1 IDENTIFICATION OF THE SUBSTANCE AND OF THE COMPANY/UNDERTAKING

1.1 Product identifier:

Identification on the label/Trade name(s): **FUEL OIL; FUEL OIL M-100**

Name of Substance:	CAS No.:	EC No.:	Index No.:
Fuel oil, residual	**68476-33-5**	**270-675-6**	**649-024-00-9**

REACH registration No.: **01-2119474894-22-0067**

1.2 Relevant identified uses of the substance and uses advised against:

1.2.1 Identified uses:

-Manufacture of substances,
-Use of substance as intermediate,
-Distribution of substance,
-Formulation and repackaging of substances & mixtures
-Uses in Coatings: Industrial, professional
-Use in Road and Construction Applications: Professional
-Use as a fuel: Industrial, professional

1.2.2 Uses advised against: Uses other than those given above, are not recommended.

1.3 Manufacturer

"Orsknefteorgsintez", OJSC. Goncharova str., 1a, Orsk city, Orenburg region, 462407, Russian Federation

1.4 Details of the supplier of the safety data sheet:

Only Representative: **SpetsInterProject Oy** E-mail: hs@reach-registrator.net

1.5 Emergency telephone Number:

2 HAZARDS IDENTIFICATION

2.1 Classification of the substance

2.1.1 Classification:

EU CLP 1272/2008: This classification relates to Heavy Fuel Oil Components (> 20.5 mm^2/s @ 40°C)
Classification: Acute Tox. 4; H332; Repr. 2; H361; Carc. 1B; H350; STOT RE 2; H373; Aquatic Chronic 1; H410

For full text of H- phrases: see section 2.2.

67/548/EEC(DSD): This classification relates to Heavy Fuel Oil Components **Status: Annex 1 in combination with Self Classification**
Classification: Xn; R20; R48/21; R66; Carc. Cat. 2; R45; Repr. Cat. 3; R63; N; R50/53 Indication of danger: Xn - harmful N - dangerous for the environment R-phrases: R20 - harmful by inhalation R45 - may cause cancer R48/21 - harmful: danger of serious damage to health by prolonged exposure in contact with skin R63 - possible risk of harm to the unborn child R66 - repeated exposure may cause skin dryness or cracking R50/53 – Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment S-phrases: S23 - do not breathe gas/fumes/vapour/spray (appropriate wording to be specified by the manufacturer) S24 - avoid contact with skin S36/37 - wear suitable protective clothing and gloves S45 - in case of accident or if you feel unwell, seek medical advice immediately (show the label where possible) S51 - use only in well-ventilated areas S53 - avoid exposure - obtain special instructions before use S61 - avoid release to the environment. refer to special instructions/safety data sheets

2.1.2 The most important adverse effects

Physical/chemical hazards: The product is not classified as flammable but consists of hydrocarbons and can burn. Vapours may form explosive mixtures with air. If water gets into contact with hot product (>100 °C) there is a risk of splashing and boil-over.

For health hazards: Repeated exposure may cause skin dryness or cracking. Danger of serious damage to health by

prolonged exposure in contact with skin. Long or repeated skin contact may irritate the skin and may cause formation of cancer tumors. Vapours may irritate eyes and respiratory system. High doses may cause nausea and headaches. Harmful by inhalation. May cause cancer. Possible risk of harm to the unborn child.

For environmental hazards: Very toxic to aquatic life with long lasting effects. Release of the product into water will result in a film of hydrocarbons floating on the surface. Due to low water solubility the predominant loss is through volatilisation. Molecules with higher molecular weight will be absorbed on sediment.

2.2 Label elements:

Hazard Pictograms:

GHS09 GHS07 GHS08

Signal Word(S): **Danger**

Hazard Statements:
H350: May cause cancer.
H332: Harmful if inhaled.
H361: Suspected of damaging fertility or the unborn child.
H373: May cause damage to organs through prolonged or repeated exposure.
H410: Very toxic to aquatic life with long lasting effects.

Precautionary Statements:
P201: Obtain special instructions before use.
P260: Do not breathe dust/fume/gas/mist/vapours/spray.
P273: Avoid release to the environment.
P281: Use personal protective equipment as required.
P308+P313: IF exposed or concerned: Get medical advice/attention.
P501: Dispose of contents/container to...

Additional labelling requirements (CLP supplemental hazard statement):
EUH066: Repeated exposure may cause skin dryness or cracking.

2.3 Other hazards: The substance does not fulfill the PBT / vPvB criteria.

3 COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substance:

Description: The liquid product from various refinery streams, usually residues. The composition is complex and varies with the source of the crude oil.
The substance is UCVB substance. The purity is 100%

Ingredient(s)/Constituent(s):

Name of Constituent:	CAS No.:	EC No.:	Index No.:	Composition, % (w/w):
Mono-aromatic hydrocarbons	-	-	-	**5.4**
Di-aromatic hydrocarbons	-	-	-	**2.9**
Tri-aromatic hydrocarbons and higher	-	-	-	**1.4**
Saturated hydrocarbons	-	-	-	**90.3**

4 FIRST AID MEASURES

4.1 Description of first aid measures:

4.1.0 Warning: before intervention

Spillages make surface slippery
Before attempting to rescue casualties, isolate area from all potential sources of ignition including disconnecting electrical supply.
Ensure adequate ventilation and check that a safe, breathable atmosphere is present before entry into confined spaces. (Subject to applicability) Hydrogen sulphide (H2S) can accumulate in the headspace of storage tanks and reach potentially hazardous concentrations.

4.1.1 In case of inhalation:

Symptoms: irritation of the respiratory tract due to excess fume, mists or vapour exposure
If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing.
If casualty is unconscious and:
* Not breathing – ensure that there is no obstruction to breathing and give artificial respiration by trained personnel. If necessary, give external cardiac massage and obtain medical assistance.
* Breathing – place in the recovery position. Administer oxygen if necessary.
Obtain medical assistance if breathing remains difficult.
If there is any suspicion of inhalation of H2S:
- Rescuers must wear breathing apparatus, belt and safety rope, and follow rescue procedures.
- Remove casualty to fresh air as quickly as possible.
- Immediately begin artificial respiration if breathing has ceased.
-Provision of oxygen may help.
- Obtain medical advice for further treatment.

4.1.2 In case of skin contact:

Symptoms: dry skin, irritation in case of repeated or prolonged exposure. May cause burn in case of contact with product at high temperature
Remove contaminated clothing and footwear and dispose of safely. Wash affected area with soap and water.
Never use gasoline, kerosene or other solvents for washing of contaminated skin. Seek medical attention if skin irritation, swelling or redness occurs. When using high-pressure equipment, injection of product can occur. If high-pressure injuries occur, immediately seek professional medical attention. Do not wait for symptoms to develop. For minor thermal burns: Cool the burn. Hold the burned area under cold running water for at least five minutes, or until the pain subsides. However, body hypothermia must be avoided. Do not put ice on the burn; Remove non-sticking garments carefully. DO NOT attempt to remove portions of clothing glued to burnt skin but cut round them. Seek medical attention in all cases of serious burns.

4.1.3 In case of eyes contact:

Symptoms: slight irritation (unspecific) . May cause burn in case of contact with product at high temperature
Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do so. Continue rinsing. If irritation, blurred vision or swelling occurs and persists, obtain medical advice from a specialist. If hot product is splashed into the eye, it should be cooled immediately to dissipate heat, under cold running water. Immediately obtain specialist medical assessment and treatment for the casualty.

4.1.4 In case of ingestion/aspiration:

Symptoms: Few or no symptoms are expected. If any, nausea and diarrhea might occur.
Do not induce vomiting. Ask for medical assistance. Do not give anything by mouth to an unconscious person.

4.2 Most important symptoms and effects, both acute and delayed

Inhalation:	Irritation of the respiratory tract due to excess fume, mists or vapour exposure. Not breathing. Headache, nausea, dizziness. Longer inhalation of high-concentration vapours may cause loss of consciousness, as well as hypoxia if oxygen concentration in air drops below 17%.
Skin contact:	Dry skin, irritation in case of repeated or prolonged exposure. Irritating and de-greasing effect, with possible appearance of redness and/or dermatitis in sensitive persons . May cause burn in case of contact with product at high temperature.
Eyes contact:	Slight irritation (unspecific) of eyes. Redness, tearing in sensitive persons. May cause burn in case of contact with product at high temperature.
Ingestion/aspiration:	Nausea and diarrhea might occur, irritation to mucous membranes, vomiting, and risk of pulmonary oedema due to aspiration into lungs.

4.3 Indication of any immediate medical attention and special treatment needed

Immediately call a POISON CENTER or doctor/physician.

5 FIRE-FIGHTING MEASURES

5.1 Extinguishing media:

Suitable extinguishing media: Foam (Specifically trained personnel only), water fog (Specifically trained personnel only), dry chemical powder, carbon dioxide, other inert gases (subject to regulations), sand or earth.
Unsuitable extinguishing media: Do not use direct water jets on the burning product; they could cause splattering and spread the fire. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.

5.2 Special hazards arising from the substance or mixture

Combustion Products: Incomplete combustion is likely to give rise to a complex mixture of airborne solid and liquid particulates and gases, including carbon monoxide, H2S, SOx (sulfur oxides) or sulfuric acid and unidentified organic and inorganic compounds.
This substance will float and can be reignited on surface water.

