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ACCORDING TO EC-REGULATIONS 1907/2006 (REACH), 1272/2008 (CLP) & 2015/830

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

1.1	Product identifier Product Name Product Description Trade Name Product code CAS No. EC No. REACH Registration No.	V200 FUEL FO38	pil, residual 2-FUEL OIL 380 CST-Fuel oil, residual - OIL 380 CST 30C, V2002 6-33-5 375-6	
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	11
		2	Formulation and (re)packing of Fuel oil, residual	15
		3	Use of Fuel oil, residual as a Fuel (Industrial)	19
		4	Use of Fuel oil, residual as a Fuel (Professional)	22
	Uses Advised Against	Anyth	ning other than the above.	
1.3	Details of the supplier of the safety data sheet			
	Company Identification	Vitol \$	SA	
		Place	e des Bergues 3	
			Box 2056	
			Geneva 1	
		Switz	erland	
	Telephone	+31 1	0 498 7200	
	Fax	+31 1	0 452 9545	
	E-Mail (competent person)	xrea	ch@vitol.com	
1.4	Emergency telephone number			
	Emergency Phone No.	+44 (0) 1235 239 670, 24/7	
	Languages spoken	All of	ficial 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

Product Description

Hazard Pictogram(s)

According to Regulation (EC) No. 1272/2008 (CLP) V2002-FUEL OIL 380 CST-Fuel oil, residual



Signal Word(s)

Danger

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Hazard Statement(s)	H304: May be fatal if swallowed and enters airways. H332: Harmful if inhaled. 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. P281: Use personal protective equipment as required. P301+P310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. P331: Do NOT induce vomiting. P273: Avoid release to the environment.
Supplemental information	EUH066: Repeated exposure may cause skin dryness or cracking.
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. Remove contaminated clothing and wash clothing before reuse.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

2.3

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

beware of pits and confined spaces.

Vapour may create explosive atmosphere. The vapour is heavier than air;

SECTION 4: FIRST AID MEASURES



4.1	Description of first aid measures	
	Self-protection of the first aider	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.
	H2S Warning:	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.
	Inhalation	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.
	Skin Contact	IF ON SKIN (or hair): Remove contaminated clothing immediately and drench affected skin with plenty of water, then wash with soap and water. If irritation (redness, rash, blistering) develops, get medical attention.
	Eye Contact	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.
	Ingestion	IF SWALLOWED: Do not induce vomiting because of risk of aspiration into the lungs. If vomiting occurs spontaneously, keep head below hips to prevent

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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:

aspiration into the lungs. If unconscious, place in recovery position and get medical attention immediately. Do not give anything by mouth to an unconscious person. Get medical attention immediately. Do not wait for symptoms to appear. Inhalation: Vapour may be irritant to the respiratory tract.

Skin Contact: Repeated and/or prolonged skin contact may cause irritation. Eye Contact: May cause eye irritation.

Ingestion: Aspiration hazard. 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 substar

5.2 Special hazards arising from the substance or mixture 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

5.3 Advice for fire-fighters

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	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.	
	H2S Warning:	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	
	Small spillages:	Wear flame-resistant antistatic protective clothing.	
	Large spillages:	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.	
6.2	Environmental precautions	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.	
6.3	Methods and material for containment and cleaning	Provided it is safe to do so, isolate the source of the leak. The vapour is heavier	
	up	than air; beware of pits and confined spaces. Ensure that the equipment is	

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	adequately grounded. Allow small spillages to evaporate provided there is adequate ventilation.
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 jet.
Spillages on water or at sea:	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 and if
	fire/explosion risks can be adequately prevented. Otherwise control the
	spreading of the spillage, and let the substance evaporate naturally.
Reference to other sections	See Section: 8,13

6.4

SEC	SECTION 7: HANDLING AND STORAGE			
7.1	Precautions for safe handling H2S Warning:	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,		
7.2	Conditions for safe storage, including any incompatibilities	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.		
	Storage temperature	Stable at ambient temperatures.		
	Storage measures	Suitable containers: Stainless steel, Mild steel Unsuitable containers: Synthetic materials		
	Incompatible materials	Keep away from oxidising agents.		
7.3	Specific end use(s)	See Section: 1.2 and/or Exposure Scenario.		

