SAFETY DATA SHEET

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

1.1. Product identifier

Name of the substance  Reformate
Identification number 649-308-00-2
Registration number 01-2119485927-18-0046
Synonyms None.
SDS number 2019
Issue date 12-August-2011
Revision date 09-July-2013
Supersedes date 17-August-2012

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

Identified uses  Distribution of a substance. Formulation & (re) packaging of substances and mixtures. Manufacture of substance. Use as an intermediate.

Uses advised against  None known.

1.3. Details of the supplier of the safety data sheet

Supplier
Company name Valero Energy Ltd
Address 1 Westferry Circus
Canary Wharf
London E14 4HA
UK
Telephone 01/210 345 4593 (General information; US)
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+;R12, 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

<table>
<thead>
<tr>
<th>Physical hazards</th>
<th>Health hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flammable liquids</td>
<td>Category 1</td>
</tr>
<tr>
<td>H224 - Extremely flammable liquid and vapour.</td>
<td></td>
</tr>
<tr>
<td>Acute toxicity, inhalation</td>
<td>Category 3</td>
</tr>
<tr>
<td>H311 - Toxic if inhaled.</td>
<td></td>
</tr>
<tr>
<td>Skin corrosion/irritation</td>
<td>Category 2</td>
</tr>
<tr>
<td>H315 - Causes skin irritation.</td>
<td></td>
</tr>
<tr>
<td>Germ cell mutagenicity</td>
<td>Category 1B</td>
</tr>
<tr>
<td>H340 - May cause genetic defects.</td>
<td></td>
</tr>
<tr>
<td>Carcinogenicity</td>
<td>Category 1B</td>
</tr>
<tr>
<td>H350 - May cause cancer.</td>
<td></td>
</tr>
<tr>
<td>Reproductive toxicity</td>
<td>Category 2</td>
</tr>
<tr>
<td>H361fd - Suspected of damaging fertility. Suspected of damaging the unborn child.</td>
<td></td>
</tr>
<tr>
<td>Specific target organ toxicity - single exposure</td>
<td></td>
</tr>
<tr>
<td>H336 - May cause drowsiness or dizziness.</td>
<td></td>
</tr>
<tr>
<td>Aspiration hazard</td>
<td>Category 1</td>
</tr>
<tr>
<td>H304 - May be fatal if swallowed and enters airways.</td>
<td></td>
</tr>
</tbody>
</table>
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
Extremely 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. Prolonged or repeated contact with skin may cause redness, itching, irritation, eczema/chapping and oil acne. Prolonged and repeated contact with the product may cause skin cancer. Components of the product may be absorbed into the body through the skin. Droplets of the product aspirated into the lungs through ingestion or vomiting may cause a serious chemical pneumonia. Material will float and can be re-ignited on surface of water.

Main symptoms
Irritation of eyes and mucous membranes. Skin irritation. Dermatitis. Ingestion may cause irritation and malaise.

2.2. Label elements
Label according to Regulation (EC) No. 1272/2008 as amended
Contains:
Naphtha (petroleum), catalytic reformed
Identification number
649-308-00-2
Hazard pictograms

Signal word
Danger

Hazard statements
H224 - Extremely flammable liquid and vapour.
H304 - May be fatal if swallowed and enters airways.
H315 - Causes skin irritation.
H331 - Toxic if inhaled.
H336 - May cause drowsiness or dizziness.
H340 - May cause genetic defects.
H350 - May cause cancer.
H361fd - Suspected of damaging fertility. Suspected of damaging the unborn child.
H411 - Toxic to aquatic life with long lasting effects.

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
Static accumulator - Static accumulating flammable materials can become electrostatically charged even in bonded and grounded equipment. Sparks may ignite material and vapor may cause flash fire (or explosion).

SECTION 3: Composition/information on ingredients

3.1. Substances
General information

Naphtha (petroleum), catalytic reformed

Classification: DSD: F+; R12, Carc. Cat. 2; R45, Muta. Cat. 2; R46, Xi; R65, Xi; R38, R67, N; R51/53

CLP: Flam. Liq. 1; H224, Asp. Tox. 1; H304, Skin Irrit. 2; H315, STOT SE 3; H336, Muta. 1B; H340, Carc. 1B; H350, Repr. 2; H361fd, Aquatic Chronic 2; H411

Additional components

<table>
<thead>
<tr>
<th>Chemical name</th>
<th>%</th>
<th>CAS-No. / EC No.</th>
<th>REACH Registration No.</th>
<th>INDEX No.</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene</td>
<td>8-12</td>
<td>71-43-2</td>
<td>-</td>
<td>601-020-00-8</td>
<td>#</td>
</tr>
</tbody>
</table>

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

If exposed or concerned: get medical attention/advice. Show this safety data sheet to the doctor in attendance. Wash contaminated clothing before re-use.

