SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier
Name of the substance: Benzene Concentrate
Identification number: 649-388-00-9
Registration number: 01-2119474694-26-0005
Synonyms: None.
SDS number: 2002
Issue date: 28-July-2011
Version number: 05
Revision date: 09-September-2013
Supersedes date: 17-August-2012

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


Uses advised against: None known.

1.3. Details of the supplier of the safety data sheet
Supplier: Valero Energy Ltd
Address: 1 Westferry Circus
Canary Wharf
London E14 4HA
UK
Telephone: 01/210 345 4593 (General information; US)
e-mail: CorpHSE@valero.com
Contact person: Industrial Hygienist

1.4. Emergency telephone number
0044/(0)18 65 407333

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

The substance has been assessed and/or tested for its physical, health and environmental hazards and the following classification applies.

Classification according to Directive 67/548/EEC or 1999/45/EC as amended

Classification:
- F;R11, Carc. Cat. 2;R45, Muta. Cat. 2;R46, Repr. Cat. 3;R62-63, Xn;R65, Xi;R38, R67, N;R51/53

The full text for all R-phrases is displayed in section 16.

Classification according to Regulation (EC) No 1272/2008 as amended

Physical hazards
- Flammable liquids: Category 2
- H225 - Highly flammable liquid and vapour.
- H315 - Causes skin irritation. Category 2
- H340 - May cause genetic defects. Category 1B
- H350 - May cause cancer. Category 1B
- H361 - Suspected of damaging fertility or the unborn child. Category 2

Health hazards
- Skin corrosion/irritation: Category 2
- Germ cell mutagenicity: Category 1B
- Carcinogenicity: Category 1B
- Reproductive toxicity: Category 2
- Specific target organ toxicity - single exposure: Category 3 narcotic effects
- Aspiration hazard: Category 1

Environmental hazards
- Hazardous to the aquatic environment, long-term aquatic hazard: Category 2
- H411 - Toxic to aquatic life with long lasting effects.

Hazard summary
Physical hazards: Highly flammable.
Health hazards
May cause cancer. May cause heritable genetic damage. Irritating to skin. Possible risk of impaired fertility. Possible risk of harm to the unborn child. Also harmful: may cause lung damage if swallowed. Vapours may cause drowsiness and dizziness.

Environmental hazards
Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Specific hazards
Breathing of high vapour concentrations may cause dizziness, light-headedness, headache, nausea and loss of co-ordination. Continued inhalation may result in unconsciousness. May be absorbed through the skin. Prolonged and repeated exposure to benzene may cause serious injury to blood forming organs and is associated with anaemia and to the later development of acute myelogenous leukaemia (AML). May cause central nervous system effects. May cause damage to the liver. Hydrogen sulphide, a highly toxic gas, may be present. Signs and symptoms of overexposure to hydrogen sulphide include respiratory and eye irritation, dizziness, nausea, coughing, a sensation of dryness and pain in the nose, and loss of consciousness. Odour does not provide a reliable indicator of the presence of hazardous levels in the atmosphere. Material will float and can be re-ignited on surface of water.

Main symptoms
Symptoms include itching, burning, redness, and tearing of eyes. Dermatitis. Skin irritation. Headaches, malaise, dizziness, fever, nausea and vomiting. Ingestion may cause irritation and malaise.

2.2. Label elements
Label according to Regulation (EC) No. 1272/2008 as amended
Contains:
Identification number 649-388-00-9
Hazard pictograms
Signal word Danger
Hazard statements

Precautionary statements
Prevention
P201 - Obtain special instructions before use. P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking. P280 - Wear protective gloves/protective clothing/eye protection/face protection.
Response
P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTRE or doctor/physician.
Storage
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed.
Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations.

Supplemental label information
Not applicable.
2.3. Other hazards
Not a PBT or vPvB substance or mixture.

SECTION 3: Composition/information on ingredients
3.1. Substances
General information
Chemical name Distillates (petroleum), C6-rich % 100 CAS-No. / EC No. 93165-19-6 / 296-903-4 REACH Registration No. 01-2119474694-26-0005 INDEX No. 649-388-00-9 Notes

Classification: DSD: F;R11, Carc. Cat. 2;R45, Muta. Cat. 2;R46, Repr. Cat. 3;R62-63, Xi;R65, Xi;R38, R67, N;R51/53
CLP: Flam. Liq. 2;H225, Asp. Tox. 1;H304, Skin Irrit. 2;H315, STOT SE 3;H336, Muta. 1B;H340, Carc. 1B;H350, Repr. 2;H361, Aquatic Chronic 2;H411

DSD: Directive 67/548/EEC. CLP: Regulation No. 1272/2008. #: This substance has been assigned Community workplace exposure limit(s).
**Chemical name** | **%** | **CAS-No. / EC No.** | **REACH Registration No.** | **INDEX No.** | **Notes**
--- | --- | --- | --- | --- | ---
Benzene | 40 - 50 | 71-43-2 | - | 601-020-00-8 | #

**Composition comments**
This product is registered under the REACH Regulation 1907/2006 as a UVCB. The full text for all R- and H-phrases is displayed in section 16. All concentrations are in percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

**SECTION 4: First aid measures**

**General information**
Get medical attention if any discomfort develops.

**4.1. Description of first aid measures**

**Inhalation**
Move to fresh air. If breathing is difficult, give oxygen. Get medical attention if discomfort develops or persists.

**Skin contact**
Immediately remove contaminated clothing. Wash with soap and water. Continue to rinse for at least 15 minutes. In case of rashes, wounds or other skin disorders: Seek medical attention and bring along these instructions.

**Eye contact**
Immediately flush with plenty of water for up to 15 minutes. Remove any contact lenses and open eyelids wide apart. Get medical attention if irritation develops or persists.

**Ingestion**
Immediately rinse mouth and drink plenty of water or milk. Keep person under observation. Do not induce vomiting. If vomiting occurs, keep head low. Transport immediately to hospital and take these instructions. Never give anything by mouth to an unconscious person.

**4.2. Most important symptoms and effects, both acute and delayed**
Irritation of eyes and mucous membranes. Skin irritation. Dermatitis. May irritate and cause malaise. Droplets of the product aspirated into the lungs through ingestion or vomiting may cause a serious chemical pneumonia.

**4.3. Indication of any immediate medical attention and special treatment needed**
Treat symptomatically. The effects might be delayed.

**SECTION 5: Firefighting measures**

**General fire hazards**
The product is combustible, and heating may generate vapours which may form explosive vapour/air mixtures. Material will float and can be re-ignited on surface of water.

**5.1. Extinguishing media**

**Suitable extinguishing media**
Water spray, foam, dry powder or carbon dioxide.

**Unsuitable extinguishing media**
Do not use water jet as an extinguisher, as this will spread the fire.

**5.2. Special hazards arising from the substance or mixture**
Thermal decomposition may produce smoke, oxides of carbon and lower molecular weight organic compounds whose composition have not been characterised. Sulfur Oxides (SOx). Nitrogen Oxides (NOx).

**5.3. Advice for firefighters**

**Special protective equipment for firefighters**
Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

**Special fire fighting procedures**
Move containers from fire area if you can do it without risk. Use water spray to cool unopened containers. Cool containers with flooding quantities of water until well after fire is out.

**SECTION 6: Accidental release measures**

**6.1. Personal precautions, protective equipment and emergency procedures**

**For non-emergency personnel**
Keep upwind. Ventilate closed spaces before entering. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Local authorities should be advised if significant spillages cannot be contained. Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). In case of spills, beware of slippery floors and surfaces.

**For emergency responders**
Keep unnecessary personnel away. Wear protective clothing as described in Section 8 of this safety data sheet.
6.2. Environmental precautions

Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. If facility or operation has an "oil or hazardous substance contingency plan", activate its procedures. Stay upwind and away from spill. Wear appropriate protective equipment including respiratory protection as conditions warrant. Do not enter or stay in an area unless monitoring indicates that it is safe to do so. Isolate hazard area and restrict entry to emergency crew. Extremely flammable. Review Fire and Explosion Hazard Data before proceeding with clean up. Keep all sources of ignition (flames, smoking, flares, etc.) and hot surfaces away from release. Contain spill in smallest possible area. Recover as much product as possible (e.g., by vacuuming). Stop leak if it can be done without risk. Use water spray to disperse vapors. Spilled material may be absorbed by an appropriate absorbent, and then handled in accordance with environmental regulations. Prevent spilled material from entering sewers, storm drains, other unauthorized treatment or drainage systems and natural waterways. Contact fire authorities and appropriate federal, state and local agencies.

6.3. Methods and material for containment and cleaning up

ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Use non-sparking tools and explosion-proof equipment. Stop leak if you can do so without risk. This material is a water pollutant and should be prevented from contaminating soil or from entering sewage and drainage systems and bodies of water. Dike the spilled material, where this is possible. Prevent entry into waterways, sewers, basements or confined areas.

