

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2020/878
 SDS Reference number: RAFF-226
 Issue date: 12/12/2022 Supersedes version of: 7/7/2021 Version: 11.9

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

1.1. Product identifier

| | |
|-----------------------|---|
| Product form | : Substance |
| Substance name | : FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082) |
| Chemical name | : Fuel oil, residual; Heavy Fuel oil; [The liquid product from various refinery streams, usually residues. The composition is complex and varies with the source of the crude oil.] |
| EC-No. | : 270-675-6 |
| CAS-No. | : 68476-33-5 |
| REACH registration No | : 01-2119474894-22 |
| Synonyms | : BUNKER FUELS ; FIOUL LOURD 0,5% (FZN) ; FIOUL LOURD TBTS ≤ 1% (FZN) ; HEIZOL SCHWER ; VLSFO ; VLSFO2 ; FC3 - FC3Y0 - FC3Y1 - FC3Y3 - FC3Y5 - FC3Y7 - FC4 - FC9LS - FG6 - FC3FR - FC72 - FUEL OIL (TRA) ; 68476-33-5 |
| Product group | : - |

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

1.2.1. Relevant identified uses

| | |
|------------------------------|--|
| --- | |
| Main use category | : Professional use, Industrial use |
| Use of the substance/mixture | : Manufacture of substances Distribution of substance Formulation & (re)packing of substances and mixtures Intermediates Use as a fuel. For the detailed uses of the product see annex of the safety data sheet |

1.2.2. Uses advised against

| | |
|---------------------|--|
| Restrictions on use | : Use in road and construction products, Coating |
|---------------------|--|

1.3. Details of the supplier of the safety data sheet

TotalEnergies
 Branche Raffinage & Chimie
 2 Place Jean Millier
 92078 PARIS LA DEFENSE
 FRANCE
 T +33 (0)1.41.35.40.00
rc.fer-sds@totalenergies.com - www.totalenergies.com

1.4. Emergency telephone number

| | |
|------------------|--|
| Emergency number | : Emergency call Carechem 24 International : <ul style="list-style-type: none"> • for English speaking countries: +44 (0) 1235 239 670 • for Europe (in local languages): + 33 1 49 00 00 49 • for Africa and Middle East: + 44 (0) 1235 239 671 • for China: 400 120 6011 • for Asia Pacific (Hong-Kong, Singapore, Taiwan, Philippines, India, Vietnam, Sri Lanka, Japan, Korea, Malaysia, Indonesia, Thailand) : + 65 3158 1074 |
|------------------|--|

| Country | Organisation/Company | Address | Emergency number | Comment |
|---------|--|--|--|---------|
| Ireland | National Poisons Information Centre Beaumont Hospital | PO Box 1297 Beaumont Road 9 Dublin | +353 1 809 2566 (Healthcare professionals-24/7) +353 1 809 2166 (public, 8am - 10pm, 7/7) | |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2020/878

| Country | Organisation/Company | Address | Emergency number | Comment |
|----------------|-----------------------------------|---------|------------------|---------|
| United Kingdom | National Poisons Emergency number | | 08 45 46 47 | |

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

| | |
|---|-------|
| Acute toxicity (inhal.), Category 4 | H332 |
| Carcinogenicity, Category 1B | H350 |
| Reproductive toxicity, Category 2 | H361d |
| Specific target organ toxicity – Repeated exposure, Category 2 | H373 |
| Hazardous to the aquatic environment – Acute Hazard, Category 1 | H400 |
| Hazardous to the aquatic environment – Chronic Hazard, Category 1 | H410 |
| Full text of H- and EUH-statements: see section 16 | |

Adverse physicochemical, human health and environmental effects

May cause cancer. Suspected of damaging the unborn child. May cause damage to organs (blood, thymus, liver) through prolonged or repeated exposure. Harmful if inhaled. Causes skin irritation. Very toxic to aquatic life with long lasting effects.

2.2. Label elements

Labelling according to Regulation (EC) No. 1272/2008 [CLP]

Hazard pictograms (CLP)



Signal word (CLP)

: Danger

Hazard statements (CLP)

- : H332 - Harmful if inhaled.
H350 - May cause cancer.
H361d - Suspected of damaging the unborn child.
H373 - May cause damage to organs through prolonged or repeated exposure.
H410 - Very toxic to aquatic life with long lasting effects.
- Precautionary statements (CLP)
- : P201 - Obtain special instructions before use.
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P243 - Take precautionary measures against static discharge.
P260 - Do not breathe dusts or mists.
P273 - Avoid release to the environment.
P280 - Wear protective gloves/protective clothing/eye protection/face protection.
P303+P361+P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304+P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P314 - Get medical advice/attention if you feel unwell.
P403+P233 - Store in a well-ventilated place. Keep container tightly closed.
- EUH-statements
- : EUH066 - Repeated exposure may cause skin dryness or cracking.
- Extra phrases
- : M-Factor (CLP)= 1.

2.3. Other hazards

Other hazards which do not result in classification : Product may release Hydrogen Sulphide: a specific assessment of inhalation risks from the presence of hydrogen sulphide in tank headspaces, confined spaces, product residue, tank waste and waste water, and unintentional releases should be made to help determine controls appropriate to local circumstances. Contact with hot material - prevent serious burns. In use, may form flammable/explosive vapour-air mixture. Handling this product may result in electrostatic accumulation. Use proper grounding procedures.

This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII

This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII

Contains no PBT/vPvB substances $\geq 0.1\%$ assessed in accordance with REACH Annex XIII

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2020/878

The substance is not included in the list established in accordance with Article 59(1) of REACH for having endocrine disrupting properties, or is not identified as having endocrine disrupting properties in accordance with the criteria set out in Commission Delegated Regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605

SECTION 3: Composition/information on ingredients

3.1. Substances

Comments : UVCB
Name : FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)
CAS-No. : 68476-33-5
EC-No. : 270-675-6

| Name | Product identifier | % | Classification according to Regulation (EC) No. 1272/2008 [CLP] |
|--------------------|--|-----|---|
| Fuel oil, residual | CAS-No.: 68476-33-5 EC-No.: 270-675-6 REACH-no: 01-2119474894-22 | 100 | Acute Tox. 4 (Inhalation:vapour), H332 Carc. 1B, H350 Repr. 2, H361d STOT RE 2, H373 Aquatic Acute 1, H400 Aquatic Chronic 1, H410 |

Full text of H- and EUH-statements: see section 16

Comments : Contains :
Sulfur compounds
(<0.5%)
Product may release Hydrogen Sulphide: a specific assessment of inhalation risks from the presence of hydrogen sulphide in tank headspaces, confined spaces, product residue, tank waste and waste water, and unintentional releases should be made to help determine controls appropriate to local circumstances

3.2. Mixtures

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : Get medical advice/attention if you feel unwell.
First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. Call a physician immediately. If breathing is difficult, give oxygen. If breathing stops, give artificial respiration. Place under medical observation. Product may release Hydrogen Sulphide: a specific assessment of inhalation risks from the presence of hydrogen sulphide in tank headspaces, confined spaces, product residue, tank waste and waste water, and unintentional releases should be made to help determine controls appropriate to local circumstances.
First-aid measures after skin contact : Take off immediately all contaminated clothing. Wash off immediately and plentifully with water for at least 20 minutes. Exposure to splashing of hot product: Treat the affected part with cold water (by spraying or immersion). Get medical advice/attention.
First-aid measures after eye contact : Immediately rinse with water for a prolonged period while holding the eyelids wide open. Consult an eye specialist.
First-aid measures after ingestion : Do not give anything to drink. Do not induce vomiting. Take immediately victim to hospital. If swallowed, rinse mouth with water (only if the person is conscious).

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

Symptoms/effects : Refer to § 11 for more details on effects.
Symptoms/effects after inhalation : Harmful if inhaled.
Symptoms/effects after skin contact : May cause skin irritation.
Symptoms/effects after eye contact : May cause eye irritation.

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2020/878

Chronic symptoms : May cause cancer. Suspected of damaging the unborn child.

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

Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Carbon dioxide. Dry powder. Foam.
Unsuitable extinguishing media : Do not use a solid water stream as it may scatter and spread fire.

5.2. Special hazards arising from the substance or mixture

Explosion hazard : Heavier than air, vapours may travel long distances along ground, ignite and flash back to source. Heat may build pressure, rupturing closed containers, spreading fire and increasing risk of burns and injuries.
Hazardous decomposition products in case of fire : Toxic fumes. Carbon oxides (CO, CO₂). Aldehydes. Polycyclic-aromatic hydrocarbons (PAH). Carbon (C). ketones. Sulphur dioxide.

5.3. Advice for firefighters

Protection during firefighting : Complete protective clothing. Do not enter fire area without proper protective equipment, including respiratory protection.
Other information : Notify fire brigade and environmental authorities. Evacuate unnecessary personnel. Use water spray or fog for cooling exposed containers.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : No flames, no sparks. Eliminate all sources of ignition. Do not smoke. Use special care to avoid static electric charges. Prevent any contact with hot surfaces.

6.1.1. For non-emergency personnel

Protective equipment : Do not attempt to take action without suitable protective equipment. Gloves. Safety glasses.
Emergency procedures for non-emergency personnel : Avoid contact with skin and eyes.

6.1.2. For emergency responders

Protective equipment : Do not attempt to take action without suitable protective equipment. Breathing apparatus.
Emergency procedures for emergency responders : Evacuate unnecessary personnel. Eliminate all ignition sources if safe to do so.

6.2. Environmental precautions

Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

For containment : If spilled, may cause the floor to be slippery. Sweep up or vacuum up the product. Dike for recovery or absorb with appropriate material. Take up liquid spill into absorbent material, e.g.: sand, saw dust. On water, recover/skim from surface and pour out in disposal container.
Other information : Dispose of contaminated material at an authorized site. Notify authorities if product enters sewers or public waters.

6.4. Reference to other sections

For further information refer to section 13.

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2020/878

SECTION 7: Handling and storage

7.1. Precautions for safe handling

- Precautions for safe handling : Ensure good ventilation of the work station. In use, may form flammable/explosive vapour-air mixture. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Take precautionary measures against static discharge during blending and transfer operations. Explosion-free electrical equipment and lighting with earth.
- Hygiene measures : Do not eat, drink or smoke when using this product. Keep away from food and drink. Always wash hands after handling the product. Take off contaminated clothing.

