

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

1.1. Product identifier

Chemical type	: Substance
Substance name	: Fuel oil, residual
Trade name	: Fuel Oil Exportation
EC index no	: 649-024-00-9
EC no	: 270-675-6
CAS No.	: 68476-33-5
REACH registration No.	: 01-2119474894-22-0084
Product code	: 67Z, SDS # PbR0269
Synonyms	: None known.

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

1.2.1. Relevant identified uses

Use of the substance/preparation	: Manufacture of substances Intermediate Formulation [mixing] of preparations and/or re-packaging Coatings Building and construction work. Road work Fuels
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1.2.2. Uses advised against

No additional information available

1.3. Details of the supplier of the safety data sheet

Petrobras International Braspetro B.V. – PIB BV
Prins Bernhardplein 200, 1097 – JB Amsterdam
The Netherlands

All communications shall be addressed exclusively to the following address:
Petrobras Europe Ltd
4th Floor, 20 North Audley Street
London W1K 6WL – United Kingdom
Fax number: +44(0) 20 7355 8750
E-mail: reach@petrobras.com.br

1.4. Emergency telephone number

Emergency number	: For Chemical Emergency, Spill, Leak, Fire, Exposure or Accident Call CHEMTREC Day or Night Within USA and Canada: 1-800-424-9300 Outside USA and Canada (collect calls accepted): 1-703-527-3887
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SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

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

Acute Tox. 4 (Inhalation)	H332
Carc. 1B	H350
Repr. 2	H361
STOT RE 2	H373
Aquatic Acute 1	H400
Aquatic Chronic 1	H410

Full text of H-phrases: see section 16.

Classification according to Directive 67/548/EEC or 1999/45/EC

Xn; R20
Xn; R48/21
R66
Repr.Cat.2; R63
N; R50/53
Carc.Cat.1; R45

Full text of R-phrases: see section 16.

Adverse physicochemical, human health and environmental effects

Repeated exposure may cause skin dryness or cracking. Prolonged/repetitive skin contact may cause skin defatting or dermatitis. Depression of the central nervous system. The inhalation of airborne droplets or aerosols causes irritation of the respiratory tract.

Fuel Oil Exportation

Safety Data Sheet

according to Regulation (EC) No. 453/2010

2.2. Label elements

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

Hazard pictograms (CLP) :



GHS07

GHS08

GHS09

Signal word (CLP) :

Danger

Hazard statements (CLP) :

H332 - Harmful if inhaled
H350 - May cause cancer
H361 - Suspected of damaging fertility or the unborn child
H373 - May cause damage to organs (blood, liver, thymus) through prolonged or repeated exposure
H410 - Very toxic to aquatic life with long lasting effects
H400 - Very toxic to aquatic life

Precautionary statements (CLP) :

P201 - Obtain special instructions before use
P260 - Do not breathe mist, spray, vapours.
P273 - Avoid release to the environment
P281 - Use personal protective equipment as required
P308+P313 - IF exposed or concerned: Get medical advice/attention
P501 - Dispose of contents/container to Comply with applicable local, national and international regulation..

EUH phrases

: EUH066 - Repeated exposure may cause skin dryness or cracking

2.3. Other hazards

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

other hazards which do not result in classification

: Combustible liquid.

SECTION 3: Composition/information on ingredients

3.1. Substances

Name	Product identifier	%	Classification according to Directive 67/548/EEC
Fuel oil, residual	(CAS No.) 68476-33-5 (EC no) 270-675-6 (EC index no) 649-024-00-9	100	Xn; R20 Xn; R48/21 R66 Repr.Cat.2; R63 N; R50/53 Carc.Cat.1; R45
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 (EC index no) 649-024-00-9	100	Carc. 1B, H350 Acute Tox. 4 (Inhalation), H332 Repr. 2, H361 STOT RE 2, H373 Aquatic Chronic 1, H410 Aquatic Acute 1, H400 EUH066

Full text of R-, H- and EUH-phrases: see section 16.

3.2. Mixtures

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general

: To avoid the risks of fires, all contaminated materials should be placed in a closed metal container soaked with water. This material is combustible and can be ignited by heat, sparks, flames, or other sources of ignition (e.g. static electricity, pilot lights, or mechanical/electrical equipment).

First-aid measures after inhalation

: Remove victim to fresh air and keep at rest in a position comfortable for breathing. In case of breathing difficulties administer oxygen. In case of irregular breathing or respiratory arrest provide artificial respiration. Get immediate medical advice/attention. If medical advice is needed, have product container or label at hand.

First-aid measures after skin contact

: After contact with skin, take off immediately all contaminated clothing, and wash immediately with plenty of water and soap. Wash thoroughly (shower or bath). If medical advice is needed, have product container or label at hand. Clean contaminated surfaces with a soap solution. Clean contaminated surfaces with an excess of water.

Fuel Oil Exportation

Safety Data Sheet

according to Regulation (EC) No. 453/2010

- First-aid measures after eye contact : In case of contact with eyes, rinse immediately with plenty of flowing water for 10 to 15 minutes holding eyelids apart. Subsequently consult an ophthalmologist. If medical advice is needed, have product container or label at hand.
- First-aid measures after ingestion : If swallowed, rinse mouth with water (only if the person is conscious). Do not induce vomiting. Seek medical advice.

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

- Symptoms/injuries after inhalation : Irritant effect on the respiratory tract: Depression of the central nervous system, headaches, dizziness, drowsiness, loss of co-ordination.
- Symptoms/injuries after skin contact : Slightly irritating to skin. Frequent or prolonged contact with skin may cause dermal irritation.
- Symptoms/injuries after eye contact : Slightly irritating to eyes.
- Symptoms/injuries after ingestion : Risk of aspiration pneumonia.

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

Treat symptomatically. May result in aspiration into the lungs. Depression of the central nervous system.

SECTION 5: Firefighting measures

5.1. Extinguishing media

- Suitable extinguishing media: : Carbon dioxide (CO₂). Foam. Extinguishing powder. Water spray.

5.2. Special hazards arising from the substance or mixture

- Fire hazard : Combustible.
- Reactivity : On combustion, forms. Carbon monoxide. Sulphur dioxide (SO₂). Carbon dioxide (CO₂).

5.3. Advice for firefighters

- Firefighting instructions : Cool tanks/drums with water spray/remove them into safety.
- Protective equipment for firefighters : In case of fire: Wear self-contained breathing apparatus. Refer to section 8.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

- General measures : Evacuate area. Evacuate personnel to a safe area. Avoid contact with skin and eyes. Eliminate all ignition sources if safe to do so. Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

6.1.1. For non-emergency personnel

- Protective equipment : Wear suitable protective clothing, gloves and eye/face protection. Refer to section 8.
- Emergency procedures : Stop leak if safe to do so. Remove all sources of ignition.

6.1.2. For emergency responders

- Protective equipment : Wear suitable protective clothing, gloves and eye/face protection. In case of fire: Wear self-contained breathing apparatus. Refer to section 8.
- Emergency procedures : Evacuate unnecessary personnel. Remove all sources of ignition. Stop leak if safe to do so. Eliminate leaks immediately.

6.2. Environmental precautions

Prevent spreading over great surfaces (e.g. by damming or installing oil booms). Do not discharge into drains or the environment. Do not discharge into surface water. Avoid release to the environment.

6.3. Methods and material for containment and cleaning up

- Methods for cleaning up : Collect in closed containers for disposal. Absorb with liquid-binding material (e.g. sand, diatomaceous earth, acid- or universal binding agents). Absorb remaining liquid with sand or inert absorbent and remove to safe place. Do not use water for cleaning.
- Other information : Do not remove as household garbage. Relevant water authorities should be notified of any large spillage to water course or drain.

6.4. Reference to other sections

Refer to sections 8 and 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

- Precautions for safe handling : Handle in accordance with good industrial hygiene and safety procedures. Use only in well-ventilated areas. Ground/bond container and receiving equipment. Use only non-sparking tools.

7.2. Conditions for safe storage, including any incompatibilities

- Technical measures: : Provide adequate ventilation. Floors should be impenetrable, resistant to liquids and easy to clean. Only use anti-static equipped (spark-free) tools. Keep away from sources of ignition - No smoking.
- Incompatible materials : Oxidizing agents, strong.

Fuel Oil Exportation

Safety Data Sheet

according to Regulation (EC) No. 453/2010

Storage area : Ensure adequate ventilation of the storage area. Store at room temperature. Keep away from open flames, hot surfaces and sources of ignition. Only use anti-static equipped (spark-free) tools.

7.3. Specific end use(s)

No data available.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Fuel oil, residual (68476-33-5)		
Italy - Portugal - USA ACGIH	ACGIH TWA (mg/m ³)	0.2 mg/m ³
Fuel oil, residual (68476-33-5)		
DNEL/DMEL (Workers)		
Acute - local effects, inhalation	4700 mg/m ³ 15 min.	
Long-term - systemic effects, dermal	0.07 mg/kg bodyweight/day	
Long-term - local effects, inhalation	0.12 mg/m ³ /day	
DNEL/DMEL (General Population)		
Long-term - systemic effects, oral	0.02 mg/kg bodyweight/day	

8.2. Exposure controls

Appropriate engineering controls : Provide adequate ventilation.

Personal protective equipment : Wear protective gloves/protective clothing/eye protection/face protection. The entire protective clothing must be washed after use. Used working clothes should not be used outside the work area. Do not eat, drink or smoke when using this product.

Materials for protective clothing : neoprene/natural rubber. neoprene/butyl rubber.

Hand protection : Wear protective gloves. Rubber gloves. neoprene.

Eye protection : Wear eye protection/face protection.

Skin and body protection : Wear suitable protective clothing or Rubber apron.

Respiratory protection : Work in well ventilated zones or use proper respiratory protection. In case of fire: Wear self-contained breathing apparatus.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Liquid

Appearance : viscous.

Colour : dark brown.

Odour : Solvent.

Odour threshold : No data available

pH : No data available

Melting point : < 30 °C

Solidification point : No data available

Boiling point : 150-750 °C

Flash point : > 66 °C (Closed cup)

Relat. evapor. rate comp. to butylacetate : No data available

Flammability (solid, gas) : No data available

Explosive limits : 1-6 vol %

Vapour pressure : 0.02-0.861 kPa

Relative vapour density at 20 °C : No data available

Relative density : 0.986 g/cm³

Density : 840-1200 kg/m³

Solubility : Soluble in organic solvents.
Water: Negligible.

Log Pow : No data available

Self ignition temperature : 220-550 °C

Decomposition temperature : No data available

Viscosity, kinematic : > 100 cSt @ 50°C

Viscosity, dynamic : No data available

Explosive properties : No data available

Oxidising properties : No data available

9.2. Other information

Other properties : No data available.