4.1. Description of first aid measures

Inhalation

Move to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention.

Skin contact

Remove contaminated clothing and shoes. Wash off immediately with soap and plenty of water. Get medical attention if irritation develops or persists. Wash clothing separately before reuse. Destroy or thoroughly clean contaminated shoes. If high pressure injection under the skin occurs, always seek medical attention.

Eye contact

Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention.

Ingestion

Rinse mouth thoroughly. Do not induce vomiting without advice from poison control centre. Do not give mouth-to-mouth resuscitation. Get medical attention immediately.

4.2. Most important symptoms and effects, both acute and delayed


4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically. Symptoms may be delayed.

SECTION 5: Firefighting measures

General fire hazards

The product is extremely flammable, and explosive vapour/air mixtures may be formed even at normal room temperatures. Containers may explode when heated.

5.1. Extinguishing media

Suitable extinguishing media


Unsuitable extinguishing media

Do not use a solid water stream as it may scatter and spread fire.

5.2. Special hazards arising from the substance or mixture

Vapor may cause flash fire. Vapors can flow along surfaces to distant ignition source and flash back. Sensitive to static discharge.

5.3. Advice for firefighters

Special protective equipment for firefighters

Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask.
SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
- For non-emergency personnel: Keep unnecessary personnel away. Local authorities should be advised if significant spillages cannot be contained. Keep out of low areas. Ventilate closed spaces before entering. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. See Section 8 for personal protective equipment.
- 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 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
- Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Never return spills in original containers for re-use. Prevent entry into waterways, sewers, basements or confined areas. 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. Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Should not be released into the environment. This material and its container must be disposed of as hazardous waste. Use non-sparking tools and explosion-proof equipment.
- Small Spills: Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Cover with plastic sheet to prevent spreading. Following product recovery, flush area with water. Clean surface thoroughly to remove residual contamination. Wipe up with absorbent material (e.g. cloth, fleece).

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
Eliminate sources of ignition. Avoid spark promoters. Ground/bond container and equipment. These alone may be insufficient to remove static electricity. Do not breathe dust/fume/gas/mist/vapors/spray. Avoid contact with eyes, skin, and clothing. Do not taste or swallow. Avoid prolonged exposure. Use only with adequate ventilation. Wash thoroughly after handling. The product is extremely flammable, and explosive vapour/air mixtures may be formed even at normal room temperatures. DO NOT handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. Take precautionary measures against static discharges. All equipment used when handling the product must be grounded. Use non-sparking tools and explosion-proof equipment. When using, do not eat, drink or smoke.

7.2. Conditions for safe storage, including any incompatibilities
Flammable liquid storage. Do not handle or store near an open flame, heat or other sources of ignition. Keep container tightly closed in a cool, well-ventilated place.

7.3. Specific end use(s)
### SECTION 8: Exposure controls/personal protection

#### 8.1. Control parameters

### Occupational exposure limits

**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>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene (CAS 71-43-2)</td>
<td>TWA</td>
<td>30 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 ppm</td>
</tr>
</tbody>
</table>

**Czech Republic. OELs. Government Decree 361**

<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>10 mg/m³</td>
</tr>
<tr>
<td></td>
<td>TWA</td>
<td>3 mg/m³</td>
</tr>
</tbody>
</table>