5.3 Advice for fire-fighters:

In case of a large fire or in confined or poorly ventilated spaces wear full fire resistant protective clothing and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures:

6.1.1 For non-emergency personnel:

Stop or contain leak at the source if safe to do so. Avoid direct contact with released material. Stay upwind. In case of large spillages, alert occupants in downwind areas. Keep non-involved personnel away from the area of spillage. Alert emergency personnel. Except in case of small spillages, the feasibility of any actions should always be assessed and advised, if possible, by a trained, competent person in charge of managing the emergency. It is recommended to eliminate all ignition sources if safe to do so (e.g. electricity, sparks, fires, flares). When the presence of dangerous amounts of H2S around the spilled product is suspected or proved, additional or special actions may be warranted, including access restrictions, use of special protection equipment, procedures and personnel training. If required, notify relevant authorities according to all applicable regulations.

6.1.2 For emergency responders:

Small spillages: normal antistatic working clothes are usually adequate. Large spillages: full body suit of chemically resistant and antistatic material, if necessary heat resistant and insulated.
Work gloves providing adequate chemical resistance, specifically to aromatic hydrocarbons. Note: gloves made of PVA are not water-resistant, and are not suitable for emergency use.
If contact with hot product is possible or anticipated, gloves should be heat-resistant and thermally insulated.
Work helmet. Antistatic non-skid safety shoes or boots, if necessary heat-resistant.
Goggles or face shield, if splashes or contact with eyes is possible or anticipated.
Respiratory protection: A half or full-face respirator with filter(s) for organic vapours/H2S or a Self Contained Breathing Apparatus (SCBA) can be used according to the extent of spill and predictable amount of exposure. If the situation cannot be completely assessed, or if an oxygen deficiency is possible, only SCBA's should be used.

6.2 Environmental precautions:

Prevent product from entering sewers, rivers, waterways or other bodies of water

6.3 Methods for containment and cleaning up:

Spillages onto land

Prevent product from entering sewers, rivers, waterways or other bodies of water. If necessary dike the product with dry earth, sand or similar non-combustible materials. Let hot product cool down naturally. Large spillages may be cautiously covered with foam, if available, to limit fire risk. Do not use direct jets. When inside buildings or confined spaces ensure adequate ventilation. Absorb spilled product with suitable non-combustible materials. Collect free product with suitable means. Collect recovered product and other contaminated materials in suitable containers for recycle, recovery or safe disposal. In case of soil contamination, remove contaminated soil for remediation or disposal, in accordance with local regulations.

Spillages on water or at sea

Product less dense than water: In case of small spillages in closed waters (i.e. ports), contain product with floating barriers or other equipment. Collect spilled product by absorbing with specific floating absorbents. If possible, large spillages in open waters should be contained with floating barriers or other mechanical means. If this is not possible, control the spreading of the spillage, and collect the product by skimming or other suitable mechanical means. The use of dispersants should be advised by an expert, and, if required, approved by local authorities. Collect recovered product and other contaminated materials in suitable tanks or containers for recycle, recovery or safe disposal. Product which is denser than water will sink to the bottom, and usually no intervention will be feasible. If possible, collect the product and contaminated materials with mechanical means, and store/dispose of according to relevant regulations. In special

situations (to be assessed on case-by case basis, according to expert judgement and local conditions), excavations of trenches on the bottom to collect the product, or burying the product with sand may be a feasible option.

6.4 Reference to other sections:

See Section 7 for information on safe handling.
See section 8 for information on personal protection equipment.
See Section 13 for information on disposal.

6.5 Additional information:

Note: recommended measures are based on the most likely spillage scenarios for this material; however, local conditions (wind, air temperature, wave/current direction and speed) may significantly influence the choice of appropriate actions. For this reason, local experts should be consulted when necessary. Local regulations may also prescribe or limit actions to be taken.
Concentration of H2S in tank headspaces may reach hazardous values, especially in case of prolonged storage. This situation is especially relevant for those operations which involve direct exposure to the vapours in the tank.
Spillages of limited amounts of products, especially in the open air when vapours will be usually quickly dispersed, are dynamic situations, which are unlikely to entail exposure to dangerous concentrations. As H2S has a density greater than ambient air, a possible exception may regard the build-up of dangerous concentrations in specific spots, like trenches, depressions or confined spaces. In all these circumstances, however, the correct actions should be assessed on a case-by-case basis.

7 HANDLING AND STORAGE

7.1 Precautions for safe handling:

General information:
Obtain special instructions before use. Ensure that all relevant regulations regarding handling and storage facilities of flammable products are followed. A specific assessment of inhalation risks from the presence of H2S in tank headspaces, confined spaces, product residue, tank waste and waste water, and unintentional releases must be made to help determine controls appropriate to local circumstances. It is recommended to keep away from sparks/open flames/hot surfaces. – No smoking. Use and store only outdoors or in a well-ventilated area. Avoid contact with the product.
Avoid release to the environment.

7.1.1 Protective measures:

Take precautionary measures against static electricity. Ground/bond containers, tanks and transfer/receiving equipment. The vapour is heavier than air. Beware of accumulation in pits and confined spaces. Do not breathe fume/ mist/ vapours Avoid contact with skin. Precautions should be taken to avoid skin burns when handling hot product. Use adequate personal protective equipment as required. For more information regarding protective equipment and operational conditions see Exposure scenarios.

7.1.2 Advice on general occupational hygiene:

Ensure that proper housekeeping measures are in place. Contaminated materials should not be allowed to accumulate in the workplaces and should never be kept inside the pockets. Keep away from food and beverages. Do not eat, drink or smoke while using this product. Wash the hands thoroughly after handling. Change contaminated clothes at the end of working shift.

7.2 Conditions for safe storage, including any incompatibilities

Storage area layout, tank design, equipment and operating procedures must comply with the relevant European, national or local legislation. Storage installations should be designed with adequate bunds so as to prevent ground and water pollution in case of leaks or spills. Cleaning, inspection and maintenance of internal structure of storage tanks must be done only by properly equipped and qualified personnel as defined by national, local or company regulations.
Before entering storage tanks and commencing any operation in a confined area, check the atmosphere for oxygen content, hydrogen sulphide (H2S) and flammability. Store separately from oxidising agents.

Recommended and Unsuitable Materials for Storage

Recommended materials: For containers, or container linings use mild steel, stainless steel.
Unsuitable materials: some synthetic materials may be unsuitable for containers or container linings depending on the material specification and intended use. Compatibility should be checked with the manufacturer.

Container Advice

If the product is supplied in containers:

- Keep only in the original container or in a suitable container for this kind of product.
- Store in a well-ventilated place.
- Keep containers tightly closed and properly labelled.

- Empty containers may contain combustible product residues. Do not weld, solder, drill, cut or incinerate empty containers, unless they have been properly cleaned.

7.3 Specific end use(s): Not applicable

8 EXPOSURE CONTROL/PERSONAL PROTECTION

8.1 Control parameters:

8.1.1 Occupational exposure limits: Consult local authorities for acceptable exposure limits

Oil mist:

EH40-WEL (United Kingdom (UK), 2002)

STEL: 10 mg/m3 15 minute(s)

TWA: 5 mg/m3 8 hour(s)

8.1.2 Additional exposure limits under the conditions of use: Not available.

8.1.3 DNEL/DMEL values (see table below) and PNEC-Values (none)

DNEL/DMEL			Exposure route	Exposure frequency
Worker		Consumer		
Industry	Professional			
			Oral	Acute
		0.015 mg/kg/24h		Repeated
No hazard identified for this route (data available)		No DNEL needed since no exposure expected	Dermal	Acute
0.065 mg/kg/8h		No DNEL needed since no exposure expected		Repeated
4700 mg/m3/15 min (for lethality) [aerosol]		No DNEL needed since no exposure expected	Inhalation	Acute
0.12 mg/m3/8h [aerosol]		No DNEL needed since no exposure expected		Repeated

PNEC oral (secondary poisoning): 66.7 mg/kg food

8.2 Exposure controls

PPE20: If repeated and/or prolonged skin exposure to the substance is likely, then wear suitable gloves tested to EN374 and provide employee skin care programmes

Please refer to Annex of eSDS for controls of each exposure scenario.

9 PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance:	Viscous Liquid	**Vapour density:**	Not applicable
Colour:	Dark	**Relative Density (15°C):**	840 - 1200 Kg/m³
Odour:	Specific for oil products	**Water solubility:**	Insoluble
Odour threshold:	Not available	**n-Octanol/Water (log Po/w) :**	Not applicable
pH:	Not available	**Auto-ignition temperature:**	350 °C (662 °F)
Melting point/range (°C):	<30	**Decomposition temperature:**	Not available
Boiling point/range (°C):	Approx. 236.1 – 541.9	**Assumed viscosity 100 °C:**	6,8°
Flash point (°C):	min 110 °C (for sort M-100)	**Viscosity at 100°C:**	50 mm²/s
Evaporation rate:	Not applicable	**Explosive properties:**	Non explosive
Flammability:	Non flammable	**Oxidising properties:**	Not oxidising
Upper/lower flammability limits in air:	91 ÷ 155 °C (195.8 ÷ 311 °F)	**Pour point:**	max 25 °C (M-100) for Fuel Oil prepared from highly paraffinic crude: max 42 °C (M-100).
Explosive concentration of vapors in air :	1.4 – 8.0% (by volume)	**Sulphur:**	III sort: max 1.5%; IV sort: max 2.0%; V sort: max 2.5%; VI sort: max 3.0%.
Vapour pressure:	0.02 to 0.791 kPa at 120°C	**Ash:**	Low ash: max 0.05%; Ashy:

	(MW 330 to 500) 0.063 to 0.861 kPa at 150°C (MW 350 to 420)	max 0.14%.