7.2. Conditions for safe storage, including any incompatibilities

- Technical measures : Proper grounding procedures to avoid static electricity should be followed.
- Storage conditions : Product may release Hydrogen Sulphide: a specific assessment of inhalation risks from the presence of hydrogen sulphide in tank headspaces, confined spaces, product residue, tank waste and waste water, and unintentional releases should be made to help determine controls appropriate to local circumstances. Store in a well-ventilated place. Keep container tightly closed. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Containers (tanks) should be grounded and provided with adequate pressure relief valve. Explosive vapour/air mixtures may be formed.
- Storage area : Store away from heat. Earth the equipment. Store in a well-ventilated place.
- Packaging materials : Stainless steel.

7.3. Specific end use(s)

Recommended to professional users.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

8.1.1 National occupational exposure and biological limit values

No additional information available

8.1.2. Recommended monitoring procedures

No additional information available

8.1.3. Air contaminants formed

No additional information available

8.1.4. DNEL and PNEC

Fuel oil, residual; Heavy Fuel oil; [The liquid product from various refinery streams, usually residues. The composition is complex and varies with the source of the crude oil.] (68476-33-5)

DNEL/DMEL (Workers)

| | |
|--|----------------------------|
| Acute - systemic effects, inhalation | 4717 mg/m ³ |
| Long-term - systemic effects, dermal | 0.065 mg/kg bodyweight/day |
| Long-term - systemic effects, inhalation | 0.18 mg/m ³ |

DNEL/DMEL (General population)

| | |
|------------------------------------|----------------------------|
| Long-term - systemic effects, oral | 0.015 mg/kg bodyweight/day |
|------------------------------------|----------------------------|

PNEC (Oral)

| | |
|---------------------------------|-----------------|
| PNEC oral (secondary poisoning) | 66.7 mg/kg food |
|---------------------------------|-----------------|

8.1.5. Control banding

No additional information available

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2020/878

8.2. Exposure controls

8.2.1. Appropriate engineering controls

Appropriate engineering controls:

The substance is flammable and therefore the following conditions must be met to ensure safe use: "Risks are controlled by storage and use under conditions which avoid all ignition sources."

. Ensure adequate ventilation. Safety shower. Eye fountain.

8.2.2. Personal protection equipment

Personal protective equipment:

Exposure controls/personal protection.

Personal protective equipment symbol(s):



8.2.2.1. Eye and face protection

Eye protection:

Safety glasses. Do not wear contact lenses

8.2.2.2. Skin protection

Skin and body protection:

Wear suitable protective clothing. Safety foot-wear

Hand protection:

hydrocarbons resistant gloves. In case of repeated or prolonged contact wear gloves. recommended material: fluorinated polymer. polyvinyl alcohol. Layer thickness : all thicknesses. Breakthrough time: > 480 min. EN 374-3. In the event of contact with the liquid: Nitrile rubber gloves. Layer thickness : > 0,30 mm. Breakthrough time: > 60 min. EN 374-3. Gloves may degrade in contact with this chemical.

• Carefully check the glove for cracks or damage before reusing it, dispose of gloves where the penetration time is exceeded. • The penetration time depends on temperature, glove material, thickness and construction.

Penetration time is measured against EN 374 in laboratory conditions corresponding to permanent static contact and is not necessarily representative of the risk in the workplace. Contact the gloves' supplier for further information on the selection and resistance of gloves.

8.2.2.3. Respiratory protection

Respiratory protection:

Ensure good ventilation of the work station. Do not breathe gas, fumes, vapour or spray. Air-fed respiratory protective equipment should be worn when this product is sprayed if the exposure of the sprayer or other people nearby cannot be controlled to below the occupational exposure limit. In case of over-exposure or in confined areas : Wear respiratory protection. Filter

8.2.2.4. Thermal hazards

No additional information available

8.2.3. Environmental exposure controls

Environmental exposure controls:

Avoid release to the environment. Assure that emissions are compliant with all applicable air pollution control regulations.

Other information:

Do not eat, drink or smoke when using this product. Handle in accordance with good industrial hygiene and safety procedures.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

| | |
|-----------------|----------------------------------|
| Physical state | : Liquid |
| Colour | : dark green. dark brown. Black. |
| Appearance | : Viscous. at 20 °C. |
| Odour | : Hydrocarbon. |
| Odour threshold | : Not available |
| Melting point | : Not available |
| Freezing point | : Not available |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2020/878

| | |
|---|--|
| Initial boiling point and boiling range | : 160 – 750 °C |
| Flammability | : Not available |
| Explosive limits | : Not available |
| Lower explosion limit | : Not available |
| Upper explosion limit | : Not available |
| Flash point | : > 60 °C |
| Auto-ignition temperature | : 220 – 550 °C |
| Decomposition temperature | : Not available |
| pH | : Not available |
| Viscosity, kinematic | : > 3 mm ² /s > 3 mm ² /s (100°C) / 30-700 mm ² /s (50°C) |
| Solubility | : insoluble in water. Soluble in aromatic hydrocarbons. Aliphatic hydrocarbons. |
| Partition coefficient n-octanol/water (Log Kow) | : Not available |
| Vapour pressure | : < 10 hPa (150°C) |
| Vapour pressure at 50°C | : Not available |
| Density | : 840 – 1100 kg/m ³ (15°C) |
| Relative density | : Not available |
| Relative vapour density at 20°C | : Not available |
| Particle characteristics | : Not applicable |

9.2. Other information

9.2.1. Information with regard to physical hazard classes

No additional information available

9.2.2. Other safety characteristics

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

No additional information available

10.2. Chemical stability

Stable at ambient temperature and under normal conditions of use.

10.3. Possibility of hazardous reactions

None under normal use.

10.4. Conditions to avoid

No flames, no sparks. Eliminate all sources of ignition. High temperature. Avoid the build-up of electrostatic charge.

10.5. Incompatible materials

No additional information available

10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1. Information on hazard classes as defined in Regulation (EC) No 1272/2008

| | |
|-----------------------------|---|
| Acute toxicity (oral) | : Not classified |
| Acute toxicity (dermal) | : Not classified |
| Acute toxicity (inhalation) | : Harmful if inhaled. |
| Additional information | : May release poisonous hydrogen sulfide Inhalation may affect the nervous system causing headache, possibly dizziness, nausea, weakness, loss of coordination and unconsciousness |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2020/878

Fuel oil, residual (68476-33-5)

| | |
|---------------------|--|
| LD50 oral rat | > 5000 mg/kg Bridging principle "Substantially similar mixtures" |
| LD50 dermal rabbit | > 2000 mg/kg Bridging principle "Substantially similar mixtures" |
| LC50 inhalation rat | 4 mg/l/4h |

| | |
|-----------------------------------|--|
| Skin corrosion/irritation | : Not classified |
| Additional information | : Repeated exposure may cause skin dryness or cracking. |
| Serious eye damage/irritation | : Not classified |
| Additional information | : May cause eye irritation |
| Respiratory or skin sensitisation | : Not classified |
| Additional information | : Based on available data, the classification criteria are not met |
| Germ cell mutagenicity | : Not classified |
| Additional information | : Based on available data, the classification criteria are not met |
| Carcinogenicity | : May cause cancer. |
| Reproductive toxicity | : Suspected of damaging the unborn child. |
| STOT-single exposure | : Not classified |
| STOT-repeated exposure | : May cause damage to organs through prolonged or repeated exposure. |
| Additional information | : Target organ(s) : blood thymus liver |

Fuel oil, residual (68476-33-5)

| | |
|------------------------|--|
| STOT-repeated exposure | May cause damage to organs through prolonged or repeated exposure. |
| Aspiration hazard | : Not classified |

Fuel oil, residual; Heavy Fuel oil; [The liquid product from various refinery streams, usually residues. The composition is complex and varies with the source of the crude oil.] (68476-33-5)

| | |
|----------------------|--|
| Viscosity, kinematic | > 3 mm ² /s > 3 mm ² /s (100°C) / 30-700 mm ² /s (50°C) |
|----------------------|--|

11.2. Information on other hazards

11.2.1. Endocrine disrupting properties

| | |
|--|---|
| Adverse health effects caused by endocrine disrupting properties | : The substance is not included in the list established in accordance with Article 59(1) of REACH for having endocrine disrupting properties, or is not identified as having endocrine disrupting properties in accordance with the criteria set out in Commission Delegated Regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 |
|--|---|

11.2.2. Other information

No additional information available

SECTION 12: Ecological information

12.1. Toxicity

| | |
|---|---|
| Ecology - general | : Do not allow product to spread into the environment. |
| Ecology - air | : Product evaporates when in contact with the air. |
| Ecology - water | : the product spreads out on the surface of the water, a small fraction of the constituents may be dissolved. |
| Hazardous to the aquatic environment, short-term (acute) | : Very toxic to aquatic life. |
| Hazardous to the aquatic environment, long-term (chronic) | : Very toxic to aquatic life with long lasting effects. |

Fuel oil, residual; Heavy Fuel oil; [The liquid product from various refinery streams, usually residues. The composition is complex and varies with the source of the crude oil.] (68476-33-5)

| | |
|----------------------|-----------|
| LC50 - Fish [1] | 79 mg/l |
| EC50 - Crustacea [1] | 0.22 mg/l |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2020/878

Fuel oil, residual; Heavy Fuel oil; [The liquid product from various refinery streams, usually residues. The composition is complex and varies with the source of the crude oil.] (68476-33-5)

| | |
|------------------------|-------------------|
| ErC50 algae | 0.32 mg/l |
| NOEC chronic fish | 0.1 mg/l |
| NOEC chronic crustacea | 0.27 mg/l |
| Additional information | M-Factor (CLP)= 1 |

12.2. Persistence and degradability

Fuel oil, residual; Heavy Fuel oil; [The liquid product from various refinery streams, usually residues. The composition is complex and varies with the source of the crude oil.] (68476-33-5)

| | |
|-------------------------------|----------------------------|
| Persistence and degradability | Not readily biodegradable. |
|-------------------------------|----------------------------|

12.3. Bioaccumulative potential

No additional information available

12.4. Mobility in soil

Fuel oil, residual; Heavy Fuel oil; [The liquid product from various refinery streams, usually residues. The composition is complex and varies with the source of the crude oil.] (68476-33-5)

| | |
|----------------|---|
| Ecology - soil | Avoid sub-soil penetration. it may pass through the soil and is likely to contaminate ground water. |
|----------------|---|

12.5. Results of PBT and vPvB assessment

Fuel oil, residual; Heavy Fuel oil; [The liquid product from various refinery streams, usually residues. The composition is complex and varies with the source of the crude oil.] (68476-33-5)

This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII

This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII

12.6. Endocrine disrupting properties

Adverse effects on the environment caused by endocrine disrupting properties : The substance is not included in the list established in accordance with Article 59(1) of REACH for having endocrine disrupting properties, or is not identified as having endocrine disrupting properties in accordance with the criteria set out in Commission Delegated Regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605

12.7. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste treatment methods : Hazardous waste. Dispose of in accordance with relevant local regulations. Use only registered transporters. Do not discharge the product into the environment. Empty containers should be taken for recycling, recovery or waste in accordance with local regulation.