**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>


<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>
</tr>
<tr>
<td></td>
<td></td>
<td>0.5 ppm</td>
</tr>
</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>
<tr>
<td>Country</td>
<td>Regulations</td>
<td>Value Type</td>
</tr>
<tr>
<td>-------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>Ireland</td>
<td>Occupational Exposure Limits</td>
<td>TWA</td>
</tr>
<tr>
<td>Italy</td>
<td>OELs</td>
<td>STEL</td>
</tr>
<tr>
<td>Latvia</td>
<td>Occupational exposure limit values of chemical substances in work environment</td>
<td>TWA</td>
</tr>
<tr>
<td>Lithuania</td>
<td>OELs. Limit Values for Chemical Substances, General Requirements (Hygiene Norm HN 23:2007)</td>
<td>STEL</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>OELs for Carcinogens/Mutagens</td>
<td>TWA</td>
</tr>
<tr>
<td>Netherlands</td>
<td>OELs (binding)</td>
<td>STEL</td>
</tr>
<tr>
<td>Norway</td>
<td>Administrative Norms for Contaminants in the Workplace</td>
<td>TWA</td>
</tr>
<tr>
<td>Poland</td>
<td>MACs. Minister of Labour and Social Policy Regarding Maximum Allowable Concentrations and Intensities in Working Environment</td>
<td>TWA</td>
</tr>
<tr>
<td>Portugal</td>
<td>VLEs. Norm on occupational exposure to chemical agents (NP 1796)</td>
<td>STEL</td>
</tr>
<tr>
<td>Romania</td>
<td>OELs. Protection of workers from exposure to chemical agents at the workplace</td>
<td>TWA</td>
</tr>
<tr>
<td>Slovenia</td>
<td>Regulations concerning protection of workers against risks due to exposure to chemicals while working (Official Gazette of the Republic of Slovenia)</td>
<td>TWA</td>
</tr>
<tr>
<td>Sweden</td>
<td>Occupational Exposure Limit Values</td>
<td>STEL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA</td>
</tr>
<tr>
<td>Sweden. Occupational Exposure Limit Values</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Additional components</strong></td>
<td><strong>Type</strong></td>
<td><strong>Value</strong></td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Switzerland. SUVA Grenzwerte am Arbeitsplatz</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Additional components</strong></td>
</tr>
<tr>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>Benzene (CAS 71-43-2)</td>
</tr>
<tr>
<td>0.5 ppm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UK. EH40 Workplace Exposure Limits (WELs)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Additional components</strong></td>
</tr>
<tr>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>---------------------------------------------</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EU. OELs, Directive 2004/37/EC on carcinogen and mutagens from Annex III, Part A</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Additional components</strong></td>
</tr>
<tr>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>---------------------------------------------</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Biological limit values</th>
</tr>
</thead>
<tbody>
<tr>
<td>France. Biological indicators of exposure (IBE) (National Institute for Research and Security (INRS, ND 2065))</td>
</tr>
<tr>
<td><strong>Additional components</strong></td>
</tr>
<tr>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>---------------------------------------------</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Additional components</strong></td>
</tr>
<tr>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>---------------------------------------------</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Spain. Biological Limit Values (VLBs), Occupational Exposure Limits for Chemical Agents, Table 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Additional components</strong></td>
</tr>
<tr>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>---------------------------------------------</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Switzerland. BAT-Werte (Biological Limit Values in the Workplace as per SUVA)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Additional components</strong></td>
</tr>
<tr>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>---------------------------------------------</td>
</tr>
</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><strong>Type</strong></th>
<th><strong>Route</strong></th>
<th><strong>Value</strong></th>
<th><strong>Form</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Reformate (CAS 68955-35-1)</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
  Wear chemical-resistant, impervious gloves. 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

Consult supervisor for special handling instructions. Avoid contact with eyes. Avoid contact with skin. Wash hands before breaks and immediately after handling the product. Provide eyewash station and safety shower. Handle in accordance with good industrial hygiene and safety practices.

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

- Physical state: Liquid.
- Form: Liquid.
- Colour: Not available.
- Odour: Hydrocarbon.
- Odour threshold: Not available.
- pH: Not available.
- Melting point/freezing point: Not applicable.
- Initial boiling point and boiling range: 32,2 - 221,1 °C (89,96 - 429,98 °F)
- Flash point: < -7,0 °C (< 19,4 °F)
- Evaporation rate: Not available.
- Flammability (solid, gas): Not applicable.

Upper/lower flammability or explosive limits

- Flammability limit - lower (%): 1,4 % v/v
- Flammability limit - upper (%): 7,6 % v/v

Vapour pressure: 5 - 15 psi (37,8°C)
Vapour density: 3 - 4
Relative density: Not available.
Solubility(ies): Insoluble in water.
Partition coefficient (n-octanol/water): Log Kow: >3
Auto-ignition temperature: 280 - 446 °C (536 - 834,8 °F)
Decomposition temperature: Not available.

Viscosity: $< 7 \text{ mm}^2/\text{s}$ (40°C)

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: Hazardous polymerisation does not occur. Hazardous reactions do not occur.

