SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1 Product identifier

| Trade name | : | Jet A-1 |

1.2 Relevant identified uses of the substance or mixture and uses advised against

Use of the Substance/Mixture

| Intended usage | : | Operation of aircraft engines. For further information our Competence Center Fuels is available to you at the telephone no. +43-1-40440-43486. |
| Identified uses according to CSR (Chemical Safety Report) | : | Manufacture 01-Manufacture of substance Formulation or re-packing 02 - Formulation & (re)packing of substances and mixtures Use at industrial sites 01a - Distribution of substance 12a - Use as a fuel - Industrial Widespread use by professional workers 12b - Use as a fuel - Professional |

For details related to the Uses please see Annex. Recommended restrictions on use

| Uses advised against | : | The Professional and or Consumer Uses of Kerosine substances in coatings, cleaning agents, lubricants, metal working fluids, binders and release agents, agrochemicals, road and construction applications, and explosives are advised against. For reasons of protection of human health, these uses are no longer supported in the registration dossiers. |

1.3 Details of the supplier of the safety data sheet

| Full address Manufacturer, importer, supplier | : | OMV Refining & Marketing GmbH Trabrennstrasse 6-8 1020 Wien Austria |
| Telephone | : | +43 (0) 810 240 282 |
| E-mail address of the competent person | : | info.msds@omv.com |

1.4 Emergency telephone number

| +43 (0) 664 91 08 787 | : | Green-line refinery Schwechat 24h/7d |
| +43 (0) 1 406 43 43 | : | Poison Control Centre - Hours of operation: 24h/7d |

SECTION 2: HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Classification (EC Regulation No 1272/2008)

Flam. Liq. 3 H226, Skin Irrit. 2 H315, Asp. Tox. 1 H304, STOT SE 3 H336, Aquatic Chronic 2 H411,
Safety Data Sheet as per EC Regulation No. 1907/2006

Jet A-1
Pdnr. 442000

Date of issue: 01.12.1989
Revision Date: 01.02.2018

For the full text of classifications referred to in this section and H-phrases, see Section 16.

2.2 Label elements

Labelling (EC Regulation No 1272/2008)

Hazard pictograms:

- Signal word: Danger
- Hazard statements:
  - H226 Flammable liquid and vapour.
  - H304 May be fatal if swallowed and enters airways.
  - H315 Causes skin irritation.
  - H336 May cause drowsiness or dizziness.
  - H411 Toxic to aquatic life with long lasting effects.
- Precautionary statements:
  - P102 Keep out of reach of children.
  - Prevention:
    - P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
    - P273 Avoid release to the environment.
    - P280 Wear protective gloves/protective clothing/eye protection/face protection.
  - Response:
    - P301 + P310 IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
    - P331 Do NOT induce vomiting.
  - Disposal:
    - P501 Dispose of contents/container according to the disposal routes specified by law.

2.3 Other hazards

Remarks: Particular danger of slipping caused by the escaped or spilled product.
Further dangers to man and environment caused by the product are not known.
According to the results of current assessment(s), contains no substance assessed to be a PBT or a vPvB.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

not applicable

3.2 Mixtures

<table>
<thead>
<tr>
<th>Chemical nature</th>
<th>Hydrocarbons</th>
</tr>
</thead>
</table>

Printing date: 28.11.2018 .... Version: 8.0  442000, AT / English
<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Index-No. (CAS-No., EINECS-No./ELINCS No., Registration number)</th>
<th>Classification (EC Regulation No 1272/2008)</th>
<th>Concentration [%W/W]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kerosine (petroleum)</td>
<td>649-404-00-4 8008-20-6 232-366-4 01-2119485517-27-0000</td>
<td>Flam. Liq. 3; H226</td>
<td>&lt;= 100,00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Skin Irrit. 2; H315</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Asp. Tox. 1; H304</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>STOT SE 3; H336</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Aquatic Chronic 2; H411</td>
<td></td>
</tr>
<tr>
<td>Kerosine (petroleum), hydrodesulfurized</td>
<td>649-423-00-8 64742-81-0 265-184-9 01-2119462828-25-0096</td>
<td>Flam. Liq. 3; H226</td>
<td>&lt;= 100,00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Skin Irrit. 2; H315</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Asp. Tox. 1; H304</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>STOT SE 3; H336</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Aquatic Chronic 2; H411</td>
<td></td>
</tr>
<tr>
<td>Kerosine (petroleum), sweetened</td>
<td>649-427-00-X 91770-15-9 294-799-5 01-2119502385-46-0000</td>
<td>Flam. Liq. 3; H226</td>
<td>&lt;= 100,00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Skin Irrit. 2; H315</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Asp. Tox. 1; H304</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>STOT SE 3; H336</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Aquatic Chronic 2; H411</td>
<td></td>
</tr>
</tbody>
</table>
These values do not represent any product specification / max. possible mass percentages for classification
For the full text of classifications referred to in this section and H-phrases, see Section 16.

**SECTION 4. FIRST AID MEASURES**

### 4.1 Description of first aid measures

<table>
<thead>
<tr>
<th>General advice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Always assess scene safety prior to attempting to rescue casualties and administering first aid. Own protection of the first responders to be considered. Always call for help prior to helping the casualty. Spillages make surface slippery. Before attempting to rescue casualties, isolate area from all potential sources of ignition including disconnecting electrical supply. Ensure adequate ventilation and check that a safe, breathable atmosphere is present before entry into confined spaces. Drench contaminated clothing with water before removing to avoid risk of sparks from static electricity.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Inhalation</th>
</tr>
</thead>
<tbody>
<tr>
<td>After inhaling the vapours during an accident affected persons are to be taken to the fresh air. Keep warm and at rest. If the casualty is conscious, place in the recovery position. (upright or leaning slightly forward in a sitting position). If casualty is unconscious and not breathing: Ensure that there is no obstruction to breathing and give artificial respiration by trained personnel. If necessary, give external cardiac massage and obtain medical advice. If casualty is unconscious and breathing: place in the recovery position and keep the head below the level of the torso. Administer oxygen if necessary. Obtain medical attention if casualty has an altered state of consciousness or if symptoms do not resolve.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Skin contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remove contaminated clothing, contaminated footwear and dispose of safely. Wash affected area with soap and water. (10 to 15 minutes). Never use gasoline, kerosene or other solvents for washing of contaminated skin. Seek medical attention if skin irritation, swelling or redness develops and persists. When using high-pressure equipment, injection of product can occur. If high-pressure injuries occur, immediately seek professional medical attention. Do not wait for symptoms to develop. For minor thermal burns, cool the burn. Hold the burned area under cold running water for at least five minutes, or until the pain subsides. How ever, body hypothermia must be avoided.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Eye contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upon the contact with the eye rinse it under running water and with the lids forced apart or by means of the eye rinsing bottle for 15 minutes. Remove contact lenses if safe and easy to do so and continue rinsing. Avoid contaminated water coming into contact with the other eye or face. In case of persistent discomforts an ophthalmologist is to be consulted.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ingestion, Intake into the Lungs</th>
</tr>
</thead>
<tbody>
<tr>
<td>In case of ingestion, always assume that aspiration has occurred. The casualty should be sent immediately to hospital. Do not wait for symptoms to develop. Do not induce vomiting as there is high risk of aspiration. Consulting a doctor. In case of suspicion (vomiting, coughing, breathing troubles) a doctor is to be consulted. Do not give anything by mouth to an unconscious person.</td>
</tr>
</tbody>
</table>
4.2 Most important symptoms and effects, both acute and delayed

| Symptoms | Nausea, vomiting, and diarrhea as well as the danger of a chemical pneumonitis due to the aspiration during the swallowing or vomiting. Product vapours in high concentrations may cause irritations of the eyes and mucous skins (nose, throat). Upon a long-term inhalation of concentrated vapours headache, vertigo, euphoria, excitation, tremors, tonoclonic spasms, unconsciousness, circulatory insufficiency, and paralysis of the central respiratory system may occur. Very high concentrations lead to unconsciousness after short-term exposure already. By skin contact: reddening, irritation; By eye contact: Slight eye irritation (unspecific). |
| Effects | Irritates the skin and poses risk of chemo pneumonia in case of aspiration. Central nervous system depression including confusion, altered mental status, and seizure can occur after acute, high dose exposure. Cardiac rhythm abnormalities can occur after acute, high dose exposure. |

4.3 Indication of any immediate medical attention and special treatment needed

| Treatment | If necessary in-patient treatment in a hospital to be initiated. Upon the intake of doses of more than 1 to 2 ml per kg of body weight activated carbon (approx. 50 g) is to be given and the person hospitalised. Sedative medicaments (upon medical advice) to be applied in the case of strong excitation. |

SECTION 5: FIREFIGHTING MEASURES

5.1 Extinguishing media

| Suitable extinguishing media | For small sources of fire: extinguishing powder. Sand or earth. In the case of a large source of fire: foam or water in a spraying jet. Foam (trained personnel only); Water fog (trained personnel only); | |
| Unsuitable extinguishing media | Water in a full jet; (could cause splattering and spread the fire); Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam. |

5.2 Special hazards arising from the substance or mixture

| Particular hazards due to the substance or the mixture, its products of combustion, or the gases produced during the combustion | This substance will float and can be reignited on surface water. Evaporated product is heavier than air and rests close to the bottom. The vapours can produce an explosive mixture together with air. Prevent the penetration into the sewer system and rooms at low levels. Prevent the penetration into the soil and waters. Sources of ignition to be kept off. Use explosion-proof and solvent resistant devices only. This substance can propagate on the surface and reignite. Incomplete combustion is likely to give rise to a complex mixture of airborne solid and liquid particulates, gases, including carbon monoxide. |

5.3 Advice for firefighters

| Special protecting equipment | In case of a large fire or in confined or poorly ventilated spaces, wear full fire resistant and chemical resistant protective clothing and self-contained breathing apparatus (SCBA) with full face-piece operated in positive pressure mode. |
SECTION 6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

**Personal precautions**

- Approaching only in the direction of the wind (changes of the wind directions to be considered). Stop or contain leaks at the source, if safe to do so. Avoid direct contact with released material. Stay upwind. In case of large spillages, alert occupants in downwind areas. Make explosimeter measurements for determining the dangerous zone and cordon it off. Keep uninvolved persons off the site. Alert emergency personnel. Except in case of small spillages: The feasibility of any actions should always be assessed and advised, if possible, by a trained, competent person in charge of managing the emergency. If required, notify relevant authorities according to all applicable regulations. Personal protection equipment for emergency responders. Small spillages: normal antistatic working clothes are usually adequate. Large spillages: full body suit of chemically resistant and antistatic material; if necessary heat resistant and insulated. Work gloves providing adequate chemical resistance, specifically to aromatic hydrocarbons. Note: gloves made of PVA (Polyvinyl Alcohol) are not water-resistant, and are not suitable for emergency use. Respiratory protection: A half or full face respirator with filter(s) for organic vapours (and when applicable for H2S) or a Self Contained Breathing Apparatus (SCBA) can be used according to the extent of spill and predictable amount of exposure. If the situation cannot be completely assessed, or if an oxygen deficiency is possible, only SCBA’s should be used. Affected rooms to be ventilated thoroughly. Eliminate all ignition sources if safe to do so (e.g. electricity, sparks, fires, flares). In the dangerous zone non explosion-proof machinery, devices, and vehicles are to be stopped, no smoking, no actuation of any switch or electrical device that may produce a spark. Evaporated product is heavier than air and propagates close to the ground.

