SAFETY DATA SHEET

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

1.1. Product identifier

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

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

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)
e-mail	CorpHSE@valero.com
Contact person	Industrial Hygienist

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

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

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

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

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

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

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

Physical hazards		
Flammable liquids	Category 2	H225 - Highly flammable liquid and vapour.
Health hazards		
Skin corrosion/irritation	Category 2	H315 - Causes skin irritation.
Germ cell mutagenicity	Category 1B	H340 - May cause genetic defects.
Carcinogenicity	Category 1B	H350 - May cause cancer.
Reproductive toxicity	Category 2	H361 - Suspected of damaging fertility or the unborn child.
Specific target organ toxicity - single exposure	Category 3 narcotic effects	H336 - May cause drowsiness or dizziness.
Aspiration hazard	Category 1	H304 - May be fatal if swallowed and enters airways.
Environmental hazards		
Hazardous to the aquatic environment, long-term aquatic hazard	Category 2	H411 - Toxic to aquatic life with long lasting effects.

Hazard summary

Physical hazards Highly flammable.

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

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

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

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

2.2. Label elements

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

Contains: Distillates (petroleum), C6-rich

Identification number 649-388-00-9

Hazard pictograms

Signal word Danger

Hazard statements
H225 - Highly flammable liquid and vapour.
H304 - May be fatal if swallowed and enters airways.
H315 - Causes skin irritation.
H336 - May cause drowsiness or dizziness.
H340 - May cause genetic defects.
H350 - May cause cancer.
H361 - Suspected of damaging fertility or the unborn child.
H411 - Toxic to aquatic life with long lasting effects.

Precautionary statements

Prevention
P201 - Obtain special instructions before use.
P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P280 - Wear protective gloves/protective clothing/eye protection/face protection.

Response P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTRE or doctor/physician.

Storage P403 + P233 - Store in a well-ventilated place. Keep container tightly closed.

Disposal P501 - Dispose of contents/container in accordance with local/regional/national/international regulations.

Supplemental label information Not applicable.

2.3. Other hazards

Not a PBT or vPvB substance or mixture.

SECTION 3: Composition/information on ingredients

3.1. Substances

General information

Chemical name	%	CAS-No. / EC No.	REACH Registration No.	INDEX No.	Notes
Distillates (petroleum), C6-rich	100	93165-19-6 296-903-4	01-2119474694-26-0005	649-388-00-9	

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

CLP: Flam. Liq. 2;H225, Asp. Tox. 1;H304, Skin Irrit. 2;H315, STOT SE 3;H336, Muta. 1B;H340, Carc. 1B;H350, Repr. 2;H361, Aquatic Chronic 2;H411

DSD: Directive 67/548/EEC.
CLP: Regulation No. 1272/2008.
#: This substance has been assigned Community workplace exposure limit(s).

Additional components

Chemical name	%	CAS-No. / EC No.	REACH Registration No.	INDEX No.	Notes
Benzene	40 - 50	71-43-2 200-753-7	-	601-020-00-8	#

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

SECTION 4: First aid measures

General information Get medical attention if any discomfort develops.

4.1. Description of first aid measures

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

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

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

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

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

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

SECTION 5: Firefighting measures

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

5.1. Extinguishing media

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

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

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

5.3. Advice for firefighters

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

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

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

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

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

6.2. Environmental precautions

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

6.3. Methods and material for containment and cleaning up

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

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

Large Spills: Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Prevent product from entering drains. Do not allow material to contaminate ground water system. Should not be released into the environment. Ensure that waste and contaminated materials are collected and removed from the work area as soon as possible in a suitably labelled container.

6.4. Reference to other sections

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

SECTION 7: Handling and storage

7.1. Precautions for safe handling

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

7.2. Conditions for safe storage, including any incompatibilities

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

7.3. Specific end use(s)

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

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Occupational exposure limits

Austria. TRK List

Additional components	Type	Value
Benzene (CAS 71-43-2)	STEL	12,8 mg/m3
		4 ppm
	TWA	3,2 mg/m3
		1 ppm

Belgium. Exposure Limit Values.

Additional components	Type	Value
Benzene (CAS 71-43-2)	TWA	3,25 mg/m3
		1 ppm

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

Additional components	Type	Value
Benzene (CAS 71-43-2)	TWA	3,25 mg/m3

Cyprus. OELs. Control of factory atmosphere and dangerous substances in factories regulation, PI 311/73, as amended.

