SAFETY DATA SHEET
Heavy fuel oil 40...420, low sulphur grade; Neste heavy fuel oil LS 40...LS 420 (PORL40,...,PORL420, PORLS40...PORLS420); PORLSW

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

1.1. Product identifier

Product name
Heavy fuel oil 40...420, low sulphur grade; Neste heavy fuel oil LS 40...LS 420 (PORL40,...,PORL420, PORLS40...PORLS420); PORLSW

Product number
ID 14358

Internal identification
170263, 170248, 170264, 170265, 170246, 170266, 170260, 170267, 170253, 170385, 170391, 170390, 170381, 170380, 170382, 170383; 170710

EU REACH registration number
01-2119474894-22-0010

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

Identified uses
Manufacture of substance Distribution of substance Formulation & (re)packing of substances and mixtures Use as an intermediate Use as a fuel

Uses advised against
Uses in coatings : Professional
Road and construction applications : Professional

1.3. Details of the supplier of the safety data sheet

Supplier
Neste Oyj
Keilaranta 21, Espoo, P.O.B. 95, FIN-00095 NESTE, FINLAND
Tel. +358 10 45811
SDS@neste.com (chemical safety)

1.4. Emergency telephone number

National emergency telephone +358 800 147 111, +358 9 471 977, Poison Information Centre number

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification (SI 2019 No. 720)
Physical hazards Not Classified
Health hazards Acute Tox. 4 - H332 Carc. 1B - H350 Repr. 2 - H361d STOT RE 2 - H373
Environmental hazards Aquatic Acute 1 - H400 Aquatic Chronic 1 - H410

2.2. Label elements

Hazard pictograms

Signal word Danger
Heavy fuel oil 40...420, low sulphur grade; Neste heavy fuel oil LS 40...LS 420 (PORL40,...,PORL420, PORLS40...PORLS420); PORLSW

Hazard statements
- 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
- P260 Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
- P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.
- P273 Avoid release to the environment.
- P308+P313 IF exposed or concerned: Get medical advice/ attention.

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

Contains
Fuel oil, residual

2.3. Other hazards
Combustible liquid. Mainly non-volatile. Unloading gases (Hydrogen sulphide (H2S), Hydrocarbons.) : Irritating to eyes. Irritating to respiratory system. High concentrations can depress the central nervous system. Contact with hot product can cause serious thermal burns.

This product does not contain substances considered to have endocrine disrupting properties at levels of 0.1% or higher.

SECTION 3: Composition/information on ingredients

3.2. Mixtures

<table>
<thead>
<tr>
<th>Fuel oil, residual</th>
<th>~ 100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS number: 68476-33-5</td>
<td>EC number: 270-675-6</td>
</tr>
<tr>
<td>M factor (Acute) = 1</td>
<td>M factor (Chronic) = 1</td>
</tr>
</tbody>
</table>

Classification
- Acute Tox. 4 - H332
- Carc. 1B - H350
- Repr. 2 - H361d
- STOT RE 2 - H373
- Aquatic Acute 1 - H400
- Aquatic Chronic 1 - H410

The Full Text for all R-Phrases and Hazard Statements are Displayed in Section 16.

Other information
- Mixture of a petroleum product and additives., Substance of Unknown or Variable composition, Complex reaction products or Biological materials (UVCB).

SECTION 4: First aid measures

4.1. Description of first aid measures

Inhalation
Obtain medical attention if oil mist is inhaled (risk of chemicals pneumonitis). Unloading gases (Hydrogen sulphide (H2S), Hydrocarbons.) : Move affected person to fresh air and keep warm and at rest in a position comfortable for breathing. If breathing stops, provide artificial respiration. For breathing difficulties, oxygen may be necessary. Get medical attention.

Ingestion
Do not induce vomiting. Get medical attention if symptoms are severe or persist.
Heavy fuel oil 40...420, low sulphur grade; Neste heavy fuel oil LS 40...LS 420 (PORL40,...,PORL420, PORLS40...PORLS420); PORLSW

Skin contact
Remove contaminated clothing. Wash skin thoroughly with soap and water or use an approved skin cleanser. Do not use the following: Solvent. Continue to rinse for at least 10 minutes. Get medical attention if irritation persists after washing.

Eye contact
Rinse immediately with plenty of water. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention.

4.2. Most important symptoms and effects, both acute and delayed
General information
Repeated exposure may cause skin dryness or cracking. Oil mist: May cause eye and respiratory system irritation. Unloading gases (Hydrogen sulphide (H2S), Hydrocarbons.): Causes eye irritation. Irritating to respiratory system. High concentrations can depress the central nervous system.

4.3. Indication of any immediate medical attention and special treatment needed
Notes for the doctor

SECTION 5: Firefighting measures

5.1. Extinguishing media
Suitable extinguishing media
Foam, carbon dioxide or dry powder.

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

5.2. Special hazards arising from the substance or mixture
Specific hazards
Containers can burst violently or explode when heated, due to excessive pressure build-up.

Hazardous combustion products

5.3. Advice for firefighters
Protective actions during firefighting
Cool containers exposed to heat with water spray and remove them from the fire area if it can be done without risk. Prevent fire extinguishing water from contaminating surface water or the ground water system.

Special protective equipment for firefighters
Wear positive-pressure self-contained breathing apparatus (SCBA) and appropriate protective clothing.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
For emergency responders
Keep unnecessary and unprotected personnel away from the spillage. Eliminate all ignition sources if safe to do so.

6.2. Environmental precautions
Environmental precautions
Avoid release to the environment. Stop leak if safe to do so. Avoid the spillage or runoff entering drains, sewers or watercourses. Contain spillage with sand, earth or other suitable non-combustible material. Inform the relevant authorities if environmental pollution occurs (sewers, waterways, soil or air). Risk of soil and ground water contamination.

6.3. Methods and material for containment and cleaning up
Methods for cleaning up
Immediately start clean-up of the liquid and contaminated soil. Allow hot product solidify first (if there is no risk of spreading into the environment). Solid product can be taken up. Stains can be cleaned with a hydrocarbon solvent. Pay attention to the fire and health hazards caused by the product. Wear adequate protective equipment at all operations.
Heavy fuel oil 40...420, low sulphur grade; Neste heavy fuel oil LS 40...LS 420
(PORL40,...,PORL420, PORLS40...PORLS420); PORLSW

6.4. Reference to other sections

Reference to other sections For personal protection, see Section 8. For waste disposal, see Section 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Usage precautions Eliminate all sources of ignition. Take precautionary measures against static discharges. Unloading gases: Avoid inhalation of vapours. (Hydrogen sulphide (H2S), Hydrocarbons.) Provide adequate ventilation. Oil mist: Avoid inhalation of vapours and contact with skin and eyes. Use personal protective equipment and/or local ventilation when needed. Wash hands and any other contaminated areas of the body with soap and water before leaving the work site. Product is usually handled heated. Handling and storage temperature must not exceed the flash point. If there is a risk of contact with hot product, all protective equipment worn should be suitable for use with high temperatures. During tank operations follow special instructions (risk of oxygen displacement, hydrogen sulfide and hydrocarbons).

