentita (MCC)</i>
Netherlands	- <i>Maximale Aanvaarde Concentratie (MAC)</i>
Norway	- Tiltaks- og grenseverdier
Sweden	- Hygieniska gränsvärden
UK	<i>Maximum Exposure Limits (MEL) and Occupational Exposure Standards (OES)</i>
US	<i>Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PEL)</i>

EXPOSURE CONTROLS/ PERSONAL PROTECTION

(continued)

ACGIH Threshold Limit Values (TLVs)

The ACGIH specifies three categories of TLVs:

- a) **Threshold Limit Value - Time-Weighted Average (TLV-TWA)**
This is the Time-Weighted Average concentration for a normal 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.
- b) **Threshold Limit Value - Short Term Exposure Limit (TLV-STEL)**
This is the concentration to which workers can be exposed continuously for a short period of time without suffering from
- 1) **irritation,**
 - 2) **chronic** or irreversible tissue damage, or
 - 3) **narcosis** of sufficient degree
- to increase the likelihood of accidental injury, impair capability to self-rescue or materially reduce work efficiency, and provided that the daily TLV-TWA is not exceeded. It is not a separate or independent **exposure** limit as it supplements the 8 hour time-weighted average (TWA) limit in cases where there are recognized **acute effects** from a **substance** whose **toxic effects** are primarily of a chronic nature. TLV-STELs are recommended only where toxic effects have been reported from high short-term exposures of either humans or animals.
- A TLV-STEL is defined as a 15-minute TWA exposure that should not be exceeded at any time during a workday. Even if the 8-hour TWA is within the TLV-TWA, exposures above the TLV-TWA up to the TLV-STEL should not be longer than 15 minutes and should not occur more than four times per day. There should be at least 60 minutes between successive exposures in this range. An averaging period other than 15 minutes may be recommended when this is warranted by observed biological effects.
- c) **Threshold Limit Value - Ceiling Value (TLV-C)**
This represents the concentration that should not be exceeded during any part of the working **exposure**. In conventional **industrial hygiene** practice, if instantaneous monitoring is not feasible, then the TLV-C can be assessed by sampling over a 15-minute period, except for those **substances** that may cause immediate **irritation** when exposures are "*short*" (typically less than 15 minutes).
- For some **substances**, e.g., **irritant** gases, only one category, the TLV-C, may be relevant. For other substances, one or more categories may be relevant, depending upon their physiological actions. It is important to observe that if any one of the TLV categories is exceeded, a potential **risk** from that substance is presumed to exist.

ExxonMobil Occupational Exposure Limits

ExxonMobil Occupational Exposure Limits (OELs) are Company equivalents of the **ACGIH Threshold Limit Values (TLVs)**.

Together with the list of adopted TLVs they form a set of OELs for use throughout ExxonMobil to ensure that the standard of protection for ExxonMobil employees from airborne materials is uniform and soundly based. They are also offered as guidance to customers and carriers.

The definition of the **ExxonMobil OEL** is identical to that of the ACGIH **TLV**, i.e., the airborne concentration of a **substance** to which workers may be repeatedly exposed, day after day, without adverse effect. The ExxonMobil OELs, like the **TLV-TWAs** are for an 8-hour day, 40-hour week, unless specified otherwise.

ExxonMobil OELs are recommended for **substances** without an ACGIH **TLV**, or where it is considered necessary to modify the TLV. Where there is an existing TLV for a material that is considered adequate by the ExxonMobil OEL Committee, this TLV is used and an ExxonMobil OEL is unnecessary; occasionally the Committee may propose an OEL lower than an existing TLV.

Derived No-Effect Levels (DNELs) & Derived Minimal Effect Levels (DMELs)

DNELs are developed by industry for a substance as part of the REACH Registration process. They are expected to address all relevant routes of exposure (inhalation, dermal, oral) and affected populations (workers and consumers). DNELs are also expected to be developed for each relevant health endpoint (acute and chronic effects; short term and long term exposure durations). Consequently, there may be as many as 10-12 DNELs associated with any substance dependent on its hazardous properties.

A DNEL (Derived No-Effect Level) is defined by REACH as the level of exposure above which humans should not be exposed. In the risk characterization phase of the Registration, the exposure of each human population known to be or likely to be exposed to the substance (e.g. workers, consumers) is compared with the appropriate DNEL. The risk to humans can be considered to be controlled if the exposure levels estimated do not exceed the appropriate DNEL i.e. the primary purpose of the DNEL is its use by manufacturers/importers to develop conditions of use and necessary risk management measures in order to define the safe use of classified substances as part of the Exposure Scenarios provided to downstream users.

A DNEL is established using a detailed process laid out in the REACH Technical Guidance Documents (Chapter R8). The process is different to that usually applied when setting OELs. Although DNELs in part define the safe conditions of use of the chemical, they are not legally binding in the sense that OELs are. Having said this, for some substances

EXPOSURE CONTROLS/ PERSONAL PROTECTION

(continued)

where no OELs or similar accepted regulatory limits exist, then the DNEL may contain information that is helpful in assessing the nature of workplace risks. The DNELs also may contain useful information for routes of exposure that are not addressed by the OELs.

DMELs (Derived Minimal Effect Levels).

For non-threshold effects, the underlying assumption is that a no-effect-level cannot be established and a DMEL therefore expresses an exposure level corresponding to a low, possibly theoretical, risk, which should be seen as a tolerable risk.

Predicted No Effect Concentrations (PNECs)

These are established by industry under REACH to express the concentration of the substance below which adverse effects in the environmental sphere of concern are not expected to occur. They can be developed to cover a range of environmental compartments (e.g. water, air, soil, sediments) as well as different time periods (short and long term) and scales (local and regional releases). The risk to the environment can be considered to be controlled if the predicted exposures do not exceed the appropriate PNEC i.e. the primary purpose of the PNEC is its use by manufacturers / importers to develop conditions of use and necessary risk management measures in order to define the safe use of classified substances as part of the Exposure Scenarios provided to downstream users.

There are no specific EU legal expectations that relate to the use or adoption of PNECs by downstream users e.g. as part of any process of environmental risk assessment. Although PNECs in part define the safe conditions of use of the chemical, they are not legally binding as regulatory release limits. Having said this, for some substances where no accepted regulatory release limits exist, then the PNEC may contain information that is helpful in assessing the nature of workplace risks.

8.2. EXPOSURE CONTROLS

Engineering Control Measures

Where applicable, advice is given on engineering control measures, e.g. the use of **dilution** or **local exhaust ventilation**. Engineering control measures should always take precedence over any requirement to use personal protection devices. However, in many situations, the latter can offer a simple and effective method of limiting **exposures** to an acceptable level.

Personal Protection

Practical advice is given. Wherever possible, engineering control measures such as the isolation or enclosure of the process, the introduction of process or equipment changes to minimize release or contact, and the use of properly designed ventilation systems, should be adopted to control hazardous materials at source. Personal protection equipment (which usually will take the form of respiratory, hand, eye, skin and/or body protection), together with working practices that serve to support its effective use, should be considered as a secondary line of defense against exposures that are impracticable to control in any other way.

8.3 ENVIRONMENTAL CONTROLS

Several sections of the SDS can contain reference to technologies and systems for minimizing and controlling environmental emissions (most notably Sections 6, 7, 12 and 13). If the SDS has an Annex, then these measures will be further detailed in the Exposure Scenarios. Rather than duplicating what is provided elsewhere in the SDS or in the Annex, Section 8 simply refers users to those sections that more directly deal with this information.

Section 9 PHYSICAL AND CHEMICAL PROPERTIES

This section describes the empirical data relating to substances and mixtures. The physical-chemical properties have been determined in accordance with the testing methods covered in regulation (EC) No 440/2008, referred to regulation (EC) No 1272/2008 (REACH) or any other comparable method. This information is consistent with that provided in the registration and/or in the chemical safety report where required, and with the classification of the substance or mixture.

Critical information including test temperatures and methods used, which affect the value of the reported physical-chemical properties and safety characteristics, are documented. In cases where it is noted that a specific property or hazard does not apply, or if information is not available, the reasons are clearly given.

For mixtures, information is typically given on the properties of the mixture as a whole. However, where it is considered necessary to give information for properties of specific components, this is clearly differentiated.

9.1. INFORMATION ON BASIC PHYSICAL AND CHEMICAL PROPERTIES

The following physical-chemical properties are identified, and where appropriate, a reference is given to the test method used, units of measure and/or test conditions. These values are not technical product specifications but are generally typical of the product being sold. Not all properties are relevant for all products

Appearance

The physical state (solid, liquid or gas) and the color of the substance or mixture as supplied. For solids, appropriate and available safety information on granulometry and specific surface area is reported.

Odor

If odor is perceptible, it is briefly described.

Odor threshold

The odor threshold represents the lowest concentration of a vapor in air which can be detected by smell.

pH

The pH of the substance or mixture as supplied or as an aqueous solution. In the case of aqueous solutions, the concentration is specified.

Melting point / freezing point

The melting point of a solid is the temperature at which the vapor pressure of the solid and the liquid are equal. At the melting point, the solid and liquid phases exist in equilibrium. When considered as the temperature of the reverse change i.e., from liquid to solid, it is referred to as the freezing point.

Initial boiling point and boiling range:

A **boiling point** is normally quoted at a pressure of 1 atmosphere. Where the material does not exhibit a single boiling point, e.g., for mixtures of hydrocarbons, a distillation range will be quoted, i.e., from an initial to a final boiling point.

Flash point

Flash point can be determined by a number of methods. When available, data obtained by more than one method may be quoted. The actual methods used are stated and the abbreviations used for the various methods are:

Abbreviation	Method	Designation
COC	Cleveland Open Cup	ASTM D 92, IP 36
TOC	Tag Open Cup	ASTM D 1310
TCC	Tag Closed Cup	ASTM D 56
ACC	Abel Closed Cup	IP 170
PMCC	Pensky-Martens Closed Cup	ASTM D 93
SF	Seta Flash	IP 303, ASTM D3278

Evaporation rate

Where applicable, the **evaporation rate** relative to a named **substance** is quoted. In most cases, n-butyl acetate = 1.0, has been used as the standard. On this scale, the smaller the number, the less volatile the material.

Flammability (solid, gas)

Flammability is defined as how easily something will burn or ignite, causing fire or combustion.

Upper/lower flammability or explosive limits

Flammability limits refer to the range of concentrations of a flammable gas or vapor where ignition can occur. **LEL** refers to the Lower Explosive Limit and **UEL** to the Upper Explosive Limit. The LEL is an important parameter when determining the amount of ventilation needed to prevent a build-up of dangerous concentrations of a **substance**. When known, LELs and UELs are displayed as percentages by volume. Temperatures are mentioned only where specifically quoted in reference sources.

PHYSICAL AND CHEMICAL PROPERTIES

(continued)

Vapor Pressure

Vapor pressure is used as an indirect measure of the evaporation rate of volatile petroleum solvents. Wherever possible, vapor pressure is given at several temperatures over the normal operating range. It is stated if the vapor pressure was measured or calculated and which substance(s) the vapor pressure refers to.

Vapor pressures stated in "**SI**" Units (Pascals, Pa) are regarded as the standard but other units maybe quoted. The conversion factors between the typical different systems of units quoted are as follows:

1 mm Hg	=	0.133 kPa
1 psi	=	6.895 kPa
1 atm	=	101.3 kPa

Note, these are all absolute, not gauge, pressures.

Vapor density

Vapor density is the density of a vapor in relation to that of hydrogen. It may be defined as mass of a certain volume of a substance divided by mass of same volume of hydrogen.