Additional components	Type	Value
Benzene (CAS 71-43-2)	TWA	30 mg/m3 10 ppm

Czech Republic. OELs. Government Decree 361

Additional components	Type	Value
Benzene (CAS 71-43-2)	Ceiling	10 mg/m3
	TWA	3 mg/m3

Denmark. Exposure Limit Values

Additional components	Type	Value
Benzene (CAS 71-43-2)	TLV	1,6 mg/m3 0,5 ppm

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

Additional components	Type	Value
Benzene (CAS 71-43-2)	STEL	9 mg/m3 3 ppm
	TWA	1,5 mg/m3 0,5 ppm

Finland. Workplace Exposure Limits

Additional components	Type	Value
Benzene (CAS 71-43-2)	TWA	3,25 mg/m3 1 ppm

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

Additional components	Type	Value
Benzene (CAS 71-43-2)	VME	3,25 mg/m3 1 ppm

Hungary. OELs. Joint Decree on Chemical Safety of Workplaces

Additional components	Type	Value
Benzene (CAS 71-43-2)	Ceiling	3 mg/m3

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

Additional components	Type	Value
Benzene (CAS 71-43-2)	TWA	1,6 mg/m3 0,5 ppm

Ireland. Occupational Exposure Limits

Additional components	Type	Value
Benzene (CAS 71-43-2)	TWA	3 mg/m3 1 ppm

Italy. OELs

Additional components	Type	Value
Benzene (CAS 71-43-2)	STEL	2,5 ppm
	TWA	0,5 ppm

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

Additional components	Type	Value
Benzene (CAS 71-43-2)	TWA	3,25 mg/m3 1 ppm

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

Additional components	Type	Value
Benzene (CAS 71-43-2)	STEL	19 mg/m3 6 ppm
	TWA	3,25 mg/m3

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

Additional components	Type	Value
		1 ppm

Luxembourg. OELs for Carcinogens/Mutagens

Additional components	Type	Value
Benzene (CAS 71-43-2)	TWA	3,25 mg/m3 1 ppm

Netherlands. OELs (binding)

Additional components	Type	Value
Benzene (CAS 71-43-2)	TWA	3,25 mg/m3

Norway. Administrative Norms for Contaminants in the Workplace

Additional components	Type	Value
Benzene (CAS 71-43-2)	TLV	3 mg/m3 1 ppm

Poland. MACs. Minister of Labour and Social Policy Regarding Maximum Allowable Concentrations and Intensities in Working Environment

Additional components	Type	Value
Benzene (CAS 71-43-2)	TWA	1,6 mg/m3

Portugal. VLEs. Norm on occupational exposure to chemical agents (NP 1796)

Additional components	Type	Value
Benzene (CAS 71-43-2)	STEL	2,5 ppm
	TWA	0,5 ppm

Romania. OELs. Protection of workers from exposure to chemical agents at the workplace

Additional components	Type	Value
Benzene (CAS 71-43-2)	TWA	3,25 mg/m3 1 ppm

Slovenia. OELs. Regulations concerning protection of workers against risks due to exposure to chemicals while working (Official Gazette of the Republic of Slovenia)

Additional components	Type	Value
Benzene (CAS 71-43-2)	TWA	3,25 mg/m3 1 ppm

Sweden. Occupational Exposure Limit Values

Additional components	Type	Value
Benzene (CAS 71-43-2)	STEL	9 mg/m3 3 ppm
	TWA	1,5 mg/m3 0,5 ppm

Switzerland. SUVA Grenzwerte am Arbeitsplatz

Additional components	Type	Value
Benzene (CAS 71-43-2)	TWA	1,6 mg/m3 0,5 ppm

UK. EH40 Workplace Exposure Limits (WELs)

Additional components	Type	Value
Benzene (CAS 71-43-2)	TWA	3,25 mg/m3 1 ppm

EU. OELs, Directive 2004/37/EC on carcinogen and mutagens from Annex III, Part A

Additional components	Type	Value
Benzene (CAS 71-43-2)	TWA	3,25 mg/m3 1 ppm

Biological limit values

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

Additional components	Value	Determinant	Specimen	Sampling time
Benzene (CAS 71-43-2)	5 mg/l	Acide muconique	Urine	*

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

Hungary. Chemical Safety at Workplace Ordinance Joint Decree No. 25/2000 (Annex 2): Permissible limit values of biological exposure (effect) indices

Additional components	Value	Determinant	Specimen	Sampling time
Benzene (CAS 71-43-2)	1,5 mg/g	t,t-muconic acid	Creatinine in urine	*

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

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

Additional components	Value	Determinant	Specimen	Sampling time
Benzene (CAS 71-43-2)	5 µg/l	Benceno total	Blood	*
	0,045 mg/g	Ácido S-Fenilmercaptú rico	Creatinine in urine	*
	2 mg/l	Ácido t,t-Mucónico	Urine	*

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

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

Additional components	Value	Specimen	Sampling time
Benzene (CAS 71-43-2)	25 µg/g	Creatinine in urine	*

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

Recommended monitoring procedures Follow standard monitoring procedures.