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 **Control parameters**

8.1.1 **Occupational Exposure Limits** No Occupational Exposure Limit assigned. Users are advised to consider national Occupational Exposure Limits or other equivalent values.

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8.1.2 **Biological limit value** Not established.

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8.1.3 PNECs and DNELs

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 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	0.18 mg/m ³	0.065 mg/kg bw/day
	Worker - Short term - Systemic effects	-	4700 mg/m ³	-
8.2 8.2.1	Exposure controls Appropriate engineering controls	•	, , , ,	propriate local extraction if due ore in a cool/low-temperature, w

8.2.2 Individual protection measures, such as personal protective equipment (PPE)

Eye/ face protection

Ű

Skin protection



Respiratory protection



Thermal hazards

8.2.3 Environmental Exposure Controls

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

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.

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

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

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.

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 A2

Closed system(s): Not normally required.

Not applicable.

Avoid release to the environment.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

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9.1 Information on basic physical and chemical properties
Appearance
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Odour Odour threshold pH Melting point/freezing point Liquid, Viscous, May be coloured. Fuel oil-like Not established. Not established. < 30 °C

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Initial boiling point and boiling range Flash point Evaporation rate Flammability (solid, gas) Upper/lower flammability or explosive limits Vapour pressure Vapour density Relative density Solubility(ies) Partition coefficient: n-octanol/water Auto-ignition temperature Decomposition Temperature Viscosity Explosive properties Oxidising properties

> 60 °C Not established . Not applicable - Liquid Not established. 0.5 kPa @ 20°C >1 (Air=1) 0.80 - 0.99 g/cm³ @ 15 °C Water: 0.4 mg/l @ 22 °C Slightly soluble. 2.7 - 6 log P > 225 °C Not established. 7 - 20.5 mm²/s @ 40 °C (<60 mm²/s @ 100 °C) Not explosive. (Vapour may create explosive atmosphere.) Not oxidising.

9.2 Other information

SECTION 10: STABILITY AND REACTIVITY

10.1 10.2	Stability and reactivity 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 Keep away from heat, sources of ignition and direct sunlight.
10.5	Incompatible materials	Keep away from oxidising agents. Strong Acids and Alkalis.
10.6	Hazardous decomposition product(s)	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,

None known.

> 350 °C

SECTION 11: TOXICOLOGICAL INFORMATION

11.1	Information on toxicological effects	All test data taken from existing ECHA registrations for the substances
		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 sensitization	Based 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.
		ECHA Registration Endpoint summary:
		Reproductive toxicity: Negative
		Developmental toxicity: Positive
	STOT - single exposure	Based upon the available data, the classification criteria are not met.

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11.2	Inhalation:	Weight of evidence approach STOT RE 2; May cause damage to organs through prolonged or repeated exposure. No data NOAEL 1.06 mg/kg bw/day (rat) (OECD 410) Asp. Tox. 1; May be fatal if swallowed and enters airways. Viscosity: 7 – 20.5 mm²/s @ 40 °C (<60 mm²/s @ 100 °C) None.
SECT	ION 12: ECOLOGICAL INFORMATION	
12.1	Toxicity Short Term (acute):	Aquatic Acute 1; Very toxic to aquatic life. Aquatic Chronic 1; Very toxic to aquatic life with long lasting effects. EL50 48hr (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 degradibility 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. Results of PBT and vPvB assessment 12.5 Not classified as PBT or vPvB. Other adverse effects 12.6 None known.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

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)