Additional information : Handle empty containers with care because residual vapours are flammable.






SECTION 14: Transport information

In accordance with ADR / IMDG / IATA / ADN / RID

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2020/878

| ADR | IMDG | IATA | ADN | RID |
|---|---|---|--|---|
| 14.1. UN number or ID number | | | | |
| UN 3082 | UN 3082 | UN 3082 | UN 3082 | UN 3082 |
| 14.2. UN proper shipping name | | | | |
| ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. | ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. | Environmentally hazardous substance, liquid, n.o.s. | ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. | ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. |
| Transport document description | | | | |
| UN 3082 ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S., 9, III, (E) | UN 3082 ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S., 9, III, MARINE POLLUTANT | UN 3082 Environmentally hazardous substance, liquid, n.o.s., 9, III | UN 3082 ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S., 9, III | UN 3082 ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S., 9, III |
| 14.3. Transport hazard class(es) | | | | |
| 9 | 9 | 9 | 9 | 9 |
|  |  |  |  |  |
| 14.4. Packing Group | | | | |
| III | III | III | III | III |
| 14.5. Environmental hazards | | | | |
| Dangerous for the environment: Yes | Dangerous for the environment: Yes Marine Pollutant: Yes | Dangerous for the environment: Yes | Dangerous for the environment: Yes | Dangerous for the environment: Yes |
| No supplementary information available | | | | |

14.6. Special precautions for user

Overland transport

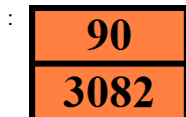
| | |
|---|---|
| Transport regulations (ADR) | : Note: Transport as cold, product in solid state |
| Classification code (ADR) | : M6 |
| Special provisions (ADR) | : 274, 335, 601, 375 |
| Limited quantities (ADR) | : 5I |
| Excepted quantities (ADR) | : E1 |
| Packing instructions (ADR) | : P001, IBC03, LP01, R001 |
| Special packing provisions (ADR) | : PP1 |
| Mixed packing provisions (ADR) | : MP19 |
| Portable tank and bulk container instructions (ADR) | : T4 |
| Portable tank and bulk container special provisions (ADR) | : TP1, TP29 |
| Tank code (ADR) | : LGBV |
| Vehicle for tank carriage | : AT |
| Transport category (ADR) | : 3 |
| Special provisions for carriage - Packages (ADR) | : V12 |
| Special provisions for carriage - Loading, unloading and handling (ADR) | : CV13 |
| Hazard identification number (Kemler No.) | : 90 |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2020/878

Orange plates



Tunnel restriction code (ADR)

: E

EAC code

: •3Z

Transport by sea (IMDG)

Transport regulations (IMDG) : Note: Transport as cold, product in solid state

Special provisions (IMDG) : 274, 335

Limited quantities (IMDG) : 5 L

Excepted quantities (IMDG) : E1

Packing instructions (IMDG) : P001, LP01

Special packing provisions (IMDG) : PP1

IBC packing instructions (IMDG) : IBC03

Tank instructions (IMDG) : T4

Tank special provisions (IMDG) : TP2, TP29

EmS-No. (Fire) : F-A

EmS-No. (Spillage) : S-F

Stowage category (IMDG) : A

Air transport (IATA)

Transport regulations (IATA) : Note: Transport as cold, product in solid state

PCA Excepted quantities (IATA) : E1

PCA Limited quantities (IATA) : Y964

PCA limited quantity max net quantity (IATA) : 30kgG

PCA packing instructions (IATA) : 964

PCA max net quantity (IATA) : 450L

CAO packing instructions (IATA) : 964

CAO max net quantity (IATA) : 450L

Special provisions (IATA) : A97, A158, A197

ERG code (IATA) : 9L

Inland waterway transport

Transport regulations (ADN) : Note: Transport as cold, product in solid state

Classification code (ADN) : M6

Special provisions (ADN) : 274, 335, 61

Limited quantities (ADN) : 5 L

Excepted quantities (ADN) : E1

Carriage permitted (ADN) : T

Equipment required (ADN) : PP

Number of blue cones/lights (ADN) : 0

Rail transport

Transport regulations (RID) : Note: Transport as cold, product in solid state

Classification code (RID) : M6

Special provisions (RID) : 274, 335, 601

Limited quantities (RID) : 5L

Excepted quantities (RID) : E1

Packing instructions (RID) : P001, IBC03, LP01, R001

Special packing provisions (RID) : PP1

Mixed packing provisions (RID) : MP19

Portable tank and bulk container instructions (RID) : T4

Portable tank and bulk container special provisions (RID) : TP1, TP29

Tank codes for RID tanks (RID) : LGBV

Transport category (RID) : 3

Special provisions for carriage – Packages (RID) : W12

Special provisions for carriage - Loading, unloading

and handling (RID)

Colis express (express parcels) (RID) : CE8

Hazard identification number (RID) : 90

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2020/878

14.7. Maritime transport in bulk according to IMO instruments

Not applicable

SECTION 15: Regulatory information

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

15.1.1. EU-Regulations

REACH Annex XVII (Restriction List)

| EU restriction list (REACH Annex XVII) | | |
|--|---|---|
| Reference code | Applicable on | Entry title or description |
| 28. | Fuel oil, residual; Heavy Fuel oil; [The liquid product from various refinery streams, usually residues. The composition is complex and varies with the source of the crude oil.] | Substances which are classified as carcinogen category 1A or 1B in Part 3 of Annex VI to Regulation (EC) No 1272/2008 and are listed in Appendix 1 or Appendix 2, respectively. |
| 3(b) | Fuel oil, residual; Heavy Fuel oil; [The liquid product from various refinery streams, usually residues. The composition is complex and varies with the source of the crude oil.] | Substances or mixtures fulfilling the criteria for any of the following hazard classes or categories set out in Annex I to Regulation (EC) No 1272/2008: Hazard classes 3.1 to 3.6, 3.7 adverse effects on sexual function and fertility or on development, 3.8 effects other than narcotic effects, 3.9 and 3.10 |
| 3(c) | Fuel oil, residual; Heavy Fuel oil; [The liquid product from various refinery streams, usually residues. The composition is complex and varies with the source of the crude oil.] | Substances or mixtures fulfilling the criteria for any of the following hazard classes or categories set out in Annex I to Regulation (EC) No 1272/2008: Hazard class 4.1 |

REACH Annex XIV (Authorisation List)

Not listed on REACH Annex XIV (Authorisation List)

REACH Candidate List (SVHC)

Not listed on the REACH Candidate List

PIC Regulation (Prior Informed Consent)

Not listed on the PIC list (Regulation EU 649/2012)

POP Regulation (Persistent Organic Pollutants)

Not listed on the POP list (Regulation EU 2019/1021)

Ozone Regulation (1005/2009)

Not listed on the Ozone Depletion list (Regulation EU 1005/2009)

Explosives Precursors Regulation (2019/1148)

Contains no substance(s) listed on the Explosives Precursors list (Regulation EU 2019/1148 on the marketing and use of explosives precursors)

Drug Precursors Regulation (273/2004)

Contains no substance(s) listed on the Drug Precursors list (Regulation EC 273/2004 on the manufacture and the placing on market of certain substances used in the illicit manufacture of narcotic drugs and psychotropic substances)

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2020/878

15.1.2. National regulations

Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)
Complies the United States TSCA (Toxic Substances Control Act) inventory
Listed on the Canadian DSL (Domestic Substances List)
Listed introduction on Australian Industrial Chemicals Introduction Scheme (AICIS Inventory)
Listed on NZIoC (New Zealand Inventory of Chemicals)
Listed on the China Inventory of Existing Chemical Substances (IECSC)
Listed on or are exempt from listing on the Taiwan TCSI (Taiwan Chemical Substances Inventory)
Listed on INSQ (Mexican National Inventory of Chemical Substances)

15.2. Chemical safety assessment

A chemical safety assessment has been carried out

SECTION 16: Other information

Indication of changes

| Section | Changed item | Change | Comments |
|---------|--------------|--------|----------|
| 1.1 | | | |

Abbreviations and acronyms:

| | |
|-------|---|
| ADN | European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways |
| ADR | European Agreement concerning the International Carriage of Dangerous Goods by Road |
| ATE | Acute Toxicity Estimate |
| BCF | Bioconcentration factor |
| LC50 | Median lethal concentration |
| CLP | Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008 |
| DMEL | Derived Minimal Effect level |
| DNEL | Derived-No Effect Level |
| EC50 | Median effective concentration |
| IATA | International Air Transport Association |
| IMDG | International Maritime Dangerous Goods |
| LD50 | Median lethal dose |
| PBT | Persistent Bioaccumulative Toxic |
| PNEC | Predicted No-Effect Concentration |
| REACH | Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (EC) No 1907/2006 |
| RID | Regulations concerning the International Carriage of Dangerous Goods by Rail |
| vPvB | Very Persistent and Very Bioaccumulative |

Full text of H- and EUH-statements:

| | |
|----------------------------------|---|
| Acute Tox. 4 (Inhalation) | Acute toxicity (inhal.), Category 4 |
| Acute Tox. 4 (Inhalation:vapour) | Acute toxicity (inhalation:vapour) Category 4 |
| Aquatic Acute 1 | Hazardous to the aquatic environment – Acute Hazard, Category 1 |
| Aquatic Chronic 1 | Hazardous to the aquatic environment – Chronic Hazard, Category 1 |
| Carc. 1B | Carcinogenicity, Category 1B |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2020/878

Full text of H- and EUH-statements:

| | |
|-----------|--|
| EUH066 | Repeated exposure may cause skin dryness or cracking. |
| H332 | Harmful if inhaled. |
| H350 | May cause cancer. |
| H361d | Suspected of damaging the unborn child. |
| H373 | May cause damage to organs through prolonged or repeated exposure. |
| H400 | Very toxic to aquatic life. |
| H410 | Very toxic to aquatic life with long lasting effects. |
| Repr. 2 | Reproductive toxicity, Category 2 |
| STOT RE 2 | Specific target organ toxicity – Repeated exposure, Category 2 |

Safety Data Sheet (SDS), EU

This information applies to the PRODUCT AS SUCH and conforming to specifications of TOTALENERGIES.