Derived no-effect level (DNEL)

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

Predicted no effect concentrations (PNECs) Not available.

Exposure guidelines

EU. OELs from Annex III, Part A to Directive 2004/37/EC: Skin designation

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

8.2. Exposure controls

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

Individual protection measures, such as personal protective equipment

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

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

Skin protection

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

- Other Full body suit and boots are recommended when handling large volumes or in emergency situations. Flame retardant protective clothing is recommended.

Respiratory protection	In case of inadequate ventilation or risk of inhalation of vapours, use suitable respiratory equipment with gas filter (type A2). Use a positive-pressure air-supplied respirator if there is any potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air-purifying respirators may not provide adequate protection.
Thermal hazards	When material is heated, wear gloves to protect against thermal burns.
Hygiene measures	When using, do not eat, drink or smoke. Wash hands after handling. Launder contaminated clothing before reuse. Private clothes and working clothes should be kept separately. Handle in accordance with good industrial hygiene and safety practices. Follow up on any medical surveillance requirements.
Environmental exposure controls	Contain spills and prevent releases and observe national regulations on emissions.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance	Colorless to yellow liquid.
Physical state	Liquid.
Form	Liquid.
Colour	Colorless to yellow.
Odour	Aromatic odor.
Odour threshold	Not available.
pH	Not applicable.
Melting point/freezing point	Not applicable.
Initial boiling point and boiling range	60 - 90 °C (140 - 194 °F)
Flash point	< -5,0 °C (< 23,0 °F) Closed cup
Evaporation rate	Not available.
Flammability (solid, gas)	Not applicable.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	1,3
Flammability limit - upper (%)	7,9
Vapour pressure	4 - 240 kPa (37,8 °C)
Vapour density	> 1
Relative density	0,62 - 0,88 (15 °C)
Solubility(ies)	Insoluble in water.
Partition coefficient (n-octanol/water)	Not applicable.
Auto-ignition temperature	> 503 °C (> 937,4 °F)
Decomposition temperature	Not available.
Viscosity	<= 1 mm²/s @ 40 °C (104 °F)
Explosive properties	Not explosive.
Oxidizing properties	Not oxidizing.
9.2. Other information	No relevant additional information available.

SECTION 10: Stability and reactivity

10.1. Reactivity	The product is stable and non reactive under normal conditions of use, storage and transport.
10.2. Chemical stability	Stable under normal temperature conditions and recommended use.
10.3. Possibility of hazardous reactions	Not available.
10.4. Conditions to avoid	Heat, flames and sparks. Ignition sources. Contact with incompatible materials. Do not pressurize, cut, weld, braze, solder, drill, grind or expose empty containers to heat, flame, sparks, static electricity, or other sources of ignition; they may explode and cause injury or death.
10.5. Incompatible materials	Strong acids. Strong oxidizers such as nitrates, chlorates, peroxides.
10.6. Hazardous decomposition products	Thermal decomposition or combustion may liberate carbon oxides and other toxic gases or vapours.

SECTION 11: Toxicological information

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

Information on likely routes of exposure

Ingestion Ingestion may cause irritation and malaise.

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

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

Eye contact May cause eye irritation on direct contact.

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

11.1. Information on toxicological effects

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

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

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

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

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

Germ cell mutagenicity May cause genetic defects.

Carcinogenicity May cause cancer.

IARC Monographs. Overall Evaluation of Carcinogenicity

Benzene (CAS 71-43-2)	1 Carcinogenic to humans.

Reproductive toxicity Suspected of damaging the unborn child.

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

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

Aspiration hazard May be fatal if swallowed and enters airways.

Mixture versus substance information Not available.

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

SECTION 12: Ecological information

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

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

12.3. Bioaccumulative potential No data available on bioaccumulation.

Partition coefficient n-octanol/water (log Kow)

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

Bioconcentration factor (BCF) Not available.