7.2. Conditions for safe storage, including any incompatibilities

Storage precautions Flammable liquid storage. Can be stored heated. Store in a demarcated bunded area to prevent release to drains and/or watercourses. Change contaminated thermal insulation material (autoignition hazard). Store away from the following materials: Oxidising agents. Use containers made of the following materials: Carbon steel. Stainless steel.

7.3. Specific end use(s)

Specific end use(s) Not known.

SECTION 8: Exposure controls/Personal protection

8.1. Control parameters

Occupational exposure limits Oil mist: 5 mg/m3 (8h) HTP 2020/FIN. Hydrogen sulfide: 5 ppm (8h), 7 mg/m3 (8h), 10 ppm (15 min), 14 mg/m3 (15 min) HTP 2020/FIN, EU OELV (EC/2009/161).

Fuel oil, residual (CAS: 68476-33-5)

<table>
<thead>
<tr>
<th>DNEL</th>
<th>Workers - Inhalation; Short term systemic effects: 4700 mg/m², (15 min), Aerosol Workers - Inhalation; Long term systemic effects: 0,18 mg/m², (8h), Aerosol Workers - Dermal; Long term systemic effects: 0,065 mg/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>PNEC</td>
<td>- Oral; 66,7 mg/kg (food, secondary poisoning)</td>
</tr>
</tbody>
</table>

8.2. Exposure controls

Appropriate engineering controls All handling should only take place in well-ventilated areas. Use personal protective equipment and/or local ventilation when needed. If there is a risk of contact with hot product, all protective equipment worn should be suitable for use with high temperatures. Handle in accordance with good industrial hygiene and safety practice.

Eye/face protection Tight-fitting safety glasses. Face shield when needed.

Hand protection Thick, thermally insulated protective gloves. It is recommended that gloves are made of the following material: Polyvinyl chloride (PVC). Nitrile rubber. Change protective gloves regularly. Protective gloves according to standards EN 374 and EN 407.

Other skin and body protection Protective clothing when needed. If there is a risk of contact with hot product, all protective equipment worn should be suitable for use with high temperatures.
Heavy fuel oil 40...420, low sulphur grade; Neste heavy fuel oil LS 40...LS 420 (PORL40,...,PORL420, PORLS40...PORLS420); PORLSW

Respiratory protection
Filter device/full mask Combination filter, type A2/P3. (B2) Filter device could be used maximum 2 hours at a time. Filter devices must not be used in conditions where the oxygen level is low (< 19 vol.-%). At high concentrations a breathing apparatus must be used (self-contained or fresh air hose breathing apparatus). Filter must be changed often enough. Respirators according standards EN 136 and EN 140.

Environmental exposure controls
Take precautions against leakage by constructing collecting pools and sewerage systems as well as by surfacing the loading and unloading stations.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Liquid</td>
</tr>
<tr>
<td>Colour</td>
<td>Black</td>
</tr>
<tr>
<td>Odour</td>
<td>Strong. Characteristic.</td>
</tr>
<tr>
<td>Odour threshold</td>
<td>-</td>
</tr>
<tr>
<td>pH</td>
<td>-</td>
</tr>
<tr>
<td>Melting point</td>
<td>Pour point &lt; 30°C (ISO 3016)</td>
</tr>
<tr>
<td>Initial boiling point and range</td>
<td>150... &gt; 750°C</td>
</tr>
<tr>
<td>Flash point</td>
<td>≥ 65°C</td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>-</td>
</tr>
<tr>
<td>Upper/lower flammability or</td>
<td>Lower flammable/explosive limit: ~ 1% Upper flammable/explosive limit: ~ 6 %</td>
</tr>
<tr>
<td>explosive limits</td>
<td></td>
</tr>
<tr>
<td>Vapour pressure</td>
<td>&lt; 1 kPa @ 38°C</td>
</tr>
<tr>
<td>Vapour density</td>
<td>-</td>
</tr>
<tr>
<td>Relative density</td>
<td>~ 0.9 - 1.0 @ 15/4°C</td>
</tr>
<tr>
<td>Solubility(ies)</td>
<td>The product has poor water-solubility.</td>
</tr>
<tr>
<td>Partition coefficient</td>
<td>log Kow: 4 - &gt; 6</td>
</tr>
<tr>
<td>Auto-ignition temperature</td>
<td>&gt; 400°C</td>
</tr>
<tr>
<td>Decomposition Temperature</td>
<td>-</td>
</tr>
<tr>
<td>Viscosity</td>
<td>Kinematic viscosity ≥ 20 mm²/s @ 50°C</td>
</tr>
<tr>
<td>Explosive properties</td>
<td>Not considered to be explosive.</td>
</tr>
<tr>
<td>Oxidising properties</td>
<td>Does not meet the criteria for classification as oxidising.</td>
</tr>
</tbody>
</table>

9.2. Other information
Not known.

SECTION 10: Stability and reactivity

10.1. Reactivity
Reactivity
There are no known reactivity hazards associated with this product.

10.2. Chemical stability
Stability
Stable at normal ambient temperatures and when used as recommended.
Heavy fuel oil 40...420, low sulphur grade; Neste heavy fuel oil LS 40...LS 420 (PORL40,...,PORL420, PORLS40...PORLS420); PORLSW

10.3. Possibility of hazardous reactions
Possibility of hazardous reactions
No potentially hazardous reactions known.

10.4. Conditions to avoid
Conditions to avoid
Keep away from heat, sparks and open flame.

10.5. Incompatible materials
Materials to avoid
Oxidising agents.

10.6. Hazardous decomposition products
Hazardous decomposition products
Hydrogen sulphide (H2S). Combustion ash contains inorganic nickel and vanadium compounds, which are hazardous to health.

SECTION 11: Toxicological information

11.1. Information on toxicological effects
Toxicological effects
Harmful if inhaled.

Acute toxicity - inhalation
ATE inhalation (dusts/mists mg/l) 1.5

Skin corrosion/irritation
Skin corrosion/irritation
Repeated exposure may cause skin dryness or cracking. Based on available data the classification criteria are not met. (OECD 404)

Serious eye damage/irritation
Based on available data the classification criteria are not met. (EC B.5)

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

Skin sensitisation
Based on available data the classification criteria are not met. (OECD 406)

Germ cell mutagenicity
Based on available data the classification criteria are not met. (OECD 471, 476)

Genotoxicity - in vitro
Based on available data the classification criteria are not met. (OECD 475, EC B.12)

Carcinogenicity
May cause cancer. (OECD 451)

Reproductive toxicity
Reproductive toxicity - fertility
Based on available data the classification criteria are not met.