9.2 Other information:

Fat solubility(solvent– oil to be specified) etc.:	Dissoluble in organic solvents, oils.
Bulk Density:	Not available
Dissociation constant in water(pKa):	Not available
Oxidation-reduction Potential:	Not available

10 STABILITY AND REACTIVITY

10.1 Reactivity: Stable at prescribed storage and use conditions.
10.2 Chemical stability: Under normal conditions, the product is stable. No hazardous reaction when handled and stored according to provisions.
10.3 Possibility of hazardous reactions: Under normal conditions, not hazardous reactions will occur.
10.4 Conditions to avoid: Heating causes evaporation of flammable vapours.
10.5 Incompatible materials: Strong oxidising agents.
10.6 Hazardous decomposition products: Burning product gives rise to a complex mixture of gases and airborne particles including carbon monoxide and sulphur oxides.

11 TOXICOLOGICAL INFORMATION

11.1 Toxicokinetics, metabolism and distribution

No experimental data were located on the absorption, distribution, metabolism or elimination of Heavy Fuel Oil Components in vivo. This is not unexpected given the predictable technical difficulties associated with characterising the fate of complex UVCB petroleum substances in the body.
Physicochemical considerations suggest that uptake across skin is possible but will be relatively low since only around 2% of the hydrocarbon blocks present have a log Pow <5 (ECHA, 2008). This is supported by results from animal acute dermal toxicity testing, where no mortality and only limited (gross) systemic changes were recorded following 24 h occluded exposure to 2-5 g kg-1 bw of test substance, indicating that uptake by undamaged skin was limited; or that the absorbed hydrocarbon components were of low inherent toxicity. No measured data are available on the distribution or metabolic fate of Heavy Fuel Oil Components.
Results from a rat acute inhalation toxicity study (where no grossly observable systemic changes were found at necropsy) combined with the low water solubility of Heavy Fuel Oil Components suggests that uptake across the lung is low. This is supported by physicochemical consideration (ECHA, 2008). No information was located on the uptake and subsequent in vivo fate of Heavy Fuel Oil Components following inhalation exposure to aerosol or vapour.
With regard to uptake after ingestion, modelled information indicates that the majority of hydrocarbon substances present in Heavy Fuel Oil Components have a predicted log Pow of >5 suggesting that uptake by micellar solubilisation is possible (ECHA, 2008). The extent is uncharacterised however, but oral LD50 values in the range 4 g/kg bw/d to >25 g/kg bw/d suggests either that this is low, or that the absorbed components are of low intrinsic toxicity. No information was located on the metabolism and subsequent fate of Heavy Fuel Oil Components in vivo after ingestion.

11.2 Information on toxicological effects

Acute toxicity:	Acute oral LD50 > 5000 mg/kg Acute Inhalation LC50 = 4.1 mg/l Harmful by inhalation Acute dermal LD50 > 2000 mg/kg
Skin corrosion/Irritation:	In vivo skin irritation - Not irritant. Repeated exposure may cause skin dryness or cracking
Serious eye damage/irritation:	In vivo eye irritation - Not irritant.
Skin sensitization:	No evidence of sensitisation.
Germ cell mutagenicity:	Not mutagenic In vitro cytogenicity study in mammalian cells – Ambiguous In vivo cytogenicity – Negative In vivo gene mutation - Negative
Carcinogenicity:	Carcinogenic.
Reproductive toxicity:	Adversely affect foetal development.

	Reproductive toxicity LOAEL =1 mg/kg/day
STOT- single exposure:	No data
STOT-repeated exposure:	Danger of serious damage to health by prolonged exposure in contact with skin. Changes in haematological and clinical chemistry parameters and organ weights were recorded after treatment with Heavy Fuel Oil Components. In general, alterations in serum cholesterol and blood urea nitrogen were recorded following administration of higher dermal doses accompanied by red cell, platelet, liver and thymus effects at lower treatment levels. Sub-chronic repeat dose dermal : NOAEL =1.1 mg/kg
Aspiration hazard:	Not classified

12 ECOLOGICAL INFORMATION

12.1 Toxicity:
Very toxic to aquatic life with long lasting effects.
Acute aquatic invertebrate EL50 2 mg/l
Acute aquatic algae ErL50 0.75 mg/l
Acute aquatic fish LL50 79 mg/l
Long-term invertebrate NOEL 0.27 mg/l
Long-term fish NOEL 0.1 mg/l
Reproductive toxicity bird NOAEL 20,000 mg/kg diet

12.2 Persistence and degradability:
Heavy fuel oils are resistant to hydrolysis because they lack a functional group that is hydrolytically reactive. Therefore, this fate process will not contribute to a measurable degradative loss of these substances from the environment.
This substance does not have the potential to undergo photolysis in water and soil, and this fate process will not contribute to a measurable degradative loss of this substance from the environment.
An evaluation of representative hydrocarbon structures indicates some structures meet the Persistent (P) or very Persistent (vP) criteria (see CONCAWE, 2010b).

12.3 Bioaccumulative potential:
An evaluation of representative hydrocarbon structures indicates no structures meet the very Bioaccumulative (vB) criterion but some structures meet the Bioaccumulative (B) criterion (see CONCAWE, 2010b).

12.4 Mobility in soil:
Not available.

12.5 Results of PBT&vPvB assessment:
Anthracene is not present in this substance at greater than 0.1% (CONCAWE, 2010b). No other representative hydrocarbon structures were found to meet the PBT / vPvB criteria. The substance does not fulfil the PBT / vPvB criteria (see CONCAWE, 2010b).

12.6 Other adverse effects:
This substance may contribute to ozone formation in the near surface atmosphere. However, the photochemical formation of ozone depends on a complex interaction of other atmospheric pollutant sources and environmental conditions. Therefore, the contribution of this substance to ozone formation is outside the scope of this substance assessment and is more appropriately addressed via EU air quality directives.
The product emits Volatile Organic Compounds to the atmosphere. Release of the product into water will result in a film of hydrocarbons floating on the surface. The main fate process is expected to be slow biodegradation in soil and sediment.

13 DISPOSAL CONSIDERATIONS

Waste of residues:	Recycling (redistillation) or incineration.
Contaminated packaging:	Through authorized contractor or collector.
European waste catalogue (EWC):	13 07 03* other fuels (including mixtures).
Hazardous waste:	It is recommended to handle product remnants as hazardous waste.

14 TRANSPORT INFORMATION

	Land transport (ADR/RID)	*Sea transport (IMDG)*	*Air transport (ICAO/IATA)*

UN-Number:	3256	3256	3256
UN Proper shipping name:	- Transport temperature < to the flash point: Not concerned by transport regulations. - Transport temperature above the flash point: Proper shipping name: ELEVATED TEMPERATURE LIQUID, FLAMMABLE, N.O.S. having a flash point higher than 60°C, at a temperature equal or higher than its flash point.		
Transport hazard Class:	3	3	3
Packaging group:	III	III	III
Environmental hazards:	3 Flammable liquids. Environmentally hazardous substance mark	3 Flammable liquids. Marine pollutant mark.	3 Flammable liquids. Environmentally hazardous substance mark
Special precautions for user:	See section 2.2	See section 2.2	See section 2.2

15 REGULATORY INFORMATION

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

Relevant information regarding authorization: Not applicable
Relevant information regarding restriction: Not applicable
Other EU regulations: Regulation (EU) No 453/2010
Regulation (EC) No 1272/2008
Other National regulations: Not applicable.

The Chemical Safety Assessment has been performed for the substance.

16 OTHER INFORMATION

16.1 Indication of changes

Version 1.2 reflects a change of the Only Representative and a change in the trade name of the product.
Version 1.1 amended by EU No 453/2010. The data was updated and is in consistency with the Chemical Safety Report provided by the Lead Registrant of the joint submission during REACH registration process. Section 3 was updated and is in consistency with the registration dossier on the substance provided by the manufacturer's Only Representative during REACH registration process.

16.2 Key sources for data

CONCAWE Chemical Safety Report prepared for Heavy Fuel Oil Components, 2010.

