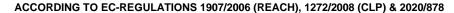
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SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1 Product identifier

Product name Fuel oil, residual

Product description V2011-LOW SULPHUR FUEL OIL, RESIDUAL

Trade Name LOW SULPHUR FUEL OIL

 Product code
 LSFO, V2011

 CAS No.
 68476-33-5

 EC No.
 270-675-6

REACH Registration No. 01-2119474894-22-xxxx

1.2 Relevant identified uses of the substance or mixture

and uses advised against

Identified use(s)	No Exposure Scenario		Page:
	1	Distribution of Fuel oil, residual	12
	2	Formulation and (re)packing of Fuel oil, residual	16
	3	Use as a fuel (Industrial)	20
	4	Use as a fuel (Professional)	24

Uses advised against

Anything other than the above.

1.3 Details of the supplier of the safety data sheet

Company Identification Vitol SA

Place des Bergues 3 1201 Geneva Switzerland +31 10 498 7200 +31 10 452 9545

Fax +31 10 452 9545
E-mail (competent person) xreach@vitol.com

1.4 Emergency Telephone Number

Telephone

Emergency Phone No. +44 (0) 1235 239 670, 24/7 Language(s) spoken: All official European languages.

SECTION 2: HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

2.1.1 Regulation (EC) No. 1272/2008 (CLP) Asp. Tox. 1; H304

Acute Tox. 4; H332 Carc. 1B; H350 Repr. 2; H361d

STOT RE 2; H373 (Thymus, Liver, Blood effects)

Aquatic Acute 1; H400 Aquatic Chronic 1; H410

2.2 Label elements According to Regulation (EC) No. 1272/2008 (CLP)

Product description V2011-LOW SULPHUR FUEL OIL-FUEL OIL, RESIDUAL

Hazard Pictogram(s)





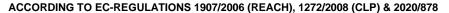


Signal Word(s) DANGER

Hazard Statement(s) H304: May be fatal if swallowed and enters airways.

H332: Harmful if inhaled.

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H350: May cause cancer.

H361d: Suspected of damaging the unborn child.

H373: May cause damage to organs through prolonged or repeated exposure:

Thymus, Liver, Blood effects

H410: Very toxic to aquatic life with long lasting effects.

Precautionary Statement(s) P201: Obtain special instructions before use.

P260: Do not breathe dust/fume/gas/mist/vapours/spray.

P273: Avoid release to the environment.

P280: Wear protective gloves/protective clothing/eye protection/face protection. P301+P310: IF SWALLOWED: Immediately call a POISON CENTER or

doctor/physician.

P331: Do NOT induce vomiting.

Supplemental information EUH066: Repeated exposure may cause skin dryness or cracking.

2.3 Other hazards Product may release Hydrogen Sulphide: A specific assessment of inhalation risks from the presence of hydrogen sulphide in tank headspaces, confined spaces, product residue, tank waste and waste water, and unintentional releases should be made to help determine controls appropriate to local circumstances. Vapour may create explosive atmosphere. The vapour is heavier than air; beware

of pits and confined spaces.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1 **Substances**

SUBSTANCE	CAS No.	EC No.	%W/W
Fuel oil, residual	68476-33-5	270-675-6	100

SECTION 4: FIRST AID MEASURES



4.1 Description of first aid measures

Self-protection of the first aider

H2S Warning:

Inhalation

Skin contact

Eve contact

Ingestion

The vapour is heavier than air; beware of pits and confined spaces. If it is suspected that fumes are still present, the responder should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Avoid all contact. Do not ingest. If swallowed then seek immediate medical assistance.

Hydrogen sulphide (H2S) can accumulate in the headspace of storage tanks and reach potentially hazardous concentrations.

If there is any suspicion of inhalation: A self contained breathing apparatus should be worn. Remove to fresh air immediately.

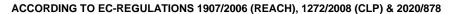
IF INHALED: If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. If symptoms persist, obtain medical attention.

IF ON SKIN (or hair): Remove contaminated clothing immediately and wash affected skin with plenty of water or soap and water. If irritation (redness, rash, blistering) develops, get medical attention.

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, get medical advice/attention.

IF SWALLOWED: Do not induce vomiting because of risk of aspiration into the lungs. If vomiting occurs spontaneously, keep head below hips to prevent aspiration. If unconscious, place in recovery position and get medical attention

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4.2 Most important symptoms and effects, both acute and delayed

4.3 Indication of any immediate medical attention and special treatment needed

Notes to a physician:

immediately. Do not give anything by mouth to an unconscious person. Get medical attention immediately. Do not wait for symptoms to appear.

Vapour may be irritant to the respiratory tract. Repeated and/or prolonged skin contact may cause irritation. May cause eye irritation. Aspiration into the lungs may cause chemical pneumonitis, which can be fatal.

If breathing is laboured, oxygen should be administered by qualified personnel. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

IF INHALED: If unconscious, place in recovery position and get medical attention immediately. Administer oxygen if available and artificial respiration if necessary. IF SWALLOWED: Do not induce vomiting because of risk of aspiration into the lungs. If aspiration is suspected obtain immediate medical attention. If vomiting occurs spontaneously, keep head below hips to prevent aspiration into the lungs.

SECTION 5: FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media Unsuitable extinguishing media

5.2 Special hazards arising from the substance or mixture

5.3 Advice for firefighters

Foam, Carbon dioxide, Water fog or dry powder.

Do not use water jet. Direct water jet may spread the fire.

Not flammable but will support combustion. The vapour is heavier than air; beware of pits and confined spaces. Will float and can be reignited on surface water. Decomposes in a fire giving off toxic fumes: A mixture of solid and liquid particulates and gases including unidentified organic and inorganic compounds. If sulphur compounds are present in appreciable amounts, combustion products may include also H2S and SOx (sulfur oxides) or sulfuric acid.

Fight fire with normal precautions from a reasonable distance. Fire fighters should wear complete protective clothing including self-contained breathing apparatus. Keep containers cool by spraying with water if exposed to fire. Avoid release to the environment. Dike fire control water for later disposal.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

H2S Warning:

Small spillages: Large spillages:

6.2 Environmental precautions

6.3 Methods and material for containment and cleaning up

Caution - spillages may be slippery. Ensure operatives are trained to minimise exposures. Ensure suitable personal protection during removal of spillages. Eliminate sources of ignition. Shut off leaks if without risk. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Avoid all contact with substance. Ensure adequate ventilation. Do not breathe vapour. Do not ingest. If swallowed then seek immediate medical assistance. Do not use sparking tools.

Product may release Hydrogen Sulphide. Exposure controls - These controls may include: Segregation of areas, Access only to authorised persons, Permit to work systems, Confined space working procedures, Area H2S alarms, Personal H2S alarms, Personal escape sets, H2S awareness training. Please see section 8 for appropriate personal protection equipment.

Wear flame-resistant antistatic protective clothing.

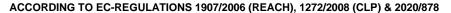
Evacuate the area and keep personnel upwind. Drench contaminated clothing with water before removing to avoid risk of sparks from static electricity. Avoid all contact. Wear chemical protection suit and breathing apparatus. See Also Section: 8

Avoid release to the environment. Do not allow to enter drains, sewers or watercourses. Spillages or uncontrolled discharges into watercourses must be alerted to the Environment Agency or other appropriate regulatory body. If necessary: Dike area to contain the spill and prevent releases to sewers, drains, or other waterways.

Provided it is safe to do so, isolate the source of the leak. The vapour is heavier than air; beware of pits and confined spaces. Ensure that the equipment is adequately grounded. Allow small spillages to evaporate provided there is adequate ventilation.