Reproductive toxicity - development
Suspected of damaging the unborn child. (EPA OTS 798.4900)

Specific target organ toxicity - single exposure
STOT - single exposure
No adverse effects known.

Specific target organ toxicity - repeated exposure
STOT - repeated exposure
May cause damage to organs through prolonged or repeated exposure. (EPA OPPTS 870.3250)
Heavy fuel oil 40...420, low sulphur grade; Neste heavy fuel oil LS 40...LS 420 (PORL40,...,PORL420, PORLS40...PORLS420); PORLSW

Aspiration hazard
Based on available data the classification criteria are not met.

General information
Especially fresh product may contain traces of highly toxic hydrogen sulphide, which irritates severely eyes and respiratory tract. High concentrations can depress the central nervous system. The product contains traces of nickel and vanadium compounds, which are hazardous to health.

This product does not contain substances considered to have endocrine disrupting properties at levels of 0.1% or higher.

Toxicological information on ingredients.

Fuel oil, residual

Acute toxicity - oral
Notes (oral LD₅₀) LD₅₀ 4320 - 5270 mg/kg, Oral, Rat (OECD 401)

Acute toxicity - dermal
Notes (dermal LD₅₀) LD₅₀ > 2000 mg/kg, Dermal, Rabbit (EC B.3, OECD 434)

Acute toxicity - inhalation
Notes (inhalation LC₅₀) LC₅₀ 4100 mg/m³, Inhalation, Rat (EPA OTS 798.1150)
ATE inhalation (dusts/mists mg/l) 1.5

SECTION 12: Ecological information

12.1. Toxicity
Toxicity Very toxic to aquatic life with long lasting effects.

Ecological information on ingredients.

Fuel oil, residual

Acute aquatic toxicity
LE(C)₅₀ 0.1 < L(E)C50 ≤ 1
M factor (Acute) 1

Acute toxicity - fish
LL₅₀, 96 hours: 79 mg/l, Oncorhynchus mykiss (Rainbow trout) WAF (OECD 203)

Acute toxicity - aquatic invertebrates
EL₅₀, 48 hours: 0,22 mg/l, Daphnia magna WAF (OECD 202)

Acute toxicity - aquatic plants
EL₅₀, 72 hours: 0,32 mg/l, Pseudokirchneriella subcapitata WAF (OECD 201)
NOELR, 72 hours: 0,05 mg/l, Pseudokirchneriella subcapitata WAF (EPA-600/9-018)

Acute toxicity - microorganisms
LL₅₀, 72 hours: > 1000 mg/l, Micro-organisms (wastewater sludge), Tetrahymena pyriformis NOEL, 72 hours: 14,9 mg/l, Micro-organisms (wastewater sludge), Tetrahymena pyriformis

Heavy fuel oil (QSAR)
Heavy fuel oil 40...420, low sulphur grade; Neste heavy fuel oil LS 40...LS 420 (PORL40,...,PORL420, PORLS40...PORLS420); PORLSW

Chronic aquatic toxicity

M factor (Chronic) 1

Chronic toxicity - fish early life stage
NOEL, 28 days: 0.1 mg/l, Oncorhynchus mykiss (Rainbow trout)
Heavy fuel oil (QSAR)

Chronic toxicity - aquatic invertebrates
NOEL, 21 days: 0.27 mg/l, Daphnia magna
Heavy fuel oil (QSAR)

12.2. Persistence and degradability

Stability (hydrolysis) Not relevant.

Biodegradation The product is slowly degradable.
Lightest hydrocarbons are volatile.

12.3. Bioaccumulative potential

Bioaccumulative potential Possibly bioaccumulative.

Partition coefficient log Kow: 4 - > 6

12.4. Mobility in soil

Mobility The product is insoluble in water. Mainly non-volatile. The product contains substances which are bound to particulate matter and are retained in soil.

12.5. Results of PBT and vPvB assessment

Results of PBT and vPvB assessment This product does not contain any substances classified as PBT or vPvB.

12.6. Other adverse effects

Other adverse effects Product causes fouling, and direct contact produces harmful effects e.g. to birds and vegetation. Adsorbed hydrocarbon residues can be harmful to sediment organisms.

Endocrine-disrupting properties This product does not contain substances considered to have endocrine disrupting properties at levels of 0.1% or higher.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Disposal methods Dispose of waste to licensed waste disposal site in accordance with the requirements of the local Waste Disposal Authority. When handling waste, the safety precautions applying to handling of the product should be considered. Care should be taken when handling emptied containers that have not been thoroughly cleaned or rinsed out. Product residues retained in emptied containers can be hazardous.

SECTION 14: Transport information

14.1. UN number

UN No. (ADR/RID) 3082

14.2. UN proper shipping name

Proper shipping name (ADR/RID) UN 3082, ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (FUEL OIL)

14.3. Transport hazard class(es)

ADR/RID class 9
14.4. Packing group
ADR/RID packing group III

14.5. Environmental hazards
Environmentally hazardous substance/marine pollutant MARINE POLLUTANT

14.6. Special precautions for user
Hazard Identification Number (ADR/RID) 90
Tunnel restriction code (-)

14.7. Transport in bulk according to Annex II of MARPOL and the IBC Code
Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code No

SECTION 15: Regulatory information

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

15.2. Chemical safety assessment
A chemical safety assessment has been carried out.

SECTION 18: Other information

Abbreviations and acronyms used in the safety data sheet DNEL = Derived No-Effect Level
PNEC = Predicted No-Effect Concentration
NOEL = No Observed Effect Level
VAK = Vaarallisten Aineiden Kuljetus; Finnish Transport Legislation
WAF = Water Accommodated Fraction

Key literature references and sources for data Concawe Report no. 13/17, Chemical Safety Report Heavy Fuel Oil Components (HFO) ; CAS-number 68476-33-5, Fuel oil, residual, 2018.

Revision comments Updated, sections: 2.3, 11, 12. NOTE: Lines within the margin indicate significant changes from the previous revision.