Fuel Oil Exportation

Safety Data Sheet

according to Regulation (EC) No. 453/2010

SECTION 10: Stability and reactivity

10.1. Reactivity

On combustion, forms. Carbon monoxide. Sulphur dioxide (SO₂). Carbon dioxide (CO₂).

10.2. Chemical stability

No data available.

10.3. Possibility of hazardous reactions

No data available.

10.4. Conditions to avoid

No data available.

10.5. Incompatible materials

Oxidizing agents, strong. Peroxides.

10.6. Hazardous decomposition products

No data available.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Harmful if inhaled.

Fuel oil, residual (68476-33-5)	
LD50 oral rat	> 5000 mg/kg
LD50 dermal rabbit	> 2000 mg/kg
LC50 inhalation rat (mg/l)	> 4.1 mg/l/4h

Skin corrosion/irritation : Not classified
moderate skin irritation

Serious eye damage/irritation : Not classified
Not irritating

Respiratory or skin sensitisation : Not classified

Germ cell mutagenicity : Not classified

Carcinogenicity : May cause cancer.

Reproductive toxicity : Suspected of damaging fertility or the unborn child.

Specific target organ toxicity (single exposure) : Not classified

Specific target organ toxicity (repeated exposure) : May cause damage to organs (blood, liver, thymus) through prolonged or repeated exposure.

Fuel oil, residual (68476-33-5)	
NOAEL (dermal,rat/rabbit,90 days)	> 30 mg/kg bodyweight/day

Aspiration hazard : Not classified

Potential Adverse human health effects and symptoms : Prolonged/repetitive skin contact may cause skin defatting or dermatitis. Inhalation may affect the nervous system causing headache, possibly dizziness, nausea, weakness, loss of coordination and unconsciousness.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : Slightly volatile.

Ecology - water : In case of large spills the product may be hazardous to aquatic organisms due to possible formation of a film on the surface water which can diminish dissolved oxygen levels.

Fuel oil, residual (68476-33-5)	
LC50 fishes	> 79 mg/l 96 hours
EC50 Daphnia	> 2 mg/l 48 hours
ErC50 (algae)	> 0.75 mg/l 72 hours

12.2. Persistence and degradability

Fuel oil, residual (68476-33-5)	
Persistence and degradability	No data available.

12.3. Bioaccumulative potential

Fuel oil, residual (68476-33-5)	
Bioaccumulative potential	No data available.

Fuel Oil Exportation

Safety Data Sheet

according to Regulation (EC) No. 453/2010

12.4. Mobility in soil

Fuel oil, residual (68476-33-5)

Ecology - soil

Do not allow to enter into soil/subsoil. If product enters soil, it will be mobile and may contaminate groundwater.

12.5. Results of PBT and vPvB assessment

Fuel oil, residual (68476-33-5)

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

12.6. Other adverse effects

Other adverse effects : No data available.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste disposal recommendations : Consult the local waste disposal expert about waste disposal. Do not empty into drains or the aquatic environment. Waste is to be kept separate from other types of waste until its disposal. Dispose of this material and its container to hazardous or special waste collection point. Disposal must be done according to official regulations.

SECTION 14: Transport information

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

14.1. UN number

UN-No. : 3256

14.2. UN proper shipping name

Proper shipping name : ELEVATED TEMPERATURE LIQUID, FLAMMABLE, N.O.S.

Transport document description : UN 3256 ELEVATED TEMPERATURE LIQUID, FLAMMABLE, N.O.S., 3, III, (D/E)

14.3. Transport hazard class(es)

Class (UN) : 3

Hazard labels (UN) : 3



14.4. Packing group

Packing group (UN) : III

14.5. Environmental hazards

Marine pollutant :



Other information : No supplementary information available.

14.6. Special precautions for user

Special transport precautions : No data available.

14.6.1. Overland transport

Hazard identification number (Kemler No.) : 30

Classification code : F2

Orange plates :



Tunnel restriction code : D/E

Limited quantities (ADR) : LQ00

Excepted quantities (ADR) : E0

EAC code : 2Y

14.6.2. Transport by sea

No additional information available

Fuel Oil Exportation

Safety Data Sheet

according to Regulation (EC) No. 453/2010

14.6.3. Air transport

No additional information available

14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

IBC code : No data available.

SECTION 15: Regulatory information

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

15.1.1. EU-Regulations

No ingredients included in the REACH Candidate list

Other regulations, restrictions and prohibition regulations : Compliance with following regulations: Regulation (EC) 1907/2006 as amended. Regulation (EC) 1272/2008 as amended. Directive 1999/45/EC as amended. Directive 67/548/EEC as amended.

15.1.2. National regulations

Regional legislation : No data has been reported. In case of need contact our Product Safety office.

15.2. Chemical safety assessment

Chemical safety assessment has been established in the attachment.

SECTION 16: Other information

Sources of Key data : PETROBRAS. MSDS.

Abbreviations and acronyms : ASTM - American Society for Testing and Materials . CLP - Classification, Labelling and Packaging. CSR - Chemical Safety Report. EC - European Community. EEC - European Economic Community. GHS - Globally Harmonised System. REACH - Registration, Evaluation, Authorisation and Restriction of Chemicals. SDS - Safety Data Sheet.

Full text of R-, H- and EUH-phrases:

Acute Tox. 4 (Inhalation)	Acute toxicity (inhalation) 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
Repr. 2	Reproductive toxicity Category 2
STOT RE 2	Specific target organ toxicity (repeated exposure) Category 2
H332	Harmful if inhaled
H350	May cause cancer
H361	Suspected of damaging fertility or 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
R20	Harmful by inhalation.
R45	May cause cancer.
R48/21	Harmful: danger of serious damage to health by prolonged exposure in contact with skin.
R50/53	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R63	Possible risk of harm to the unborn child.
R66	Repeated exposure may cause skin dryness or cracking.

SDS PETROBRAS USES

The information presented in this Safety Data Sheet is based on current knowledge and is believed to be complete and accurate. It describes the product for the purposes of health, safety and environment requirements only and shall, therefore, be used only as a guide. The data refers to a specific product and may not be valid for combined uses with other products. It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. Petrobras shall not be responsible for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices.



Fuel oil exportation

Annex to the Safety Data Sheet

according to Regulation (EC) No. 453/2010
Revision date: July 14, 2011

Supersedes:

Version: 1.0

Exposure Scenarios for: Fuel oil exportation

Trade Name : Fuel oil exportation
CAS Number : 68476-33-5
EC Number : 270-675-6
SDS Reference : PbR0269

Table of Contents:

Summary of parameters used for assessing safe use:	1
Exposure Scenario (ES1): Manufacture of fuel oil exportation - Industrial.....	2
Exposure Scenario (ES2): Use of fuel oil exportation as as an intermediate - Industrial.....	6
Exposure Scenario (ES3): Distribution of fuel oil exportation - Industrial.....	10
Exposure Scenario (ES4): Formulation & (Re)packing of fuel oil exportation - Industrial.....	14
Exposure Scenario (ES5): Use of fuel oil exportation in coatings - Industrial.....	18
Exposure Scenario (ES6): Use of fuel oil exportation in coatings – Professional.....	22
Exposure Scenario (ES7): Use of fuel oil exportation as a fuel – Industrial.....	26
Exposure Scenario (ES8): Use of fuel oil exportation as a fuel – Professional	30
Exposure Scenario (ES9): Use of fuel oil exportation in road and construction applications – Professional	34

Summary of parameters used for assessing safe use:

DNEL: Worker - inhalation (acute): 4700 mg/m³/15 min
Worker - inhalation (long term): 0.12 mg/m³/8 h
Worker - dermal (long term): 0.065 mg/kg/8 h

Acronyms:

CSA : Chemical safety assessment
DNEL : Derived no effect level
DU : Downstream user
ERC : Environmental release category
ES : Exposure scenario
PC : Product category
PEC : Predicted environmental concentration
PNEC : Predicted no effect concentration
PPE : Personal protection equipment
PROC : Process category
RCR : Risk characterisation ratio
STP : Sewage treatment plant
SU : Sector of use
WWTP : Wastewater treatment plant

Exposure Scenario (ES1):

Manufacture of fuel oil exportation - Industrial

9.1.1. Exposure scenario addressing uses carried out by workers	
Manufacture of fuel oil exportation - Industrial	
Use descriptors related to the life cycle stage	SU3 : Industrial uses: Uses of substances as such or in preparations at industrial sites SU8 : Manufacture of bulk, large scale chemicals (including petroleum products) SU9 : Manufacture of fine chemicals 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 ERC1 : Manufacture of substances ERC4 : Industrial use of processing aids in processes and products, not becoming part of articles
Specific environmental release category	ESVOC SpERC 1.1.v1
9.1.2. Operational conditions and risk management measures	
9.1.2.1. Control of environmental exposure	
Product characteristic	
Physical state	Liquid
Concentration of substance in product	Up to 100%
Vapour pressure of substance	<0.5 kPa at STP
Amounts used	
Daily at point sources	2,000,000 kg/day
Annually at point sources	600,000 t/year (maximum in worst case)
Annually total	11,000,000 t/year total market
Frequency and duration of use/exposure	
Emission days per year	300
Environment factors not influenced by risk management	
Flow rate of receiving surface water	18,000 m ³ /day (default)
Other given operational conditions affecting environmental exposure	
Release fraction to air from process before RMMs	0.0001

Release fraction to waste water from process before RMMs	0.000003
Release fraction to soil from process before RMMs	0.0001
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates are used.	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Apply technical measures aiming at reducing releases to air (containment by preference or catalytic or thermal gas oxidation)	Treat air emissions to provide a typical removal efficiency of >90%.
Apply technical measures aiming at reduction and cleaning of waste water (WWTP /local STP (e.g. biological treatment))	Typical onsite wastewater treatment technology provides removal efficiency of 85.9%.
Risk from environmental exposure is driven by humans via indirect exposure. No wastewater treatment is required. Prevent discharge of undissolved substance to or recover from onsite wastewater.	
Organizational measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment	88.8%
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs	88.8%
Maximum allowable site tonnage (M_{safe}) (kg/d)	2,300,000
Assumed domestic sewage treatment plant flow (m^3/d)	10,000
Conditions and measures related to treatment of waste	
During manufacturing no waste of the substance is generated to treat or recover.	
9.1.2.2. Control of worker exposure	
Frequency and duration of use/exposure	
Frequency of use for which the ES ensures control of risk	days/year: not restricted
Duration of use for which the ES ensures control of risk	8 hours/day (PROC 1, 3, 8a & 15) <15 minutes/day (PROC 2) <4 hours/day (PROC 2 & 8b)
Human factors not influenced by risk management	
Not applicable.	
Other given operational conditions affecting workers exposure	
Operation is carried out at elevated temperature (>20° above ambient temperature).	
Assumes a good basic standard of occupational hygiene is implemented.	
Technical conditions and measures at process level (source) to prevent release	
Consider technical advances and process upgrades (including automation) for the elimination of releases (all PROCs) Regularly inspect, test and maintain all control measures (all PROCs) Store substance within a closed system (PROC 2) Transfer via enclosed lines (PROC 8b) Clear transfer lines prior to de-coupling (PROC 8b) Ensure material transfers are under containment or extract ventilation (PROC 8b)	