6.2 Environmental precautions

**Environmental precautions**

- Escaping point to be sealed. When inside buildings or confined spaces, ensure adequate ventilation. Preventing the penetration into the sewer system, surface waters, and the groundwater by erecting sand and/or earth blockings or by means of other suitable blocking measures. In the case of escapes into surface waters, the sewer system, or into the soil the competent authorities are to be informed.
SECTION 7: HANDLING AND STORAGE

7.1 Precautions for safe handling

Information on the safe handling

- Use and store only outdoors or in a well-ventilated area. Very good aeration and ventilation of the workplace and of the storage room, also close to the bottom, to be assured. Avoid contact with skin and eyes. Do not ingest. Avoid breathing vapours. Use personal protective equipment as required. Formation of aerosols to be avoided. Spilling of the product to be avoided.

Advice on protection against fire and explosion

- Evaporated product is heavier than air and rests close to the bottom. The vapours can produce an explosive mixture together with air. Prevent the penetration into the sewer system and rooms at low levels. Prevent the penetration into the soil and waters. Measures against electrostatic charging to be taken. All devices to be earthed or connected via conductors. Keep away from electrical devices, open flames, sources of heat, and sparks. Explosion-proof devices / valves and non-sparking tools to be used. No smoking. Do not use compressed air for filling, discharging, or handling operations. Ensure that all relevant regulations regarding explosive atmospheres, and handling and storage facilities of flammable products, are followed.

See also section 8 (personal protective equipment) and 13 (disposal).
7.2 Conditions for safe storage, including any incompatibilities

| Requirements for storage areas and containers | Storage area layout, tank design, equipment and operating procedures must comply with the relevant European, national or local legislation. Storage installations should be designed with adequate bunds so as to prevent ground and water pollution in case of leaks or spills. Containers to be kept tightly closed and at a thoroughly ventilated place. Only approved stationary containers to be used. All tanks and devices to be earthed or connected via conductors. Storage upon a suitable underground. Normally, a tightly sealed and resistant storage room is required. Cleaning, inspection and maintenance of internal structure of storage tanks must be done only by properly equipped and qualified personnel as defined by national, local or company regulations. Before entering storage tanks and beginning work in enclosed spaces, the air must be tested for oxygen content, air pollutants and explosive atmosphere. Recommended materials: For containers, or container linings use mild steel, stainless steel. Unsuitable materials: Some synthetic materials may be unsuitable for containers or container linings depending on the material specification and intended use. Compatibility should be checked with the manufacturer. If the product is supplied in containers: Keep only in the original container. Keep containers properly labelled. Protect from the sunlight. Light hydrocarbon vapours can build up in the headspace of containers. These can cause flammability / explosion hazards. Emptied containers may contain residues of flammable product. |
| Further information on storage conditions | Heat influences to be avoided. Sources of ignition to be kept off. |
Advice on common storage

Do not store together with:
- explosive hazardous substances (LGK 1),
- gases (LGK 2 A),
- other explosive hazardous substances (LGK 4.1 A),
- flammable solid hazardous substances (LGK 4.1 B),
- pyrophoric or self-heating hazardous substances (LGK 4.2),
- hazardous substances which develop flammable gases upon contact with water (LGK 4.3),
- highly oxidising hazardous substances (LGK 5.1 A),
- ammonium nitrate and preparations containing ammonium nitrate (LGK 5.1 C),
- organic peroxides and self-reactive hazardous substances (LGK 5.2),
- non-combustible, acutely toxic cat. 1 and 2 / very toxic hazardous substances (LGK 6.1 B),
- infectious substances (LGK 6.2),
- radioactive substances (LGK 7).

Restrictions for storage with:
- oxidising hazardous substances (LGK 5.1 B),
- non-combustible hazardous substances that are of acute toxicity cat. 3 / toxic or with chronic effects (LGK 6.1 D),
- combustible solids (LGK 11),
- other combustible and non-combustible substances (LGK 10-13),

Due to specific storage instructions and because of particular properties of the substances within a storage facility, other restrictions may result from the assessment of the hazards.
TRGS 509 resp. 510 must be observed.

7.3 Specific end use(s)

Information relating to special applications

Relevant exposure scenarios see Annex. Observe the maximum allowable daily amount (MSafe) listed for the mixture in the attached exposure scenarios to ensure safe use.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Occupational limit value of the product

No data known

Occupational limit value of the components

Components: Intentional ingredients of mixtures and/or markers for substance classification
Kerosine (petroleum) - CAS-No.: 8008-20-6 - EINECS-No.: 232-366-4

<table>
<thead>
<tr>
<th>Type</th>
<th>mg/m³</th>
<th>ppm</th>
<th>Exceeding coefficient</th>
<th>Note</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLV-TWA</td>
<td>-</td>
<td>70</td>
<td>-</td>
<td>Mixture of hydrocarbons, 1-25% aromatics, &lt; 1% n-Hexane</td>
<td>Austrian Ordinance on Limit Values</td>
</tr>
</tbody>
</table>

Kerosine (petroleum), hydrodesulfurized - CAS-No.: 64742-81-0 - EINECS-No.: 265-184-9

<table>
<thead>
<tr>
<th>Type</th>
<th>mg/m³</th>
<th>ppm</th>
<th>Exceeding coefficient</th>
<th>Note</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLV-TWA</td>
<td>-</td>
<td>70</td>
<td>-</td>
<td>Mixture of hydrocarbons, 1-25% aromatics, &lt; 1% n-Hexane</td>
<td>Austrian Ordinance on Limit Values</td>
</tr>
</tbody>
</table>

Kerosine (petroleum), sweetened - CAS-No.: 91770-15-9 - EINECS-No.: 294-799-5

<table>
<thead>
<tr>
<th>Type</th>
<th>mg/m³</th>
<th>ppm</th>
<th>Exceeding coefficient</th>
<th>Note</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLV-TWA</td>
<td>-</td>
<td>50</td>
<td>-</td>
<td>Mixture of hydrocarbons &gt;=5% n-Hexane</td>
<td>Austrian Ordinance on Limit Values</td>
</tr>
</tbody>
</table>

A  Fraction passing the alveoles
E  Inhalable fraction
H  Skin resorptive
Y  A risk of teratogenic effects need not be feared when the occupational exposure limit and the biological limit value (BLV) are respected.
Z  A risk of teratogenic effects cannot be excluded even if the OEL and the BLV are respected.
Sh  danger of skin sensitisation
SP  danger of photo contact sensitisation
Sa  respiratory sensitiser
Sah Risk of sensitisation of the respiratory tract and skin
X  carcinogenic substance of the Cat. 1A/1B

Biological limit values of the product

No data known

Biological limit values of the components

No data known

DNEL or DMEL of product

End Use: oral; Long-term, systemic effects

Value: 19 mg/kg

DNEL, General population

PNEC of product

Water, waste water, soil, sediment

No single PNEC can be given because the product is a mixture of hydrocarbon UVCB substances.
8.2 Exposure controls

Relevant exposure scenarios see Annex. Observe the maximum allowable daily amount (MSafe) listed for the mixture in the attached exposure scenarios to ensure safe use.

General safety measures

| Hygiene measures | Ensure that proper housekeeping measures are in place. Any contact with the eyes, the skin, and clothing to be avoided. Clothing contaminated by that substance to be changed immediately and not to be reused before its cleaning. |

Personal protective equipment

| Respiratory protection | When vapours are produced: respiratory protecting and filtering device with gas filter A, characteristic colour: brown (A1 up to 0.1 % vv, A2 up to 0.5 % vv, A3 up to 1 % vv) to be used. In the case of high concentrations and ambiguous situations a respiratory protecting device independent from the ambient air (breathing apparatus) to be used. |
| Hand protection | Because of the great number of influence factors (e.g. temperature, mechanical stress) the duration of use of the recommended chemical protection gloves can be shorter than the penetration time determined in accordance with EN 374. In case of possible hand contact, wear liquid-proof protective gloves. |
| Material: Nitrile | Break through time: 480 min | Strength of material: 0.40 mm | Test method: DIN EN 374 |
| Material: Viton | Break through time: 480 min | Strength of material: 0.70 mm | Test method: DIN EN 374 |
| Material: Butyl | Break through time: 60 min | Strength of material: 0.70 mm | Test method: DIN EN 374 |
| Material: Polychloroprene | Break through time: 30 min | Strength of material: 0.60 mm | Test method: DIN EN 374 |
| Eye/face protection | Fully protecting goggles or protecting screen if there is a danger of splashing. Otherwise protecting goggles with lateral protection. |
| Body protection | Permanently flame retardant and permanently anti-static, solvent-resistant and impervious protective clothing. Work helmet. Antistatic non-skid safety shoes or boots. |
Limitations and supervision of the exposure of the environment

Limitations and supervision of the exposure of the environment:

- Use preferably closed apparatuses. At risk of exposure, suitable extraction should be carried out. Emission limits to be respected, cleaning of the exhaust air to be provided (if required). Also refer to section 6 “Measures in the cases of accidental release”