In case of formulations or mixtures, it is necessary to ascertain that a new danger will not appear.

The information contained is based on our knowledge of the product, at the date of publishing and it is given quite sincerely. However the revision of some data is in progress.

Users are advised of possible additional hazards when the product is used in applications for which it was not intended. This sheet shall only be used and reproduced for prevention and security purposes.

The references to legislative, regulatory and codes of practice documents cannot be considered as exhaustive.

It is the responsibility of the person receiving the product to refer to the totality of the official documents concerning the use, the possession and the handling of the product.

It is also the responsibility of the handlers of the product to pass on to any subsequent persons who will come into contact with the product. (usage, storage, cleaning of containers, other processes) the totality of the information contained within this safety data sheet and necessary for safety at work, the protection of health and the protection of environment.

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2020/878

Annex to the safety data sheet

Product exposure scenario(s)

| ES Type | ES title |
|---------|--|
| Worker | Manufacture of substances |
| Worker | Formulation & (re)packing of substances and mixtures |
| Worker | Use as an intermediate |
| Worker | Distribution of substance |
| Worker | Use as a fuel (Industrial) |
| Worker | Use as a fuel (Professional) |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

1. Exposure scenario HFOCARC-68476-33-5-SE1

Manufacture of substances

ES Ref.: HFOCARC-68476-33-5-SE1
ES Type: Worker
Version: 1.0

| | |
|-------------------|--|
| Assessment method | The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated Hydrocarbon Block Method (Petrorisk) |
|-------------------|--|

2. Operational conditions and risk management measures

2.1.1. Contributing scenario controlling worker exposure (PROC1, PROC2, PROC3, PROC8a, PROC8b, PROC15)

| Generic exposure scenario | |
|---------------------------|--|
| PROC1 | Use in closed process, no likelihood of exposure |
| PROC2 | Use in closed, continuous process with occasional controlled exposure |
| PROC3 | Use in closed batch process (synthesis or formulation) |
| PROC8a | Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities |
| PROC8b | Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities |
| PROC15 | Use as laboratory reagent |

| Product characteristics | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

| Operational conditions | |
|---|---|
| Frequency and duration of use | Covers daily exposures up to 8 hours |
| Other given operational conditions affecting workers exposure | Operation is carried out at elevated temperature (> 20°C above ambient temperature) |
| | Assumes a good basic standard of occupational hygiene is implemented |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

| Risk Management Measures | | | |
|--|---|--------------------------------|--|
| Organisational measures to prevent/limit releases, dispersion and exposure | 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. | General measures (carcinogens) | |
| | Avoid contact with contaminated tools and objects | | |
| | Avoid splashes and spills | | |
| | Management/supervision in place to check that RMMs on place are being used correctly and OCs followed | | |
| | Training staff on good practice | | |

2.1.2. Contributing scenario controlling worker exposure

General exposures (closed systems)

Product characteristics

| | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

Operational conditions

No additional information

Risk Management Measures

| | | |
|---|--|--|
| Technical conditions and measures at process level (source) to prevent release | Handle substance within a closed system | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training | |

2.1.3. Contributing scenario controlling worker exposure

Process sampling + Outdoor

Product characteristics

| | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

| Operational conditions | | |
|-------------------------------|--|--|
| Frequency and duration of use | Avoid carrying out activities involving exposure for more than 15 minutes per day. | |

| Risk Management Measures | | |
|---|--|--|
| Organisational measures to prevent/limit releases, dispersion and exposure | Sample via a closed loop or other system to avoid exposure | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training | |

2.1.4. Contributing scenario controlling worker exposure

Bulk product storage

| Product characteristics | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

| Operational conditions | | |
|-------------------------------|---|--|
| Frequency and duration of use | Avoid carrying out activities involving exposure for more than 4 hours per day. | |

| Risk Management Measures | | |
|---|--|--|
| Technical conditions and measures at process level (source) to prevent release | Store substance within a closed system | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training | |

2.1.5. Contributing scenario controlling worker exposure

Laboratory activities

| Product characteristics | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

| Operational conditions | | |
|---------------------------|--|--|
| No additional information | | |

| Risk Management Measures | | |
|---|---|--|
| Technical conditions and measures at process level (source) to prevent release | Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear suitable gloves tested to EN374 | |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

2.1.6. Contributing scenario controlling worker exposure

Marine vessel/barge

Product characteristics

| | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

Operational conditions

| | |
|-------------------------------|---|
| Frequency and duration of use | Avoid carrying out activities involving exposure for more than 4 hours per day. |
|-------------------------------|---|

Risk Management Measures

| | | |
|---|--|--|
| Technical conditions and measures at process level (source) to prevent release | Transfer via enclosed lines | |
| | Clear transfer lines prior to de-coupling | |
| | Retain drain downs in sealed storage pending disposal or for subsequent recycle | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training | |

2.1.7. Contributing scenario controlling worker exposure

Equipment cleaning and maintenance

Product characteristics

| | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

Operational conditions

| |
|---------------------------|
| No additional information |
|---------------------------|

Risk Management Measures

| | | |
|---|---|--|
| Technical conditions and measures at process level (source) to prevent release | Drain down and flush system prior to equipment break-in or maintenance | |
| | Retain drain downs in sealed storage pending disposal or for subsequent recycle | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with specific activity training | |

2.2. Contributing scenario controlling environmental exposure (ERC1, ESVOC SPERC 1.1.v1)

| | |
|--------------------|--|
| ERC1 | Manufacture of substances |
| ESVOC SPERC 1.1.v1 | Manufacture of substances : Industrial(SU8, SU9) |

Product characteristics

| | |
|--------------------------|--|
| Physical form of product | Liquid |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

| Product characteristics | |
|-------------------------------|--|
| Other product characteristics | Substance is complex UVCB, Predominantly hydrophobic |

| Operational conditions | | |
|---|--|----------------|
| Amounts used | Fraction of EU tonnage used in region: | 0.1 |
| | Regional use tonnage | 6700000 t/yr |
| | Fraction of Regional tonnage used locally: | 0.09 |
| | Annual site tonnage (tons/year): | 600000 t/yr |
| | Maximum daily site tonnage (kg/d): | 2000000 kg/day |
| Frequency and duration of use | Continuous release | |
| | Emission days | 300 days/yr |
| Environmental factors not influenced by risk management | Local freshwater dilution factor: | 10 |
| | Local marine water dilution factor: | 100 |

| Risk Management Measures | | |
|--|--|-------------------------|
| Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil | Prevent discharge of undissolved substance to or recover from onsite wastewater | |
| | Treat air emission to provide a typical removal efficiency of | 90 % |
| | Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of | ≥ 93.2 % |
| | If discharging to municipal sewage treatment plant, no onsite wastewater treatment required. | |
| Conditions and measures related to sewage treatment plant | Estimated substance removal from wastewater via municipal sewage treatment | 94.2 % |
| | Total efficiency of removal from wastewater after onsite and offsite municipal treatment plant) RMMs | 94.2 % |
| | Maximum allowable site tonnage (MSafe) based on release following total wastewater treatment removal | 2300000 |
| | Assumed domestic sewage treatment plant flow | 10000 m ³ /d |
| Conditions and measures related to external treatment of waste for disposal | During manufacturing no waste of the substance is generated | |
| | Do not apply industrial sludge to natural soils | |
| | Sewage sludge should be incinerated, contained or reclaimed. | |

3. Exposure estimation and reference to its source

3.1. Health

| Information for contributing exposure scenario | |
|--|---|
| 2.1.1 | Available hazard data do not enable the derivation of a DNEL for carcinogenic effects, Available hazard data do not support the need for a DNEL to be established for other health effects, Risk Management Measures are based on qualitative risk characterisation |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

3.2. Environment

Information for contributing exposure scenario

2.2 Risk from environmental exposure is driven by freshwater sediment

| Environmental exposure | Unit | Exposure estimation | PNEC | RCR | Assessment method |
|------------------------|------|---------------------|------|--------|-------------------|
| Freshwater | | | | ≤ 0.85 | |

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

4.1. Health

| | |
|-------------------|---|
| Guidance - Health | Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels |
|-------------------|---|

4.2. Environment

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

Additional good practice advice beyond the REACH CSA

No data available

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

1. Exposure scenario HFOCARC-68476-33-5-SE2

Formulation & (re)packing of substances and mixtures

ES Ref.: HFOCARC-68476-33-5-SE2
ES Type: Worker
Version: 1

Assessment method

The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated
Hydrocarbon Block Method (Petrorisk)

2. Operational conditions and risk management measures

2.1.1. Contributing scenario controlling worker exposure (PROC1, PROC2, PROC3, PROC8a, PROC8b, PROC15)

Generic exposure scenario

| | |
|--------|--|
| PROC1 | Use in closed process, no likelihood of exposure |
| PROC2 | Use in closed, continuous process with occasional controlled exposure |
| PROC3 | Use in closed batch process (synthesis or formulation) |
| PROC8a | Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities |
| PROC8b | Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities |
| PROC15 | Use as laboratory reagent |