Technical conditions and measures to control dispersion from source towards the worker						
<p>Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/ local exhaust ventilation* (all PROCs)</p> <p>Avoid carrying activities involving exposure for more than 15 minutes (PROC 2)</p> <p>Avoid carrying activities involving exposure for more than 4 hours (PROC 2 & 8b)</p> <p>Handle substance within a closed system (PROC 1 & 3)</p> <p>Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure (PROC 15)</p>						
Organisational measures to prevent /limit releases, dispersion and exposure						
<p>Avoid direct skin contact with product (all PROCs)</p> <p>Identify potential areas for indirect skin contact (all PROCs)</p> <p>Wash off skin contamination immediately (all PROCs)</p> <p>Sample via a closed loop or other system intended to avoid exposure (PROC 2)</p> <p>Drain down systems and clear transfer lines prior to breaking containment. Clean/ flush equipment, where possible, prior to maintenance* (all PROCs)</p> <p>Retain drain downs in sealed storage pending disposal or for subsequent recycle (PROC 8a & 8b)</p> <p>Provide basic employee training to prevent/minimise exposures and to report and skin effects that may develop* (all PROCs)</p>						
Conditions and measures related to personal protection, hygiene and health evaluation						
<p>Restrict access to authorized staff *</p> <p>Clean up spills immediately and dispose of wastes safely* (all PROCs)</p> <p>Consider the need for risk based health surveillance* (all PROCs)</p> <ol style="list-style-type: none"> 1. PPE: wear suitable gloves (tested to EN374) and coveralls to prevent skin contamination (all PROCs) 2. PPE: wear respiratory protection when its use is identified for certain contributing scenarios* (all PROCs) <p>*mandatory RMM for R45 derived by qualitative risk assessment</p>						
9.1.3. Exposure information and reference to its source						
9.1.3.1. Prediction of environmental exposure resulting from the conditions described above						
<p>Substance is a complex hydrocarbon UVCB. Predominantly hydrophobic.</p> <p>The Hydrocarbon Block Method with the Petrorisk model is used for environmental risk assessment. PNECs have been derived using HC5 statistical extrapolation method and the target lipid model using representative structures. For more detailed information contact supplier - see Product Library tab in Petrorisk spreadsheet.</p> <p>When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed the resulting risk characterisation ratios are expected to be less than 1.</p>						
Environmental exposure	In STP/ untreated wastewater (mg/l)	In local freshwater (mg/l)	In local soil (mg/kg dw)	In local marine water (mg/l)	In sediment freshwater (mg/kg dw)	In sediment marine water (mg/kg dw)
PEC	0.066	0.0066	0.00023	0.00066	0.85	0.000066
9.1.3.2. Prediction of workers exposure resulting from the conditions described above						
<p>Workers exposure estimation is calculated with Ectoc TRA model. Where applicable, predicted exposures and RCR values are reported as ranges. For DNEL values, please refer to Page 1.</p>						

Process category	Inhalatory worker exposure (mg/m ³)	Dermal worker exposure (mg/kg/day)
PROC 1	0.01	0.03
PROC 2	0.04 - 0.34	0.03
PROC 3	0.34	0.03
PROC 8a	0	0.05
PROC 8b	0.03 – 0.04	0.02 – 0.03
PROC 15	0.05	0.01

Predicted exposures are not expected to exceed the applicable exposure limits (DNEL as provided above) when the operational conditions/risk management measures described above are implemented

Risk characterization:

Process category	RCR (inhalation)	RCR (dermal)	RCR (all routes)
PROC 1	0.058	0.567	0.625
PROC 2	0.292 – 0.320	0.567	0.858 – 0.887
PROC 3	0.320	0.567	0.887
PROC 8a	0.020	0.833	0.853
PROC 8b	0.283 – 0.320	0.340 – 0.567	0.623 – 0.887
PROC 15	0.417	0.100	0.517

9.1.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

The workers exposure and environmental emissions have been evaluated using Ecetoc TRA integrated tool and Hydrocarbon Block Method with the Petrorisk model respectively.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

9.1.5. Additional good practice advice beyond the REACH CSA

Use specific measures expected to reduce the predicted exposure beyond the level estimated based on the exposure scenario when possible.

Exposure Scenario (ES2):

Use of fuel oil exportation as as an intermediate - Industrial

9.2.1. Exposure scenario addressing uses carried out by workers	
Use of fuel oil exportation as as an intermediate - Industrial	
Use descriptors related to the life cycle stage	<p>SU3 : Industrial uses: Uses of substances as such or in preparations at industrial sites</p> <p>SU8 : Manufacture of bulk, large scale chemicals (including petroleum products)</p> <p>SU9 : Manufacture of fine chemicals</p> <p>PROC1 : Use in closed process, no likelihood of exposure</p> <p>PROC2 : Use in closed, continuous process with occasional controlled exposure</p> <p>PROC3 : Use in closed batch process (synthesis or formulation)</p> <p>PROC8a : Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities</p> <p>PROC8b : Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities</p> <p>PROC15 : Use as laboratory reagent</p> <p>ERC6a : Industrial use resulting in manufacture of another substance (use of intermediates)</p>
Specific environmental release category	ESVOC SpERC 6.1a.v1
9.2.2. Operational conditions and risk management measures	
9.2.2.1. Control of environmental exposure	
Product characteristic	
Physical state	Liquid
Concentration of substance in product	Up to 100%
Vapour pressure of substance	<0.5 kPa at STP
Amounts used	
Daily at point sources	50,000 kg/day
Annually at point sources	15,000 t/year (maximum in worst case)
Annually total	130,000,000 t/year total market
Frequency and duration of use/exposure	
Emission days per year	300
Environment factors not influenced by risk management	
Flow rate of receiving surface water	18,000 m ³ /day (default)
Other given operational conditions affecting environmental exposure	
Release fraction to air from process before RMMs	0.00001

Release fraction to waste water from process before RMMs	0.00001
Release fraction to soil from process before RMMs	0.001
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates are used.	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Apply technical measures aiming at reducing releases to air (containment by preference or catalytic or thermal gas oxidation)	Treat air emissions to provide a typical removal efficiency of >80%.
Apply technical measures aiming at reduction and cleaning of waste water (WWTP /local STP (e.g. biological treatment))	Typical onsite wastewater treatment technology provides removal efficiency of 54%.
Risk from environmental exposure is driven by humans via indirect exposure. No wastewater treatment is required. Prevent discharge of undissolved substance to or recover from onsite wastewater.	
Organizational measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment	88.8%
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs	88.8%
Maximum allowable site tonnage (M_{safe}) (kg/d)	190,000
Assumed domestic sewage treatment plant flow (m^3/d)	2,000
Conditions and measures related to treatment of waste	
During manufacturing no waste of the substance is generated to treat or recover.	
9.2.2.2. Control of worker exposure	
Frequency and duration of use/exposure	
Frequency of use for which the ES ensures control of risk	days/year: not restricted
Duration of use for which the ES ensures control of risk	8 hours/day (PROC 1, 3, 8a & 15) <15 minutes/day (PROC 2) <1 hour/day (PROC 8b) <4 hours/day (PROC 2)
Human factors not influenced by risk management	
Not applicable.	
Other given operational conditions affecting workers exposure	
Operation is carried out at elevated temperature (>20° above ambient temperature).	
Assumes a good basic standard of occupational hygiene is implemented.	
Technical conditions and measures at process level (source) to prevent release	
Consider technical advances and process upgrades (including automation) for the elimination of releases (all PROCs) Regularly inspect, test and maintain all control measures (all PROCs) Store substance within a closed system (PROC 2) Transfer via enclosed lines (PROC 8b) Clear transfer lines prior to de-coupling (PROC 8b) Ensure material transfers are under containment or extract ventilation (PROC 8b)	

Technical conditions and measures to control dispersion from source towards the worker						
<p>Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/ local exhaust ventilation* (all PROCs)</p> <p>Avoid carrying activities involving exposure for more than 15 minutes (PROC 2)</p> <p>Avoid carrying activities involving exposure for more than 1 hour (PROC 8b)</p> <p>Avoid carrying activities involving exposure for more than 4 hours (PROC 2)</p> <p>Handle substance within a closed system (PROC 1, 2 & 3)</p> <p>Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure (PROC 15)</p>						
Organisational measures to prevent /limit releases, dispersion and exposure						
<p>Avoid direct skin contact with product (all PROCs)</p> <p>Identify potential areas for indirect skin contact (all PROCs)</p> <p>Wash off skin contamination immediately (all PROCs)</p> <p>Sample via a closed loop or other system intended to avoid exposure (PROC 2)</p> <p>Drain down systems and clear transfer lines prior to breaking containment. Clean/ flush equipment, where possible, prior to maintenance* (all PROCs)</p> <p>Retain drain downs in sealed storage pending disposal or for subsequent recycle (PROC 8a & 8b)</p> <p>Provide basic employee training to prevent/minimise exposures and to report and skin effects that may develop* (all PROCs)</p>						
Conditions and measures related to personal protection, hygiene and health evaluation						
<p>Restrict access to authorized staff *</p> <p>Clean up spills immediately and dispose of wastes safely* (all PROCs)</p> <p>Consider the need for risk based health surveillance* (all PROCs)</p> <ol style="list-style-type: none"> 1. PPE: wear suitable gloves (tested to EN374) and coveralls to prevent skin contamination (all PROCs) 2. PPE: wear respiratory protection when its use is identified for certain contributing scenarios* (all PROCs) <p>*mandatory RMM for R45 derived by qualitative risk assessment</p>						
9.2.3. Exposure information and reference to its source						
9.2.3.1. Prediction of environmental exposure resulting from the conditions described above						
<p>Substance is a complex hydrocarbon UVCB. Predominantly hydrophobic.</p> <p>The Hydrocarbon Block Method with the Petrorisk model is used for environmental risk assessment. PNECs have been derived using HC5 statistical extrapolation method and the target lipid model using representative structures. For more detailed information contact supplier - see Product Library tab in Petrorisk spreadsheet.</p> <p>When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed the resulting risk characterisation ratios are expected to be less than 1.</p>						
Environmental exposure	In STP/ untreated wastewater (mg/l)	In local freshwater (mg/l)	In local soil (mg/kg dw)	In local marine water (mg/l)	In sediment freshwater (mg/kg dw)	In sediment marine water (mg/kg dw)
PEC	0.066	0.0066	0.00023	0.00066	0.85	0.000066
9.2.3.2. Prediction of workers exposure resulting from the conditions described above						
<p>Workers exposure estimation is calculated with Ectoc TRA model. Where applicable, predicted exposures and RCR values are reported as ranges. For DNEL values, please refer to Page 1.</p>						