Revision date 29/03/2023
Supersedes date 15/06/2021
SDS number 5680

Hazard statements in full 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.
Heavy fuel oil 40...420, low sulphur grade; Neste heavy fuel oil LS 40...LS 420 (PORL40,...,PORL420, PORLS40...PORLS420); PORLSW

Use Descriptor Codes, Industrial uses
Manufacture of substance, (SU NA; PROC 1, 2, 3, 8a, 8b, 15; ERC 1)
Use as an intermediate, (SU 8, 9; PROC 1, 2, 3, 8a, 8b, 15; ERC 6a)
Distribution of substance, (SU NA; PROC 1, 2, 3, 8a, 8b, 15; ERC 4, 5, 6a, 6b, 6c, 6d, 7)
Formulation & (re)packing of substances and mixtures, (SU NA; PROC 1, 2, 3, 8a, 8b, 15; ERC 2)
Use as a fuel, (SU NA; PROC 1, 2, 3, 8a, 8b, 16; ERC 7)

Use Descriptor Codes, Professional uses
Use as a fuel, (SU NA; PROC 1, 2, 3, 8a, 8b, 16; ERC 9a, 9b)
Exposure scenario
Use of Substance as Intermediate - Industrial

Identification

<table>
<thead>
<tr>
<th>Product name</th>
<th>Fuel oil, residual</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS number</td>
<td>68476-33-5</td>
</tr>
<tr>
<td>EC number</td>
<td>270-675-6</td>
</tr>
<tr>
<td>Version number</td>
<td>2018</td>
</tr>
<tr>
<td>Es reference</td>
<td>ES01b</td>
</tr>
</tbody>
</table>

1. Title of exposure scenario

Main title
Use of Substance as Intermediate - Industrial

Process scope
Use of substance as an intermediate (not related to Strictly Controlled Conditions). Includes recycling/recovery, material transfers, storage, sampling, associated laboratory activities, maintenance and loading (including marine vessel/barge, road/rail car and bulk container).

Sector of use
SU8 Manufacture of bulk, large-scale chemicals (including petroleum products)
SU9 Manufacture of fine chemicals

Environment

Environmental release category: ERC6a Use of intermediate
SPERC: ESVOC SPERC 6.1a.v1

Worker

Process category
PROC1 Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions
PROC2 Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions
PROC3 Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition
PROC8a Transfer of substance or mixture (charging and discharging) at non-dedicated facilities
PROC8b Transfer of substance or mixture (charging and discharging) at dedicated facilities
PROC15 Use as laboratory reagent.

2. Conditions of use affecting exposure (Industrial - Environment 1)

Product characteristics
Substance is complex UVCB. Predominantly hydrophobic.

Amounts used
Fraction of EU tonnage used in region: 0.1
Regional use tonnage: 1.8E+06 tonnes/year
Fraction of Regional tonnage used locally: 8.3E-03
Annual site tonnage: 1.5E+04 tonnes
Maximum daily site tonnage: 5.0E+04 kg

Frequency and duration of use
Continuous release.
Emission days: 300 days/year
# Use of Substance as Intermediate - Industrial

## Other given operational conditions affecting environmental exposure

<table>
<thead>
<tr>
<th>Emission factor - air</th>
<th>Release fraction to air from process (initial release prior to RMM): 1.0E-04</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emission factor - water</td>
<td>Release fraction to wastewater from process (initial release prior to RMM): 9.9E-07</td>
</tr>
<tr>
<td>Emission factor - soil</td>
<td>Release fraction to soil from process (initial release prior to RMM): 0.001</td>
</tr>
</tbody>
</table>

## Environmental factors not influenced by risk management measures

<table>
<thead>
<tr>
<th>Dilution</th>
<th>Local freshwater dilution factor: 10</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Local marine water dilution factor: 100</td>
</tr>
</tbody>
</table>

## Risk management measures

### Good practice

Common practices vary across sites, thus conservative process release estimates used.

Risk from environmental exposure is driven by terrestrial secondary poisoning.

### STP details

Not applicable as there is no release to wastewater.

Estimated substance removal from wastewater via domestic sewage treatment: 94.2%

Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs: 94.2%

Maximum allowable site tonnage (Msafe), based on release following total wastewater treatment removal: 7.3E+04 kg/day

Assumed domestic sewage treatment plant flow (m³/day): 2000.

## Technical onsite conditions and measures to reduce or limit discharges to air, water and soil

### Air

Treat air emission to provide a typical removal efficiency of 80%.

### Water

If discharging to domestic sewage treatment plant, no onsite wastewater treatment required.

Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%): ≥ 0.0. If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of ≥ 0.0%. Prevent discharge of undissolved substance to or recover from onsite waste water.

### Soil

Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.

## Conditions and measures related to external treatment of waste for disposal

### Waste treatment

This substance is consumed during use and no waste of the substance is generated.

## Conditions and measures related to external recovery of waste

### Recovery method

This substance is consumed during use and no waste of the substance is generated.

## 2. Conditions of use affecting exposure (Workers - Health 1)

### Product characteristics

<table>
<thead>
<tr>
<th>Physical state</th>
<th>Liquid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vapour pressure</td>
<td>Vapour pressure &lt; 0.5 kPa at STP.</td>
</tr>
<tr>
<td>Concentration details</td>
<td>Covers percentage substance in the product up to 100% (unless stated differently).</td>
</tr>
<tr>
<td>Frequency and duration of use</td>
<td>Covers daily exposures up to 8 hours (unless stated differently).</td>
</tr>
</tbody>
</table>

## Other given operational conditions affecting workers exposure

### Setting

Assumes a good basic standard of occupational hygiene is implemented.

### Temperature

Operation is carried out at elevated temperature (> 20°C above ambient temperature).
**Use of Substance as Intermediate - Industrial**

**Organisational measures to prevent/limit releases, dispersion and exposure**

**Organisational measures**

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

**Risk management measures**
Use of Substance as Intermediate - Industrial

General exposures (closed systems)
Handle substance within a closed system.
Wear chemically-resistant gloves (tested to EN374) in combination with ‘basic’ employee training.

Process sampling
Outdoor.
Handle substance within a closed system.
Sample via a closed loop or other system to avoid exposure.
Avoid carrying out activities involving exposure for more than 15 minutes.
Wear chemically-resistant gloves (tested to EN374) in combination with ‘basic’ employee training.

Bulk product storage
Store substance within a closed system.
Avoid carrying out activities involving exposure for more than 4 hours.
Wear chemically-resistant gloves (tested to EN374) in combination with ‘basic’ employee training.

Laboratory activities
Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure.
Wear suitable gloves tested to EN374.

Marine vessel/barge (un)loading.
Avoid carrying out activities involving exposure for more than 4 hours.
Transfer via enclosed lines.
Clear transfer lines prior to de-coupling.
Retain drain-downs in sealed storage pending disposal or for subsequent recycle.
Wear chemically-resistant gloves (tested to EN374) in combination with ‘basic’ employee training.

Road tanker/rail car loading.
Ensure material transfers are under containment or extract ventilation.
Wear chemically-resistant gloves (tested to EN374) in combination with ‘basic’ employee training.

Equipment cleaning and maintenance
Drain down and flush system prior to equipment break-in or maintenance.
Wear chemically-resistant gloves (tested to EN374) in combination with specific activity training.
Retain drain-downs in sealed storage pending disposal or for subsequent recycle.

3. Exposure estimation (Environment 1)

Assessment method
Used Petrorisk model. (Hydrocarbon Block Method)

Risk-driving RCR - air compartment driven 6.9E-01
Risk-driving RCR - water compartment driven 1.1E-02

4. Guidance to check compliance with the exposure scenario (Environment 1)
Use of Substance as Intermediate - Industrial

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 onsite 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).

