SAFETY DATA SHEET

Renewable hydrocarbons

Date of issue: 20th December 2023
Version: 1.0

ACCORDING TO EC-REGULATIONS 1907/2006 (REACH), 1272/2008 (CLP) & 2020/878

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

1.1 Product Identifier

Product Name	Renewable hydrocarbons
Molecular formula	C10-20H22-42
CAS No.	928771-01-1
EC No.	700-571-2
REACH Registration No.	06-2120907698-41-0000

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

Identified use(s)

Uses advised against: Anything other than the above.

1.3 Details of the supplier of the safety data sheet

Company Identification:
HARTREE PARTNERS (UK) LIMITED
2nd Floor, Cardinal Place 100 Victoria Street
London
SW1E 5JL
United Kingdom

Telephone: +44 (0) 2072017132
E-mail (competent person): Londonops@hartreepartners.com

Only representative of a non-Community manufacturer
Company Identification:
Hartree (Germany) GmbH
Ballindamm 39
20095 Hamburg
Germany

Telephone: +49 (40) 999 993 146
E-mail (competent person): HamburgOps@hartreepartners.com

1.4 Emergency Telephone Number

Emergency Phone No.: +32 3 575 11 30 (SGS Emergency Hotline)
Language(s) spoken: 24 hours, English spoken
Ireland Poison Center

Emergency Phone No.	+353 1 809 2566 (Healthcare Professionals)	24 hours / 7 days
	+353 1 809 2166 (Members of Public)	Office hours: 8am - 10pm, 7 days per week
Language(s) spoken:	English	

SECTION 2: HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Regulation (EC) No. 1272/2008 (CLP) Asp. Tox. 1; H304

2.2 Label elements

Product name: Renewable hydrocarbons
CAS No.: 928771-01-1
EINECS No.: 700-571-2

Hazard Pictogram(s)

Signal Word(s): DANGER

Hazard Statement(s): H304: May be fatal if swallowed and enters airways.

Precautionary Statement(s): P301+P310: IF SWALLOWED: Immediately call a POISON CENTER/doctor/....
P331: Do NOT induce vomiting.

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

2.3 Other hazards None known

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

SUBSTANCE	CAS No.	EC No.	REACH Registration No.	%W/W
Renewable hydrocarbons	928771-01-1	700-571-2	06-2120907698-41-0000	100

3.2 Mixtures

Not applicable

SECTION 4: FIRST AID MEASURES

4.1 Description of first aid measures

Self-protection of the first aider: Use personal protective equipment as required. Wear appropriate personal protective equipment, avoid direct contact. Ensure adequate ventilation. Avoid breathing mist/vapours/spray. Contaminated clothing should be laundered before reuse.

Inhalation: IF INHALED: If breathing is difficult, remove to fresh air and keep at rest in a position comfortable for breathing. Administer oxygen if necessary. Apply artificial respiration only if patient is not breathing. In the event of cardiac arrest apply external cardiac massage. Obtain medical attention.

	Skin contact	IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing and wash it before reuse. If symptoms persist, obtain medical attention.
	Eye contact	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention if irritation persists.
	Ingestion	IF SWALLOWED: Do not induce vomiting because of risk of aspiration into the lungs. If vomiting occurs spontaneously, keep head below hips to prevent aspiration into the lungs. Never give anything by mouth to an unconscious person. Seek immediate medical attention.
4.2	**Most important symptoms and effects, both acute and delayed**	Irritation of the respiratory tract. Repeated exposure may cause skin dryness or cracking. May cause diarrhoea and nausea. May be fatal if swallowed and enters airways.
4.3	**Indication of any immediate medical attention and special treatment needed**	Treat symptomatically.

SECTION 5: FIREFIGHTING MEASURES

5.1	**Extinguishing media**	
	Suitable extinguishing media	As appropriate for surrounding fire. Use water, CO_2, dry chemical, or foam
	Unsuitable extinguishing media	Do not use water jet. Direct water jet may spread the fire. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam
5.2	**Special hazards arising from the substance or mixture**	Incomplete combustion is likely to give rise to a complex mixture of airborne solid and liquid particulates and gases, including carbon monoxide and unidentified organic and inorganic compounds.
5.3	**Advice for firefighters**	Fight fire with normal precautions from a reasonable distance. Fire fighters should wear complete protective clothing including self-contained breathing apparatus. Keep containers cool by spraying with water if exposed to fire. Avoid run off to waterways and sewers.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1	**Personal precautions, protective equipment and emergency procedures**	Caution - spillages may be slippery. Evacuate the area and keep personnel upwind. Ensure operatives are trained to minimise exposures. Eliminate sources of ignition. Ensure suitable personal protection during removal of spillages. Shut off leaks if without risk. Ensure adequate ventilation. Avoid breathing mist/vapours/spray. Do not ingest. Use personal protective equipment as required. Take off contaminated clothing and wash it before reuse.
6.2	**Environmental precautions**	Avoid release to the environment. Do not allow to enter drains, sewers or water courses.
6.3	**Methods and material for containment and cleaning up**	Provided it is safe to do so, isolate the source of the leak. Clean up spill immediately. Absorb spillage in earth, sand, or any suitable absorbent material. Transfer to a container for disposal or recovery. Ventilate the area and wash spill site after material pick-up is complete.
6.4	**Reference to other sections**	See Section: 8, 13.

SECTION 7: HANDLING AND STORAGE

7.1	**Precautions for safe handling**	Ensure operatives are trained to minimise exposures. When using do not eat or drink. Take precautionary measures against static discharge. Bund storage facilities to prevent soil and water pollution in the event of spillage. Containers of this material may be hazardous when empty since they retain product residue. Do not cut, drill, grind, weld on or near this container. Ensure adequate ventilation. Avoid breathing mist/vapours/spray. Avoid splashing. Do not ingest. Use personal protective equipment as required. Take off contaminated clothing and wash it before reuse.
7.2	**Conditions for safe storage, including any incompatibilities**	Keep only in the original container. Store in a cool/low-temperature, well-ventilated (dry) place away from heat and ignition sources. Do not use or store near heat or open flame. Protect from direct sunlight. Keep away from food, drinks and animal food.
	Storage temperature	Store at ambient temperature.

	Incompatible materials	Keep away from: Strong oxidising agents.
7.3	**Specific end use(s)**	See Section: 1.2.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

8.1.1 Occupational exposure limits Not established

8.1.2 Biological limit value Not established

8.1.3 PNECs and DNELs

Predicted No Effect Concentration	Value
Aquatic Compartment	PNEC Water (freshwater) 0.01 mg/L
	PNEC Water (marine water) 0.01 mg/L
	PNEC Water (freshwater sediment) 3810 mg/kg dw
	PNEC Water (marine water sediment) 3.73 mg/kg dw
Soil	PNEC Soil 761 mg/kg dw
STP (sewage treatment plant)	PNEC STP 10 mg/L

Renewable hydrocarbons Derived No-Effect Level	Oral	Inhalation	Dermal
Worker - Long Term - Systemic effects	-	147 mg/m³	42 mg/kg bw/day
Consumer - Long Term - Systemic effects	18 mg/kg bw/day	94 mg/m³	18 mg/kg bw/day

8.2 Exposure controls

8.2.1 Appropriate engineering controls Ensure adequate ventilation. Store in a cool/low-temperature, well-ventilated (dry) place away from heat and ignition sources.

8.2.2 Individual protection measures, such as personal protective equipment Use personal protective equipment as required. Keep good industrial hygiene. Do not eat, drink or smoke at the work place. Avoid breathing mist/vapours/spray. Avoid splashing. Do not ingest.

Protective clothing should be selected specifically for the working place, depending on concentration and quantity of the hazardous substances handled. The resistance of the protective clothing to chemicals should be ascertained with the respective supplier.

Eye/ face protection

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

Skin protection

Hand protection: Wear impervious gloves (EN374). Gloves should be changed regularly to avoid permeation problems. Breakthrough time of the glove material: refer to the information provided by the gloves' producer.

Body protection: Wear suitable coveralls to prevent exposure to the skin.

Respiratory protection

In case of inadequate ventilation wear respiratory protection. Use NIOSH approved respiratory protection.