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Spillages onto land: In case of soil contamination, remove contaminated soil and treat in accordance with local regulations. Adsorb spillages onto sand, earth or any suitable adsorbent material. Transfer to a lidded container for disposal or recovery. Dispose of this material and its container as hazardous waste.

> Small spillages: Allow small spillages to evaporate provided there is adequate ventilation. Wear flame-resistant antistatic protective clothing.

> Large spillages: Cover spillage with foam to reduce evaporation. Do not use water iet.

Collect as much as possible in clean container for reuse or disposal.

Small spillages: Contain product with floating barriers or other equipment. Collect spilled product by absorbing with specific floating absorbents.

Large spillages: Open waters should be contained with floating barriers or other mechanical means and recovered, only if this is strictly necessary. Otherwise control the spreading of the spillage, and let the substance evaporate naturally.

See Section: 8,13

6.4 Reference to other sections

SECTION 7: HANDLING AND STORAGE

Spillages on water or at sea:

7.1 Precautions for safe handling

H2S Warning:

7.2 Conditions for safe storage, including any incompatibilities

> Storage temperature Storage measures

Incompatible materials

7.3 Specific end use(s) Obtain special instructions before use. Keep away from sources of ignition. - No smoking. Use only outdoors or in a well-ventilated area. Prevent vapour build up by providing adequate ventilation during and after use. Take action to prevent static discharges. Use non-sparking tools. All parts of the plant and equipment should be electrically bonded together and connected to earth. Electrical continuity should be checked at regular intervals. Antistatic clothing and footwear should be used. The vapour is heavier than air; beware of pits and confined spaces. Avoid all contact with substance. Do not ingest. If swallowed then seek immediate medical assistance. Do not breathe vapour. See Section: 8. Keep good industrial hygiene. Wash hands thoroughly after handling. Contaminated clothing should be thoroughly cleaned.

Product may release Hydrogen Sulphide: A specific assessment of inhalation risks from the presence of hydrogen sulphide in tank headspaces, confined spaces, product residue, tank waste and waste water, and unintentional releases should be made to help determine controls appropriate to local circumstances. These controls may include: Segregation of areas, Access only to authorised persons, Permit to work systems, Confined space working procedures, Area H2S alarms, Personal H2S alarms, Personal escape sets, H2S awareness training. Light hydrocarbon vapours can build up in the headspace of containers. These can cause flammability / explosion hazards. Bund storage facilities to prevent soil and water pollution in the event of spillage. Keep only in original packaging. Keep containers properly sealed when not in use. Protect from sunlight. Containers of this material may be hazardous when empty since they retain product residue. Empty container may contain product residue which may result in flammable or explosive vapours inside the container.

Stable at ambient temperatures.

Suitable containers: Mild steel, Stainless steel. Unsuitable containers: Synthetic materials

Keep away from oxidising agents. Strong acids and Alkalis.

See Section: 1.2 and/or Exposure Scenario

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

8.1.1 Occupational exposure limits

8.1.2 **Biological limit value**

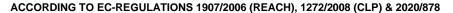
8.1.3 **PNECs and DNELs** Not established

Not established

PNEC: Fuel Oil, Residual is a hydrocarbon UVCB. The hydrocarbon block method is used in PETRORISK to calculate the environmental toxicity (HC5) of each group of components in the substance. These are used to estimate the

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environmental risk for the substance. Therefore individual environmental compartments PNECs are not available for this product.

Fuel Oil, Residual Derived No-Effect Level	Oral	Inhalation	Dermal
Worker - Long Term - Systemic effects	0.015 mg/kg bw/day	0.015 mg/kg bw/day	0.015 mg/kg bw/day
Worker - Short term - Systemic effects	-	4700 mg/m³	-

8.2 **Exposure controls**

8.2.1 Appropriate engineering controls Provide adequate ventilation, including appropriate local extraction if dusts, fumes or vapours are likely to be evolved. Store in a cool/low-temperature, wellventilated (dry) place away from heat and ignition sources. Guarantee that the eye flushing systems and safety showers are located close to the working place.

Individual protection measures, such as personal 8.2.2 protective equipment

Fuels are typically used, transferred and transported in closed systems. If exposure is likely (i.e. during sampling) the following advice may be appropriate. Keep good industrial hygiene. Always wash hands before smoking, eating and drinking. Do not eat, drink or smoke at the work place.

Refer to annexes for exposure scenarios detailing use specific exposure controls.

Protective clothing should be selected specifically for the working place, depending on concentration and quantity of the hazardous substances handled. The resistance of the protective clothing to chemicals should be ascertained with the respective supplier.

Eye/ face protection



Use eye protection according to EN 166, designed to protect against liquid splashes.

Skin protection



Hand protection: Wear impervious gloves (EN374). Gloves should be changed regularly to avoid permeation problems. Breakthrough time of the glove material: refer to the information provided by the gloves' producer.

Recommended: Nitrile rubber

Body protection: Wear anti-static clothing and shoes.

Small scale: Wear suitable coveralls to prevent exposure to the skin.

Large scale: Chemical protection suit

Respiratory protection



When the product is heated/In case of inadequate ventilation wear respiratory protection. The use of a high efficiency filter (EN143) is recommended. Filter type

Closed system(s): Not normally required

Thermal hazards Not applicable

8.2.3 **Environmental exposure controls** Avoid release to the environment.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

> Physical state Liquid

Colour Odour

Melting point/freezing point

Boiling point or initial boiling point and boiling range

Flammability

Lower and upper explosion limit

Flash point

May be coloured

Fuel oil-like

< 30 °C

> 350 °C

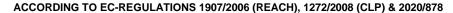
Non-flammable.

Not established

> 60 °C

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Auto-ignition temperature > 225 °C

Decomposition temperature Not established PH Not established

Kinematic viscosity 7 – 20.5 mm²/s at 40 °C (<60 mm²/s at 100 °C)

Solubility Water: 0.4 mg/l at 22 °C slightly soluble.

Partition coefficient: n-octanol/water (log value) 2.7 – 6 log P Vapour pressure 0.5 kPa at 20°C

Density and/or relative density 0.80 – 0.99 g/cm³ at 15 °C

Relative vapour density > 1 (Air = 1)
Particle characteristics Not established

9.2 Other information Vapour may create explosive atmosphere.

SECTION 10: STABILITY AND REACTIVITY

10.1 Reactivity
 10.2 Chemical stability
 Stable under normal conditions. Reacts with - Strong oxidising agents
 Stable under normal conditions. Hazardous polymerisation will not occur.

Product may release Hydrogen Sulphide.

10.3 Possibility of hazardous reactions Vapours are heavier than air and may travel considerable distances to a source

of ignition and flashback. Product may release Hydrogen Sulphide.

10.4 Conditions to avoid Elevated temperature: > 50 °C

10.5 Incompatible materialsKeep away from heat, sources of ignition and direct sunlight.Keep away from oxidising agents. Strong acids and Alkalis.

10.6 Hazardous decomposition products

A mixture of solid and liquid particulates and gases including unidentified

organic and inorganic compounds. Decomposes in a fire giving off toxic fumes:

COx, H2S, Sox.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1 Information on hazard classes as defined in All test data taken from existing ECHA registrations for the substances

Regulation (EC) No 1272/2008 mentioned.

Acute toxicity - Ingestion Based upon the available data, the classification criteria are not met.

LD50 (oral,rat) mg/kg: >2000 (OECD 401)

Acute toxicity - Inhalation Acute Tox. 4: Harmful if inhaled.