Small Spills: Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Clean surface thoroughly to remove residual contamination. This material and its container must be disposed of as hazardous waste.

Large Spills: Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Prevent product from entering drains. Do not allow material to contaminate ground water system. Should not be released into the environment.

Ensure that waste and contaminated materials are collected and removed from the work area as soon as possible in a suitably labelled container.

6.4. Reference to other sections

For personal protection, see section 8 of the SDS. For waste disposal, see section 13 of the SDS.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Before entering storage tanks and commencing any operation in a confined area check the atmosphere for oxygen content and flammability. (Subject to applicability) If sulfur compounds are suspected to be present in the product, check the atmosphere for H2S content. Access to work area should be restricted to people handling the product only. Aerosol producing work should be handled in closed systems, if possible. Eliminate sources of ignition. Ground/bond container and equipment. These alone may be insufficient to remove static electricity. Avoid inhalation of vapours. Avoid contact with eyes, skin, and clothing. Wear personal protective equipment. Immediately change contaminated clothes. When using, do not eat, drink or smoke. Be aware of potential for surfaces to become slippery. Avoid release to the environment. Observe good industrial hygiene practices.

7.2. Conditions for safe storage, including any incompatibilities

Store in a cool, dry place with adequate ventilation. Keep away from incompatible materials, open flames and high temperatures. Keep away from food, drink and animal feeding stuffs.

7.3. Specific end use(s)


SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Austria. TRK List

<table>
<thead>
<tr>
<th>Additional components</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene (CAS 71-43-2)</td>
<td>STEL</td>
<td>12,8 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 ppm</td>
</tr>
<tr>
<td></td>
<td>TWA</td>
<td>3,2 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 ppm</td>
</tr>
</tbody>
</table>

Belgium. Exposure Limit Values.

<table>
<thead>
<tr>
<th>Additional components</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene (CAS 71-43-2)</td>
<td>TWA</td>
<td>3,25 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 ppm</td>
</tr>
</tbody>
</table>

Bulgaria. OELs. Regulation No 13 on protection of workers against risks of exposure to chemical agents at work

<table>
<thead>
<tr>
<th>Additional components</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene (CAS 71-43-2)</td>
<td>TWA</td>
<td>3,25 mg/m³</td>
</tr>
</tbody>
</table>
### Cyprus. OELs. Control of factory atmosphere and dangerous substances in factories regulation, PI 311/73, as amended.

<table>
<thead>
<tr>
<th>Additional components</th>
<th>Type</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Benzene (CAS 71-43-2)</td>
<td>TWA</td>
<td>30 mg/m³</td>
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<td></td>
<td>10 ppm</td>
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</table>

### Czech Republic. OELs. Government Decree 361

<table>
<thead>
<tr>
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<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene (CAS 71-43-2)</td>
<td>Ceiling</td>
<td>10 mg/m³</td>
</tr>
<tr>
<td></td>
<td>TWA</td>
<td>3 mg/m³</td>
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### Denmark. Exposure Limit Values

<table>
<thead>
<tr>
<th>Additional components</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene (CAS 71-43-2)</td>
<td>TLV</td>
<td>1.6 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.5 ppm</td>
</tr>
</tbody>
</table>

### Estonia. OELs. Occupational Exposure Limits of Hazardous Substances. (Annex of Regulation No. 293 of 18 September 2001)

<table>
<thead>
<tr>
<th>Additional components</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene (CAS 71-43-2)</td>
<td>STEL</td>
<td>9 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 ppm</td>
</tr>
<tr>
<td></td>
<td>TWA</td>
<td>1.5 mg/m³</td>
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<tr>
<td></td>
<td></td>
<td>0.5 ppm</td>
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</tbody>
</table>

### Finland. Workplace Exposure Limits

<table>
<thead>
<tr>
<th>Additional components</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene (CAS 71-43-2)</td>
<td>TWA</td>
<td>3.25 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 ppm</td>
</tr>
</tbody>
</table>

### France. Threshold Limit Values (VLEP) for Occupational Exposure to Chemicals in France, INRS ED 984

<table>
<thead>
<tr>
<th>Additional components</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene (CAS 71-43-2)</td>
<td>VME</td>
<td>3.25 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 ppm</td>
</tr>
</tbody>
</table>

### Hungary. OELs. Joint Decree on Chemical Safety of Workplaces

<table>
<thead>
<tr>
<th>Additional components</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene (CAS 71-43-2)</td>
<td>Ceiling</td>
<td>3 mg/m³</td>
</tr>
</tbody>
</table>

### Iceland. OELs. Regulation 154/1999 on occupational exposure limits

<table>
<thead>
<tr>
<th>Additional components</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene (CAS 71-43-2)</td>
<td>TWA</td>
<td>1.6 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.5 ppm</td>
</tr>
</tbody>
</table>

### Ireland. Occupational Exposure Limits

<table>
<thead>
<tr>
<th>Additional components</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene (CAS 71-43-2)</td>
<td>TWA</td>
<td>3 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 ppm</td>
</tr>
</tbody>
</table>

### Italy. OELs

<table>
<thead>
<tr>
<th>Additional components</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene (CAS 71-43-2)</td>
<td>STEL</td>
<td>2.5 ppm</td>
</tr>
<tr>
<td></td>
<td>TWA</td>
<td>0.5 ppm</td>
</tr>
</tbody>
</table>

### Latvia. OELs. Occupational exposure limit values of chemical substances in work environment

<table>
<thead>
<tr>
<th>Additional components</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene (CAS 71-43-2)</td>
<td>TWA</td>
<td>3.25 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 ppm</td>
</tr>
</tbody>
</table>

### Lithuania. OELs. Limit Values for Chemical Substances, General Requirements (Hygiene Norm HN 23:2007)

<table>
<thead>
<tr>
<th>Additional components</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene (CAS 71-43-2)</td>
<td>STEL</td>
<td>19 mg/m³</td>
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<tr>
<td></td>
<td></td>
<td>6 ppm</td>
</tr>
<tr>
<td></td>
<td>TWA</td>
<td>3.25 mg/m³</td>
</tr>
<tr>
<td>Country</td>
<td>OELs Description</td>
<td>Additional components</td>
</tr>
<tr>
<td>-------------------------</td>
<td>----------------------------------------------------------------------------------</td>
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<tr>
<td>Lithuania</td>
<td>Limit Values for Chemical Substances, General Requirements (Hygiene Norm HN 23:2007)</td>
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<tr>
<td>Luxembourg</td>
<td>OELs for Carcinogens/Mutagens</td>
<td>Benzene (CAS 71-43-2)</td>
</tr>
<tr>
<td>Netherlands</td>
<td>OELs (binding)</td>
<td>Benzene (CAS 71-43-2)</td>
</tr>
<tr>
<td>Norway</td>
<td>Administrative Norms for Contaminants in the Workplace</td>
<td>Benzene (CAS 71-43-2)</td>
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<tr>
<td>Poland</td>
<td>MACs. Minister of Labour and Social Policy Regarding Maximum Allowable Concentrations and Intensities in Working Environment</td>
<td>Benzene (CAS 71-43-2)</td>
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<tr>
<td>Portugal</td>
<td>VLEs. Norm on occupational exposure to chemical agents (NP 1796)</td>
<td>Benzene (CAS 71-43-2)</td>
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<tr>
<td>Romania</td>
<td>OELs. Protection of workers from exposure to chemical agents at the workplace</td>
<td>Benzene (CAS 71-43-2)</td>
</tr>
<tr>
<td>Slovenia</td>
<td>OELs. Regulations concerning protection of workers against risks due to exposure to chemicals while working (Official Gazette of the Republic of Slovenia)</td>
<td>Benzene (CAS 71-43-2)</td>
</tr>
<tr>
<td>Sweden</td>
<td>Occupational Exposure Limit Values</td>
<td>Benzene (CAS 71-43-2)</td>
</tr>
<tr>
<td>Switzerland</td>
<td>SUVA Grenzwerte am Arbeitsplatz</td>
<td>Benzene (CAS 71-43-2)</td>
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<tr>
<td>UK</td>
<td>EH40 Workplace Exposure Limits (WELs)</td>
<td>Benzene (CAS 71-43-2)</td>
</tr>
<tr>
<td>EU</td>
<td>OELs, Directive 2004/37/EC on carcinogen and mutagens from Annex III, Part A</td>
<td>Benzene (CAS 71-43-2)</td>
</tr>
</tbody>
</table>
Biological limit values

France. Biological indicators of exposure (IBE) (National Institute for Research and Security (INRS, ND 2065)

<table>
<thead>
<tr>
<th>Additional components</th>
<th>Value</th>
<th>Determinant</th>
<th>Specimen</th>
<th>Sampling time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene (CAS 7-43-2)</td>
<td>5 mg/l</td>
<td>Acide muconique</td>
<td>Urine</td>
<td>*</td>
</tr>
</tbody>
</table>

* - For sampling details, please see the source document.