8.3 Additional advice

In a concrete case and following an individual assessment of the hazards another personal protecting equipment may be required.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Values</th>
<th>Method</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>liquid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aggregate condition</td>
<td>liquid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colour</td>
<td>light, clear at ambient temperature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Odour</td>
<td>petroleumnesque</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Odour threshold</td>
<td>Odour clearly perceptible</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td>not applicable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Melting point/Freezing point</td>
<td>&lt;= -47 °C</td>
<td>ASTM D2386</td>
<td></td>
</tr>
<tr>
<td>start of boiling</td>
<td>ca. 150 °C</td>
<td>ASTM D 86</td>
<td></td>
</tr>
<tr>
<td>final boiling point</td>
<td>&lt;= 300 °C</td>
<td>ASTM D 86</td>
<td></td>
</tr>
<tr>
<td>Flash point</td>
<td>&gt; 38 °C</td>
<td>ASTM D 3828</td>
<td></td>
</tr>
<tr>
<td>Evaporation rate</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Flammability (solid/gas)</td>
<td></td>
<td></td>
<td>no data available</td>
</tr>
<tr>
<td>Lower explosion limit</td>
<td>0,6 % (V)</td>
<td>Literature: Hommel 2010</td>
<td></td>
</tr>
<tr>
<td>Upper explosion limit</td>
<td>6,5 % (V)</td>
<td>Literature: Hommel 2010</td>
<td></td>
</tr>
<tr>
<td>Vapour pressure</td>
<td>&lt;= 2 kPa at 37,8 °C</td>
<td>ASTM D 6378</td>
<td></td>
</tr>
<tr>
<td>Vapour density</td>
<td></td>
<td></td>
<td>not determined</td>
</tr>
<tr>
<td>Density</td>
<td>775 - 840 kg/m³ at 15 °C</td>
<td>ASTM D 4052</td>
<td></td>
</tr>
<tr>
<td>Relative density</td>
<td></td>
<td></td>
<td>no data available</td>
</tr>
<tr>
<td>Water solubility</td>
<td>immiscible</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solubility(ies)</td>
<td></td>
<td></td>
<td>no data available</td>
</tr>
<tr>
<td>Partition coefficient (n-octanol/water)</td>
<td></td>
<td></td>
<td>no data available</td>
</tr>
<tr>
<td>Auto-ignition temperature</td>
<td>&gt; 220 °C</td>
<td>Literature: CSR 2017</td>
<td></td>
</tr>
</tbody>
</table>
Jet A-1
PdNr. 442000

Decomposition temperature
no data available

Viscosity, kinematic <= 8,0 mm²/s at -20 °C ASTM D 445

Viscosity, dynamic
not determined

Explosive properties
Derivation from chemical structure not explosive

Oxidising properties
Derivation from chemical structure not oxidising

9.2 Other information

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Values</th>
<th>Method</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conductivity</td>
<td></td>
<td>ASTM D2624</td>
<td>Note: Electrical conductivity: 50-600 pS/m</td>
</tr>
</tbody>
</table>

SECTION 10: STABILITY AND REACTIVITY

10.1 Reactivity
Stable under normal conditions.

10.2 Chemical stability
Stable under normal conditions.

10.3 Possibility of hazardous reactions

Hazardous reactions: The formation of explosive mixtures of vapours and air is possible. Note: Under normal conditions of storage and use, hazardous reactions will not occur.

10.4 Conditions to avoid

Conditions to avoid: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

10.5 Incompatible materials

Materials to avoid: strong acids and oxidizing agents;

10.6 Hazardous decomposition products

Hazardous decomposition products: no hazardous decomposition products known;
10.7 Additional advice
Invisible vapour, heavier than air

SECTION 11: TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

| Acute oral effect | LD50 rat  
Dose: >5,000 mg/kg bw  
Method: OECD 420  
Test substance: 64742-81-0  
LD50 rat  
Dose: >5000 mg/kg bw  
Method: EPA OTS 798.1175  
Test substance: 8008-20-6 |
| Acute inhaling effect | LC50 rat  
Dose: > 5.28 mg/l / 4 h  
Method: OECD 403  
Test substance: 8008-20-6  
LC50 rat  
Dose: > 5.2 mg/l / 4 h  
Method: OECD 403  
Test substance: 64742-81-0 |
| Acute dermal effect | LD50 rabbit  
Dose: >2,000 mg/kg bw  
Method: OECD 402  
Test substance: 64742-81-0  
LD50 rabbit  
Dose: >2,000 mg/kg bw  
Method: OECD 402  
Test substance: 8008-20-6 |
| Acute effect (other) | no data available |
| Other effects | no information |

Skin corrosion/irritation

| Skin irritation | Rabbit skin  
Result: irritating  
Test substance: 8008-20-6 |
| | Rabbit skin  
Result: not irritating  
Method: OECD 404  
Test substance: 64742-81-0 |

Serious eye damage/eye irritation
### Eye irritation

- **Rabbit eye**
  - Result: not irritating
  - Method: EPA OTS 798.4500
  - Test substance: 68333-23-3

- **Rabbit eye**
  - Result: not irritating
  - Test substance: 8008-20-6

### Respiratory or skin sensitisation

- **Buehler Test**
  - Guinea pig skin
  - Result: not sensitising
  - Test substance: 8008-20-6

### Germ cell mutagenicity

#### Genotoxicity in vitro

- **Ames test**
  - Result: negative
  - Method: OECD 471
  - Test substance: 8008-20-6

- **Sister chromatid exchange assay**
  - Result: negative
  - Method: OECD 479
  - Test substance: 64742-81-0

#### Genotoxicity in vivo

- **Sister Chromatid Exchange Assay**
  - Species: mouse
  - Test substance: 64742-81-0
  - Method: OECD 479
  - Result: negative (female); positive (male)

- **Chromosome aberration test**
  - Test substance: 8008-20-6
  - Method: OECD 475
  - Result: negative

### Toxicological Assessment Germ cell mutagenicity

Based on the available data the substance is not classified as mutagenic.
### Carcinogenicity

<table>
<thead>
<tr>
<th>Carcinogenic effect</th>
<th>dermal, mouse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dose</td>
<td>50 μl</td>
</tr>
<tr>
<td>Test substance</td>
<td>64742-81-0</td>
</tr>
<tr>
<td>Method</td>
<td>OECD 451</td>
</tr>
<tr>
<td>Result</td>
<td>positive</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Carcinogenic effect</th>
<th>dermal, mouse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test substance</td>
<td>8008-20-6</td>
</tr>
<tr>
<td>Method</td>
<td>OECD 451</td>
</tr>
<tr>
<td>Result</td>
<td>positive</td>
</tr>
<tr>
<td>LOAEL Dose</td>
<td>250 mg/kg bw/day</td>
</tr>
</tbody>
</table>

### Toxicological Assessment Carcinogenicity

Kerosene is not carcinogenic via oral or inhalation routes. Chronic skin contact can lead to tumour formation owing to a repeated sequence of irritation, skin damage and healing.

### Toxicity to reproduction

#### Reproduction toxicity/fertility

<table>
<thead>
<tr>
<th>rat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test substance: most likely 64742-81-0</td>
</tr>
<tr>
<td>Method: OECD 421</td>
</tr>
<tr>
<td>Dose: &gt;=494 mg/kg/d (maternal/developmental toxicity); NOAEL dermal; (P, F1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>rat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test substance: 8008-20-6</td>
</tr>
<tr>
<td>Method: OECD 415</td>
</tr>
<tr>
<td>Dose: &gt;=1500 mg/kg/d (female); NOAEL (P) oral</td>
</tr>
</tbody>
</table>

#### Developmental toxicity/teratogenicity

| Application Route: Inhalation |
| Application Route: oral; |
| Application Route: 8008-20-6 |
| Method: OECD 414 |
| NOAEC >= 364 ppm (maternal/developmental toxicity) Key study, reliable without restriction (1) |

| Application Route: 8008-20-6 |
| Method: OECD 414 |
| NOAEL (fetal) toxicity: 1000 mg/kg bw/day; NOAEL (maternal toxicity): 500 mg/kg bw/day |

### Toxicological Assessment Developmental toxicity/teratogenicity

Reproduction toxicity/fertility: There are no indications of reproduction toxicity and teratogenicity for kerosene.

### Specific Target Organ Toxicity - Single exposure

<table>
<thead>
<tr>
<th>Specific Target Organ Toxicity - Single exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>The product can cause drowsiness and dizziness.; Affected organs: Central nervous system; Route of exposure: Inhalation</td>
</tr>
</tbody>
</table>
Specific Target Organ Toxicity - Repeated exposure

<table>
<thead>
<tr>
<th>Effect upon repeated or longtime exposure</th>
<th>Causes skin irritation.</th>
</tr>
</thead>
</table>

### Aspiration hazard

<table>
<thead>
<tr>
<th>Aspiration toxicity</th>
<th>May be fatal if swallowed and enters airways.</th>
</tr>
</thead>
</table>

### Neurological effects

<table>
<thead>
<tr>
<th>Narcotic effect</th>
<th>Inhalation of high concentrations can cause drowsiness and dizziness.</th>
</tr>
</thead>
</table>

### Toxicological Assessment

#### Acute effects

<table>
<thead>
<tr>
<th>see above</th>
</tr>
</thead>
</table>

#### Repeated dose toxicity

| Rat NOAEL oral; Dose: 750 mg/kg bw /day, Method: OECD 408 Test substance: 8008-20-6 Rat NOAEL inhalation Dose: >=1000 mg/m³ air Method: OECD 413 Test substance: 8008-20-6 Rat NOAEC inhalation Dose: >=24 mg/m³ air Method: OECD 412 Test substance: 64742-81-0 Rat NOAEL dermal Dose: >=495 mg/kg bw /day Method: OECD 411 Test substance: 64742-81-0 Rat NOAEL dermal Dose: >=0.25 ml/kg bw Method: OECD 410 Test substance: 8008-20-6 |