LC50 (inhalation,rat) mg/l/4h: 4.1 (EPA OTS 798.1150)

Acute toxicity - Skin contact Based upon the available data, the classification criteria are not met.

LD50 (skin,rabbit) mg/kg: >2000 (OECD 434)

Skin corrosion/irritation Based upon the available data, the classification criteria are not met.

Not irritating to skin. (rabbit) (OECD 404)

EUH066: Repeated exposure may cause skin dryness or cracking. (rat) (OECD

410)

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

Not irritating to eyes. (rabbit) (EU Method B.5)

Respiratory or skin sensitisationBased upon the available data, the classification criteria are not met.

Sensitisation (guinea pig) - Negative (OECD 406)

Germ cell mutagenicity Based upon the available data, the classification criteria are not met.

ECHA Registration Endpoint summary:

Not classified. Studies showed no consistent evidence of mutagenic activity

Carcinogenicity Carc. 1B; May cause cancer.

ECHA Registration Endpoint summary:

Positive (mouse)

Reproductive toxicity Repr. 2; H361d: Suspected of damaging the unborn child.

Reproductive toxicity: No data available.

Developmental toxicity: Positive (rat) EPA OTS 798.4900

STOT - Single Exposure Based upon the available data, the classification criteria are not met.

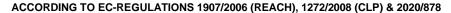
Weight of evidence approach.

STOT - Repeated Exposure STOT RE 2; May cause damage to organs through prolonged or repeated

exposure.

Oral: No data available. Inhalation: No data available.

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Dermal: NOAEL: 1.06 mg/kg bw/day (rat) (OECD 410)

Asp. Tox. 1; May be fatal if swallowed and enters airways.

Kinematic viscosity: 7 - 20.5 mm²/s at 40 °C (<60 mm²/s at 100 °C)

11.2 Information on other hazards

Other information

11.2.2

12.7

Aspiration hazard

11.2.1 Endocrine disrupting properties This product does not contain a substance that has endocrine disrupting

properties with respect to humans as no components meets the criteria.

None known

SECTION 12: ECOLOGICAL INFORMATION

12.1	Toxicity	Aquatic Acute 1; Very toxic to aquatic life.
		Aquatic Chronic 1; Very toxic to aquatic life with long lasting effects.
	Short Term (acute):	EL50: (48 hour) (Daphnia magna) 0.22 mg/l (OECD 202)
	Long term (chronic):	The aquatic toxicity was estimated using the PETROTOX computer model.
		Estimated: 0.1 mg/l (Fish)
12.2	Persistence and degradability	Substance is complex UVCB. Standard tests for this endpoint are intended for
		single substances and are not appropriate for this complex substance
12.3	Bioaccumulative potential	Substance is complex UVCB. Standard tests for this endpoint are intended for
		single substances and are not appropriate for this complex substance
12.4	Mobility in soil	Substance is complex UVCB. Standard tests for this endpoint are intended for
		single substances and are not appropriate for this complex substance
12.5	Results of PBT and vPvB assessment	Not classified as PBT or vPvB. None of the substances in this product fulfil the
		criteria for being regarded as a PBT or vPvB substance.
12.6	Endocrine disrupting properties	This product does not contain a substance that has endocrine disrupting

None known

SECTION 13: DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Other adverse effects

Do not empty into drains, dispose of this material and its container at hazardous or special waste collection point. Disposal should be in accordance with local, state or national legislation. Containers of this material may be hazardous when empty since they retain product residue. Containers must not be punctured or destroyed by burning, even when empty. Allocation of a waste code number, according to the European Waste Catalogue, should be carried out in agreement with the regional waste disposal company. Waste code: Fuel Oil (13 07 01)

properties with respect to humans as no components meets the criteria.

Waste classification according to Directive 2008/98/EC (Waste Framework Directive)

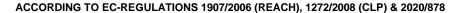
HP5, HP6, HP7, HP10, HP14

SECTION 14: TRANSPORT INFORMATION

		ADR/RID	IMDG/ADN
14.1	UN number or ID number	UN 3082	UN 3082
14.2	UN proper shipping name	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, FUEL OIL, RESIDUAL	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, FUEL OIL, RESIDUAL
14.3	Transport hazard class(es)	9	9 (N1, CMR, F)
14.4	Packing group	III	III
14.5	Environmental hazards	Environmentally hazardous substance	Classified as a Marine Pollutant.
14.6	Special precautions for user	See Section: 2	
14.7	Maritime transport in bulk according to IMO instruments	No information available.	No information available.
14.8	Additional information	HIN: 90	EmS: F-A, S-F
		Tunnel restriction code: 3 E	Limited Quantity: 5L
		Limited Quantity: 5L	
		Special provisions: 274, 335, 375, 601	

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SECTION 15: REGULATORY INFORMATION

15.1 Safety, health and environmental

regulations/legislation specific for the substance or

mixture

15.1.1 EU regulations

Annex XVII (Restrictions) In accordance with REACH Annex XVII entry 30 (c) this substance is exempt from

Entry 28 and 29 of REACH Annex XVII as it is to be sold as a fuel in a closed

system.

Seveso Upper Tier: 25000 tonnes

Lower Tier: 2500 tonnes

15.1.2 National regulations

Germany Water hazard class: 3

15.2 Chemical Safety Assessment A REACH chemical safety assessment (CSA) has been carried out. Refer to

annexes for exposure scenarios detailing use specific exposure controls.

SECTION 16: OTHER INFORMATION

The following sections contain revisions or new statements: New SDS Regulation 2020/878 format, all sections have been updated to include new information. Please review SDS with care.

References:

Existing Safety Data Sheet (SDS).

Harmonised Classification(s) for Fuel Oil, Residual (CAS No. 68476-33-5).

Existing ECHA registration(s) for Fuel Oil, Residual (CAS No. 68476-33-5) and Chemical Safety Report.

EU Classification: This Safety Data Sheet was prepared in accordance with EC Regulation (EC) 1907/2006 (REACH), 1272/2008 (CLP) & 2020/878

Legend

ADR ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road

CAS Chemical Abstracts Service

CLP Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures

EC European Community
ECHA European Chemicals Agency

EL50: Loading rate of test substance (in dilution water) which causes adverse effects in 50% of exposed population

EU European Union
DNEL Derived no effect level

IATA IATA: International Air Transport Association
ICAO ICAO: International Civil Aviation Organization
IMDG IMDG: International Maritime Dangerous Goods

LC50 Lethal Concentration at which 50% of the population is killed

LD50 Lethal Dose at which 50% of the population is killed

LTEL Long term exposure limit

NOAEL No Observed Adverse Effect Level

OECD Organisation for Economic Cooperation and Development

PBT PBT: Persistent, Bioaccumulative and Toxic

PNEC Predicted No Effect Concentration

REACH Registration, Evaluation, Authorisation and Restriction of Chemicals

RID RID: Regulations concerning the international railway transport of dangerous goods

STEL Short term exposure limit

UN United Nations

UVCB Unknown or Variable Composition, Complex reaction products or Biological materials

vPvB vPvB: very Persistent and very Bioaccumulative

Hazard classification / Classification code:

Asp. Tox. 1; Aspiration hazard, Category 1 Acute Tox. 4; Acute Toxicity, Category 4 Carc. 1B; Carcinogenicity, Category 1B

Repr. 2; Reproductive toxicity, Category 2

Hazard Statement(s)

EUH066: Repeated exposure may cause skin dryness or cracking.

H304: May be fatal if swallowed and enters airways.

H332: Harmful if inhaled. H350: May cause cancer.

H361d: Suspected of damaging the unborn child.