Thermal hazards Not applicable

8.2.3 Environmental exposure controls Avoid release to the environment. Do not allow to enter drains, sewers or water courses.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Colour	Colourless
Odour	Characteristic
Melting point/freezing point	-20 °C at 1 atm
Boiling point or initial boiling point and boiling range	242 °C at 1 atm
Flammability	Non-flammable.
Lower and upper explosion limit	Not established
Flash point	64 °C at 1013 hPa
Auto-ignition temperature	204 °C at 1013 hPa
Decomposition temperature	Not established
pH	5.3 – 6.3
Kinematic viscosity	2.6 mm^2/s at 40 °C
Solubility	0.075 mg/L at 25 °C Insoluble in water
Partition coefficient: n-octanol/water (log value)	Log KOW = 8.4 at 20 °C
Vapour pressure	87.1 Pa at 25 °C
Density and/or relative density	0.772 at 20 °C
Relative vapour density	Not established
Particle characteristics	Not established

9.2 Other information None known

SECTION 10: STABILITY AND REACTIVITY

10.1	**Reactivity**	Stable under normal conditions
10.2	**Chemical stability**	Stable under normal conditions
10.3	**Possibility of hazardous reactions**	None anticipated. Hazardous polymerisation will not occur.
10.4	**Conditions to avoid**	Avoid high temperatures or direct sunlight.
10.5	**Incompatible materials**	Keep away from: Strong oxidising agents.
10.6	**Hazardous decomposition products**	Incomplete combustion is likely to give rise to a complex mixture of airborne solid and liquid particulates and gases, including carbon monoxide and unidentified organic and inorganic compounds.

SECTION 11: TOXICOLOGICAL INFORMATION

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

Acute toxicity - Ingestion	Based upon the available data, the classification criteria are not met. LD50 (oral,rat) mg/kg: >2000 (EU Method B.1) (Mullaney, 2005)
Acute toxicity - Inhalation	Based upon the available data, the classification criteria are not met. LC50 (inhalation,rat) mg/l/4h: 4467 (OECD 403) (Nilsen, Haugen & Zaglsen, 1988)
Acute toxicity - Skin contact	Based upon the available data, the classification criteria are not met. LD50 (skin,rat) mg/kg: >2000 (EU Method B.3) (Sanders, 2006)
Skin corrosion/irritation	Based upon the available data, the classification criteria are not met. Not irritating to skin (rabbit) (EU Method B.4) (Sanders, 2007)
Serious eye damage/irritation	Based upon the available data, the classification criteria are not met. Reversible effects on the eye (rabbit) (EU Method B.5) (Sanders, 2007)
Respiratory or skin sensitisation	Based upon the available data, the classification criteria are not met. Sensitisation (guinea pig) – Negative (EU Method B.6) (Richeux, 2008)
Germ cell mutagenicity	Based upon the available data, the classification criteria are not met. Mutagenicity – Negative (bacteria) (EU Method B.13/14) (Thompson, 2005)
Carcinogenicity	Based upon the available data, the classification criteria are not met. No data available
Reproductive toxicity	Based upon the available data, the classification criteria are not met. Reproductive toxicity: Negative (rat) (OECD 416) (Dhinsa, Brooks & Watson 2009)

		NOAEL = 1000 mg/kg bw/day Developmental toxicity: Negative (rabbit) (OECD 414) (Hartman-Van Dycke, 2020) NOAEL = 1000 mg/kg bw/day
	STOT - Single Exposure	Based upon the available data, the classification criteria are not met. No data available
	STOT - Repeated Exposure	Based upon the available data, the classification criteria are not met. NOAEL = 1000 mg/kg bw/day (rat) (OECD 408) (Dhinsa, Brooks & Watson 2009)
	Aspiration hazard	Based upon the available data, the classification criteria are not met. Kinematic viscosity: 2.6 mm^2/s at 40 °C
11.2	**Information on other hazards**	
11.2.1	Endocrine disrupting properties	This product does not contain a substance that has endocrine disrupting properties with respect to humans as no components meets the criteria.
11.2.2	Other information	None known

SECTION 12: ECOLOGICAL INFORMATION

12.1	**Toxicity**	Based upon the available data, the classification criteria are not met. LL50 (48 hour): > 1000 mg/L (fish)(OECD 203) (Goodband, 2005) NOELR (48 hour): > 1000 mg/L (fish) ((Q)SAR) (CONCAWE, 2006)
12.2	**Persistence and degradability**	Readily biodegradable. % Degradation: 82 (28 days) (OECD 301B) (Clarke, 2008)
12.3	**Bioaccumulative potential**	The substance has low potential for bioaccumulation. BCF = 116.3 (OECD 305A) (Boethling et al., 1997)
12.4	**Mobility in soil**	The substance has low mobility in soil. Koc > 427000 (BCFWIN v2.17) (O' Connor & Woolley, 2009)
12.5	**Results of PBT and vPvB assessment**	Not classified as PBT or vPvB. None of the substances in this product fulfil the criteria for being regarded as a PBT or vPvB substance.
12.6	**Endocrine disrupting properties**	This product does not contain a substance that has endocrine disrupting properties with respect to non-target organisms as no components meets the criteria.
12.7	**Other adverse effects**	None known

SECTION 13: DISPOSAL CONSIDERATIONS

13.1	**Waste treatment methods**	Avoid release to the environment. Do not allow to enter drains, sewers or water courses. This material and its container must be disposed of as hazardous waste. Dispose of contents/container to hazardous waste collection point. Disposal should be in accordance with local, state or national legislation.

SECTION 14: TRANSPORT INFORMATION

Not classified according to the United Nations 'Recommendations on the Transport of Dangerous Goods'.

		ADR/RID	**ADN**	**IMDG**	**IATA/ICAO**
14.1	**UN number or ID number**	Not assigned	Not assigned	Not assigned	Not assigned
14.2	**UN proper shipping name**	Not assigned	Not assigned	Not assigned	Not assigned
14.3	**Transport hazard class(es)**	Not assigned	Not assigned	Not assigned	Not assigned
14.4	**Packing group**	Not assigned	Not assigned	Not assigned	Not assigned
14.5	**Environmental hazards**	Not classified as Environmentally hazardous substance	Not classified as Environmentally hazardous substance	Not classified as a Marine Pollutant.	Not classified as Environmentally hazardous substance
14.6	**Special precautions for user**	See Section: 2			
14.7	**Maritime transport in bulk according to IMO instruments**	No information available.	No information available.	No information available.	No information available.
14.8	**Additional information**	None known			

SECTION 15: REGULATORY INFORMATION

15.1	**Safety, health and environmental regulations/legislation specific for the substance or mixture**	
15.1.1	**EU regulations**	
	Authorisations and/or restrictions on use	Not restricted
	To follow:	Directive 98/24/EC of 7 April 1998 on the protection of the health and safety of workers from the risks related to chemical agents at work
15.1.2	**National regulations**	
	Germany	Water hazard class: nwg (Self classification)
15.2	**Chemical Safety Assessment**	A REACH chemical safety assessment (CSA) has been carried out. Refer to annexes for exposure scenarios detailing use specific exposure controls.

SECTION 16: OTHER INFORMATION

The following sections contain revisions or new statements: Not applicable – V1.0

References:
Existing Safety Data Sheet (SDS).
Existing ECHA registration(s) for Renewable hydrocarbons (EC No. 700-571-2) and Chemical Safety Report.