Process category	Inhalatory worker exposure (mg/m ³)	Dermal worker exposure (mg/kg/day)
PROC 1	0.01	0.03
PROC 2	0.04	0.03
PROC 3	0.04	0.03
PROC 8a	0	0.05
PROC 8b	0.03 – 0.04	0.02 – 0.03
PROC 15	0.05	0.01

Predicted exposures are not expected to exceed the applicable exposure limits (DNEL as provided above) when the operational conditions/risk management measures described above are implemented

Risk characterization:

Process category	RCR (inhalation)	RCR (dermal)	RCR (all routes)
PROC 1	0.058	0.567	0.625
PROC 2	0.292 – 0.320	0.567	0.858 – 0.887
PROC 3	0.320	0.567	0.887
PROC 8a	0.020	0.833	0.853
PROC 8b	0.283 – 0.320	0.340 – 0.567	0.623 – 0.887
PROC 15	0.417	0.100	0.517

9.2.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

The workers exposure and environmental emissions have been evaluated using Ecetoc TRA integrated tool and Hydrocarbon Block Method with the Petrorisk model respectively.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

9.2.5. Additional good practice advice beyond the REACH CSA

Use specific measures expected to reduce the predicted exposure beyond the level estimated based on the exposure scenario when possible.

Exposure Scenario (ES3):

Distribution of fuel oil exportation - Industrial

9.3.1. Exposure scenario addressing uses carried out by workers	
Distribution of fuel oil exportation - Industrial	
Use descriptors related to the life cycle stage	<p>SU3 : Industrial uses: Uses of substances as such or in preparations at industrial sites</p> <p>PROC1 : Use in closed process, no likelihood of exposure</p> <p>PROC2 : Use in closed, continuous process with occasional controlled exposure</p> <p>PROC3 : Use in closed batch process (synthesis or formulation)</p> <p>PROC8a : Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities</p> <p>PROC8b : Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities</p> <p>PROC15 : Use as laboratory reagent</p> <p>ERC1 : Manufacture of substances</p> <p>ERC2 : Formulation of preparations</p> <p>ERC3 : Formulation in materials</p> <p>ERC4 : Industrial use of processing aids in processes and products, not becoming part of articles</p> <p>ERC5 : Industrial use resulting in inclusion into or onto a matrix</p> <p>ERC6a : Industrial use resulting in manufacture of another substance (use of intermediates)</p> <p>ERC6b : Industrial use of reactive processing aids</p> <p>ERC6c : Industrial use of monomers for manufacture of thermo-plastics</p> <p>ERC6d : Industrial use of process regulators for polymerisation processes in production of resins, rubbers, polymers</p> <p>ERC7 : Industrial use of substances in closed systems</p>
Specific environmental release category	ESVOC SpERC 1.1b.v1
9.3.2. Operational conditions and risk management measures	
9.3.2.1. Control of environmental exposure	
Product characteristic	
Physical state	Liquid
Concentration of substance in product	Up to 100%
Vapour pressure of substance	<0.5 kPa at STP

Amounts used	
Daily at point sources	77,000 kg/day
Annually at point sources	23,000 t/year (maximum in worst case)
Annually total	11,000,000 t/year total market
Frequency and duration of use/exposure	
Emission days per year	300
Environment factors not influenced by risk management	
Flow rate of receiving surface water	18,000 m ³ /day (default)
Other given operational conditions affecting environmental exposure	
Release fraction to air from process before RMMs	0.0001
Release fraction to waste water from process before RMMs	0.0000001
Release fraction to soil from process before RMMs	0.00001
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates are used.	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Apply technical measures aiming at reducing releases to air (containment by preference or catalytic or thermal gas oxidation)	Treat air emissions to provide a typical removal efficiency of >90%.
Apply technical measures aiming at reduction and cleaning of waste water (WWTP /local STP (e.g. biological treatment))	Typical onsite wastewater treatment technology provides removal efficiency of 0%.
Risk from environmental exposure is driven by humans via indirect exposure. No wastewater treatment is required. Prevent discharge of undissolved substance to or recover from onsite wastewater.	
Organizational measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment	88.8%
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs	88.8%
Maximum allowable site tonnage (M _{safe}) (kg/d)	380,000
Assumed domestic sewage treatment plant flow (m ³ /d)	2,000
Conditions and measures related to treatment of waste	
External treatment, disposal, recovery and recycling of waste should comply with applicable regulations.	
9.3.2.2. Control of worker exposure	
Frequency and duration of use/exposure	
Frequency of use for which the ES ensures control of risk	days/year: not restricted
Duration of use for which the ES ensures control of risk	8 hours/day (PROC 8a & 15) <15 minutes/day (PROC 2) <4 hours/day (PROC 1, 2, 3 & 8b)
Human factors not influenced by risk management	
Not applicable.	

Other given operational conditions affecting workers exposure
Assumes use not >20° above ambient temperature, unless stated differently.
Assumes a good basic standard of occupational hygiene is implemented.
Technical conditions and measures at process level (source) to prevent release
Consider technical advances and process upgrades (including automation) for the elimination of releases (all PROCs) Regularly inspect, test and maintain all control measures (all PROCs) Store substance within a closed system (PROC 2) Transfer via enclosed lines (PROC 8b) Clear transfer lines prior to de-coupling (PROC 8b) Ensure material transfers are under containment or extract ventilation (PROC 8b)
Technical conditions and measures to control dispersion from source towards the worker
Minimise exposure using measures such as closed systems, dedicated facilities and suitable genera/ local exhaust ventilation* (all PROCs) Avoid carrying activities involving exposure for more than 15 minutes (PROC 2) Avoid carrying activities involving exposure for more than 4 hours (PROC 1, 2, 3 & 8b) Handle substance within a closed system (PROC 1 & 3) Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure (PROC 15)
Organisational measures to prevent /limit releases, dispersion and exposure
Avoid direct skin contact with product (all PROCs) Identify potential areas for indirect skin contact (all PROCs) Wash off skin contamination immediately (all PROCs) Sample via a closed loop or other system intended to avoid exposure (PROC 1, 2 & 3) Drain down systems and clear transfer lines prior to breaking containment. Clean/ flush equipment, where possible, prior to maintenance* (all PROCs) Retain drain downs in sealed storage pending disposal or for subsequent recycle (PROC 8a & 8b) Provide basic employee training to prevent/minimise exposures and to report and skin effects that may develop* (all PROCs)
Conditions and measures related to personal protection, hygiene and health evaluation
Restrict access to authorized staff * Clean up spills immediately and dispose of wastes safely* (all PROCs) Consider the need for risk based health surveillance* (all PROCs) 1. PPE: wear suitable gloves (tested to EN374) and coveralls to prevent skin contamination (all PROCs) 2. PPE: wear respiratory protection when its use is identified for certain contributing scenarios* (all PROCs) *mandatory RMM for R45 derived by qualitative risk assessment
9.3.3. Exposure information and reference to its source
9.3.3.1. Prediction of environmental exposure resulting from the conditions described above
Substance is a complex hydrocarbon UVCB. Predominantly hydrophobic. The Hydrocarbon Block Method with the Petrorisk model is used for environmental risk assessment. PNECs have been derived using HC5statistical extrapolation method and the target lipid model using representative structures. For more detailed information contact supplier - see Product Library tab in Petrorisk spreadsheet.
When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed the resulting risk characterisation ratios are expected to be less than 1.

Environmental exposure	In STP/ untreated waste water (mg/l)	In local freshwater (mg/l)	In local soil (mg/kg dw)	In local marine water (mg/l)	In sediment freshwater (mg/kg dw)	In sediment marine water (mg/kg dw)
PEC	0.066	0.0066	0.00023	0.00066	0.85	0.000066

9.3.3.2. Prediction of workers exposure resulting from the conditions described above

Workers exposure estimation is calculated with Ecetoc TRA model. Where applicable, predicted exposures and RCR values are reported as ranges. For DNEL values, please refer to Page 1.

Process category	Inhalatory worker exposure (mg/m ³)	Dermal worker exposure (mg/kg/day)
PROC 1	0.01	0.03
PROC 2	0.04	0.03
PROC 3	0.04	0.03
PROC 8a	0	0.05
PROC 8b	0.03 – 0.04	0.03
PROC 15	0.05	0.01

Predicted exposures are not expected to exceed the applicable exposure limits (DNEL as provided above) when the operational conditions/risk management measures described above are implemented

Risk characterization:

Process category	RCR (inhalation)	RCR (dermal)	RCR (all routes)
PROC 1	0.058	0.567	0.625
PROC 2	0.292 – 0.320	0.567	0.858 – 0.887
PROC 3	0.320	0.567	0.887
PROC 8a	0.020	0.833	0.853
PROC 8b	0.283 – 0.320	0.567	0.850 – 0.887
PROC 15	0.417	0.100	0.517

9.3.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

The workers exposure and environmental emissions have been evaluated using Ecetoc TRA integrated tool and Hydrocarbon Block Method with the Petrorisk model respectively.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

9.3.5. Additional good practice advice beyond the REACH CSA

Use specific measures expected to reduce the predicted exposure beyond the level estimated based on the exposure scenario when possible.