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ACCORDING TO EC-REGULATIONS 1907/2006 (REACH), 1272/2008 (CLP) & 2020/878



STOT RE 2; Specific target organ toxicity — repeated exposure, H373: May cause damage to organs through prolonged or repeated Category 2 exposure. Aquatic Acute 1; Hazardous to the aquatic environment, Acute, Category H400: Very toxic to aquatic life. Aquatic Chronic 1; Hazardous to the aquatic environment, Chronic, H410: Very toxic to aquatic life with long lasting effects.

Category 1

Training advice: Consideration should be given to the work procedures involved and the potential extent of exposure as they may determine whether a higher level of protection is required.

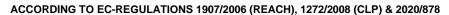
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Annex to the extended Safety Data Sheet (eSDS)

See below -

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Fuel oil, residual

CAS No. 68476-33-5 EINECS No. 270-675-6

Summary of Parameters

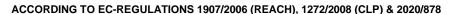
Physical Parameters	;		
Vapour pressure (Pa)			Value used for exposure assessment = 2.0E+02
Partition coefficient (lo	og K _{ow})		1.99 – 18.02
Aqueous solubility (m	g/l)		2.7E-12 – 2.0E+03 Value used for environmental exposure assessment = 7.3E+00
Molecular weight			Not applicable
Biodegradability			Standard tests for this endpoint are intended for single substances and are not appropriate for this complex substance
Human Health (DNEL)			
	Short term	Inhalation (mg/m³)	4700
Workers	Short term	Dermal (mg/kg bw/day)	Not defined
vvoikers	Long Torm	Inhalation (mg/m³)	0.18
	Long Term	Dermal (mg/kg bw/day)	0.065
		Inhalation (mg/m³)	Not defined
Consumer		Dermal (mg/kg bw/day)	Not defined
		Oral (mg/kg bw/day)	0.015

Environmental Parameters (PNECs)

Fuel oil, residual is a hydrocarbon UVCB. The hydrocarbon block method is used in PETRORISK to calculate the environmental toxicity (HC5) of each group of components in the substance. These are used to estimate the environmental risk for the substance. Therefore individual environmental compartments PNECs are not available for this product.

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Contents

Number	Title	Page:
Exposure scenario 1	Distribution of Fuel oil, residual	12
Exposure scenario 2	Formulation and (re)packing of Fuel oil, residual	16
Exposure scenario 3	Use as a fuel (Industrial)	20
Exposure scenario 4	Use as a fuel (Professional)	24

Contributing Scenarios

Workers

PROC1 Use in closed process, no likelihood of exposure

PROC2 Use in closed, continuous process with occasional controlled exposure

(Storage) Bulk product storage.

(Sampling) Product sampling.

(Fuel filtering) Operation of solids filtering equipment.

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

(Maintenance) Equipment cleaning and maintenance.

PROC8b Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

(Marine) Marine vessel or barge loading.

(Road/Rail) Road tanker/rail car loading.

(Drum) Drum or batch transfers.

(Bulk) Bulk closed loading and unloading.

(Refuelling) Refuelling.

PROC15 Use as laboratory reagent.

PROC16 Using material as fuel sources, limited exposure to unburned product to be expected Click or tap here to enter text.

Environment

ERC2 Formulation of preparations

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 thermo-plastics

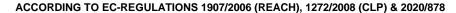
ERC6d Industrial use of process regulators for polymerisation processes in production of resins, rubbers, polymers

ERC7 Industrial use of substances in closed systems

ERC9a Wide dispersive indoor use of substances in closed systems

ERC9b Wide dispersive outdoor use of substances in closed systems

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Exposure Scenario 1 - Distribution of Fuel oil, residual

1.0 Contributing scenarios		
Sector of Use [SU]	SU3 Industrial uses: Uses of substances as such or in preparations at industrial sites	
	PROC1	
	PROC2	
	PROC2 (Storage)	
	PROC2 (Sampling)	
Process Category [PROC]	PROC3	
	PROC8a (Maintenance)	
	PROC8b (Marine)	
	PROC8b (Road/Rail)	
	PROC15	
Chemical Product Category [PC]	Not applicable	
Article Categories [AC]	Not applicable	
	ERC4	
	ERC5	
	ERC6a	
Environmental Release Categories [ERC]	ERC6b	
	ERC6c	
	ERC6d	
	ERC7	
Specific Environmental Release Categories [SPERC]	ESVOC SpERC 1.1b.v1	

	2.0 Operational conditions and risk management measures			
Liquid				
<0.5 kPa @ STP				
Covers percentage substance	in the product up to 100 % (unless stated differently).			
anagement				
Not defined				
Frequency and duration of use				
PROC1, PROC8a	Covers daily exposures up to 8 hours (unless stated differently).			
(Maintenance), PROC15	Covers daily exposures up to 6 riodis (unless stated differently).			
PROC2 (Storage), PROC3,	Covers exposure up to 1 - 4 hour(s)			
PROC8b (Marine)	Covers exposure up to 1 - 4 flour(s)			
PROC8b (Road/Rail)	Covers exposure up to 15 min - 1 hour(s)			
PROC2, PROC2 (Sampling)	Covers exposure up to 15 min			
300				
orker exposure				
PROC2 (Sampling)	Outdoor			
All other PROC's	Not defined (default = Indoor)			
Not defined				
•	<0.5 kPa @ STP Covers percentage substance inagement Not defined PROC1, PROC8a (Maintenance), PROC15 PROC2 (Storage), PROC3, PROC8b (Marine) PROC8b (Road/Rail) PROC2, PROC2 (Sampling) 300 Forker exposure PROC2 (Sampling) All other PROC's			

General measures applicable to all activities

Assumes a good basic standard of occupational hygiene is implemented. Assumes activities are at ambient temperature (unless stated differently).

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.

Technical conditions of use

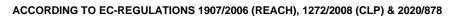
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ACCORDING TO EC-REGULATIONS 1907/2006 (REACH), 1272/2008 (CLP) & 2020/878

PROC1, PROC2, PROC2 (Storage),	Handle substance within a closed system.			
PROC3	·			
PROC8b (Road/Rail)	Ensure material transfers are under containment or extract ventilation (Efficiency of at least 80%)			
PROC15				
Organisational measures				
PROC2; PROC3	Sample via a closed loop or other system to avoid exposure.			
PROC8b (Marine)			ear transfer lines prior to de-coupling.	
PROC8a (Maintenance)			prior to equipment break-in or maintenance.	
PROC8a (Maintenance), PROC8b (Marine)			storage pending disposal or for subsequent recycle.	
PROC8b (Road/Rail)		ansfers are u	under containment or extract ventilation	
Risk management measures related to hun				
Respiratory protection	No special measu		ired.	
Hand and/or Skin protection	PROC1, PROC2, (Storage), PROC2 (Sampling), PROC PROC8b (Marine) (Road/Rail)	! 3,	Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.(Efficiency of at least 90 %).	
	PROC15		Wear suitable gloves tested to EN374. (Efficiency of at least 80 %).	
	PROC8a (Mainten	ance)	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 75%)	
Eye Protection	No special measu	res are requ	ired.	
2.2 Control of environmental exposure		<u>'</u>		
Amounts used				
Fraction of EU tonnage used in region:		0.1		
Regional use tonnage (tons/year):		9.3E+06		
Fraction of Regional tonnage used locally (ton	ıs/year):	2.0E-03		
Annual site tonnage (tons/year):	, ,		1.9E+04	
Maximum daily site tonnage (kg/day):		6.2E+04		
Environment factors not influenced by risk	management			
Flow rate of receiving surface water (m³/d):		Not define	d (default = 18,000)	
Local freshwater dilution factor:		10		
Local marine water dilution factor:		100		
Operational conditions				
Emission days (days/year): 300				
Release fraction to air from process (initial release prior to RMM):		1.0E-04		
Release fraction to wastewater from process (initial release prior to RMM):		1.0E-06		
Release fraction to soil from process (initial release prior to RMM):		1.0E-05		
Technical conditions and measures at pro-				
Common practices vary across sites thus cons				
Technical onsite conditions and measures				
Risk from environmental exposure is driven by humans via indirect exposure (primarily ingestion). No wastewater treatment required.				
Treat air emission to provide a typical removal efficiency of (%):		90		
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%):		0		
If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of (%):		0		
Treat soil emission to provide a typical removal efficiency of (%): No			d	
Organisational measures to prevent/limit release from site				
Do not apply industrial sludge to natural soils.			ontained or reclaimed.	
Conditions and measures related to munic				
Size of municipal sewage system/treatment pl	ant (m³/d):	2.0E+03		
Degradation effectiveness (%): 94.2				
Conditions and measures related to external treatment of waste for disposal				
External treatment and disposal of waste should comply with applicable local and/or national regulations. Conditions and measures related to external recovery of waste				
External recovery and recycling of waste should comply with applicable local and/or national regulations.				
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Substance release quantities after risk management measures		
Release to waste water from process (mg/l):	Not defined	
Maximum allowable site tonnage (MSafe) based on release following total wastewater treatment removal (kg/d):	8.0E+04	