12.4. Mobility in soil Not available.

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

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

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

SECTION 13: Disposal considerations

13.1. Waste treatment methods

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 01* The Waste code should be assigned in discussion between the user, the producer and the waste disposal company.
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 products, n.o.s. (Distillates (petroleum), C6-rich)
14.3. Transport hazard class(es)	3
Subsidiary class(es)	-
14.4. Packing group	II
14.5. Environmental hazards	Yes
Tunnel restriction code	D/E
Labels required	3
14.6. Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

RID

14.1. UN number	UN1268
14.2. UN proper shipping name	Petroleum products, n.o.s. (Distillates (petroleum), C6-rich)
14.3. Transport hazard class(es)	3
Subsidiary class(es)	-
14.4. Packing group	II
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 products, n.o.s. (Distillates (petroleum), C6-rich)
14.3. Transport hazard class(es)	3
Subsidiary class(es)	-
14.4. Packing group	II
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 PRODUCTS, N.O.S. (Distillates (petroleum), C6-rich)
14.3. Transport hazard class(es)	3
Subsidiary class(es)	-
14.4. Packing group	II
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 PRODUCTS, N.O.S. (Distillates (petroleum), C6-rich)
14.3. Transport hazard class(es)	3

Subsidiary class(es)	-
14.4. Packing group	II
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. 1005/2009 on substances that deplete the ozone layer, Annex I

Not listed.

Regulation (EC) No. 1005/2009 on substances that deplete the ozone layer, Annex II

Not listed.

Regulation (EC) No. 850/2004 On persistent organic pollutants, Annex I as amended

Not listed.

Regulation (EC) No. 689/2008 concerning the export and import of dangerous chemicals, Annex I, part 1 as amended

Benzene (CAS 71-43-2)

Regulation (EC) No. 689/2008 concerning the export and import of dangerous chemicals, Annex I, part 2 as amended

Not listed.

Regulation (EC) No. 689/2008 concerning the export and import of dangerous chemicals, Annex I, part 3 as amended

Not listed.

Regulation (EC) No. 689/2008 concerning the export and import of dangerous chemicals, Annex V as amended

Not listed.

Regulation (EC) No. 166/2006 Annex II Pollutant Release and Transfer Registry

Not listed.

Regulation (EC) No. 1907/2006, REACH Article 59(1) Candidate List as currently published by ECHA

Not listed.

Authorisations

Regulation (EC) No. 1907/2006, REACH Annex XIV Substances subject to authorisation, as amended

Not listed.

Restrictions on use

Regulation (EC) No. 1907/2006, REACH Annex XVII Substances subject to restriction on marketing and use as amended

Benzene (CAS 71-43-2)

Directive 2004/37/EC: on the protection of workers from the risks related to exposure to carcinogens and mutagens at work

Benzene (CAS 71-43-2)

Directive 92/85/EEC: on the safety and health of pregnant workers and workers who have recently given birth or are breastfeeding

Benzene (CAS 71-43-2)
Distillates (petroleum), C6-rich (CAS 93165-19-6)

Other EU regulations

Directive 96/82/EC (Seveso II) on the control of major-accident hazards involving dangerous substances

Not regulated.

Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work

Benzene (CAS 71-43-2)
Distillates (petroleum), C6-rich (CAS 93165-19-6)

Directive 94/33/EC on the protection of young people at work

Benzene (CAS 71-43-2)
Distillates (petroleum), C6-rich (CAS 93165-19-6)

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

National regulations	Young people under 18 years old are not allow to work with this product according to the EU Directive 94/33/EC on the protection of young people at work.
15.2. Chemical safety assessment	For this substance a chemical safety assessment has been carried out.

SECTION 16: Other information

List of abbreviations	DSD: Directive 67/548/EEC. CLP: Regulation No. 1272/2008. DNEL: Derived No-Effect Level. PNEC: Predicted No-Effect Concentration. PBT: Persistent, bioaccumulative and toxic. vPvB: Very Persistent and very Bioaccumulative.
References	CONCAWE Chemical safety report.
Information on evaluation method leading to the classification of mixture	The mixture is classified based on test data for physical hazards. The classification for health and environmental hazards is derived by a combination of calculation methods and test data, if available. For details, refer to Sections 9, 11 and 12.
Full text of any statements or R-phrases and H-statements under Sections 2 to 15	R11 Highly flammable. R38 Irritating to skin. R45 May cause cancer. R46 May cause heritable genetic damage. R51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. R62 Possible risk of impaired fertility. R63 Possible risk of harm to the unborn child. R65 Also harmful: may cause lung damage if swallowed. R67 Vapours may cause drowsiness and dizziness. H225 Highly flammable liquid and vapour. H304 May be fatal if swallowed and enters airways. H315 Causes skin irritation. H336 May cause drowsiness or dizziness. H340 May cause genetic defects. H350 May cause cancer. H361 Suspected of damaging fertility or the unborn child. H411 Toxic to aquatic life with long lasting effects.
This SDS contains revisions in the following section(s):	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16.
Training information	Follow training instructions when handling this material.
Disclaimer	This material Safety Data Sheet (SDS) was prepared in accordance with EC No 1272/2008 by Valero Energy Ltd. Valero Energy Ltd. does not assume any liability arising out of product use by others. The information, recommendations, and suggestions presented in this SDS are based upon test results and data believed to be reliable. The end user of the product has the responsibility for evaluating the adequacy of the data under the conditions of use, determining the safety, toxicity and suitability of the product under these conditions, and obtaining additional or clarifying information where uncertainty exists. No guarantee expressed or implied is made as to the effects of such use, the results to be obtained, or the safety and toxicity of the product in any specific application. Furthermore, the information herein is not represented as absolutely complete, since it is not practicable to provide all the scientific and study information in the format of this document, plus additional information may be necessary under exceptional conditions of use, or because of applicable laws or government regulations.