<table>
<thead>
<tr>
<th>Additional components</th>
<th>Value</th>
<th>Determinant</th>
<th>Specimen</th>
<th>Sampling time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene (CAS 7-43-2)</td>
<td>1.5 mg/g</td>
<td>t-t-muconic acid</td>
<td>Creatinine in urine</td>
<td>*</td>
</tr>
</tbody>
</table>

* - For sampling details, please see the source document.

Spain. Biological Limit Values (VLBs), Occupational Exposure Limits for Chemical Agents, Table 4

<table>
<thead>
<tr>
<th>Additional components</th>
<th>Value</th>
<th>Determinant</th>
<th>Specimen</th>
<th>Sampling time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene (CAS 7-43-2)</td>
<td>5 µg/l</td>
<td>Benceno total</td>
<td>Blood</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>0,045 mg/g</td>
<td>Acido S-Fenilmercapt ú rico</td>
<td>Creatinine in urine</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>2 mg/l</td>
<td>Acido t-t-Mucónico</td>
<td>Urine</td>
<td>*</td>
</tr>
</tbody>
</table>

* - For sampling details, please see the source document.

Switzerland. BAT-Werte (Biological Limit Values in the Workplace as per SUVA)

<table>
<thead>
<tr>
<th>Additional components</th>
<th>Value</th>
<th>Specimen</th>
<th>Sampling time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene (CAS 7-43-2)</td>
<td>25 µg/g</td>
<td>Creatinine in urine</td>
<td>*</td>
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</tbody>
</table>

* - For sampling details, please see the source document.

Recommended monitoring procedures

Follow standard monitoring procedures.

Derived no-effect level (DNEL)

<table>
<thead>
<tr>
<th>Material</th>
<th>Type</th>
<th>Route</th>
<th>Value</th>
<th>Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distillates (petroleum), C6-rich (CAS 93165-19-6)</td>
<td>Workers</td>
<td>Inhalation</td>
<td>1300 mg/m³/15min</td>
<td>Acute exposure systemic effects</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inhalation</td>
<td>1100 mg/m³/15min</td>
<td>Acute exposure local effects</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inhalation</td>
<td>840 mg/m³/8h</td>
<td>Long term exposure local effects</td>
</tr>
</tbody>
</table>

Predicted no effect concentrations (PNECs)

Not available.

Exposure guidelines


Benzene (CAS 71-43-2) Can be absorbed through the skin.

8.2. Exposure controls

Appropriate engineering controls

Provide adequate general and local exhaust ventilation. Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Use explosion-proof equipment.

Individual protection measures, such as personal protective equipment

General information

Use personal protective equipment as required. Personal protective equipment should be chosen according to the CEN standards and in discussion with the supplier of the personal protective equipment. Keep working clothes separately. Launder contaminated clothing before reuse.

Eye/face protection

Wear safety glasses. If splash potential exists, wear full face shield or chemical goggles.

Skin protection

- Hand protection

Wear chemical-resistant, impervious gloves. Chlorinated Polyethylene (or Chlorosulfonated Polyethylene), Viton, Polyurethane, Nitrile rubber. Suitable gloves can be recommended by the glove supplier. Be aware that the liquid may penetrate the gloves. Frequent change is advisable.

- Other

Full body suit and boots are recommended when handling large volumes or in emergency situations. Flame retardant protective clothing is recommended.
Respiratory protection
In case of inadequate ventilation or risk of inhalation of vapours, use suitable respiratory equipment with gas filter (type A2). Use a positive-pressure air-supplied respirator if there is any potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air-purifying respirators may not provide adequate protection.

Thermal hazards
When material is heated, wear gloves to protect against thermal burns.

Hygiene measures
When using, do not eat, drink or smoke. Wash hands after handling. Launder contaminated clothing before reuse. Private clothes and working clothes should be kept separately. Handle in accordance with good industrial hygiene and safety practices. Follow up on any medical surveillance requirements.

Environmental exposure controls
Contain spills and prevent releases and observe national regulations on emissions.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties
Appearance
Colorless to yellow liquid.

Physical state
Liquid.

Form
Liquid.

Colour
Colorless to yellow.

Odour
Aromatic odor.

Odour threshold
Not available.

pH
Not applicable.

Melting point/freezing point
Not applicable.

Initial boiling point and boiling range
60 - 90 °C (140 - 194 °F)

Flash point
< -5,0 °C (< 23,0 °F) Closed cup

Evaporation rate
Not available.

Flammability (solid, gas)
Not applicable.

Upper/lower flammability or explosive limits

Flammability limit - lower (%) 1,3
Flammability limit - upper (%) 7,9

Vapour pressure
4 - 240 kPa (37,8 °C)

Vapour density
> 1

Relative density
0,62 - 0,88 (15 °C)

Solubility(ies)
Insoluble in water.

Partition coefficient (n-octanol/water)
Not applicable.

Auto-ignition temperature
> 503 °C (> 937,4 °F)

Decomposition temperature
Not available.

Viscosity
<= 1 mm²/s @ 40 °C (104 °F)

Explosive properties
Not explosive.

Oxidizing properties
Not oxidizing.

9.2. Other information
No relevant additional information available.

SECTION 10: Stability and reactivity

10.1. Reactivity
The product is stable and non reactive under normal conditions of use, storage and transport.

10.2. Chemical stability
Stable under normal temperature conditions and recommended use.

10.3. Possibility of hazardous reactions
Not available.

10.4. Conditions to avoid
Heat, flames and sparks. Ignition sources. Contact with incompatible materials. Do not pressurize, cut, weld, braze, solder, drill, grind or expose empty containers to heat, flame, sparks, static electricity, or other sources of ignition; they may explode and cause injury or death.

10.5. Incompatible materials
Strong acids. Strong oxidizers such as nitrates, chlorates, peroxides.

10.6. Hazardous decomposition products
Thermal decomposition or combustion may liberate carbon oxides and other toxic gases or vapours.
SECTION 11: Toxicological information

General information
Occupational exposure to the substance or mixture may cause adverse effects.

Information on likely routes of exposure

**Ingestion**
Ingestion may cause irritation and malaise.

**Inhalation**
Breathing of high concentrations may cause dizziness, light-headedness, headache, nausea and loss of co-ordination. Continued inhalation may result in unconsciousness.

**Skin contact**
Causes skin irritation. May be absorbed through the skin.

**Eye contact**
May cause eye irritation on direct contact.

**Symptoms**
Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Dermatitis. Skin irritation. Headaches, malaise, dizziness, fever, nausea and vomiting. Ingestion may cause irritation and malaise.

11.1. Information on toxicological effects

**Acute toxicity**
Breathing of high concentrations may cause dizziness, light-headedness, headache, nausea and loss of co-ordination. Continued inhalation may result in unconsciousness. May irritate and cause stomach pain, vomiting, diarrhoea and nausea. Alcohol consumption increases the risk of poisoning/liver damage.

**Skin corrosion/irritation**
Causes skin irritation. Pre-existing skin conditions including dermatitis might be aggravated by exposure to this product.

**Serious eye damage/eye irritation**
Based on available data, the classification criteria are not met.

**Respiratory sensitisation**
Due to lack of data the classification is not possible.

**Skin sensitisation**
Based on available data, the classification criteria are not met.

**Germ cell mutagenicity**
May cause genetic defects.

**Carcinogenicity**
May cause cancer.

IARC Monographs. Overall Evaluation of Carcinogenicity
Benzene (CAS 71-43-2) 1 Carcinogenic to humans.

**Reproductive toxicity**
Suspected of damaging the unborn child.

**Specific target organ toxicity - single exposure**
May cause drowsiness or dizziness.

**Specific target organ toxicity - repeated exposure**
May cause adverse effects on the cardiovascular (heart and blood vessels) or hematopoietic (blood) systems (cardiovascular or blood toxicity). Prolonged and repeated exposure to benzene may cause serious injury to blood forming organs and is associated with anaemia and to the later development of acute myelogenous leukaemia (AML).

**Aspiration hazard**
May be fatal if swallowed and enters airways.

**Mixture versus substance information**
Not available.

**Other information**
Components of the product may be absorbed into the body through the skin.

SECTION 12: Ecological information

12.1. Toxicity
Oil spills are generally hazardous to the environment.

12.2. Persistence and degradability
The degradability of the product has not been stated.

12.3. Bioaccumulative potential
No data available on bioaccumulation.

**Partition coefficient n-octanol/water (log Kow)**

Benzene (CAS 71-43-2) 2,13

**Bioconcentration factor (BCF)**
Not available.

12.4. Mobility in soil
Not available.

**Mobility in general**
The product is insoluble in water. It will spread on the water surface while some of the components will eventually sediment in water systems. The volatile components of the product will spread in the atmosphere.