3. Exposure estimation and reference to its source		
3.1 Human exposure prediction		
Exposure assessment (method/calculation model)	The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. (PROC1, PROC2, PROC2 (Sampling), PROC15) The Advanced REACH Tool (ART) has been used to estimate workplace exposures unless otherwise indicated. (PROC2 (Storage), PROC3, PROC8a (Maintenance), PROC8b (Marine), PROC8b (Road/Rail)).	

	Inhalation Dermal			Combined	
Process Category [PROC]	Inhalation exposure (mg/m³)	Risk characterisation ratio (RCR)	Dermal exposure (mg/kg bw/day)	Risk characterisation ratio (RCR)	Risk characterisation ratio (RCR)
PROC1	0.01	0.04	0.03	0.57	0.61
PROC2	0.04	0.19	0.03	0.57	0.76
PROC2 (Storage)	0.04	0.21	0.03	0.57	0.78
PROC2 (Sampling)	0.04	0.19	0.03	0.57	0.76
PROC3	0.04	0.21	0.03	0.57	0.78
PROC8a (Maintenance)	0.00	0.01	0.05	0.83	0.85
PROC8b (Marine)	0.06	0.35	0.03	0.57	0.92
PROC8b (Road/Rail)	0.03	0.19	0.03	0.57	0.76
PROC15	0.05	0.28	0.01	0.10	0.38

3.2 Environmental exposure prediction

Exposure assessment (method/calculation model)

The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.

Fuel oil, residual is a hydrocarbon UVCB. The hydrocarbon block method is used in PETRORISK to calculate the environmental toxicity (HC5) of each group of components in the substance. These are used to estimate the environmental risk for the substance. Therefore individual environmental compartments PNECs are not available for this product.

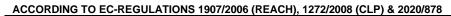
Environmental exposure	STP	Freshwater	Marine water	Soil	Freshwater sediment	Marine sediment
Predicted Environmental Exposure (PEC)	1.9E-03 mg/l	1.9E-04 mg/l	1.9E-05 mg/l	6.2E-02 mg/kg ww	1.4E+00 mg/kg ww	3.7E-02 mg/kg ww
Risk characterisation ratio (RCR)	2.0E-03	7.6E-03	7.6E-04	3.3E-05	1.3E-02	9.9E-04

Human exposure prediction:

Route of Exposure	Exposure (µg/kg/Day) Risk chara	
Oral	2.0E+01	7.7E-01
Inhalation	1.6E-01	3.2E-03

4. Evaluation guidance to downstream user					
For scaling see	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 support the need for a DNEL to be established for other health effects. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html).				

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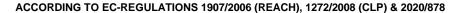




Exposure assessment instrument/tool/method	Worker	The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. (PROC1, PROC2, PROC2 (Sampling), PROC15) The Advanced REACH Tool (ART) has been used to estimate workplace exposures unless otherwise indicated. (PROC2 (Storage), PROC3, PROC8a (Maintenance), PROC8b (Marine), PROC8b (Road/Rail)).
	Environment	The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.

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Exposure Scenario 2 - Formulation and (re)packing of Fuel oil, residual

1.0 Contributing scenarios				
Sector of Use [SU]	SU3 Industrial uses: Uses of substances as such or in preparations at industrial sites SU10 Formulation [mixing] of preparations and/or re-packaging (excluding alloys)			
Process Category [PROC]	PROC1 PROC2 PROC2 (Storage) PROC2 (Sampling) PROC3 PROC8a (Maintenance) PROC8b (Marine) PROC8b (Road/Rail) PROC8b (Drum) PROC8b (Drum)			
Chemical Product Category [PC]	Not applicable			
Article Categories [AC]	Not applicable			
Environmental Release Categories [ERC]	ERC2			
Specific Environmental Release Categories [SPERC]	ESVOC SpERC 2.2.v1			

2.0 Operational conditions and risk management measures						
2.1 Control of worker exposure						
Product characteristics						
Physical form of product	Liquid					
Vapour pressure	<0.5 kPa @ STP					
Concentration of substance in product	Covers percentage substance	in the product up to 100 % (unless stated differently).				
Human factors not influenced by risk m	anagement					
Potential exposure area	Not defined					
Frequency and duration of use	Frequency and duration of use					
	PROC1, PROC8a (Maintenance), PROC15	Covers daily exposures up to 8 hours (unless stated differently).				
Exposure duration per day	PROC2 (Storage), PROC3, PROC8b (Marine)	Covers exposure up to 1 - 4 hour(s)				
, , , , , , , , ,	PROC8b (Road/Rail), PROC8b (Drum)	Covers exposure up to 15 min - 1 hour(s)				
	PROC2, PROC2 (Sampling)	Covers exposure up to 15 min				
Emission days (days/year):	mission days (days/year): 300					
Other operational conditions affecting worker exposure						
Area of use	All contributing scenarios Not defined (default = Indoor)					
Characteristics of the surroundings	rroundings Not defined					
Consider management applicable to all activities						

General measures applicable to all activities

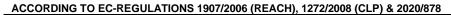
Assumes a good basic standard of occupational hygiene is implemented. Assumes activities are at ambient temperature (unless stated differently).

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.

Technical conditions of use	
PROC1, PROC2, PROC3	Handle substance within a closed system.
PROC8b (Drum)	Ensure material transfers are under containment or extract ventilation. (Efficiency of at least 97%).
PROC15	Handle in a fume cupboard or under extract ventilation. (Efficiency of at least 90 %).
Organisational measures	
PROC2, PROC2 (Sampling)	Minimise the volume and frequency of sampling. Ensure dedicated sample points are provided.