SECTION 14: TRANSPORT INFORMATION ADR/RID IMDG/ADN 14.1 **UN number** UN 3082 UN 3082 14.2 **Proper Shipping Name** ENVIRONMENTALLY HAZARDOUS ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, SUBSTANCE, LIQUID, FUEL OIL, RESIDUAL FUEL OIL, RESIDUAL 14.3 Transport hazard class(es) 9 9 (N1, CMR, F) 14.4 Ш Packing group Ш 14.5 **Environmental hazards** MILIEUGEVAARLIJK / ENVIRONMENTALLY HAZARDOUS/ UMWELTGEFÄHREND / DANGEREUX POUR/ L'ENVIRONNEMENT 14.6 Special precautions for user See Section: 2 14.7 Transport in bulk according to Annex II of MARPOL This product is being carried under the scope of MARPOL Annex 1. Special 73/78 and the IBC Code Precautions: Refer to Chapter 7 'Handling and Storage' for special precautions which a user needs to be aware of, or needs to comply with, in connection with transport. 14.8 Additional Information ADR HIN: 90 EmS: F-A, S-F Tunnel Restriction Code: 3 E Limited Quantity: 5L Limited Quantity: 5L

SECTION 15: REGULATORY INFORMATION

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regulations/legislation specific for the substance or mixture

15.1.1	EU regulations	Authorisations and/or Restrictions On Use
	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	Wassergefährdungsklasse (Germany). WGK number: 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

Sections indicated with the following have been revised Header and Section 1.3

Updated version and date. Please review SDS with care.

References:

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

This Safety Data Sheet was prepared in accordance with EC Regulation (EC) 1907/2006 (REACH), 1272/2008 (CLP) & 2015/830.

LEGEND

LTEL	Long Term Exposure Limit
STEL	Short Term Exposure Limit
DNEL	Derived No Effect Level
PNEC	Predicted No Effect Concentration
PBT	PBT: Persistent, Bioaccumulative and Toxic
vPvB	very Persistent and very Bioaccumulative
OECD	Organisation for Economic Cooperation and Development

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.

Disclaimers

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Annex to the extended Safety Data Sheet (eSDS)

See below -

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Fuel oil, residual	
CAS No.	
EINECS No.	

68476-33-5 270-675-6

Summary of Parameters

Physical paramet			
Vapour pressure (Pa)			Value used for exposure assessment = 2.0E+02
Partition coefficient (log K _{OW})			1.99 – 18.02
Aqueous solubility	(mg/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/m ³)	4700
Workers		Dermal (mg/kg bw/day)	Not defined
WOIKEIS	Long Term	Inhalation (mg/m ³)	0.18
		Dermal (mg/kg bw/day)	0.065
		Inhalation (mg/m ³)	Not defined
Consumer		Dermal (mg/kg bw/day)	Not defined
		Oral (mg/kg bw/day)	0.015
		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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Exposure scenario 4	Use of Fuel oil, residual as a Fuel (Professional)	22

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 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
Process Category [PROC]	PROC1 PROC2 PROC2 (Storage) PROC2 (Sampling) PROC3 PROC8a (Maintenance) PROC8b (Marine) PROC8b (Road/Rail)
Chemical Product Category [PC]	PROC15 Not applicable
Article Categories [AC]	Not applicable
Environmental Release Categories [ERC]	ERC4 ERC5 ERC6a ERC6b ERC6c ERC6d ERC7
Specific Environmental Release Categories [SPERC]	ESVOC SpERC 1.1b.v1

Product characteristics Physical form of product		
,		
	Liquid	
/apour 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 ma	anagement	
Potential exposure area	Not defined	
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)	Covers exposure up to 15 min - 1 hour(s)
	PROC2, PROC2 (Sampling)	Covers exposure up to 15 min
Emission days (days/year):	300	·
Other operational conditions affecting w	orker exposure	
Area of use	PROC2 (Sampling)	Outdoor
Area of use	All other PROC's	Not defined (default = Indoor)
Characteristics of the surroundings	Not defined	·
General measures applicable to all activ	ities	
Assumes a good basic standard of occupat	ional hygiene is implemented. Ass	sumes activities are at ambient temperature (unless stated differently).
•		or the elimination of releases. minimise exposure using measures suc ntilation. Drain down systems and clear transfer lines prior to breaki

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, PROC2 (Storage),	Handle substance within a closed system.