3. Exposure estimation (Health 1)

Assessment method

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

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. Qualitative approach used to conclude safe use.

4. Guidance to check compliance with the exposure scenario (Health 1)

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.
# Exposure scenario
## Distribution of Substance - Industrial

### Identification

<table>
<thead>
<tr>
<th>Product name</th>
<th>Fuel oil, residual</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS number</td>
<td>68476-33-5</td>
</tr>
<tr>
<td>EC number</td>
<td>270-675-6</td>
</tr>
<tr>
<td>Version number</td>
<td>2018</td>
</tr>
<tr>
<td>Es reference</td>
<td>ES01a</td>
</tr>
</tbody>
</table>

### 1. Title of exposure scenario

<table>
<thead>
<tr>
<th>Main title</th>
<th>Distribution of Substance - Industrial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process scope</td>
<td>Loading (including marine vessel/barge, rail/road car and IBC loading) and repacking (including drums and small packs) of substance, including its sampling, storage, unloading distribution and associated laboratory activities.</td>
</tr>
<tr>
<td>Sector of use</td>
<td>NA</td>
</tr>
</tbody>
</table>

### Environment

<table>
<thead>
<tr>
<th>Environmental release category</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERC4 Use of non-reactive processing aid at industrial site (no inclusion into or onto article)</td>
</tr>
<tr>
<td>ERC5 Use at industrial site leading to inclusion into/onto article</td>
</tr>
<tr>
<td>ERC6 Use of intermediate</td>
</tr>
<tr>
<td>ERC6b Use of reactive processing aid at industrial site (no inclusion into or onto article)</td>
</tr>
<tr>
<td>ERC6c Use of monomer in polymerisation processes at industrial site (inclusion or not into/onto article)</td>
</tr>
<tr>
<td>ERC6d Use of reactive process regulators in polymerisation processes at industrial site (inclusion or not into/onto article)</td>
</tr>
<tr>
<td>ERC7 Use of functional fluid at industrial site</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SPERC</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESVOC SPERC 1.1b.v1</td>
</tr>
</tbody>
</table>

### Worker

<table>
<thead>
<tr>
<th>Process category</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROC1 Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions</td>
</tr>
<tr>
<td>PROC2 Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions</td>
</tr>
<tr>
<td>PROC3 Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition</td>
</tr>
<tr>
<td>PROC8a Transfer of substance or mixture (charging and discharging) at non-dedicated facilities</td>
</tr>
<tr>
<td>PROC8b Transfer of substance or mixture (charging and discharging) at dedicated facilities</td>
</tr>
</tbody>
</table>

### 2. Conditions of use affecting exposure (Industrial - Environment 1)

#### Product characteristics

Substance is complex UVCB. Predominantly hydrophobic.

#### Amounts used
Distribution of Substance - Industrial

Fraction of EU tonnage used in region: 0.1
Regional use tonnage: 9.3E+06 tonnes/year
Fraction of Regional tonnage used locally: 2.0E-03
Annual site tonnage: 1.9E+04 tonnes
Maximum daily site tonnage: 6.2E+04 kg

Frequency and duration of use
Continuous release.
Emission days: 300 days/year

Other given operational conditions affecting environmental exposure

Emission factor - air
Release fraction to air from process (initial release prior to RMM): 1.0E-03

Emission factor - water
Release fraction to wastewater from process (initial release prior to RMM): 1.0E-06

Emission factor - soil
Release fraction to soil from process (initial release prior to RMM): 0.00001

Environmental factors not influenced by risk management measures

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

Risk management measures

Good practice
Common practices vary across sites, thus conservative process release estimates used.
Risk from environmental exposure is driven by terrestrial secondary poisoning.

STP details
Not applicable as there is no release to wastewater.
Estimated substance removal from wastewater via domestic sewage treatment: 94.2%
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs: 94.2%
Maximum allowable site tonnage (Msafe), based on release following total wastewater treatment removal: 8.9E+04 kg/day
Assumed domestic sewage treatment plant flow (m³/day): 2000.

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

Air
Treat air emission to provide a typical removal efficiency of 90%.

Water
No wastewater treatment required. Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%): ≥ 0.0. If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of 0.0%.

Soil
Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.

Conditions and measures related to external treatment of waste for disposal

Waste treatment
External treatment and disposal of waste should comply with applicable local and/or national regulations.

Conditions and measures related to external recovery of waste

Recovery method
External recovery and recycling of waste should comply with applicable local and/or national regulations.

2. Conditions of use affecting exposure (Workers - Health 1)

Product characteristics
Physical state Liquid
Distribution of Substance - Industrial

**Vapour pressure**
Vapour pressure < 0.5 kPa at STP.

**Concentration details**
Covers percentage substance in the product up to 100% (unless stated differently).

**Frequency and duration of use**
Covers daily exposures up to 8 hours (unless stated differently).

**Other given operational conditions affecting workers exposure**

**Setting**
Assumes a good basic standard of occupational hygiene is implemented.

**Temperature**
Assumes use at not more than 20°C above ambient temperature, unless stated differently.

**Organisational measures to prevent/limit releases, dispersion and exposure**

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

**Risk management measures**
Distribution of Substance - Industrial

Process sampling
Outdoor.
Sample via a closed loop or other system to avoid exposure.
Avoid carrying out activities involving exposure for more than 15 minutes.
Wear chemically-resistant gloves (tested to EN374) in combination with ‘basic’ employee training.

General exposures (closed systems)
Handle substance within a closed system.
Avoid carrying out activities involving exposure for more than 4 hours.
Sample via a closed loop or other system to avoid exposure.
Wear chemically-resistant gloves (tested to EN374) in combination with ‘basic’ employee training.

Bulk product storage
Store substance within a closed system.
Avoid carrying out activities involving exposure for more than 4 hours.
Wear chemically-resistant gloves (tested to EN374) in combination with ‘basic’ employee training.

Product sampling
Sample via a closed loop or other system to avoid exposure.
Avoid carrying out activities involving exposure for more than 15 minutes.
Wear chemically-resistant gloves (tested to EN374) in combination with ‘basic’ employee training.

Laboratory activities
Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure.
Wear suitable gloves tested to EN374.

Marine vessel/barge (un)loading.
Avoid carrying out activities involving exposure for more than 4 hours.
Transfer via enclosed lines.
Clear transfer lines prior to de-coupling.
Retain drain-downs in sealed storage pending disposal or for subsequent recycle.
Wear chemically-resistant gloves (tested to EN374) in combination with ‘basic’ employee training.

Road tanker/rail car loading.
Ensure material transfers are under containment or extract ventilation.
Wear chemically-resistant gloves (tested to EN374) in combination with ‘basic’ employee training.