12.5. Results of PBT and vPvB assessment
Not a PBT or vPvB substance or mixture.

12.6. Other adverse effects
Very toxic to aquatic life with long lasting effects. Oil spills are generally hazardous to the environment.

SECTION 13: Disposal considerations

13.1. Waste treatment methods
**SECTION 14: Transport information**

**ADR**
14.1. UN number UN1268
14.2. UN proper shipping name Petroleum products, n.o.s. (Distillates (petroleum), C6-rich)
14.3. Transport hazard class(es) 3
14.4. Packing group II
14.5. Environmental hazards Yes
14.6. Special precautions for user Read safety instructions, SDS and emergency procedures before handling.

**RID**
14.1. UN number UN1268
14.2. UN proper shipping name Petroleum products, n.o.s. (Distillates (petroleum), C6-rich)
14.3. Transport hazard class(es) 3
14.4. Packing group II
14.5. Environmental hazards Yes
14.6. Special precautions for user Read safety instructions, SDS and emergency procedures before handling.

**ADN**
14.1. UN number UN1268
14.2. UN proper shipping name Petroleum products, n.o.s. (Distillates (petroleum), C6-rich)
14.3. Transport hazard class(es) 3
14.4. Packing group II
14.5. Environmental hazards Yes
14.6. Special precautions for user Read safety instructions, SDS and emergency procedures before handling.

**IATA**
14.1. UN number UN1268
14.2. UN proper shipping name PETROLEUM PRODUCTS, N.O.S. (Distillates (petroleum), C6-rich)
14.3. Transport hazard class(es) 3
14.5. Environmental hazards Yes
14.6. Special precautions for user Read safety instructions, SDS and emergency procedures before handling.

**IMDG**
14.1. UN number UN1268
14.2. UN proper shipping name PETROLEUM PRODUCTS, N.O.S. (Distillates (petroleum), C6-rich)
14.3. Transport hazard class(es) 3
14.4. Packing group

- Marine pollutant

Labels required

- EmS: F-E, S-E

14.6. Special precautions for user

Read safety instructions, SDS and emergency procedures before handling.

14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable. However, this product is a liquid and if transported in bulk covered under MARPOL 73/78, Annex I.

SECTION 15: Regulatory information

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

EU regulations

- Regulation (EC) No. 1005/2009 on substances that deplete the ozone layer, Annex I
  Not listed.
- Regulation (EC) No. 1005/2009 on substances that deplete the ozone layer, Annex II
  Not listed.
  Not listed.
- Regulation (EC) No. 689/2008 concerning the export and import of dangerous chemicals, Annex I, part 1 as amended
  Benzene (CAS 71-43-2)
- Regulation (EC) No. 689/2008 concerning the export and import of dangerous chemicals, Annex I, part 2 as amended
  Not listed.
- Regulation (EC) No. 689/2008 concerning the export and import of dangerous chemicals, Annex I, part 3 as amended
  Not listed.
- Regulation (EC) No. 689/2008 concerning the export and import of dangerous chemicals, Annex V as amended
  Not listed.
- Regulation (EC) No. 166/2006 Annex II Pollutant Release and Transfer Registry
  Not listed.
- Regulation (EC) No. 1907/2006, REACH Article 59(1) Candidate List as currently published by ECHA
  Not listed.

Authorisations

- Regulation (EC) No. 1907/2006, REACH Annex XIV Substances subject to authorisation, as amended
  Not listed.

Restrictions on use

- Regulation (EC) No. 1907/2006, REACH Annex XVII Substances subject to restriction on marketing and use as amended
  Benzene (CAS 71-43-2)
- Directive 2004/37/EC: on the protection of workers from the risks related to exposure to carcinogens and mutagens at work
  Benzene (CAS 71-43-2)
- Directive 92/85/EEC: on the safety and health of pregnant workers and workers who have recently given birth or are breastfeeding
  Benzene (CAS 71-43-2)
  Distillates (petroleum), C6-rich (CAS 93165-19-6)

Other EU regulations

- Directive 96/82/EC (Seveso II) on the control of major-accident hazards involving dangerous substances
  Not regulated.
- Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work
  Benzene (CAS 71-43-2)
  Distillates (petroleum), C6-rich (CAS 93165-19-6)
- Directive 94/33/EC on the protection of young people at work
  Benzene (CAS 71-43-2)
  Distillates (petroleum), C6-rich (CAS 93165-19-6)

Other regulations

The product is classified and labelled in accordance with Regulation (EC) 1272/2008 (CLP Regulation) as amended and respective national laws implementing EC directives. This Safety Data Sheet complies with the requirements of Regulation (EC) No 1907/2006. 96/82/EC (Seveso II) Directive; Part 2 (Classified Substances) - Flammable
National regulations

Young people under 18 years old are not allow to work with this product according to the EU Directive 94/33/EC on the protection of young people at work.

15.2. Chemical safety assessment

For this substance a chemical safety assessment has been carried out.

SECTION 16: Other information

List of abbreviations

DSD: Directive 67/548/EEC.
DNEL: Derived No-Effect Level.
PNEC: Predicted No-Effect Concentration.
PBT: Persistent, bioaccumulative and toxic.
vPvB: Very Persistent and very Bioaccumulative.

References

CONCAWE
Chemical safety report.

Information on evaluation method leading to the classification of mixture

The mixture is classified based on test data for physical hazards. The classification for health and environmental hazards is derived by a combination of calculation methods and test data, if available. For details, refer to Sections 9, 11 and 12.

Full text of any statements or R-phrases and H-statements under Sections 2 to 15

R11 Highly flammable.
R38 Irritating to skin.
R45 May cause cancer.
R46 May cause heritable genetic damage.
R51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R62 Possible risk of impaired fertility.
R63 Possible risk of harm to the unborn child.
R65 Also harmful: may cause lung damage if swallowed.
R67 Vapours may cause drowsiness and dizziness.
H225 Highly flammable liquid and vapour.
H304 May be fatal if swallowed and enters airways.
H315 Causes skin irritation.
H336 May cause drowsiness or dizziness.
H340 May cause genetic defects.
H350 May cause cancer.
H361 Suspected of damaging fertility or the unborn child.
H411 Toxic to aquatic life with long lasting effects.

This SDS contains revisions in the following section(s):

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16.

Training information

Follow training instructions when handling this material.

Disclaimer

This material Safety Data Sheet (SDS) was prepared in accordance with EC No 1272/2008 by Valero Energy Ltd. Valero Energy Ltd. does not assume any liability arising out of product use by others. The information, recommendations, and suggestions presented in this SDS are based upon test results and data believed to be reliable. The end user of the product has the responsibility for evaluating the adequacy of the data under the conditions of use, determining the safety, toxicity and suitability of the product under these conditions, and obtaining additional or clarifying information where uncertainty exists. No guarantee expressed or implied is made as to the effects of such use, the results to be obtained, or the safety and toxicity of the product in any specific application. Furthermore, the information herein is not represented as absolutely complete, since it is not practicable to provide all the scientific and study information in the format of this document, plus additional information may be necessary under exceptional conditions of use, or because of applicable laws or government regulations.
1. Distribution of substance

List of use descriptors

- Sector(s) of Use: SU3: Industrial uses
- Product categories [PC]: Not available.

Name of contributing environmental scenario and corresponding ERC

- ERC4: Industrial use of processing aids in processes and products, not becoming part of articles.
- ERC5: Industrial use resulting in inclusion into or onto a matrix.
- ERC6a: Industrial use resulting in manufacture of another substance (use of intermediates).
- ERC6b: Industrial use of reactive processing aids.
- ERC6c: Industrial use of monomers for manufacture of thermoplastics.
- ERC7: Industrial use of substances in closed systems.

Specific Environmental Release Category:
ESVOC SpERC 1.1b.v1

List of names of contributing worker scenarios and corresponding PROCs

- PROC1: Use in closed process, no likelihood of exposure.
- PROC2: Use in closed, continuous process with occasional controlled exposure.
- PROC3: Use in closed batch process (synthesis or formulation).
- PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities.
- PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities.
- PROC15: Use as laboratory reagent.

Further explanations

Other Process or activity

Bulk loading (including marine vessel/barge, rail/road car and IBC loading) of substance within closed or contained systems, including incidental exposures during its sampling, storage, unloading, maintenance and associated laboratory activities.

2.1. Contributing exposure scenario controlling environmental exposure for Industrial use of processing aids in processes and products, not becoming part of articles.

Product characteristics

Concentration of the substance in a mixture

Covers percentage substance in the product up to 100 % (unless stated differently).

Substance is complex UVCB. Predominantly hydrophobic.

Physical state

Liquid

Viscosity

- Kinematic viscosity: 1,6 mm²/s 40 °C
- Dynamic viscosity: Not available.