Literature References:

1. Boethling RS, Meylan WM, Howard PH, Aronson D, Printup H abd Gouchie S 1997: Improved Method for Estimating Bioconcentration Factor (BCF) from Octanol/Water Partition Coefficient (publication), SRC TR-97- 006 2nd Update.
2. Clarke, N 2008: NExBTL Biodiesel: Assessment of ready biodegradability; CO2 evolution test (study report), Testing laboratory: Safepharm Laboratories Ltd., Shardlow Business Park, Shardlow, Derbyshire DE72 2GD UK, Report no: 2106/0028. Owner company; Neste Oil Oyj,
3. CONCAWE 2006: PETROTOX—CONCAWE's ecotoxicity predictor for petroleum products. A user-friendly tool to assess aquatic toxicity hazard of complex petroleum and related substances (publication), CONCAWE Review, Volume 15, Number 2, Autumn 2006, pg. 16-18.. Owner company; CONCAWE
4. Dhinsa, NK, Brooks, P and Watson, P 2009: NExBTL Renewable Diesel: oral (gavage) two generation reproduction study in the rat with evaluation of subchronic toxicity (study report), Testing laboratory: Harlan Laboratories Ltd, Shardlow Business Park, Shardlow, Derbyshire, DE72 2GD, UK, Report no: 2106/0025. Owner company; Neste Oil Oyj, POB 95, FI-00095, NESTE OIL, Finland, Report date: Dec 9, 2009
5. Goodband, TJ 2005: NExBTL biodiesel, Acute toxicity to fish rainbow trout (Onchorynchus mykiss) (study report), Testing laboratory: SafePharm Laboratories, Report no: 2106/0009. Owner company; Neste Oil Corporation Renewable Fuels POB 95 FI-00095 NESTE OIL (Espoo) FINLAND, Report date: Aug 30, 2005
6. Hartman-Van Dycke, K.C.G. 2020: Prenatal Developmental Toxicity Study of Neste Renewable Diesel by Oral Gavage in Rats (study report), Testing laboratory: Charles River Laboratories Den Bosch BV (Hambakenwetering 7, 5231 DD 's-Hertogenbosch, The Netherlands) and Charles River Laboratories Den Bosch B.V. (Nistelrooisebaan 3, 5374 RE Schaijk, The Netherlands), Report no: 20223627. Owner company; Neste Oyj (Keilaranta 21, Espoo, PL95, 00095 Neste, Finland), Report date: Nov 16, 2020
7. Mullaney, T 2005: Acute oral toxicity of NExBTL Biodiesel in the rat - acute toxic class method (study report), Testing laboratory: SafePharm Laboratories, Shardlow Business Park, Shardlow, Derbyshire, DE72 2GD, UK, Report no: 2106/002. Owner company; Neste Oil Oyj, POB 95, FI-00095, NESTE OIL, Finland, Report date: Jul 7, 2007
8. Nilsen, OG, Haugen, OA, Zaglsen, K et al. 1988: Toxicity of n-C9 to n-C13 alkanes in the rat on short term inhalation (publication), Pharmacology and Toxicology 62, 259-266.
9. O'Connor B J, Woolley S M 2009: NExBTL renewable diesel: DETERMINATION OF GENERAL PHYSICOCHEMICAL PROPERTIES (study report), Testing laboratory: Harlan Laboratories Ltd Shardlow Business Park Shardlow Derbyshire DE72 2GD UK, Report no: 2106-0031. Owner company; Neste Oil Corporation Renewable Fuels POB 95 FI-00095 NESTE OIL (Espoo) FINLAND, Report date: Oct 29, 2009
10. Richeux, F 2008: NExBTL - Renewable diesel. Skin sensitisation in the guinea pig - Magnusson and Kligman maximisation method (study report), Testing laboratory: Phycher Bio Developpement, 33611 CESTAS Cedex, France, Report no: SMK-PH-07/0460. Owner company; Neste Oil Oyj, POB 95, FI-00095, NESTE OIL, Finland, Report date: May 20, 2008
11. Sanders, A 2006: NExBTL Biodiesel: acute dermal toxicity (limit test) in the rat (study report), Testing laboratory: SafePharm Laboratories, Shardlow Business Park, Shardlow, Derbyshire, DE72 2GD, UK, Report no: 2106/007. Owner company; Neste Oil Oyj, POB 95, FI-00095, NESTE OIL, Finland, Report date: Oct 23, 2006
12. Sanders, A 2007: NExBTL Biodiesel: acute dermal irritation in the rabbit (study report), Testing laboratory: SafePharm Laboratories, Shardlow Business Park, Shardlow, Derbyshire, DE72 2GD, UK, Report no: 2106/0021. Owner company; Neste Oil Oyj, POB 95, FI-00095, NESTE OIL, Finland, Report date: Aug 28, 2007

13. Thompson, PW 2005: NExBTL Biodiesel: reverse mutation assay “Ames Test” using Salmonella typhimurium. (study report), Testing laboratory: SafePharm Laboratories, Shardlow Business Park, Shardlow, Derbyshire, DE72 2GD, UK, Report no: 2106/003. Owner company; Neste Oil Oyj, POB 95, FI-00095, NESTE OIL, Finland, Report date: Jul 25, 2005

EU Classification: This Safety Data Sheet was prepared in accordance with EC Regulation (EC) 1907/2006 (REACH), 1272/2008 (CLP) & 2020/878

Legend

ADR	ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road
ADN	ADN: European Agreement on the International Transport of Dangerous Goods by Inland Waterways
BCF	Bioconcentration Factor
CAS	Chemical Abstracts Service
CLP	Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures
DNEL	Derived no effect level
EC	European Community
IATA	IATA: International Air Transport Association
ICAO	ICAO: International Civil Aviation Organization
IMDG	IMDG: International Maritime Dangerous Goods
LC50	Lethal Concentration at which 50% of the population is killed
LD50	Lethal Dose at which 50% of the population is killed
LTEL	Long term exposure limit
NOAEL	No Observed Adverse Effect Level
OECD	Organisation for Economic Cooperation and Development
PBT	PBT: Persistent, Bioaccumulative and Toxic
PNEC	Predicted No Effect Concentration
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
RID	RID: Regulations concerning the international railway transport of dangerous goods
STEL	Short term exposure limit
UN	United Nations
vPvB	vPvB: very Persistent and very Bioaccumulative
UVCB	Unknown or Variable Composition, Complex reaction products or Biological materials
WGK	Wassergefährdungsklasse (Germany) / Water hazard class

Training advice: Consideration should be given to the work procedures involved and the potential extent of exposure as they may determine whether a higher level of protection is required.

Hazard classification / Classification code:

Asp. Tox. 1; Aspiration hazard, Category 1

Hazard Statement(s)

EUH066: Repeated exposure may cause skin dryness or cracking.
H304: May be fatal if swallowed and enters airways.

Disclaimers

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Annex to the extended Safety Data Sheet (eSDS)

See below -

NAME Renewable hydrocarbons

CAS No. 928771-01-1
EC No. 700-571-2

Summary of Parameters

Physical parameters			
Vapour pressure (hPa)			87.1Pa at 25°C
Partition Coefficient (log K_{OW})			Log Kow (Log Pow): 8.4 at 20°C
Solubility (Water) (mg/l)			0.075mg/L at 25°C
Molecular weight			>142.3 - <285.5
Biodegradability			Readily biodegradable Degradation rate (%): 82 (28d) (% degradation (CO2 evolution) evolution))
Human Health (DNEL)			
Workers	Long Term - Systemic effects	Inhalation (mg/m³)	147mg/m³
		Dermal (mg/kg bw/day)	42mg/kg bw/day
Consumer	Long Term – Systemic effects	Inhalation (mg/m³)	94mg/m³
		Dermal (mg/kg bw/day)	18mg/kg bw/day
		Oral (mg/kg bw/day)	18mg/kg bw/day

Environmental Parameters (PNECs)

Freshwater (mg/L)	0.01mg/L
Marine water (mg/L)	0.01mg/L
Freshwater Sediment (mg/kg Sediment dw)	3810mg/kg Sediment dw
Marine water Sediment (mg/kg Sediment dw)	3.73mg/kg sediment dw
Sewage treatment plant (mg/L)	10mg/L
Soil (mg/kg soil dw)	761mg/kg soil dw

Contents

Contributing Scenarios

PROC Codes

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)
PROC4 Use in batch and other process (synthesis) where opportunity for exposure arises
PROC5 Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)
PROC7 Industrial spraying
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
PROC9 Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
PROC10 Roller application or brushing
PROC11 Non industrial spraying
PROC13 Treatment of articles by dipping and pouring
PROC15 Use as laboratory reagent
PROC16 Using material as fuel sources, limited exposure to unburned product to be expected
PROC17 Lubrication at high energy conditions and in partly open process
PROC18 Greasing at high energy conditions
PROC19 Hand-mixing with intimate contact and only PPE available
PROC20 Heat and pressure transfer fluids in dispersive, professional use but closed systems