Relative density

For the majority of materials, it is quoted as the specific gravity at 15.5/15.5°C (i.e., relative to water at 15.5°C). For solids it may be quoted either as the specific gravity or as the density. The specific gravity of a vapor is quoted as the vapor density of the material relative to air as 1, at a pressure of 1 atmosphere. The bulk density of solids may also be specified under this heading.

Solubility(ies)

Quoted as the weight percentage of a substance that is soluble in a solvent (e.g. water) at the given temperature. For mixtures, this is useful information for individual constituents only.

Partition coefficient: n-octanol/water

The ratio of the concentration of a substance in n-octanol as compared to the concentration in water. The octanol/water partition coefficient is a key parameter in studies of the environmental fate of organic chemicals. It has been found to be related to water solubility, soil/sediment adsorption coefficients, and bioconcentration factors for aquatic life.

Auto-ignition Temperature (AIT)

Auto-ignition temperatures are difficult to determine and values found in the literature vary considerably. The safest, i.e., the minimum, value is generally quoted. However, these values should be regarded only as indicators, as the **AIT** is particularly sensitive to changes in pressure and humidity.

Decomposition temperature

The decomposition temperature of a substance is the temperature at which the substance decomposes into smaller substances or into its constituent atoms.

Viscosity

Viscosity is a measure of the resistance to flow of a fluid. In simple terms, the less viscous the fluid is, the greater its ease of movement. It may be quoted as the dynamic (sometime called the absolute viscosity) or more typically as Kinematic viscosity, which is equivalent to the dynamic viscosity (units of mPas) divided by the fluids **density**. Kinematic viscosity is the measure of a fluid's resistance to flow under gravity and is reported in units of **centistokes** (cSt).

Explosive properties:

The explosive properties of any substance or mixture supplied are disclosed.

Oxidizing properties:

Liquid or solid substances or mixtures, which, while in themselves are not necessarily combustible, may, generally by yielding oxygen, cause or contribute to, the combustion of other materials. Gas or gas mixtures which may, generally by providing oxygen, cause or contribute to the combustion of other materials more than air does.

Physical Hazards

The relevant hazard classes for both substances and mixtures are provided, including:

- Explosives
- Flammable gases
- Flammable aerosols
- Oxidizing gases
- Gases under pressure
- Flammable liquids
- Flammable solids
- Self-reactive substances or mixtures
- Pyrophoric liquids
- Pyrophoric solids
- Self-heating substances or mixtures
- Substances or mixtures which, in contact with water, emit flammable gases
- Oxidizing liquids
- Oxidizing solids
- Organic peroxides
- Corrosive to metals

PHYSICAL AND CHEMICAL PROPERTIES

(continued)

If data for any of these hazard classes is not available, those hazard classes will be listed with a statement that data is not available or not applicable. Examples of standard phrases used in this section include:

- *Not applicable*
- *Not determined*
- *Calculated*
- *Technical literature*
- *No data available*
- *Based on available literature*
- *Not relevant*
- *Literature reference*

9.2. OTHER SAFETY INFORMATION

This section is designed to contain other physical-chemical properties and safety information that maybe relevant to completion of the hazard assessment of the substance or mixture supplied. Details such as miscibility, fat solubility, conductivity, gas group, properties of explosive atmospheres (mixtures) and limiting oxygen concentration may be supplied. Appropriate and available safety information on reduction-oxidation potentials, radical formation potential and photo-catalytic properties shall be indicated.

Section 10 STABILITY AND REACTIVITY

This section describes the stability of the substance or mixture and the potential for hazardous reactions occurring under certain conditions of use and also if released into the environment. Where appropriate references to the test methods used are cited. If it is stated that a particular property does not apply or if information on a particular property is not available, the reasons are documented.

10.1. REACTIVITY:

Information about reactivity is provided in the other sub-sections.

10.2. CHEMICAL STABILITY:

It is indicated if the substance or mixture is stable or unstable under normal (ambient temperatures and pressures) and anticipated storage and handling conditions.

Any stabilizers which are, or may be required to be, used to maintain the chemical stability of the substance or mixture are described.

The safety significance of any change in the physical appearance of the substance or mixture is also indicated.

10.3. POSSIBILITY OF HAZARDOUS REACTIONS:

If relevant, it is stated if the substance or mixture reacts or polymerizes, releasing excess pressure or heat, or creating other hazardous conditions. The conditions under which the hazardous reactions may occur is given.

10.4. CONDITIONS TO AVOID:

Any conditions that should be avoided (e.g., static discharge) to prevent hazardous situations arising are listed and where appropriate a brief description of the measures to be taken to manage the risks associated with such hazards is given.

10.5. INCOMPATIBLE MATERIALS:

Listed here are any materials that could react in a hazardous manner (e.g., produce an explosion or release toxic materials) with the substance or mixture as a result of an accident or unplanned event. Where appropriate a brief description of the measures to be taken to manage risks associated with such hazards is given.

It should be noted that this does not mean that these materials cannot be mixed together under carefully controlled conditions. For example, uncontrolled mixing of hydrocarbons and strong oxidizing agents can be very dangerous.

10.6. HAZARDOUS DECOMPOSITION PRODUCTS:

Lists known and reasonably anticipated hazardous decomposition products produced as a result of use, storage, heating and spillage. Hazardous combustion products are also included in Section 5.

Section 11 TOXICOLOGICAL INFORMATION

Section 11 provides a more detailed description of the possible health hazards of the product, which are presented in summary form in Section 2. The toxicological information for the product is derived from animal test programs and/or human experience and covers health hazards that can arise from short-term (**acute**) or long-term (**chronic**) **exposure** to the product by **inhalation**, skin contact, eye contact or **ingestion**. The toxicological information also provides the basis for the advice found in Section 4, "*First-aid measures*", and Section 8, "*Exposure controls/personal protection*".

Principles of Toxicology:

- Every chemical substance is potentially toxic if the **dose** is high enough. For most substances there is a dose below which the substance will have no adverse effect.
- Different animal species and the individuals within a species do not necessarily respond in the same way to the same dose of a given substance.

Toxic responses can be categorized as:

Acute toxicity

Health effects that result from a single **exposure**, usually to a relatively large amount of a substance over a short time (hours).

Subchronic toxicity

Health effects that arise from repeated **exposure** to relatively smaller quantities of a **substance** over a period of up to 6 months. Reproductive effects (fertility, development of the offspring) are included in this category.

Chronic toxicity

Health effects with a delayed onset, resulting from repeated **exposure** to a chemical over periods often measured in years. **Carcinogenicity** is an example of a toxicological end point.

Irritation /Corrosion

Reversible (irritation) or irreversible (corrosion) damage to living tissue by chemical action at the site of contact.

Sensitization

An allergic reaction to a **substance**; chemicals that have the potential to cause such an effect are called **sensitizers** and may cause an allergic response after skin contact or respiratory exposure.

11.1. INFORMATION ON TOXICOLOGICAL EFFECTS

Section 11.1 provides information for the product itself or substances in the product for each of the following hazard classes:

- Acute toxicity – inhalation, ingestion, skin
- Skin corrosion/irritation
- Serious eye damage/irritation
- Sensitization – skin or respiratory
- Germ cell mutagenicity
- Carcinogenicity
- Reproductive Toxicity
- Specific Target Organ Toxicity (STOT) – single exposure
- Specific Target Organ Toxicity (STOT) - repeated exposure
- Aspiration

In Section 11.1 the first table presents for each hazard class a conclusion as to the potential toxicity of the product and the basis for the conclusion. For each hazard class information is provided that describes the availability of test data supporting the conclusion, whether or not the data were obtained from tests of the actual product or a structurally similar material, or from an assessment of the individual components of the product, and a reference to the type of test.

In the case of the acute toxicity tests, actual numerical values (LD50 or LC50 for inhalation) that define the lethality of the product will be presented, when available. For other hazard classes the availability of data will be indicated, but no specific data will be shown. When test data are available for a specific hazard class a reference to specific test guideline(s) will be included, where appropriate. Specific test guidelines are not available for aspiration hazard and respiratory sensitization. Aspiration hazard is based on a specific physico-chemical property (kinematic viscosity), while respiratory sensitization is based on human experience.

When a product contains components the available acute lethality values (LD50, LC50) for the components are presented in a separate table immediately below the Hazard Class table. Other pertinent toxicological information is presented below the table(s) under the heading OTHER INFORMATION. Included is detailed toxicological information on the product itself, including the identity of known target organs from single or repeated exposures, as well as pertinent toxicological information for individual components of the product.

Toxicology within ExxonMobil

ExxonMobil has a dedicated group conducting health and environmental assessment on products. ExxonMobil Biomedical Sciences Inc. (**EMBSI**), provides comprehensive support for ExxonMobil and its operations around the world.

Section 12 ECOLOGICAL INFORMATION

In addition to the overall environmental assessment found under the sub-title “*Environmental hazards*” in Section 2, Section 12 provides complementary ecological information describing the possible effects, behavior and **environmental fate** of the **substance** or **mixture** in air, water and/or soil. The basis for the information is either direct testing results or read-across from data relating to other products of a similar nature.

Some basics of **ecotoxicology** are listed below.

Environmental toxicology or **ecotoxicology** is the study of the fate and effects of chemicals in the environment.

Whenever the potential effects of chemicals on the environment are considered, two key factors need to be addressed:

- the **environmental fate** of the chemical,
- the **toxic effects** on environmental species.

Only when these two factors are considered can a balanced assessment of the environmental **hazard** be made.

Environmental Fate Studies/Definitions

Environmental fate studies are concerned with the presence, movement and persistence of chemicals in the air, water and soil, and the resulting potential for **exposure** of organisms. The properties that enable an assessment of the environmental fate of a chemical to be made, include the following.

Biodegradation

The biological breakdown of materials in soil and water, primarily by micro-organisms (bacteria, fungi, yeast). Micro-organisms are quite versatile when confronted with foreign chemicals. Reactions of which they are capable include dehalogenation, hydrolysis, oxidation, reduction, conjugation and methylation.

Several types of **biodegradation** studies are possible, with varying stringency and applicability.

1 **Biochemical Oxygen Demand (BOD)**

The **BOD** is the quantity of oxygen required for the biological oxidation of a specified quantity of a material under prescribed conditions. A *5-day BOD* is the simplest type of **biodegradation** study.

2 **Chemical Oxygen Demand (COD)**

The **COD** is the quantity of oxygen required for the chemical oxidation of a specified quantity of a material under laboratory conditions.

By comparing the BOD with the COD it is possible to assess the degree of **biodegradability** of a material.

3 **Primary biodegradation**

Primary biodegradation refers to the loss of the parent compound and is contrasted with *ultimate biodegradation* which is the conversion of materials to CO₂ and H₂O.

4 **Ready biodegradability**

Ready **biodegradability** is defined as the potential to degrade quickly in unadapted systems.

5 **Inherent biodegradability**

Inherent **biodegradability** is defined as the potential to degrade eventually if sufficient time is allowed.

Bioaccumulation

The build-up of a chemical within an organism as a result of **exposure** directly from the ambient environment and/or via the food chain. Materials that do not degrade very readily and/or which are not **metabolized** to a significant extent within organisms may present a high potential for **bioaccumulation**, e.g., polychlorinated biphenyls. Bioaccumulation has also been shown to be associated with chemicals that have a high lipid **solubility**.

Partition Coefficient Octanol Water (K_{ow})

K_{ow} is used as an indicator of **bioaccumulation** potential. This test involves shaking the chemical with a mixture of octanol and water and then measuring the concentration in each. **Log K_{ow} values** of greater than 4 are indicative that a material may have a high bioaccumulation potential. The concern with a chemical that will bioaccumulate is that levels in organisms in a food chain will gradually build until toxic levels are reached. This may have potential consequences for all members of that particular food chain, even if only one member suffers **toxic effects**. Bioaccumulation studies are usually carried out using fish and may involve radio-labelled materials. Terms commonly used here, are **bioconcentration** and the **bioconcentration factor**.