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. Swallowing or vomiting of the liquid may result in aspiration into the lungs.
- **Inhalation**: Vapours may cause drowsiness and dizziness.
- **Skin contact**: Causes skin irritation. Repeated exposure may cause skin dryness or cracking.
- **Eye contact**: Direct contact with eyes may cause temporary irritation.


11.1. Information on toxicological effects:

**Acute toxicity**: May be fatal if swallowed and enters airways. In high concentrations, vapours and spray mists are narcotic and may cause headache, fatigue, dizziness and nausea.

<table>
<thead>
<tr>
<th>Product</th>
<th>Species</th>
<th>Test results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reformate (CAS 68955-35-1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Acute</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dermal LD50</td>
<td>Rabbit</td>
<td>$&gt; 2000 \text{ mg/kg}$</td>
</tr>
<tr>
<td>Inhalation LC50</td>
<td>Rat</td>
<td>$&gt; 5610 \text{ mg/m3}$</td>
</tr>
<tr>
<td>Oral LD50</td>
<td>Rat</td>
<td>$&gt; 5000 \text{ mg/kg}$</td>
</tr>
</tbody>
</table>

**Skin corrosion/irritation**: Causes skin irritation.

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

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

**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 fertility or the unborn child.

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

**Specific target organ toxicity - repeated exposure**: Not classified.

**Aspiration hazard**: May be fatal if swallowed and enters airways.
SECTION 12: Ecological information

12.1. Toxicity

Oil spills are generally hazardous to the environment.

<table>
<thead>
<tr>
<th>Product</th>
<th>Species</th>
<th>Test results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reformate (CAS 68955-35-1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aquatic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Algae</td>
<td>EC50</td>
<td>Pseudokirchneriella subcapitata</td>
</tr>
<tr>
<td>Crustacea</td>
<td>EC50</td>
<td>Daphnia magna</td>
</tr>
<tr>
<td>Fish</td>
<td>LC50</td>
<td>Oncorhynchus mykiss</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pimephales promelas</td>
</tr>
</tbody>
</table>

12.2. Persistence and degradability

Expected to be inherently biodegradable.

12.3. Bioaccumulative potential

Has the potential to bioaccumulate.

Partition coefficient n-octanol/water (log Kow)

<table>
<thead>
<tr>
<th>Benzene (CAS 71-43-2)</th>
<th>Log Kow: &gt;3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bioconcentration factor (BCF)</td>
<td>Not available.</td>
</tr>
</tbody>
</table>

12.4. Mobility in soil

Based on the calculation model the product has a low potential of being absorbed in the soil.

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

Toxic to aquatic life with long lasting effects. The product contains volatile organic compounds which have a photochemical ozone creation potential. Oil spills are generally hazardous to the environment.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Residual waste

Dispose of in accordance with local regulations.

Contaminated packaging

Since emptied containers may retain product residue, follow label warnings even after container is emptied.

EU waste code

13 07 02*

Disposal methods/information

Dispose in accordance with all applicable regulations. This material and its container must be disposed of as hazardous waste. Do not discharge into drains, water courses or onto the ground.

SECTION 14: Transport information

ADR

14.1. UN number

UN1268

14.2. UN proper shipping name

Petroleum distillates, n.o.s. (Naphtha (petroleum), catalytic reformed)

14.3. Transport hazard class(es)

3

14.4. Packing group

1

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 distillates, n.o.s. (Naphtha (petroleum), catalytic reformed)

14.3. Transport hazard class(es)

3
Subsidiary class(es) -
14.4. Packing group I
14.5. Environmental hazards Yes
Labels required 3
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 distillates, n.o.s. (Naphtha (petroleum), catalytic reformed)
14.3. Transport hazard class(es) 3
Subsidiary class(es) -
14.4. Packing group I
14.5. Environmental hazards Yes
Labels required 3
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 distillates, n.o.s. (Naphtha (petroleum), catalytic reformed)
14.3. Transport hazard class(es) 3
Subsidiary class(es) -
14.4. Packing group I
14.5. Environmental hazards Yes
Labels required 3
ERG Code 3H
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 distillates, n.o.s. (Naphtha (petroleum), catalytic reformed)
14.3. Transport hazard class(es) 3
Subsidiary class(es) -
14.4. Packing group I
14.5. Environmental hazards Marine pollutant Yes
Labels required 3
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. 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)
Naphtha (petroleum), catalytic reformed (CAS 68955-35-1)

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)
Naphtha (petroleum), catalytic reformed (CAS 68955-35-1)

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) - Extremely 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. Pregnant women should not work with the product, if there is the least risk of exposure. Follow national regulation for work with chemical agents.