Amounts used

Fraction of EU tonnage used in region: 0,1
Regional use tonnage (tons/year): 1,87 e7
Fraction of Regional tonnage used locally: 0,002
Annual site tonnage (tons/year): 3,75 e4
Maximum daily site tonnage (kg/day): 1,2 e5

Frequency and duration of use

Batch process: Not available.
Continuous process: Emission days (days/year): 300

Environment factors not influenced by risk management

- Local freshwater dilution factor: 10
- Local marine water dilution factor: 100

Other given operational conditions affecting environmental exposure

<table>
<thead>
<tr>
<th>Type</th>
<th>Emission days (days/year)</th>
<th>Air</th>
<th>Emission factors</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>initial release prior to RMM</td>
<td>300</td>
<td>0,001</td>
<td>0,00001</td>
<td>0,00001</td>
</tr>
</tbody>
</table>
Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

Common practices vary across sites thus conservative process release estimates used.

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil

- **Air**: Treat air emission to provide a typical removal efficiency of (%) 90
- **Soil**: Not available.
- **Water**: Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of ≥ (%): 12. If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of ≥ (%): 0
- **Sediment**: Not available.
- **Remarks**: Risk from environmental exposure is driven by humans via indirect exposure (primarily inhalation). If discharging to domestic sewage treatment plant, no onsite wastewater treatment required.

Organisational 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 municipal sewage treatment plant

**Size of municipal sewage system/treatment plant (m3/d)**

<table>
<thead>
<tr>
<th>Type</th>
<th>Municipal STP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge rate</td>
<td>2000</td>
</tr>
<tr>
<td>Treatment effectiveness</td>
<td>95.5</td>
</tr>
<tr>
<td>Sludge treatment technique</td>
<td>Not available.</td>
</tr>
<tr>
<td>Measures to limit air emissions</td>
<td>Not available.</td>
</tr>
<tr>
<td>Remarks</td>
<td>Maximum allowable site tonnage (MSafe) based on release following total wastewater treatment removal (kg/d): 1,1e6</td>
</tr>
</tbody>
</table>

**Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)**

95.5

Conditions and measures related to external treatment of waste for disposal

**Fraction of used amount transferred to external waste treatment**

- Suitable waste treatment: Not available.
- Disposal methods: Not available.
- Treatment effectiveness: Not available.
- Remarks: External treatment and disposal of waste should comply with applicable local and/or national regulations.

Conditions and measures related to external recovery of waste

**Fraction of used amount transferred to external waste treatment**

- Suitable recover operations: External recovery and recycling of waste should comply with applicable local and/or national regulations.
- Treatment effectiveness: Not available.
- Remarks: Not available.

**Addition advice beyond the REACH CSA**

Additional information on the basis for the allocation of the indentified OCs and RMMs is contained in the PETRORISK file.

2.2. Contributing exposure scenario controlling worker exposure for Use in closed process, no likelihood of exposure.

**Process categories beyond the REACH CSA**

Use in closed, continuous process with occasional controlled exposure. Use in closed batch process (synthesis or formulation). Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities. Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities. Use as laboratory reagent.

**Product characteristics**

- **Concentration of the substance in a mixture**: Covers percentage substance in the product up to 100 % (unless stated differently).
- **Physical form of the product**: Liquid.
**Vapour pressure**  
Liquid, vapour pressure > 10 kPa at STP.

**Process temperature**  
Assumes use at not more than 20°C above ambient temperature, unless stated differently.

**Amounts used**  
Not available.

**Frequency and duration of use**

<table>
<thead>
<tr>
<th>Duration</th>
<th>Frequency of use</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Covers daily exposures up to 8 hours (unless stated differently).</td>
<td>8</td>
<td>Assumes a good basic standard of occupational hygiene is implemented.</td>
</tr>
</tbody>
</table>

**Human factors not influenced by risk management**

**Exposed skin areas**  
Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop.

**Other given operational conditions affecting workers exposure**

<table>
<thead>
<tr>
<th>Area of use</th>
<th>Room size</th>
<th>Temperature</th>
<th>Ventilation rate</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Other relevant operational conditions**  
Not available.

**Risk management measures (RMM)**

**Technical conditions and measures at process level (source) to prevent release**

- General exposures (closed systems), with sample collection;
- Handle substance within a closed system.
  - Sample via a closed loop or other system to avoid exposure.
- General exposures (closed systems);
- Provide extract ventilation to points where emissions occur.
- Handle substance within a closed system.
- Process sampling;
- Sample via a closed loop or other system to avoid exposure.
- Equipment cleaning and maintenance;
- Drain down and flush system prior to equipment break-in or maintenance.
- Retain drain downs in sealed storage pending disposal or for subsequent recycle.
- Storage;
- Store substance within a closed system.

**Technical conditions and measures to control dispersion from source towards the worker**

- General exposures (closed systems), with sample collection;
- Ensure operation is undertaken outdoors.
- General exposures (closed systems);
- Ensure operation is undertaken outdoors.
- Laboratory activities;
- Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure.
- Bulk closed loading;
- Ensure material transfers are under containment or extract ventilation.
- Bulk closed loading and unloading;
- Ensure material transfers are under containment or extract ventilation.
- Equipment cleaning and maintenance;
- Clear spills immediately.
- Ensure operation is undertaken outdoors.
- Provide a good standard of controlled ventilation (10 to 15 air changes per hour).
Organizational measures to prevent/limit releases, dispersion and exposure

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 any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop.

General measures (carcinogens);
Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenario; clean up spills immediately and dispose of waste safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance.

Conditions and measures related to personal protection, hygiene and health evaluations

General exposures (closed systems), with sample collection;
Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Avoid carrying out activities involving exposure for more than 1 hour.

General exposures (closed systems);
Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Avoid carrying out activities involving exposure for more than 1 hour.

Process sampling;
Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Avoid carrying out activities involving exposure for more than 1 hour.

Laboratory activities;
Avoid carrying out activities involving exposure for more than 1 hour.

Bulk closed loading;
Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Avoid carrying out activities involving exposure for more than 1 hour. or, Wear a respirator conforming to EN140 with Type A filter or better.

Bulk closed loading and unloading;
Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Avoid carrying out activities involving exposure for more than 1 hour. or, Wear a respirator conforming to EN140 with Type A filter or better.

Equipment cleaning and maintenance;
Wear chemically resistant gloves (tested to EN374) in combination with intensive management supervision controls. Avoid carrying out activities involving exposure for more than 4 hours. Wear a respirator conforming to EN140 with Type A filter or better.

Storage;
Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. Avoid carrying out activities involving exposure for more than 1 hour.

3. Exposure Estimation

Environment
See PETRORISK file in IUCLID Section 13 - "LocalCSR" worksheet.

Health

<table>
<thead>
<tr>
<th>Exposure level</th>
<th>RCR</th>
<th>Method</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>General exposures (closed systems)</td>
<td>0,01 ppm</td>
<td>0.009</td>
<td>**</td>
</tr>
<tr>
<td>General exposures (closed system) + With sample collection</td>
<td>50 ppm</td>
<td>0.327</td>
<td>**</td>
</tr>
<tr>
<td>General exposures (closed systems)</td>
<td>100 ppm</td>
<td>0.654</td>
<td>**</td>
</tr>
<tr>
<td>Process sampling</td>
<td>100 ppm</td>
<td>0.935</td>
<td>**</td>
</tr>
<tr>
<td>Laboratory activities</td>
<td>50 ppm</td>
<td>0.467</td>
<td>**</td>
</tr>
<tr>
<td>Bulk closed loading</td>
<td>150 ppm</td>
<td>0.841</td>
<td>**</td>
</tr>
<tr>
<td>Bulk closed loading and unloading</td>
<td>150 ppm</td>
<td>0.841</td>
<td>**</td>
</tr>
</tbody>
</table>
Equipment cleaning and maintenance

<table>
<thead>
<tr>
<th></th>
<th>Exposure</th>
<th>Inhibition</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>250 ppm</td>
<td>0.294</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td>50 ppm</td>
<td>0.467</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
</tbody>
</table>

** - The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated.

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

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 on-site 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).

Health

Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

Available hazard data do not enable the derivation of a DNEL for dermal irritant effects. Available hazard data do not support the need for a DNEL to be established for other health effects. Risk Management Measures are based on qualitative risk characterisation.
2 - Exposure Scenario Worker

1. Formulation & (re)packing of substances and mixtures

List of use descriptors

Sector(s) of Use
- SU3: Industrial uses
- SU10: Formulation [mixing] of preparations and/or re-packaging

Product categories [PC]:
Not available.

Name of contributing environmental scenario and corresponding ERC
- ERC2: Formulation of preparations.

Specific Environmental Release Category:
ESVOC SpERC 2.2.v1

List of names of contributing worker scenarios and corresponding PROCs
- PROC1: Use in closed process, no likelihood of exposure.
- PROC2: Use in closed, continuous process with occasional controlled exposure.
- PROC3: Use in closed batch process (synthesis or formulation).
- PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities.
- PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities.
- PROC15: Use as laboratory reagent.