Annex to the extended Safety Data Sheet (eSDS)

1 - Exposure Scenario Worker

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. ERC6d: Industrial use of process regulators for polymerisation processes in production of resins, rubbers, polymers. ERC7: Industrial use of substances in closed systems. Specific Environmental Release Category: ESVOC SpERC 1.1b.v1
List of names of contributing worker scenarios and corresponding PROCs	PROC1: Use in closed process, no likelihood of exposure. PROC2: Use in closed, continuous process with occasional controlled exposure. PROC3: Use in closed batch process (synthesis or formulation). PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities. PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities. PROC15: Use as laboratory reagent.

Further explanations

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

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

Product characteristics

Concentration of the substance in a mixture	Covers percentage substance in the product up to 100 % (unless stated differently). Substance is complex UVCB. Predominantly hydrophobic.
Physical state	Liquid
Viscosity	
Kinematic viscosity	1,6 mm²/s 40 °C
Dynamic viscosity	Not available.

Amounts used

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

Frequency and duration of use

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

Environment factors not influenced by risk management

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

Other given operational conditions affecting environmental exposure

	Emission days	Emission factors			
Type	**(days/year)**	**Air**	**Soil**	**Water**	**Remarks**
initial release prior to RMM	300	0,001	0,00001	0,00001	

Risk management measures (RMM)

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

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

Air	Treat air emission to provide a typical removal efficiency of (%): 90
Soil	Not available.
Water	Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of ≥ (%): 12. If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of ≥ (%): 0
Sediment	Not available.
Remarks	Risk from environmental exposure is driven by humans via indirect exposure (primarily inhalation). If discharging to domestic sewage treatment plant, no onsite wastewater treatment required.
Organisational measures to prevent/limit release from site	Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.

Conditions and measures related to municipal sewage treatment plant

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

Type	Municipal STP
Discharge rate	2000
Treatment effectiveness	95,5
Sludge treatment technique	Not available.
Measures to limit air emissions	Not available.
Remarks	Maximum allowable site tonnage (MSafe) based on release following total wastewater treatment removal (kg/d): 1,1e6
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	95,5

Conditions and measures related to external treatment of waste for disposal

Fraction of used amount transferred to external waste treatment

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

Conditions and measures related to external recovery of waste

Fraction of used amount transferred to external waste treatment

Suitable recover operations	External recovery and recycling of waste should comply with applicable local and/or national regulations.
Treatment effectiveness	Not available.
Remarks	Not available.
Additional good practice advice beyond the REACH CSA	Additional information on the basis for the allocation of the indentified OCs and RMMs is contained in the PETRORISK file.

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

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

Product characteristics

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

Vapour pressure	Liquid, vapour pressure > 10 kPa at STP.
Process temperature	Assumes use at not more than 20°C above ambient temperature, unless stated differently.

Amounts used

Not available.

Frequency and duration of use

	Duration	Frequency of use	Remarks
Covers daily exposures up to 8 hours (unless stated differently).	8		Assumes a good basic standard of occupational hygiene is implemented.

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

Area of use	Room size	Temperature	Ventilation rate	Remarks

Other relevant operational conditions

Not available.

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release	General exposures (closed systems), with sample collection; Handle substance within a closed system. Sample via a closed loop or other system to avoid exposure. General exposures (closed systems); Provide extract ventilation to points where emissions occur. Handle substance within a closed system. Process sampling; Sample via a closed loop or other system to avoid exposure. Equipment cleaning and maintenance; Drain down and flush system prior to equipment break-in or maintenance. Retain drain downs in sealed storage pending disposal or for subsequent recycle. Storage; Store substance within a closed system.
Technical conditions and measures to control dispersion from source towards the worker	General exposures (closed systems), with sample collection; Ensure operation is undertaken outdoors. General exposures (closed systems); Ensure operation is undertaken outdoors. Laboratory activities; Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure. Bulk closed loading; Ensure material transfers are under containment or extract ventilation. Bulk closed loading and unloading; Ensure material transfers are under containment or extract ventilation. Equipment cleaning and maintenance; Clear spills immediately. Ensure operation is undertaken outdoors. Provide a good standard of controlled ventilation (10 to 15 air changes per hour).