15.2. Chemical safety assessment
For this substance a chemical safety assessment has been carried out.
Exposure scenarios relevant for this material are annexed and distributed as separate document to this eSDS.

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.
eSDS: extended Safety Data Sheet.
STP: Sewage Treatment Plant.

References
CLP files – http://concawe.org/
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.
<table>
<thead>
<tr>
<th>Full text of any statements or R-phrases and H-statements under Sections 2 to 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>R12 Extremely flammable.</td>
</tr>
<tr>
<td>R38 Irritating to skin.</td>
</tr>
<tr>
<td>R45 May cause cancer.</td>
</tr>
<tr>
<td>R46 May cause heritable genetic damage.</td>
</tr>
<tr>
<td>R51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.</td>
</tr>
<tr>
<td>R62 Possible risk of impaired fertility.</td>
</tr>
<tr>
<td>R63 Possible risk of harm to the unborn child.</td>
</tr>
<tr>
<td>R65 Also harmful: may cause lung damage if swallowed.</td>
</tr>
<tr>
<td>R67 Vapours may cause drowsiness and dizziness.</td>
</tr>
<tr>
<td>H224 Extremely flammable liquid and vapour.</td>
</tr>
<tr>
<td>H304 May be fatal if swallowed and enters airways.</td>
</tr>
<tr>
<td>H315 Causes skin irritation.</td>
</tr>
<tr>
<td>H336 May cause drowsiness or dizziness.</td>
</tr>
<tr>
<td>H340 May cause genetic defects.</td>
</tr>
<tr>
<td>H350 May cause cancer.</td>
</tr>
<tr>
<td>H361fd Suspected of damaging fertility. Suspected of damaging the unborn child.</td>
</tr>
<tr>
<td>H411 Toxic to aquatic life with long lasting effects.</td>
</tr>
</tbody>
</table>

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

This safety data sheet contains revisions in the following section(s): 2, 4, 7, 8, 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) and repacking (including drums and small packs) of substance, including 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 Emission factors</th>
<th>Soil Emission factors</th>
<th>Water 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>
<td></td>
</tr>
</tbody>
</table>

Risk management measures (RMM)

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

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>Discharge rate</th>
<th>Treatment effectiveness</th>
<th>Sludge treatment technique</th>
<th>Measures to limit air emissions</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipal STP</td>
<td>2000</td>
<td>95,5</td>
<td>Not available.</td>
<td>Not available.</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 recovery 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>1 hours per day</td>
</tr>
</tbody>
</table>

**Remarks**
Assumes a good basic standard of occupational hygiene is implemented.

**Human factors not influenced by risk management**
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>
</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);
- 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);
- Provide extract ventilation to points where emissions occur.
- 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.
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 suitable gloves tested to EN374.

General exposures (closed systems);
Wear suitable gloves tested to EN374.
Avoid carrying out activities involving exposure for more than 4 hours.

Process sampling;
Wear suitable gloves tested to EN374.

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

Bulk closed loading and unloading;
Wear chemically resistant gloves (tested to EN374) in combination with specific activity 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 1 hour. or, Wear a respirator conforming to EN140 with Type A filter or better.

Storage;
Wear suitable gloves tested to EN374.