Further explanations

Other Process or activity
Formulation of the substance and its mixtures in batch or continuous operations within closed or contained systems, including incidental exposures during storage, materials transfers, mixing, maintenance, sampling and associated laboratory activities.


Product characteristics

Concentration of the substance in a mixture
Covers percentage substance in the product up to 100 % (unless stated differently).

Substance is complex UVCB. Predominantly hydrophobic.

Physical state
Liquid

Viscosity
- Kinematic viscosity: 1,6 mm²/s 40 °C
- Dynamic viscosity: Not available.

Amounts used
- Fraction of EU tonnage used in region: 0,1
- Regional use tonnage (tons/year): 1,65 e7
- Fraction of Regional tonnage used locally: 0,0018
- Annual site tonnage (tons/year): 3 e4
- Maximum daily site tonnage (kg/day): 1 e5

Frequency and duration of use
- Batch process: Not available.
- Continuous process: Emission days (days/year): 300

Environment factors not influenced by risk management
- Local freshwater dilution factor: 10
- Local marine water dilution factor: 100

Other given operational conditions affecting environmental exposure

<table>
<thead>
<tr>
<th>Type</th>
<th>Emission days (days/year)</th>
<th>Air</th>
<th>Emission factors</th>
<th>Water</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>initial release prior to RMM</td>
<td>300</td>
<td>0,025</td>
<td>0,0001</td>
<td>0,002</td>
<td></td>
</tr>
</tbody>
</table>

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release
Common practices vary across sites thus conservative process release estimates used.

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil
Air
Treat air emission to provide a typical removal efficiency of (%): 56,5
Soil  Not available.
Water  Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of ≥ (%): 94.7. If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of ≥ (%): 0
Sediment  Not available.
Remarks  Prevent discharge of undissolved substance to or recover from onsite wastewater. Risk from environmental exposure is driven by humans via indirect exposure (primarily inhalation). If discharging to domestic sewage treatment plant, no onsite wastewater treatment required.

Organisational 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 municipal sewage treatment plant

Size of municipal sewage system/treatment plant (m³/d)
- Type: Municipal STP
- Discharge rate: 2000
- Treatment effectiveness: 95.5
- Sludge treatment technique: Not available.
- Measures to limit air emissions: Not available.
- Remarks: Maximum allowable site tonnage (MSafe) based on release following total wastewater treatment removal (kg/d): 1.0e5
- Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%): 95.5

Conditions and measures related to external treatment of waste for disposal

Fraction of used amount transferred to external waste treatment
- Suitable waste treatment: Not available.
- Disposal methods: Not available.
- Treatment effectiveness: Not available.
- Remarks: External treatment and disposal of waste should comply with applicable local and/or national regulations.

Conditions and measures related to external recovery of waste

Fraction of used amount transferred to external waste treatment
- Suitable recover operations: External recovery and recycling of waste should comply with applicable local and/or national regulations.
- Treatment effectiveness: Not available.
- Remarks: Not available.

Additional good practice advice beyond the REACH CSA
- Additional information on the basis for the allocation of the indentified OCs and RMMs is contained in the PETRORISK file.

2.2. Contributing exposure scenario controlling worker exposure for Use in closed process, no likelihood of exposure.

Process categories beyond the REACH CSA
- Use in closed, continuous process with occasional controlled exposure.
- Use in closed batch process (synthesis or formulation).
- Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities.
- Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities.
- Use as laboratory reagent.

Product characteristics
- Concentration of the substance in a mixture: Covers percentage substance in the product up to 100 % (unless stated differently).
- Physical form of the product: Liquid
- Vapour pressure: Liquid, vapour pressure > 10 kPa at STP.
- Process temperature: Assumes use at not more than 20°C above ambient temperature, unless stated differently.

Amounts used
- Not available.
Frequency and duration of use

<table>
<thead>
<tr>
<th>Duration</th>
<th>Frequency of use</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Covers daily exposures up to 8 hours (unless stated differently).</td>
<td>8</td>
<td>Assumes a good basic standard of occupational hygiene is implemented.</td>
</tr>
</tbody>
</table>

Human factors not influenced by risk management

Exposed skin areas

Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop.

Other given operational conditions affecting workers exposure

<table>
<thead>
<tr>
<th>Area of use</th>
<th>Room size</th>
<th>Temperature</th>
<th>Ventilation rate</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>General exposures (closed systems), with sample collection; Handle substance within a closed system. Sample via a closed loop or other system to avoid exposure.</td>
<td>General exposures (closed systems); Provide extract ventilation to points where emissions occur. Handle substance within a closed system.</td>
<td>Process sampling; Sample via a closed loop or other system to avoid exposure.</td>
<td>Equipment cleaning and maintenance; Drain down and flush system prior to equipment break-in or maintenance. Retain drain downs in sealed storage pending disposal or for subsequent recycle.</td>
<td>Storage; Store substance within a closed system.</td>
</tr>
</tbody>
</table>

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

General exposures (closed systems), with sample collection; Handle substance within a closed system. Sample via a closed loop or other system to avoid exposure.

Technical conditions and measures to control dispersion from source towards the worker

General exposures (closed systems), with sample collection; Ensure operation is undertaken outdoors.

Organizational measures to prevent/limit releases, dispersion and exposure

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 any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop.

General measures (carcinogens); Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenario; clean up spills immediately and dispose of waste safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance.
Conditions and measures related to personal protection, hygiene and health evaluations

General exposures (closed systems), with sample collection;
Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Avoid carrying out activities involving exposure for more than 1 hour.

General exposures (closed systems);
Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Avoid carrying out activities involving exposure for more than 1 hour.

Process sampling;
Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Avoid carrying out activities involving exposure for more than 1 hour.

Laboratory activities;
Avoid carrying out activities involving exposure for more than 1 hour.

Bulk transfers;
Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Avoid carrying out activities involving exposure for more than 1 hour.

Drum/batch transfers;
Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Avoid carrying out activities involving exposure for more than 1 hour.

Equipment cleaning and maintenance;
Wear chemically resistant gloves (tested to EN374) in combination with intensive management supervision controls. Avoid carrying out activities involving exposure for more than 4 hours. Wear a respirator conforming to EN140 with Type A filter or better.

Storage;
Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. Avoid carrying out activities involving exposure for more than 1 hour.

3. Exposure Estimation

Environment
See PETRORISK file in IUCLID Section 13 - "LocalCSR" worksheet.

Health

<table>
<thead>
<tr>
<th>Activity</th>
<th>Exposure level</th>
<th>RCR</th>
<th>Method</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>General exposures (closed systems)</td>
<td>0.01 ppm</td>
<td>0.009</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td>General exposures (closed system) + With sample collection</td>
<td>50 ppm</td>
<td>0.327</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td>General exposures (closed systems)</td>
<td>100 ppm</td>
<td>0.654</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td>Storage</td>
<td>50 ppm</td>
<td>0.467</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td>Process sampling</td>
<td>100 ppm</td>
<td>0.935</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td>Laboratory activities</td>
<td>50 ppm</td>
<td>0.467</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td>Bulk transfers</td>
<td>150 ppm</td>
<td>0.841</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td>Drum/batch transfers</td>
<td>150 ppm</td>
<td>0.841</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td>Equipment cleaning and maintenance</td>
<td>250 ppm</td>
<td>0.294</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
</tbody>
</table>

** - The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated.
4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

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 on-site 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).

Health

Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

Available hazard data do not enable the derivation of a DNEL for dermal irritant effects. Available hazard data do not support the need for a DNEL to be established for other health effects. Risk Management Measures are based on qualitative risk characterisation.
1. Manufacture of substance

List of use descriptors

Sector(s) of Use
- SU3: Industrial uses
- SU8: Manufacture of bulk, large scale chemicals (including petroleum products)
- SU9: Manufacture of fine chemicals

Product categories [PC]: Not available.

Name of contributing environmental scenario and corresponding ERC
- ERC1: Manufacture of substances.

List of names of contributing worker scenarios and corresponding PROCs
- PROC1: Use in closed process, no likelihood of exposure.
- PROC2: Use in closed, continuous process with occasional controlled exposure.
- PROC3: Use in closed batch process (synthesis or formulation).
- PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities.
- PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities.
- PROC15: Use as laboratory reagent.

Further explanations

Other Process or activity
- Manufacture of substance within closed or contained systems. Includes incidental exposures during recycling/recovery, material transfers, storage, sampling, associated laboratory activities, maintenance and loading (including marine vessel/barge, road/rail car and bulk container).


Product characteristics

Concentration of the substance in a mixture
- Covers percentage substance in the product up to 100 % (unless stated differently).
- Substance is complex UVCB. Predominantly hydrophobic.

Physical state
- Liquid

Viscosity
- Kinematic viscosity: 1,6 mm²/s 40 °C
- Dynamic viscosity: Not available.