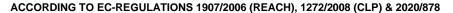
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PROC8b (Marine)	Transfer via enclosed lines. Clear transfer lines prior to de-coupling.				
PROC8a (Maintenance)	Drain down and flush system prior to equipment break-in or maintenance.				
PROC8a (Maintenance), PROC8b (Marine)	Retain drain downs in sealed storage pending disposal or for subsequent recycle.				
PROC8b (Road/Rail), PROC8b (Drum)	Ensure material transfers are under containment or extract ventilation				
Risk management measures related to hur	nan health				
Respiratory protection	No special measur	res are requ	ired.		
	PROC1, PROC2,	ROC1, PROC2, PROC2			
	(Storage), PROC2 (Sampling), PROC PROC8b (Marine)	23,	Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.(Efficiency of at least 90 %).		
Hand and/or Skin protection	(Road/Rail), PRO((Drum)	•	, , , , , , , , , , , , , , , , , , , ,		
	PROC8a (Mainten	ance)	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 75%)		
	PROC15		Wear suitable gloves tested to EN374. (Efficiency of at least 80 %).		
Eye Protection	No special measur	res are requ	ired.		
2.2 Control of environmental exposure					
Amounts used					
Fraction of EU tonnage used in region:		0.1			
Regional use tonnage (tons/year):		7.5E+06			
Fraction of Regional tonnage used locally (tor	ns/year):	4.0E-03			
Annual site tonnage (tons/year):		3.0E+04			
Maximum daily site tonnage (kg/day):		1.0E+05			
Environment factors not influenced by risk	management	l			
Flow rate of receiving surface water (m³/d):		Not define	d (default = 18,000)		
Local freshwater dilution factor:		10			
Local marine water dilution factor:		100			
Operational conditions		.00			
Emission days (days/year):		300			
Release fraction to air from process (after type	Release fraction to air from process (after typical onsite RMMs consistent with EU Solvent Emissions Directive requirements):				
to RMM):	Release fraction to wastewater from process (initial release prior				
Release fraction to soil from process (initial re RMM):		1.0E-04			
Technical conditions and measures at pro					
Common practices vary across sites thus con					
Technical onsite conditions and measures					
		_ ` `	primarily ingestion). No wastewater treatment required.		
Treat air emission to provide a typical remova	. , ,	0			
Treat onsite wastewater (prior to receiving wa provide the required removal efficiency of (%)	J ,	81.3			
If discharging to domestic sewage treatment prequired onsite wastewater removal efficiency		0			
Treat soil emission to provide a typical remove	al efficiency of (%):	Not defined			
Common practices vary across sites thus conservative process release estimates used.					
Organisational measures to prevent/limit r	elease from site				
Do not apply industrial sludge to natural soils.	Sludge should be in	cinerated, c	ontained or reclaimed.		
Conditions and measures related to munic					
Size of municipal sewage system/treatment plant (m³/d): 2			2.0E+03		
Degradation effectiveness (%):		94.2			
Conditions and measures related to external treatment of waste for disposal					
External treatment and disposal of waste sho	uld comply with appli	cable local a	and/or national regulations.		
Conditions and measures related to external recovery of waste					
External recovery and recycling of waste should comply with applicable local and/or national regulations.					
Substance release quantities after risk ma					
Release to waste water from process (mg/l):		Not defined			
Maximum allowable site tonnage (MSafe) bas		1.1E+05			
following total wastewater treatment removal	(kg/d):				

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3. Exposure estimation and reference to its source

3.1 Human exposure prediction

Exposure assessment (method/calculation model)

The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. (PROC1, PROC2, PROC2 (Sampling), PROC8b (Drum), PROC15)

The Advanced REACH Tool (ART) has been used to estimate workplace exposures unless otherwise indicated. (PROC2 (Storage), PROC3, PROC8a (Maintenance), PROC8b (Marine), PROC8b (Road/Rail)).

	Inhalation		Dermal		Combined
Process Category [PROC]	Inhalation exposure (mg/m³)	Risk characterisation ratio (RCR)	Dermal exposure (mg/kg bw/day)	Risk characterisation ratio (RCR)	Risk characterisation ratio (RCR)
PROC1	0.01	0.04	0.03	0.57	0.61
PROC2	0.04	0.19	0.03	0.57	0.76
PROC2 (Storage)	0.04	0.21	0.03	0.57	0.78
PROC2 (Sampling)	0.04	0.19	0.03	0.57	0.76
PROC3	0.04	0.21	0.03	0.57	0.78
PROC8a (Maintenance)	0.00	0.01	0.05	0.83	0.85
PROC8b (Marine)	0.06	0.36	0.03	0.57	0.92
PROC8b (Road/Rail)	0.03	0.20	0.03	0.57	0.76
PROC8b (Drum)	0.02	0.12	0.03	0.57	0.68
PROC15	0.05	0.28	0.01	0.10	0.38

3.2 Environmental exposure prediction

Exposure assessment (method/calculation model)

The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.

Fuel oil, residual is a hydrocarbon UVCB. The hydrocarbon block method is used in PETRORISK to calculate the environmental toxicity (HC5) of each group of components in the substance. These are used to estimate the environmental risk for the substance. Therefore individual environmental compartments PNECs are not available for this product.

Environmental exposure	STP	Freshwater	Marine water	Soil	Freshwater sediment	Marine sediment
Predicted Environmental Exposure (PEC)	6.1E-02 mg/l	6.1E-03 mg/l	6.1E-04 mg/l	6.3E-02 mg/kg ww	1.5E+00 mg/kg ww	5.5E-02 mg/kg ww
Risk characterisation ratio (RCR)	6.4E-02	2.4E-01	2.4E-02	5.3E-04	3.1E-01	3.1E-02

Human exposure prediction:

Route of Exposure	Exposure (μg/kg/Day)	Risk characterisation ratio (RCR)
Oral	2.1E+01	8.1E-01
Inhalation	6.6E+00	1.3E-01

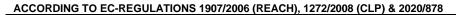
4. Evaluation guidance to downstream user

For scaling see

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 support the need for a DNEL to be established for other health effects.

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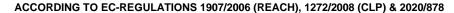




	Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html).		
Exposure assessment instrument/tool/method	Worker	The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. (PROC1, PROC2, PROC2 (Sampling), PROC8b (Drum), PROC15) The Advanced REACH Tool (ART) has been used to estimate workplace exposures unless otherwise indicated. (PROC2 (Storage), PROC3, PROC8a (Maintenance), PROC8b (Marine), PROC8b (Road/Rail)).	
	Environment	The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.	

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Exposure Scenario 3 – Use as a fuel (Industrial)

1.0 Contributing scenarios			
Sector of Use [SU]	SU3 Industrial uses: Uses of substances as such or in preparations at industrial sites		
	PROC1		
	PROC2		
	PROC2 (Fuel filtering)		
	PROC2 (Storage)		
Process Category [PROC]	PROC3		
	PROC8a (Maintenance)		
	PROC8b (Bulk)		
	PROC8b (Drum)		
	PROC16		
Chemical Product Category [PC]	Not applicable		
Article Categories [AC]	Not applicable		
Environmental Release Categories [ERC]	ERC7		
Specific Environmental Release Categories [SPERC]	ESVOC SpERC 7.12a.v1		

agement measures		
Liquid		
<0.5 kPa @ STP		
Covers percentage substance	e in the product up to 100 % (unless stated differently).	
anagement		
Not defined		
PROC1, PROC8a (Maintenance), PROC8b (Bulk), PROC16	Covers daily exposures up to 8 hours (unless stated differently).	
PROC2 (Fuel filtering), PROC2 (Storage), PROC3	Covers exposure up to 1 - 4 hour(s)	
PROC2, PROC8b (Drum)	Covers exposure up to 15 min - 1 hour(s)	
300		
vorker exposure		
PROC8b (Bulk)	Outdoor	
All other PROC's	Not defined (default = Indoor)	
Not defined		
	<0.5 kPa @ STP Covers percentage substance anagement Not defined PROC1, PROC8a (Maintenance), PROC8b (Bulk), PROC16 PROC2 (Fuel filtering), PROC2 (Storage), PROC3 PROC2, PROC8b (Drum) 300 vorker exposure PROC8b (Bulk) All other PROC's	

General measures applicable to all activities

Assumes a good basic standard of occupational hygiene is implemented. Assumes activities are at ambient temperature (unless stated differently).