Exposure Scenario (ES4):

Formulation & (Re)packing of fuel oil exportation - Industrial

9.4.1. Exposure scenario addressing uses carried out by workers	
Formulation & (Re)packing of fuel oil exportation - Industrial	
Use descriptors related to the life cycle stage	SU3 : Industrial uses: Uses of substances as such or in preparations at industrial sites SU10 : Formulation [mixing] of preparations and/or re-packaging (excluding alloys) 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 ERC2 : Formulation of preparations
Specific environmental release category	ESVOC SpERC 2.2.v1
9.4.2. Operational conditions and risk management measures	
9.4.2.1. Control of environmental exposure	
Product characteristic	
Physical state	Liquid
Concentration of substance in product	Up to 100%
Vapour pressure of substance	<0.5 kPa at STP
Amounts used	
Daily at point sources	100,000 kg/day
Annually at point sources	30,000 t/year (maximum in worst case)
Annually total	11,000,000 t/year total market
Frequency and duration of use/exposure	
Emission days per year	300
Environment factors not influenced by risk management	
Flow rate of receiving surface water	18,000 m ³ /day (default)
Other given operational conditions affecting environmental exposure	
Release fraction to air from process before RMMs	0.0022
Release fraction to waste water from process before RMMs	0.000005
Release fraction to soil from process before RMMs	0.0001

Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates are used.	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Apply technical measures aiming at reducing releases to air (containment by preference or catalytic or thermal gas oxidation)	Treat air emissions to provide a typical removal efficiency of >0%.
Apply technical measures aiming at reduction and cleaning of waste water (WWTP /local STP (e.g. biological treatment))	Typical onsite wastewater treatment technology provides removal efficiency of 54%.
Risk from environmental exposure is driven by humans via indirect exposure. No wastewater treatment is required. Prevent discharge of undissolved substance to or recover from onsite wastewater.	
Organizational measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment	88.8%
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs	88.8%
Maximum allowable site tonnage (M_{safe}) (kg/d)	110,000
Assumed domestic sewage treatment plant flow (m^3/d)	2,000
Conditions and measures related to treatment of waste	
External treatment, disposal, recovery and recycling of waste should comply with applicable regulations.	
9.4.2.2. Control of worker exposure	
Frequency and duration of use/exposure	
Frequency of use for which the ES ensures control of risk	days/year: not restricted
Duration of use for which the ES ensures control of risk	8 hours/day (PROC 8a & 15) <15 minutes/day (PROC 2) <1 hour/day (PROC 8b) <4 hours/day (PROC 1, 2, 3 & 8b)
Human factors not influenced by risk management	
Not applicable.	
Other given operational conditions affecting workers exposure	
Assumes use not >20° above ambient temperature, unless stated differently.	
Assumes a good basic standard of occupational hygiene is implemented.	
Technical conditions and measures at process level (source) to prevent release	
Consider technical advances and process upgrades (including automation) for the elimination of releases (all PROCs) Regularly inspect, test and maintain all control measures (all PROCs) Store substance within a closed system (PROC 2) Transfer via enclosed lines (PROC 8b) Clear transfer lines prior to de-coupling (PROC 8b) Ensure material transfers are under containment or extract ventilation (PROC 8b)	
Technical conditions and measures to control dispersion from source towards the worker	
Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/ local exhaust ventilation* (all PROCs)	

Avoid carrying activities involving exposure for more than 15 minutes (PROC 2)
 Avoid carrying activities involving exposure for more than 1 hour (PROC 8b)
 Avoid carrying activities involving exposure for more than 4 hours (PROC 1, 2, 3 & 8b)
 Provide a good standard of controlled ventilation (not less than 3 to 5 air changes per hour) (PROC 8b)
 Handle substance within a closed system (PROC 1, 2 & 3)
 Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure (PROC 15)

Organisational measures to prevent /limit releases, dispersion and exposure

Avoid direct skin contact with product (all PROCs)
 Identify potential areas for indirect skin contact (all PROCs)
 Wash off skin contamination immediately (all PROCs)
 Sample via a closed loop or other system intended to avoid exposure (PROC 1, 2 & 3)
 Ensure operations is undertaken outdoors (PROC 8b)
 Drain down systems and clear transfer lines prior to breaking containment. Clean/ flush equipment, where possible, prior to maintenance* (all PROCs)
 Retain drain downs in sealed storage pending disposal or for subsequent recycle (PROC 8a & 8b)
 Provide basic employee training to prevent/minimise exposures and to report and skin effects that may develop* (all PROCs)

Conditions and measures related to personal protection, hygiene and health evaluation

Restrict access to authorized staff *
 Clean up spills immediately and dispose of wastes safely* (all PROCs)
 Consider the need for risk based health surveillance* (all PROCs)
 1. PPE: wear suitable gloves (tested to EN374) and coveralls to prevent skin contamination (all PROCs)
 2. PPE: wear respiratory protection when its use is identified for certain contributing scenarios* (all PROCs)

*mandatory RMM for R45 derived by qualitative risk assessment

9.4.3. Exposure information and reference to its source

9.4.3.1. Prediction of environmental exposure resulting from the conditions described above

Substance is a complex hydrocarbon UVCB. Predominantly hydrophobic.
 The Hydrocarbon Block Method with the Petrorisk model is used for environmental risk assessment. PNECs have been derived using HC5statistical extrapolation method and the target lipid model using representative structures. For more detailed information contact supplier - see Product Library tab in Petrorisk spreadsheet.

When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed the resulting risk characterisation ratios are expected to be less than 1.

Environmental exposure	In STP/ untreated wastewater (mg/l)	In local freshwater (mg/l)	In local soil (mg/kg dw)	In local marine water (mg/l)	In sediment freshwater (mg/kg dw)	In sediment marine water (mg/kg dw)
PEC	0.066	0.0066	0.00023	0.00066	0.85	0.000066

9.4.3.2. Prediction of workers exposure resulting from the conditions described above

Workers exposure estimation is calculated with Ecetoc TRA model. Where applicable, predicted exposures and RCR values are reported as ranges. For DNEL values, please refer to Page 1.

Process category	Inhalatory worker exposure (mg/m ³)	Dermal worker exposure (mg/kg/day)
PROC 1	0.01	0.03
PROC 2	0.04	0.03
PROC 3	0.04	0.03
PROC 8a	0	0.05
PROC 8b	0.02 – 0.03	0.03
PROC 15	0.05	0.01

Predicted exposures are not expected to exceed the applicable exposure limits (DNEL as provided above) when the operational conditions/risk management measures described above are implemented

Risk characterization:

Process category	RCR (inhalation)	RCR (dermal)	RCR (all routes)
PROC 1	0.058	0.567	0.625
PROC 2	0.292 – 0.320	0.567	0.858 – 0.887
PROC 3	0.320	0.567	0.887
PROC 8a	0.020	0.833	0.853
PROC 8b	0.175 – 0.320	0.567	0.742 – 0.887
PROC 15	0.417	0.100	0.517

9.4.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

The workers exposure and environmental emissions have been evaluated using Ecetoc TRA integrated tool and Hydrocarbon Block Method with the Petrorisk model respectively.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

9.4.5. Additional good practice advice beyond the REACH CSA

Use specific measures expected to reduce the predicted exposure beyond the level estimated based on the exposure scenario when possible.

Exposure Scenario (ES5):

Use of fuel oil exportation in coatings - Industrial

9.5.1. Exposure scenario addressing uses carried out by workers	
Use of fuel oil exportation in coatings - Industrial	
Use descriptors related to the life cycle stage	<p>SU3 : Industrial uses: Uses of substances as such or in preparations at industrial sites</p> <p>PROC1 : Use in closed process, no likelihood of exposure</p> <p>PROC2 : Use in closed, continuous process with occasional controlled exposure</p> <p>PROC3 : Use in closed batch process (synthesis or formulation)</p> <p>PROC8a : Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities</p> <p>PROC8b : Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities</p> <p>PROC15 : Use as laboratory reagent</p> <p>ERC4 : Industrial use of processing aids in processes and products, not becoming part of articles</p>
Specific environmental release category	ESVOC SpERC 4.3a.v1
9.5.2. Operational conditions and risk management measures	
9.5.2.1. Control of environmental exposure	
Product characteristic	
Physical state	Liquid
Concentration of substance in product	Up to 100%
Vapour pressure of substance	<0.5 kPa at STP
Amounts used	
Daily at point sources	5,000 kg/day
Annually at point sources	100 t/year (maximum in worst case)
Annually total	1000 t/year total market
Frequency and duration of use/exposure	
Emission days per year	20
Environment factors not influenced by risk management	
Flow rate of receiving surface water	18,000 m ³ /day (default)
Other given operational conditions affecting environmental exposure	
Release fraction to air from process before RMMs	0.98
Release fraction to waste water from process before RMMs	0.00002
Release fraction to soil from process before RMMs	0

Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates are used.	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Apply technical measures aiming at reducing releases to air (containment by preference or catalytic or thermal gas oxidation)	Treat air emissions to provide a typical removal efficiency of >90%.
Apply technical measures aiming at reduction and cleaning of waste water (WWTP /local STP (e.g. biological treatment))	Typical onsite wastewater treatment technology provides removal efficiency of 0%.
Risk from environmental exposure is driven by humans via indirect exposure. No wastewater treatment is required. Prevent discharge of undissolved substance to or recover from onsite wastewater.	
Organizational measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment	88.8%
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs	88.8%
Maximum allowable site tonnage (M_{safe}) (kg/d)	110,000
Assumed domestic sewage treatment plant flow (m^3/d)	2,000
Conditions and measures related to treatment of waste	
External treatment, disposal, recovery and recycling of waste should comply with applicable regulations.	
9.5.2.2. Control of worker exposure	
Frequency and duration of use/exposure	
Frequency of use for which the ES ensures control of risk	days/year: not restricted
Duration of use for which the ES ensures control of risk	8 hours/day (all PROCs)
Human factors not influenced by risk management	
Not applicable.	
Other given operational conditions affecting workers exposure	
Assumes use not >20° above ambient temperature, unless stated differently.	
Assumes a good basic standard of occupational hygiene is implemented.	
Technical conditions and measures at process level (source) to prevent release	
Consider technical advances and process upgrades (including automation) for the elimination of releases (all PROCs) Regularly inspect, test and maintain all control measures (all PROCs) Store substance within a closed system (PROC 1) Ensure material transfers are under containment or extract ventilation (PROC 8b)	
Technical conditions and measures to control dispersion from source towards the worker	
Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/ local exhaust ventilation* (all PROCs) Provide a good standard of controlled ventilation (not less than 10 to 15 air changes per hour) (PROC 3 & 8b) Provide extract ventilation to points where emissions occur (PROC 2 & 3) Handle substance within a closed system (PROC 3) Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure (PROC 15)	

Organisational measures to prevent /limit releases, dispersion and exposure

Avoid direct skin contact with product (all PROCs)
Identify potential areas for indirect skin contact (all PROCs)
Wash off skin contamination immediately (all PROCs)
Drain down systems and clear transfer lines prior to breaking containment. Clean/ flush equipment, where possible, prior to maintenance* (all PROCs)
Retain drain downs in sealed storage pending disposal or for subsequent recycle (PROC 8a)
Provide basic employee training to prevent/minimise exposures and to report and skin effects that may develop* (all PROCs)

Conditions and measures related to personal protection, hygiene and health evaluation

Restrict access to authorized staff *
Clean up spills immediately and dispose of wastes safely* (all PROCs)
Consider the need for risk based health surveillance* (all PROCs)
1. PPE: wear suitable gloves (tested to EN374) and coveralls to prevent skin contamination (all PROCs)
2. PPE: wear respiratory protection when its use is identified for certain contributing scenarios* (all PROCs)
*mandatory RMM for R45 derived by qualitative risk assessment

9.5.3. Exposure information and reference to its source

9.5.3.1. Prediction of environmental exposure resulting from the conditions described above

Substance is a complex hydrocarbon UVCB. Predominantly hydrophobic.
The Hydrocarbon Block Method with the Petrorisk model is used for environmental risk assessment. PNECs have been derived using HC5statistical extrapolation method and the target lipid model using representative structures. For more detailed information contact supplier - see Product Library tab in Petrorisk spreadsheet.