Amounts used
- Fraction of EU tonnage used in region: 0,1
- Regional use tonnage (tons/year): 1,87 e7
- Fraction of Regional tonnage used locally: 0,03
- Annual site tonnage (tons/year): 6 e5
- Maximum daily site tonnage (kg/day): 2 e6

Frequency and duration of use
- Batch process: Not available.
- Continuous process: Emission days (days/year): 300

Environment factors not influenced by risk management
- Local freshwater dilution factor: 10
- Local marine water dilution factor: 100

Other given operational conditions affecting environmental exposure

<table>
<thead>
<tr>
<th>Type</th>
<th>Emission days (days/year)</th>
<th>Air</th>
<th>Emission factors Soil</th>
<th>Water</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>initial release prior to RMM</td>
<td>300</td>
<td>0,05</td>
<td>0,0001</td>
<td>0,003</td>
<td></td>
</tr>
</tbody>
</table>

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release
- Common practices vary across sites thus conservative process release estimates used.
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil

<table>
<thead>
<tr>
<th>Element</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air</td>
<td>Treat air emission to provide a typical removal efficiency of (%) 99,0</td>
</tr>
<tr>
<td>Soil</td>
<td>Not available.</td>
</tr>
<tr>
<td>Water</td>
<td>Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of ≥ (%) 95,2. If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of ≥ (%) 80,4</td>
</tr>
<tr>
<td>Sediment</td>
<td>Not available.</td>
</tr>
<tr>
<td>Remarks</td>
<td>Prevent discharge of undissolved substance to or recover from onsite wastewater. Risk from environmental exposure is driven by humans via indirect exposure (primarily inhalation). Onsite wastewater treatment required.</td>
</tr>
</tbody>
</table>

Organisational 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 municipal sewage treatment plant

<table>
<thead>
<tr>
<th>Size of municipal sewage system/treatment plant (m3/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
</tr>
<tr>
<td>Discharge rate</td>
</tr>
<tr>
<td>Treatment effectiveness</td>
</tr>
<tr>
<td>Sludge treatment technique</td>
</tr>
<tr>
<td>Measures to limit air emissions</td>
</tr>
<tr>
<td>Remarks</td>
</tr>
<tr>
<td>Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)</td>
</tr>
</tbody>
</table>

Conditions and measures related to external treatment of waste for disposal

<table>
<thead>
<tr>
<th>Fraction of used amount transferred to external waste treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suitable waste treatment</td>
</tr>
<tr>
<td>Disposal methods</td>
</tr>
<tr>
<td>Treatment effectiveness</td>
</tr>
<tr>
<td>Remarks</td>
</tr>
</tbody>
</table>

Conditions and measures related to external recovery of waste

<table>
<thead>
<tr>
<th>Fraction of used amount transferred to external waste treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suitable recover operations</td>
</tr>
<tr>
<td>Treatment effectiveness</td>
</tr>
<tr>
<td>Remarks</td>
</tr>
</tbody>
</table>

Additional good practice advice beyond the REACH CSA

Additional information on the basis for the allocation of the indentified OCs and RMMs is contained in the PETRORISK file.

2.2. Contributing exposure scenario controlling worker exposure for Use in closed process, no likelihood of exposure.

Process categories beyond the REACH CSA

Use in closed, continuous process with occasional controlled exposure.
Use in closed batch process (synthesis or formulation).
Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities.
Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities.
Use as laboratory reagent.

Product characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concentration of the substance in a mixture</td>
<td>Covers percentage substance in the product up to 100 % (unless stated differently).</td>
</tr>
<tr>
<td>Physical form of the product</td>
<td>Liquid</td>
</tr>
<tr>
<td>Vapour pressure</td>
<td>Liquid, vapour pressure &gt; 10 kPa at STP.</td>
</tr>
<tr>
<td>Process temperature</td>
<td>Operation is carried out at elevated temperature (&gt; 20°C above ambient temperature).</td>
</tr>
</tbody>
</table>

Amounts used

Not available.
Frequency and duration of use

<table>
<thead>
<tr>
<th>Duration</th>
<th>Frequency of use</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Covers daily exposures up to 8 hours (unless stated differently)</td>
<td></td>
<td>Assumes a good basic standard of occupational hygiene is implemented.</td>
</tr>
</tbody>
</table>

Human factors not influenced by risk management

Exposed skin areas

Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop.

Other given operational conditions affecting workers exposure

<table>
<thead>
<tr>
<th>Area of use</th>
<th>Room size</th>
<th>Temperature</th>
<th>Ventilation rate</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Other relevant operational conditions

Not available.

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

General exposures (closed systems), with sample collection; Handle substance within a closed system. Sample via a closed loop or other system to avoid exposure.

General exposures (closed systems); Provide extract ventilation to points where emissions occur. Handle substance within a closed system.

Process sampling; Sample via a closed loop or other system to avoid exposure.

Equipment cleaning and maintenance; Drain down and flush system prior to equipment break-in or maintenance. Retain drain downs in sealed storage pending disposal or for subsequent recycle.

Storage; Store substance within a closed system.

Technical conditions and measures to control dispersion from source towards the worker

General exposures (closed systems), with sample collection; Ensure operation is undertaken outdoors.

General exposures (closed systems); Ensure operation is undertaken outdoors.

Laboratory activities; Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure.

Bulk transfers; Ensure material transfers are under containment or extract ventilation.

Equipment cleaning and maintenance; Clear spills immediately. Ensure operation is undertaken outdoors.

Provide a good standard of controlled ventilation (10 to 15 air changes per hour).

Organizational measures to prevent/limit releases, dispersion and exposure

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 any skin contamination immediately. provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop.

General measures (carcinogens); Consider technical advances and process upgrades (including automation) for the elimination of releases. minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenario; clear up spills immediately and dispose of waste safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance.
Conditions and measures related to personal protection, hygiene and health evaluations

General exposures (closed systems), with sample collection;
Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.
Avoid carrying out activities involving exposure for more than 1 hour.

General exposures (closed systems);
Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.
Avoid carrying out activities involving exposure for more than 1 hour.

Process sampling;
Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.
Avoid carrying out activities involving exposure for more than 1 hour.

Laboratory activities;
Avoid carrying out activities involving exposure for more than 1 hour.

Bulk transfers;
Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.
Avoid carrying out activities involving exposure for more than 1 hour. or, Wear a respirator conforming to EN140 with Type A filter or better.

Equipment cleaning and maintenance;
Wear chemically resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Avoid carrying out activities involving exposure for more than 4 hours.
Wear a respirator conforming to EN140 with Type A filter or better.

Storage;
Wear chemically resistant gloves (tested to EN374) in combination with specific activity training.
Avoid carrying out activities involving exposure for more than 1 hour.

3. Exposure Estimation

Environment
See PETRORISK file in IUCLID Section 13 - "LocalCSR" worksheet.

Health

<table>
<thead>
<tr>
<th>Activity</th>
<th>Exposure level</th>
<th>RCR</th>
<th>Method</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>General exposures</td>
<td>0.01 ppm</td>
<td>0.009</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td>(closed systems)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General exposures</td>
<td>50 ppm</td>
<td>0.327</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td>(closed system) + With sample</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>collection</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General exposures</td>
<td>100 ppm</td>
<td>0.654</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td>(closed systems)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laboratory activities</td>
<td>50 ppm</td>
<td>0.467</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td>Bulk transfers</td>
<td>150 ppm</td>
<td>0.841</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td>Clean down and Maintenance</td>
<td>250 ppm</td>
<td>0.294</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td>Storage</td>
<td>50 ppm</td>
<td>0.467</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
</tbody>
</table>

** - The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated.
4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

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 on-site 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). Scaled local assessments for EU refineries have been performed using site-specific data and are attached in PETRORISK file - "Site-Specific Production" worksheet. If scaling reveals a condition of unsafe use (i.e., RCRs > 1), additional RMMs or a site-specific chemical safety assessment is required. Measured data have been used to demonstrate that the PETRORISK predicted fence-line concentrations in air are overestimated. These data support the conclusion that no refineries have RCRs > 1 (Appendix 4 and PETRORISK file in IUCLID section 13 - "Tier II worksheet").

Health

Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

Available hazard data do not enable the derivation of a DNEL for dermal irritant effects. Available hazard data do not support the need for a DNEL to be established for other health effects. Risk Management Measures are based on qualitative risk characterisation.
1. Use as an intermediate

List of use descriptors

<table>
<thead>
<tr>
<th>Sector(s) of Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>SU3: Industrial uses</td>
</tr>
<tr>
<td>SU8: Manufacture of bulk, large scale chemicals (including petroleum products)</td>
</tr>
<tr>
<td>SU9: Manufacture of fine chemicals</td>
</tr>
</tbody>
</table>

Product categories [PC]: Not available.