Bioconcentration

The increase in concentration of a test compound in or on a test organism (or specified tissues thereof) relative to the concentration of test compound in the ambient water. The **bioconcentration factor** is the ratio of the test **substance** concentration in the test organism to the concentration in the test water at a steady state.

Density

Important for determining whether a material will sink or float and hence whether it will enter sediments or remain on the water surface.

Water solubility

Affecting persistence in water and **exposure** of aquatic organisms.

ECOLOGICAL INFORMATION

(continued)

Hydrolysis

The breakdown of the material due to reaction with water. Hydrolysis will determine the persistence of the parent compound in water.

Vapour pressure

Influences emissions to air.

12.1. TOXICITY

Ecotoxicity Studies

Ecotoxicity studies are concerned with the direct **toxic effects** of chemicals on environmental species. These studies enable an assessment of the **toxicity** of a chemical for environmental species and include:

- **Acute toxicity** for fish and water fleas (Daphnia magna 48 hour EC₅₀)
- Toxicity for algae
- Earthworm toxicity
- Effects on higher plants
- Prolonged fish toxicity studies (14 days)
- 21-day Daphnia magna reproduction studies
- Life cycle fish tests

The Predicted Environmental Concentration (PEC).

Based on **environmental fate** data, it is possible to estimate the **Predicted Environmental Concentration (PEC)** in a particular environmental compartment (e.g., air, water or soil). The potential environmental persistence of a chemical is very important. If a material does not degrade either by biological or physico-chemical processes then it may accumulate in the environment with the potential to bioaccumulate and/or cause damage, chlorofluorocarbons and polychlorinated biphenyls for instance.

The No-Observed-Effect Concentration (NOEC)

Toxicology studies on environmental species can usually enable a NOEC to be established. Comparing the Predicted Environmental Concentration (PEC) with the NOEC allows for an estimate of the safety margin and a hazard assessment to be made.

Acute Toxicity for Fish and Daphnia

The **LC₅₀** for fish is the lethal concentration in **ppm** or **mg/l**, for 50% of a group of exposed fish. The **EC₅₀** for Daphnia magna (the *effect concentration*) refers to the concentration causing immobilization in 50% of a group of daphnia. Daphnia are small filter feeding [water fleas] invertebrates and are an important organism in the aquatic food chain. They are also highly sensitive to organic chemicals, particularly those with a high fat **solubility**.

12.2. PERSISTENCE AND DEGRADABILITY

Information is provided about biodegradation of the product, and effects of hydrolysis, photolysis and atmospheric oxidation on this same product..

12.3. BIOACCUMULATIVE POTENTIAL

Information is provided on the potential of the product to accumulate in aquatic organisms.

12.4. MOBILITY IN SOIL

Information is given whether product is expected to migrate to sediments or to the solid phase of waste water.

12.5 RESULTS OF PBT AND vPvB ASSESSMENT

are given where a chemical safety report is required.

12.6 OTHER ADVERSE EFFECTS

Information on other adverse effects to the environment may also be included in this section.

Section 13 DISPOSAL CONSIDERATIONS

13.1. WASTE TREATMENT METHODS

Chemical products may present a danger to man and the environment when they are not disposed of properly. Surplus product or waste, resulting from production or transportation, should be disposed of, by following the instructions of the manufacturer. In addition, any contaminated packaging must be subject to similar considerations. If the disposal of the **substance** or **mixture** (surplus or waste resulting from the foreseeable use) presents a **hazard**, a description of these residues and information on their safe handling will be given. Indications on the appropriate methods of disposal of both the substance or mixture and any contaminated packaging (incineration, recycling, landfilling, etc.) will also be provided.

Appropriate methods of waste treatment include for example:

- recycling
- incineration
- landfilling

REGULATORY DISPOSAL INFORMATION

Waste treatment methods are governed in many cases by local and national legislation. Before disposal, a knowledgeable person should be consulted. Users should be aware of the **regulations** that apply in their local operational sites and should identify suitable experts for advice.

Combination or reaction with other chemicals can modify the nature and characteristics of a product so that another route of disposal may be more appropriate or even imposed legally.

In addition to these measures, where an exposure assessment is required the information provided in this section needs to be consistent with the exposure scenarios in the annex to the SDS.

Section 14 TRANSPORT INFORMATION

To promote public safety, the international transport of dangerous goods is governed by a number of regulations specific to each mode of transport. However, except for the IBC Code, the definite source is the **UN Recommendations on the Transport of Dangerous Goods**, better known as the **Orange Book**. The latest editions of the modal regulations, now largely harmonized, include provisions for classification, packing, labelling/placarding & marking, and transport documents

- Dangerous goods substances, including solutions and mixtures, are classified by type of risk involved on the basis of their properties.
- They are assigned to a Class, UN number and Proper Shipping Name according to the hazard or the most predominant of the hazards they present in transport.
- Highly dangerous and unstable substances are prohibited from transport.

The classes are:

Class 1	Explosives
Class 2	Gases
Class 3	Flammable liquids
Class 4.1	Flammable solids, self-reactive substances and solid desensitized explosives
Class 4.2	Substances liable to spontaneous combustion
Class 4.3	Substances, which in contact with water, emit flammable gases
Class 5.1	Oxidizing substances
Class 5.2	Organic peroxides
Class 6.1	Toxic substances
Class 6.2	Infectious substances
Class 7	Radioactive material
Class 8	Corrosive substances
Class 9	Miscellaneous dangerous substances and articles, including environmentally hazardous substances

Though aligned with **GHS**, there may still be differences to other existing regulations, as transport regulations focus primarily on imminent hazards under normal conditions of transport, i.e. on physical and acute health hazards.

LAND TRANSPORT

The following **regulations** are applicable:

- The European Agreement Concerning the International Carriage of Dangerous Goods by Road (**ADR**),
- The Regulations concerning the International Carriage of Dangerous Goods by Rail (**RID**).

These codes regulate the carriage of dangerous goods in packages and/or cargo transport units (freight or tank containers/vehicles) in more than forty mostly European countries.

The information provided in the SDS includes:

14.1. UN Number: the four-digit identification number of the substance, mixture or article

14.2. UN Proper Shipping Name (Technical Name): the official name of the dangerous good to be used for transport outside enclosed areas (transport in commerce). In the case of Generic or "not otherwise specified" (N.O.S.) Proper Shipping Names, it shall be supplemented with the Technical name (or recognized chemical name) of the goods into brackets

14.3. Transport Hazard Class(es): The Class and/or the Label model numbers, identifying the predominant hazards for transport

14.4. Packing Group: where assigned

14.5. Environmental Hazards: The identification of the product as an **Environmentally hazardous substance**

14.6. Special Precautions for users:

The following information may also be shown:

- The physical and technical characteristics supplementing the PSN to determine different tank codes for the carriage of substances of the same packing group in ADR tanks.
- Where necessary, other relevant special provisions, exemptions or transport prohibitions

INLAND WATERWAYS TRANSPORT (ADNR/ADN)

The applicable regulation is the **European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADNR)**.

14.1. UN (or ID) Number: The UN or Substance identification number

14.2. UN Proper Shipping Name (Technical Name): The official name of the dangerous good to be used for transport outside enclosed areas (transport in commerce). In the case of Generic or "not otherwise specified" (N.O.S.) Proper Shipping Names, it shall be supplemented with the Technical name (or recognized chemical name) of the goods into brackets.

14.3. Transport Hazard Class (es): The Class *and/or* Label model number *for carriage in packages or tanks and/or, if relevant, the "Danger" information for carriage in tank vessels*

14.4. Packing Group: where assigned

14.5. Environmental Hazards: Danger information points to inherent hazards, including environmental and CMR properties

SEA TRANSPORT

The International Maritime Dangerous Goods Code (**IMDG-Code**) regulates the sea transports of dangerous goods in packaged form. "*Packaged form*" includes any form of packaging, IBC's, portable tanks or road and rail vehicles.

For each product the SDS includes the following IMDG Code data:

14.1. UN Number: the four-digit identification number of a dangerous good assigned by the UN Sub-Committee of Experts on the Transport of Dangerous Goods

14.2. UN Proper Shipping Name (Technical Name): the official name of the substance or article to be used in transport documents. In the case of Generic or "not otherwise specified" (N.O.S.) Proper Shipping Names, it shall be supplemented with the Technical name (or recognized chemical name) of the goods into brackets. In the case of Marine pollutant, the Generic or "not otherwise specified" (N.O.S.) Proper Shipping Names shall be supplemented with the recognized chemical name of the marine pollutant constituent.

14.3. Transport Hazard Class(es): The IMDG-Code primary and subsidiary **hazard classes** or, when assigned, the divisions of the goods;

14.4. Packing Group: when assigned, identifies the degree of danger the product presents and defines minimum consignment standards for safe transportation:

- I for *great* danger,
- II for *medium* danger and
- III for *low* danger,

14.5. Environmental Hazards: The identification of the product as a **marine pollutant**,

14.6. Special Precautions for users: The following information may also be shown:

- If applicable, the Technical Name, i.e. the name(s) of one or two constituents which most predominantly contribute to the hazard or hazards of the mixture
- Where necessary, other relevant special provisions, exemptions or transport prohibitions
- If necessary, the **Emergency Schedule (EmS) number** indicating the procedures to follow on board ships in the case of incidents involving dangerous goods, which correspond to the properties of the hazardous constituents,

SEA (MARPOL 73/78 Convention - Annex II):**14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code**

If applicable, the following information is provided for the carriage, in bulk by sea, according to Annex II of MARPOL 73/78, which leads to the minimum carriage requirements defined in the IBC Code:

- The **Product Name**, the name to be used in shipping documents for the purposes of MARPOL Annex II and the IBC Code.
- The **Ship Type**, S.T. 1, 2 or 3 depending on the cargoes safety and pollution hazards; and
- The **Pollution Category**, X, Y, Z or OS, depending on the hazards to marine resources, human health or amenities.

AIR TRANSPORT

Except for samples, chemicals are rarely shipped by air. The air transport of dangerous goods is regulated by the International Air Transport Association (**IATA**) Dangerous Goods Regulation, and is based on International Civil Air Organization (**ICAO**) requirements. Product classifications are similar to those for sea transport; risk is considerably reduced by the use of small package sizes. The **UN number**, **PSN**, **Class(es)** or **Division**, **Packing group** and **Environmental hazards** are indicated in this sub-section.

Section 15 REGULATORY INFORMATION

REGULATORY STATUS AND APPLICABLE LAWS AND REGULATIONS

15.1. SAFETY, HEALTH AND ENVIRONMENTAL REGULATIONS/LEGISLATION SPECIFIC FOR THE SUBSTANCE OR MIXTURE

The information provided here details the regulatory status of the product (if a substance) or of contained substances (if a mixture):

Statement is given whether product or substances present in the product is/are subject to various safety, health and environmental EU regulations including Regulation 1005/2009 on Ozone Depleting Substances, Regulation 850/2004 on Persistent Organic Pollutants, Regulation 689/2008 on Export/import of Dangerous Chemicals and Directive 2012/18/EU a.k.a. Seveso III.

Advice is given regarding actions to be taken by SDS recipient as a result of these regulatory provisions.