Equipment cleaning and maintenance
Drain down and flush system prior to equipment break-in or maintenance.
Wear chemically-resistant gloves (tested to EN374) in combination with specific activity training.
Retain drain-downs in sealed storage pending disposal or for subsequent recycle.

3. Exposure estimation (Environment 1)
**Distribution of Substance - Industrial**

**Assessment method**

Used Petrorisk model. (Hydrocarbon Block Method)

Maximum Risk Characterisation Ratios for air emissions 7.0E-01
Maximum Risk Characterisation Ratios for wastewater emissions 1.3E-02

**4. Guidance to check compliance with the exposure scenario (Environment 1)**

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 onsite 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).

**3. Exposure estimation (Health 1)**

**Assessment method**

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

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. Qualitative approach used to conclude safe use.

**4. Guidance to check compliance with the exposure scenario (Health 1)**

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.
Exposure scenario
Formulation & (Re)packing of Substances and Mixtures - Industrial

Identification

<table>
<thead>
<tr>
<th>Product name</th>
<th>Fuel oil, residual</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS number</td>
<td>68476-33-5</td>
</tr>
<tr>
<td>EC number</td>
<td>270-675-6</td>
</tr>
<tr>
<td>Version number</td>
<td>2018</td>
</tr>
<tr>
<td>Es reference</td>
<td>ES02</td>
</tr>
</tbody>
</table>

1. Title of exposure scenario

<table>
<thead>
<tr>
<th>Main title</th>
<th>Formulation &amp; (Re)packing of Substances and Mixtures - Industrial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process scope</td>
<td>Formulation, packing and re-packing of the substance and its mixtures in batch or continuous operations, including storage, materials transfers, mixing, tableting, compression, pelletisation, extrusion, large and small scale packing, sampling, maintenance and associated laboratory activities.</td>
</tr>
<tr>
<td>Sector of use</td>
<td>NA</td>
</tr>
</tbody>
</table>

Environment

<table>
<thead>
<tr>
<th>Environmental release category</th>
<th>ERC2 Formulation into mixture</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPERC</td>
<td>ESVOC SPERC 2.2.v1</td>
</tr>
</tbody>
</table>

Worker

<table>
<thead>
<tr>
<th>Process category</th>
<th>PROC1 Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PROC2 Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions</td>
</tr>
<tr>
<td></td>
<td>PROC3 Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition</td>
</tr>
<tr>
<td></td>
<td>PROC8a Transfer of substance or mixture (charging and discharging) at non-dedicated facilities</td>
</tr>
<tr>
<td></td>
<td>PROC8b Transfer of substance or mixture (charging and discharging) at dedicated facilities</td>
</tr>
<tr>
<td></td>
<td>PROC15 Use as laboratory reagent.</td>
</tr>
</tbody>
</table>

2. Conditions of use affecting exposure (Industrial - Environment 1)

<table>
<thead>
<tr>
<th>Product characteristics</th>
<th>Substance is complex UVCB. Predominantly hydrophobic.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amounts used</td>
<td>Fraction of EU tonnage used in region: 0.1</td>
</tr>
<tr>
<td></td>
<td>Regional use tonnage: 7.5E+06 tonnes/year</td>
</tr>
<tr>
<td></td>
<td>Fraction of Regional tonnage used locally: 4.0E-03</td>
</tr>
<tr>
<td></td>
<td>Annual site tonnage: 3.0E+04 tonnes</td>
</tr>
<tr>
<td></td>
<td>Maximum daily site tonnage: 100 tonnes</td>
</tr>
<tr>
<td>Frequency and duration of use</td>
<td>Continuous release.</td>
</tr>
<tr>
<td></td>
<td>Emission days: 300 days/year</td>
</tr>
</tbody>
</table>
Formulation & (Re)packing of Substances and Mixtures - Industrial

Other given operational conditions affecting environmental exposure

<table>
<thead>
<tr>
<th>Emission factor - air</th>
<th>Release fraction to air from process (after typical onsite RMMs consistent with EU Solvent Emissions Directive requirements): 2.5E-03</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emission factor - water</td>
<td>Release fraction to wastewater from process (initial release prior to RMM): 9.5E-06</td>
</tr>
<tr>
<td>Emission factor - soil</td>
<td>Release fraction to soil from process (initial release prior to RMM): 0.0001</td>
</tr>
</tbody>
</table>

Environmental factors not influenced by risk management measures

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

Risk management measures

Good practice
- Common practices vary across sites, thus conservative process release estimates used.
- Risk from environmental exposure is driven by terrestrial secondary poisoning.

STP details
- Not applicable as there is no release to wastewater.
- Estimated substance removal from wastewater via domestic sewage treatment: 94.2%
- Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs: 94.2%
- Maximum allowable site tonnage (Msafe), based on release following total wastewater treatment removal: 1.1E+05 kg/day
- Assumed domestic sewage treatment plant flow (m³/day): 2000.

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

Air
- Treat air emission to provide a typical removal efficiency of 0%.

Water
- Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%): ≥ 60.9. If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of 0.0%. Prevent discharge of undissolved substance to or recover from onsite waste water. If discharging to domestic sewage treatment plant, no onsite wastewater treatment required.

Soil
- Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.

Conditions and measures related to external treatment of waste for disposal

Waste treatment
- External treatment and disposal of waste should comply with applicable local and/or national regulations.

Conditions and measures related to external recovery of waste

Recovery method
- External recovery and recycling of waste should comply with applicable local and/or national regulations.

2. Conditions of use affecting exposure (Workers - Health 1)

Product characteristics

<table>
<thead>
<tr>
<th>Physical state</th>
<th>Liquid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vapour pressure</td>
<td>Vapour pressure &lt; 0.5 kPa at STP.</td>
</tr>
<tr>
<td>Concentration details</td>
<td>Covers percentage substance in the product up to 100% (unless stated differently).</td>
</tr>
<tr>
<td>Frequency and duration of use</td>
<td>Covers daily exposures up to 8 hours (unless stated differently).</td>
</tr>
</tbody>
</table>

Other given operational conditions affecting workers exposure
Formulation & (Re)packing of Substances and Mixtures - Industrial

Setting
Assumes a good basic standard of occupational hygiene is implemented.

Temperature
Assumes use at not more than 20°C above ambient temperature, unless stated differently.

Organisational measures to prevent/limit releases, dispersion and exposure

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

Risk management measures
Formulation & (Re)packing of Substances and Mixtures - Industrial

General exposures (closed systems)
Process sampling
Handle substance within a closed system.
Sample via a closed loop or other system to avoid exposure.
Avoid carrying out activities involving exposure for more than 15 minutes.
Wear chemically-resistant gloves (tested to EN374) in combination with ‘basic’ employee training.