PC Codes

PC1 Adhesives, sealants
PC4 Anti-Freeze and de-icing products
PC8 Biocidal products (e.g. Disinfectants, pest control)
PC9a Coatings and paints, thinners, paint removers
PC9b Fillers, putties, plasters, modelling clay
PC9c Finger paints
PC13 Fuels
PC15 Non-metal-surface treatment products
PC16 Heat transfer fluids
PC17 Hydraulic fluids
PC18 Ink and toners
PC23 Leather tanning, dye, finishing, impregnation and care products
PC24 Lubricants, greases, release products
PC31 Polishes and wax blends
PC34 Textile dyes, finishing and impregnating products; including bleaches and other processing aids
PC31 Polishes and wax blends
PC35 Washing and cleaning products (including solvent based products)

SU Codes

SU0 Other

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

Exposure Scenario 1: Formulation or re-packing

1.0 Contributing Scenarios	
Process category [PROC]	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) PROC3 Use in closed batch process (synthesis or formulation) (Elevated temperature) PROC5 Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) 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 PROC9 Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC15 Use as laboratory reagent
Environmental release categories [ERC]	ERC2 Formulation of preparations – CS1 (Bitumen) CS2 (Fuel)

2.0 Operational conditions and risk management measures		
2.1 Control of worker exposure		
Product characteristics		
Physical form of product	Liquid / Includes: Paste / Slurry / Suspension	
Concentration of substance in product	All PROC's	100
Human factors not influenced by risk management		
Frequency and duration of use		
Exposure duration per day	All PROC's	8hr
Other operational conditions affecting worker exposure		
Area of use	All PROC's	Indoor
Operating temperature	All PROC's	<= 40 °C
Vapour pressure	All PROC's	288.8 Pa
General measures applicable to all activities Assumes a good basic standard of occupational hygiene is implemented. maximum process temperature: 40°C. Control any potential exposure using measures such as contained or enclosed systems, properly designed and maintained facilities and a good standard of general ventilation. Drain down systems and clear transfer lines prior to breaking containment. Drain down and flush equipment where possible prior to maintenance. Where there is potential for exposure: Ensure relevant staff are informed of the nature of exposure and aware of basic actions to minimise exposures; Ensure suitable personal protective equipment is available; Clear up spills and dispose of waste in accordance with regulatory requirements; monitor effectiveness of control measures; consider the need for health surveillance; identify and implement corrective actions. ***General measures (skin irritants)*** Avoid contact with skin and eyes. Avoid inhalation of vapours.		
Organisational measures		
All PROC's	Occupational Health and Safety Guidelines - Management System: Advanced (industrial) exposure controls assumed	
Technical conditions of use		
PROC1	Use in closed process, no likelihood of exposure. Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Advanced Basic general ventilation (1-3 air changes per hour)	
PROC2, PROC3	Use in closed, continuous process with occasional controlled exposure. Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Advanced Basic general ventilation (1-3 air changes per hour)	
PROC5, PROC8a, PROC8b, PROC9, PROC15	Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Advanced Basic general ventilation (1-3 air changes per hour)	
Risk management measures related to human health		
Respiratory protection	Not required	
Hand and/or Skin protection	Not required Not required	
Eye Protection	Not required	
2.2 Control of environmental exposure		

Amounts used	
Fraction of EU tonnage used in region:	100 % (CS2)
Regional use tonnage (tons/year):	1.5E6
Annual site tonnage (tons/year):	<= 3E4
Maximum daily site tonnage (kg/day):	<= 10 000
Operational conditions	
Emission days (days/year):	300
Release fraction to air from process (initial release prior to RMM):	0.5% (CS1) 0.5 (CS2)
Release fraction to wastewater from process (initial release prior to RMM):	5E-4% (CS1) 5E-4% (CS2)
Local release rate (Air) (kg/day)	50 (CS1)
Local release rate (Water) (kg/day)	0.05 (CS1)
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Typical measures to maintain workplace concentrations of airborne VOCs and particulates below respective OELs: e.g. thermal wet scrubber, gas removal and/or air filtration, particle removal and/or thermal oxidation and/or vapour recovery, adsorption. Upgrade of the system in place or additional air treatment measures, such as wet scrubber and/or air filtration and/or thermal oxidation and/or vapour recovery systems, in order to achieve a reduction of the air emissions.	
Equipment cleaning and maintenance: Not applicable as there is no release to wastewater.	
Treat air emission to provide a typical removal efficiency of (%):	50% (CS2)
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%):	70% (CS2)
Organisational measures to prevent/limit release from site	
Process optimized for efficient use of raw materials.	
Conditions and measures related to municipal sewage treatment plant	
Discharge rate of STP	>= 2E3 m3/day (CS2)
Degradation effectiveness (%)	94.63% (CS2)
Substance release quantities after risk management measures	
Release factor after on-site RMM (Air)	0.5% (CS1) 0.25% (CS2)
Release factor after on-site RMM (Water)	5E-4% (CS1) 1.5E-4% (CS2)
Release factor after on-site RMM (soil)	0.01% (CS1) (CS2)

3. Exposure estimation and reference to its source

3.1 Human exposure prediction

Exposure assessment (method/calculation model)	ECETOC TRA

	Inhalation		Dermal		Combined
Process category [PROC]	**inhalation exposure (mg/m³)**	**Risk characterisation ratio (RCR)**	**dermal exposure(mg/kg bw/day)**	**Risk characterisation ratio (RCR)**	**Risk characterisation ratio (RCR)**
PROC1	0.091	<0.01	0.034	<0.01	<0.01
PROC2	9.083	0.062	1.37	0.033	0.094
PROC3	27.25	0.185	0.69	0.016	0.202
PROC5	45.41	0.309	13.71	0.326	0.635
PROC8a	90.83	0.618	13.71	0.326	0.944
PROC8b	45.41	0.309	13.71	0.326	0.635
PROC9	45.41	0.309	6.86	0.163	0.472
PROC15	45.41	0.309	0.34	< 0.01	0.317

3.2 Environmental exposure prediction

Exposure assessment (method/calculation model)	PETRORISK v7.04

environmental exposure	freshwater	marine water	soil	freshwater sediment	marine sediment
Predicted Environmental Exposure (PEC) (Regional)	1.7E-03	7.3E-05	3.2E-03	5.7E-01	5.7E-02
Risk Characterization Ratio (RCR)	6.4E-01	3.0E-02	3.2E-03	3.3E-01	3.3E-02

Indirect exposure to humans via the environment:

Exposure route	Exposure estimation (µg/kg/day)	Risk characterisation ratio (RCR)

Oral	6.8E-05	2.3E-04
Inhalation	7.1E-06	2.2E-03
Combined routes	7.5E-05	2.4E-03

4. Evaluation guidance to downstream user		
For scaling see	Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.	
Exposure assessment instrument/tool/method	Workers	TRA Workers 3.0
	Environmental exposure	PETRORISK v7.04

Exposure Scenario 2: Use at industrial sites (Use as Intermediate by Industry)

1.0 Contributing Scenarios	
Sector of uses SU	SU8 Manufacture of bulk, large scale chemicals (including petroleum products) SU9 Manufacture of fine chemicals
Process category [PROC]	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
Environmental release categories [ERC]	ERC6a Industrial use resulting in manufacture of another substance (use of intermediates)

2.0 Operational conditions and risk management measures		
2.1 Control of worker exposure		
Product characteristics		
Physical form of product	Liquid / Includes: Paste / Slurry / Suspension	
Concentration of substance in product	All PROC's	100
Human factors not influenced by risk management		
Frequency and duration of use		
Exposure duration per day	All PROC's	8hr
Other operational conditions affecting worker exposure		
Area of use	All PROC's	Indoor
Operating temperature	All PROC's	<= 40 °C
Vapour pressure	All PROC's	288.8 Pa
General measures applicable to all activities Assumes a good basic standard of occupational hygiene is implemented. maximum process temperature: 40°C. Control any potential exposure using measures such as contained or enclosed systems, properly designed and maintained facilities and a good standard of general ventilation. Drain down systems and clear transfer lines prior to breaking containment. Drain down and flush equipment where possible prior to maintenance. Where there is potential for exposure: Ensure relevant staff are informed of the nature of exposure and aware of basic actions to minimise exposures; Ensure suitable personal protective equipment is available; Clear up spills and dispose of waste in accordance with regulatory requirements; monitor effectiveness of control measures; consider the need for health surveillance; identify and implement corrective actions. ***General measures (skin irritants)*** Avoid contact with skin and eyes. Avoid inhalation of vapours.		
Organisational measures		
All PROC's	Occupational Health and Safety Guidelines - Management System: Advanced (industrial) exposure controls assumed	
Technical conditions of use		
PROC1	Use in closed process, no likelihood of exposure. Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Advanced Basic general ventilation (1-3 air changes per hour)	
PROC2, PROC3	Use in closed, continuous process with occasional controlled exposure. Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Advanced Basic general ventilation (1-3 air changes per hour)	
PROC8a, PROC8b, PROC15	Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Advanced Basic general ventilation (1-3 air changes per hour)	
Risk management measures related to human health		
Respiratory protection	Not required	
Hand and/or Skin protection	Not required	
	Not required	
Eye Protection	Not required	
2.2 Control of environmental exposure		
Amounts used		
Annual site tonnage (tons/year):	1.5E4	
Maximum daily site tonnage (kg/day):	<= 50 000	
Operational conditions		
Emission days (days/year):	300	
Release fraction to air from process (initial release prior to RMM):	0.01%	