- Any other national laws or measures that may be relevant are mentioned for the concerned EU Member State.
- When a substance subject to or candidate substance for Authorization with respect to REACH is present in the product, details are given (substance name, authorization number and expiration date, authorized use).
- For Hydrocarbon substances that has been provided a new identification number by ECHA, the CAS number the substance is identified with in countries not subject to the REACH regulation is disclosed

15.2. CHEMICAL SAFETY ASSESSMENT

- Information is given whether a REACH Chemical Safety Assessment has been conducted for the product (or a substance in the mixture).
- For mixtures with hazardous content that do not require an Annex the following phrase will appear in the SDS' section 15.2.: *"REACH Information: A Chemical Safety Assessment has been carried out for one or more substances present in the material."*

Section 16 OTHER INFORMATION

REFERENCES:

Information that is not covered in the previous sections that may have an effect on or an important relationship to safety, health or the environment, is added here on an ad hoc basis. In particular, this section provides:

- the references to the sections that have been updated since the last issue of the SDS, as well as its reference date and that of the previous SDS revision.
- the sources of data used to compile this SDS.
- the list of relevant hazard statements and risk phrases as referenced in Section 3.
- in the case of mixtures, the method used for classification determination e.g. calculation method, test data.
- a legend with the abbreviations and acronyms used in the Safety Data Sheet.

When a Chemical Safety Report is included in the registration dossier, this information is conveyed to downstream users in the SDS as an Annex when the product is considered as a substance and included in the text for mixtures. When not required, this information can be found in this section.

ANNEX I

Exposure Scenarios (in the SDS Annex)

If a substance is classified as hazardous or is determined to possess PBT properties, then a Chemical Safety Assessment (CSA) needs to be undertaken by the Manufacturer/Importer (M/I) as part of the registration of the substance. The **Exposure Scenario** (ES) is the output of the CSA and describes the information that enables the substance to be used safely in all situations where it is likely to be handled. Relevant ESs for the substance are contained in the Annex to the SDS (which REACH then refers to as an extended SDS or ext-SDS). The ES focuses primarily on human health & environmental risks, but may also cover risks due to the physicochemical properties of a material e.g. flammability. Under REACH (Article 37), **downstream users** (DU) have an obligation to either follow the measures outlined in the ES or, where this is not the case, then to either request a revised ES from their supplier or to undertake a DU CSA/ES themselves.

The Exposure Scenario represents the output of the Chemical Safety Assessment for the substance (that forms part of its Chemical Safety and which is, in turn, part of the Registration package for that substance). It is written in standard sentences (in order to facilitate ready translation into other languages) and includes the many of the terms described elsewhere in the Guide (and in the Glossary)

The basic form of an Exposure Scenario is shown below. The Exposure Scenario is comprised of 4 basic sections. These contain the information that users are expected to refer to when evaluating the risks that may arise as a consequence of their use of the substance. The ES typically consists of:

1. Broad information that explains the Use Descriptors covered by the ES, together with a simple explanation that is more likely to be understandable by the user/customer (and which in turn relates to information contained in Section 1 of the SDS).
2. Basic information that states the assumptions (termed Operational Conditions, OCs) behind the ES e.g. detail of the key physicochemical properties and that it covers daily exposures to 100% of the product.
3. Specific **Risk Management Measures** (RMMs) and/or further OCs that are considered necessary to manage the risks for particular activities associated with its area of use e.g. the use of specific types of extract ventilation or personal protection when transferring or spraying the material; the need for specific forms of sampling when this activity is undertaken; etc.. This information covers both the controls necessary to manage both human health and environmental risks.
4. Information that enables the downstream user to obtain an idea of the likely exposures associated with the use conditions described in the ES. Where the use conditions differ to those described in the ES, information that enables the downstream user to be able to "scale" from the ES i.e. how any DU may be able to determine whether the controls encountered at the local level might be considered to represent something that is equivalent to, better or worse than those described in the exposure scenario.

Section 1 Title : Formulation & (Re)packing of Substances and Mixtures	
Use Descriptor	
Sector(s) of Use	3, 10
Process Categories	1, 2, 3, 4, 5, 8a, 8b, 9, 14, 15
Environmental Release Categories	2
Specific Environmental Release Category	ESVOC SpERC 2.2.v1
Processes, tasks, activities covered	
Formulation, packing and re-packing of the substance and its mixtures in batch or continuous operations, including storage, materials transfers, mixing, tableting, compression, pelletization, extrusion, large and small scale packing, maintenance, sampling and associated laboratory activities	
Assessment Method	
See Section 3.	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product characteristics	
Physical form of product	Liquid
Vapour pressure (kPa)	Liquid, vapour pressure <0.5 kPa at STP.
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently)
Frequency and duration of use/exposure	Covers daily exposures up to 8 hours (unless stated differently)
Other Operational Conditions affecting exposure	Assumes use at not more than 20°C above ambient temperature, unless stated differently. Assumes a good basic standard of occupational hygiene is implemented

Title and scope of Exposure Scenario

Basic assumptions underpinning the Scenarios

Contributing Scenarios	Specific Risk Management Measures and Operating Conditions
General measures (skin irritants)	Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/ spills as soon as they occur. Wash off skin contamination immediately. Provide basic employee training to prevent / minimize exposures and to report any skin effects that may develop.
General exposures (closed systems)	Handle substance within a closed system
General exposures (open systems)	Wear suitable gloves tested to EN374
Process sampling	No other specific measures identified
Drum and batch transfers	Use drum pumps or carefully pour from container. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training
Bulk transfers	Handle substance within a closed system. Wear suitable gloves tested to EN374
Mixing operations (open systems)	Provide extract ventilation to points where emissions occur. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training
Drum and small package filling	Wear suitable gloves tested to EN374
Equipment clean down and maintenance	Drain down system prior to equipment break-in or maintenance. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.
Additional information on the basis for the allocation of the identified OCs and RMMs is contained in Appendices 1 to 3	
Section 2.2 Control of environmental exposure	
Product characteristics	
Substance is complex UVCB. Predominantly hydrophobic	
Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tons/year)	2.8e7
Fraction of Regional tonnage used locally	0.0011
Annual site tonnage (tons/year)	3.0e4
Maximum daily site tonnage (kg/day)	1.0e5
Frequency and duration of use	
Continuous release [FD2].	
Emission days (days/year)	300
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other given operational conditions affecting environmental exposure	
Release fraction to air from process (after typical onsite RMMs, consistent with EU Solvent Emissions Directive requirements)	1.0e-2
Release fraction to wastewater from process (initial release prior to RMM)	2.0e-5
Release fraction to soil from process (initial release prior to RMM)	0.0001
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates used.	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Risk from environmental exposure is driven by freshwater sediment Prevent discharge of undissolved substance to or recover from onsite wastewater	
Treat air emission to provide a typical removal efficiency of (%)	0
Treat onsite wastewater (prior to receiving water discharge) to provide	60.0

Risk management measures covering workers

Risk management measures covering the environment

the required removal efficiency \geq (%)	
If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of \geq (%)	0
Organization measures to prevent/limit release from site	
Prevent discharge of undissolved substance to or recover from wastewater. Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%)	94.1
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	94.1
Maximum allowable site tonnage (M_{safe}) based on release following total wastewater treatment removal (kg/d)	6.8e5
Assumed domestic sewage treatment plant flow (m^3/d)	2000
Conditions and measures related to external treatment of waste for disposal	
External treatment and disposal of waste should comply with applicable regulations	
Conditions and measures related to external recovery of waste	
External recovery and recycling of waste should comply with applicable regulations	
Section 3 Exposure Estimation	
3.1. Health	
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated.	
3.2. Environment	
The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.	
Section 4 Guidance to check compliance with the Exposure Scenario	
4.1. Health	
Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.	
4.2. Environment	
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html).	

Further advice on environmental risk management

Advice on how ES information may be further refined and 'scaled'

ANNEX II

Derived No-Effect Level (DNEL): Frequently Asked Questions

0. What is a DNEL?

A DNEL (Derived No-Effect Level) is defined by REACH as the level of exposure above which humans should not be exposed. In the risk characterization phase of the Registration, the exposure of each human population known to be or likely to be exposed to the substance is compared with the appropriate DNEL. The risk to humans can be considered to be controlled if the exposure levels estimated do not exceed the appropriate DNEL i.e. the primary purpose of the DNEL is its use by manufacturers/importers in order to fulfill their responsibilities to develop Exposure Scenario for classified substances.

A DNEL is established using a detailed process laid out in the REACH Technical Guidance Documents (Chapter R8). The process is different to that usually applied when setting OELs. For this reason, the value of DNELs can be much more conservative than equivalent OELs.

1. Do DNELs have the same status as OELs ?

No. DNELs are developed by industry as part of the REACH Registration process. However the criteria used to develop DNELs are not the same as those used to develop OELs or TLVs. For this reason, within EM the process for workplace health risk assessment remains the same as that described in the relevant Appendix of the ExxonMobil Exposure Assessment Strategy Reference Manual i.e. a comparison of exposure against regulatory or EM-authorized OEL values.

2. Is there any Legal Obligation to Use DNELs?

No. The legal obligations within REACH refer to the risk management information described within the Exposure Scenario. The DNELs do not serve as formal regulatory limits. Having said this, for some substances where no OELs or similar accepted regulatory limits exist, then the DNEL may contain information that is helpful in assessing the nature of workplace risks. (and see #3 Below)

3. Will EM be Reviewing the Content of DNELs?

Yes. Industry is investing high levels of resource into developing DNELs and, for many substances, EM is involved in these activities. For this reason, as part of the activities of the EM OEL Committee, EMBSI will be reviewing the basis for DNELs in order to determine whether these should be adopted for use as EM OELs.

4. What happens if a DNEL is more stringent than an OEL?

DNELs, as previously described, are intended to be used as reference values for the development of Exposure Scenario information under REACH. The nature of the REACH Guidance in this area means that very often a DNEL will appear more stringent than an equivalent or comparable OEL. This is because the DNEL is not intended to be used as an OEL and has been established using different criteria.

5. Are DNELs expected to be adopted by European regulators?

EU regulators have stated that only those OELs developed under tripartite systems (i.e. those involving regulators, employers and workers) have any status under EU H&S law (e.g. the Chemical Agents Directive). As DNELs are only developed by industry, they do not meet this criterion. However, the EU recognize that a tremendous amount of new information will result from the implementation of REACH. Accordingly, the EU is currently exploring how this information can be used, over time, to develop further EU OELs (that would then subsequently be introduced into the Indicative Limit Value Directives consistent with other regulatory OELs in Europe).

6. Are DNELs only available for classified substances?

Where a substance is classified, then because an Exposure Scenario is required to support the substance's Registration, REACH requires a DNEL to be developed for all relevant routes of exposure e.g. inhalation and dermal exposures for workplace applications (but with the caveat that DNELs can only be developed provided sufficient hazard data are available). REACH also encourages chemical suppliers to develop DNELs for non-classified substances. Therefore, DNELs will be available for classified substances where sufficient data exist to support their development. They may also be available for some non-classified substances.

7. What is a DMEL?

For non-threshold effects, the underlying assumption is that a no-effect-level cannot be established and a DMEL therefore expresses an exposure level corresponding to a low, possibly theoretical, risk, which should be seen as a tolerable risk.