When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed the resulting risk characterisation ratios are expected to be less than 1.

Environmental exposure	In STP/ untreated wastewater (mg/l)	In local freshwater (mg/l)	In local soil (mg/kg dw)	In local marine water (mg/l)	In sediment freshwater (mg/kg dw)	In sediment marine water (mg/kg dw)
PEC	0.066	0.0066	0.00023	0.00066	0.85	0.000066

9.5.3.2. Prediction of workers exposure resulting from the conditions described above

Workers exposure estimation is calculated with Ectoc TRA model. Where applicable, predicted exposures and RCR values are reported as ranges. For DNEL values, please refer to Page 1.

Process category	Inhalatory worker exposure (mg/m ³)	Dermal worker exposure (mg/kg/day)
PROC 1	0.01	0.03
PROC 2	0.05	0.01
PROC 3	0.03	0.03
PROC 8a	0.01	0.05
PROC 8b	0.03	0.03
PROC 15	0.05	0.03

Predicted exposures are not expected to exceed the applicable exposure limits (DNEL as provided above) when the operational conditions/risk management measures described above are implemented

Risk characterization:

Process category	RCR (inhalation)	RCR (dermal)	RCR (all routes)
PROC 1	0.083	0.567	0.650
PROC 2	0.417	0.233	0.650
PROC 3	0.250	0.500	0.750
PROC 8a	0.073	0.833	0.907
PROC 8b	0.283	0.567	0.850
PROC 15	0.417	0.500	0.917

9.5.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

The workers exposure and environmental emissions have been evaluated using Ecetoc TRA integrated tool and Hydrocarbon Block Method with the Petrorisk model respectively.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

9.5.5. Additional good practice advice beyond the REACH CSA

Use specific measures expected to reduce the predicted exposure beyond the level estimated based on the exposure scenario when possible.

Exposure Scenario (ES6):

Use of fuel oil exportation in coatings – Professional

9.6.1. Exposure scenario addressing uses carried out by workers	
Use of fuel oil exportation in coatings – Professional	
Use descriptors related to the life cycle stage	<p>SU22 : Professional uses: Public domain (administration, education, entertainment, services, craftsmen)</p> <p>PROC1 : Use in closed process, no likelihood of exposure</p> <p>PROC2 : Use in closed, continuous process with occasional controlled exposure</p> <p>PROC3 : Use in closed batch process (synthesis or formulation)</p> <p>PROC8a : Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities</p> <p>PROC8b : Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities</p> <p>PROC15 : Use as laboratory reagent</p> <p>ERC8a : Wide dispersive indoor use of processing aids in open systems</p> <p>ERC8b : Wide dispersive indoor use of reactive substances in open systems</p>
Specific environmental release category	ESVOC SpERC 8.3b.v1
9.6.2. Operational conditions and risk management measures	
9.6.2.1. Control of environmental exposure	
Product characteristic	
Physical state	Liquid
Concentration of substance in product	Up to 100%
Vapour pressure of substance	<0.5 kPa at STP
Amounts used	
Daily at point sources	0.14 kg/day
Annually at point sources	0.05 t/year (maximum in worst case)
Annually total	100 t/year total market
Frequency and duration of use/exposure	
Emission days per year	365
Environment factors not influenced by risk management	
Flow rate of receiving surface water	18,000 m ³ /day (default)
Other given operational conditions affecting environmental exposure	
Release fraction to air from process before RMMs	0.98
Release fraction to waste water from process before RMMs	0.01

Fuel oil exportation

Annex to the Safety Data Sheet

according to Regulation (EC) No. 453/2010
Revision date: July 14, 2011

Supersedes:

Version: 1.0

Release fraction to soil from process before RMMs	0.01
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates are used.	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Apply technical measures aiming at reducing releases to air (containment by preference or catalytic or thermal gas oxidation)	Treat air emissions to provide a typical removal efficiency of %. N/A
Apply technical measures aiming at reduction and cleaning of waste water (WWTP /local STP (e.g. biological treatment))	Typical onsite wastewater treatment technology provides removal efficiency of 0%.
Risk from environmental exposure is driven by humans via indirect exposure. No wastewater treatment is required. Prevent discharge of undissolved substance to or recover from onsite wastewater.	
Organizational measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment	88.8%
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs	88.8%
Maximum allowable site tonnage (M_{safe}) (kg/d)	0.7
Assumed domestic sewage treatment plant flow (m^3/d)	2,000
Conditions and measures related to treatment of waste	
External treatment, disposal, recovery and recycling of waste should comply with applicable regulations.	
9.6.2.2. Control of worker exposure	
Frequency and duration of use/exposure	
Frequency of use for which the ES ensures control of risk	days/year: not restricted
Duration of use for which the ES ensures control of risk	8 hours/day (all PROCs) <15 minutes/day (PROC 8a & 8b)
Human factors not influenced by risk management	
Not applicable.	
Other given operational conditions affecting workers exposure	
Assumes use not >20° above ambient temperature, unless stated differently.	
Assumes a good basic standard of occupational hygiene is implemented.	
Technical conditions and measures at process level (source) to prevent release	
Consider technical advances and process upgrades (including automation) for the elimination of releases (all PROCs) Regularly inspect, test and maintain all control measures (all PROCs) Store substance within a closed system (PROC 1) Ensure material transfers are under containment or extract ventilation (PROC 8b)	
Technical conditions and measures to control dispersion from source towards the worker	
Minimise exposure using measures such as closed systems, dedicated facilities and suitable genera/ local exhaust ventilation* (all PROCs) Avoid carrying out activities involving exposure for more than 15 minutes (PROC 8a & 8b) Provide extract ventilation to points where emissions occur (PROC 2 & 3)	

Handle substance within a closed system (PROC 2 & 3)
Limit the substance content in the products to 5% (PROC 2 & 3)
Limit the substance content in the products to 1% (PROC 8a & 8b)
Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure (PROC 15)

Organisational measures to prevent /limit releases, dispersion and exposure

Avoid direct skin contact with product (all PROCs)
Identify potential areas for indirect skin contact (all PROCs)
Wash off skin contamination immediately (all PROCs)
Deal with spills immediately (PROC 8a)
Drain down systems and clear transfer lines prior to breaking containment. Clean/ flush equipment, where possible, prior to maintenance* (all PROCs)
Retain drain downs in sealed storage pending disposal or for subsequent recycle (PROC 8a)
Provide basic employee training to prevent/minimise exposures and to report and skin effects that may develop* (all PROCs)

Conditions and measures related to personal protection, hygiene and health evaluation

Restrict access to authorized staff *
Clean up spills immediately and dispose of wastes safely* (all PROCs)
Consider the need for risk based health surveillance* (all PROCs)
1. PPE: wear suitable gloves (tested to EN374) and coveralls to prevent skin contamination (all PROCs)
2. PPE: wear respiratory protection when its use is identified for certain contributing scenarios* (all PROCs)
*mandatory RMM for R45 derived by qualitative risk assessment

9.6.3. Exposure information and reference to its source

9.6.3.1. Prediction of environmental exposure resulting from the conditions described above

Substance is a complex hydrocarbon UVCB. Predominantly hydrophobic.
The Hydrocarbon Block Method with the Petrorisk model is used for environmental risk assessment. PNECs have been derived using HC5statistical extrapolation method and the target lipid model using representative structures. For more detailed information contact supplier - see Product Library tab in Petrorisk spreadsheet.

When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed the resulting risk characterisation ratios are expected to be less than 1.

Environmental exposure	In STP/ untreated wastewater (mg/l)	In local freshwater (mg/l)	In local soil (mg/kg dw)	In local marine water (mg/l)	In sediment freshwater (mg/kg dw)	In sediment marine water (mg/kg dw)
PEC	0.066	0.0066	0.00023	0.00066	0.85	0.000066

9.6.3.2. Prediction of workers exposure resulting from the conditions described above

Workers exposure estimation is calculated with Ectoc TRA model. Where applicable, predicted exposures and RCR values are reported as ranges. For DNEL values, please refer to Page 1.

Fuel oil exportation

Annex to the Safety Data Sheet

according to Regulation (EC) No. 453/2010
Revision date: July 14, 2011

Supersedes:

Version: 1.0

Process category	Inhalatory worker exposure (mg/m ³)	Dermal worker exposure (mg/kg/day)
PROC 1	0.01	0.03
PROC 2	0.04	0.03
PROC 3	0.04	0.01
PROC 8a	0.05	0.01
PROC 8b	0.05	0.03
PROC 15	0.05	0.03

Predicted exposures are not expected to exceed the applicable exposure limits (DNEL as provided above) when the operational conditions/risk management measures described above are implemented

Risk characterization:

Process category	RCR (inhalation)	RCR (dermal)	RCR (all routes)
PROC 1	0.083	0.567	0.650
PROC 2	0.333	0.467	0.800
PROC 3	0.333	0.100	0.433
PROC 8a	0.417	0.229	0.645
PROC 8b	0.417	0.572	0.988
PROC 15	0.417	0.500	0.917

9.6.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

The workers exposure and environmental emissions have been evaluated using Ecetoc TRA integrated tool and Hydrocarbon Block Method with the Petrorisk model respectively.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

9.6.5. Additional good practice advice beyond the REACH CSA

Use specific measures expected to reduce the predicted exposure beyond the level estimated based on the exposure scenario when possible.