Product characteristics

| | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

Operational conditions

| | | |
|---|--|--|
| Frequency and duration of use | Covers daily exposures up to 8 hours | |
| Other given operational conditions affecting workers exposure | Assumes use at not more than 20°C above ambient temperature. | |
| | Assumes a good basic standard of occupational hygiene is implemented | |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

| Risk Management Measures | | | |
|--|---|--------------------------------|--|
| Organisational measures to prevent/limit releases, dispersion and exposure | 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. | General measures (carcinogens) | |
| | Avoid contact with contaminated tools and objects | | |
| | Management/supervision in place to check that RMMs on place are being used correctly and OCs followed | | |
| | Training staff on good practice | | |
| | Avoid splashes and spills | | |

2.1.2. Contributing scenario controlling worker exposure

General exposures (closed systems) + Process sampling

| Product characteristics | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

| Operational conditions | |
|-------------------------------|--|
| Frequency and duration of use | Avoid carrying out activities involving exposure for more than 15 minutes per day. |

| Risk Management Measures | | |
|---|--|--|
| Technical conditions and measures at process level (source) to prevent release | Handle substance within a closed system | |
| | Sample via a closed loop or other system to avoid exposure | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training | |

2.1.3. Contributing scenario controlling worker exposure

General exposures (closed systems)

| Product characteristics | |
|--------------------------|--------|
| Physical form of product | Liquid |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

| Product characteristics | |
|---------------------------------------|--|
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

| Operational conditions | |
|-------------------------------|---|
| Frequency and duration of use | Avoid carrying out activities involving exposure for more than 4 hours per day. |

| Risk Management Measures | |
|---|--|
| Technical conditions and measures at process level (source) to prevent release | Handle substance within a closed system |
| | Sample via a closed loop or other system to avoid exposure |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training |

2.1.4. Contributing scenario controlling worker exposure

Bulk product storage

| Product characteristics | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

| Operational conditions | |
|-------------------------------|---|
| Frequency and duration of use | Avoid carrying out activities involving exposure for more than 4 hours per day. |

| Risk Management Measures | |
|---|--|
| Technical conditions and measures at process level (source) to prevent release | Store substance within a closed system |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training |

2.1.5. Contributing scenario controlling worker exposure

Product sampling

| Product characteristics | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

| Operational conditions | |
|-------------------------------|--|
| Frequency and duration of use | Avoid carrying out activities involving exposure for more than 15 minutes per day. |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

Risk Management Measures

| | | |
|---|--|--|
| Technical conditions and measures at process level (source) to prevent release | Sample via a closed loop or other system to avoid exposure | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training | |

2.1.6. Contributing scenario controlling worker exposure

Laboratory activities

Product characteristics

| | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

Operational conditions

No additional information

Risk Management Measures

| | | |
|---|---|--|
| Technical conditions and measures at process level (source) to prevent release | Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear suitable gloves tested to EN374 | |

2.1.7. Contributing scenario controlling worker exposure

Marine vessel/barge

Product characteristics

| | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

Operational conditions

| | | |
|-------------------------------|---|--|
| Frequency and duration of use | Avoid carrying out activities involving exposure for more than 4 hours per day. | |
|-------------------------------|---|--|

Risk Management Measures

| | | |
|---|--|--|
| Technical conditions and measures at process level (source) to prevent release | Transfer via enclosed lines | |
| | Clear transfer lines prior to de-coupling | |
| | Retain drain downs in sealed storage pending disposal or for subsequent recycle | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training | |

2.1.8. Contributing scenario controlling worker exposure

Road tanker/rail car

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

| Product characteristics | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

| Operational conditions | |
|---------------------------|--|
| No additional information | |

| Risk Management Measures | | |
|---|--|--|
| Technical conditions and measures at process level (source) to prevent release | Ensure material transfers are under containment or extract ventilation | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training | |

2.1.9. Contributing scenario controlling worker exposure

Drum/batch transfers

| Product characteristics | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

| Operational conditions | | |
|-------------------------------|--|--|
| Frequency and duration of use | Avoid carrying out activities involving exposure for more than 1 hour per day. | |

| Risk Management Measures | | |
|---|---|--|
| Technical conditions and measures at process level (source) to prevent release | Ensure material transfers are under containment or extract ventilation | |
| | Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). or. Ensure operation is undertaken outdoors | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training | |

2.1.10. Contributing scenario controlling worker exposure

Equipment cleaning and maintenance

| Product characteristics | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

| Operational conditions | |
|---------------------------|--|
| No additional information | |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

| Risk Management Measures | | |
|---|---|--|
| Technical conditions and measures at process level (source) to prevent release | Drain down and flush system prior to equipment break-in or maintenance | |
| | Retain drain downs in sealed storage pending disposal or for subsequent recycle | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with specific activity training | |

2.2. Contributing scenario controlling environmental exposure (ERC2, ESVOC SPERC 2.2.v1)

| | |
|--------------------|---|
| ERC2 | Formulation of preparations |
| ESVOC SPERC 2.2.v1 | Formulation & packing of preparations and mixtures: Industrial (SU10) |

| Product characteristics | |
|-------------------------------|--|
| Physical form of product | Liquid |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |
| Other product characteristics | Substance is complex UVCB, Predominantly hydrophobic |

| Operational conditions | | |
|---|--|---------------|
| Amounts used | Fraction of EU tonnage used in region: | 0.1 |
| | Regional use tonnage | 7500000 t/yr |
| | Fraction of Regional tonnage used locally: | 0.004 |
| | Annual site tonnage (tons/year): | 30000 t/yr |
| | Maximum daily site tonnage (kg/d): | 100000 kg/day |
| Frequency and duration of use | Continuous release | |
| | Emission days | 300 days/yr |
| Environmental factors not influenced by risk management | Local freshwater dilution factor: | 10 |
| | Local marine water dilution factor: | 100 |

| Risk Management Measures | | |
|--|--|----------|
| 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 (primarily ingestion) | |
| | Prevent discharge of undissolved substance to or recover from onsite wastewater | |
| | 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 of | ≥ 81.3 % |
| | If discharging to municipal sewage treatment plant, no onsite wastewater treatment required. | |
| Organisation measures to prevent/limit release from site | Do not apply industrial sludge to natural soils | |
| | Sewage sludge should be incinerated, contained or reclaimed. | |
| Conditions and measures related to sewage treatment plant | Estimated substance removal from wastewater via municipal sewage treatment | 94.2 % |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

| Risk Management Measures | | |
|---|--|------------------------|
| | Total efficiency of removal from wastewater after onsite and offsite municipal treatment plant) RMMs | 94.2 % |
| | Maximum allowable site tonnage (MSafe) based on release following total wastewater treatment removal | 110000 |
| | Assumed domestic sewage treatment plant flow | 2000 m ³ /d |
| Conditions and measures related to external treatment of waste for disposal | External treatment and disposal of waste should comply with applicable local and/or national regulations | |
| | Do not apply industrial sludge to natural soils | |
| | Sewage sludge should be incinerated, contained or reclaimed. | |
| Conditions and measures related to external recovery of waste | External recovery and recycling of waste should comply with applicable local and/or national regulations | |

3. Exposure estimation and reference to its source

3.1. Health

Information for contributing exposure scenario

| | |
|-------|---|
| 2.1.1 | Available hazard data do not enable the derivation of a DNEL for carcinogenic effects, Available hazard data do not support the need for a DNEL to be established for other health effects, Risk Management Measures are based on qualitative risk characterisation |
|-------|---|

3.2. Environment

Information for contributing exposure scenario

| | |
|-----|--|
| 2.2 | Risk from environmental exposure is driven by humans via indirect exposure (primarily ingestion) |
|-----|--|

| Environmental exposure | Unit | Exposure estimation | PNEC | RCR | Assessment method |
|------------------------|------|---------------------|------|--------|-------------------|
| Freshwater | | | | ≤ 0.31 | |

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

4.1. Health

| | |
|-------------------|---|
| Guidance - Health | Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels |
|-------------------|---|

4.2. Environment

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

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

Additional good practice advice beyond the REACH CSA

No data available

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

1. Exposure scenario HFOCARC-68476-33-5-SE3

Use as an intermediate

ES Ref.: HFOCARC-68476-33-5-SE3
ES Type: Worker
Version: 1.0

| | |
|-------------------|--|
| Assessment method | The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated Hydrocarbon Block Method (Petrorisk) |
|-------------------|--|

2. Operational conditions and risk management measures

2.1.1. Contributing scenario controlling worker exposure (PROC1, PROC2, PROC3, PROC8a, PROC8b, PROC15)

| Generic exposure scenario | |
|---------------------------|--|
| PROC1 | Use in closed process, no likelihood of exposure |
| PROC2 | Use in closed, continuous process with occasional controlled exposure |
| PROC3 | Use in closed batch process (synthesis or formulation) |
| PROC8a | Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities |
| PROC8b | Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities |
| PROC15 | Use as laboratory reagent |

| Product characteristics | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

| Operational conditions | | |
|---|---|--|
| Frequency and duration of use | Covers daily exposures up to 8 hours | |
| Other given operational conditions affecting workers exposure | Operation is carried out at elevated temperature (> 20°C above ambient temperature) | |
| | Assumes a good basic standard of occupational hygiene is implemented | |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

| Risk Management Measures | | | |
|--|---|--------------------------------|--|
| Organisational measures to prevent/limit releases, dispersion and exposure | 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. | General measures (carcinogens) | |
| | Avoid contact with contaminated tools and objects | | |
| | Management/supervision in place to check that RMMs on place are being used correctly and OCs followed | | |
| | Training staff on good practice | | |
| | Avoid splashes and spills | | |

2.1.2. Contributing scenario controlling worker exposure

General exposures (closed systems)

Product characteristics

| | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

Operational conditions

No additional information

Risk Management Measures

| | | |
|---|--|--|
| Technical conditions and measures at process level (source) to prevent release | Handle substance within a closed system | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training | |

2.1.3. Contributing scenario controlling worker exposure

General exposures (closed systems) + Process sampling + Outdoor

Product characteristics

| | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

| Operational conditions | | |
|-------------------------------|--|--|
| Frequency and duration of use | Avoid carrying out activities involving exposure for more than 15 minutes per day. | |

| Risk Management Measures | | |
|---|--|--|
| Technical conditions and measures at process level (source) to prevent release | Handle substance within a closed system | |
| | Sample via a closed loop or other system to avoid exposure | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training | |