### 11.2 Additional advice

for the mixture no data available;
SECTION 12: ECOLOGICAL INFORMATION

12.1 Toxicity

Acute toxicity

<table>
<thead>
<tr>
<th>Acute toxicity for fish</th>
<th>( LL_{50} )</th>
<th>Species: Oncorhynchus mykiss (rainbow trout)</th>
<th>Dose: 2 - 5 mg/l</th>
<th>Exposure time: 96 h</th>
<th>Test substance: 64742-94-5</th>
<th>Method: OECD Guideline 203 (Fish, Acute Toxicity Test)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Acute toxicity for aquatic invertebrates</th>
<th>( EL_{50} )</th>
<th>Species: Daphnia magna (large water flea)</th>
<th>Dose: 1.4 mg/l</th>
<th>Exposure time: 48 h</th>
<th>Test substance: 64742-81-0</th>
<th>Method: OECD 202</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Toxicity for algae and aquatic plants</th>
<th>( EL_{50} )</th>
<th>Species: Pseudokirchneriella subcapitata</th>
<th>Dose: 1 - 3 mg/l</th>
<th>Exposure time: 72 h</th>
<th>Test substance: 64742-94-5</th>
<th>Method: OECD Guideline 201 (Alga, Growth Inhibition Test)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Toxicity for micro-organisms</th>
<th>( LL_{50} )</th>
<th>Species: Tetrahymena pyriformis</th>
<th>Dose: 677.9 mg/l</th>
<th>Exposure time: 72 h</th>
<th>Test substance: kerosene</th>
<th>Method: QSAR</th>
</tr>
</thead>
</table>

Toxicity to edaphic organisms : no data available

Toxicity for terrestrial plants : no data available

Toxicity to other terrestrial non-mammalian organisms : no data available

Chronic toxicity

<table>
<thead>
<tr>
<th>Toxicity to fish (Chronic toxicity)</th>
<th>NOEL</th>
<th>Species: Oncorhynchus mykiss (rainbow trout)</th>
<th>Dose: 0.098 mg/l</th>
<th>Exposure time: 28 d</th>
<th>Test substance: kerosene</th>
<th>Method: QSAR</th>
</tr>
</thead>
</table>
Toxicity to daphnia and other aquatic invertebrates. (Chronic toxicity) : EL50
Species: Daphnia magna
Dose: 0.89 mg/l
Exposure time: 21 d
Test substance: 64742-81-0
Method: OECD Guideline 211 (Daphnia Magna Reproduction Test)

Aquatic Acute : conclusive but not sufficient for classification
Aquatic Chronic : The product can have long-term damaging effect in waters.

Toxicity Data on Soil : no data available
Other organisms relevant to the environment : no data available

12.2 Persistence and degradability
Persistence, Biodegradability : Not readily biodegradable, but inherently biodegradable.

12.3 Bioaccumulative potential
Bioaccumulation : no data available
Bioaccumulative potential (Partition coefficient (n-octanol/water)) : no data available

12.4 Mobility in soil
Mobility : Remarks:
Do not allow the product to be released uncontrolled into the environment.
Transport between environmental compartments : Dissolves only slightly in water. Component substances partition primarily to air when emitted to the environment.
Physical-chemical eliminability : The product is insoluble and floats on water. May be separated mechanically in waste water plants.

12.5 Results of PBT and vPvB assessment
Results of PBT and vPvB assessment : According to the results of current assessment(s), contains no substance assessed to be a PBT or a vPvB

12.6 Other adverse effects
Effects upon sewage treatment plants : no information
Other adverse effects : Air: Keep evaporation losses as low as possible. Water: do not discharge liquid hydrocarbons into canals or water bodies. Ground: Do not spill hydrocarbons, prevent from entering the ground. In the case of accidents call for assistance by professional oil-fighting forces.

12.7 Further information
Further information : For the mixture no data available;
SECTION 13: DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

| Information on the disposal of the product | ONORM S 2100, key code group 54  
Product residues are to be disposed of in accordance with the legal stipulations. |
| Contaminated packaging | If the product has been supplied within a packaging, the empty original containers are to be reused preferably or, if this is not possible, they are to be recycled preferably. |

Disposal key according to European disposal index when using as described in Section 1.:

| Waste from residues | 13 07 03* other fuels [incl. mixtures] |
| Contaminated packaging | 15 01 10* packaging which contain residues of hazardous substances or which are contaminated by hazardous substances |

13.2 Additional advice

The Waste Code depends on the origin of the waste and can deviate from the above data in a specific case.
SECTION 14: TRANSPORT INFORMATION

Road transport (ADR)

<table>
<thead>
<tr>
<th>14.1</th>
<th>UN number</th>
<th>1223</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.2</td>
<td>UN proper shipping name</td>
<td>KEROSENE</td>
</tr>
<tr>
<td>14.3</td>
<td>Transport hazard class(es)</td>
<td>3</td>
</tr>
<tr>
<td>14.4</td>
<td>Packing group</td>
<td>III</td>
</tr>
<tr>
<td>14.5</td>
<td>Environmental hazards</td>
<td>yes</td>
</tr>
<tr>
<td>14.6</td>
<td>Special precautions for user</td>
<td>See section 7 and references therein.</td>
</tr>
</tbody>
</table>

Further information

| Number to designate the hazard | 30 |
| ADR/RID-Labels                | 3  |
| Classification Code           | F1 |
| Tunnel restriction code       | (D/E) |
| Advice                        | Danger Label No 3, Fish and tree - Environmentally hazardous substance mark |

Rail transport (RID)

<table>
<thead>
<tr>
<th>14.1</th>
<th>UN number</th>
<th>1223</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.2</td>
<td>UN proper shipping name</td>
<td>KEROSENE</td>
</tr>
<tr>
<td>14.3</td>
<td>Transport hazard class(es)</td>
<td>3</td>
</tr>
<tr>
<td>14.4</td>
<td>Packing group</td>
<td>III</td>
</tr>
<tr>
<td>14.5</td>
<td>Environmental hazards</td>
<td>yes</td>
</tr>
<tr>
<td>14.6</td>
<td>Special precautions for user</td>
<td>See section 7 and references therein.</td>
</tr>
</tbody>
</table>

Further information

| Number to designate the hazard | 30 |
| ADR/RID-Labels                | 3  |
## Classification Code

<table>
<thead>
<tr>
<th>Classification Code</th>
<th>:</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td></td>
</tr>
</tbody>
</table>

## Advice

<table>
<thead>
<tr>
<th>Advice</th>
<th>:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Danger Label No 3, Fish and tree - Environmentally hazardous substance mark</td>
<td></td>
</tr>
</tbody>
</table>

### Inland navigation with tanker barges (ADN)

<table>
<thead>
<tr>
<th>14.1 UN number</th>
<th>: 1223</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.2 UN proper shipping name</td>
<td>: KEROSENE</td>
</tr>
<tr>
<td>14.3 Transport hazard class(es)</td>
<td>: 3</td>
</tr>
<tr>
<td>14.4 Packing group</td>
<td>: III</td>
</tr>
<tr>
<td>14.5 Environmental hazards</td>
<td>: yes</td>
</tr>
<tr>
<td>14.6 Special precautions for user</td>
<td>: See section 7 and references therein.</td>
</tr>
</tbody>
</table>

### Further information

<table>
<thead>
<tr>
<th>Advice</th>
<th>: (N2+F)</th>
</tr>
</thead>
</table>

### Sea transport (IMDG)

<table>
<thead>
<tr>
<th>14.1 UN number</th>
<th>: 1223</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.2 UN proper shipping name</td>
<td>: KEROSENE</td>
</tr>
<tr>
<td>14.3 Transport hazard class(es)</td>
<td>: 3</td>
</tr>
<tr>
<td>14.4 Packing group</td>
<td>: III</td>
</tr>
<tr>
<td>14.5 Marine pollutant</td>
<td>: yes</td>
</tr>
<tr>
<td>14.6 Special precautions for user</td>
<td>: See section 7 and references therein.</td>
</tr>
<tr>
<td>14.7 Transport in bulk according to Annex II of MARPOL and the IBC Code</td>
<td>: MARPOL Annex 1</td>
</tr>
</tbody>
</table>

### Further information

<table>
<thead>
<tr>
<th>ICAO hazard labels</th>
<th>: 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>EmS</td>
<td>: F-E, S-E</td>
</tr>
</tbody>
</table>

### Air transport (ICAO-TI/IATA-DGR)

<table>
<thead>
<tr>
<th>14.1 UN number</th>
<th>: 1223</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.2 UN proper shipping name</td>
<td>: KEROSENE</td>
</tr>
<tr>
<td>14.3 Transport hazard class(es)</td>
<td>: 3</td>
</tr>
<tr>
<td>14.4 Packing group</td>
<td>: III</td>
</tr>
<tr>
<td>14.5 Environmental hazards</td>
<td>: yes</td>
</tr>
<tr>
<td>14.6 Special precautions for user</td>
<td>: See section 7 and references therein.</td>
</tr>
</tbody>
</table>
Safety Data Sheet as per EC Regulation No. 1907/2006

Jet A-1
PdNr. 442000

Further information

ICAO hazard labels : 3

Additional advice

This product can also be transported as UN 1863 aviation fuel.

In case of need further information on the transport classification can be requested from the producer.

SECTION 15: REGULATORY INFORMATION

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

<table>
<thead>
<tr>
<th>ASchG, BGBl. No. 450/1994</th>
<th>Dangerous substance at workplace</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire hazard class</td>
<td>A II: Flash point 21°C TO 55°C, at 15°C not miscible in water</td>
</tr>
</tbody>
</table>

Community provisions on the protection of the health and the environment

<table>
<thead>
<tr>
<th>Directive 2010/75/EU on industrial emissions (integrated pollution prevention and control) - Chapter V - Special provisions for installations and activities using organic solvents.</th>
<th>When properly used, product is not subject to VOC-Guideline (see Section 1.2).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulation (EC) no. 1907/2006, Annex XVII (REACH regulation)</td>
<td>No. 3 - liquid substances or mixtures classified as dangerous by the definitions of the EEC Directive no. 67/548 and the Directive 1999/45/EC; No. 40; Substances which according to the criteria of Directive 67/548/EEC have been classified as flammable, highly flammable or extremely flammable, irrespective of whether they are listed in Annex VI Part 3 of Regulation (EC) No. 1272/2008.</td>
</tr>
</tbody>
</table>
15.2 Chemical Safety Assessment

A chemical safety assessment for the substances in the mixture was performed within the framework of the REACH registration. Since the safe use is ensured if the operational conditions and risk management measures defined for the lead substance are applied, the exposure scenarios of the lead substance are provided in this MSDS. The lead substance was determined using the methodology developed by ECHA and CEFIC [CEFIC: REACH Practical Guide on Safe Use Information for Mixtures under REACH http://www.cefic.org/Documents/IndustrySupport/REACH-Implementation/Guidance-and-Tools/REACH-Practical-Guide-on-Safe-Use-Information-for-Mixtures-under-REACH-The-LOD-Methodology.pdf]. In the attached exposure scenarios, the listed Maximum allowable site tonnages (M(Safe) based on release following total wastewater treatment removal (kg/d) were corrected for the mixture using the same methodology.