16.3 List of relevant R phrases, hazard statements, safety phrases and precautionary statements

Hazard Statements: H350: May cause cancer. H332: Harmful if inhaled. H361: Suspected of damaging fertility or the unborn child. H373: May cause damage to organs through prolonged or repeated exposure. H410: Very toxic to aquatic life with long lasting effects. EUH066: Repeated exposure may cause skin dryness or cracking. **Precautionary Statements:** P201: Obtain special instructions before use. P260: Do not breathe dust/fume/gas/mist/vapours/spray. P273: Avoid release to the environment. P281: Use personal protective equipment as required. P308+P313: IF exposed or concerned: Get medical	**R-phrases:** R20 - harmful by inhalation R45 - may cause cancer R48/21 - harmful: danger of serious damage to health by prolonged exposure in contact with skin R63 - possible risk of harm to the unborn child R66 - repeated exposure may cause skin dryness or cracking R50/53 – Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment **S-phrases:** S23 - do not breathe gas/fumes/vapour/spray (appropriate wording to be specified by the manufacturer) S24 - avoid contact with skin S36/37 - wear suitable protective clothing and gloves S45 - in case of accident or if you feel unwell, seek medical

advice/attention. P501: Dispose of contents/container to...	advice immediately (show the label where possible) S51 - use only in well-ventilated areas S53 - avoid exposure - obtain special instructions before use S61 - avoid release to the environment. refer to special instructions/safety data sheets

16.4 Acronyms, abbreviations

AC: Article category
ADR: European Agreement concerning international carriage of Dangerous goods by Road
ACGIH - American Conference of Governmental Industrial Hygienists
DNEL: Derivative No effect Level
DSD: Dangerous Substances Directive
EC: European Community
EU: European Union
EU CLP 1272/2008: Regulation (EC) No 1272/2008
EUH: European Hazard Statement
GHS: Global Harmonized System
IMDG: International Maritime Dangerous Goods
IATA: International Air Transport Association
LD50/LC50 - Lethal Dose/Concentration kill 50%
LC50: Median lethal dose
NOAEC/NOAEL: No Observable Adverse Effect Concentration / Level
OECD: Organization for Economic Co-Operation and Development
OSHA - Occupational Safety & Health Administration
PBT: Persistent, bioaccumulative, Toxic
PC: Product Category
PEL: Permissible exposure limits
PNEC: Predicted No effect Concentration
Ppm: Part per million
PROC: Process Category
eSDS: Extended Safety Data Sheet
STEL: Short Term Exposure Limit
SU: Sector of Use
TWA: Time weighted average
TVL: Threshold Limit Values
USEPA: United States Environmental Protection Agency
UCVB substances: Substances of Unknown or Variable Composition
vPvB: Very persistent and very bioaccumulative
WEL: Workplace Exposure Limit
WEL-STEL = Workplace Exposure Limit - Short-term exposure limit (15-minute reference period)
WEL-TWA = Workplace Exposure Limit - Long-term exposure limit (8-hour TWA (= time weighted average) reference period)
w/w: weight by weight

16.5 Notice to reader:

This information is based upon the present state of our knowledge. This SDS has been compiled and is solely intended for this product.

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgment of suitability of this information to ensure proper use and protect the health and safety of employees.

This information is furnished without warranty, and any use of the product not in conformance with this Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Appendix 1 - Exposure Scenarios

1. Manufacture of Heavy Fuel Oil – Industrial

Section 1 Exposure Scenario Title Heavy Fuel Oil	
Title	
Manufacture of Substance	
Use Descriptor	
Sector(s) of Use	3, 8, 9
Process Categories	1, 2, 3, 8a, 8b, 15
Environmental Release Categories	1, 4
Specific Environmental Release Category	ESVOC SpERC 1.1.v1
Processes, tasks, activities covered	
Manufacture of the substance or use as a process chemical or extraction agent within closed or contained systems. Includes incidental exposures during recycling/ recovery, material transfers, storage, sampling, associated laboratory activities, maintenance and loading (including marine vessel/barge, road/rail car and bulk container).	
Assessment Method	
See Section 3.	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product characteristics	
Physical form of product	Liquid, vapour pressure <0.5 kPa at STP. OC3.
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) G13
Amount used	Not applicable
Frequency and duration of use/exposure	Covers daily exposures up to 8 hours (unless stated differently) G2
Human factors not influenced by risk management	Not applicable
Other Operational Conditions affecting exposure	Operation is carried out at elevated temperature (> 20°C above ambient temperature). OC7. Assumes a good basic standard of occupational hygiene is implemented G1.
Contributing Scenarios	**Specific Risk Management Measures and Operating Conditions**
General measures (carcinogens) G18	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 scenarios; clear up spills immediately and dispose of wastes 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. G20
CS15 General exposures (closed systems).	Handle substance within a closed system E47. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS2 Process sampling. +OC9 Outdoor	Sample via a closed loop or other system to avoid exposure E8. Avoid carrying out activities involving exposure for more than 15 minutes OC26. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS85 Bulk product storage.	Store substance within a closed system E84. Avoid carrying out activities involving exposure for more than 4 hours OC28. Wear chemically

	resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS36 Laboratory activities	Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure E12. Wear suitable gloves tested to EN374 PPE15.
CS510 Marine vessel/barge (un)loading	Avoid carrying out activities involving exposure for more than 4 hours OC28. Transfer via enclosed lines E52. Clear transfer lines prior to de- coupling E39. Retain drain downs in sealed storage pending disposal or for subsequent recycle ENVT4. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS511 Road tanker/Railcar loading	Ensure material transfers are under containment or extract ventilation E66. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS39 Equipment cleaning and maintenance	Drain down and flush system prior to equipment break-in or maintenance E55. Wear chemically resistant gloves (tested to EN374) in combination with specific activity training PPE17. Retain drain downs in sealed storage pending disposal or for subsequent recycle ENVT4.

Section 2.2 Control of environmental exposure

Product characteristics	
Substance is complex UVCB [PrC3]. Predominantly hydrophobic [PrC4a].	
Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tonnes/year)	1.1e7
Fraction of Regional tonnage used locally	5.2e-2
Annual site tonnage (tonnes/year)	6.0e5
Maximum daily site tonnage (kg/day)	2.0e6
Frequency and duration of use	
Continuous release [FD2].	
Emission days (days/year)	300
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other given operational conditions affecting environmental exposure	
Release fraction to air from process (initial release prior to RMM)	1.0e-4
Release fraction to wastewater from process (initial release prior to RMM)	3.0e-6
Release fraction to soil from process (initial release prior to RMM)	0.0001
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates used [TCS1].	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Risk from environmental exposure is driven by humans via indirect exposure [TCR1j]. Onsite wastewater treatment required [TCR13]. Prevent discharge of undissolved substance to or recover from onsite wastewater [TRC14].	
Treat air emission to provide a typical removal efficiency of (%)	90
Treat onsite wastewater (prior to receiving water discharge) to provide	85.9
the required removal efficiency □ (%)	
If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of □ (%)	0.0
Organisation measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils [OMS2]. Sludge should be incinerated, contained or reclaimed [OMS3].	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%)	88.8
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	88.8

Maximum allowable site tonnage (M_{Safe}) based on release following total wastewater treatment removal (kg/d)	2.3e6
Assumed domestic sewage treatment plant flow (m^3/d)	10000
Conditions and measures related to external treatment of waste for disposal	
During manufacturing no waste of the substance is generated to treat [ETW4].	
Conditions and measures related to external recovery of waste	
During manufacturing no waste of the substance is generated to recover [ERW2].	
Section 3 Exposure Estimation	
3.1. Health	
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. G21.	
3.2. Environment	
The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model [EE2].	
Section 4 Guidance to check compliance with the Exposure Scenario	
4.1. Health	
Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented. G22. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. G23. Available hazard data do not enable the derivation of a DNEL for carcinogenic effects. G33. Available hazard data do not support the need for a DNEL to be established for other health effects. G36. Risk Management Measures are based on qualitative risk characterisation. G37.	
4.2. Environment	
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures [DSU1]. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination [DSU2]. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination [DSU3]. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4]. Scaled assessments for EU refineries have been performed using site-specific data and are attached in PETRORISK file in IUCLID Section 13 – "Site-Specific Production" worksheet [DSU6]. For refinery sites where scaling revealed a condition of unsafe use (i.e., RCRs > 1), a site-specific chemical safety assessment was required [DSU8]. Consequently a Tier 2 assessment was performed in an attempt to refine conservative exposure assumptions and improve risk estimates. The Tier 2 analysis demonstrates that no refineries have RCRs>1 (see Appendix 4 and PETRORISK file in IUCLID section 13 – "Tier 2 Site Specific Production worksheet"). Max RCR Water = 9,09E-01 Max RCR Air = 6,69E-02	

2. Use of Heavy Fuel Oil as Intermediate – Industrial

Section 1 Exposure Scenario Title Heavy Fuel Oil	
Title	
Use as Substance as Intermediate	
Use Descriptor	
Sector(s) of Use	3, 8, 9
Process Categories	1, 2, 3, 8a, 8b, 15 Further information on the mapping and allocation of PROC codes is contained in Table 9.1
Environmental Release Categories	6a
Specific Environmental Release Category	ESVOC SpERC 6.1a.v1
Processes, tasks, activities covered	
Use of substance as an intermediate within closed or contained systems. Includes incidental exposures during recycling/ recovery, material transfers, storage, sampling, associated laboratory activities, maintenance and loading (including marine vessel/barge, road/rail car and bulk container).	