Exposure Scenario (ES7):

Use of fuel oil exportation as a fuel – Industrial

9.7.1. Exposure scenario addressing uses carried out by workers	
Use of fuel oil exportation as a fuel – Industrial	
Use descriptors related to the life cycle stage	<p>SU3 : Industrial uses: Uses of substances as such or in preparations at industrial sites</p> <p>PROC1 : Use in closed process, no likelihood of exposure</p> <p>PROC2 : Use in closed, continuous process with occasional controlled exposure</p> <p>PROC3 : Use in closed batch process (synthesis or formulation)</p> <p>PROC8a : Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities</p> <p>PROC8b : Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities</p> <p>PROC16 : Using material as fuel sources, limited exposure to unburned product to be expected</p> <p>ERC7 : Industrial use of substances in closed systems</p>
Specific environmental release category	ESVOC SpERC 7.12a.v1
9.7.2. Operational conditions and risk management measures	
9.7.2.1. Control of environmental exposure	
Product characteristic	
Physical state	Liquid
Concentration of substance in product	Up to 100%
Vapour pressure of substance	<0.5 kPa at STP
Amounts used	
Daily at point sources	5,000,000 kg/day
Annually at point sources	1,500,000 t/year (maximum in worst case)
Annually total	11,000,000 t/year total market
Frequency and duration of use/exposure	
Emission days per year	300
Environment factors not influenced by risk management	
Flow rate of receiving surface water	18,000 m ³ /day (default)
Other given operational conditions affecting environmental exposure	
Release fraction to air from process before RMMs	0.0007
Release fraction to waste water from process before RMMs	0.00000044

Release fraction to soil from process before RMMs	0
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates are used.	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Apply technical measures aiming at reducing releases to air (containment by preference or catalytic or thermal gas oxidation)	Treat air emissions to provide a typical removal efficiency of %. N/A
Apply technical measures aiming at reduction and cleaning of waste water (WWTP /local STP (e.g. biological treatment))	Typical onsite wastewater treatment technology provides removal efficiency of 0%.
Risk from environmental exposure is driven by humans via indirect exposure. No wastewater treatment is required. Prevent discharge of undissolved substance to or recover from onsite wastewater.	
Organizational measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment	88.8%
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs	88.8%
Maximum allowable site tonnage (M_{safe}) (kg/d)	0.7
Assumed domestic sewage treatment plant flow (m^3/d)	2,000
Conditions and measures related to treatment of waste	
External treatment, disposal, recovery and recycling of waste should comply with applicable regulations.	
9.7.2.2. Control of worker exposure	
Frequency and duration of use/exposure	
Frequency of use for which the ES ensures control of risk	days/year: not restricted
Duration of use for which the ES ensures control of risk	8 hours/day (PROC 8a & 16) <1 hour/day (PROC 2 & 8b) <4 hours/day (PROC 1, 2, 3 & 8b)
Human factors not influenced by risk management	
Not applicable.	
Other given operational conditions affecting workers exposure	
Assumes use not >20° above ambient temperature, unless stated differently.	
Assumes a good basic standard of occupational hygiene is implemented.	
Technical conditions and measures at process level (source) to prevent release	
Consider technical advances and process upgrades (including automation) for the elimination of releases (all PROCs) Regularly inspect, test and maintain all control measures (all PROCs) Transfer via enclosed lines (PROC 8b) Store substance within a closed system (PROC 2) Ensure material transfers are under containment or extract ventilation (PROC 8b)	
Technical conditions and measures to control dispersion from source towards the worker	
Minimise exposure using measures such as closed systems, dedicated facilities and suitable genera/ local exhaust ventilation* (all PROCs)	

Avoid carrying out activities involving exposure for more than 1 hour (PROC 2 & 8b)
 Avoid carrying out activities involving exposure for more than 4 hours (PROC 1, 2, 3 & 8b)
 Provide a good standard of controlled ventilation (3 to 5 air changes per hour) (PROC 2 & 8b)
 Provide a good standard of controlled ventilation (10 to 15 air changes per hour) (PROC 2)
 Handle substance within a closed system (PROC 1, 2 & 3)

Organisational measures to prevent /limit releases, dispersion and exposure

Avoid direct skin contact with product (all PROCs)
 Identify potential areas for indirect skin contact (all PROCs)
 Wash off skin contamination immediately (all PROCs)
 Sample via a closed loop or other system intended to avoid exposure (PROC 1, 2 & 3)
 Drain down systems and clear transfer lines prior to breaking containment. Clean/ flush equipment, where possible, prior to maintenance* (all PROCs)
 Retain drain downs in sealed storage pending disposal or for subsequent recycle (PROC 8a)
 Provide basic employee training to prevent/minimise exposures and to report and skin effects that may develop* (all PROCs)

Conditions and measures related to personal protection, hygiene and health evaluation

Restrict access to authorized staff *
 Clean up spills immediately and dispose of wastes safely* (all PROCs)
 Consider the need for risk based health surveillance* (all PROCs)
 1. PPE: wear suitable gloves (tested to EN374) and coveralls to prevent skin contamination (all PROCs)
 2. PPE: wear respiratory protection when its use is identified for certain contributing scenarios* (all PROCs)
 *mandatory RMM for R45 derived by qualitative risk assessment

9.7.3. Exposure information and reference to its source

9.7.3.1. Prediction of environmental exposure resulting from the conditions described above

Substance is a complex hydrocarbon UVCB. Predominantly hydrophobic.
 The Hydrocarbon Block Method with the Petrorisk model is used for environmental risk assessment. PNECs have been derived using HC5statistical extrapolation method and the target lipid model using representative structures. For more detailed information contact supplier - see Product Library tab in Petrorisk spreadsheet.

When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed the resulting risk characterisation ratios are expected to be less than 1.

Environmental exposure	In STP/ untreated wastewater (mg/l)	In local freshwater (mg/l)	In local soil (mg/kg dw)	In local marine water (mg/l)	In sediment freshwater (mg/kg dw)	In sediment marine water (mg/kg dw)
PEC	0.066	0.0066	0.00023	0.00066	0.85	0.000066

9.7.3.2. Prediction of workers exposure resulting from the conditions described above

Workers exposure estimation is calculated with Ecetoc TRA model. Where applicable, predicted exposures and RCR values are reported as ranges. For DNEL values, please refer to Page 1.

Fuel oil exportation

Annex to the Safety Data Sheet

according to Regulation (EC) No. 453/2010
Revision date: July 14, 2011

Supersedes:

Version: 1.0

Process category	Inhalatory worker exposure (mg/m ³)	Dermal worker exposure (mg/kg/day)
PROC 1	0.01	0.03
PROC 2	0.03	0.03
PROC 3	0.04	0.03
PROC 8a	0	0.05
PROC 8b	0.03 – 0.04	0.03
PROC 16	0.01	0.03

Predicted exposures are not expected to exceed the applicable exposure limits (DNEL as provided above) when the operational conditions/risk management measures described above are implemented

Risk characterization:

Process category	RCR (inhalation)	RCR (dermal)	RCR (all routes)
PROC 1	0.058	0.567	0.625
PROC 2	0.250 – 0.320	0.567	0.817 – 0.887
PROC 3	0.320	0.567	0.887
PROC 8a	0.020	0.833	0.853
PROC 8b	0.283 – 0.320	0.567	0.850 – 0.887
PROC 16	0.083	0.567	0.650

9.7.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

The workers exposure and environmental emissions have been evaluated using Ecetoc TRA integrated tool and Hydrocarbon Block Method with the Petrorisk model respectively.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

9.7.5. Additional good practice advice beyond the REACH CSA

Use specific measures expected to reduce the predicted exposure beyond the level estimated based on the exposure scenario when possible.

Exposure Scenario (ES8):

Use of fuel oil exportation as a fuel – Professional

9.8.1. Exposure scenario addressing uses carried out by workers	
Use of fuel oil exportation as a fuel – Professional	
Use descriptors related to the life cycle stage	<p>SU22 : Professional uses: Public domain (administration, education, entertainment, services, craftsmen)</p> <p>PROC1 : Use in closed process, no likelihood of exposure</p> <p>PROC2 : Use in closed, continuous process with occasional controlled exposure</p> <p>PROC3 : Use in closed batch process (synthesis or formulation)</p> <p>PROC8a : Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities</p> <p>PROC8b : Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities</p> <p>PROC16 : Using material as fuel sources, limited exposure to unburned product to be expected</p> <p>ERC9a : Wide dispersive indoor use of substances in closed systems</p> <p>ERC9b : Wide dispersive outdoor use of substances in closed systems</p>
Specific environmental release category	ESVOC SpERC 9.12b.v1
9.8.2. Operational conditions and risk management measures	
9.8.2.1. Control of environmental exposure	
Product characteristic	
Physical state	Liquid
Concentration of substance in product	Up to 100%
Vapour pressure of substance	<0.5 kPa at STP
Amounts used	
Daily at point sources	460 kg/day
Annually at point sources	170 t/year (maximum in worst case)
Annually total	330,000 t/year total market
Frequency and duration of use/exposure	
Emission days per year	365
Environment factors not influenced by risk management	
Flow rate of receiving surface water	18,000 m ³ /day (default)
Other given operational conditions affecting environmental exposure	
Release fraction to air from process before RMMs	0.0001
Release fraction to waste water from process before	0.00001

RMMs	
Release fraction to soil from process before RMMs	0.00001
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates are used.	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Apply technical measures aiming at reducing releases to air (containment by preference or catalytic or thermal gas oxidation)	Treat air emissions to provide a typical removal efficiency of %. N/A
Apply technical measures aiming at reduction and cleaning of waste water (WWTP /local STP (e.g. biological treatment))	Typical onsite wastewater treatment technology provides removal efficiency of 0%.
Risk from environmental exposure is driven by humans via indirect exposure. No wastewater treatment is required.	
Organizational measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment	88.8%
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs	88.8%
Maximum allowable site tonnage (M_{safe}) (kg/d)	2,300
Assumed domestic sewage treatment plant flow (m^3/d)	2,000
Conditions and measures related to treatment of waste	
Combustion emissions limited by required exhaust emission controls. Combustion emissions considered in regional exposure assessment. This substance is consumed during use and no waste of the substance is generated to recover.	
9.8.2.2. Control of worker exposure	
Frequency and duration of use/exposure	
Frequency of use for which the ES ensures control of risk	days/year: not restricted
Duration of use for which the ES ensures control of risk	8 hours/day (PROC 8a & 16) <1 hour/day (PROC 2 & 8b) <4 hours/day (PROC 1, 2, 3 & 8b)
Human factors not influenced by risk management	
Not applicable.	
Other given operational conditions affecting workers exposure	
Assumes use not >20° above ambient temperature, unless stated differently.	
Assumes a good basic standard of occupational hygiene is implemented.	
Technical conditions and measures at process level (source) to prevent release	
Consider technical advances and process upgrades (including automation) for the elimination of releases (all PROCs) Regularly inspect, test and maintain all control measures (all PROCs) Ensure material transfers are under containment or extract ventilation (PROC 8b)	
Technical conditions and measures to control dispersion from source towards the worker	
Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/ local exhaust ventilation* (all PROCs)	