Release fraction to wastewater from process (initial release prior to RMM):	1E-3%
Local release rate (Air) (kg/day)	2.5
Local release rate (Water) (kg/day)	0.15
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Typical measures to maintain workplace concentrations of airborne VOCs and particulates below respective OELs: e.g. thermal wet scrubber, gas removal and/or air filtration, particle removal and/or thermal oxidation and/or vapour recovery, adsorption. Upgrade of the system in place or additional air treatment measures, such as wet scrubber and/or air filtration and/or thermal oxidation and/or vapour recovery systems, in order to achieve a reduction of the air emissions.	
Equipment cleaning and maintenance: Not applicable as there is no release to wastewater.	
Treat air emission to provide a typical removal efficiency of (%):	50%
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%):	70%
Organisational measures to prevent/limit release from site	
Process optimized for efficient use of raw materials.	
Substance release quantities after risk management measures	
Release factor after on-site RMM (Air)	5E-3%
Release factor after on-site RMM (Water)	3E-4%
Release factor after on-site RMM (soil)	0.1%

3. Exposure estimation and reference to its source

3.1 Human exposure prediction

Exposure assessment (method/calculation model)	ECETOC TRA

	Inhalation		Dermal		Combined
Process category [PROC]	**inhalation exposure (mg/m³)**	**Risk characterisation ratio (RCR)**	**dermal exposure(mg/kg bw/day)**	**Risk characterisation ratio (RCR)**	**Risk characterisation ratio (RCR)**
PROC1	0.091	<0.01	0.034	<0.01	<0.01
PROC2	9.083	0.062	1.37	0.033	0.094
PROC3	27.25	0.185	0.69	0.016	0.202
PROC8a	90.83	0.618	13.71	0.326	0.944
PROC8b	45.41	0.309	13.71	0.326	0.635
PROC15	45.41	0.309	0.34	< 0.01	0.317

3.2 Environmental exposure prediction

Exposure assessment (method/calculation model)	PETRORISK v7.04

environmental exposure	freshwater	marine water	soil	freshwater sediment	marine sediment
Predicted Environmental Exposure (PEC) (Regional)	1.7E-03	7.3E-05	7.0E-04	5.7E-01	5.7E-02
Risk Characterization Ratio (RCR)	6.4E-01	3.0E-02	2.9E-04	3.3E-01	3.3E-02

Indirect exposure to humans via the environment:

Exposure route	Exposure estimation (µg/kg/day)	Risk characterisation ratio (RCR)
Oral	6.8E-05	1.2E-04
Inhalation	7.1E-06	2.3E-05
Combined routes	7.5E-05	1.4E-04

4. Evaluation guidance to downstream user

For scaling see	Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.	
Exposure assessment instrument/tool/method	Workers	TRA Workers 3.0
	Environmental exposure	PETRORISK v7.04

Exposure Scenario 3: Use at industrial sites (Use as a fuel)

1.0 Contributing Scenarios	
Sector of uses SU	SU0 Other
Process category [PROC]	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 PROC16 Using material as fuel sources, limited exposure to unburned product to be expected
Environmental release categories [ERC]	ERC7 Industrial use of substances in closed systems

2.0 Operational conditions and risk management measures		
2.1 Control of worker exposure		
Product characteristics		
Physical form of product	Liquid / Includes: Paste / Slurry / Suspension	
Concentration of substance in product	All PROC's	100
Human factors not influenced by risk management		
Frequency and duration of use		
Exposure duration per day	All PROC's	8hr
Other operational conditions affecting worker exposure		
Area of use	All PROC's	Indoor
Operating temperature	All PROC's	<= 40 °C
Vapour pressure	All PROC's	288.8 Pa
General measures applicable to all activities Assumes a good basic standard of occupational hygiene is implemented. maximum process temperature: 40°C. Control any potential exposure using measures such as contained or enclosed systems, properly designed and maintained facilities and a good standard of general ventilation. Drain down systems and clear transfer lines prior to breaking containment. Drain down and flush equipment where possible prior to maintenance. Where there is potential for exposure: Ensure relevant staff are informed of the nature of exposure and aware of basic actions to minimise exposures; Ensure suitable personal protective equipment is available; Clear up spills and dispose of waste in accordance with regulatory requirements; monitor effectiveness of control measures; consider the need for health surveillance; identify and implement corrective actions. ***General measures (skin irritants)*** Avoid contact with skin and eyes. Avoid inhalation of vapours.		
Organisational measures		
All PROC's	Occupational Health and Safety Guidelines - Management System: Advanced (industrial) exposure controls assumed	
Technical conditions of use		
PROC1	Use in closed process, no likelihood of exposure. Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Advanced Basic general ventilation (1-3 air changes per hour)	
PROC2	Use in closed, continuous process with occasional controlled exposure. Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Advanced Basic general ventilation (1-3 air changes per hour	
PROC3	Use in contained batch processes. Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Advanced Basic general ventilation (1-3 air changes per hour)	
PROC1(General exposures (closed systems), PROC2(General exposures (closed systems)), PROC3(General exposures (closed systems)), PROC8a, PROC8b, PROC15, PROC16	Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Advanced Basic general ventilation (1-3 air changes per hour)	
Risk management measures related to human health		
Respiratory protection	Not required	
Hand and/or Skin protection	Not required	
	Not required	
Eye Protection	Not required	
2.2 Control of environmental exposure		
Amounts used		
Annual site tonnage (tons/year):	<= 1E4	
Maximum daily site tonnage (kg/day):	<= 33 330	
Operational conditions		

Emission days (days/year):	300
Release fraction to air from process (initial release prior to RMM):	0.6%
Local release rate (Air) (kg/day)	199.9
Local release rate (Water) (kg/day)	0.02
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Typical measures to maintain workplace concentrations of airborne VOCs and particulates below respective OELs: e.g. thermal wet scrubber, gas removal and/or air filtration, particle removal and/or thermal oxidation and/or vapour recovery, adsorption. Upgrade of the system in place or additional air treatment measures, such as wet scrubber and/or air filtration and/or thermal oxidation and/or vapour recovery systems, in order to achieve a reduction of the air emissions.	
Equipment cleaning and maintenance: Not applicable as there is no release to wastewater.	
Substance release quantities after risk management measures	
Release factor after on-site RMM (Air)	0.6%
Release factor after on-site RMM (Water)	6E-5%
Release factor after on-site RMM (soil)	0%

3. Exposure estimation and reference to its source

3.1 Human exposure prediction

Exposure assessment (method/calculation model)	ECETOC TRA

	Inhalation		Dermal		Combined
Process category [PROC]	**inhalation exposure (mg/m³)**	**Risk characterisation ratio (RCR)**	**dermal exposure(mg/kg bw/day)**	**Risk characterisation ratio (RCR)**	**Risk characterisation ratio (RCR)**
PROC1	0.091	<0.01	0.034	<0.01	<0.01
PROC2	9.083	0.062	1.37	0.033	0.094
PROC3	27.25	0.185	0.69	0.016	0.202
PROC8a	90.83	0.618	13.71	0.326	0.944
PROC8b	45.41	0.309	13.71	0.326	0.635
PROC15	45.41	0.309	0.34	< 0.01	0.317
PROC16	9.083	0.062	0.34	<0.01	0.07