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PROC8a (Mantenance) with specific activity training. (Efficiency of at least 75%) Eye Protection No special measures are required. 22 Control of environmental exposure 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 (tons/year): 1.9E+04 Maximum daily site tonnage (tons/year): 1.0E-04 Rowneer dilution factor: 10 Operational conditions 1.0E-04 Release fraction to air from process (initial release prior to to 1.0E-04 RMM): 1.0E-06 Release fraction to avait from process (initial release prior to 1.0E-05 RMM): 1.0E-06 Release fraction to soil from process (initial release prior to 1.0E-05 Rownormental exposure is driven by humans via indirect exposure (primarily ingestion). No wastewater treatment required. Technical conditions and measures to reduce or limit discharges, air emissions and releases to soil <t< th=""><th>PROC3</th><th></th><th></th><th></th></t<>	PROC3					
Organisational measures Control of the system to avoid expoure. PROC2, PROC3, Marine) Transfer via enclosed lines. Clear transfer lines prior to de-oupling. PROC8, Marineanco) Drain dr	PROC8b (Road/Rail)					
PROC2: PROC3 Sample via a closed loop or other system to avoid exposure. PROC3: (Maintenance) Drain down and flush system port to equipment break-in or maintenance. PROC3: (Maintenance) Drain down and flush system port to equipment break-in or maintenance. PROC3: (Maintenance). PROC3 (Maintenance). PROC3: (Storage). PROC3. (Storage). PROC3: (PROC3: PROC3: PROC3: (Storage). PROC3. (Stor	PROC15	Handle in a fume of	cupboard or	under extract ventilation. (Efficiency of at least 90 %).		
PROC36 (Marine) Transfer via enclosed fines. Clear transfer lines prior to de-couping. PROC36 (Marine). Drait down and flueb system prior to equipment break-in or maintenance. PROC36 (Marine). PROC36 (Marine). PROC36 (Marine). PROC36 (Marine). PROC36 (Marine). PROC36 (PROC2 (Storago). PROC36 (PROC3 (Storago). No special measures are required. PROC30 (PROC2 (Storago). PROC30 (Marine). Hand and/or Skin protection No special measures are required. PROC30 (Marine). PROC30 (Marine). PROC30 (Marine). Wear chemically resistant gloves (tested to EN374) in combinatio with "bacic" employee training. (Efficiency of at least 80 %). PROC30 (Marine). PROC30 (Marine). Wear chemically resistant gloves (tested to EN374) in combinatio with "bacic" employee training. (Efficiency of at least 80 %). PROC30 (Marine). PROC30 (Marine). Wear chemically resistant gloves (tested to EN374) in combinatio with "bacic" employee training. (Efficiency of at least 80 %). PROC30 (Marine). PROC30 (Marine). Wear chemically resistant gloves (tested to EN374) in combinatio with specific activity training. (Efficiency of at least 75%) Prototion No special measures are required. 2.2 Cond Anount used PROC30 (Marine). </td <td>Organisational measures</td> <td></td> <td></td> <td></td>	Organisational measures					
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PROC68 (Mainterance), PROC8B (Marine) Retain drain downs in sailed storage pending disposal or for subsequent recycle. PROC8B (ReadRah) Ensure material transfers are under containment or extract ventilation Risk management measures related to human health No special measures are required. PROC8b (ReadRah) PROC2F, IPROC2, (Storage), PROC2B (Marine), PROC2B (Ma	PROC8b (Marine)	Transfer via enclos	sed lines. Cl	lear transfer lines prior to de-coupling.		
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External recovery and recycling of waste should comply with applicable local and/or national regulations. Substance release quantities after risk management measures				and/or national regulations.		
Substance release quantities after risk management measures						
				and/or national regulations.		
Release to waste water from process (mg/l):		nagement measure				
	Release to waste water from process (mg/l):		INOT define	20		