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.

Technical conditions of use	
PROC1, PROC2, PROC3	Handle substance within a closed system.
Organisational measures	
PROC2	Provide a good standard of controlled ventilation (10 to 15 air changes per hour).
PROC8b (Bulk)	Transfer via enclosed lines.
PROC8b (Drum), PROC2 (Fuel filtering),	Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
PROC2 (Storage), PROC16	

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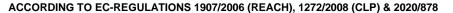


ACCORDING TO EC-REGULATIONS 1907/2006 (REACH), 1272/2008 (CLP) & 2020/878

Risk management measures related to he	Retain drain down			
Respiratory protection	No special measu	res are regu	ired.	
Troop.iatory protocolor.	PROC1, PROC2,			
Hand and/or Skin protection	(Fuel filtering), PROC2 (Storage), PROC3, PROC8t (Bulk), PROC8b (Drum), PROC16		Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training (Efficiency of at least 90 %).	
	PROC8a (Mainten	ance)	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training (Efficiency of at least 75 %).	
Eye Protection	No special measur	res are requ	ired.	
2.2 Control of environmental exposure				
Amounts used				
Fraction of EU tonnage used in region:		0.1		
Regional use tonnage (tons/year):		5.9E+06		
Fraction of Regional tonnage used locally (to	ons/year):	2.6E-01		
Annual site tonnage (tons/year):		1.5E+06		
Maximum daily site tonnage (kg/day):		5.0E+06		
Environment factors not influenced by ris	sk management	<u>l</u>		
Flow rate of receiving surface water (m³/d):		Not define	d (default = 18,000)	
Local freshwater dilution factor:		10		
Local marine water dilution factor:		100		
Operational conditions				
Emission days (days/year):		300		
Release fraction to air from process (initial release prior to RMM):		2.0E-04		
Release fraction to wastewater from process (initial release prior to RMM):		1.0E-06		
Release fraction to soil from process (initial release prior to RMM):		0		
Technical conditions and measures at pr	ocess level (source)	to prevent	release	
Common practices vary across sites thus co	nservative process re	lease estima	ites used.	
Technical onsite conditions and measure	s to reduce or limit o	discharges,	air emissions and releases to soil	
Risk from environmental exposure is driven	by humans via indirec	t exposure (primarily ingestion). No wastewater treatment required.	
Treat air emission to provide a typical remov	al efficiency of (%):	95		
Treat onsite wastewater (prior to receiving w provide the required removal efficiency of (%)		92.5		
If discharging to domestic sewage treatment required onsite wastewater removal efficience	plant, provide the	0		
Treat soil emission to provide a typical remo		Not defined		
Common practices vary across sites thus co				
Organisational measures to prevent/limit				
Do not apply industrial sludge to natural soil:		cinerated o	ontained or reclaimed.	
Conditions and measures related to mun				
Size of municipal sewage system/treatment		2.0E+03		
Degradation effectiveness (%)		94.2		
Conditions and measures related to extend	nal treatment of was	_	osal	
			tion emissions considered in regional exposure assessment. Externa	
treatment and disposal of waste should com				
Substance release quantities after risk m				
Release to waste water from process (mg/l)	gomont modoure	Not define	d	
Maximum allowable site tonnage (MSafe) based on release following total wastewater treatment removal (kg/d):		5.4E+06		

3. Exposure estimation and reference to its source	
3.1 Human exposure prediction	
Exposure assessment (method/calculation model)	The ECETOC TRA tool has been used to estimate workplace exposures unless
	otherwise indicated. (PROC1, PROC2, PROC16)

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The Advanced REACH Tool (ART) has been used to estimate workplace exposures unless otherwise indicated. (PROC2 (Storage), PROC2 (Fuel filtering), PROC3, PROC8a (Maintenance), PROC8b (Bulk), PROC8b (Drum))

	Inhalation		Dermal		Combined
Process Category [PROC]	Inhalation exposure (mg/m³)	Risk characterisation ratio (RCR)	Dermal exposure (mg/kg bw/day)	Risk characterisation ratio (RCR)	Risk characterisation ratio (RCR)
PROC1	0.01	0.04	0.03	0.57	0.61
PROC2	0.03	0.17	0.03	0.57	0.73
PROC2 (Fuel filtering)	0.04	0.21	0.03	0.57	0.78
PROC2 (Storage)	0.04	0.21	0.03	0.57	0.78
PROC3	0.04	0.21	0.03	0.57	0.78
PROC8a (Maintenance)	0.00	0.01	0.05	0.83	0.85
PROC8b (Bulk)	0.06	0.36	0.03	0.57	0.92
PROC8b (Drum)	0.03	0.19	0.03	0.57	0.76
PROC16	0.01	0.06	0.03	0.57	0.62

3.2 Environmental exposure prediction

Exposure assessment (method/calculation model)

The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.

Fuel oil, residual is a hydrocarbon UVCB. The hydrocarbon block method is used in PETRORISK to calculate the environmental toxicity (HC5) of each group of components in the substance. These are used to estimate the environmental risk for the substance. Therefore individual environmental compartments PNECs are not available for this product.

Environmental exposure	STP	Freshwater	Marine water	Soil	Freshwater sediment	Marine sediment
Predicted Environmental Exposure (PEC)	1.5E-01 mg/l	1.5E-02 mg/l	1.5E-03 mg/l	6.3E-02 mg/kg ww	1.8E+00 mg/kg ww	4.6E-02 mg/kg ww
Risk characterisation ratio (RCR)	1.6E-01	6.1E-01	6.1E-02	3.0E-04	7.7E-01	7.7E-02

Human exposure prediction:

Route of Exposure	Exposure (μg/kg/Day)	Risk characterisation ratio (RCR)	
Oral	2.2E+01	8.7E-01	
Inhalation	3.4E+00	6.6E-02	

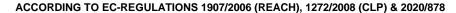
4. Evaluation guidance to de	ownstream user	
For scaling see	Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. Available hazard data do not support the need for a DNEL to be established for other health effects. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html).	
Exposure assessment instrument/tool/method	Worker	The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. (PROC1, PROC2, PROC16) The Advanced REACH Tool (ART) has been used to estimate workplace exposures unless otherwise indicated. (PROC2 (Storage), PROC2 (Fuel filtering), PROC3, PROC8a (Maintenance), PROC8b (Bulk), PROC8b (Drum))
	Environment	The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.