Assessment Method	
See Section 3.	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product characteristics	
Physical form of product	Liquid, vapour pressure <0.5 kPa at STP. OC3.
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) G13
Amount used	Not applicable
Frequency and duration of use/exposure	Covers daily exposures up to 8 hours (unless stated differently) G2
Human factors not influenced by risk management	Not applicable
Other Operational Conditions affecting exposure	Operation is carried out at elevated temperature (> 20°C above ambient temperature). OC7. Assumes a good basic standard of occupational hygiene is implemented G1.
Contributing Scenarios	**Specific Risk Management Measures and Operating Conditions**
General measures (carcinogens) G18	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 scenarios; clear up spills immediately and dispose of wastes 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. G20
CS15 General exposures (closed systems).	Handle substance within a closed system E47. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS15 General exposures (closed systems). + CS2 Process sampling. +OC9 Outdoor	Handle substance within a closed system E47. Sample via a closed loop or other system to avoid exposure E8. Avoid carrying out activities involving exposure for more than 15 minutes OC26. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS85 Bulk product storage.	Store substance within a closed system E84. Avoid carrying out activities involving exposure for more than 4 hours OC28. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS36 Laboratory activities	Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure E12. Wear suitable gloves tested to EN374 PPE15.
CS510 Marine vessel/barge (un)loading	Avoid carrying out activities involving exposure for more than 4 hours OC28. Transfer via enclosed lines E52. Clear transfer lines prior to de- coupling E39. Retain drain downs in sealed storage pending disposal or for subsequent recycle ENVT4. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS511 Road tanker/Railcar loading	Avoid carrying out activities involving exposure for more than 1 hour OC27, or: G9 Ensure material transfers are under containment or extract ventilation E66. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS39 Equipment cleaning and maintenance	Drain down and flush system prior to equipment break-in or maintenance E55. Wear chemically resistant gloves (tested to EN374) in combination with specific activity training PPE17. Retain drain downs in sealed storage pending

	disposal or for subsequent recycle ENVT4.
Section 2.2 Control of environmental exposure	
Product characteristics	
Substance is complex UVCB [PrC3]. Predominantly hydrophobic [PrC4a].	
Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tonnes/year)	1.3e5
Fraction of Regional tonnage used locally	1.2e-1
Annual site tonnage (tonnes/year)	1.5e4
Maximum daily site tonnage (kg/day)	5.0e4
Frequency and duration of use	
Continuous release [FD2].	
Emission days (days/year)	300
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other given operational conditions affecting environmental exposure	
Release fraction to air from process (initial release prior to RMM)	1.0e-5
Release fraction to wastewater from process (initial release prior to RMM)	1.0e-5
Release fraction to soil from process (initial release prior to RMM)	0.001
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates used [TCS1].	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Risk from environmental exposure is driven by freshwater sediment [TCR1b]. If discharging to domestic sewage treatment plant, no onsite wastewater treatment required [TCR9]. Prevent discharge of undissolved substance to or recover from onsite wastewater [TRC14].	
Treat air emission to provide a typical removal efficiency of (%)	80
Treat onsite wastewater (prior to receiving water discharge) to provide	54.0
the required removal efficiency □ (%)	
If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of □ (%)	0
Organisation measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils [OMS2]. Sludge should be incinerated, contained or reclaimed [OMS3].	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%)	88.8
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	88.8
Maximum allowable site tonnage (M_{Safe}) based on release following total wastewater treatment removal (kg/d)	1.9e5
Assumed domestic sewage treatment plant flow (m^3/d)	2000
Conditions and measures related to external treatment of waste for disposal	
This substance is consumed during use and no waste of the substance is generated to treat [ETW5].	
Conditions and measures related to external recovery of waste	
This substance is consumed during use and no waste of the substance is generated to recover [ERW3].	
Section 3 Exposure Estimation	
3.1. Health	
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. G21.	
3.2. Environment	
The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model	

[EE2].
Section 4 Guidance to check compliance with the Exposure Scenario
4.1. Health
Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented. G22. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. G23. Available hazard data do not enable the derivation of a DNEL for carcinogenic effects. G33. Available hazard data do not support the need for a DNEL to be established for other health effects. G36. Risk Management Measures are based on qualitative risk characterisation. G37.
4.2. Environment
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures [DSU1]. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination [DSU2]. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination [DSU3]. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html) Max RCR Water = 2,43E-01 Max RCR Air = 2,74E-02

3. Distribution of Heavy Fuel Oil – Industrial

Section 1 Exposure Scenario Title Heavy Fuel Oil	
Title	
Distribution of Substance	
Use Descriptor	
Sector(s) of Use	3
Process Categories	1, 2, 3, 8a, 8b, 15
Environmental Release Categories	1, 2, 3, 4, 5, 6a, 6b, 6c, 6d, 7
Specific Environmental Release Category	ESVOC SpERC 1.1b.v1
Processes, tasks, activities covered	
Bulk loading (including marine vessel/barge, rail/road car and IBC loading) of substance within closed or contained systems, including incidental exposures during its sampling, storage, unloading, maintenance and associated laboratory activities.	
Assessment Method	
See Section 3.	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product characteristics	
Physical form of product	Liquid
Vapour pressure (kPa)	Liquid, vapour pressure <0.5 kPa at STP. OC3.
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) G13
Frequency and duration of use/exposure	Covers daily exposures up to 8 hours (unless stated differently) G2
Other Operational Conditions affecting exposure	Assumes use at not more than 20°C above ambient temperatures, unless stated differently. G15. Assumes a good basic standard of occupational hygiene is implemented G1
Contributing Scenarios	**Specific Risk Management Measures and Operating Conditions**
General measures (carcinogens) G18	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 scenarios; clear up spills immediately and dispose of wastes 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. G20
CS2 Process sampling. + OC9 Outdoor	Sample via a closed loop or other system to avoid exposure E8. Avoid carrying out activities involving exposure for more than 15 minutes OC26. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS15 General exposures (closed systems).	Handle substance within a closed system E47. Avoid carrying out activities involving exposure for more than 4 hours OC28. Sample via a
	closed loop or other system to avoid exposure E8. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS85 Bulk product storage.	Store substance within a closed system E84. Avoid carrying out activities involving exposure for more than 4 hours OC28. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS137 Product sampling	Sample via a closed loop or other system to avoid exposure E8. Avoid carrying out activities involving exposure for more than 15 minutes OC26. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS36 Laboratory activities	Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure E12. Wear suitable gloves tested to EN374 PPE15.
CS510_Marine vessel/barge (un)loading	Avoid carrying out activities involving exposure for more than 4 hours OC28. Transfer via enclosed lines E52. Clear transfer lines prior to de- coupling E39. Retain drain downs in sealed storage pending disposal or for subsequent recycle ENVT4. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS511 Road tanker/Railcar loading	Ensure material transfers are under containment or extract ventilation E66. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS39 Equipment cleaning and maintenance	Drain down and flush system prior to equipment break-in or maintenance E55. Wear chemically resistant gloves (tested to EN374) in combination with specific activity training PPE17. Retain drain downs in sealed storage pending disposal or for subsequent recycle ENVT4.

Section 2.2 Control of environmental exposure	
Product characteristics	
Substance is complex UVCB [PrC3]. Predominantly hydrophobic [PrC4a].	
Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tonnes/year)	1.1e7
Fraction of Regional tonnage used locally	2.0e-3
Annual site tonnage (tonnes/year)	2.3e4
Maximum daily site tonnage (kg/day)	7.7e4
Frequency and duration of use	
Continuous release [FD2].	
Emission days (days/year)	300
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other given operational conditions affecting environmental exposure	
Release fraction to air from process (initial release prior to RMM)	1.0e-4

Release fraction to wastewater from process (initial release prior to RMM)	1.0e-7
Release fraction to soil from process (initial release prior to RMM)	0.00001
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates used [TCS1].	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Risk from environmental exposure is driven by humans via indirect exposure [TCR1j]. No wastewater treatment required [TCR6].	
Treat air emission to provide a typical removal efficiency of (%)	90
Treat onsite wastewater (prior to receiving water discharge) to provide	0
the required removal efficiency □ (%)	
If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of □ (%)	0
Organisation measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils [OMS2]. Sludge should be incinerated, contained or reclaimed [OMS3].	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%)	88.8
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	88.8
Maximum allowable site tonnage (M_{Safe}) based on release following total wastewater treatment removal (kg/d)	3.8e5
Assumed domestic sewage treatment plant flow (m^3/d)	2000
Conditions and measures related to external treatment of waste for disposal	
External treatment and disposal of waste should comply with applicable regulations [ETW3].	
Conditions and measures related to external recovery of waste	
External recovery and recycling of waste should comply with applicable regulations [ERW1].	
Section 3 Exposure Estimation	
3.1. Health	
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. G21.	
3.2. Environment	
The Hydrocarbon Block Method has been used to calculate environmental exposure with the PETRORISK model [EE2].	
Section 4 Guidance to check compliance with the Exposure Scenario	
4.1. Health	
Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented. G22. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. G23. Available hazard data do not enable the derivation of a DNEL for carcinogenic effects. G33. Available hazard data do not support the need for a DNEL to be established for other health effects. G36. Risk Management Measures are based on qualitative risk characterisation. G37.	
4.2. Environment	
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures [DSU1]. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination [DSU2]. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination [DSU3]. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4]. Max RCR Water = 1,71E-01 Max RCR Air = 2,92E-02	