GLOSSARY OF TERMS AND ABBREVIATIONS

GLOSSARY OF TERMS AND ABBREVIATIONS

Absorption	The penetration of one substance into the inner structure of another substance, c.f. adsorption .
ACC	Abel Closed Cup, a flash point test method.
ACGIH	The American Conference of Governmental Industrial Hygienists (US) . The organization is engaged in a number of occupational safety and health programs, including the publication of Threshold Limit Values (TLVs) .
Acute	Single or short-lived, possibly severe, c.f. chronic .
Acute Effect	An adverse effect that occurs immediately or shortly after a single exposure .
Acute Exposure	An exposure of short duration, usually to relatively high concentrations or amounts of a material.
Acute Toxicity	The adverse effect resulting from a brief or single exposure to a material. See chronic .
Additives	A generic name for a wide range of materials that may be added, usually in low concentrations, to stabilise or improve the performance of other products.
ADN	European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways
ADR	Accord européen relatif au transport de marchandises Dangereuses par Route . Agreement concerning the International Carriage of Dangerous Goods by Road
Adsorption	The attraction of the atoms, ions or molecules of a gas or liquid to the surface of another substance , c.f., absorption .
Adverse effect	Change in morphology, physiology, growth, development or lifespan of an organism which results in impairment of its functional capacity or impairment of its capacity to compensate for additional stress or increased susceptibility to the harmful effects of other environmental influences.
Air Monitoring	The measurement of airborne concentrations of materials, usually contaminants .
AIT	Autoignition Temperature.
Alcohol Type Foams	Fire fighting foams developed for use with highly flammable water-soluble substances ; have less mechanical strength than other foams and must be applied with care.
Aliphatic	Refers to hydrocarbons having straight, branched or cyclic carbon chain structures, e.g., methane, ethane and ethylene; includes paraffins (alkanes), olefins (alkenes), and naphthenes (cycloalkanes), c.f. aromatic .
Allergen	A material capable of stimulating an allergy .
Allergy	An exaggerated susceptibility to a material which is without effect for the majority of individuals.
Amendment	Generally modifies the main Articles of the Directive or Regulation .
Ames Test	A screening test using strains of bacteria to determine whether a chemical has mutagenic effects.
Anaerobe	A micro-organism that survives without oxygen.
Anesthesia	The loss of sensation, possibly including the temporary loss of consciousness.
Antidote	A treatment, specific to the material causing the effect, to relieve, prevent or counter-act the effect of a poison.

Appearance	The physical state (solid, liquid or gas) and the color of the substance or mixture as supplied.
Aromatic	Refers to hydrocarbons with one or more unsaturated carbon ring structures, e.g., benzene, toluene and xylene, c.f., aliphatic .
ASTM	The American Society for Testing and Materials (US) . The organization devises consensus standards for materials characterization and use.
Cataract	An opaque body which can form in the eye, obscuring the transparency of the lens.
Category code	Used by CLP; Severity level; Category 1 is the most severe and Category 5 is of relatively low severity.
Caustic	An alkaline (strongly basic) material that strongly irritates, burns , corrodes or destroys living tissue.
CEFIC	European Chemical Industry Council (B).
Ceiling Value	See TLV .
Centistoke, cSt mm/second (mm ² /sec).	Unit of kinematic viscosity . 1 cSt equals 1 square
Central Nervous System Depression	Effects on the CNS can include convulsions, dizziness, drowsiness, irritability, headache, tremors, fatigue, narcosis , behavioral changes, lethargy, etc.
Chemical Burns	Similar to other burns ; after emergency first-aid, treatment is the same as for <i>thermal burns</i> .
Chemical category	In the context of REACH a category of substances is a group of substances whose physicochemical, toxicological and/or ecotoxicological properties are likely to be similar or follow a regular pattern as a result of structural similarity. The similarities may be based on the following: a) common functional group(s) (e.g. aldehyde, epoxide, ester, specific metal ion). b) common constituents or chemical classes, similar carbon range numbers. This is frequently the case with complex substances often known as "substances of Unknown or Variable composition, Complex reaction products or Biological material" (UVCB substances). c) an incremental and constant change across the category (e.g. a chain-length category), often observed in physicochemical properties, e.g. boiling point range. d) the likelihood of common precursors and/or breakdown products, via physical or biological processes, which result in structurally similar chemicals (e.g. the "metabolic pathway approach" of examining related chemicals such as acid/ester/salt).
Chemical Formula	A convention for representing the elements making up a molecule.
Chemical Oxygen Demand (COD)	The quantity of oxygen required for the chemical oxidation of a specified quantity of a material under laboratory conditions. A comparison of the COD with the corresponding BOD gives a measure of the material's biodegradability .
Chemical Safety Assessment (CSA)	The CSA is used by a Registrant, as part of the Registration process, to determine whether risks (to man and/or the environment) are considered to exist arising from the use of the substance. Risks are considered to exist when the predicted/likely exposure exceeds any DNEL/PNEC etc.. The Exposure Scenario describes the measures considered necessary to control exposures to levels below the DNEL/PNEC. The CSA process only applies to classified substances and forms part of the CSR.
Chemical Safety Report (CSR)	Chemical Safety Reports are the main end point for data assessment under REACH in which hazard and exposure data are considered together to assess the risk for a substance
Chronic	Repeated or prolonged, c.f., acute .
Chronic Effect	Generally considered an adverse effect that occurs after repeated or prolonged exposures normally to small quantities of a material, or where symptoms develop slowly and persist or recur frequently. Can also result from acute exposures to highly irritant materials.
Chronic Exposure	Continuous or intermittent exposure over a long time period, usually to relatively low concentrations or amounts of material.

Chronic Toxicity	The adverse effect resulting from repeated or prolonged exposures to a material.
CIA	Chemical Industries Association Ltd. (UK).
CLOGP	A computer software program calculating Log P_{ow} values for specific substances based on their chemical structures.
CLP	Classification, Labelling and Packaging regulation (EC) No 1272/2008.
CNS	Central Nervous System ; the nervous system associated with the brain and spinal cord.
COC	Cleveland Open Cup , a flash point test method.
COD	Chemical Oxygen Demand .
Coefficient of Thermal Expansion	The volume expansion coefficient for liquids: the ratio of the change in volume per degree to the volume at 0°C.
Compatible Materials	Materials, for instance the contents of a package and the packaging itself, which can coexist in close contact under normal conditions of use without risk of chemical or physical interaction, degradation or loss of quality or functionality.
Conc.	Concentration.
CONCAWE	Conservation of clean air and water in Europe . Group of Oil companies in Europe carrying out research on environmental issues relevant to the oil industry.
Conditions of use	Conditions of use include the operational conditions (OC) and risk management measures (RMM)
Conjunctivitis	Inflammation of the membranes (conjunctiva) that line the eyelids and cover the front of the eyeball.
Contaminant	A harmful, irritating or nuisance material that is foreign to its current environment.
Control of risks	= risks are controlled. For substances for which it is possible to derive no-effect-levels (DNEL or PNEC) the risk characterization has to conclude that the estimated exposure levels do not exceed these no-effect-levels. However, there are also cases where the risk characterization needs to be based on other approaches: <i>f</i> For those human health effects and environmental spheres for which it is not possible to determine a DNEL or PNEC, the risk characterization consists of semi-quantitative or qualitative assessment of the likelihood that adverse effects are avoided. <i>f</i> For substances fulfilling the PBT and vPvB criteria (see Annex XIII of REACH) the risks can be concluded to be controlled when the emissions and exposures are minimized by the implementation of the ES. In addition, the assessment of physico-chemical hazards has to conclude that the likelihood and severity of an event occurring due to these properties is negligible.
Cornea	Transparent membrane covering the outer portion of the eye.
Corrosive	A material which causes destruction of, or damage to, materials or living tissue, as a result of chemical action at the point of contact.
Cumulative = combined exposure	A substance registered by one manufacturer may enter into the environment via different products and processes. In the exposure estimate however the registrant should take into account all routes and pathways. The same applies to consumer exposure to the same substance via different pathways, including indirect exposure via the environment. The registrant is not obliged to take into account the exposure to the same substances from other manufacturers or importers. Nevertheless it can be wise to be aware of the fact that too high cumulative exposure across the substance volumes from different manufacturers may trigger Community action
Dangerous Goods Class	A class allocated to a substance (UN usage) .

Decomposition temperature	The decomposition temperature of a substance is the temperature at which the substance decomposes into
Density	The ratio of a substance's mass to its volume.
Dermal	Relating to the skin.
Dermatitis	Inflammation of the skin from any cause, in particular irritation or sensitization .
Desquamation	The sloughing (shredding or casting-off) of the outer <i>epidermal</i> layer of the skin.
Determinants of emissions and/or exposure	Factors determining the exposure and or release when a substance is manufactured or used (including the subsequent life cycle stages (service life and waste disposal). These factors include the characteristics of the substance, the operational conditions and risk management measures.
Downstream use	Use of a substance, either on its own or in a preparation, in the course of his industrial or professional activities. A distributor or a consumer is not a downstream user.
Detonation	A sudden and severe explosion of a flammable vapor gas, mist or solid air mixture which develops in such a way that extremely high pressures are built up in a very short period of time.
Dilution Ventilation	The controlled dilution of contaminated air with clean air to maintain contaminants at acceptable levels. Not to be applied for control of dusts , fumes or toxic vapors or gases, or for the control of fire or explosion hazards in areas where workers are employed. Can be applied to situations where workers are distant from predictable, constant emission rate, diffuse sources of relatively low toxicity vapors or gases. Other forms of ventilation control such as Laboratory Hoods or Local Exhaust Ventilation should be applied for control of toxic emissions.
Directives (DSD and DPD)	<p><i>The key directives that still govern (together with CLP regulation) the classification of hazardous substances or mixtures:</i></p> <ul style="list-style-type: none"> • <u>COUNCIL DIRECTIVE 67/548/EEC</u> as last amended by Commission Directive 2004/73/EC of 29 April 2004 adapting to technical progress for the 29th time on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances. • <u>DIRECTIVE 1999/45/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL</u> as amended by Commission Directive 2006/8/EC of 23 January 2006 adapting to technical progress on the approximation of the laws, regulations and administrative provisions of the Member States relating to the classification, packaging and labelling of dangerous preparations.
Dose	Used interchangeably with dosage to express the amount of chemical, physical or biological agent absorbed in a unit volume of an organ or individual. Dose rate is the dose delivered per unit of time.
Dose-Effect Relationship	The relationship between dose and the incidence or severity of a specified effect, e.g. health.
DOT	Department of Transportation (US).
Downstream use	Use of a substance, either on its own or in a preparation, in the course of his industrial or professional activities. A distributor or a consumer is not a downstream user.
DNA	Deoxyribonucleic acid ; a biological polymer of only four monomers that codes the proteins in the body and controls the body's chemistry. DNA occurs in all animals.
DNEL (Derived No-Effect Level)	Under REACH, a DNEL is considered to be the level of exposure to the substance below which no adverse effects are expected to occur. The DNEL is the level value that is used within the CSA process to determine whether a risk exists i.e. whether humans are expected to be exposed above the DNEL. DNEL is a derived level of exposure because it is normally calculated on the basis of available dose descriptors from animal studies such as No Observed Adverse Effect Levels (NOAELs) or benchmark doses (BMDs). The process for developing for DNELs differs to that applied for the deriving OELs. For this reason, DNELs are usually more stringent than comparable OELs.