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</td>
<td>**</td>
</tr>
<tr>
<td>0,34 mg/kg bw/day</td>
<td>0,291</td>
<td>**</td>
<td>Dermal Exposure</td>
</tr>
<tr>
<td>0,34 mg/kg bw/day</td>
<td>0,292</td>
<td>**</td>
<td>All routes</td>
</tr>
<tr>
<td>General exposures (closed system) + With sample collection</td>
<td>50 ppm</td>
<td>0,467</td>
<td>**</td>
</tr>
<tr>
<td>1,37 mg/kg bw/day</td>
<td>0,234</td>
<td>**</td>
<td>Dermal Exposure</td>
</tr>
<tr>
<td>1,37 mg/kg bw/day</td>
<td>0,701</td>
<td>**</td>
<td>All routes</td>
</tr>
<tr>
<td>General exposures (closed systems)</td>
<td>100 ppm</td>
<td>0,785</td>
<td>**</td>
</tr>
<tr>
<td>0,34 mg/kg bw/day</td>
<td>0,058</td>
<td>**</td>
<td>Dermal Exposure</td>
</tr>
<tr>
<td>0,34 mg/kg bw/day</td>
<td>0,843</td>
<td>**</td>
<td>All routes</td>
</tr>
<tr>
<td>Process sampling</td>
<td>100 ppm</td>
<td>0,935</td>
<td>**</td>
</tr>
<tr>
<td>0,34 mg/kg bw/day</td>
<td>0,058</td>
<td>**</td>
<td>Dermal Exposure</td>
</tr>
<tr>
<td>0,34 mg/kg bw/day</td>
<td>0,993</td>
<td>**</td>
<td>All routes</td>
</tr>
<tr>
<td>Laboratory activities</td>
<td>50 ppm</td>
<td>0,935</td>
<td>**</td>
</tr>
<tr>
<td>0,03 mg/kg bw/day</td>
<td>0,026</td>
<td>**</td>
<td>Dermal Exposure</td>
</tr>
<tr>
<td>0,03 mg/kg bw/day</td>
<td>0,960</td>
<td>**</td>
<td>All routes</td>
</tr>
<tr>
<td>Bulk closed loading</td>
<td>150 ppm</td>
<td>0,561</td>
<td>**</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.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Exposure</th>
<th>RfD</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk closed loading and unloading</td>
<td>0.69 mg/kg bw/day</td>
<td>0.029, **</td>
<td>Dermal Exposure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.590, **</td>
<td>All routes</td>
</tr>
<tr>
<td>Equipment cleaning and maintenance</td>
<td>250 ppm</td>
<td>0.654, **</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td></td>
<td>0.69 mg/kg bw/day</td>
<td>0.029, **</td>
<td>Dermal Exposure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.590, **</td>
<td>All routes</td>
</tr>
<tr>
<td>Storage</td>
<td>13.71 mg/kg bw/day</td>
<td>0.234, **</td>
<td>Dermal Exposure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.898, **</td>
<td>All routes</td>
</tr>
<tr>
<td></td>
<td>50 ppm</td>
<td>0.467, **</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td></td>
<td>1.37 mg/kg bw/day</td>
<td>0.234, **</td>
<td>Dermal Exposure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.701, **</td>
<td>All routes</td>
</tr>
</tbody>
</table>
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.
  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 (Emission factors)</th>
<th>Soil (Emission factors)</th>
<th>Water (Emission factors)</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)

<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): 1,0e5</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
Not available.

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

Suitable recover operations
Not available.

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>
</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), Outdoor.; 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**

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.

Drum/batch transfers; Ensure material transfers are under containment or extract ventilation.

Equipment cleaning and maintenance; Clear spills immediately.

**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.
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 **</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td></td>
<td>0,34 mg/kg bw/day</td>
<td>0.291 **</td>
<td>Dermal Exposure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.292 **</td>
<td>All routes</td>
</tr>
<tr>
<td>General exposures (closed system) + With sample collection</td>
<td>50 ppm</td>
<td>0.327 **</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td></td>
<td>1,37 mg/kg bw/day</td>
<td>0.234 **</td>
<td>Dermal Exposure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.561 **</td>
<td>All routes</td>
</tr>
<tr>
<td>General exposures (closed systems)</td>
<td>100 ppm</td>
<td>0.785 **</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td></td>
<td>0,34 mg/kg bw/day</td>
<td>0.058 **</td>
<td>Dermal Exposure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.843 **</td>
<td>All routes</td>
</tr>
<tr>
<td>Storage</td>
<td>50 ppm</td>
<td>0.561 **</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td></td>
<td>1,37 mg/kg bw/day</td>
<td>0.234 **</td>
<td>Dermal Exposure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.795 **</td>
<td>All routes</td>
</tr>
<tr>
<td>Sample collection</td>
<td>100 ppm</td>
<td>0.561 **</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td></td>
<td>1,37 mg/kg bw/day</td>
<td>0.234 **</td>
<td>Dermal Exposure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.795 **</td>
<td>All routes</td>
</tr>
<tr>
<td>Laboratory activities</td>
<td>50 ppm</td>
<td>0.935 **</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td></td>
<td>0,03 mg/kg bw/day</td>
<td>0.026 **</td>
<td>Dermal Exposure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.960 **</td>
<td>All routes</td>
</tr>
<tr>
<td>Bulk transfers</td>
<td>150 ppm</td>
<td>0.561 **</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td></td>
<td>0,69 mg/kg bw/day</td>
<td>0.029 **</td>
<td>Dermal Exposure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.590 **</td>
<td>All routes</td>
</tr>
<tr>
<td>Drum/batch transfers</td>
<td>150 ppm</td>
<td>0.841 **</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td></td>
<td>0,69 mg/kg bw/day</td>
<td>0.118 **</td>
<td>Dermal Exposure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.959 **</td>
<td>All routes</td>
</tr>
<tr>
<td>Equipment cleaning and maintenance</td>
<td>250 ppm</td>
<td>0.654 **</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td></td>
<td>13,71 mg/kg bw/day</td>
<td>0.234 **</td>
<td>Dermal Exposure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.889 **</td>
<td>All routes</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 substances