2.1.4. Contributing scenario controlling worker exposure

Bulk product storage

| Product characteristics | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

| Operational conditions | | |
|-------------------------------|---|--|
| Frequency and duration of use | Avoid carrying out activities involving exposure for more than 4 hours per day. | |

| Risk Management Measures | | |
|---|--|--|
| Technical conditions and measures at process level (source) to prevent release | Store substance within a closed system | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training | |

2.1.5. Contributing scenario controlling worker exposure

Laboratory activities

| Product characteristics | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

| Operational conditions | | |
|---------------------------|--|--|
| No additional information | | |

| Risk Management Measures | | |
|---|---|--|
| Technical conditions and measures at process level (source) to prevent release | Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear suitable gloves tested to EN374 | |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

2.1.6. Contributing scenario controlling worker exposure

Marine vessel/barge

Product characteristics

| | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

Operational conditions

| | |
|-------------------------------|---|
| Frequency and duration of use | Avoid carrying out activities involving exposure for more than 4 hours per day. |
|-------------------------------|---|

Risk Management Measures

| | | |
|---|--|--|
| Technical conditions and measures at process level (source) to prevent release | Transfer via enclosed lines | |
| | Clear transfer lines prior to de-coupling | |
| | Retain drain downs in sealed storage pending disposal or for subsequent recycle | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training | |

2.1.7. Contributing scenario controlling worker exposure

Road tanker/rail car

Product characteristics

| | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

Operational conditions

| |
|---------------------------|
| No additional information |
|---------------------------|

Risk Management Measures

| | | |
|---|---|--|
| Technical conditions and measures at process level (source) to prevent release | Avoid carrying out operation for more than 1 hour. or. Ensure material transfers are under containment or extract ventilation | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training | |

2.1.8. Contributing scenario controlling worker exposure

Equipment cleaning and maintenance

Product characteristics

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

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

| Product characteristics | |
|-------------------------|--|
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

| Operational conditions | |
|---------------------------|--|
| No additional information | |

| Risk Management Measures | | |
|---|---|--|
| Technical conditions and measures at process level (source) to prevent release | Drain down and flush system prior to equipment break-in or maintenance | |
| | Retain drain downs in sealed storage pending disposal or for subsequent recycle | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with specific activity training | |

2.2. Contributing scenario controlling environmental exposure (ERC6a, ESVO SPERC 6.1a.v1)

| | |
|--------------------|---|
| ERC6a | Industrial use resulting in manufacture of another substance (use of intermediates) |
| ESVO SPERC 6.1a.v1 | Manufacture of substances : Industrial(SU8, SU9) |

| Product characteristics | |
|-------------------------------|--|
| Physical form of product | Liquid |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |
| Other product characteristics | Substance is complex UVCB, Predominantly hydrophobic |

| Operational conditions | | |
|---|--|--------------|
| Amounts used | Fraction of EU tonnage used in region: | 0.1 |
| | Regional use tonnage | 1800000 t/yr |
| | Fraction of Regional tonnage used locally: | 0.0083 |
| | Annual site tonnage (tons/year): | 15000 t/yr |
| | Maximum daily site tonnage (kg/d): | 50000 kg/day |
| Frequency and duration of use | Continuous release | |
| | Emission days | 300 days/yr |
| Environmental factors not influenced by risk management | Local freshwater dilution factor: | 10 |
| | Local marine water dilution factor: | 100 |

| Risk Management Measures | | |
|--|--|----------|
| Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil | Prevent discharge of undissolved substance to or recover from onsite wastewater | |
| | Treat air emission to provide a typical removal efficiency of | 80 % |
| | Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of | ≥ 92.5 % |
| | If discharging to municipal sewage treatment plant, no onsite wastewater treatment required. | |
| Conditions and measures related to sewage treatment plant | Estimated substance removal from wastewater via municipal sewage treatment | 94.2 % |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

| Risk Management Measures | | |
|---|--|------------------------|
| | Total efficiency of removal from wastewater after onsite and offsite municipal treatment plant) RMMs | 94.2 % |
| | Maximum allowable site tonnage (MSafe) based on release following total wastewater treatment removal | 64000 |
| | Assumed domestic sewage treatment plant flow | 2000 m ³ /d |
| 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 | |
| | Do not apply industrial sludge to natural soils | |
| | Sewage sludge should be incinerated, contained or reclaimed. | |

3. Exposure estimation and reference to its source

3.1. Health

Information for contributing exposure scenario

| | |
|-------|---|
| 2.1.1 | Available hazard data do not enable the derivation of a DNEL for carcinogenic effects, Available hazard data do not support the need for a DNEL to be established for other health effects, Risk Management Measures are based on qualitative risk characterisation |
|-------|---|

3.2. Environment

Information for contributing exposure scenario

| | |
|-----|--|
| 2.2 | Risk from environmental exposure is driven by humans via indirect exposure (primarily ingestion) |
|-----|--|

| Environmental exposure | Unit | Exposure estimation | PNEC | RCR | Assessment method |
|------------------------|------|---------------------|------|--------|-------------------|
| Freshwater | | | | ≤ 0.77 | |

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

4.1. Health

| | |
|-------------------|---|
| Guidance - Health | Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels |
|-------------------|---|

4.2. Environment

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

Additional good practice advice beyond the REACH CSA

No data available

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

1. Exposure scenario HFOCARC-68476-33-5-SE4

Distribution of substance

ES Ref.: HFOCARC-68476-33-5-SE4
ES Type: Worker
Version: 1.0

| | |
|-------------------|--|
| Assessment method | The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated Hydrocarbon Block Method (Petrorisk) |
|-------------------|--|

2. Operational conditions and risk management measures

2.1.1. Contributing scenario controlling worker exposure (PROC1, PROC2, PROC3, PROC8a, PROC8b, PROC15)

| Generic exposure scenario | |
|---------------------------|--|
| PROC1 | Use in closed process, no likelihood of exposure |
| PROC2 | Use in closed, continuous process with occasional controlled exposure |
| PROC3 | Use in closed batch process (synthesis or formulation) |
| PROC8a | Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities |
| PROC8b | Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities |
| PROC15 | Use as laboratory reagent |

| Product characteristics | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

| Operational conditions | | |
|---|--|--|
| Frequency and duration of use | Covers daily exposures up to 8 hours | |
| Other given operational conditions affecting workers exposure | Assumes use at not more than 20°C above ambient temperature. | |
| | Assumes a good basic standard of occupational hygiene is implemented | |

| Risk Management Measures | | |
|--|--|--|
| Technical conditions and measures at process level (source) to prevent release | | |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

| Risk Management Measures | | | |
|--|---|--------------------------------|--|
| Organisational measures to prevent/limit releases, dispersion and exposure | 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. | General measures (carcinogens) | |
| | Avoid contact with contaminated tools and objects | | |
| | Management/supervision in place to check that RMMs on place are being used correctly and OCs followed | | |
| | Training staff on good practice | | |
| | Avoid splashes and spills | | |

2.1.2. Contributing scenario controlling worker exposure

Process sampling + Outdoor

Product characteristics

| | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

Operational conditions

| | | |
|-------------------------------|--|--|
| Frequency and duration of use | Avoid carrying out activities involving exposure for more than 15 minutes per day. | |
|-------------------------------|--|--|

Risk Management Measures

| | | |
|---|--|--|
| Technical conditions and measures at process level (source) to prevent release | Sample via a closed loop or other system to avoid exposure | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training | |

2.1.3. Contributing scenario controlling worker exposure

General exposures (closed systems)

Product characteristics

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

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

| Product characteristics | |
|-------------------------|--|
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

| Operational conditions | |
|-------------------------------|---|
| Frequency and duration of use | Avoid carrying out activities involving exposure for more than 4 hours per day. |

| Risk Management Measures | |
|---|--|
| Technical conditions and measures at process level (source) to prevent release | Handle substance within a closed system |
| | Sample via a closed loop or other system to avoid exposure |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training |

2.1.4. Contributing scenario controlling worker exposure

Product storage

| Product characteristics | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

| Operational conditions | |
|-------------------------------|---|
| Frequency and duration of use | Avoid carrying out activities involving exposure for more than 4 hours per day. |

| Risk Management Measures | |
|---|--|
| Technical conditions and measures at process level (source) to prevent release | Store substance within a closed system |
| | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training |

2.1.5. Contributing scenario controlling worker exposure

Product sampling

| Product characteristics | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

| Operational conditions | |
|-------------------------------|--|
| Frequency and duration of use | Avoid carrying out activities involving exposure for more than 15 minutes per day. |

| Risk Management Measures | |
|--|--|
| Technical conditions and measures at process level (source) to prevent release | Sample via a closed loop or other system to avoid exposure |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

Risk Management Measures

| | | |
|---|--|--|
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training | |
|---|--|--|

2.1.6. Contributing scenario controlling worker exposure

Laboratory activities

Product characteristics

| | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

Operational conditions

No additional information

Risk Management Measures

| | | |
|---|---|--|
| Technical conditions and measures at process level (source) to prevent release | Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear suitable gloves tested to EN374 | |

2.1.7. Contributing scenario controlling worker exposure

Marine vessel/barge

Product characteristics

| | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

Operational conditions

| | | |
|-------------------------------|---|--|
| Frequency and duration of use | Avoid carrying out activities involving exposure for more than 4 hours per day. | |
|-------------------------------|---|--|

Risk Management Measures

| | | |
|---|--|--|
| Technical conditions and measures at process level (source) to prevent release | Transfer via enclosed lines | |
| | Clear transfer lines prior to de-coupling | |
| | Retain drain downs in sealed storage pending disposal or for subsequent recycle | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training | |

2.1.8. Contributing scenario controlling worker exposure

Road tanker/rail car

Product characteristics

| | |
|--------------------------|--------|
| Physical form of product | Liquid |
|--------------------------|--------|

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

| Product characteristics | |
|---------------------------------------|--|
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

| Operational conditions | |
|---------------------------|--|
| No additional information | |

| Risk Management Measures | | |
|---|--|--|
| Technical conditions and measures at process level (source) to prevent release | Ensure material transfers are under containment or extract ventilation | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training | |