DMEL (Derived Minimal Effect Level)	For non-threshold effects, the underlying assumption is that a no-effect-level cannot be established and a DMEL therefore expresses an exposure level corresponding to a low, possibly theoretical, risk, which should be seen as a tolerable risk. The risk levels used to derive DMELs are often significantly lower than those that have been historically applied for deriving OELs.
Dry Chemical Powder	A mixture of inorganic substances , usually sodium or potassium bicarbonate and mono-ammonium phosphate, with small percentages of added ingredients to render it free-flowing and water repellent. Used as a fire extinguisher on fires in electric equipment, oils, greases, gasoline, paints and flammable gases.
Dusts	Solid particles of matter which have become airborne. Total dust is all dust, which is airborne. <i>Respirable dust</i> is the fraction of total dust that may be deposited in the gas exchange region of the lung. <i>Inspirable dusts</i> are those which may be deposited anywhere in the respiratory tract. Thoracic dusts are those which may be deposited anywhere within the lung airways and gas exchange region.
Dyspnea	Shortness of breath; difficult or labored breathing.
EC	The E uropean C ommunity or Communities; the forerunner of the EU .
ECHA	E uropean C hemicals A gency
Ecotoxicity	The toxic effect of materials on environmental systems.
EEC	The E uropean E conomic C ommunity. One of three European Communities (EC); now replaced, in legislative and political terms, by the European Union (EU).
EC Number	The three European lists of substances from the previous EU chemicals regulatory framework, EINECS, ELINCS and the NLP-list, in combination are called the EC Inventory. The EC Inventory is the source for the EC Number as an identifier of substances.
EEL	Emergency Exposure Limit.
Effect	A biological change caused by, or related to, exposure .
EINECS	The E uropean I nventry of E xisting C hemical S ubstances. Published in June 1990, it defines, by exclusion, chemical substances that are "new" and therefore potentially subject to pre-marketing notification (PMN) requirements.
Electrostatic Accumulation	Static electricity generated and accumulated when material flows through or is discharged from a pipe, or falls freely through the air.
ELINCS	The E uropean L ist of N otified C hemical S ubstances. Updated as necessary, it lists substances introduced with a PMN after the closing of the EINECS inventory.
Embryotoxic	Causing toxic effects to an embryo during early pregnancy.
EMBSI	ExxonMobil Biomedical Sciences Inc. (US) . ExxonMobil Corporation's central organization for the study of health and environmental issues and effects, based in Clinton, New Jersey.
Emergency Exposure Limit (EEL)	The concentration of a contaminant in air that, it's believed, can be tolerated in an emergency without adversely affecting health permanently, but not necessarily without temporary discomfort or other evidence of irritation or intoxication.
EmS	Group Emergency Schedules for Ships Carrying Dangerous Goods (recommended emergency procedure providing master of ship with advice on immediate actions to be taken in case of an emergency).
EmS Number	A number referring to the product's relevant Emergency Schedule.
Entity	A single chemical.
Environmental release Categories	A pre-set combination of life cycle stage, distribution of emission sources, fate of substance in the technical process, level of containment and risk management measures, typical for an identified use.
Environmental Fate	Disposition of the chemical in the environment.

Environmental Mobility	The mobility of a material in the environment is dependent on its physical parameters (e.g. vapor pressure , water solubility , density). These parameters Determine into which compartments of the environment (e.g., air, water, soil, sediments) a substance with a high vapor pressure can partition in a relatively short period of time (or, even faster if the substance has low water solubility). This in turn indicates which organisms may come into contact with that material, e.g., a relatively high water solubility and a low vapor pressure would suggest that organisms in aquatic habitats would be concerned if the material was released to the environment.
Environmental Monitoring	The systematic collection, analysis and evaluation of environmental samples.
Environmental Partitioning	Relative distribution of material between environmental media (i.e., water, soil, air, sediments).
Environmental Toxicology	The study of the fate and effects of chemicals in the environment, also ecotoxicology
EPA	Environmental Protection Agency (US) .
Epidemiology	The study of disease patterns (e.g., incidence or prevalence) in human populations.
EU	The European Union , comprising, as of 1 January, 1995, the 12 Member States of the three European Communities (EC/EEC), plus Austria, Sweden and Finland.
ext-SDS	The extended Safety Data Sheet (ext-SDS) is described under Art a requirement of REACH and refers to the SDS to which the Exposure Scenarios (describing the safe uses for classified substances) are included as an Annex. This means that two forms of SDS exist under REACH; one that describes the hazards and general precautions (and which is essentially the same format and content as pre-REACH SDS') and a second 'extended' version that includes relevant Exposure Scenarios.
Evaporation Rate	The ratio of the time required to evaporate a measured amount of a liquid to the time required to evaporate the same amount of a reference liquid (e.g., n-butyl acetate) under ideal test conditions. On this scale, the smaller the number, the less volatile the material.
Excursion	Deviation from a definite path, a movement above or below a norm.
Exposure	Qualitative or quantitative representation of a contact between any chemical or physical agent and the surface of the human body. Contact most commonly takes place via the skin or in the lungs. Once absorbed by the body surfaces, the amount of substance entering the tissues is more correctly named the dose .
Exposure assessment	Exposure assessment includes i) exposure scenario building and ii) exposure estimation.
Exposure estimation	Quantification of exposure related to the operational conditions and risk management measures as described in an exposure scenario. Exposure scenario building and the related exposure estimate together build the exposure assessment.
Exposure Scenario (ES)	Addresses the set of conditions, including operational conditions and risk management measures, covering the substance life-cycle, that describe how the manufacturer or importer controls, or recommends downstream users to control, exposures of humans and the environment. The ES in the context of the CSR and in context of the SDS have a different purpose, and thus their content may differ. For example, the ES in the CSR will contain justifications and comments, the ES in the SDS annex will not. However the CSR chapters and their content must be consistent with the content of ES in the SDS.
ExxonMobil OEL	The company equivalent of the ACGIH TLVs . Adopted by ExxonMobil, as needed, for substances which do not have TLVs or where there is reason to modify the TLV.
Fainting	A temporary loss of consciousness as a result of a diminished supply of blood to the brain, also known as <i>Syncope</i> .
Fever	A condition in which the body temperature remains above its regular or <i>normal</i> level of 37°C.

Fibrosis	A condition marked by an increase of interstitial fibrous tissue in the lungs, usually as a response to inhaled materials. May reduce lung and gas exchange capacity.
Flammability	How easily something will burn, ignite, causing fire or combustion.
Flammable Limits	The minimum and maximum concentrations of a flammable gas or vapor in air between which ignition can occur; also known as flammability or <i>explosive</i> limits.
Flash Point	The lowest temperature at which a liquid gives off enough vapor to form an ignitable mixture with air and produce a transient flame when a source of ignition is present. Determined by standard test procedures, i.e., PMCC , TCC and TOC .
Foetotoxicity	Causing toxic effects to the fetus during pregnancy.
Foetus	The developing organism; for humans, from the 4th month after conception to birth.
Fume	An aerosol of minute particles resulting generally from the heating of a solid, often accompanied by a chemical reaction with any oxygen present. May also be produced by some chemical reactions.
Generic exposure Scenario	Exposure scenario(s) for the typical conditions of use(s) of a certain type of substance (e.g. solvents, pigments, resins, detergents) within a certain sector industry (area of use), suitable to control risks for substances with a certain generic hazard profile (e.g. high DNEL, low volatility). Such GES aims to cover the whole life cycle of the type of substance
Generic Name	A name applied to a category or class of chemicals (e.g., azo dyes, halogenated aromatic amines , etc.).
Genotoxic	Able to cause damage to genetic material (DNA), c.f., mutagenic .
GHS	United Nations G lobally H armonized S ystem of Classification and Labelling.
GLP	Good Laboratory Practices .
Hemoglobin	The red coloring matter of the blood which carries oxygen throughout the body.
Hemorrhage	The loss of blood from the blood vessels and/or capillaries.
Hallucination	Hearing, seeing or feeling things that are not really there.
Hazard	The potential for a chemical, physical or biological agent to cause harm in man or animals.
Hazard class	Used by CLP; means the nature of the physical, health or environmental hazard, e.g., flammable solid carcinogen, oral acute toxicity.
Hazard Pictogram	It is a pictorial presentation of a particular hazard that should be disclosed on the label. Used by CLP and equivalent to Symbols in Dangerous Substance Directive
Hazard Statement	Statement assigned to a hazard class and category that describes the nature of the hazards of a hazardous product, including where appropriate, the degree of the hazard. Used by CLP and equivalent to Risk phrase in Dangerous Substance Directive.
HAZCHEM	Also called the emergency action code (EAC) An emergency response system for road and rail transport (UK). Transported goods are coded to describe the procedures to be followed in any incident involving the escape of chemicals to the environment.
HDH	Hazard Data Handbook , a collection of SDS' (ExxonMobil Chemical usage).
Heat of Vaporization (latent, kJ/Kg)	The quantity of heat necessary to change one gram of liquid to vapour without a change of temperature.
Henry's Law Constant	An environmental fate parameter; the ratio of a material's concentration in air to its concentration in water when the two phases are in contact and in equilibrium.
Hereditary	Genetically transmitted or transmittable from parent to offspring.
Heritable	Capable of being inherited.

HIN	Two or 3-digit Hazard Identification Number that ADR/RID/ assigns to dangerous goods carried in tanks. HIN's of substances , which react dangerously with water, are prefixed by the letter "X".
HSE	Health & Safety Executive (UK).
Hygroscopic	Describes the tendency of a product to absorb moisture from the air.
Hypersensitive Persons	Individuals in whom, for various reasons, exposure to a given level of a material results in a greater response than in the majority of similarly exposed individuals.
Hypnotic hypnosis.	Inducing sleep; producing effects generally attributed to
H Phrase	Hazard phrases will be introduced as part of the CLP regulation to replace the old Risk (R) phrases referenced in EC directives (67/548/EC and 1999/45/EC)
IARC	The I nternational A gency for R esearch on C ancer; part of the <i>World Health Organisation (WHO)</i> .
IATA	I nternational A ir T ransport A ssociation.
IATA-DGR	I nternational A ir T ransport A ssociation - D angerous G oods R egulations (" <i>field manual</i> " version of ICAO-TI)
IBC-Code (BCH Code)	I nternational C ode for the C onstruction and E quipment of S hips C arrying D angerous C hemicals in B ulk. Chemical tankers built on or after 1 July 1986 must comply with the IBC-Code. Chemical tankers constructed before 1 July 1986 must comply with the BCH-Code.
ICAO	I nternational C ivil A viation O rganisation.
Identified use	Use means: any processing, formulation, consumption, storage, keeping, treatment, filling into containers, transfer from one container to another, mixing, production of an article or any other utilization; Identified use: means a use of a substance on its own or in a preparation, or a use of a preparation, that is intended by an actor in the supply chain, including his own use, or downstream user; Note: Using articles (including the substances contained) or treatment of waste (including the substances contained) is not a <i>use</i> in the meaning of REACH. These life cycle stages result from a downstream use (e.g. processing substances into an article) or a consumer use of substances or preparations.
Ignition Source	Anything that provides energy, heat, spark or flame sufficient to cause combustion or explosion.
ILO	I nternational L abour O rganisation.
IMDG-Code	I nternational M aritime D angerous G oods C ode.
IMO	I nternational M aritime O rganisation.
Industrial Hygiene	The discipline of anticipating, recognizing, evaluating and controlling health hazards in the working environment with the objective of protecting worker health and well-being, as well as safeguarding the community at large, also <i>Occupational Hygiene</i> .
Inflammation	The reaction of body tissue to injury whether by infection or trauma ; the inflamed area is generally red, hot, swollen and painful.
Ingestion	Swallowing; the process of taking substances into the body via the mouth, as food, drink, medicine, etc., for digestion. For cells, the act of engulfing or taking up bacteria and other foreign matter.
Inhalation	Breathing in.
Intravenous	Into or inside the vein.