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.

Specific Environmental Release Category:

- ESVOC SpERC 1.1.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**
  Manufacture of substance or use as process chemical or extracting agent 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</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>0,05</td>
<td>0,0001</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 (%): 99,0

**Soil**
Not available.

**Water**
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

**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). 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>10000</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>
</tbody>
</table>
| Remarks | Maximum allowable site tonnage (MSafe) based on release following total wastewater treatment removal (kg/d): 2,0e6

**Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)**
99,1

**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 | During manufacturing 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 | During manufacturing 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></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), Continuous process;
Handle substance within a closed system.

General exposures (closed systems), Batch process;
Handle substance within a closed system.

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

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

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

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

Equipment cleaning and maintenance;
Clear spills immediately.

Storage;
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; 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.
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</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(closed systems)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.01 ppm</td>
<td>0</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td>0.34 mg/kg bw/day</td>
<td>0.291</td>
<td>**</td>
<td>Dermal Exposure</td>
</tr>
<tr>
<td>0.342 **</td>
<td></td>
<td>All routes</td>
<td></td>
</tr>
<tr>
<td>General exposures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(closed system) + With sample collection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 ppm</td>
<td>0.327</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td>1.37 mg/kg bw/day</td>
<td>0.234</td>
<td>**</td>
<td>Dermal Exposure</td>
</tr>
<tr>
<td>0.561 **</td>
<td></td>
<td>All routes</td>
<td></td>
</tr>
<tr>
<td>General exposures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(closed systems)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 ppm</td>
<td>0.785</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td>0.34 mg/kg bw/day</td>
<td>0.058</td>
<td>**</td>
<td>Dermal Exposure</td>
</tr>
<tr>
<td>0.843 **</td>
<td></td>
<td>All routes</td>
<td></td>
</tr>
<tr>
<td>Laboratory activities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 ppm</td>
<td>0.935</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td>0.03 mg/kg bw/day</td>
<td>0.026</td>
<td>**</td>
<td>Dermal Exposure</td>
</tr>
<tr>
<td>0.960 **</td>
<td></td>
<td>All routes</td>
<td></td>
</tr>
<tr>
<td>Bulk transfers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150 ppm</td>
<td>0.561</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td>0.029 **</td>
<td></td>
<td>All routes</td>
<td></td>
</tr>
<tr>
<td>Equipment cleaning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>and maintenance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>250 ppm</td>
<td>0.654</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td>13.71 mg/kg bw/day</td>
<td>0.234</td>
<td>**</td>
<td>Dermal Exposure</td>
</tr>
<tr>
<td>0.889 **</td>
<td></td>
<td>All routes</td>
<td></td>
</tr>
<tr>
<td>Storage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 ppm</td>
<td>0.467</td>
<td>**</td>
<td>Inhalation Exposure</td>
</tr>
<tr>
<td>1.37 mg/kg bw/day</td>
<td>0.234</td>
<td>**</td>
<td>Dermal Exposure</td>
</tr>
<tr>
<td>0.701 **</td>
<td></td>
<td>All routes</td>
<td></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

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
- ERC6a: Industrial use resulting in manufacture of another substance (use of intermediates).
- ESVOC SpERC 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

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): 2,21 e6
- Fraction of Regional tonnage used locally: 0,0068
- Annual site tonnage (tons/year): 1,5 e4
- Maximum daily site tonnage (kg/day): 5 e4

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</td>
<td>300</td>
<td>0,025</td>
<td>0,001</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/Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air</td>
<td>Treat air emission to provide a typical removal efficiency of (%): 80</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 ≥ (%): 92.9. If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of ≥ (%): 0</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 freshwater sediment. If discharging to domestic sewage treatment plant, no 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>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Municipal STP</td>
</tr>
<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>
</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

<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>Details</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>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>
</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.