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Exposure Scenario 4 – Use as a fuel (Professional)

1.0 Contributing scenarios	
Sector of Use [SU]	SU22 Professional uses: Public domain (administration, education, entertainment, services,
Sector of Ose [SO]	craftsmen)
Process Category [PROC]	PROC1 PROC2 PROC2 (Storage) PROC3 PROC8a (Maintenance) PROC8b (Bulk) PROC8b (Drum/batch transfers) PROC8b (Refuelling) PROC16
Chemical Product Category [PC]	Not applicable
Article Categories [AC]	Not applicable
Environmental Release Categories [ERC]	ERC9a ERC9b
Specific Environmental Release Categories [SPERC] ESVOC SpERC 9.12b.v1	

2.1 Control of worker exposure			
Product characteristics			
Physical form of product	Liquid		
Vapour pressure	<0.5 kPa @ STP		
Concentration of substance in product	Covers percentage substance	e in the product up to 100 % (unless stated differently).	
Human factors not influenced by risk ma	anagement		
Potential exposure area	Not defined		
Frequency and duration of use	•		
	PROC1, PROC8a (Maintenance), PROC16	Covers daily exposures up to 8 hours (unless stated differently).	
	PROC2 (Storage)	Covers exposure up to 1 - 4 hour(s)	
Exposure duration per day	PROC2, PROC8b (Bulk), PROC8b (Drum), PROC8b (Refuelling)	Covers exposure up to 15 min - 1 hour(s)	
	PROC3	Covers exposure up to 15 min	
Exposure duration (days/year)	365		
Other operational conditions affecting v	orker exposure		
Area of use	All PROC's Not defined (default = Indoor)		
Characteristics of the surroundings	Not defined	•	

General measures applicable to all activities

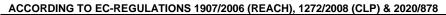
Assumes a good basic standard of occupational hygiene is implemented. Assumes activities are at ambient temperature (unless stated differently).

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.

Technical conditions of use					
PROC1, PROC2, PROC3 Handle substance within a closed system.					
Organisational measures					
PROC2, PROC3, PROC8b (Bulk), PROC8b (Drum)	Provide a good standard of controlled ventilation (10 to 15 air changes per hour).				
PROC2 (Storage), PROC8a (Maintenance), PROC16	Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).				

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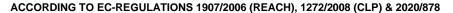


	Ensure material transfers are under containment or extract ventilation. Clear transfer lines prior to de-coupling.							
PROC8b (Bulk), PROC8b (Drum), PROC8a (Maintenance)	Retain drain downs in sealed storage pending disposal or for subsequent recycle.							
Risk management measures related to hum	an health							
Respiratory protection No special measures are required.								
, ,,	PROC1, PROC2 (
	PROC3, PROC8b	- ,	Wear chemically resistant gloves (tested to EN374) in combination					
	PROC8b (Drum), I	, ,	with 'basic' employee training (Efficiency of at least 90 %).					
Hand and/or Skin protection	(Refuelling),							
			Wear chemically resistant gloves (tested to EN374) in combination					
	(Maintenance)		with specific activity training (Efficiency of at least 95 %).					
Eye Protection	No special measur	res are requi						
2.2 Control of environmental exposure	·	_						
Amounts used								
Fraction of EU tonnage used in region:		0.1						
Regional use tonnage (tons/year):		1.7E+06						
Fraction of Regional tonnage used locally (tons	s/vear):	5.0E-04						
Annual site tonnage (tons/year):	<i>y</i> /	8.5E+02						
Maximum daily site tonnage (kg/day):		2.3E+03						
Environment factors not influenced by risk	management	2.02100						
Flow rate of receiving surface water (m³/d):	managomont	Not define	d (default = 18,000)					
Local freshwater dilution factor:		10	a (acradit = 10,000)					
		100						
Local marine water dilution factor: Operational conditions								
Emission days (days/year):		365						
Release fraction to air from wide dispersive us	e (regional only):	1.0E-05						
Release fraction to wastewater from wide dispersive use:		1.0E-03						
Release fraction to soil from wide dispersive use (regional only):		1.0E-05						
Technical conditions and measures at process level (source)			release					
Common practices vary across sites thus cons								
Technical onsite conditions and measures								
			orimarily ingestion). No wastewater treatment required.					
Treat air emission to provide a typical removal		Not applica						
Treat onsite wastewater (prior to receiving water discharge) to								
provide the required removal efficiency of (%):			0					
If discharging to domestic sewage treatment plant, provide the								
required onsite wastewater removal efficiency of (%):								
Treat soil emission to provide a typical removal efficiency of (%):		Not defined						
Common practices vary across sites thus cons	• ` '							
Organisational measures to prevent/limit re								
Do not apply industrial sludge to natural soils.		cinerated, c	ontained or reclaimed.					
Conditions and measures related to munici								
Size of municipal sewage system/treatment plant (m³/d):		2.0E+03						
Degradation effectiveness (%):		94.2						
Conditions and measures related to external treatment of was								
			tion emissions considered in regional exposure assessment. External					
treatment and disposal of waste should comply								
Conditions and measures related to externa			-					
This substance is consumed during use and no								
Substance release quantities after risk mark								
Substance release quantities after risk man Release to waste water from process (mg/l):		Not define	u					
	ed on release	3.0E+03	u					

3. Exposure estimation and reference to its source

3.1 Human exposure prediction

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Exposure assessment (method/calculation model)	The ECETOC TRA tool has been used to estimate workplace exposures unless
	otherwise indicated. (PROC1, PROC2, PROC3, PROC16).
	The Advanced REACH Tool (ART) has been used to estimate workplace
	exposures unless otherwise indicated (PROC2 (Storage), PROC8a

(Maintenance), PROC8b (Bulk), PROC8b (Drum) and PROC8b (Refuelling))

	Inhal	ation	Der	mal	Combined		
Process Category [PROC]	Inhalation exposure (mg/m³)	Risk characterisation ratio (RCR)	Dermal exposure (mg/kg bw/day)	Risk characterisation ratio (RCR)	Risk characterisation ratio (RCR)		
PROC1	0.01	0.06	0.03	0.57	0.62		
PROC2	0.06	0.33	0.02	0.28	0.62		
PROC2 (Storage)	0.04	0.21	0.03	0.57	0.78		
PROC3	0.03	0.17	0.03	0.57	0.73		
PROC8a (Maintenance)	0.01	0.05	0.05	0.83	0.88		
PROC8b (Bulk)	0.03	0.19	0.03	0.57	0.76		
PROC8b (Drum)	0.03	0.19	0.03	0.57	0.76		
PROC8b (Refuelling)	0.03	0.19	0.03	0.57	0.76		
PROC16	0.01	0.06	0.03	0.57	0.62		

3.2 Environmental exposure prediction

The Hydrocarbon Block Method has been used to calculate environmental Exposure assessment (method/calculation model) exposure with the Petrorisk model.

Fuel oil, residual is a hydrocarbon UVCB. The hydrocarbon block method is used in PETRORISK to calculate the environmental toxicity (HC5) of each group of components in the substance. These are used to estimate the environmental risk for the substance. Therefore individual environmental compartments PNECs are not available for this product.

Environmental exposure	STP	Freshwater	Marine water	Soil	Freshwater sediment	Marine sediment
Predicted Environmental Exposure (PEC)	7.2E-06 mg/l	1.1E-04 mg/l	7.3E-07 mg/l	6.2E-02 mg/kg ww	1.4E+00 mg/kg ww	3.6E-02 mg/kg ww
Risk characterisation ratio (RCR)	7.5E-06	4.7E-03	6.2E-05	5.7E-05	3.5E-03	4.1E-05

Human exposure prediction:

Route of Exposure	Exposure (μg/kg/Day)	Risk characterisation ratio (RCR)
Oral	2.0E+01	7.7E-01
Inhalation	1.2E-01	2.3E-03

4. Evaluation guidance to d	ownstream user				
For scaling see	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 support the need for a DNEL to be established for other health effects. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html).				
Exposure assessment instrument/tool/method	Worker	The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. (PROC1, PROC2, PROC3, PROC16). The Advanced REACH Tool (ART) has been used to estimate workplace exposures unless otherwise indicated. (PROC2 (Storage), PROC8a (Maintenance), PROC8b (Bulk), PROC8b (Drum) and PROC8b (Refuelling))			

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En	Facing and at	The Hydrocarbon	Block	Method	has	been	used to	calculate	environmental
Environment	exposure with the F	Petroris	k model.						