General exposures (closed systems)
Handle substance within a closed system.
Sample via a closed loop or other system to avoid exposure.
Avoid carrying out activities involving exposure for more than 4 hours.
Wear chemically-resistant gloves (tested to EN374) in combination with ‘basic’ employee training.

Bulk product storage
Store substance within a closed system.
Avoid carrying out activities involving exposure for more than 4 hours.
Wear chemically-resistant gloves (tested to EN374) in combination with ‘basic’ employee training.

Product sampling
Sample via a closed loop or other system to avoid exposure.
Avoid carrying out activities involving exposure for more than 15 minutes.
Wear chemically-resistant gloves (tested to EN374) in combination with ‘basic’ employee training.

Laboratory activities
Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure.
Wear suitable gloves tested to EN374.

Marine vessel/barge (un)loading.
Transfer via enclosed lines.
Avoid carrying out activities involving exposure for more than 4 hours.
Clear transfer lines prior to de-coupling.
Retain drain-downs in sealed storage pending disposal or for subsequent recycle.
Wear chemically-resistant gloves (tested to EN374) in combination with ‘basic’ employee training.

Road tanker/rail car loading.
Ensure material transfers are under containment or extract ventilation.
Wear chemically-resistant gloves (tested to EN374) in combination with ‘basic’ employee training.

Drum/batch transfers
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.
Avoid carrying out activities involving exposure for more than 1 hour.
Wear chemically-resistant gloves (tested to EN374) in combination with ‘basic’ employee training.

Equipment cleaning and maintenance
Formulation & (Re)packing of Substances and Mixtures - Industrial

Drain down and flush system prior to equipment break-in or maintenance.
Wear chemically-resistant gloves (tested to EN374) in combination with specific activity training.
Retain drain-downs in sealed storage pending disposal or for subsequent recycle.

3. Exposure estimation (Environment 1)

Assessment method
Used Petrorisk model. (Hydrocarbon Block Method)

Maximum Risk Characterisation Ratios for air emissions 7.0E-01
Maximum Risk Characterisation Ratios for wastewater emissions 1.5E-01

4. Guidance to check compliance with the exposure scenario (Environment 1)

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 onsite 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).

3. Exposure estimation (Health 1)

Assessment method
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated

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. Qualitative approach used to conclude safe use.

4. Guidance to check compliance with the exposure scenario (Health 1)

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.
Exposure scenario
Use as a Fuel - Industrial

1. Title of exposure scenario

Main title
Use as a Fuel - Industrial

Process scope
Covers the use as a fuel (or fuel additive) and includes activities associated with its transfer, use, equipment maintenance and handling of waste.

Sector of use
NA

Environment

Environmental release category
ERC7 Use of functional fluid at industrial site

SPERC
ESVOC SPERC 7.12a.v1

Worker

Process category
PROC1 Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions
PROC2 Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions
PROC3 Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition
PROC8a Transfer of substance or mixture (charging and discharging) at non-dedicated facilities
PROC8b Transfer of substance or mixture (charging and discharging) at dedicated facilities
PROC16 Use of fuels

2. Conditions of use affecting exposure (Industrial - Environment 1)

Product characteristics
Substance is complex UVCB. Predominantly hydrophobic.

Amounts used
Fraction of EU tonnage used in region: 0.1
Regional use tonnage: 5.9E+06 tonnes/year
Fraction of Regional tonnage used locally: 2.6E-01
Annual site tonnage: 1.5E+06 tonnes
Maximum daily site tonnage: 5000 tonnes

Frequency and duration of use
Continuous release.
Emission days: 300 days/year

Other given operational conditions affecting environmental exposure
Use as a Fuel - Industrial

**Emission factor - air**
Release fraction to air from process (initial release prior to RMM): 2.0E-04

**Emission factor - water**
Release fraction to wastewater from process (initial release prior to RMM): 1.9E-07

**Emission factor - soil**
Release fraction to soil from process (initial release prior to RMM): 0

**Environmental factors not influenced by risk management measures**

**Dilution**
- Local freshwater dilution factor: 10
- Local marine water dilution factor: 100

**Risk management measures**

**Good practice**
Common practices vary across sites, thus conservative process release estimates used.

Risk from environmental exposure is driven by terrestrial secondary poisoning.

**STP details**
Not applicable as there is no release to wastewater.
Estimated substance removal from wastewater via domestic sewage treatment: 94.2%
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs: 94.2%
Maximum allowable site tonnage (Msafe), based on release following total wastewater treatment removal: 7.2E+06 kg/day
Assumed domestic sewage treatment plant flow (m³/day): 2000.

**Technical onsite conditions and measures to reduce or limit discharges to air, water and soil**

**Air**
Treat air emission to provide a typical removal efficiency of 95%.

**Water**
If discharging to domestic sewage treatment plant, no onsite wastewater treatment required.
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%): ≥ 61.1. If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of 0.0%.

**Soil**
Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.

**Conditions and measures related to external treatment of waste for disposal**

**Waste treatment**
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**

**Recovery method**
This substance is consumed during use and no waste of the substance is generated.

### 2. Conditions of use affecting exposure (Workers - Health 1)

**Product characteristics**

**Physical state**
Liquid

**Vapour pressure**
Vapour pressure < 0.5 kPa at STP.

**Concentration details**
Covers percentage substance in the product up to 100% (unless stated differently).

**Frequency and duration of use**
Covers daily exposures up to 8 hours (unless stated differently).

**Other given operational conditions affecting workers exposure**

**Setting**
Assumes a good basic standard of occupational hygiene is implemented.

**Temperature**
Assumes use at not more than 20°C above ambient temperature, unless stated differently.
Use as a Fuel - Industrial

Organisational measures to prevent/limit releases, dispersion and exposure

Organisational measures

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

Risk management measures
Use as a Fuel - Industrial

General exposures (closed systems)
Handle substance within a closed system.
Sample via a closed loop or other system to avoid exposure.
Avoid carrying out activities involving exposure for more than 4 hours.
Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

General exposures (closed systems)
Product sampling
Handle substance within a closed system.
Sample via a closed loop or other system to avoid exposure.
Avoid carrying out activities involving exposure for more than 1 hour.
Provide a good standard of controlled ventilation (10 to 15 air changes per hour).
Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

Bulk closed unloading
Outdoor.
Transfer via enclosed lines.
Avoid carrying out activities involving exposure for more than 4 hours.
Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

Drum/batch transfers
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).
Avoid carrying out activities involving exposure for more than 1 hour.
Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

Operation of solids filtering equipment
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Avoid carrying out activities involving exposure for more than 4 hours.
Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

Bulk product storage
Store substance within a closed system.
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Avoid carrying out activities involving exposure for more than 4 hours.
Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

Use as a fuel
(closed systems)
Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

Equipment cleaning and maintenance
Drain down and flush system prior to equipment break-in or maintenance.
Wear chemically-resistant gloves (tested to EN374) in combination with specific activity training.
Retain drain-downs in sealed storage pending disposal or for subsequent recycle.
Use as a Fuel - Industrial

3. Exposure estimation (Environment 1)

**Assessment method**

Used Petrorisk model. (Hydrocarbon Block Method)

Maximum Risk Characterisation Ratios for air emissions 6.9E-01
Maximum Risk Characterisation Ratios for wastewater emissions 1.5E-01

4. Guidance to check compliance with the exposure scenario (Environment 1)

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 onsite 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).