3.2 Environmental exposure prediction

Exposure assessment (method/calculation model)	PETRORISK v7.04

environmental exposure	**freshwater**	**marine water**	**soil**	**freshwater sediment**	**marine sediment**
Predicted Environmental Exposure (PEC) (Regional)	9.5E-04	2.9E-06	1.3E-03	1.6E-01	2.3E-03
Risk Characterization Ratio (RCR)	3.6E-01	1.2E-03	1.3E-03	1.1E-01	1.3E-03

Indirect exposure to humans via the environment:

Exposure route	**Exposure estimation (µg/kg/day)**	**Risk characterisation ratio (RCR)**
Oral	6.8E-05	8.7E-04
Inhalation	7.1E-06	7.5E-05
Dermal	7.5E-05	9.5E-04

4. Evaluation guidance to downstream user

For scaling see	Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.	
Exposure assessment instrument/tool/method	Workers	TRA Workers 3.0
	Environmental exposure	PETRORISK v7.04

Exposure Scenario 4: Use at industrial sites (Use in coatings)

1.0 Contributing Scenarios

Sector of uses SU	SU0 Other
Process category [PROC]	PROC1 Use in closed process, no likelihood of exposure PROC2 Use in closed, continuous process with occasional controlled exposure PROC4 Use in batch and other process (synthesis) where opportunity for exposure arises PROC5 Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC7 Industrial spraying 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 PROC10 Roller application or brushing PROC13 Treatment of articles by dipping and pouring PROC15 Use as laboratory reagent
Environmental release categories [ERC]	ERC7 Industrial use of substances in closed systems

2.0 Operational conditions and risk management measures		
2.1 Control of worker exposure		
Product characteristics		
Physical form of product	Liquid / Includes: Paste / Slurry / Suspension	
Concentration of substance in product	All PROC's	100
Human factors not influenced by risk management		
Frequency and duration of use		
Exposure duration per day	All PROC's	8hr
Other operational conditions affecting worker exposure		
Area of use	All PROC's	Indoor
Operating temperature	All PROC's	<= 40 °C
Vapour pressure	All PROC's	288.8 Pa
General measures applicable to all activities Assumes a good basic standard of occupational hygiene is implemented. maximum process temperature: 40°C. Control any potential exposure using measures such as contained or enclosed systems, properly designed and maintained facilities and a good standard of general ventilation. Drain down systems and clear transfer lines prior to breaking containment. Drain down and flush equipment where possible prior to maintenance. Where there is potential for exposure: Ensure relevant staff are informed of the nature of exposure and aware of basic actions to minimise exposures; Ensure suitable personal protective equipment is available; Clear up spills and dispose of waste in accordance with regulatory requirements; monitor effectiveness of control measures; consider the need for health surveillance; identify and implement corrective actions. ***General measures (skin irritants)*** Avoid contact with skin and eyes. Avoid inhalation of vapours.		
Organisational measures		
All PROC's	Occupational Health and Safety Guidelines - Management System: Advanced (industrial) exposure controls assumed	
Technical conditions of use		
PROC1, PROC2, PROC4, PROC5, PROC8a, PROC8b, PROC10, PROC13, PROC15	Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Advanced Basic general ventilation (1-3 air changes per hour)	
PROC7	Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Advanced. Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).	
Risk management measures related to human health		
Respiratory protection	PROC1, PROC2, PROC4, PROC5, PROC8a, PROC8b, PROC10, PROC13, PROC15	Not required
	PROC7	Yes (APF >= 10)
Hand and/or Skin protection	PROC1, PROC2, PROC4, PROC5, PROC8a, PROC8b, PROC13, PROC15	Not required
	PROC 7, PROC10	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. Dermal treatment effectiveness: 80%
Eye Protection	Not required	
2.2 Control of environmental exposure		
Amounts used		
Annual site tonnage (tons/year):	<= 5E3	
Maximum daily site tonnage (kg/day):	<= 18 500	
Operational conditions		
Emission days (days/year):	300	
Release fraction to air from process (initial release prior to RMM):	98%	

Release fraction to wastewater from process (initial release prior to RMM):	2E-3%
Local release rate (Air) (kg/day)	1.81E4 kg/day
Local release rate (Water) (kg/day)	0.37 kg/day
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Typical measures to maintain workplace concentrations of airborne VOCs and particulates below respective OELs: e.g. thermal wet scrubber, gas removal and/or air filtration, particle removal and/or thermal oxidation and/or vapour recovery, adsorption. Upgrade of the system in place or additional air treatment measures, such as wet scrubber and/or air filtration and/or thermal oxidation and/or vapour recovery systems, in order to achieve a reduction of the air emissions.	
Equipment cleaning and maintenance: Not applicable as there is no release to wastewater.	
Organisational measures to prevent/limit release from site	
Process optimized for efficient use of raw materials.	
Substance release quantities after risk management measures	
Release factor before on-site RMM (Air)	0.98%
Release factor after on-site RMM (Air)	0.98%
Release factor before on-site RMM (Water)	2E-3%
Release factor after on-site RMM (Water)	2E-3%
Release factor after on-site RMM (soil)	0%

3. Exposure estimation and reference to its source

3.1 Human exposure prediction

Exposure assessment (method/calculation model)	ECETOC TRA

	Inhalation		Dermal		Combined
Process category [PROC]	**inhalation exposure (mg/m³)**	**Risk characterisation ratio (RCR)**	**dermal exposure(mg/kg bw/day)**	**Risk characterisation ratio (RCR)**	**Risk characterisation ratio (RCR)**
PROC1	0.091	<0.01	0.034	<0.01	<0.01
PROC2	9.083	0.062	1.37	0.033	0.094
PROC4	45.41	0.309	6.86	0.163	0.472
PROC7	63.58	0.433	8.572	0.204	0.637
PROC8a	90.83	0.618	13.71	0.326	0.944
PROC8b	45.41	0.309	13.71	0.326	0.635
PROC10	90.83	0.618	5.486	0.131	0.749
PROC13	90.83	0.618	13.71	0.326	0.944
PROC15	45.41	0.309	0.34	< 0.01	0.317

3.2 Environmental exposure prediction

Exposure assessment (method/calculation model)	PETRORISK v7.04

environmental exposure	freshwater	marine water	soil	freshwater sediment	marine sediment
Predicted Environmental Exposure (PEC) (Regional)	1.4E-03	4.9E-05	1.1E-01	3.8E-01	3.8E-02
Risk Characterization Ratio (RCR)	5.4E-01	2.0E-02	1.1E-01	2.2E-01	2.2E-02

Indirect exposure to humans via the environment:

Exposure route	Exposure estimation (µg/kg/day)	Risk characterisation ratio (RCR)
Oral	6.8E-05	6.0E-03
Inhalation	7.1E-06	7.1E-02
Combined routes	7.5E-05	7.7E-02

4. Evaluation guidance to downstream user

For scaling see	Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.	
Exposure assessment instrument/tool/method	Workers	TRA Workers 3.0
	Environmental exposure	PETRORISK v7.04

Exposure Scenario 5: Use at industrial sites (Use in lubricants)

1.0 Contributing Scenarios	
Sector of uses SU	SU0 Other
Process category [PROC]	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) PROC4 Use in batch and other process (synthesis) where opportunity for exposure arises PROC7 Industrial spraying 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 PROC9 Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC10 Roller application or brushing PROC13 Treatment of articles by dipping and pouring PROC17 Lubrication at high energy conditions and in partly open process PROC18 Greasing at high energy conditions
Environmental release categories [ERC]	ERC7 Industrial use of substances in closed systems