Organizational measures to prevent/limit releases, dispersion and exposure	General measures (skin irritants); Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. wash off any skin contamination immediately. provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop. General measures (carcinogens); Consider technical advances and process upgrades (including automation) for the elimination of releases. minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenario; clear up spills immediately and dispose of waste safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance.
Conditions and measures related to personal protection, hygiene and health evaluations	General exposures (closed systems), with sample collection; Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Avoid carrying out activities involving exposure for more than 1 hour. General exposures (closed systems); Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Avoid carrying out activities involving exposure for more than 1 hour. Process sampling; Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Avoid carrying out activities involving exposure for more than 1 hour. Laboratory activities; Avoid carrying out activities involving exposure for more than 1 hour. Bulk closed loading; Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Avoid carrying out activities involving exposure for more than 1 hour. or, Wear a respirator conforming to EN140 with Type A filter or better. Bulk closed loading and unloading; Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Avoid carrying out activities involving exposure for more than 1 hour. or, Wear a respirator conforming to EN140 with Type A filter or better. Equipment cleaning and maintenance; Wear chemically resistant gloves (tested to EN374) in combination with intensive management supervision controls. Avoid carrying out activities involving exposure for more than 4 hours. Wear a respirator conforming to EN140 with Type A filter or better. Storage; Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. Avoid carrying out activities involving exposure for more than 1 hour.

3. Exposure Estimation

Environment

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

Health

	Exposure level	RCR	Method	Remarks
General exposures (closed systems)	0,01 ppm	0.009	**	Inhalation Exposure
General exposures (closed system) + With sample collection	50 ppm	0.327	**	Inhalation Exposure
General exposures (closed systems)	100 ppm	0.654	**	Inhalation Exposure
Process sampling	100 ppm	0.935	**	Inhalation Exposure
Laboratory activities	50 ppm	0.467	**	Inhalation Exposure
Bulk closed loading	150 ppm	0.841	**	Inhalation Exposure
Bulk closed loading and unloading	150 ppm	0.841	**	Inhalation Exposure

Equipment cleaning and maintenance	250 ppm	0.294	**	Inhalation Exposure
Storage	50 ppm	0.467	**	Inhalation Exposure

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

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

Environment

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html).

Health

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

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

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

2 - Exposure Scenario Worker

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

List of use descriptors

Sector(s) of Use	SU3: Industrial uses SU10: Formulation [mixing] of preparations and/or re-packaging
Product categories [PC]:	Not available.
Name of contributing environmental scenario and corresponding ERC	ERC2: Formulation of preparations. Specific Environmental Release Category: ESVOC SpERC 2.2.v1
List of names of contributing worker scenarios and corresponding PROCs	PROC1: Use in closed process, no likelihood of exposure. PROC2: Use in closed, continuous process with occasional controlled exposure. PROC3: Use in closed batch process (synthesis or formulation). PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities. PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities. PROC15: Use as laboratory reagent.

Further explanations

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

2.1. Contributing exposure scenario controlling environmental exposure for Formulation of preparations.

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

	Emission days	Emission factors			
Type	**(days/year)**	**Air**	**Soil**	**Water**	**Remarks**
initial release prior to RMM	300	0,025	0,0001	0,002	

Risk management measures (RMM)

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

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

Air	Treat air emission to provide a typical removal efficiency of (%): 56,5

Soil	Not available.
Water	Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of ≥ (%): 94,7. If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of ≥ (%): 0
Sediment	Not available.
Remarks	Prevent discharge of undissolved substance to or recover from onsite wastewater. Risk from environmental exposure is driven by humans via indirect exposure (primarily inhalation). If discharging to domestic sewage treatment plant, no onsite wastewater treatment required.
Organisational measures to prevent/limit release from site	Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.

Conditions and measures related to municipal sewage treatment plant

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

Type	Municipal STP
Discharge rate	2000
Treatment effectiveness	95,5
Sludge treatment technique	Not available.
Measures to limit air emissions	Not available.
Remarks	Maximum allowable site tonnage (MSafe) based on release following total wastewater treatment removal (kg/d): 1,0e5
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	95,5

Conditions and measures related to external treatment of waste for disposal

Fraction of used amount transferred to external waste treatment

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

Conditions and measures related to external recovery of waste

Fraction of used amount transferred to external waste treatment

Suitable recover operations	External recovery and recycling of waste should comply with applicable local and/or national regulations.
Treatment effectiveness	Not available.
Remarks	Not available.
Additional good practice advice beyond the REACH CSA	Additional information on the basis for the allocation of the indentified OCs and RMMs is contained in the PETRORISK file.