2.1.9. Contributing scenario controlling worker exposure

Equipment cleaning and maintenance

| Product characteristics | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

| Operational conditions | |
|---------------------------|--|
| No additional information | |

| Risk Management Measures | | |
|---|---|--|
| Technical conditions and measures at process level (source) to prevent release | Drain down and flush system prior to equipment break-in or maintenance | |
| | Retain drain downs in sealed storage pending disposal or for subsequent recycle | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with specific activity training | |

2.2. Contributing scenario controlling environmental exposure (ERC4, ERC5, ERC6a, ERC6b, ERC6c, ERC6d, ERC7, ESVOC SPERC 1.1b.v1)

| | |
|---------------------|--|
| ERC4 | Industrial use of processing aids in processes and products, not becoming part of articles |
| ERC5 | Industrial use resulting in inclusion into or onto a matrix |
| ERC6a | Industrial use resulting in manufacture of another substance (use of intermediates) |
| ERC6b | Industrial use of reactive processing aids |
| ERC6c | Industrial use of monomers for manufacture of thermo-plastics |
| ERC6d | Industrial use of process regulators for polymerisation processes in production of resins, rubbers, polymers |
| ERC7 | Industrial use of substances in closed systems |
| ESVOC SPERC 1.1b.v1 | Distribution: Industrial (SU3) |

| Product characteristics | |
|--------------------------|--------|
| Physical form of product | Liquid |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

| Product characteristics | |
|-------------------------------|--|
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |
| Other product characteristics | Substance is complex UVCB, Predominantly hydrophobic |

| Operational conditions | | |
|---|--|--------------|
| Amounts used | Fraction of EU tonnage used in region: | 0.1 |
| | Regional use tonnage | 9300000 t/yr |
| | Fraction of Regional tonnage used locally: | 0.002 |
| | Annual site tonnage (tons/year): | 19000 t/yr |
| | Maximum daily site tonnage (kg/d): | 62000 kg/day |
| Frequency and duration of use | Continuous release | |
| | Emission days | 300 days/yr |
| Environmental factors not influenced by risk management | Local freshwater dilution factor: | 10 |
| | Local marine water dilution factor: | 100 |

| Risk Management Measures | | |
|--|--|------------------------|
| Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil | Treat air emission to provide a typical removal efficiency of | 90 % |
| | Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of | 0 % |
| | If discharging to municipal sewage treatment plant, no onsite wastewater treatment required. | |
| Conditions and measures related to sewage treatment plant | Estimated substance removal from wastewater via municipal sewage treatment | 94.2 % |
| | Total efficiency of removal from wastewater after onsite and offsite municipal treatment plant) RMMs | 94.2 % |
| | Maximum allowable site tonnage (MSafe) based on release following total wastewater treatment removal | 80000 |
| | Assumed domestic sewage treatment plant flow | 2000 m ³ /d |
| Conditions and measures related to external treatment of waste for disposal | External treatment and disposal of waste should comply with applicable local and/or national regulations | |
| | Do not apply industrial sludge to natural soils | |
| | Sewage sludge should be incinerated, contained or reclaimed. | |
| Conditions and measures related to external recovery of waste | External recovery and recycling of waste should comply with applicable local and/or national regulations | |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

3. Exposure estimation and reference to its source

3.1. Health

Information for contributing exposure scenario

| | |
|-------|---|
| 2.1.1 | Available hazard data do not enable the derivation of a DNEL for carcinogenic effects, Available hazard data do not support the need for a DNEL to be established for other health effects, Risk Management Measures are based on qualitative risk characterisation |
|-------|---|

3.2. Environment

Information for contributing exposure scenario

| | |
|-----|--|
| 2.2 | Risk from environmental exposure is driven by humans via indirect exposure (primarily ingestion) |
|-----|--|

| Environmental exposure | Unit | Exposure estimation | PNEC | RCR | Assessment method |
|------------------------|------|---------------------|------|---------|-------------------|
| Freshwater | | | | ≤ 0.013 | |

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

4.1. Health

| | |
|-------------------|---|
| Guidance - Health | Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels |
|-------------------|---|

4.2. Environment

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

Additional good practice advice beyond the REACH CSA

No data available

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

1. Exposure scenario HFOCARC-68476-33-5-SE5

Use as a fuel (Industrial)

ES Ref.: HFOCARC-68476-33-5-SE5

ES Type: Worker

Version: 1.0

| | |
|-------------------|--|
| Assessment method | The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated Hydrocarbon Block Method (Petrorisk) |
|-------------------|--|

2. Operational conditions and risk management measures

2.1.1. Contributing scenario controlling worker exposure (PROC1, PROC2, PROC3, PROC8a, PROC8b, PROC16)

| Generic exposure scenario | |
|---------------------------|--|
| PROC1 | Use in closed process, no likelihood of exposure |
| PROC2 | Use in closed, continuous process with occasional controlled exposure |
| PROC3 | Use in closed batch process (synthesis or formulation) |
| PROC8a | Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities |
| PROC8b | Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities |
| PROC16 | Using material as fuel sources, limited exposure to unburned product to be expected |

| Product characteristics | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

| Operational conditions | | |
|---|--|--|
| Frequency and duration of use | Covers daily exposures up to 8 hours | |
| Other given operational conditions affecting workers exposure | Assumes use at not more than 20°C above ambient temperature. | |
| | Assumes a good basic standard of occupational hygiene is implemented | |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

| Risk Management Measures | | |
|--|---|--------------------------------|
| Organisational measures to prevent/limit releases, dispersion and exposure | 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. | General measures (carcinogens) |
| | Avoid contact with contaminated tools and objects | |
| | Management/supervision in place to check that RMMs on place are being used correctly and OCs followed | |
| | Training staff on good practice | |
| | Avoid splashes and spills | |

2.1.2. Contributing scenario controlling worker exposure

General exposures (closed systems)

Product characteristics

| | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

Operational conditions

| | |
|-------------------------------|---|
| Frequency and duration of use | Avoid carrying out activities involving exposure for more than 4 hours per day. |
|-------------------------------|---|

Risk Management Measures

| | | |
|---|--|--|
| Technical conditions and measures at process level (source) to prevent release | Handle substance within a closed system | |
| | Sample via a closed loop or other system to avoid exposure | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training | |

2.1.3. Contributing scenario controlling worker exposure

General exposures (closed systems) + Product sampling

Product characteristics

| | |
|--------------------------|--------|
| Physical form of product | Liquid |
|--------------------------|--------|

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

| Product characteristics | |
|---------------------------------------|--|
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

| Operational conditions | |
|-------------------------------|--|
| Frequency and duration of use | Avoid carrying out activities involving exposure for more than 1 hour per day. |

| Risk Management Measures | |
|---|--|
| Technical conditions and measures at process level (source) to prevent release | Handle substance within a closed system |
| | Sample via a closed loop or other system to avoid exposure |
| | Provide a good standard of controlled ventilation (10 to 15 air changes per hour) |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training |

2.1.4. Contributing scenario controlling worker exposure

bulk closed unloading + Outdoor

| Product characteristics | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

| Operational conditions | |
|-------------------------------|---|
| Frequency and duration of use | Avoid carrying out activities involving exposure for more than 4 hours per day. |

| Risk Management Measures | |
|---|--|
| Technical conditions and measures at process level (source) to prevent release | Transfer via enclosed lines |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training |

2.1.5. Contributing scenario controlling worker exposure

Drum/batch transfers

| Product characteristics | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

| Operational conditions | |
|-------------------------------|--|
| Frequency and duration of use | Avoid carrying out activities involving exposure for more than 1 hour per day. |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

Risk Management Measures

| | | |
|---|--|--|
| Technical conditions and measures at process level (source) to prevent release | Ensure material transfers are under containment or extract ventilation. or. Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training | |

2.1.6. Contributing scenario controlling worker exposure

Operation of solids filtering equipment

Product characteristics

| | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

Operational conditions

| | | |
|-------------------------------|---|--|
| Frequency and duration of use | Avoid carrying out activities involving exposure for more than 4 hours per day. | |
|-------------------------------|---|--|

Risk Management Measures

| | | |
|---|--|--|
| Technical conditions and measures at process level (source) to prevent release | Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training | |

2.1.7. Contributing scenario controlling worker exposure

Bulk product storage

Product characteristics

| | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

Operational conditions

| | | |
|-------------------------------|---|--|
| Frequency and duration of use | Avoid carrying out activities involving exposure for more than 4 hours per day. | |
|-------------------------------|---|--|

Risk Management Measures

| | | |
|---|--|--|
| Technical conditions and measures at process level (source) to prevent release | Store substance within a closed system | |
| | Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training | |

2.1.8. Contributing scenario controlling worker exposure

Use as a fuel Closed systems

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

Product characteristics

| | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

Operational conditions

No additional information

Risk Management Measures

| | |
|---|--|
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training |
|---|--|

2.1.9. Contributing scenario controlling worker exposure

Equipment cleaning and maintenance

Product characteristics

| | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

Operational conditions

No additional information

Risk Management Measures

| | | |
|---|---|--|
| Technical conditions and measures at process level (source) to prevent release | Drain down and flush system prior to equipment break-in or maintenance | |
| | Retain drain downs in sealed storage pending disposal or for subsequent recycle | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with specific activity training | |

2.2. Contributing scenario controlling environmental exposure (ERC7, ESVOC SPERC 7.12a.v1)

| | |
|----------------------|--|
| ERC7 | Industrial use of substances in closed systems |
| ESVOC SPERC 7.12a.v1 | Use as a fuel: Industrial (SU3) |

Product characteristics

| | |
|-------------------------------|--|
| Physical form of product | Liquid |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |
| Other product characteristics | Substance is complex UVCB, Predominantly hydrophobic |