3. Exposure estimation (Health 1)

**Assessment method**

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

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. Qualitative approach used to conclude safe use.

4. Guidance to check compliance with the exposure scenario (Health 1)

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.
## Exposure scenario

**Use as a Fuel - Professional**

### Identification

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product name</strong></td>
<td>Fuel oil, residual</td>
</tr>
<tr>
<td><strong>CAS number</strong></td>
<td>68476-33-5</td>
</tr>
<tr>
<td><strong>EC number</strong></td>
<td>270-675-6</td>
</tr>
<tr>
<td><strong>Version number</strong></td>
<td>2018</td>
</tr>
<tr>
<td><strong>Es reference</strong></td>
<td>ES12b</td>
</tr>
</tbody>
</table>

### 1. Title of exposure scenario

- **Main title**: Use as a Fuel - Professional
- **Process scope**: Covers the use as a fuel (or fuel additive) and includes activities associated with its transfer, use, equipment maintenance and handling of waste.
- **Sector of use**: NA

### Environment

- **Environmental release category**: ERC9a Widespread use of functional fluid (indoor)
- **ERC9b Widespread use of functional fluid (outdoor)**
- **SPERC**: ESVOC SPERC 9.12b.v1

### Worker

- **Process category**: PROC1 Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions
- PROC2 Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions
- PROC3 Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition
- PROC8a Transfer of substance or mixture (charging and discharging) at non-dedicated facilities
- PROC8b Transfer of substance or mixture (charging and discharging) at dedicated facilities
- PROC16 Use of fuels

### 2. Conditions of use affecting exposure (Industrial - Environment 1)

- **Product characteristics**: Substance is complex UVCB. Predominantly hydrophobic.
- **Amounts used**: Fraction of EU tonnage used in region: 0.1
  
  Regional use tonnage: 1.7E+06 tonnes/year
  
  Fraction of Regional tonnage used locally: 5.0E-04
  
  Annual site tonnage: 8.5E+02 tonnes
  
  Maximum daily site tonnage: 2.3E+03 kg

- **Frequency and duration of use**: Continuous release.
  
  Emission days: 365 days/year

- **Other given operational conditions affecting environmental exposure**
Use as a Fuel - Professional

**Emission factor - air**
Release fraction to air from wide dispersive use (regional only): 1.0E-04

**Emission factor - water**
Release fraction to wastewater from wide dispersive use: 7.0E-10

**Emission factor - soil**
Release fraction to soil from wide dispersive use (regional only): 0.00001

**Environmental factors not influenced by risk management measures**

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

**Risk management measures**

**Good practice**
Common practices vary across sites, thus conservative process release estimates used.

Risk from environmental exposure is driven by humans via indirect exposure (primarily ingestion).

**STP details**
Not applicable as there is no release to wastewater.

Estimated substance removal from wastewater via domestic sewage treatment: 94.2%
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs: 94.2%
Maximum allowable site tonnage (Msafe), based on release following total wastewater treatment removal: 3.8E+03 kg/day
Assumed domestic sewage treatment plant flow (m³/day): 2000.

**Technical onsite conditions and measures to reduce or limit discharges to air, water and soil**

**Air**
Treat air emission to provide a typical removal efficiency of N/A%.

**Water**
No wastewater treatment required. Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%): ≥ 0.0. If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of 0.0%.

**Soil**
Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.

**Conditions and measures related to external treatment of waste for disposal**

**Waste treatment**
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**

**Recovery method**
This substance is consumed during use and no waste of the substance is generated.

**2. Conditions of use affecting exposure (Workers - Health 1)**

**Product characteristics**

**Physical state**
Liquid

**Vapour pressure**
Vapour pressure < 0.5 kPa at STP.

**Concentration details**
Covers percentage substance in the product up to 100% (unless stated differently).

**Frequency and duration of use**
Covers daily exposures up to 8 hours (unless stated differently).

**Other given operational conditions affecting workers exposure**

**Setting**
Assumes a good basic standard of occupational hygiene is implemented.

**Temperature**
Assumes use at not more than 20°C above ambient temperature, unless stated differently.
Use as a Fuel - Professional

Organisational measures to prevent/limit releases, dispersion and exposure

Organisational measures

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

Risk management measures
Use as a Fuel - Professional

General exposures (closed systems)
Product sampling
Handle substance within a closed system.
Sample via a closed loop or other system to avoid exposure.
Avoid carrying out activities involving exposure for more than 1 hour.
Provide a good standard of controlled ventilation (10 to 15 air changes per hour).
Wear chemically-resistant gloves (tested to EN374) in combination with specific activity training.

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Handle substance within a closed system.
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Avoid carrying out activities involving exposure for more than 1 hour.
Provide a good standard of controlled ventilation (10 to 15 air changes per hour).
Wear chemically-resistant gloves (tested to EN374) in combination with ‘basic’ employee training.

Bulk closed unloading
Provide a good standard of controlled ventilation (10 to 15 air changes per hour).
Wear chemically-resistant gloves (tested to EN374) in combination with ‘basic’ employee training.
Avoid carrying out activities involving exposure for more than 1 hour.
, or:
Ensure material transfers are under containment or extract ventilation.

Drum/batch transfers
Provide a good standard of controlled ventilation (10 to 15 air changes per hour).
Wear chemically-resistant gloves (tested to EN374) in combination with ‘basic’ employee training.
Avoid carrying out activities involving exposure for more than 1 hour.
, or:
Ensure material transfers are under containment or extract ventilation.

Refuelling
Ensure material transfers are under containment or extract ventilation.
Wear chemically-resistant gloves (tested to EN374) in combination with ‘basic’ employee training.
Avoid carrying out activities involving exposure for more than 1 hour.

Use as a fuel
(closed systems)
Wear chemically-resistant gloves (tested to EN374) in combination with ‘basic’ employee training.

Equipment cleaning and maintenance
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Wear chemically-resistant gloves (tested to EN374) in combination with specific activity training.
Drain down and flush system prior to equipment break-in or maintenance.
Retain drain-downs in sealed storage pending disposal or for subsequent recycle.
Clear spills immediately.

3. Exposure estimation (Environment 1)
### Use as a Fuel - Professional

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<thead>
<tr>
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<tr>
<td></td>
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#### 4. Guidance to check compliance with the exposure scenario (Environment 1)

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