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

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

Product characteristics

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

Amounts used

Not available.

Frequency and duration of use

	Duration	Frequency of use	Remarks
Covers daily exposures up to 8 hours (unless stated differently).	8		Assumes a good basic standard of occupational hygiene is implemented.

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

Area of use	Room size	Temperature	Ventilation rate	Remarks

Other relevant operational conditions

Not available.

Risk management measures (RMM)

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

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

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

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

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

Storage;
Store substance within a closed system.

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

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

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

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

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

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

Equipment cleaning and maintenance;
Clear spills immediately.
Ensure operation is undertaken outdoors.
Provide a good standard of controlled ventilation (10 to 15 air changes per hour).

Organizational measures to prevent/limit releases, dispersion and exposure

General measures (skin irritants);
Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. wash off any skin contamination immediately. provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop.

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

Conditions and measures related to personal protection, hygiene and health evaluations	General exposures (closed systems), with sample collection; Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Avoid carrying out activities involving exposure for more than 1 hour. General exposures (closed systems); Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Avoid carrying out activities involving exposure for more than 1 hour. Process sampling; Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Avoid carrying out activities involving exposure for more than 1 hour. Laboratory activities; Avoid carrying out activities involving exposure for more than 1 hour. Bulk transfers; Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Avoid carrying out activities involving exposure for more than 1 hour. Drum/batch transfers; Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Avoid carrying out activities involving exposure for more than 1 hour. Equipment cleaning and maintenance; Wear chemically resistant gloves (tested to EN374) in combination with intensive management supervision controls. Avoid carrying out activities involving exposure for more than 4 hours. Wear a respirator conforming to EN140 with Type A filter or better. Storage; Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. Avoid carrying out activities involving exposure for more than 1 hour.

3. Exposure Estimation

Environment

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

Health

	Exposure level	RCR	Method	Remarks
General exposures (closed systems)	0,01 ppm	0.009	**	Inhalation Exposure
General exposures (closed system) + With sample collection	50 ppm	0.327	**	Inhalation Exposure
General exposures (closed systems)	100 ppm	0.654	**	Inhalation Exposure
Storage	50 ppm	0.467	**	Inhalation Exposure
Process sampling	100 ppm	0.935	**	Inhalation Exposure
Laboratory activities	50 ppm	0.467	**	Inhalation Exposure
Bulk transfers	150 ppm	0.841	**	Inhalation Exposure
Drum/batch transfers	150 ppm	0.841	**	Inhalation Exposure
Equipment cleaning and maintenance	250 ppm	0.294	**	Inhalation Exposure

** - 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.

3 - Exposure Scenario Worker

1. Manufacture of substance

List of use descriptors

Sector(s) of Use	SU3: Industrial uses SU8: Manufacture of bulk, large scale chemicals (including petroleum products) SU9: Manufacture of fine chemicals
Product categories [PC]:	Not available.
Name of contributing environmental scenario and corresponding ERC	ERC1: Manufacture of substances. 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 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 Manufacture of substances.

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

	Emission days	Emission factors			
Type	**(days/year)**	**Air**	**Soil**	**Water**	**Remarks**
initial release prior to RMM	300	0,05	0,0001	0,003	

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)

Type	Municipal STP
Discharge rate	10000
Treatment effectiveness	95,5
Sludge treatment technique	Not available.
Measures to limit air emissions	Not available.
Remarks	Maximum allowable site tonnage (MSafe) based on release following total wastewater treatment removal (kg/d): 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

	Duration	Frequency of use	Remarks
Covers daily exposures up to 8 hours (unless stated differently).	8		Assumes a good basic standard of occupational hygiene is implemented.

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

Area of use	Room size	Temperature	Ventilation rate	Remarks

Other relevant operational conditions

Not available.

Risk management measures (RMM)

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

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

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

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

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

Storage;
Store substance within a closed system.

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

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

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

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

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

Equipment cleaning and maintenance;
Clear spills immediately.
Ensure operation is undertaken outdoors.
Provide a good standard of controlled ventilation (10 to 15 air changes per hour).

Organizational measures to prevent/limit releases, dispersion and exposure

General measures (skin irritants);
Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. wash off any skin contamination immediately. provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop.