4. Formulation & (Re)packing of Heavy Fuel Oil – Industrial

Section 1 Exposure Scenario Title Heavy Fuel Oil	
Title	
Formulation & (Re)packing of Substances and Mixtures	
Use Descriptor	
Sector(s) of Use	3, 10
Process Categories	1, 2, 3, 8a, 8b, 15
Environmental Release Categories	2
Specific Environmental Release Category	ESVOC SpERC 2.2.v1
Processes, tasks, activities covered	
Formulation of the substance and its mixtures in batch or continuous operations within closed or contained systems, including incidental exposures during storage, materials transfers, mixing, maintenance, sampling and associated laboratory activities.	
Assessment Method	
See Section 3.	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product characteristics	
Physical form of product	Liquid
Vapour pressure (kPa)	Liquid, vapour pressure <0.5 kPa at STP. OC3.
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) G13
Frequency and duration of use/exposure	Covers daily exposures up to 8 hours (unless stated differently) G2
Other Operational Conditions affecting exposure	Assumes use at not more than 20°C above ambient temperatures, unless stated differently. G15. Assumes a good basic standard of occupational hygiene is implemented G1
Contributing Scenarios	**Specific Risk Management Measures and Operating Conditions**
General measures (carcinogens) G18	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 scenarios; clear up spills immediately and dispose of wastes 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. G20
CS15 General exposures (closed systems). + CS2 Process sampling.	Handle substance within a closed system E47. Sample via a closed loop or other system to avoid exposure E8. Avoid carrying out activities involving exposure for more than 15 minutes OC26. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS15 General exposures	Handle substance within a closed system E47. Sample via a closed loop
(closed systems).	or other system to avoid exposure E8. Avoid carrying out activities involving exposure for more than 4 hours OC28. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS85 Bulk product storage.	Store substance within a closed system E84. Avoid carrying out activities involving exposure for more than 4 hours OC28. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS137 Product sampling	Sample via a closed loop or other system to avoid exposure E8. Avoid carrying out activities involving exposure for more than 15 minutes OC26. Wear

	chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS36 Laboratory activities	Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure E12. Wear suitable gloves tested to EN374 PPE15.
CS510 Marine vessel/barge (un)loading	Transfer via enclosed lines E52 Avoid carrying out activities involving exposure for more than 4 hours OC28..Clear transfer lines prior to de-coupling E39. Retain drain downs in sealed storage pending disposal or for subsequent recycle ENVT4. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS511 Road tanker/Railcar loading	Ensure material transfers are under containment or extract ventilation E66. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS8 Drum/batch transfers	Ensure material transfers are under containment or extract ventilation E66. Provide a general ventilation (not less than 3 to 5 air changes per hour) E11, or G9; Ensure operation is undertaken outdoors. E69. Avoid carrying out activities involving exposure for more than 1 hour OC27. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS39 Equipment cleaning and maintenance	Drain down and flush system prior to equipment break-in or maintenance E55. Wear chemically resistant gloves (tested to EN374) in combination with specific activity training PPE17. Retain drain downs in sealed storage pending disposal or for subsequent recycle ENVT4.

Section 2.2 Control of environmental exposure

Product characteristics	
Substance is complex UVCB [PrC3]. Predominantly hydrophobic [PrC4a].	
Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tonnes/year)	1.1e7
Fraction of Regional tonnage used locally	2.6e-3
Annual site tonnage (tonnes/year)	3.0e4
Maximum daily site tonnage (kg/day)	1.0e5
Frequency and duration of use	
Continuous release [FD2].	
Emission days (days/year)	300
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other given operational conditions affecting environmental exposure	
Release fraction to air from process (after typical onsite RMMs, consistent with EU Solvent Emissions Directive requirements)	2.2e-3
Release fraction to wastewater from process (initial release prior to RMM)	5.0e-6
Release fraction to soil from process (initial release prior to RMM)	0.0001
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates used [TCS1].	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Risk from environmental exposure is driven by humans via indirect exposure [TCR1j]. **If discharging to domestic sewage treatment plant, no onsite wastewater treatment required [TCR9].** **Prevent discharge of undissolved substance to or recover from onsite wastewater [TRC14].**	
Treat air emission to provide a typical removal efficiency of (%)	0
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency ≥ (%)	54.0
If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of ≥ (%)	0
Organisation measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils [OMS2]. Sludge should be incinerated, contained or	

reclaimed [OMS3].	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%)	88.8
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	88.8
Maximum allowable site tonnage (M_{Safe}) based on release following total wastewater treatment removal (kg/d)	1.1e5
Assumed domestic sewage treatment plant flow (m^3/d)	2000
Conditions and measures related to external treatment of waste for disposal	
External treatment and disposal of waste should comply with applicable regulations [ETW3].	
Conditions and measures related to external recovery of waste	
External recovery and recycling of waste should comply with applicable regulations [ERW1].	
Section 3 Exposure Estimation	
3.1. Health	
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. G21.	
3.2. Environment	
The Hydrocarbon Block Method has been used to calculate environmental exposure with the PETRORISK model [EE2].	
Section 4 Guidance to check compliance with the Exposure Scenario	
4.1. Health	
Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented. G22. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. G23. Available hazard data do not enable the derivation of a DNEL for carcinogenic effects. G33. Available hazard data do not support the need for a DNEL to be established for other health effects. G36. Risk Management Measures are based on qualitative risk characterisation. G37.	
4.2. Environment	
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures [DSU1]. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination [DSU2]. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination [DSU3]. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4]. Max RCR Water = 2,43E-01 Max RCR Air = 7,19E-01	

5. Uses of Heavy Fuel Oil in Coatings – Industrial

Section 1 Exposure Scenario Title Heavy Fuel Oil	
Title	
Uses in Coatings	
Use Descriptor	
Sector(s) of Use	3
Process Categories	1, 2, 3, 8a, 8b, 15
Environmental Release Categories	4
Specific Environmental Release Category	ESVOC SpERC 4.3a.v1
Processes, tasks, activities covered	
Covers the use in coatings (paints, inks, adhesives, etc) within closed or contained systems including incidental exposures during use (including materials receipt, storage, preparation and transfer from bulk and semi-bulk, application activities and film formation) and equipment cleaning, maintenance and associated laboratory activities.	

Assessment Method	
See Section 3.	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product characteristics	
Physical form of product	Liquid
Vapour pressure (kPa)	Liquid, vapour pressure <0.5 kPa at STP. OC3.
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) G13
Frequency and duration of use/exposure	Covers daily exposures up to 8 hours (unless stated differently) G2
Other Operational Conditions affecting exposure	Assumes use at not more than 20°C above ambient temperatures, unless stated differently. G15. Assumes a good basic standard of occupational hygiene is implemented G1
Contributing Scenarios	**Specific Risk Management Measures and Operating Conditions**
General measures (carcinogens) G18	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 scenarios; clear up spills immediately and dispose of wastes 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. G20
CS99 Film formation - force drying, stoving and other technologies.	Provide extract ventilation to points where emissions occur E54. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS15 General exposures (closed systems).	Handle substance within a closed system E47. Provide extract ventilation to points where emissions occur E54. Provide a good standard of
	controlled ventilation (10 to 15 air changes per hour) E40. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS3 Material transfers	Provide a good standard of controlled ventilation (10 to 15 air changes per hour) E40. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16. Ensure material transfers are under containment or extract ventilation E66.
CS36 Laboratory activities.	Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure E12. Wear suitable gloves tested to EN374 PPE15.
CS39 Equipment cleaning and maintenance	Drain down and flush system prior to equipment break-in or maintenance E55. Wear chemically resistant gloves (tested to EN374) in combination with specific activity training PPE17. Retain drain downs in sealed storage pending disposal or for subsequent recycle ENVT4.
CS67 Storage.	Store substance within a closed system E84. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
Section 2.2 Control of environmental exposure	
Product characteristics	
Substance is complex UVCB [PrC3]. Predominantly hydrophobic [PrC4a].	
Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tonnes/year)	1.0e2
Fraction of Regional tonnage used locally	1

Annual site tonnage (tonnes/year)	1.0e2
Maximum daily site tonnage (kg/day)	5.0e3
Frequency and duration of use	
Continuous release [FD2].	
Emission days (days/year)	20
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other given operational conditions affecting environmental exposure	
Release fraction to air from process (initial release prior to RMM)	0.98
Release fraction to wastewater from process (initial release prior to RMM)	2.0e-5
Release fraction to soil from process (initial release prior to RMM)	0
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates used [TCS1].	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Risk from environmental exposure is driven by humans via indirect exposure [TCR1j]. No wastewater treatment required [TCR6]. Prevent discharge of undissolved substance to or recover from onsite wastewater [TRC14].	
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 ≥ (%)	0
If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of ≥ (%)	0
Organisation measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils [OMS2]. Sludge should be incinerated, contained or reclaimed [OMS3].	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%)	88.8
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	88.8
Maximum allowable site tonnage (M_{Safe}) based on release following total wastewater treatment removal (kg/d)	1.1e5
Assumed domestic sewage treatment plant flow (m^3/d)	2000
Conditions and measures related to external treatment of waste for disposal	
External treatment and disposal of waste should comply with applicable regulations [ETW3].	
Conditions and measures related to external recovery of waste	
External recovery and recycling of waste should comply with applicable regulations [ERW1].	
Section 3 Exposure Estimation	
3.1. Health	
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. G21.	
3.2. Environment	
The Hydrocarbon Block Method has been used to calculate environmental exposure with the PETRORISK model [EE2].	
Section 4 Guidance to check compliance with the Exposure Scenario	
4.1. Health	
Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented. G22. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. G23.	