Technical conditions and measures to control dispersion from source towards the worker
Laboratory activities; Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure.

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

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

Equipment cleaning and maintenance; Clear spills immediately.

Storage; 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 suitable gloves tested to EN374.

Equipment cleaning and maintenance; Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.
3. Exposure Estimation

Environment

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

<table>
<thead>
<tr>
<th>Exposure level (closed systems)</th>
<th>Exposure level (closed system) + With sample collection</th>
<th>Method</th>
<th>RCR</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>General exposures</td>
<td>General exposures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(closed systems)</td>
<td>General exposures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.01 ppm</td>
<td>0.137 mg/kg bw/day</td>
<td>**</td>
<td>0.234</td>
<td>Dermal Exposure</td>
</tr>
<tr>
<td>0.34 mg/kg bw/day</td>
<td>0.34 mg/kg bw/day</td>
<td>**</td>
<td>0.561</td>
<td>All routes</td>
</tr>
<tr>
<td>0.291</td>
<td>0.292</td>
<td>**</td>
<td>0.292</td>
<td>All routes</td>
</tr>
<tr>
<td>0.34 mg/kg bw/day</td>
<td>0.292</td>
<td>**</td>
<td>0.292</td>
<td>All routes</td>
</tr>
<tr>
<td>50 ppm</td>
<td>0.34 mg/kg bw/day</td>
<td>**</td>
<td>0.561</td>
<td>All routes</td>
</tr>
<tr>
<td>1,37 mg/kg bw/day</td>
<td>0.34 mg/kg bw/day</td>
<td>**</td>
<td>0.561</td>
<td>All routes</td>
</tr>
<tr>
<td>100 ppm</td>
<td>0.34 mg/kg bw/day</td>
<td>**</td>
<td>0.561</td>
<td>All routes</td>
</tr>
<tr>
<td>Laboratory activities</td>
<td>0.34 mg/kg bw/day</td>
<td>**</td>
<td>0.561</td>
<td>All routes</td>
</tr>
<tr>
<td>0.29 mg/kg bw/day</td>
<td>0.29 mg/kg bw/day</td>
<td>**</td>
<td>0.292</td>
<td>All routes</td>
</tr>
<tr>
<td>0.395</td>
<td>0.395</td>
<td>**</td>
<td>0.395</td>
<td>All routes</td>
</tr>
<tr>
<td>Bulk transfers</td>
<td>0.395</td>
<td>**</td>
<td>0.395</td>
<td>All routes</td>
</tr>
<tr>
<td>150 ppm</td>
<td>0.395</td>
<td>**</td>
<td>0.395</td>
<td>All routes</td>
</tr>
<tr>
<td>0.69 mg/kg bw/day</td>
<td>0.69 mg/kg bw/day</td>
<td>**</td>
<td>0.690</td>
<td>All routes</td>
</tr>
<tr>
<td>0.590</td>
<td>0.590</td>
<td>**</td>
<td>0.590</td>
<td>All routes</td>
</tr>
<tr>
<td>Equipment cleaning and maintenance</td>
<td>0.395</td>
<td>**</td>
<td>0.395</td>
<td>All routes</td>
</tr>
<tr>
<td>250 ppm</td>
<td>0.395</td>
<td>**</td>
<td>0.395</td>
<td>All routes</td>
</tr>
<tr>
<td>Storage</td>
<td>0.395</td>
<td>**</td>
<td>0.395</td>
<td>All routes</td>
</tr>
<tr>
<td>13.71 mg/kg bw/day</td>
<td>0.395</td>
<td>**</td>
<td>0.395</td>
<td>All routes</td>
</tr>
<tr>
<td>150 ppm</td>
<td>0.395</td>
<td>**</td>
<td>0.395</td>
<td>All routes</td>
</tr>
<tr>
<td>0.69 mg/kg bw/day</td>
<td>0.69 mg/kg bw/day</td>
<td>**</td>
<td>0.690</td>
<td>All routes</td>
</tr>
<tr>
<td>0.590</td>
<td>0.590</td>
<td>**</td>
<td>0.590</td>
<td>All routes</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.