Operational conditions

| | | |
|--------------|--|--------------|
| Amounts used | Fraction of EU tonnage used in region: | 0.1 |
| | Regional use tonnage | 5900000 t/yr |
| | Fraction of Regional tonnage used locally: | 0.26 |
| | Annual site tonnage (tons/year): | 1500000 t/yr |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

| Operational conditions | | |
|---|-------------------------------------|----------------|
| | Maximum daily site tonnage (kg/d): | 5000000 kg/day |
| Frequency and duration of use | Continuous release | |
| | Emission days | 300 days/yr |
| Environmental factors not influenced by risk management | Local freshwater dilution factor: | 10 |
| | Local marine water dilution factor: | 100 |

| Risk Management Measures | | |
|--|--|------------------------|
| Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil | 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 of | ≥ 92.5 % |
| | If discharging to municipal sewage treatment plant, provide the required onsite wastewater removal efficiency of | ≥ 0 % |
| Conditions and measures related to sewage treatment plant | Estimated substance removal from wastewater via municipal sewage treatment | 94.2 % |
| | Total efficiency of removal from wastewater after onsite and offsite municipal treatment plant) RMMs | 94.2 % |
| | Maximum allowable site tonnage (MSafe) based on release following total wastewater treatment removal | 5400000 |
| | Assumed domestic sewage treatment plant flow | 2000 m ³ /d |
| Conditions and measures related to external treatment of waste for disposal | Do not apply industrial sludge to natural soils | |
| | Sewage sludge should be incinerated, contained or reclaimed. | |
| | Combustion emissions limited by required exhaust emission controls | |
| | Combustion emissions considered in regional exposure assessment | |
| | External treatment and disposal of waste should comply with applicable local and/or national regulations | |
| Conditions and measures related to external recovery of waste | This substance is consumed during use and no waste of the substance is generated | |

3. Exposure estimation and reference to its source

3.1. Health

| Information for contributing exposure scenario | |
|--|---|
| 2.1.1 | Available hazard data do not enable the derivation of a DNEL for carcinogenic effects, Available hazard data do not support the need for a DNEL to be established for other health effects, Risk Management Measures are based on qualitative risk characterisation |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

3.2. Environment

Information for contributing exposure scenario

2.2 Risk from environmental exposure is driven by freshwater sediment

| Environmental exposure | Unit | Exposure estimation | PNEC | RCR | Assessment method |
|------------------------|------|---------------------|------|--------|-------------------|
| Freshwater | | | | ≤ 0.77 | |

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

4.1. Health

| | |
|-------------------|---|
| Guidance - Health | Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels |
|-------------------|---|

4.2. Environment

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

Additional good practice advice beyond the REACH CSA

No data available

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

1. Exposure scenario HFOCARC-68476-33-5-SE6

Use as a fuel (Professional)

ES Ref.: HFOCARC-68476-33-5-SE6

ES Type: Worker

Version: 1.0

| | |
|-------------------|--|
| Assessment method | The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated Hydrocarbon Block Method (Petrorisk) |
|-------------------|--|

2. Operational conditions and risk management measures

2.1.1. Contributing scenario controlling worker exposure (PROC1, PROC2, PROC3, PROC8a, PROC8b, PROC16)

| Generic exposure scenario | |
|---------------------------|--|
| PROC1 | Use in closed process, no likelihood of exposure |
| PROC2 | Use in closed, continuous process with occasional controlled exposure |
| PROC3 | Use in closed batch process (synthesis or formulation) |
| PROC8a | Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities |
| PROC8b | Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities |
| PROC16 | Using material as fuel sources, limited exposure to unburned product to be expected |

| Product characteristics | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

| Operational conditions | | |
|---|--|--|
| Frequency and duration of use | Covers daily exposures up to 8 hours | |
| Other given operational conditions affecting workers exposure | Assumes use at not more than 20°C above ambient temperature. | |
| | Assumes a good basic standard of occupational hygiene is implemented | |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

| Risk Management Measures | | |
|--|---|--------------------------------|
| Organisational measures to prevent/limit releases, dispersion and exposure | 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. | General measures (carcinogens) |
| | Avoid contact with contaminated tools and objects | |
| | Management/supervision in place to check that RMMs on place are being used correctly and OCs followed | |
| | Training staff on good practice | |
| | Avoid splashes and spills | |

2.1.2. Contributing scenario controlling worker exposure

General exposures (closed systems) + Product sampling

Product characteristics

| | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

Operational conditions

| | |
|-------------------------------|--|
| Frequency and duration of use | Avoid carrying out activities involving exposure for more than 1 hour per day. |
|-------------------------------|--|

Risk Management Measures

| | | |
|---|---|--|
| Technical conditions and measures at process level (source) to prevent release | Handle substance within a closed system | |
| | Sample via a closed loop or other system to avoid exposure | |
| | Provide a good standard of controlled ventilation (10 to 15 air changes per hour) | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with specific activity training | |

2.1.3. Contributing scenario controlling worker exposure

General exposures (closed systems)

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

Product characteristics

| | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

Operational conditions

| | |
|-------------------------------|--|
| Frequency and duration of use | Avoid carrying out activities involving exposure for more than 1 hour per day. |
|-------------------------------|--|

Risk Management Measures

| | | |
|---|--|--|
| Technical conditions and measures at process level (source) to prevent release | Handle substance within a closed system | |
| | Sample via a closed loop or other system to avoid exposure | |
| | Provide a good standard of controlled ventilation (10 to 15 air changes per hour) | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training | |

2.1.4. Contributing scenario controlling worker exposure

bulk closed unloading

Product characteristics

| | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

Operational conditions

| |
|---------------------------|
| No additional information |
|---------------------------|

Risk Management Measures

| | | |
|---|---|--|
| Technical conditions and measures at process level (source) to prevent release | Provide a good standard of controlled ventilation (10 to 15 air changes per hour) | |
| | Avoid carrying out operation for more than 1 hour. or. Ensure material transfers are under containment or extract ventilation | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training | |

2.1.5. Contributing scenario controlling worker exposure

Drum/batch transfers

Product characteristics

| | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

Operational conditions

No additional information

Risk Management Measures

| | | |
|---|---|--|
| Technical conditions and measures at process level (source) to prevent release | Provide a good standard of controlled ventilation (10 to 15 air changes per hour) | |
| | Avoid carrying out operation for more than 1 hour. or. Ensure material transfers are under containment or extract ventilation | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training | |

2.1.6. Contributing scenario controlling worker exposure

refuelling

Product characteristics

| | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

Operational conditions

| | | |
|-------------------------------|--|--|
| Frequency and duration of use | Avoid carrying out activities involving exposure for more than 1 hour per day. | |
|-------------------------------|--|--|

Risk Management Measures

| | | |
|---|--|--|
| Technical conditions and measures at process level (source) to prevent release | Ensure material transfers are under containment or extract ventilation | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training | |

2.1.7. Contributing scenario controlling worker exposure

Use as a fuel Closed systems

Product characteristics

| | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

Operational conditions

No additional information

Risk Management Measures

| | | |
|---|--|--|
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training | |
|---|--|--|

2.1.8. Contributing scenario controlling worker exposure

Equipment cleaning and maintenance

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

| Product characteristics | |
|---------------------------------------|--|
| Physical form of product | Liquid |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently) |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |

| Operational conditions |
|---------------------------|
| No additional information |

| Risk Management Measures | | |
|---|---|--|
| Technical conditions and measures at process level (source) to prevent release | Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) | |
| | Drain down system prior to equipment break-in or maintenance | |
| | Retain drain downs in sealed storage pending disposal or for subsequent recycle | |
| Organisational measures to prevent/limit releases, dispersion and exposure | Clear spills immediately | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with specific activity training | |

2.2. Contributing scenario controlling environmental exposure (ERC9a, ERC9b, ESVOC SPERC 9.12b.v1)

| | |
|----------------------|---|
| ERC9a | Wide dispersive indoor use of substances in closed systems |
| ERC9b | Wide dispersive outdoor use of substances in closed systems |
| ESVOC SPERC 9.12b.v1 | Use as a fuel: Professional (SU22) |

| Product characteristics | |
|-------------------------------|--|
| Physical form of product | Liquid |
| Vapour pressure | Liquid, vapour pressure < 0.5 kPa at Standard Temperature and Pressure |
| Other product characteristics | Substance is complex UVCB, Predominantly hydrophobic |

| Operational conditions | | |
|---|--|--------------|
| Amounts used | Fraction of EU tonnage used in region: | 0.1 |
| | Regional use tonnage | 1700000 t/yr |
| | Fraction of Regional tonnage used locally: | 0.0005 |
| | Annual site tonnage (tons/year): | 850 t/yr |
| | Maximum daily site tonnage (kg/d): | 2300 kg/day |
| Frequency and duration of use | Continuous release | |
| | Emission days | 365 days/yr |
| Environmental factors not influenced by risk management | Local freshwater dilution factor: | 10 |
| | Local marine water dilution factor: | 100 |

| Risk Management Measures | | |
|--|---|--|
| Technical conditions and measures at process level (source) to prevent release | Common practices vary across sites thus conservative process release estimates used | |

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

| Risk Management Measures | | |
|--|--|------------------------|
| 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 (primarily ingestion) | |
| | No wastewater treatment required | |
| Organisation measures to prevent/limit release from site | Do not apply industrial sludge to natural soils | |
| | Sewage sludge should be incinerated, contained or reclaimed. | |
| Conditions and measures related to sewage treatment plant | Estimated substance removal from wastewater via municipal sewage treatment | 94.2 % |
| | Total efficiency of removal from wastewater after onsite and offsite municipal treatment plant) RMMs | 94.2 % |
| | Maximum allowable site tonnage (MSafe) based on release following total wastewater treatment removal | 3000 |
| | Assumed domestic sewage treatment plant flow | 2000 m ³ /d |
| Conditions and measures related to external treatment of waste for disposal | Combustion emissions limited by required exhaust emission controls | |
| | Combustion emissions considered in regional exposure assessment | |
| | External treatment and disposal of waste should comply with applicable local and/or national regulations | |
| Conditions and measures related to external recovery of waste | This substance is consumed during use and no waste of the substance is generated | |

3. Exposure estimation and reference to its source

3.1. Health

No data available

3.2. Environment

| Environmental exposure | Unit | Exposure estimation | PNEC | RCR | Assessment method |
|------------------------|------|---------------------|------|----------|-------------------|
| Freshwater | | | | ≤ 0.0047 | |

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

4.1. Health

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

FUEL OIL, RESIDUAL ; LOW SULFUR FUEL OIL (UN 3082)

Annex to the safety data sheet: Exposure scenario

SDS Reference number: RAFF-226 CAS-No.: 68476-33-5 Product form: Substance Physical state: Liquid

4.2. Environment

Guidance - Environment

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

Additional good practice advice beyond the REACH CSA

No data available