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Maximum allowable site tonnage (MSafe) based on release 8.0E+04						
following total wastewater trea	tment removal (kg/d)	:	0.02			
3. Exposure estimation and	reference to its sou	rce				
3.1 Human exposure predict	ion					
Exposure assessment (metho	d/calculation model)		The	ECETOC TRA tool h	has been used to esti	mate workplace exposures unless
			othe	rwise indicated. (PRC	DC1, PROC2, PROC2	2 (Sampling), PROC15)
			The	Advanced REACH	Tool (ART) has be	een used to estimate workplace
			expo	osures unless otherw	vise indicated. (PRC	C2 (Storage), PROC3, PROC8a
			(Mai	ntenance), PROC8b	(Marine), PROC8b (F	Road/Rail)).
	Inha	ation		Der	mal	Combined
Duese of Cetemany	Inhalation	Risk		Dermal	Risk	Diek ehevestevisetien vetie
Process Category	exposure	characterisa	tion	exposure	characterisation	Risk characterisation ratio
[PROC]	(mg/m ³)	ratio (RCF	R)	(mg/kg bw/day)	ratio (RCR)	(RCR)
PROC1	0.01	0.04		0.03	0.57	0.61
PROC2	0.04	0.19		0.03	0.57	0.76
PROC2	0.04	0.21		0.03	0.57	0.78
(Storage)	0.01	0.21		0.00	0.07	
PROC2	0.04	0.19		0.03	0.57	0.76
(Sampling) PROC3	0.04	0.21		0.03	0.57	0.78
PROC8a		-				
(Maintenance)				0.05	0.83	0.85
PROC8b	0.00	0.05		0.00	0.57	0.00
(Marine)	0.06	0.35		0.03	0.57	0.92
PROC8b	0.03	0.19		0.03	0.57	0.76
(Road/Rail)						
PROC15	0.05	0.28		0.01	0.10	0.38
3.2 Environmental exposure						
Exposure assessment (metho	d/calculation model)			,		to calculate environmental
			expo	osure with the Petroris	sk model.	

FUEL OIL, RESIDUAL

V2002a

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 characterisation ratio (RCR)
Oral	2.0E+01	7.7E-01
Inhalation	1.6E-01	3.2E-03

4. Evaluation guidance to downstream user

For scaling see	are managed to at least equivalen Available hazard data do not supp	Measures/Operational Conditions are adopted, then users should ensure that risks at levels. Nort the need for a DNEL to be established for other health effects. Introl technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-
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

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	exposures unless otherwise indicated. (PROC2 (Storage), PROC3, PROC8a (Maintenance), PROC8b (Marine), PROC8b (Road/Rail)).
Environmen	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 (Marine) PROC8b (Road/Rail) PROC8b (Drum) PROC15		
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 manag	ement 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 mana	agement		
Potential exposure area	Not defined		
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):	300		
Other operational conditions affecting wor	ker exposure		
Area of use	All contributing scenarios	Not defined (default = Indoor)	
Characteristics of the surroundings	Not defined		
General measures applicable to all activitie			
	nal hygiene is implemented. Ass	sumes activities are at ambient temperature (unless stated differently).	
General measures (carcinogens)			
		or the elimination of releases. minimise exposure using measures such	
		ntilation. Drain down systems and clear transfer lines prior to breaking	
		Where there is potential for exposure: restrict access to authorised	
		wear suitable gloves and coveralls to prevent skin contamination; wear	
	•	o; clear up spills immediately and dispose of waste safely. Ensure safe	
	are in place to manage risks. F	Regularly inspect, test and maintain all control measures. Consider the	
need for risk based health surveillance.			
Technical conditions of use	1		
PROC1, PROC2, PROC3	Handle substance within a clo		
PROC8b (Drum)		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	1		
PROC2, PROC2 (Sampling)	Minimise the volume and frequency of sampling. Ensure dedicated sample points are provided.		
PROC8b (Marine)	Transfer via enclosed lines. Clear transfer lines prior to de-coupling.		