Name of contributing environmental scenario and corresponding ERC

| ERC6a: Industrial use resulting in manufacture of another substance (use of intermediates). |
| Specific Environmental Release Category: |
| ESVOC SpERG 6.1a.v1 |

List of names of contributing worker scenarios and corresponding PROCs

| PROC1: Use in closed process, no likelihood of exposure. |
| PROC2: Use in closed, continuous process with occasional controlled exposure. |
| PROC3: Use in closed batch process (synthesis or formulation). |
| PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities. |
| PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities. |
| PROC15: Use as laboratory reagent. |

Further explanations

Other Process or activity

Use of substance as an intermediate (not related to strictly controlled conditions) within closed or contained systems. Includes incidental exposures during recycling / recovery, material transfers, storage, sampling, associated laboratory activities, maintenance and loading (including marine vessel / barge, road / rail car and bulk container).

2.1. Contributing exposure scenario controlling environmental exposure for Industrial use resulting in manufacture of another substance (use of intermediates).

Product characteristics

<table>
<thead>
<tr>
<th>Concentration of the substance in a mixture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Covers percentage substance in the product up to 100 % (unless stated differently).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Physical state</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substance is complex UVCB. Predominantly hydrophobic.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Viscosity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kinematic viscosity</td>
</tr>
<tr>
<td>1,6 mm²/s 40 °C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dynamic viscosity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not available.</td>
</tr>
</tbody>
</table>

Amounts used

<table>
<thead>
<tr>
<th>Fraction of EU tonnage used in region:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0,1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Regional use tonnage (tons/year):</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,21 e6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fraction of Regional tonnage used locally:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0,0068</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Annual site tonnage (tons/year):</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,5 e4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum daily site tonnage (kg/day):</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 e4</td>
</tr>
</tbody>
</table>

Frequency and duration of use

<table>
<thead>
<tr>
<th>Batch process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not available.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Continuous process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emission days (days/year): 300</td>
</tr>
</tbody>
</table>

Environment factors not influenced by risk management

<table>
<thead>
<tr>
<th>Local freshwater dilution factor:</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Local marine water dilution factor:</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
</tr>
</tbody>
</table>

Other given operational conditions affecting environmental exposure

<table>
<thead>
<tr>
<th>Type</th>
<th>Emission days (days/year)</th>
<th>Air</th>
<th>Emission factors</th>
<th>Soil</th>
<th>Water</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>initial release prior to RMM</td>
<td>300</td>
<td>0,025</td>
<td>0,001</td>
<td>0,003</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

Common practices vary across sites thus conservative process release estimates used.
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil

Air
Treat air emission to provide a typical removal efficiency of (%) 80

Soil
Not available.

Water
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of ≥ (%) 92.9. If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of ≥ (%) 0

Sediment
Not available.

Remarks
Prevent discharge of undissolved substance to or recover from onsite wastewater. Risk from environmental exposure is driven by freshwater sediment. If discharging to domestic sewage treatment plant, no onsite wastewater treatment required.

Organisational 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 municipal sewage treatment plant

Size of municipal sewage system/treatment plant (m3/d)

<table>
<thead>
<tr>
<th>Type</th>
<th>Municipal STP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge rate</td>
<td>2000</td>
</tr>
<tr>
<td>Treatment effectiveness</td>
<td>95.5</td>
</tr>
<tr>
<td>Sludge treatment technique</td>
<td>Not available.</td>
</tr>
<tr>
<td>Measures to limit air emissions</td>
<td>Not available.</td>
</tr>
<tr>
<td>Remarks</td>
<td>Maximum allowable site tonnage (MSafe) based on release following total wastewater treatment removal (kg/d): 7.8e4</td>
</tr>
<tr>
<td>Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)</td>
<td>95.5</td>
</tr>
</tbody>
</table>

Conditions and measures related to external treatment of waste for disposal

Fraction of used amount transferred to external waste treatment

| Suitable waste treatment | Not available. |
| Disposal methods | Not available. |
| Treatment effectiveness | Not available. |
| Remarks | This substance is consumed during use and no waste of the substance is generated. |

Conditions and measures related to external recovery of waste

Fraction of used amount transferred to external waste treatment

| Suitable recover operations | External recovery and recycling of waste should comply with applicable local and/or national regulations. |
| Treatment effectiveness | Not available. |
| Remarks | This substance is consumed during use and no waste of the substance is generated. |

Additional good practice advice beyond the REACH CSA

Additional information on the basis for the allocation of the indentified OCs and RMMs is contained in the PETRORISK file.

2.2. Contributing exposure scenario controlling worker exposure for Use in closed process, no likelihood of exposure.

Process categories beyond the REACH CSA

Use in closed, continuous process with occasional controlled exposure. Use in closed batch process (synthesis or formulation). Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities. Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities. Use as laboratory reagent.

Product characteristics

| Concentration of the substance in a mixture | Covers percentage substance in the product up to 100 % (unless stated differently). |
| Physical form of the product | Liquid |
| Vapour pressure | Liquid, vapour pressure > 10 kPa at STP. |
| Process temperature | Operation is carried out at elevated temperature (> 20°C above ambient temperature). |

Amounts used
Not available.
Frequency and duration of use

<table>
<thead>
<tr>
<th>Duration</th>
<th>Frequency of use</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Covers daily exposures up to 8 hours (unless stated differently).</td>
<td>8</td>
<td>Assumes a good basic standard of occupational hygiene is implemented.</td>
</tr>
</tbody>
</table>

Human factors not influenced by risk management

Exposed skin areas

Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop.

Other given operational conditions affecting workers exposure

<table>
<thead>
<tr>
<th>Area of use</th>
<th>Room size</th>
<th>Temperature</th>
<th>Ventilation rate</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not available.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

General exposures (closed systems), with sample collection; Handle substance within a closed system. Sample via a closed loop or other system to avoid exposure.

General exposures (closed systems); Provide extract ventilation to points where emissions occur. Handle substance within a closed system.

Process sampling; Sample via a closed loop or other system to avoid exposure.

Equipment cleaning and maintenance; Drain down and flush system prior to equipment break-in or maintenance. Retain drain downs in sealed storage pending disposal or for subsequent recycle.

Storage; Store substance within a closed system.

Technical conditions and measures to control dispersion from source towards the worker

General exposures (closed systems), with sample collection; Ensure operation is undertaken outdoors.

General exposures (closed systems); Ensure operation is undertaken outdoors.

Laboratory activities; Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure.

Bulk transfers; Ensure material transfers are under containment or extract ventilation.

Equipment cleaning and maintenance; Clear spills immediately. Ensure operation is undertaken outdoors.

Provide a good standard of controlled ventilation (10 to 15 air changes per hour).

Organizational measures to prevent/limit releases, dispersion and exposure

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 any skin contamination immediately. provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop.

General measures (carcinogens); Consider technical advances and process upgrades (including automation) for the elimination of releases. minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenario; clear up spills immediately and dispose of waste safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance.

Benzene Concentrate SDS EU
904024 Version No.: 05 Revision date: 09-September-2013 Issue date: 28-July-2011
Conditions and measures related to personal protection, hygiene and health evaluations

General exposures (closed systems), with sample collection;
Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.
Avoid carrying out activities involving exposure for more than 1 hour.

General exposures (closed systems);
Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.
Avoid carrying out activities involving exposure for more than 1 hour.

Process sampling;
Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.
Avoid carrying out activities involving exposure for more than 1 hour.

Laboratory activities;
Avoid carrying out activities involving exposure for more than 1 hour.

Bulk transfers;
Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.
Avoid carrying out activities involving exposure for more than 1 hour.

Equipment cleaning and maintenance;
Wear chemically resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Avoid carrying out activities involving exposure for more than 4 hours.
Wear a respirator conforming to EN140 with Type A filter or better.

Storage;
Wear chemically resistant gloves (tested to EN374) in combination with specific activity training.
Avoid carrying out activities involving exposure for more than 1 hour.

3. Exposure Estimation

Environment
See PETRORISK file in IUCLID Section 13 - "LocalCSR" worksheet.

Health

<table>
<thead>
<tr>
<th></th>
<th>Exposure level</th>
<th>RCR</th>
<th>Method</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>General exposures</td>
<td>0.01 ppm</td>
<td>0.009</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td>(closed systems)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General exposures</td>
<td>50 ppm</td>
<td>0.327</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td>(closed system) + With</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>sample collection</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General exposures</td>
<td>100 ppm</td>
<td>0.654</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td>(closed systems)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laboratory activities</td>
<td>50 ppm</td>
<td>0.467</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td>Bulk transfers</td>
<td>150 ppm</td>
<td>0.841</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td>Equipment cleaning</td>
<td>250 ppm</td>
<td>0.294</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td>and maintenance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage</td>
<td>50 ppm</td>
<td>0.467</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
</tbody>
</table>

** - The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated.

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

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 on-site 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).

Health

Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

Available hazard data do not enable the derivation of a DNEL for dermal irritant effects. Available hazard data do not support the need for a DNEL to be established for other health effects. Risk Management Measures are based on qualitative risk characterisation.