SECTION 16: OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3

<table>
<thead>
<tr>
<th>Aquatic Chronic</th>
<th>Chronic aquatic toxicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asp. Tox.</td>
<td>Aspiration hazard</td>
</tr>
<tr>
<td>Flam. Liq.</td>
<td>Flammable liquids</td>
</tr>
<tr>
<td>Skin Irrit.</td>
<td>Skin corrosion/irritation</td>
</tr>
<tr>
<td>STOT SE</td>
<td>Specific target organ toxicity - single exposure</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>H226</td>
<td>Flammable liquid and vapour.</td>
</tr>
<tr>
<td>H304</td>
<td>May be fatal if swallowed and enters airways.</td>
</tr>
<tr>
<td>H315</td>
<td>Causes skin irritation.</td>
</tr>
<tr>
<td>H336</td>
<td>May cause drowsiness or dizziness.</td>
</tr>
<tr>
<td>H411</td>
<td>Toxic to aquatic life with long lasting effects.</td>
</tr>
</tbody>
</table>

Further information

<table>
<thead>
<tr>
<th>Other information</th>
<th>Overall updates from the previous main version (not marked as stated below) have been implemented in:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Section 1 and Annex Section 12 Section 14 Section 15 Section 16.</td>
</tr>
</tbody>
</table>

List of acronyms:

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Q)SAR</td>
<td>Quantitative Structure Activity Relationship</td>
</tr>
<tr>
<td>ADN</td>
<td>European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways</td>
</tr>
<tr>
<td>ADR</td>
<td>European Agreement concerning the International Carriage of Dangerous Goods by Road</td>
</tr>
<tr>
<td>ATE</td>
<td>Acute Toxicity Estimate</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>BCF</td>
<td>Bioconcentration factor</td>
</tr>
<tr>
<td>CAS-No</td>
<td>Chemical Abstracts Service number</td>
</tr>
<tr>
<td>CMR</td>
<td>Carcinogen, Mutagen, or toxic to Reproduction</td>
</tr>
<tr>
<td>CSA</td>
<td>Chemical Safety Assessment</td>
</tr>
<tr>
<td>CSR</td>
<td>Chemical Safety Report</td>
</tr>
<tr>
<td>DMEL</td>
<td>Derived Minimal Effect Level</td>
</tr>
<tr>
<td>DNEL</td>
<td>Derived No Effect Level</td>
</tr>
<tr>
<td>EC50</td>
<td>The effective concentration of substance that causes 50% of the maximum response</td>
</tr>
<tr>
<td>ECHA</td>
<td>European Chemicals Agency</td>
</tr>
<tr>
<td>EC-Number</td>
<td>European Inventory of Existing Commercial Chemical Substances</td>
</tr>
<tr>
<td>EINECS</td>
<td>European List of notified Chemical Substances</td>
</tr>
<tr>
<td>EL50</td>
<td>Effective load 50%</td>
</tr>
<tr>
<td>ELS</td>
<td>European List of notified Chemical Substances</td>
</tr>
<tr>
<td>EPA</td>
<td>Environmental Protection Agency (U.S.)</td>
</tr>
<tr>
<td>GES</td>
<td>Generic Exposure Scenario</td>
</tr>
<tr>
<td>IATA</td>
<td>International Air Transport Association</td>
</tr>
<tr>
<td>IC50</td>
<td>Inhibition concentration 50%</td>
</tr>
<tr>
<td>ICAO-TI</td>
<td>Technical Instructions for the Safe Transport of Dangerous Goods by Air</td>
</tr>
<tr>
<td>IMDG</td>
<td>International Maritime Dangerous Goods</td>
</tr>
<tr>
<td>Kow</td>
<td>Octanol-water partition coefficient</td>
</tr>
<tr>
<td>Koc</td>
<td>Soil organic carbon-water partitioning coefficient</td>
</tr>
<tr>
<td>LC50</td>
<td>Lethal Concentration to 50% of a test population</td>
</tr>
<tr>
<td>LD50</td>
<td>Lethal Dose to 50% of a test population (Median Lethal Dose)</td>
</tr>
<tr>
<td>LL50</td>
<td>Lethal Load 50%</td>
</tr>
<tr>
<td>LOAEC</td>
<td>Lowest Observed Adverse Effect Concentration</td>
</tr>
<tr>
<td>LOAEL</td>
<td>Lowest Observed Adverse Effect Level</td>
</tr>
<tr>
<td>NOAEC</td>
<td>No Observed Adverse Effect Concentration</td>
</tr>
<tr>
<td>NOAEL</td>
<td>No Observed Adverse Effect Level</td>
</tr>
<tr>
<td>NOEC</td>
<td>No Observed Effect Concentration</td>
</tr>
<tr>
<td>NOEL</td>
<td>No Observed Effect Level</td>
</tr>
<tr>
<td>OECD</td>
<td>Organization for Economic Co-operation and Development</td>
</tr>
<tr>
<td>BLV</td>
<td>Biological Limit Value</td>
</tr>
<tr>
<td>OEL</td>
<td>Occupational Exposure Limit</td>
</tr>
<tr>
<td>OSHA</td>
<td>European Agency for Safety and Health at work</td>
</tr>
<tr>
<td>PBT</td>
<td>Persistent, Bioaccumulative and Toxic substance</td>
</tr>
<tr>
<td>PEC</td>
<td>Predicted Effect Concentration</td>
</tr>
<tr>
<td>PNEC</td>
<td>Predicted No Effect Concentration</td>
</tr>
<tr>
<td>RID</td>
<td>Regulations concerning the International Carriage of Dangerous Goods by Rail</td>
</tr>
<tr>
<td>RMM</td>
<td>Risk Management Measure</td>
</tr>
<tr>
<td>SVHC</td>
<td>Substances of Very High Concern</td>
</tr>
<tr>
<td>TRA</td>
<td>Targeted Risk Assessment</td>
</tr>
<tr>
<td>TLV</td>
<td>Threshold Limit Value</td>
</tr>
<tr>
<td>STEL</td>
<td>Short term exposure limit</td>
</tr>
<tr>
<td>TWA</td>
<td>Time-Weighted Average</td>
</tr>
<tr>
<td>UVOC</td>
<td>Substance of unknown or variable composition, complex reaction products or biological materials</td>
</tr>
<tr>
<td>vPvB</td>
<td>Very Persistent and Very Bioaccumulative</td>
</tr>
<tr>
<td>LGK</td>
<td>Storage class</td>
</tr>
<tr>
<td>TRGS</td>
<td>Technical Rules for Hazardous Substances (Germany)</td>
</tr>
</tbody>
</table>
### Sources of information

<table>
<thead>
<tr>
<th>Chemical Safety Report (CSR)</th>
</tr>
</thead>
</table>

Classification and procedure used to derive the classification for mixtures according to Regulation (EC) 1272/2008 [CLP]:
- Flam. Liq. 3 H226 - On basis of test data
- Skin Irrit. 2 H315 - Calculation method
- Asp. Tox. 1 H304 - On basis of test data
- STOT SE 3 H336 - Calculation method
- Aquatic Chronic 2 H411 - Calculation method

Markings (|) in the left border and/or text in red indicate changes in the previous main version.

The above data are in accordance with our knowledge and experience at the given date of revision and exclusively refer to the product in its as-delivered condition as it is unambiguously identifiable by the product number. In the case of usages deviating from those given in section 1 or when the product is mixed with other materials or is altered in the course of a production process, the statements given in the material safety data sheet may not apply without restrictions or even not at all any more. The data are not applicable to other products of the same or a similar designation.

The product should not be used other than for the stated application or applications without seeking advice from the supplier.

It is the user’s obligation to evaluate and use this product safely and to comply with all applicable laws and regulations.

You can contact the supplier to ensure that this document is the most current available.

Alteration of this document is strictly prohibited.
Annex

The exposure scenarios for the most frequent applications are listed below. If required, other exposure scenarios will be provided upon request.

1. Brief title of the Exposure Scenario: 01-Manufacture of substance

<table>
<thead>
<tr>
<th>Life-cycle stage</th>
<th>IS: Use at industrial sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sector of use</td>
<td>SU8: Manufacture of bulk, large scale chemicals (including petroleum products) SU9: Manufacture of fine chemicals</td>
</tr>
<tr>
<td>Process category</td>
<td>PROC1: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions PROC2: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions PROC3: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment conditions PROC4: Chemical production where opportunity for exposure arises PROC8a: Transfer of substance or mixture (charging and discharging) at non-dedicated facilities PROC8b: Transfer of substance or mixture (charging and discharging) at dedicated facilities PROC15: Use as laboratory reagent</td>
</tr>
<tr>
<td>Environmental release category</td>
<td>ERC1: Manufacture of the substance ERC4: Use of non-reactive processing aid at industrial site (no inclusion into or onto article)</td>
</tr>
<tr>
<td>Further information</td>
<td>Specific Environmental Release Category ESVOC SpERC 1.1.v1</td>
</tr>
<tr>
<td>Processes, tasks, activities covered</td>
<td>Manufacture of the substance or use as a process chemical or extraction agent. Includes recycling/recovery, material transfers, storage, sampling, associated laboratory activities, maintenance and loading (including marine vessel/barge, road/rail car and bulk container).</td>
</tr>
</tbody>
</table>

2.1 Contributing scenario controlling environmental exposure for:

ERC1, Manufacture of the substance

<table>
<thead>
<tr>
<th>Amount used</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional use tonnage (tonnes/year)</td>
<td>1.9 $10^6$ t/y</td>
</tr>
<tr>
<td>Annual site tonnage (tonnes/year)</td>
<td>600.000</td>
</tr>
<tr>
<td>Maximum daily site tonnage (kg/day):</td>
<td>2 $10^6$ kg/day</td>
</tr>
<tr>
<td>Fraction of EU tonnage used in region:</td>
<td>0.10</td>
</tr>
<tr>
<td>Fraction of Regional tonnage used locally</td>
<td>0.32</td>
</tr>
<tr>
<td>Remarks</td>
<td>Substance is complex UVCB. Predominantly hydrophobic.</td>
</tr>
</tbody>
</table>

MSafe (maximum allow able site tonnage): 2.07 $10^5$ kg/day

Remarks | Maximum allow able site tonnage (MSafe) based on release following total wastewater treatment removal |
Frequency and duration of use
Continuous exposure: Continuous release.