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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 hu	man health				
Respiratory protection	No special measu	res are requ	ired.		
Hand and/or Skin protection PROC1, PROC2, F (Storage), PROC2 (Sampling), PROC3 PROC8b (Marine), (Road/Rail), PROC (Drum)		PROC2 2 C3, , PROC8b	Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.(Efficiency of at least 90 %).		
	PROC8a (Maintenance)		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 measu	res are requ			
2.2 Control of environmental exposure					
Amounts used					
Fraction of EU tonnage used in region:		0.1			
Regional use tonnage (tons/year):		0.1 7.5E+06			
Fraction of Regional tonnage used locally (ton	ns/vear).	4.0E-03			
Annual site tonnage (tons/year):	15/year).	4.0E-03 3.0E+04			
Maximum daily site tonnage (kg/day):		1.0E+04			
Environment factors not influenced by ris.	k managamant	1.00+05			
	k management	No. A. J. C.			
Flow rate of receiving surface water (m ³ /d):			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 (after typ consistent with EU Solvent Emissions Direction	ve requirements):	1.0E-03			
Release fraction to wastewater from process (initial release prior to RMM):		2.0E-05			
Release fraction to soil from process (initial re RMM):	-	1.0E-04			
Technical conditions and measures at pro					
Common practices vary across sites thus cor					
Technical onsite conditions and measures					
•	•	t exposure (primarily ingestion). No wastewater treatment required.		
Treat air emission to provide a typical remova		0			
Treat onsite wastewater (prior to receiving was provide the required removal efficiency of (%)		81.3			
If discharging to domestic sewage treatment required onsite wastewater removal efficiency	plant, provide the	0			
Treat soil emission to provide a typical remov		Not defined			
Common practices vary across sites thus cor					
Organisational measures to prevent/limit i					
Do not apply industrial sludge to natural soils		cinerated o	ontained or reclaimed.		
Conditions and measures related to munic	-				
Size of municipal sewage system/treatment plant (m ³ /d): 2.0E+03					
			94.2		
Conditions and measures related to external treatment of waste for disposal					
External treatment and disposal of waste sho					
Conditions and measures related to extern					
External recovery and recycling of waste should comply with applicable local and/or national regulations.					
Substance release quantities after risk ma			แน/งา กลแงกลา เอยูนเลแงกร.		
Release to waste water from process (mg/l):	mayement measure	Not defined			
Maximum allowable site tonnage (MSafe) bas following total wastewater treatment removal		1.1E+05			
ionoming total masternator treatment removal	(···ˈə/ u).				

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3. Exposure estimation and reference to its source					
3.1 Human exposure predic	tion				
Exposure assessment (method/calculation model)			herwise indicated. (PF ROC15) ne Advanced REACH	ROC1, PROC2, PRO Tool (ART) has bu wise indicated. (PRC	imate workplace exposures unless DC2 (Sampling), PROC8b (Drum), een used to estimate workplace DC2 (Storage), PROC3, PROC8a Road/Rail)).
	Inha	lation	De	rmal	Combined
Process Category [PROC]	Inhalation exposure (mg/m ³)	Risk characterisatior 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
55000					

(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					
			The Hydrocarbon Block		used to calculate environmental

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	are managed to at least equivalen Available hazard data do not supp	easures/Operational Conditions are adopted, then users should ensure that risks t levels. ort the need for a DNEL to be established for other health effects. trol technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-		
Exposure assessment	Worker	The ECETOC TRA tool has been used to estimate workplace exposures unless		

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instrument/tool/method		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
	Environment	exposure with the Petrorisk model.