2.0 Operational conditions and risk management measures		
2.1 Control of worker exposure		
Product characteristics		
Physical form of product	Liquid / Includes: Paste / Slurry / Suspension	
Concentration of substance in product	All PROC's	100%
Human factors not influenced by risk management		
Frequency and duration of use		
Exposure duration per day	All PROC's	8hr
Other operational conditions affecting worker exposure		
Area of use	All PROC's	Indoor
Operating temperature	All PROC's	<= 40 °C
Vapour pressure	All PROC's	288.8 Pa
General measures applicable to all activities Assumes a good basic standard of occupational hygiene is implemented. maximum process temperature: 40°C. Control any potential exposure using measures such as contained or enclosed systems, properly designed and maintained facilities and a good standard of general ventilation. Drain down systems and clear transfer lines prior to breaking containment. Drain down and flush equipment where possible prior to maintenance. Where there is potential for exposure: Ensure relevant staff are informed of the nature of exposure and aware of basic actions to minimise exposures; Ensure suitable personal protective equipment is available; Clear up spills and dispose of waste in accordance with regulatory requirements; monitor effectiveness of control measures; consider the need for health surveillance; identify and implement corrective actions. ***General measures (skin irritants)*** Avoid contact with skin and eyes. Avoid inhalation of vapours.		
Organisational measures		
All PROC's	Occupational Health and Safety Guidelines - Management System: Advanced (industrial) exposure controls assumed	
Technical conditions of use		
PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC9, PROC10, PROC13,	Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Advanced Basic general ventilation (1-3 air changes per hour)	
PROC7, PROC17	Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Advanced. Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).	
PROC18	Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Advanced. Enhanced general ventilation (5-10 air changes per hour)	
Risk management measures related to human health		
Respiratory protection	PROC1, PROC2, PROC4, PROC8a, PROC8b, PROC10, PROC13, PROC17, PROC18	Not required
	PROC7	Yes (APF >= 10)

Hand and/or Skin protection	PROC1, PROC2, PROC4, PROC8a, PROC8b, PROC13, PROC18	Not required
	PROC 7, PROC10, PROC17	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. Dermal treatment effectiveness: 80%
Eye Protection	Not required	

2.2 Control of environmental exposure	
Amounts used	
Regional use tonnage (tons/year):	<= 1E4
Annual site tonnage (tons/year):	<= 2E4
Maximum daily site tonnage (kg/day):	<= 33 330
Operational conditions	
Emission days (days/year):	300
Release fraction to air from process (initial release prior to RMM):	0.1%
Release fraction to wastewater from process (initial release prior to RMM):	1E-4%
Local release rate (Air) (kg/day)	33.33 kg/day
Local release rate (Water) (kg/day)	0.033 kg/day
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Typical measures to maintain workplace concentrations of airborne VOCs and particulates below respective OELs: e.g. thermal wet scrubber, gas removal and/or air filtration, particle removal and/or thermal oxidation and/or vapour recovery, adsorption. Upgrade of the system in place or additional air treatment measures, such as wet scrubber and/or air filtration and/or thermal oxidation and/or vapour recovery systems, in order to achieve a reduction of the air emissions.	
Equipment cleaning and maintenance: Not applicable as there is no release to wastewater.	
Organisational measures to prevent/limit release from site	
Process optimized for efficient use of raw materials.	
Substance release quantities after risk management measures	
Release factor before on-site RMM (Air)	0.1%
Release factor after on-site RMM (Air)	0.1%
Release factor before on-site RMM (Water)	1E-4%
Release factor after on-site RMM (Water)	1E-4%
Release factor after on-site RMM (soil)	0.1%

3. Exposure estimation and reference to its source

3.1 Human exposure prediction

Exposure assessment (method/calculation model)	ECETOC TRA

	Inhalation		Dermal		Combined
Process category [PROC]	**inhalation exposure (mg/m³)**	**Risk characterisation ratio (RCR)**	**dermal exposure(mg/kg bw/day)**	**Risk characterisation ratio (RCR)**	**Risk characterisation ratio (RCR)**
PROC1	0.091	<0.01	0.034	<0.01	<0.01
PROC2	9.083	0.062	1.37	0.033	0.094
PROC3	27.25	0.185	0.69	0.016	0.202
PROC4	45.41	0.309	6.86	0.163	0.472
PROC7	63.58	0.433	8.572	0.204	0.637
PROC8a	90.83	0.618	13.71	0.326	0.944
PROC8b	45.41	0.309	13.71	0.326	0.635
PROC9	45.41	0.309	6.86	0.163	0.472
PROC10	90.83	0.618	5.486	0.131	0.749
PROC13	90.83	0.618	13.71	0.326	0.944
PROC17	127.1	0.865	5.486	0.131	0.996
PROC18	54.5	0.371	13.71	0.326	0.697

3.2 Environmental exposure prediction

Exposure assessment (method/calculation model)	PETRORISK v7.04

environmental exposure	**freshwater**	**marine water**	**soil**	**freshwater sediment**	**marine sediment**
Predicted Environmental Exposure (PEC) (Regional)	9.7E-04	4.9E-06	8.8E-04	1.8E-01	3.8E-03
Risk Characterization Ratio (RCR)	3.6E-01	2.0E-03	4.8E-04	1.2E-01	2.2E-03

Indirect exposure to humans via the environment:

Exposure route	Exposure estimation (µg/kg/day)	Risk characterisation ratio (RCR)
Oral	6.8E-05	8.3E-05
Inhalation	7.1E-06	1.5E-04
Combined routes	7.5E-05	2.3E-04

4. Evaluation guidance to downstream user		
For scaling see	Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.	
Exposure assessment instrument/tool/method	Workers	TRA Workers 3.0
	Environmental exposure	PETRORISK v7.04

Exposure Scenario 6: Use at industrial sites (Use in functional fluids)

1.0 Contributing Scenarios	
Sector of uses SU	SU0 Other
Process category [PROC]	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) PROC4 Use in batch and other process (synthesis) where opportunity for exposure arises 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 PROC9 Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
Environmental release categories [ERC]	ERC7 Industrial use of substances in closed systems

2.0 Operational conditions and risk management measures		
2.1 Control of worker exposure		
Product characteristics		
Physical form of product	Liquid / Includes: Paste / Slurry / Suspension	
Concentration of substance in product	All PROC's	100%
Human factors not influenced by risk management		
Frequency and duration of use		
Exposure duration per day	All PROC's	8hr
Other operational conditions affecting worker exposure		
Area of use	All PROC's	Indoor
Operating temperature	All PROC's	<= 40 °C
Vapour pressure	All PROC's	288.8 Pa
General measures applicable to all activities Assumes a good basic standard of occupational hygiene is implemented. maximum process temperature: 40°C. Control any potential exposure using measures such as contained or enclosed systems, properly designed and maintained facilities and a good standard of general ventilation. Drain down systems and clear transfer lines prior to breaking containment. Drain down and flush equipment where possible prior to maintenance. Where there is potential for exposure: Ensure relevant staff are informed of the nature of exposure and aware of basic actions to minimise exposures; Ensure suitable personal protective equipment is available; Clear up spills and dispose of waste in accordance with regulatory requirements; monitor effectiveness of control measures; consider the need for health surveillance; identify and implement corrective actions. ***General measures (skin irritants)*** Avoid contact with skin and eyes. Avoid inhalation of vapours.		
Organisational measures		
All PROC's	Occupational Health and Safety Guidelines - Management System: Advanced (industrial) exposure controls assumed	
Technical conditions of use		

PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC9	Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Advanced Basic general ventilation (1-3 air changes per hour)	
Risk management measures related to human health		
Respiratory protection	All PROC's	Not required
Hand and/or Skin protection	All PROC's	Not required
Eye Protection	Not required	

2.2 Control of environmental exposure	
Amounts used	
Regional use tonnage (tons/year):	<= 10
Annual site tonnage (tons/year):	<= 2E4
Maximum daily site tonnage (kg/day):	<= 500
Operational conditions	
Emission days (days/year):	2.0E+01
Release fraction to air from process (initial release prior to RMM):	0.1%
Release fraction to wastewater from process (initial release prior to RMM):	1E-4%
Local release rate (Air) (kg/day)	0.5 kg/day
Local release rate (Water) (kg/day)	5E-4 kg/day
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Typical measures to maintain workplace concentrations of airborne VOCs and particulates below respective OELs: e.g. thermal wet scrubber, gas removal and/or air filtration, particle removal and/or thermal oxidation and/or vapour recovery, adsorption. Upgrade of the system in place or additional air treatment measures, such as wet scrubber and/or air filtration and/or thermal oxidation and/or vapour recovery systems, in order to achieve a reduction of the air emissions.	
Equipment cleaning and maintenance: Not applicable as there is no release to wastewater.	
Organisational measures to prevent/limit release from site	
Process optimized for efficient use of raw materials.	
Substance release quantities after risk management measures	
Release factor before on-site RMM (Air)	0.1%
Release factor after on-site RMM (Air)	0.1%
Release factor before on-site RMM (Water)	1E-4%
Release factor after on-site RMM (Water)	1E-4%
Release factor after on-site RMM (soil)	0.1%