<p>Avoid carrying out activities involving exposure for more than 1 hour (PROC 1, 2, 3 & 8b) Provide a good standard of controlled ventilation (10 to 15 air changes per hour) (PROC 1, 2, 3 & 8b) Handle substance within a closed system (PROC 1, 2 & 3)</p>														
<p>Organisational measures to prevent /limit releases, dispersion and exposure</p> <p>Avoid direct skin contact with product (all PROCs) Identify potential areas for indirect skin contact (all PROCs) Wash off skin contamination immediately (all PROCs) Clear spills immediately (PROC 8a) Sample via a closed loop or other system intended to avoid exposure (PROC 1, 2 & 3) Drain down systems and clear transfer lines prior to breaking containment. Clean/ flush equipment, where possible, prior to maintenance* (all PROCs) Retain drain downs in sealed storage pending disposal or for subsequent recycle (PROC 8a) Provide basic employee training to prevent/minimise exposures and to report and skin effects that may develop* (all PROCs)</p>														
<p>Conditions and measures related to personal protection, hygiene and health evaluation</p> <p>Restrict access to authorized staff * Clean up spills immediately and dispose of wastes safely* (all PROCs) Consider the need for risk based health surveillance* (all PROCs) 1. PPE: wear suitable gloves (tested to EN374) and coveralls to prevent skin contamination (all PROCs) 2. PPE: wear respiratory protection when its use is identified for certain contributing scenarios* (all PROCs) *mandatory RMM for R45 derived by qualitative risk assessment</p>														
<p>9.8.3. Exposure information and reference to its source</p>														
<p>9.8.3.1. Prediction of environmental exposure resulting from the conditions described above</p> <p>Substance is a complex hydrocarbon UVCB. Predominantly hydrophobic. The Hydrocarbon Block Method with the Petrorisk model is used for environmental risk assessment. PNECs have been derived using HC5statistical extrapolation method and the target lipid model using representative structures. For more detailed information contact supplier - see Product Library tab in Petrorisk spreadsheet.</p> <p>When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed the resulting risk characterisation ratios are expected to be less than 1.</p> <table border="1"> <thead> <tr> <th>Environmental exposure</th> <th>In STP/ untreated wastewater (mg/l)</th> <th>In local freshwater (mg/l)</th> <th>In local soil (mg/kg dw)</th> <th>In local marine water (mg/l)</th> <th>In sediment freshwater (mg/kg dw)</th> <th>In sediment marine water (mg/kg dw)</th> </tr> </thead> <tbody> <tr> <td>PEC</td> <td>0.066</td> <td>0.0066</td> <td>0.00023</td> <td>0.00066</td> <td>0.85</td> <td>0.000066</td> </tr> </tbody> </table>	Environmental exposure	In STP/ untreated wastewater (mg/l)	In local freshwater (mg/l)	In local soil (mg/kg dw)	In local marine water (mg/l)	In sediment freshwater (mg/kg dw)	In sediment marine water (mg/kg dw)	PEC	0.066	0.0066	0.00023	0.00066	0.85	0.000066
Environmental exposure	In STP/ untreated wastewater (mg/l)	In local freshwater (mg/l)	In local soil (mg/kg dw)	In local marine water (mg/l)	In sediment freshwater (mg/kg dw)	In sediment marine water (mg/kg dw)								
PEC	0.066	0.0066	0.00023	0.00066	0.85	0.000066								
<p>9.8.3.2. Prediction of workers exposure resulting from the conditions described above</p> <p>Workers exposure estimation is calculated with Ectoc TRA model. Where applicable, predicted exposures and RCR values are reported as ranges. For DNEL values, please refer to Page 1.</p>														

Fuel oil exportation

Annex to the Safety Data Sheet

according to Regulation (EC) No. 453/2010
Revision date: July 14, 2011

Supersedes:

Version: 1.0

Process category	Inhalatory worker exposure (mg/m ³)	Dermal worker exposure (mg/kg/day)
PROC 1	0.01	0.03
PROC 2	0.04 - 0.06	0.02 – 0.03
PROC 3	0.03	0.03
PROC 8a	0.01	0.05
PROC 8b	0.03	0.03
PROC 16	0.01	0.03

Predicted exposures are not expected to exceed the applicable exposure limits (DNEL as provided above) when the operational conditions/risk management measures described above are implemented

Risk characterization:

Process category	RCR (inhalation)	RCR (dermal)	RCR (all routes)
PROC 1	0.083	0.567	0.650
PROC 2	0.320 - 0.500	0.283 – 0.567	0.783 – 0.887
PROC 3	0.250	0.567	0.817
PROC 8a	0.073	0.833	0.907
PROC 8b	0.283	0.567	0.850
PROC 16	0.083	0.567	0.650

9.8.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

The workers exposure and environmental emissions have been evaluated using Ecetoc TRA integrated tool and Hydrocarbon Block Method with the Petrorisk model respectively.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

9.8.5. Additional good practice advice beyond the REACH CSA

Use specific measures expected to reduce the predicted exposure beyond the level estimated based on the exposure scenario when possible.

Exposure Scenario (ES9):

Use of fuel oil exportation in road and construction applications – Professional

9.9.1. Exposure scenario addressing uses carried out by workers	
Use of fuel oil exportation in road and construction applications – Professional	
Use descriptors related to the life cycle stage	SU22 : Professional uses: Public domain (administration, education, entertainment, services, craftsmen) 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 ERC8d : Wide dispersive outdoor use of processing aids in open systems ERC8f : Wide dispersive outdoor use resulting in inclusion into or onto a matrix
Specific environmental release category	ESVOC SpERC 8.15.v1
9.9.2. Operational conditions and risk management measures	
9.9.2.1. Control of environmental exposure	
Product characteristic	
Physical state	Liquid
Concentration of substance in product	Up to 100%
Vapour pressure of substance	<0.5 kPa at STP
Amounts used	
Daily at point sources	30 kg/day
Annually at point sources	11 t/year (maximum in worst case)
Annually total	22,000 t/year total market
Frequency and duration of use/exposure	
Emission days per year	365
Environment factors not influenced by risk management	
Flow rate of receiving surface water	18,000 m ³ /day (default)
Other given operational conditions affecting environmental exposure	
Release fraction to air from process before RMMs	0.95
Release fraction to waste water from process before RMMs	0.01
Release fraction to soil from process before RMMs	0.04
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates are used.	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Apply technical measures aiming at reducing releases to air (containment by preference or catalytic or thermal	Treat air emissions to provide a typical removal efficiency of %. N/A

gas oxidation)	
Apply technical measures aiming at reduction and cleaning of waste water (WWTP /local STP (e.g. biological treatment))	Typical onsite wastewater treatment technology provides removal efficiency of 30.2%.
Risk from environmental exposure is driven by humans via indirect exposure. No wastewater treatment is required.	
Organizational measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment	88.8%
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs	88.8%
Maximum allowable site tonnage (M_{safe}) (kg/d)	110
Assumed domestic sewage treatment plant flow (m^3/d)	2,000
Conditions and measures related to treatment of waste	
External treatment, disposal, recovery and recycling should comply with applicable regulations.	
9.9.2.2. Control of worker exposure	
Frequency and duration of use/exposure	
Frequency of use for which the ES ensures control of risk	days/year: not restricted
Duration of use for which the ES ensures control of risk	<15 minutes/day (all PROCs)
Human factors not influenced by risk management	
Not applicable.	
Other given operational conditions affecting workers exposure	
Operation is carried out at elevated temperature (>20° above ambient temperature).	
Assumes a good basic standard of occupational hygiene is implemented.	
Technical conditions and measures at process level (source) to prevent release	
Consider technical advances and process upgrades (including automation) for the elimination of releases (all PROCs)	
Regularly inspect, test and maintain all control measures (all PROCs)	
Ensure material transfers are under containment or extract ventilation (PROC 8b)	
Technical conditions and measures to control dispersion from source towards the worker	
Minimise exposure using measures such as closed systems, dedicated facilities and suitable genera/ local exhaust ventilation* (all PROCs)	
Avoid carrying out activities involving exposure for more than 15 minutes (all PROCs)	
Limit the substance content in the product to 1% (all PROCs)	
Organisational measures to prevent /limit releases, dispersion and exposure	
Avoid direct skin contact with product (all PROCs)	
Identify potential areas for indirect skin contact (all PROCs)	
Wash off skin contamination immediately (all PROCs)	
Deal with spills immediately (PROC 8a)	
Drain down systems and clear transfer lines prior to breaking containment. Clean/ flush equipment, where possible, prior to maintenance* (all PROCs)	
Retain drain downs in sealed storage pending disposal or for subsequent recycle (PROC 8a)	
Provide basic employee training to prevent/minimise exposures and to report and skin effects that may develop*	

(all PROCs)						
Conditions and measures related to personal protection, hygiene and health evaluation						
<p>Restrict access to authorized staff *</p> <p>Clean up spills immediately and dispose of wastes safely* (all PROCs)</p> <p>Consider the need for risk based health surveillance* (all PROCs)</p> <p>1. PPE: wear suitable gloves (tested to EN374) and coveralls to prevent skin contamination (all PROCs)</p> <p>2. PPE: wear respiratory protection when its use is identified for certain contributing scenarios* (all PROCs)</p> <p>*mandatory RMM for R45 derived by qualitative risk assessment</p>						
9.9.3. Exposure information and reference to its source						
9.9.3.1. Prediction of environmental exposure resulting from the conditions described above						
<p>Substance is a complex hydrocarbon UVCB. Predominantly hydrophobic.</p> <p>The Hydrocarbon Block Method with the Petrorisk model is used for environmental risk assessment. PNECs have been derived using HC5 statistical extrapolation method and the target lipid model using representative structures. For more detailed information contact supplier - see Product Library tab in Petrorisk spreadsheet.</p> <p>When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed the resulting risk characterisation ratios are expected to be less than 1.</p>						
Environmental exposure	In STP/ untreated wastewater (mg/l)	In local freshwater (mg/l)	In local soil (mg/kg dw)	In local marine water (mg/l)	In sediment freshwater (mg/kg dw)	In sediment marine water (mg/kg dw)
PEC	0.066	0.0066	0.00023	0.00066	0.85	0.000066
9.9.3.2. Prediction of workers exposure resulting from the conditions described above						
<p>Workers exposure estimation is calculated with Ecetoc TRA model. Where applicable, predicted exposures and RCR values are reported as ranges. For DNEL values, please refer to Page 1.</p>						
Process category	Inhalatory worker exposure (mg/m³)		Dermal worker exposure (mg/kg/day)			
PROC 8a	0.05		0.01			
PROC 8b	0.05		0.03			
<p>Predicted exposures are not expected to exceed the applicable exposure limits (DNEL as provided above) when the operational conditions/risk management measures described above are implemented</p>						
Risk characterization:						
Process category	RCR (inhalation)	RCR (dermal)		RCR (all routes)		
PROC 8a	0.417	0.229		0.645		
PROC 8b	0.417	0.572		0.988		



Fuel oil exportation

Annex to the Safety Data Sheet

according to Regulation (EC) No. 453/2010
Revision date: July 14, 2011

Supersedes:

Version: 1.0

9.9.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

The workers exposure and environmental emissions have been evaluated using Ecetoc TRA integrated tool and Hydrocarbon Block Method with the Petrorisk model respectively.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

9.9.5. Additional good practice advice beyond the REACH CSA

Use specific measures expected to reduce the predicted exposure beyond the level estimated based on the exposure scenario when possible.