Irritant	A non- corrosive material that produces irritation , especially of the skin or mucous membranes , following exposure to it; the effect may vary between individuals and according to the concentration and duration of the exposure.
Irritation	A reversible inflammatory effect on living tissue by chemical action at the site of contact.
IUPAC	International U nion of P ure and A ppplied C hemistry
Lab.	Laboratory.
Hoods	These usually take the form of semi-enclosed structures with one adjustable open face. Suitable for the handling, at relatively small scale, of more toxic materials. Are designed to enclose the emission sources and capture emissions and transport them for safe removal or discharge; also <i>fume cupboards</i> .
Latent Period	The elapsed time between an exposure and the first manifestation of damage or disease.
LC₅₀	The airborne concentration of a material which, when inhaled over a specified period of time, will kill 50 per cent of an exposed species, usually within the first 30 days.
LC_{Lo}	The lowest concentration of a material, usually in air, that is reported to have caused death in humans or animals.
LD₅₀	The oral dose of a material causing death in 50 per cent of an exposed species, usually within the first 30 days.
LD_{Lo}	The lowest dose of a material that is reported to have caused death in humans or animals.
LEL	The Lower Explosive Limit (Flammable Limit) of a flammable material.
LEV	Local Exhaust Ventilation.
Local Effect	The harmful effect of a material at the point of contact with, or on entry into, the body.
Local Exhaust Ventilation (LEV)	An engineering method to capture and control airborne releases at or close to the point of emission of toxic dusts, fumes, mists , gases or vapors by means of ventilation that transports the contaminant to a point where it can be safely collected or discharged. Best applied to point sources of release of contaminants.
Localised	Restricted to one spot or area in the body, not spread through it, c.f., systemic .
Log K_{oc}	K _{oc} is the partition coefficient (K) of a substance in a two-phase system consisting of water and soil, specifically the organic carbon content of the soil. The concentration (C) of the substance is measured during each phase after achieving equilibrium and is represented as a quotient of the two concentrations <i>C organic carbon/ C water</i> . The partition coefficient is usually presented in the form of its logarithm to the base ten. Single value for K _{oc} can only be measured when the material is a single, pure substance. Mixtures are represented by a K _{oc} range that will indicate the range of values for its various components.
Log P_{ow}	P _{ow} is the partition coefficient (P) of a substance dissolved in a two-phase system consisting of n-octanol and water. The concentration (C) of a substance is measured during each phase after achieving equilibrium and is represented as a quotient of the two concentrations <i>C octanol/ C water</i> . The partition coefficient is usually presented in the form of its logarithm to the base ten. It may also be referred to as <i>Log K_{ow}</i> , or <i>Log P</i> .
MAK	The <i>Maximale Arbeitsplatzkonzentrationen (D)</i> , issued by the Senate Commission of the Deutsche Forschungsgemeinschaft for the examination of hazardous industrial materials. MAKs are defined as the maximum concentration of a chemical substance in workplace air which generally does not have any known adverse effects on the health of the employee nor cause unreasonable annoyance even when the person is repeatedly exposed over long periods, given a 40-hour working week.
Malignant	As applied to a tumor , producing cancer , capable of undergoing metastasis .
Marine Pollutants	Substances harmful to the marine environment if carried in packaged form.

MARPOL 73/78	The International Convention for the Prevention of Pollution from ships (1973), as modified by the Protocol of 1978 relating thereto (Marpol 73/78). Annex II includes regulations for the control of pollution by noxious liquid substances in bulk. Annex III covers harmful substances carried in packaged form, i.e. substances identified as marine pollutants in the IMDG-Code .
Maximum Exposure Limit	The Maximum Exposure Limit (UK), the maximum concentration of an airborne substance averaged over a reference period to which employees may be exposed by inhalation under any circumstances, and that is specified in the UK <i>Control of Substances Hazardous to Health Regulations (COSHH, UK)</i> .
MEGC	Multiple-element gas container
Melting Point	The temperature at which a substance can exist together in both liquid and solid form, normally measured at 760 mm Hg .
Metabolism	The biochemical processes by which the body functions, converting absorbed materials, including any toxic substances , often with limited water solubility , to more water soluble forms to release energy and to facilitate excretion of by-products in the urine; some metabolic intermediates (metabolites) in these processes may be more toxic than the parent compounds from which they are derived.
Metastasis	The spread of a malignant growth from the site of a primary cancer to secondary sites due to the movement of malignant cells through the blood or lymphatic systems.
MFAG	Medical First Aid Guide for Use in Accidents involving Dangerous Goods.
mg	A unit of weight, one thousandth of a gram.
micron	A unit of length, one millionth of a meter.
Min.	Minimum.
Mist	A dispersion of liquid droplets in air, often large enough to be individually visible.
Mixture (EEC/EU usage).	An intentional mixture of two or more substances
MLD	The Minimum Lethal Dose , the smallest dose killing one of a group of animals under laboratory conditions.
mm Hg	A unit of pressure, one millimeter of mercury.
Molecular Weight	The weight of a chemical molecule relative to that of (MW) an atom of carbon 12 taken as 12.
Mucous Membranes	The lining of the hollow organs of the body, notably the mouth, stomach, intestines, respiratory system and urinary tract.
Mutagenic (DNA), c.f., genotoxic.	Able to produce heritable changes in genetic material.
Mutation	A transformation of a gene which may alter the characteristics of subsequent generations.
MW	Molecular Weight.
Narcosis	Stupor or unconsciousness produced by chemical substances .
Nausea	An unpleasant sensation, often culminating in vomiting.
Necropsy	Autopsy; post mortem.
Necrosis	The death of cellular tissue.
NFPA	National Fire Protection Association (US).
NH&MRC	National Health and Medical Research Council (Australia).
NIOSH	National Institute of Occupational Safety and Health (US).

NOEC	No-Observed-Effect Concentration ; the base point in an ecotoxicity study against which the Predicted Environmental Concentration (PEC) of a material can be compared.
NOEL / NOAEL	The No Observed Effect Level (NOEL) is the highest tested dose or exposure level at which, in a study, no statistically significant effect is observed in the exposed population compared with an appropriate control group. The No Observed Adverse Effect Level (NOAEL) is the highest tested dose or exposure level at which there are no statistically significant increases in the frequency or severity of adverse effects between the exposed population and an appropriate control group, some effects may be produced at this level, but they are not considered adverse or precursors of adverse effects
NOHSC	National Occupational Health and Safety Commissions (Australia), also known as <i>Worksafe</i> .
N.O.S.	Not Otherwise Specified ; used as a collective entry in transport regulations to which substances may be assigned if they are not mentioned by name. National Toxicology Program (US usage). A Federal activity overseen by the Department of Health and Human Services. Its goals are to develop tests useful for public health regulation of toxic chemicals, to foster testing of materials, and to communicate the results for use by others.
Nuisance Dust	Generally low toxicity dust , not recognized as the direct cause of any serious pathological condition.
Occupational Exposure Limit (OEL)	Generic term applied to the airborne concentration limit for a hazardous substance in the work environment; intended to minimize adverse effects from occupational exposure, e.g., the TLV , PEL or MAK .
Occupational Exposure Standard (OES)	The concentration of an airborne substance , averaged over a reference period, that according to current knowledge, has no evidence to be injurious to employees who are exposed daily to inhalation to that concentration (UK usage)
Odour Threshold	The minimum concentration of a material in the air detectable by the human nose; not to be used as a reliable method of identifying hazardous conditions in the workplace.
Oncogenic	Capable of producing tumors .
Operational conditions	Operational conditions include e.g. physical appearance of preparation, duration and frequency of use/exposure, amount of substance, ventilation rate. More general: The operational conditions include any action, use of tool or parameter state that prevails during manufacture or use of a substance (either in a pure state or in a preparation) that as a side effect might have an impact on exposure of humans and/ or the environment.
Oral	Affecting, or by way of, the mouth.
Oral LD₅₀	Oral Lethal Dose 50% , the oral dose of a material causing death in 50 percent of an exposed species, usually within the first 30 days.
Oral Toxicity	Adverse effects which result from taking a substance into the body via the mouth.
OSHA	Occupational Safety and Health Administration (US) .
Over Exposure	Exposure beyond specified limits.
Oxidising Agent	A material (other than a blasting agent or explosive) that initiates or promotes oxidation in other materials, possibly causing fire either of itself or through the release of oxygen or other gases.
Pa	A unit of pressure, a Pascal; normal atmospheric pressure equals 101.3 kPa, 1 Pascal equals 10 ⁻⁵ bar .
PAHs	Polynuclear Aromatic Hydrocarbons , also described as PolyNuclear Aromatics .
Partition Coefficient (n-octanol water)	The ratio of the concentration of a substance in n-octanol as compared to water. Higher values indicate a higher chance of accumulation of the substance in biological material.
PBT Persistent, Bioaccumulative, Toxic	Annex XIII defines criteria for the identification of substances that are Persistent, Bio-accumulative and Toxic (PBTs) and Annex I lays down general provisions for PBT assessment. PBTs are substances of very high concern (SVHC) and may be included in REACH Annex XIV and by that be made subject to authorization.
PEC	Predicted Environmental Concentration .

PEL	Permissible Exposure Level.
Percent Volatiles	Percentage of a mixture of materials that can be lost by evaporation.
Percent of Volatility	Volatility of the amount of solvent contained in a mixture .
Percutaneous	Through or across the skin; usually refers to absorption of material through intact skin.
Peripheral Polyneuropathy	A serious progressive and potentially irreversible disorder of the peripheral nervous system.
Permissible Exposure Level (PEL)	OELs published by the US OSHA ; based on the 1968 TLV list.
Personal Monitoring	An industrial hygiene technique to measure an individual's exposure to airborne contaminants , e.g., by a personal dosimeter.
Petrorisk	An environmental risk assessment tool developed by CONCAWE to perform REACH assessments for complex hydrocarbon substances using the hydrocarbon block method consistent with ECHA guidance.
pH	A value, on a scale 0-14, representing the acidity or alkalinity of an aqueous solution. Water is neutral at pH7. Acids have a pH of less than 7: the lower the number, the stronger the acid. Alkalis have a pH greater than 7: the higher the number, the stronger the alkali.
PMCC	Pensky-Martens Closed Cup , a flash point test method.
PMN	Pre-Marketing Notification.
PNAs See also PAH .	Polynuclear Aromatic Hydrocarbons.
PNEC	Predicted No Effect Level
Poisons Schedule	Compounds requiring special labelling and precautions in use, including restrictions at the point of sale (Australia).
Polymer	A high molecular weight material formed by chemically joining together a number (from five to several thousand, depending on the physical properties required in the end- product) of smaller molecules (<i>monomers</i>).
Polymerization	A chemical reaction leading to the formation of a polymer ; a <i>hazardous polymerization</i> is one that takes place quickly, releasing large amounts of energy.
Post Mortem	Autopsy, necropsy.
Pour Point	The lowest temperature at which a liquid will flow or pour under prescribed conditions.
P_{ow}	See Log P_{ow} and Partition Coefficient .
ppb	Parts per billion (usually the American billion, usually V/V for air contaminants).
ppm	Parts per million (usually V/V for air contaminants).
Precautionary statement	A statement indicating how the product should be handled to minimize risks to the user (as well as to other people and the general environment). Used by CLP and equivalent to Safety phrase in Dangerous Substance Directive.
Predicted Environmental Concentration	Concentration of a material predicted to be present in a particular environment compartment (air, water or soil), based on a mathematical model.
Predicted No-Effect Concentration (PNEC)	Concentration of the substance below which adverse effects in the environmental sphere of concern are not expected to occur. Source: REACH Annex I 3.0.1
Pre-Marketing Notification	The introduction of a new substance not listed in EINECS to the Member State markets of the EU .