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
Number of emission days per year: 300
Emission or Release Factor: Air: 5.00 %
Emission or Release Factor: Water: 0.03 %
Emission or Release Factor: Soil: 0.01 %
Remarks: All release factors refer to initial release prior to RMM. Release to water is release to wastewater.

Technical conditions and measures / Organizational measures:
Air: Treat air emission to provide a typical removal efficiency of: 90.0 %
Water: Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency >= (%): 99.0 %
Water: If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of >= (%): 80.2 %
Remarks: Common practices vary across sites thus conservative process release estimates used. Prevent discharge of undisolved substance to or recover from wastewater. Onsite wastewater treatment required. Risk from environmental exposure is driven by freshwater sediment.

Conditions and measures related to municipal sewage treatment plant
Flow rate of sewage treatment plant effluent: 10,000 m³/d
Effectiveness (STP): 95.1 %
Total removal from wastewater according to internal and external location measures: 99 %
Sludge Treatment: Organisation measures to prevent/limit release from site: Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.
Remarks: Conditions and measures related to municipal sewage treatment plant: Not applicable as there is no release to wastewater.

Conditions and measures related to external treatment of waste for disposal
Waste treatment: During manufacturing no waste of the substance is generated.
Conditions and measures related to external recovery of waste
Recovery Methods: During manufacturing no waste of the substance is generated.

2.2 Contributing scenario controlling worker exposure for:
PROC1: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions.
PROC2: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions
PROC3: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition
PROC4 : Chemical production where opportunity for exposure arises
PROC8a : Transfer of substance or mixture (charging and discharging) at non-dedicated facilities
PROC8b : Transfer of substance or mixture (charging and discharging) at dedicated facilities
PROC15 : Use as laboratory reagent

Product characteristics
Concentration of the Substance in Mixture/Article: Covers percentage substance in the product up to 100% (unless stated differently)
Physical Form (at time of use): Liquid
Vapour pressure: Vapour Pressure is given at STP. 0.5 - 10 kPa
Remarks: Operation is carried out at elevated temperature (>20°C above ambient temperature), Assumes a good basic standard of occupational hygiene is implemented

Frequency and duration of use
Covers daily exposures up to 8 hours (unless stated differently): 8 h

Technical conditions and measures
CS15 General exposures (closed systems).
CS16 General exposures (open systems), CS14 Bulk Transfers., CS2 Process sampling, CS36 Laboratory activities, CS39 Equipment cleaning and maintenance, CS85 Bulk Product Storage
No other specific measures identified.

Organisational measures to prevent / limit releases, dispersion and exposure:
G19 General measures (skin irritants)
Provide basic employee training to prevent / minimise exposures and to report any skin effects that may develop.
CS15 General exposures (closed systems).
CS16 General exposures (open systems), CS14 Bulk Transfers., CS2 Process sampling, CS36 Laboratory activities, CS39 Equipment cleaning and maintenance, CS85 Bulk Product Storage
No other specific measures identified.

Conditions and measures related to personal protection, hygiene and health evaluation
G19 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.
CS15 General exposures (closed systems).
CS16 General exposures (open systems), CS14 Bulk Transfers., CS2 Process sampling, CS36 Laboratory activities, CS39 Equipment cleaning and maintenance, CS85 Bulk Product Storage
No other specific measures identified.

3. Exposure estimation and reference to its source

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.

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

4.1. Health:
Available hazard data do not enable the derivation of a DNEL for dermal irritant effects. Risk Management Measures are based on qualitative risk characterisation. Available hazard data do not support the need for a DNEL to be established for other health effects. Users are advised to consider national Occupational Exposure Limits or other equivalent values. 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).

Since the safe use is ensured if the operational conditions and risk management measures defined for the lead substance are applied, the exposure scenarios of the lead substance are provided here. The lead substance was determined using the methodology developed by ECHA and CEFIC [CEFIC: REACH Practical Guide on Safe Use Information for Mixtures under REACH http://www.cefic.org/Documents/IndustrySupport/REACH-Implementation/Guidance-and-Tools/REACH-Practical-Guide-on-Safe-Use-Information-for-Mixtures-under-REACH-The-LCID-Methodology.pdf]. In addition the Maximum allow able site tonnage (MSafe) based on release following total wastewater treatment removal (kg/d) provided in this exposure scenario was corrected for the mixture using the same methodology.
1. Brief title of the Exposure Scenario: 01a - Distribution of substance

Life-cycle stage : IS: Use at industrial sites

Process category : PROC1: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions.
PROC2: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions
PROC3: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition
PROC4: Chemical production where opportunity for exposure arises
PROC6a: Transfer of substance or mixture (charging and discharging) at non-dedicated facilities
PROC6b: Transfer of substance or mixture (charging and discharging) at dedicated facilities
PROC7: Transfer of substance or mixture into small containers (dedicated filling line, including weighing)
PROC15: Use as laboratory reagent

Environmental release category : ERC4: Use of non-reactive processing aid at industrial site (no inclusion into or onto article)
ERC5: Use at industrial site leading to inclusion into/onto article
ERC6a: Use of intermediate
ERC6b: Use of reactive processing aid at industrial site (no inclusion into oronto article)
ERC6c: Use of monomer in polymerisation processes at industrial site (inclusion or not into/onto article)
ERC6d: Use of reactive process regulators in polymerisation processes at industrial site (inclusion or not into/onto article)
ERC7: Use of functional fluid at industrial site

Further information : Specific Environmental Release Category ESVOC SpERC 1.1b.v1

Processes, tasks, activities covered : Bulk loading (including marine vessel/barge, railroad car and IBC loading) and repacking (including drums and small packs) of substance, including its sampling, storage, unloading, maintenance and associated laboratory activities. Excludes emissions during transport.

2.1 Contributing scenario controlling environmental exposure for:

ERC4, Use of non-reactive processing aid at industrial site (no inclusion into or onto article)
ERC5, Use at industrial site leading to inclusion into/onto article
ERC6a, Use of intermediate
ERC6b, Use of reactive processing aid at industrial site (no inclusion into or onto article)
ERC6c, Use of monomer in polymerisation processes at industrial site (inclusion or not into/onto article)
ERC6d, Use of reactive process regulators in polymerisation processes at industrial site (inclusion or not into/onto article)
ERC7, Use of functional fluid at industrial site
### Regional use tonnage (tonnes/year)
- **Jet A**
- Regional use tonnage: **5.10E6 t/y**

### Annual site tonnage (tonnes/year)
- Annual site tonnage: **10,000**

### Maximum daily site tonnage (kg/day)
- Maximum daily site tonnage: **33,000**

### Fraction of EU tonnage used in region
- Fraction of EU tonnage: **0.10**

### Fraction of Regional tonnage used locally
- Fraction of Regional tonnage: **0.002**

### Remarks
- Substance is complex UVCB. Predominantly hydrophobic.

### MSafe (maximum allowable site tonnage)
- MSafe: **424,000 kg/day**

### Frequency and duration of use
- **Continuous exposure**
  - Continuous release.

### 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
- Number of emission days per year: **300**
- Emission or Release Factor: Air: **0.10 %**
- Emission or Release Factor: Water: **0.001 %**
- Emission or Release Factor: Soil: **0.001 %**

### Technical conditions and measures / Organizational measures:
- **Air**
  - Treat air emission to provide a typical removal efficiency of: 90.0 %
- **Water**
  - Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency >= (%): 40.3 %
  - If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of >= (%): 0 %

### Conditions and measures related to municipal sewage treatment plant
- Flow rate of sewage treatment plant effluent: **2,000 m³/d**
- Effectiveness (STP): **95.1 %**
- Total removal from wastewater according to internal and external location measures: **95.1 %**

### Sludge Treatment
- Organisation measures to prevent/limit release from site: Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.

### Conditions and measures related to external treatment of waste for disposal
- Waste treatment: External treatment and disposal of waste should comply with applicable local and/or national regulations.

### Conditions and measures related to external recovery of waste
- Recovery Methods: External recovery and recycling of waste should comply with applicable local and/or national regulations.
2.2 Contributing scenario controlling worker exposure for:

PROC1 : Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions.
PROC2 : Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions.
PROC3 : Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition.
PROC4 : Chemical production where opportunity for exposure arises.
PROC8a : Transfer of substance or mixture (charging and discharging) at non-dedicated facilities.
PROC8b : Transfer of substance or mixture (charging and discharging) at dedicated facilities.
PROC9 : Transfer of substance or mixture into small containers (dedicated filling line, including weighing).
PROC15 : Use as laboratory reagent.

Product characteristics
Concentration of the Substance in Mixture/Article: Covers percentage substance in the product up to 100% (unless stated differently).
Physical Form (at time of use): Liquid.
Vapour pressure: Vapour Pressure is given at STP. 0.5 - 10 kPa.
Remarks: Assumes use at not more than 20°C above ambient temperature, unless stated differently. Assumes a good basic standard of occupational hygiene is implemented.

Frequency and duration of use
Covers daily exposures up to 8 hours (unless stated differently): 8 h.

Technical conditions and measures
CS15 General exposures (closed systems).
CS16 General exposures (open systems), CS2 Process sampling, CS36 Laboratory activities, CS14 Bulk Transfers., CS6 Drum and small package filling, CS39 Equipment cleaning and maintenance., CS85 Bulk Product Storage.
No other specific measures identified.

Organisational measures to prevent/limit releases, dispersion and exposure:
G19 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.
CS15 General exposures (closed systems).
CS16 General exposures (open systems), CS2 Process sampling, CS36 Laboratory activities, CS14 Bulk Transfers., CS6 Drum and small package filling, CS39 Equipment cleaning and maintenance., CS85 Bulk Product Storage.
No other specific measures identified.

Conditions and measures related to personal protection, hygiene and health evaluation
G19 General measures (skin irritants).
Provide basic employee training to prevent/minimise exposures and to report any skin effects that may develop.
CS15 General exposures (closed systems).
CS16 General exposures (open systems), CS2 Process sampling, CS36 Laboratory activities, CS14 Bulk Transfers., CS6 Drum and small package filling, CS39 Equipment cleaning and maintenance., CS85 Bulk Product Storage.
No other specific measures identified.