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

Conditions and measures related to personal protection, hygiene and health evaluations	General exposures (closed systems), with sample collection; Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Avoid carrying out activities involving exposure for more than 1 hour. General exposures (closed systems); Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Avoid carrying out activities involving exposure for more than 1 hour. Process sampling; Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Avoid carrying out activities involving exposure for more than 1 hour. Laboratory activities; Avoid carrying out activities involving exposure for more than 1 hour. Bulk transfers; Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Avoid carrying out activities involving exposure for more than 1 hour. or, Wear a respirator conforming to EN140 with Type A filter or better. Equipment cleaning and maintenance; Wear chemically resistant gloves (tested to EN374) in combination with intensive management supervision controls. Avoid carrying out activities involving exposure for more than 4 hours. Wear a respirator conforming to EN140 with Type A filter or better. Storage; Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. Avoid carrying out activities involving exposure for more than 1 hour.

3. Exposure Estimation

Environment

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

Health

	Exposure level	RCR	Method	Remarks
General exposures (closed systems)	0,01 ppm	0.009	**	Inhalation Exposure
General exposures (closed system) + With sample collection	50 ppm	0.327	**	Inhalation Exposure
General exposures (closed systems)	100 ppm	0.654	**	Inhalation Exposure
Laboratory activities	50 ppm	0.467	**	Inhalation Exposure
Bulk transfers	150 ppm	0.841	**	Inhalation Exposure
Clean down and Maintenance	250 ppm	0.294	**	Inhalation Exposure
Storage	50 ppm	0.467	**	Inhalation Exposure

** - 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.

4 - Exposure Scenario Worker

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). Specific Environmental Release Category: 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

	Emission days	Emission factors			
Type	**(days/year)**	**Air**	**Soil**	**Water**	**Remarks**
initial release prior to RMM	300	0,025	0,001	0,003	

Risk management measures (RMM)

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

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

Air	Treat air emission to provide a typical removal efficiency of (%): 80
Soil	Not available.
Water	Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of ≥ (%): 92,9. If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of ≥ (%): 0
Sediment	Not available.
Remarks	Prevent discharge of undissolved substance to or recover from onsite wastewater. Risk from environmental exposure is driven by freshwater sediment. If discharging to domestic sewage treatment plant, no onsite wastewater treatment required.
Organisational measures to prevent/limit release from site	Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.

Conditions and measures related to municipal sewage treatment plant

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

Type	Municipal STP
Discharge rate	2000
Treatment effectiveness	95,5
Sludge treatment technique	Not available.
Measures to limit air emissions	Not available.
Remarks	Maximum allowable site tonnage (MSafe) based on release following total wastewater treatment removal (kg/d): 7,8e4
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	This substance is consumed during use and no waste of the substance is generated.

Conditions and measures related to external recovery of waste

Fraction of used amount transferred to external waste treatment

Suitable recover operations	External recovery and recycling of waste should comply with applicable local and/or national regulations.
Treatment effectiveness	Not available.
Remarks	This substance is consumed during use and no waste of the substance is generated.
Additional good practice advice beyond the REACH CSA	Additional information on the basis for the allocation of the indentified OCs and RMMs is contained in the PETRORISK file.

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

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Process temperature	Operation is carried out at elevated temperature (> 20°C above ambient temperature).

Amounts used

Not available.

Frequency and duration of use

	Duration	Frequency of use	Remarks
Covers daily exposures up to 8 hours (unless stated differently).	8		Assumes a good basic standard of occupational hygiene is implemented.

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

Area of use	Room size	Temperature	Ventilation rate	Remarks

Other relevant operational conditions

Not available.

Risk management measures (RMM)

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

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

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

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

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

Storage;
Store substance within a closed system.

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

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

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

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

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

Equipment cleaning and maintenance;
Clear spills immediately.
Ensure operation is undertaken outdoors.
Provide a good standard of controlled ventilation (10 to 15 air changes per hour).

Organizational measures to prevent/limit releases, dispersion and exposure

General measures (skin irritants);
Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. wash off any skin contamination immediately. provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop.

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Conditions and measures related to personal protection, hygiene and health evaluations	General exposures (closed systems), with sample collection; Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Avoid carrying out activities involving exposure for more than 1 hour. General exposures (closed systems); Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Avoid carrying out activities involving exposure for more than 1 hour. Process sampling; Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Avoid carrying out activities involving exposure for more than 1 hour. Laboratory activities; Avoid carrying out activities involving exposure for more than 1 hour. Bulk transfers; Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Avoid carrying out activities involving exposure for more than 1 hour. or, Wear a respirator conforming to EN140 with Type A filter or better. Equipment cleaning and maintenance; Wear chemically resistant gloves (tested to EN374) in combination with intensive management supervision controls. Avoid carrying out activities involving exposure for more than 4 hours. Wear a respirator conforming to EN140 with Type A filter or better. Storage; Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. Avoid carrying out activities involving exposure for more than 1 hour.

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Bulk transfers	150 ppm	0.841	**	Inhalation Exposure
Equipment cleaning and maintenance	250 ppm	0.294	**	Inhalation Exposure
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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

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