Available hazard data do not enable the derivation of a DNEL for carcinogenic effects. G33. Available hazard data do not support the need for a DNEL to be established for other health effects. G36. Risk Management Measures are based on qualitative risk characterisation. G37.
4.2. Environment
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures [DSU1]. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination [DSU2]. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination [DSU3]. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4]. Max RCR Water = 1,89E-01 Max RCR Air = 1,07E-01

6. Uses of Heavy Fuel Oil in Coatings – Professional

Section 1 Exposure Scenario Title Heavy Fuel Oil	
Title	
Uses in Coatings	
Use Descriptor	
Sector(s) of Use	22
Process Categories	1, 2, 3, 8a, 8b, 15
Environmental Release Categories	8a, 8d
Specific Environmental Release Category	ESVOC SpERC 8.3b.v1
Processes, tasks, activities covered	
Covers the use in coatings (paints, inks, adhesives, etc) within closed or contained systems including incidental exposures during use (including materials receipt, storage, preparation and transfer from bulk and semi-bulk, application activities and film formation) and equipment cleaning, maintenance and associated laboratory activities.	
Assessment Method	
See Section 3.	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product characteristics	
Physical form of product	Liquid
Vapour pressure (kPa)	Liquid, vapour pressure <0.5 kPa at STP. OC3.
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) G13
Frequency and duration of use/exposure	Covers daily exposures up to 8 hours (unless stated differently) G2
Other Operational Conditions affecting exposure	Assumes use at not more than 20°C above ambient temperatures, unless stated differently. G15. Assumes a good basic standard of occupational hygiene is implemented G1
Contributing Scenarios	**Specific Risk Management Measures and Operating Conditions**
General measures (carcinogens) G18	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 scenarios; clear up spills immediately and dispose of wastes 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. G20
Film formation - force drying, stoving and other technologies CS99.	Handle substance within closed systems E47 Limit the substance content in the product to 5 % OC17. Provide extract ventilation to points where emissions occur. E54.
CS15 General exposures (closed systems).	Handle substance within closed systems E47 Limit the substance content in the product to 5 % OC17. Provide extract ventilation to points where
	emissions occur E54.
CS3 Material transfers	Ensure material transfers are under containment or extract ventilation E66 Avoid carrying out activities involving exposure for more than 15 minutes OC26. Limit the substance content in the product to 1 % OC16. Wear chemically resistant gloves (tested to EN374) in combination with intensive management supervision controls PPE18.
CS36 Laboratory activities.	Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure. E12.
CS39 Equipment cleaning and maintenance	Drain down and flush system prior to equipment break-in or maintenance E55 Retain drain down in sealed storage pending disposal or for subsequent recycle ENVT4. Deal with spills immediately. C&H13. Avoid carrying out activities involving exposure for more than 15 minutes OC26. Limit the substance content in the product to 1 % OC16. Wear chemically resistant gloves (tested to EN374) in combination with intensive management supervision controls PPE18. Retain drain downs in sealed storage pending disposal or for subsequent recycle ENVT4.
CS67 Storage.	Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16. Store substance within a closed system. E84

Section 2.2 Control of environmental exposure

Product characteristics	
Substance is complex UVCB [PrC3]. Predominantly hydrophobic [PrC4a].	
Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tonnes/year)	1.0e2
Fraction of Regional tonnage used locally	5.0e-4
Annual site tonnage (tonnes/year)	5.0e-2
Maximum daily site tonnage (kg/day)	1.4e-1
Frequency and duration of use	
Continuous release [FD2].	
Emission days (days/year)	365
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other given operational conditions affecting environmental exposure	
Release fraction to air from wide dispersive use (regional only)	0.98
Release fraction to wastewater from wide dispersive use	0.01
Release fraction to soil from wide dispersive use (regional only)	0.01
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates used [TCS1].	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Risk from environmental exposure is driven by humans via indirect exposure [TCR1j]. No wastewater treatment required [TCR6].	
Treat air emission to provide a typical removal efficiency of (%)	N/A
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency ≥ (%)	0
If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of ≥ (%)	0
Organisation measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils [OMS2]. Sludge should be incinerated, contained or reclaimed [OMS3].	

Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%)	88.8
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	88.8
Maximum allowable site tonnage (M_{Safe}) based on release following total wastewater treatment removal (kg/d)	7.0e-1
Assumed domestic sewage treatment plant flow (m^3/d)	2000
Conditions and measures related to external treatment of waste for disposal	
External treatment and disposal of waste should comply with applicable regulations [ETW3].	
Conditions and measures related to external recovery of waste	
External recovery and recycling of waste should comply with applicable regulations [ERW1].	
Section 3 Exposure Estimation	
3.1. Health	
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. G21.	
3.2. Environment	
The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model [EE2].	
Section 4 Guidance to check compliance with the Exposure Scenario	
4.1. Health	
Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented. G22. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. G23. Available hazard data do not enable the derivation of a DNEL for carcinogenic effects. G33. Available hazard data do not support the need for a DNEL to be established for other health effects. G36. Risk Management Measures are based on qualitative risk characterisation. G37.	
4.2. Environment	
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures [DSU1]. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination [DSU2]. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination [DSU3]. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4]. Max RCR Water = 1,70E-01 Max RCR Air = 2,67E-02	

7. Use of Heavy Fuel Oil as a Fuel – Industrial

Section 1 Exposure Scenario Title Heavy Fuel Oil	
Title	
Use as a Fuel	
Use Descriptor	
Sector(s) of Use	3
Process Categories	1, 2, 3, 8a, 8b, 16
Environmental Release Categories	7
Specific Environmental Release Category	ESVOC SpERC 7.12a.v1
Processes, tasks, activities covered	
Covers the use as a fuel (or fuel additives and additive components) within closed or contained systems, including incidental exposures during activities associated with its transfer, use, equipment maintenance and handling of waste.	
Assessment Method	
See Section 3.	
Section 2 Operational conditions and risk management measures	

Section 2.1 Control of worker exposure	
Product characteristics	
Physical form of product	Liquid
Vapour pressure (kPa)	Liquid, vapour pressure <0.5 kPa at STP. OC3.
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) G13
Frequency and duration of use/exposure	Covers daily exposures up to 8 hours (unless stated differently) G2
Other Operational Conditions affecting exposure	Assumes use at not more than 20°C above ambient temperatures, unless stated differently. G15. Assumes a good basic standard of occupational hygiene is implemented G1
Contributing Scenarios	**Specific Risk Management Measures and Operating Conditions**
General measures (carcinogens) G18	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 scenarios; clear up spills immediately and dispose of wastes 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. G20
CS15 General exposures (closed systems).	Handle substance within a closed system E47. Sample via a closed loop or other system to avoid exposure E8. Avoid carrying out activities involving exposure for more than 4 hours OC28. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS15 General exposures (closed systems). + CS137 Product sampling.	Handle substance within a closed system E47. Sample via a closed loop or other system to avoid exposure E8. Avoid carrying out activities involving exposure for more than 1 hour OC27. Provide a good standard of controlled ventilation (10 to 15 air changes per hour) E40. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS502 Bulk closed unloading + OC9 Outdoor	Transfer via enclosed lines E52. Avoid carrying out activities involving exposure for more than 4 hours OC28. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS8 Drum/batch transfers	Ensure material transfers are under containment or extract ventilation E66. , or (G9): Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) E11. Avoid carrying out activities involving exposure for more than 1 hour OC27. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS 117 Operation of solids filtering equipment	Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) E11. Avoid carrying out activities involving exposure for more than 4 hours OC28. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS85 Bulk product storage.	Store substance within a closed system E84. Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) E11. Avoid carrying out activities involving exposure for more than 4 hours OC28. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
GEST_12I Use as a fuel. CS 107 (closed system)	Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS39 Equipment cleaning and	Drain down and flush system prior to equipment break-in or maintenance

maintenance	E55. Wear chemically resistant gloves (tested to EN374) in combination with specific activity training PPE17. Retain drain downs in sealed storage pending disposal or for subsequent recycle ENVT4.

Section 2.2 Control of environmental exposure

Product characteristics	
Substance is complex UVCB [PrC3]. Predominantly hydrophobic [PrC4a].	
Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tonnes/year)	1.1e7
Fraction of Regional tonnage used locally	1.4e-1
Annual site tonnage (tonnes/year)	1.5e6
Maximum daily site tonnage (kg/day)	5.0e6
Frequency and duration of use	
Continuous release [FD2].	
Emission days (days/year)	300
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other given operational conditions affecting environmental exposure	
Release fraction to air from process (initial release prior to RMM)	7.0e-4
Release fraction to wastewater from process (initial release prior to RMM)	4.4e-7
Release fraction to soil from process (initial release prior to RMM)	0
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates used [TCS1].	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Risk from environmental exposure is driven by freshwater sediment [TCR1b]. Additional onsite wastewater treatment required [TCR13]. Prevent discharge of undissolved substance to or recover from onsite wastewater [TRC14].	
Treat air emission to provide a typical removal efficiency of (%)	95
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency ≥ (%)	87.7
If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of ≥ (%)	0
Organisation measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils [OMS2]. Sludge should be incinerated, contained or reclaimed [OMS3].	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%)	88.8
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	88.8
Maximum allowable site tonnage (M_{Safe}) based on release following total wastewater treatment removal (kg/d)	5.2e6
Assumed domestic sewage treatment plant flow (m^3/d)	2000
Conditions and measures related to external treatment of waste for disposal	
Combustion emissions limited by required exhaust emission controls [ETW1]. Combustion emissions considered in regional exposure assessment [ETW2].	
Conditions and measures related to external recovery of waste	
This substance is consumed during use and no waste of the substance is generated to recover [ERW3].	