3. Exposure estimation and reference to its source
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.

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

4.1. Health:
Available hazard data do not enable the derivation of a DNEL for dermal irritant effects. Risk Management Measures are based on qualitative risk characterisation. Available hazard data do not support the need for a DNEL to be established for other health effects. Users are advised to consider national Occupational Exposure Limits or other equivalent values. 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).

Since the safe use is ensured if the operational conditions and risk management measures defined for the lead substance are applied, the exposure scenarios of the lead substance are provided here. The lead substance was determined using the methodology developed by ECHA and CEFIC [CEFIC: REACH Practical Guide on Safe Use Information for Mixtures under REACH http://www.cefic.org/Documents/IndustrySupport/REACH-Implementation/Guidance-and-Tools/REACH-Practical-Guide-on-Safe-Use-Information-for-Mixtures-under-REACH-The-LCID-Methodology.pdf]. In addition the Maximum allowable site tonnage (MSafe) based on release following total wastewater treatment removal (kg/d) provided in this exposure scenario was corrected for the mixture using the same methodology.
## 1. Brief title of the Exposure Scenario: 02 - Formulation & (re)packing of substances and mixtures

<table>
<thead>
<tr>
<th>Life-cycle stage</th>
<th>IS: Use at industrial sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sector of use</td>
<td>not applicable</td>
</tr>
<tr>
<td>Process category</td>
<td>PROC1: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions. PROC2: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions PROC3: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition PROC4: Chemical production where opportunity for exposure arises PROC8a: Transfer of substance or mixture (charging and discharging) at non-dedicated facilities PROC8b: Transfer of substance or mixture (charging and discharging) at dedicated facilities PROC14: Tabletting, compression, extrusion, pelleting, granulation PROC15: Use as laboratory reagent</td>
</tr>
<tr>
<td>Environmental release category</td>
<td>ERC2: Formulation into mixture</td>
</tr>
<tr>
<td>Further information</td>
<td>Specific Environmental Release Category ESVOC SpERC 2.2.v1</td>
</tr>
<tr>
<td>Processes, tasks, activities covered</td>
<td>Formulation, packing and re-packing of the substance and its mixtures in batch or continuous operations, including storage, materials transfers, mixing, tabletting, compression, pelleting, extrusion, large and small scale packing, maintenance, sampling and associated laboratory activities.</td>
</tr>
</tbody>
</table>

### 2.1 Contributing scenario controlling environmental exposure for:

**ERC2, Formulation into mixture**

<table>
<thead>
<tr>
<th>Amount used</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional use tonnage (tonnes/year)</td>
<td>2.1 10E6 t/y</td>
</tr>
<tr>
<td>Annual site tonnage (tonnes/year)</td>
<td>30,000</td>
</tr>
<tr>
<td>Maximum daily site tonnage (kg/day)</td>
<td>100,000</td>
</tr>
<tr>
<td>Fraction of EU tonnage used in region</td>
<td>0,10</td>
</tr>
<tr>
<td>Fraction of Regional tonnage used locally</td>
<td>0,14</td>
</tr>
<tr>
<td>Remarks</td>
<td>Substance is complex UVCB. Predominantly hydrophobic.</td>
</tr>
<tr>
<td>MSafe (maximum allow able site tonnage)</td>
<td>124,000 kg/day</td>
</tr>
<tr>
<td>Remarks</td>
<td>Maximum allow able site tonnage (MSafe) based on release following total wastewater treatment removal</td>
</tr>
</tbody>
</table>

**Frequency and duration of use**

| Continuous exposure | Continuous release. |

**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

| Number of emission days per year | 300 |
| Emission or Release Factor: Air  | 2.50% |
| Emission or Release Factor: Water | 0.02% |
| Emission or Release Factor: Soil | 0.01% |
| Remarks | Release fraction to air from process (after typical onsite RMMs consistent with EU Solvent Emissions Directive requirements) Release factors water and soil refer to initial release prior to RMM. Release to wastewater is release to wastewater.

Technical conditions and measures / Organizational measures:

**Air**
- Treat air emission to provide a typical removal efficiency of: 0%

**Water**
- Treat onsite wastewater (prior to receiving wastewater discharge) to provide the required removal efficiency >= (%):
  - 94.2%
- If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of >= (%):
  - 0%

Remarks: Common practices vary across sites thus conservative process release estimates used. Risk from environmental exposure is driven by freshwater sediment. Prevent discharge of undissolved substance to or recover from onsite wastewater. If discharging to domestic sewage treatment plant, additional onsite wastewater treatment required.

Conditions and measures related to municipal sewage treatment plant

- Flow rate of sewage treatment plant effluent: 2,000 m³/d
- Effectiveness (STP): 95.1%
- Total removal from wastewater according to internal and external location measures: 95.1%
- Sludge Treatment: Organisation measures to prevent/limit release from site: Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.
- Remarks: Conditions and measures related to municipal sewage treatment plant: Not applicable as there is no release to wastewater.

Conditions and measures related to external treatment of waste for disposal

- Waste treatment: External treatment and disposal of waste should comply with applicable local and/or national regulations.

Conditions and measures related to external recovery of waste

- Recovery Methods: External recovery and recycling of waste should comply with applicable local and/or national regulations.

2.2 Contributing scenario controlling worker exposure for:

- PROC1: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions.
- PROC2: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions.
- PROC3: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition.
- PROC4: Chemical production where opportunity for exposure arises.
- PROC5: Mixing or blending in batch processes.
- PROC8a: Transfer of substance or mixture (charging and discharging) at non-dedicated facilities.
PROC8b  : Transfer of substance or mixture (charging and discharging) at dedicated facilities

PROC9  : Transfer of substance or mixture into small containers (dedicated filling line, including weighing)

PROC14  : Tabletting, compression, extrusion, pelleting, granulation

PROC15  : Use as laboratory reagent

Product characteristics
Concentration of the Substance in Mixture/Article: Covers percentage substance in the product up to 100 % (unless stated differently)
Physical Form (at time of use): Liquid
Vapour pressure: Vapour Pressure is given at STP, 0,5 - 10 kPa
Remarks: Assumes use at not more than 20°C above ambient temperature, unless stated differently. Assumes a good basic standard of occupational hygiene is implemented

Frequency and duration of use
Covers daily exposures up to 8 hours (unless stated differently): 8 h

Technical conditions and measures
CS15 General exposures (closed systems).
CS16 General exposures (open systems), CS2 Process sampling, CS36 Laboratory activities, CS14 Bulk Transfers., CS30 mixing operations (open systems), CS8 Drum/batch transfers, CS100 Tabletting, compression, extrusion or pelleting, CS6 Drum and small package filling, CS39 Equipment cleaning and maintenance., CS85 Bulk Product Storage
No other specific measures identified.
CS34 Manual. CS22 Transfer from/pouring from containers
No other specific measures identified.

Organisational measures to prevent/limit releases, dispersion and exposure:
G19 General measures (skin irritants)
Provide basic employee training to prevent / minimise exposures and to report any skin effects that may develop.
CS15 General exposures (closed systems).
CS16 General exposures (open systems), CS2 Process sampling, CS36 Laboratory activities, CS14 Bulk Transfers., CS30 mixing operations (open systems), CS8 Drum/batch transfers, CS100 Tabletting, compression, extrusion or pelleting, CS6 Drum and small package filling, CS39 Equipment cleaning and maintenance., CS85 Bulk Product Storage
No other specific measures identified.
CS34 Manual. CS22 Transfer from/pouring from containers
No other specific measures identified.

Conditions and measures related to personal protection, hygiene and health evaluation
G19 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.
CS15 General exposures (closed systems).
CS16 General exposures (open systems), CS2 Process sampling, CS36 Laboratory activities, CS14 Bulk Transfers., CS30 mixing operations (open systems), CS8 Drum/batch transfers, CS100 Tabletting, compression, extrusion or pelleting, CS6 Drum and small package filling, CS39 Equipment cleaning and maintenance., CS85 Bulk Product Storage
No other specific measures identified.
CS34 Manual. CS22 Transfer from/pouring from containers
No other specific measures identified.

3. Exposure estimation and reference to its source
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.

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

4.1. Health:
Available hazard data do not enable the derivation of a DNEL for dermal irritant effects. Risk Management Measures are based on qualitative risk characterisation. Available hazard data do not support the need for a DNEL to be established for other health effects. Users are advised to consider national Occupational Exposure Limits or other equivalent values. 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).

Since the safe use is ensured if the operational conditions and risk management measures defined for the lead substance are applied, the exposure scenarios of the lead substance are provided here. The lead substance was determined using the methodology developed by ECHA and CEFIC [CEFIC: REACH Practical Guide on Safe Use Information for Mixtures under REACH http://www.cefic.org/Documents/IndustrySupport/REACH-Implementation/Guidance-and-Tools/REACH-Practical-Guide-on-Safe-Use-Information-for-Mixtures-under-REACH-The-LCID-Methodology.pdf]. In addition the Maximum allowable site tonnage (MSafe) based on release following total wastewater treatment removal (kg/d) provided in this exposure scenario was corrected for the mixture using the same methodology.
1. Brief title of the Exposure Scenario: 12a - Use as a fuel - Industrial

<table>
<thead>
<tr>
<th>Life-cycle stage</th>
<th>IS: Use at industrial sites</th>
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<tbody>
<tr>
<td>Process category</td>
<td>PROC1: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions. PROC2: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions PROC3: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition PROC8a: Transfer of substance or mixture (charging and discharging) at non-dedicated facilities PROC8b: Transfer of substance or mixture (charging and discharging) at dedicated facilities PROC16: Use of fuels</td>
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<tr>
<td>Processes, tasks, activities covered</td>
<td>Covers the use as a fuel or in fuels (or fuel additives and additive components) and includes activities associated with its transfer, use, equipment maintenance and handling of waste.</td>
</tr>
</tbody>
</table>

2.1 Contributing scenario controlling environmental exposure for:

ERC7, Use of functional fluid at industrial site

Amount used
- Regional use tonnage (tonnes/year) : 370,000 t/y
- Annual site tonnage (tonnes/year) : 370,000 t/y
- Maximum daily site tonnage (kg/day) : 1.2 × 10^6 kg/day
- Fraction of EU tonnage used in region : 0.10
- Fraction of Regional tonnage used locally : 1.00
- Remarks : Substance is complex UVCB. Predominantly hydrophobic.
- MSafe (maximum allow able site tonnage) : 2.48 × 10^6 kg/day
- Remarks : Maximum allow able site tonnage (MSafe) based on release following total wastewater treatment removal

Frequency and duration of use
- Continuous exposure : Continuous release.