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Exposure Scenario 3 – Use of Fuel oil, residual 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

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	<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 mar	agement			
Potential exposure area	Not defined			
Frequency and duration of use				
	PROC1, PROC8a (Maintenance), PROC8b (Bulk), PROC16	Covers daily exposures up to 8 hours (unless stated differently).		
Exposure duration per day	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)		
Emission days (days/year):	300			
Other operational conditions affecting wo	rker exposure			
Area of use	PROC8b (Bulk)	Outdoor		
	All other PROC's	Not defined (default = Indoor)		
Characteristics of the surroundings	Not defined			
General measures applicable to all activit				
	nal hygiene is implemented. As	sumes activities are at ambient temperature (unless stated differently).		
as closed systems, dedicated facilities and s containment. Clean/flush equipment, where persons; provide specific activity training to c respiratory protection when its use is identified	suitable general/local exhaust ve possible, prior to maintenance perators to minimise exposures ad for certain contributing scena	for the elimination of releases. minimise exposure using measures such entilation. Drain down systems and clear transfer lines prior to breaking where there is potential for exposure: restrict access to authorised ; wear suitable gloves and coveralls to prevent skin contamination; wear rio; clear up spills immediately and dispose of waste safely. Ensure safe Regularly inspect, test and maintain all control measures. Consider the		
Technical conditions of use				
PROC1, PROC2, PROC3	Handle substance within a clo	osed system.		
Organisational measures				
PROC2	=	ontrolled ventilation (10 to 15 air changes per hour).		
PROC8b (Bulk)	Transfer via enclosed lines.			
PROC8b (Drum), PROC2 (Fuel filtering), PROC2 (Storage), PROC16		eneral ventilation (not less than 3 to 5 air changes per hour).		
PROC8a (Maintenance)	Retain drain downs in sealed	storage pending disposal or for subsequent re		

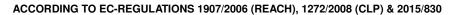
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Respiratory protection No special measure		es are requi	red.	
	PROC1, PROC2, I			
	(Fuel filtering), PR			
	(Storage), PROC3		Wear chemically resistant gloves (tested to EN374) in combination	
Hand and/or Skin protection	(Bulk), PROC8b (E		with 'basic' employee training (Efficiency of at least 90 %).	
·····	PROC16	- ,,		
			Wear chemically resistant gloves (tested to EN374) in combination	
	PROC8a (Mainten	ance)	with specific activity training (Efficiency of at least 75 %).	
Eye Protection	No special measur	es are requi		
2.2 Control of environmental exposure		<u> </u>		
Amounts used				
Fraction of EU tonnage used in region:		0.1		
Regional use tonnage (tons/year):		5.9E+06		
Fraction of Regional tonnage used locall	v (tons/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 b	y risk management			
Flow rate of receiving surface water (m ³ /	· · · · · · · · · · · · · · · · · · ·	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 (initi	ial release prior to	2.0E-04		
RMM):		2.00-04		
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 a		-		
Common practices vary across sites thus				
Technical onsite conditions and meas				
			primarily ingestion). No wastewater treatment required.	
Treat air emission to provide a typical re-		95		
Treat onsite wastewater (prior to receiving		92.5		
provide the required removal efficiency of		52.0		
If discharging to domestic sewage treatm		0		
required onsite wastewater removal effic				
Treat soil emission to provide a typical re		Not define		
Common practices vary across sites thus		ease estima	iles usea.	
Organisational measures to prevent/li		alia a wata al		
Do not apply industrial sludge to natural	•		ontained or reclaimed.	
Conditions and measures related to n		2.0E+03		
Degradation effectiveness (%)	viornal tractment of	94.2	nool	
Conditions and measures related to e				
			tion emissions considered in regional exposure assessment. Externational regulations	
treatment and disposal of waste should a			lional regulations.	
Substance release quantities after ris. Release to waste water from process (m	<u> </u>	s Not define	d	
Maximum allowable site tonnage (MSafe		NOL GEIIIIE	u	
maximum anowable site tormaye (Modit	J DUSEU UN TELEASE	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) The Advanced REACH Tool (ART) has been used to estimate workplace exposures unless otherwise indicated. (PROC2 (Storage), PROC2 (Fuel