Section 3 Exposure Estimation

3.1. Health

3.2. Environment
The Hydrocarbon Block Method has been used to calculate environmental exposure with the PETRORISK model [EE2].
Section 4 Guidance to check compliance with the Exposure Scenario
4.1. Health
Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented. G22. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. G23. Available hazard data do not enable the derivation of a DNEL for carcinogenic effects. G33. Available hazard data do not support the need for a DNEL to be established for other health effects. G36. Risk Management Measures are based on qualitative risk characterisation. G37.
4.2. Environment
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures [DSU1]. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination [DSU2]. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination [DSU3]. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4]. Max RCR Water = 9,09E-01 Max RCR Air = 5,73E-01

8. Use of Heavy Fuel Oil as a Fuel – Professional

Section 1 Exposure Scenario Title Heavy Fuel Oil	
Title	
Use as a Fuel	
Use Descriptor	
Sector(s) of Use	22
Process Categories	1, 2, 3, 8a, 8b, 16
Environmental Release Categories	9a, 9b
Specific Environmental Release Category	ESVOC SpERC 9.12b.v1
Processes, tasks, activities covered	
Covers the use as a fuel (or fuel additives and additive components) within closed or contained systems, including incidental exposures during activities associated with its transfer, use, equipment maintenance and handling of waste.	
Assessment Method	
See Section 3.	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product characteristics	
Physical form of product	Liquid
Vapour pressure (kPa)	Liquid, vapour pressure <0.5 kPa at STP. OC3.
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) G13
Frequency and duration of use/exposure	Covers daily exposures up to 8 hours (unless stated differently) G2
Other Operational Conditions affecting exposure	Assumes use at not more than 20°C above ambient temperatures, unless stated differently. G15. Assumes a good basic standard of occupational hygiene is implemented G1
Contributing Scenarios	**Specific Risk Management Measures and Operating Conditions**
General measures (carcinogens) G18	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 scenarios; clear up spills immediately and dispose of wastes 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. G20
CS15 General exposures (closed systems). + CS137 Product sampling.	Handle substance within a closed system E47. Sample via a closed loop or other system to avoid exposure E8. Avoid carrying out activities involving exposure for more than 1 hour OC27. Provide a good standard of controlled ventilation (10 to 15 air changes per hour) E40. Wear chemically resistant gloves (tested to EN374) in combination with specific activity training PPE17.
CS15 General exposures (closed systems).	Handle substance within a closed system E47. Sample via a closed loop or other system to avoid exposure E8. Avoid carrying out activities involving exposure for more than 1 hour OC27. Provide a good standard of controlled ventilation (10 to 15 air changes per hour) E40. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS502 Bulk closed unloading	Provide a good standard of controlled ventilation (10 to 15 air changes per hour) E40. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16. Avoid carrying out activities involving exposure for more than 1 hour OC27. , or G9: Ensure material transfers are under containment or extract ventilation E66.
CS8 Drum/batch transfers	Provide a good standard of controlled ventilation (10 to 15 air changes per hour) E40. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16. Avoid carrying out activities involving exposure for more than 1 hour OC27. , or G9: Ensure material transfers are under containment or extract ventilation E66.
CS507 Refuelling	Ensure material transfers are under containment or extract ventilation E66. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16. Avoid carrying out activities involving exposure for more than 1 hour OC27.
GEST_12I Use as a fuel. CS 107 (closed system)	Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.
CS39 Equipment cleaning and maintenance	Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) E11. Wear chemically resistant gloves (tested to EN374) in combination with specific activity training PPE17. Drain down system prior to equipment break-in or maintenance E65. Retain drain downs in sealed storage pending disposal or for subsequent recycle ENVT4. Clear spills immediately C&H13.

Section 2.2 Control of environmental exposure

Product characteristics	
Substance is complex UVCB [PrC3]. Predominantly hydrophobic [PrC4a].	
Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tonnes/year)	3.3e5
Fraction of Regional tonnage used locally	5.0e-4
Annual site tonnage (tonnes/year)	1.7e2
Maximum daily site tonnage (kg/day)	4.6e2
Frequency and duration of use	
Continuous release [FD2].	
Emission days (days/year)	365
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100

Other given operational conditions affecting environmental exposure	
Release fraction to air from wide dispersive use (regional only)	1.0e-4
Release fraction to wastewater from wide dispersive use	0.00001
Release fraction to soil from wide dispersive use (regional only)	0.00001
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates used [TCS1].	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Risk from environmental exposure is driven by humans via indirect exposure [TCR1j].	
No wastewater treatment required [TCR6].	
Treat air emission to provide a typical removal efficiency of (%)	N/A
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency ≥ (%)	0
If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of ≥ (%)	0
Organisation measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils [OMS2]. Sludge should be incinerated, contained or reclaimed [OMS3].	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%)	88.8
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	88.8
Maximum allowable site tonnage (M_{Safe}) based on release following total wastewater treatment removal (kg/d)	2.3e3
Assumed domestic sewage treatment plant flow (m^3/d)	2000
Conditions and measures related to external treatment of waste for disposal	
Combustion emissions limited by required exhaust emission controls [ETW1]. Combustion emissions considered in regional exposure assessment [ETW2].	
Conditions and measures related to external recovery of waste	
This substance is consumed during use and no waste of the substance is generated to recover [ERW3].	
Section 3 Exposure Estimation	
3.1. Health	
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. G21.	
3.2. Environment	
The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model [EE2].	
Section 4 Guidance to check compliance with the Exposure Scenario	
4.1. Health	
Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented. G22. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. G23. Available hazard data do not enable the derivation of a DNEL for carcinogenic effects. G33. Available hazard data do not support the need for a DNEL to be established for other health effects. G36. Risk Management Measures are based on qualitative risk characterisation. G37.	
4.2. Environment	
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures [DSU1]. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination [DSU2]. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination [DSU3]. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4].	

Max RCR Water = 1,71E-01 Max RCR Air = 2,67E-02

9. Use of Heavy Fuel Oil in Road and Construction Applications – Professional

Section 1 Exposure Scenario Title Heavy Fuel Oils	
Title	
Use in Road and Construction Applications	
Use Descriptor	
Sector(s) of Use	22
Process Categories	8a, 8b
Environmental Release Categories	8d, 8f
Specific Environmental Release Category	ESVOC SpERC 8.15.v1
Processes, tasks, activities covered	
Covers the use of surface coatings and binders within closed or contained systems, including incidental exposures during material transfers and filling operations.	
Assessment Method	
See Section 3.	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product characteristics	
Physical form of product	Liquid
Vapour pressure (kPa)	Liquid, vapour pressure <0.5 kPa at STP. OC3.
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) G13
Frequency and duration of use/exposure	Covers daily exposures up to 8 hours (unless stated differently) G2
Other Operational Conditions affecting exposure	Operation is carried out at elevated temperature (> 20°C above ambient temperature). OC7. Assumes a good basic standard of occupational hygiene is implemented G1.
Contributing Scenarios	**Specific Risk Management Measures and Operating Conditions**
General measures (carcinogens) G18	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 scenarios; clear up spills immediately and dispose of wastes 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. G20
CS3 Material transfers	Ensure material transfers are under containment or extract ventilation E66 Avoid carrying out activities involving exposure for more than 15 minutes OC26. Limit the substance content in the product to 1 % OC16. Wear chemically resistant gloves (tested to EN374) in combination with intensive management supervision controls PPE18.
CS39 Equipment cleaning and maintenance	Drain down and flush system prior to equipment break-in or maintenance E55 Retain drain down in sealed storage pending disposal or for subsequent recycle ENVT4. Deal with spills immediately. C&H13. Avoid carrying out activities involving exposure for more than 15 minutes OC26. Limit the substance content in the product to 1 % OC16. Wear chemically resistant gloves

	(tested to EN374) in combination with intensive management supervision controls PPE18. Retain drain downs in sealed storage pending disposal or for subsequent recycle ENVT4.
Section 2.2 Control of environmental exposure	
Product characteristics	
Substance is complex UVCB [PrC3]. Predominantly hydrophobic [PrC4a].	
Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tonnes/year)	2.2e4
Fraction of Regional tonnage used locally	5.0e-4
Annual site tonnage (tonnes/year)	1.1e1
Maximum daily site tonnage (kg/day)	3.0e1
Frequency and duration of use	
Continuous release [FD2].	
Emission days (days/year)	365
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other given operational conditions affecting environmental exposure	
Release fraction to air from wide dispersive use (regional only)	0.95
Release fraction to wastewater from wide dispersive use	0.01
Release fraction to soil from wide dispersive use (regional only)	0.04
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates used [TCS1].	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Risk from environmental exposure is driven by humans via indirect exposure [TCR1j]. If discharging to domestic sewage treatment plant, no onsite wastewater treatment required [TCR9].	
Treat air emission to provide a typical removal efficiency of (%)	N/A
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency ≥ (%)	30.2
If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of ≥ (%)	0
Organisation measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils [OMS2]. Sludge should be incinerated, contained or reclaimed [OMS3].	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%)	88.8
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	88.8
Maximum allowable site tonnage (M_{Safe}) based on release following total wastewater treatment removal (kg/d)	1.1e2
Assumed domestic sewage treatment plant flow (m^3/d)	2000
Conditions and measures related to external treatment of waste for disposal	
External treatment and disposal of waste should comply with applicable regulations [ETW3].	
Conditions and measures related to external recovery of waste	
External recovery and recycling of waste should comply with applicable regulations [ERW1].	
Section 3 Exposure Estimation	
3.1. Health	
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. G21.	
3.2. Environment	
The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model [EE2].	

Section 4 Guidance to check compliance with the Exposure Scenario
4.1. Health
Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented. G22. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. G23. Available hazard data do not enable the derivation of a DNEL for carcinogenic effects. G33. Available hazard data do not support the need for a DNEL to be established for other health effects. G36. Risk Management Measures are based on qualitative risk characterisation. G37.
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