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
- Number of emission days per year : 300
- Emission or Release Factor: Air : 5 %
Emission or Release Factor: Water : 0,001 %
Emission or Release Factor: Soil : 0 %
Remarks : All release factors refer to initial release prior to RMM. Release to w ater is release to w astewater.

Technical conditions and measures / Organizational measures:
Air : Treat air emission to provide a typical removal efficiency of : 95,0 %
Water : Treat onsite w astewater (prior to receiving w ater discharge) to provide the required removal efficiency >= (%): 90,7 %
Water : If discharging to domestic sew age treatment plant, provide the required onsite w astewater removal efficiency of >= (%): 0 %
Remarks : Risk from environmental exposure is driven by freshwater sediment. Common practices vary across sites thus conservative process release estimates used. If discharging to domestic sew age treatment plant, additional onsite w astewater treatment required.

Conditions and measures related to municipal sewage treatment plant
Flow rate of sew age treatment plant effluent : 2.000 m³/d
Effectiveness (STP) : 95,1 %
Total removal from w astewater according to internal and external location measures : 95,1 %
Sludge Treatment : Organisation measures to prevent/limit release from site: Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.
Remarks : Conditions and measures related to municipal sew age treatment plant: Not applicable as there is no release to w astewater.

Conditions and measures related to external treatment of waste for disposal
Waste treatment : Combustion emissions limited by required exhaust emission controls., Combustion emissions considered in regional exposure assessment., External treatment and disposal of w aste should comply w ith applicable local and/or national regulations.

Conditions and measures related to external recovery of waste
Recovery Methods : This substance is consumed during use and no w aste of the substance is generated.

2.2 Contributing scenario controlling worker exposure for:
PROC1 : Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions.
PROC2 : Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions
PROC3 : Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition
PROC8a : Transfer of substance or mixture (charging and discharging) at non-dedicated facilities
PROC8b : Transfer of substance or mixture (charging and discharging) at dedicated facilities
PROC16 : Use of fuels

Product characteristics
Concentration of the Substance in Mixture/Article : Covers percentage substance in the product up to 100 % (unless stated differently)
Physical Form (at time of use) : Liquid
Vapour pressure : Vapour Pressure is given at STP. 0,5 - 10 kPa
Safety Data Sheet as per EC Regulation No. 1907/2006

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Remarks: Assumes use at not more than 20°C above ambient temperature, unless stated differently. Assumes a good basic standard of occupational hygiene is implemented.

Frequency and duration of use
Covers daily exposures up to 8 hours (unless stated differently): 8 h

Technical conditions and measures
CS15 General exposures (closed systems).
GEST_12I Use as a fuel, CS107 (closed systems), CS14 Bulk Transfers, CS8 Drum/batch transfers, CS39 Equipment cleaning and maintenance, CS85 Bulk Product Storage
No other specific measures identified.

Organisational measures to prevent/limit releases, dispersion and exposure:
G19 General measures (skin irritants)
Provide basic employee training to prevent/minimise exposures and to report any skin effects that may develop.
CS15 General exposures (closed systems).
GEST_12I Use as a fuel, CS107 (closed systems), CS14 Bulk Transfers, CS8 Drum/batch transfers, CS39 Equipment cleaning and maintenance, CS85 Bulk Product Storage
No other specific measures identified.

Conditions and measures related to personal protection, hygiene and health evaluation
G19 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.
CS15 General exposures (closed systems).
GEST_12I Use as a fuel, CS107 (closed systems), CS14 Bulk Transfers, CS8 Drum/batch transfers, CS39 Equipment cleaning and maintenance, CS85 Bulk Product Storage
No other specific measures identified.

3. Exposure estimation and reference to its source

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.

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

4.1. Health:
Available hazard data do not enable the derivation of a DNEL for dermal irritant effects. Risk Management Measures are based on qualitative risk characterisation. Available hazard data do not support the need for a DNEL to be established for other health effects. Users are advised to consider national Occupational Exposure Limits or other equivalent values. 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).
Since the safe use is ensured if the operational conditions and risk management measures defined for the lead substance are applied, the exposure scenarios of the lead substance are provided here. The lead substance was determined using the methodology developed by ECHA and CEFIC [CEFIC: REACH Practical Guide on Safe Use Information for Mixtures under REACH http://www.cefic.org/Documents/IndustrySupport/REACH-Implementation/Guidance-and-Tools/REACH-Practical-Guide-on-Safe-Use-Information-for-Mixtures-under-REACH-The-LCID-Methodology.pdf]. In addition the Maximum allow able site tonnage (MSafe) based on release following total wastewater treatment removal (kg/d) provided in this exposure scenario was corrected for the mixture using the same methodology.
1. Brief title of the Exposure Scenario: 12b - Use as a fuel - Professional

Life-cycle stage: PW: Widespread use by professional workers

Process category:
- PROC1: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions.
- PROC2: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions.
- PROC3: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition.
- PROC8a: Transfer of substance or mixture (charging and discharging) at non-dedicated facilities.
- PROC8b: Transfer of substance or mixture (charging and discharging) at dedicated facilities.
- PROC16: Use of fuels.

Environmental release category:
- ERC9a: Widespread use of functional fluid (indoor).
- ERC9b: Widespread use of functional fluid (outdoor).

Further information:
Specific Environmental Release Category ESVOC SpERC 9.12b.v1

Processes, tasks, activities covered:
Covers the use as a fuel or in fuels (or fuel additives and additive components) and includes activities associated with its transfer, use, equipment maintenance and handling of waste.

2.1 Contributing scenario controlling environmental exposure for:
- ERC9a, Widespread use of functional fluid (indoor).
- ERC9b, Widespread use of functional fluid (outdoor).

Amount used:
- Regional use tonnage: 714,000 10^6 t/y.
- Annual site tonnage (tonnes/year): 357.
- Maximum daily site tonnage (kg/day): 978.
- Fraction of EU tonnage used in region: 0.1.
- Fraction of Regional tonnage used locally: 0.0005.
- Remarks: Substance is complex UVCB. Predominantly hydrophobic.
- MSafe (maximum allowable site tonnage): 8,960 kg/day.
- Remarks: Maximum allowable site tonnage (MSafe) based on release following total wastewater treatment removal.

Frequency and duration of use:
Continuous release.

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.
Number of emission days per year: 365
Emission or Release Factor: Air: 0,10 %
Emission or Release Factor: Water: 0,001 %
Emission or Release Factor: Soil: 0,001 %
Remarks: All release factors refer to release from wide dispersive use. Release factors for air and soil refer to regional use only. Release to water is release to wastewater.

Technical conditions and measures / Organizational measures:
Air: Treat air emission to provide a typical removal efficiency of: N/A:
Water: Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency >= (%): 54,2 %
Water: If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of >= (%): 0 %
Remarks: Common practices vary across sites thus conservative process release estimates used. Risk from environmental exposure is driven by freshwater. If discharging to domestic sewage treatment plant, no onsite wastewater treatment required.

Conditions and measures related to municipal sewage treatment plant
Flow rate of sewage treatment plant effluent: 2,000 m³/d
Effectiveness (STP): 95,0 %
Total removal from wastewater according to internal and external location measures: 95,0 %
Sludge Treatment: Organisation measures to prevent/limit release from site: Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.
Remarks: Conditions and measures related to municipal sewage treatment plant: Not applicable as there is no release to wastewater.

Conditions and measures related to external treatment of waste for disposal
Waste treatment: Combustion emissions limited by required exhaust emission controls. Combustion emissions considered in regional exposure assessment. External treatment and disposal of waste should comply with applicable local and/or national regulations.

Conditions and measures related to external recovery of waste
Recovery Methods: This substance is consumed during use and no waste of the substance is generated.

2.2 Contributing scenario controlling worker exposure for:
PROC1: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions.
PROC2: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions.
PROC3: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition.
PROC8a: Transfer of substance or mixture (charging and discharging) at non-dedicated facilities.
PROC8b: Transfer of substance or mixture (charging and discharging) at dedicated facilities.
PROC16: Use of fuels.
Vapour pressure: Vapour Pressure is given at STP. 0.5 - 10 kPa
Remarks: Assumes use at not more than 20°C above ambient temperature, unless stated differently. Assumes a good basic standard of occupational hygiene is implemented

Frequency and duration of use:
Covers daily exposures up to 8 hours (unless stated differently) 8 h

Technical conditions and measures:
CS15 General exposures (closed systems).
GEST_12I Use as a fuel, CS107 (closed systems), CS14 Bulk Transfers., CS22 Transfer from/pouring from containers., CS39 Equipment cleaning and maintenance., CS85 Bulk Product Storage
No other specific measures identified.

Organisational measures to prevent/limit releases, dispersion and exposure:
G19 General measures (skin irritants)
Provide basic employee training to prevent/ minimise exposures and to report any skin effects that may develop.
CS15 General exposures (closed systems).
GEST_12I Use as a fuel, CS107 (closed systems), CS14 Bulk Transfers., CS22 Transfer from/pouring from containers., CS39 Equipment cleaning and maintenance., CS85 Bulk Product Storage
No other specific measures identified.

Conditions and measures related to personal protection, hygiene and health evaluation:
G19 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.
CS15 General exposures (closed systems).
GEST_12I Use as a fuel, CS107 (closed systems), CS14 Bulk Transfers., CS22 Transfer from/pouring from containers., CS39 Equipment cleaning and maintenance., CS85 Bulk Product Storage
No other specific measures identified.

3. Exposure estimation and reference to its source:

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.

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario:

4.1. Health:
Available hazard data do not enable the derivation of a DNEL for dermal irritant effects. Risk Management Measures are based on qualitative risk characterisation. Available hazard data do not support the need for a DNEL to be established for other health effects. Users are advised to consider national Occupational Exposure Limits or other equivalent values. 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).
Since the safe use is ensured if the operational conditions and risk management measures defined for substance Kerosine (petroleum), sweetened (CAS 91770-15-9) are applied, the exposure scenarios of the substance Kerosine (petroleum), sweetened (CAS 91770-15-9) are provided here.