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FUEL OIL, RESIDUAL V2002a

filterina).	PROC3.	PROC8a	(Maintenance).	PROC8b	(Bulk).	PROC8b	(Drum))

	Inha	lation	Der	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
PROČ3	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 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).			
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 of Fuel oil, residual as a Fuel (Professional)

1.0 Contributing scenarios	
Sector of Use [SU]	SU22 Professional uses: Public domain (administration, education, entertainment, services, 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

2.0 Operational conditions and risk management measures

2.1 Control of worker exposure				
Product characteristics				
Physical form of product	Liquid	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 i	management			
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	worker exposure			
Area of use	All PROC's	Not defined (default = Indoor)		
Characteristics of the surroundings	Not defined			
General measures applicable to all act				
	ational nyglene is implemented. As	sumes 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				

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

recimical 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).	
PROC8b (Bulk), PROC8b (Drum)	Ensure material transfers are under containment or extract ventilation. Clear transfer lines prior to	

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	de-coupling.				
PROC8b (Bulk), PROC8b (Drum), PROC8a	Retain drain downs in sealed storage pending disposal or for subsequent recycle.				
(Maintenance)					
Risk management measures related to hur					
Respiratory protection	No special measures are required.				
	PROC1, PROC2 (Storage),				
	PROC3, PROC8b (Bulk),		Wear chemically resistant gloves (tested to EN374) in combination		
Hand and/or Skin protection	PROC8b (Drum), PROC8b		with 'basic' employee training (Efficiency of at least 90 %).		
·	(Refuelling),				
	PROC2, PROC8a		Wear chemically resistant gloves (tested to EN374) in combination		
First Darstanting	(Maintenance)		with specific activity training (Efficiency of at least 95 %).		
Eye Protection	No special measur	ires are required.			
2.2 Control of environmental exposure					
Amounts used		0.1			
	ion of EU tonnage used in region:				
Regional use tonnage (tons/year):	- (1.7E+06			
Fraction of Regional tonnage used locally (ton	s/year):	5.0E-04			
Annual site tonnage (tons/year):		8.5E+02			
Maximum daily site tonnage (kg/day):		2.3E+03			
Environment factors not influenced by risk	management				
Flow rate of receiving surface water (m ³ /d):		Not defined (default = 18,000)			
Local freshwater dilution factor:		10			
Local marine water dilution factor:		100			
Operational conditions					
Emission days (days/year):		365			
Release fraction to air from wide dispersive use (regional only):		1.0E-05 1.0E-07			
Release fraction to wastewater from wide dispersive use: Release fraction to soil from wide dispersive use (regional only):		1.0E-05			
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		Not applicable			
Treat onsite wastewater (prior to receiving wa		0			
provide the required removal efficiency of (%)					
If discharging to domestic sewage treatment plant, provide the					
required onsite wastewater removal efficiency		0			
Treat soil emission to provide a typical remova		Not defined			
Common practices vary across sites thus conservative process rel					
Organisational measures to prevent/limit r		-			
Do not apply industrial sludge to natural soils.		cinerated, c	ontained or reclaimed.		
Conditions and measures related to municipal sewage treatment plant					
Degradation effectiveness (%):		2.0E+03 94.2			
Conditions and measures related to extern	al treatment of was	ste for disp	osal		
			tion emissions considered in regional exposure assessment. External		
treatment and disposal of waste should compl					
Conditions and measures related to extern					
This substance is consumed during use and n					
Substance release quantities after risk mai					
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):		3.0E+03			
.	- /	1			

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, PROC3, PROC16).
	The Advanced REACH Tool (ART) has been used to estimate workplace

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				herwise indicated. (Bulk), PROC8b (Dru	(PROC2 (Storage), PRC im) and PROC8b (Refuelling))
	Inha	alation	Der	rmal	Combined
Process Category [PROC]	Inhalation exposure (mg/m³)	Risk characterisation ratio (RCR)	Dermal exposure (mg/kg bw/day)	Risk characterisation ratio (RCR)	Risk characterisation rati (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

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

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