Process category	Element of the use descriptor system describing the type of technical processes applied during manufacturing and use (PROCs). In other categorization systems for occupational conditions, the term <i>operation unit</i> (OU) is used.
Product Description	A description of the product's appearance and physical state.
Product Identifier	Used by CLP; means the name or number used for a hazardous product on a label or in the SDS. It provides a unique means by which the product user can identify the substance or mixture within the particular use setting (e.g. transport, consumer or workplace).
PSIMS	ExxonMobil P roduct S tewardship I nformation M anagement S ystem used for creation, storage & distribution of our safety data sheets
PSN	P roper S hipping N ame, accurate description for dangerous goods most commonly transported or the " <i>correct technical name</i> " required by regulation 4 of MARPOL 73/78
Pulmonary Oedema	An accumulation of fluid in the lungs.
Rash	A scattered and raised reddish coloring or series of blotches on the skin, sometimes covered with scales or crusts.
REACH	R egistration, E valuation, A uthorization and R estriction of C hemicals regulation EC No 1907/2006.
RCR	Risk Characterization Ratio
Regulation	A European legislative instrument (EEC/EU usage). Regulations are proposed by the <i>European Commission</i> or <i>Council</i> and specifically address the governments of the Member States. Once adopted, a Regulation creates binding legislation in the Member States which automatically enters into force on a specified date, usually several days after publication in the Official Journal. C.f., Decision or Directive .
RID	R èglement I nternational concernant le transport des marchandises d angereuses par chemins de fer. (Regulations concerning the International Carriage of Dangerous Goods by Rail)
Restriction	Any condition for or prohibition of the manufacture, use or placing on the market of a substance. The substances restricted under REACH and the conditions of their restrictions are included in Annex XVII of the Regulation.
Risk	The probability that harm will occur as a consequence of exposure during use of a chemical, physical or biological agent.
Risk management Measures	Risk management measures include e.g. containment of process, local exhaust ventilation, gloves, waste water treatment, exhaust air filters. More general: risk management measures include any action, use of tool, change of parameter state <i>that is introduced</i> during manufacture or use of a substance (either in a pure state or in a preparation) in order to prevent, control, or reduce exposure of humans and / or the environment. Measures in the control strategy for a substance that reduce the emission and exposure to a substance, thereby reducing the risk to human health or the environment.
R Phrases	Risk Phrases, a set of numbered standard sentences that appears on user labels for packaged goods; e.g., <i>R23: toxic by inhalation</i> (EEC/EU usage).
RTECS	R egistry of T oxic E ffects of C hemical S ubstances (NIOSH usage).
Safety Data Sheet (SDS)	The safety data sheet is the main tool used in industry for communicating information on the hazard of dangerous substances and preparations through the supply chain. Annex II of REACH is based on the Annex to the safety data sheet Directive (91/155/EEC) and explains what information should be included under each of the 16 safety data sheet headings. Document describing the properties and uses of a chemical product or formulation, including its identity, chemical and physical properties, health hazard information, precautions for use, and information on safe handling.
Sectors of use	Element of the use descriptor system describing the sector of economy (industry, professional service, private) a substance is used in, as such or in a preparation.

Sensitization	To make or become sensitive, or to develop an allergy , due to the effects of a chemical										
Sensitizer	A material which on first exposure may or may not elicit any response, but which may trigger an allergy on second or third exposure, following the initiation of defense mechanisms within the body										
SETA (SF)	A flash point test method, now little used										
SG	Specific Gravity.										
Shock Sensitivity SI	The tendency of a substance to explode if dropped or roughly handled International System of units , e.g., metre, kilogram										
Signal word	Used by CLP; "Danger" or "Warning" are used to emphasize hazards and indicate the relative level of severity of the hazard, assigned to a hazard class and category.										
Skin Dose	A dose , specifically placed on the surface of the skin.										
Solubility	<p>The percentage of a material (by weight) that dissolves (in water) at ambient temperature. Solubility information is useful in determining the most appropriate cleaning methods for spills and for fire-extinguishing techniques for any material. Solubility may be expressed as:</p> <table border="0"> <tr> <td><i>Negligible</i></td> <td><i>less than 0.1%;</i></td> </tr> <tr> <td><i>Slight</i></td> <td><i>0.1 to 1.0%;</i></td> </tr> <tr> <td><i>Moderate</i></td> <td><i>1 to 10%;</i></td> </tr> <tr> <td><i>Appreciable</i></td> <td><i>more than 10%;</i></td> </tr> <tr> <td><i>Complete</i></td> <td><i>soluble in all proportions.</i></td> </tr> </table> <p>It may also be expressed as a percentage by weight in a solution, as grams of solute per liter of solution, or as grams of solute dissolved in 100 g of water.</p>	<i>Negligible</i>	<i>less than 0.1%;</i>	<i>Slight</i>	<i>0.1 to 1.0%;</i>	<i>Moderate</i>	<i>1 to 10%;</i>	<i>Appreciable</i>	<i>more than 10%;</i>	<i>Complete</i>	<i>soluble in all proportions.</i>
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<i>Complete</i>	<i>soluble in all proportions.</i>										
S Phrases	Safety Phrases, a set of numbered standard sentences which any material. Solubility may be expressed as appear on user labels for packaged goods, e.g., <i>S15: keep away from heat</i> (EEC/EU usage).										
Sp. Gr.	Specific Gravity.										
Specific Gravity (SG/Sp. Gr.)	A measure of the density of a liquid compared to that of water.										
Standard Temperature & Pressure (STP)	A reference condition for gases consisting of a temperature of 0°C and a pressure of one atmosphere (760 mm Hg); note these are not the reference conditions for any system of OELs .										
STEL	Short Term Exposure Limit , see Threshold Limit Value .										
Subacute illness	An illness or condition that is not yet as serious or dangerous as the acute phase, but which may become so if not properly managed.										
Subchronic Toxicity	Subchronic toxicity effects are those with a delayed onset, resulting from repeated exposure to relatively small amounts of a chemical over a prolonged period (e.g., up to 6 months). Reproductive effects (fertility, effect on fetus) are included in this category.										
Subsidiary Risk	Class number of a subsidiary risk identified by applying the classification principles for dangerous goods. Labels/placards should be displayed for subsidiary risks.										
Substance	A chemical element or its compounds in its natural state or obtained by any production process (EEC/EU usage), c.f., mixture .										
Substitution	Replacement of a substance, or physical appearance of a preparation or a technique with an alternative (less hazardous or lower exposure potential). The registrant of a substance under REACH will usually not recommend the substitution of that substance as a risk management measure. However he can advise against a certain use of the substance or limit the uses covered in his exposure scenario. In this way he may initiate substitution further down the supply chain.										

SVHC	SVHC in the context of the REACH Regulation are: 1. CMRs category 1 or 2 2. PBTs and vPvBs meeting the criteria of Annex XIII and 3. substances, such as those having endocrine disrupting properties or those having persistent, bioaccumulative and toxic properties or very persistent and very bioaccumulative properties, which do not fulfil the criteria of Annex III, for which there is scientific evidence of probable serious effects to human health or the environment which give rise to an equivalent level of concern to those of other substances listed in points 1 and 2 and which are identified on a case-by-case basis in accordance with the procedure set out in Article 59
Systemic	Spread throughout the body and affecting one or more body systems or organs, not localized in one spot or area; where any affected body system or organ is remote from the point at which the agent causing the effect contacted or entered the body.
Systemic Effect	The effects on one or more body systems or organs remote from the point at which the agent causing the effect contacted or entered the body, c.f., local effect .
Systemic Toxicity	Effect of a toxic agent remote from the point at which the agent contacted or entered the body.
T₃₃Hydrolysis	The Hydrolysis Half-Life, a measure of the rate at which a material will physically degrade by hydrolysis. The time (T) in which one half of the concentration of a substance (the parent molecule) will hydrolyze, forming degradation end products different from the parent molecule. The degradation process involves cleavage of the parent molecule with the addition of a water molecule to form two smaller molecules.
TCC	Tag Closed Cup, a flash point test method.
TC_{Lo}	The lowest concentration of a material, usually in air, that is reported to have produced any toxic effect in humans or animals.
TD_{Lo}	The lowest dose of a material that is reported to have produced any toxic effect in humans or animals.
Teratogen	A material capable of causing teratogenesis .
Teratogenesis	The development of defects in, or deformity of, a fetus .
Threshold Limit Value (TLV)	The airborne concentrations of substances to which it is believed that nearly all workers may be repeatedly exposed day after day without adverse effects. TLVs are determined and published annually by the American Conference of Governmental Industrial Hygienists (ACGIH).
TOC	Tag Open Cup, a flash point test method.
Toxic Effect	Transient or permanent damage to an organism as a result of exposure to a toxic substance ; usually refers to systemic (functional) damage but may be developmental in respect of tissue and skeleton in the case of an embryo.
Toxic Substance	Any substance which may, within a certain dose range, impair a living organism
Toxicity	The inherent properties of a chemical, physical or biological agent which cause injurious effects in biological systems (humans, animals, plants, etc.).
Toxicology	The quantitative study of injurious effects of chemical, physical or biological agents
Trauma	An injury or wound brought about by an outside force.
Tremcard	ADR, RID, ADN instructions in writing providing actions in the event of a transport accident or emergency (Transport Emergency Card)
Tremour	An involuntary shaking, trembling or shivering.
TRK	Technische Richtkonzentrationen (Technical Guide Concentration). Used by the German Federal Ministry of Labour to describe the concentration in air of a substance that should not be exceeded in industry; applies to dangerous substances for which, in the state of present toxicological and medical knowledge, no safe MAK can be assigned, e.g., carcinogens and mutagens .
Tumor	A swelling or growth of unwanted and useless cells and tissues anywhere in the body; may be either benign or malignant .

TWA	Time-Weighted Average Concentration.
UEL	The Upper Explosive Limit (Flammable Limit) of a flammable material.
Ulcer	A result of destruction of skin or mucous membrane , with or without infection or pain.
UN	United Nations .
UN Number	A four-figure number assigned to dangerous goods most commonly carried.
US	United States (of America).
Use descriptor system (UDS)	Set of 4 descriptors which can be used i) to briefly describe identified uses in a brief general way and ii) to build the short title of an exposure scenario. The four descriptors are: <ul style="list-style-type: none"> f Sectors of use (SU) f Preparation/product Category (PC) f Process category (PROC) f Article category (AC)
Use outside the conditions described in an exposure scenario	If a downstream user cannot demonstrate that he works within the conditions described in the exposure scenario communicated to him he has the duty to <ul style="list-style-type: none"> i) carry out an own CSA and/or ii) to inform his supplier that the ES needs to be adapted or an ES that covers the conditions needs to be added to the ext-SDS.
UVCB Substances	Substances of unknown or variable composition; complex reaction products and biological materials. Although they are listed as substances in EINECS , the rules of the Dangerous Preparations Directive with regard to classification and labelling apply.
UVCB	A term used within REACH to describe substances of Unknown or Variable Composition, Complex Reaction products and Biological materials. For example, many refinery streams fall into the category of UVCB. UVCB substances are not treated
Vapor Hazard Ratio	The ratio of equilibrium vapor concentration at 25°C to the TLV expressed in ppm per ppm.
Vapor Density	The mass of a certain volume of a substance divided by the mass of the same volume of hydrogen.
Vapor Pressure	The pressure at any given temperature of a vapor in equilibrium with its liquid or solid phase.
Viscosity	Measurement of the flow of properties of a material expressed as its resistance to flow. Units of measurement and temperature are included.
vPvB very Persistent very Bioaccumulative	Applied to substances of very high concern, which are very persistent (very difficult to break down) and very bio-accumulative in living organisms. Annex XIII defines criteria for the identification of vPvBs and Annex I lays down general provisions for their assessment. vPvBs may be included in Annex XIV and by that be made subject to authorization
Volatility	The tendency or ability of a liquid to pass into the vapor phase; liquids such as alcohol or gasoline, because of their tendency to evaporate rapidly, are called <i>volatile liquids</i> .
V/V	Volume per Volume.
WEEL	Work Place Exposure Level
W/V	Weight per Volume .
W/W	Weight per Weight .
Xenobiotic	A chemical which is not a natural component of the living organism exposed to it.