3. Exposure estimation and reference to its source

3.1 Human exposure prediction

Exposure assessment (method/calculation model)	ECETOC TRA

	Inhalation		Dermal		Combined
Process category [PROC]	**inhalation exposure (mg/m³)**	**Risk characterisation ratio (RCR)**	**dermal exposure(mg/kg bw/day)**	**Risk characterisation ratio (RCR)**	**Risk characterisation ratio (RCR)**
PROC1	0.091	<0.01	0.034	<0.01	<0.01
PROC2	9.083	0.062	1.37	0.033	0.094
PROC3	27.25	0.185	0.69	0.016	0.202
PROC4	45.41	0.309	6.86	0.163	0.472
PROC8a	90.83	0.618	13.71	0.326	0.944
PROC8b	45.41	0.309	13.71	0.326	0.635
PROC9	45.41	0.309	6.86	0.163	0.472

3.2 Environmental exposure prediction

Exposure assessment (method/calculation model)	PETRORISK v7.04

environmental exposure	freshwater	marine water	soil	freshwater sediment	marine sediment
Predicted Environmental Exposure (PEC) (Regional)	9.3E-04	2.4E-06	2.2E-07	1.4E-01	4.3E-04
Risk Characterization Ratio (RCR)	3.5E-01	1.0E-03	2.6E-04	9.8E-02	1.5E-04

Indirect exposure to humans via the environment:

Exposure route	Exposure estimation (µg/kg/day)	Risk characterisation ratio (RCR)

Oral	6.8E-05	6.8E-05
Inhalation	7.1E-06	7.2E-06
Combined routes	7.5E-05	7.5E-05

4. Evaluation guidance to downstream user		
For scaling see	Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.	
Exposure assessment instrument/tool/method	Workers	TRA Workers 3.0
	Environmental exposure	PETRORISK v7.04

Exposure Scenario 7: Use at industrial sites (Use in water treatment)

1.0 Contributing Scenarios	
Sector of uses SU	SU0 Other
Process category [PROC]	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) PROC4 Use in batch and other process (synthesis) where opportunity for exposure arises 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 PROC13 Treatment of articles by dipping and pouring
Environmental release categories [ERC]	ERC4 Industrial use of processing aids in processes and products, not becoming part of articles

2.0 Operational conditions and risk management measures		
2.1 Control of worker exposure		
Product characteristics		
Physical form of product	Liquid / Includes: Paste / Slurry / Suspension	
Concentration of substance in product	All PROC's	100%
Human factors not influenced by risk management		
Frequency and duration of use		
Exposure duration per day	All PROC's	8hr
Other operational conditions affecting worker exposure		
Area of use	All PROC's	Indoor
Operating temperature	All PROC's	<= 40 °C
Vapour pressure	All PROC's	288.8 Pa
General measures applicable to all activities Assumes a good basic standard of occupational hygiene is implemented. maximum process temperature: 40°C. Control any potential exposure using measures such as contained or enclosed systems, properly designed and maintained facilities and a good standard of general ventilation. Drain down systems and clear transfer lines prior to breaking containment. Drain down and flush equipment where possible prior to maintenance. Where there is potential for exposure: Ensure relevant staff are informed of the nature of exposure and aware of basic actions to minimise exposures; Ensure suitable personal protective equipment is available; Clear up spills and dispose of waste in accordance with regulatory requirements; monitor effectiveness of control measures; consider the need for health surveillance; identify and implement corrective actions. ***General measures (skin irritants)*** Avoid contact with skin and eyes. Avoid inhalation of vapours.		
Organisational measures		
All PROC's	Occupational Health and Safety Guidelines - Management System: Advanced (industrial) exposure controls assumed	
Technical conditions of use		
PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC13	Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Advanced Basic general ventilation (1-3 air changes per hour)	
Risk management measures related to human health		
Respiratory protection	All PROC's	Not required
Hand and/or Skin protection	All PROC's	Not required

Eye Protection	Not required

2.2 Control of environmental exposure	
Amounts used	
Regional use tonnage (tons/year):	<= 1.12
Annual site tonnage (tons/year):	<= 2E4
Maximum daily site tonnage (kg/day):	<= 3.7
Operational conditions	
Emission days (days/year):	3.0E+02
Release fraction to air from process (initial release prior to RMM):	0.03%
Release fraction to wastewater from process (initial release prior to RMM):	40%
Local release rate (Air) (kg/day)	1.11E-3 kg/day
Local release rate (Water) (kg/day)	1.48 kg/day
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Typical measures to maintain workplace concentrations of airborne VOCs and particulates below respective OELs: e.g. thermal wet scrubber, gas removal and/or air filtration, particle removal and/or thermal oxidation and/or vapour recovery, adsorption. Upgrade of the system in place or additional air treatment measures, such as wet scrubber and/or air filtration and/or thermal oxidation and/or vapour recovery systems, in order to achieve a reduction of the air emissions.	
Equipment cleaning and maintenance: Not applicable as there is no release to wastewater.	
Organisational measures to prevent/limit release from site	
Process optimized for efficient use of raw materials.	
Substance release quantities after risk management measures	
Release factor before on-site RMM (Air)	0.03%
Release factor after on-site RMM (Air)	0.03%
Release factor before on-site RMM (Water)	40%
Release factor after on-site RMM (Water)	40%
Release factor after on-site RMM (soil)	0%

3. Exposure estimation and reference to its source

3.1 Human exposure prediction

Exposure assessment (method/calculation model)	ECETOC TRA

	Inhalation		Dermal		Combined
Process category [PROC]	**inhalation exposure (mg/m³)**	**Risk characterisation ratio (RCR)**	**dermal exposure(mg/kg bw/day)**	**Risk characterisation ratio (RCR)**	**Risk characterisation ratio (RCR)**
PROC1	0.091	<0.01	0.034	<0.01	<0.01
PROC2	9.083	0.062	1.37	0.033	0.094
PROC3	27.25	0.185	0.69	0.016	0.202
PROC4	45.41	0.309	6.86	0.163	0.472
PROC8a	90.83	0.618	13.71	0.326	0.944
PROC8b	45.41	0.309	13.71	0.326	0.635
PROC13	90.83	0.618	13.71	0.326	0.944

3.2 Environmental exposure prediction

Exposure assessment (method/calculation model)	PETRORISK v7.04

environmental exposure	**freshwater**	**marine water**	**soil**	**freshwater sediment**	**marine sediment**
Predicted Environmental Exposure (PEC) (Regional)	2.2E-03	2.2E-04	1.3E-06	1.6E+00	1.7E-01
Risk Characterization Ratio (RCR)	8.8E-01	8.8E-02	2.6E-04	1.0E+00	1.0E-01

Indirect exposure to humans via the environment:

Exposure route	**Exposure estimation (µg/kg/day)**	**Risk characterisation ratio (RCR)**
Oral	6.8E-05	1.4E-04
Inhalation	7.1E-06	9.9E-06
Combined routes	7.5E-05	1.5E-04

4. Evaluation guidance to downstream user		
For scaling see	Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.	
Exposure assessment instrument/tool/method	Workers	TRA Workers 3.0
	Environmental exposure	PETRORISK v7.04

Exposure Scenario 8: Widespread use by professional workers (Use as a fuel)

1.0 Contributing Scenarios	
Sector of uses SU	SU0 Other
Process category [PROC]	PROC1 Use in closed process, no likelihood of exposure PROC2 Use in closed, continuous process with occasional controlled exposure PROC8a Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC8b Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC16 Using material as fuel sources, limited exposure to unburned product to be expected
Environmental release categories [ERC]	ERC9a Wide dispersive indoor use of substances in closed systems – CS1-Use as a fuel ERC9b Wide dispersive outdoor use of substances in closed systems – CS2-Use as a fuel

2.0 Operational conditions and risk management measures		
2.1 Control of worker exposure		
Product characteristics		
Physical form of product	Liquid / Includes: Paste / Slurry / Suspension	
Concentration of substance in product	All PROC's	100%
Human factors not influenced by risk management		
Frequency and duration of use		
Exposure duration per day	All PROC's	8hr
Other operational conditions affecting worker exposure		
Area of use	All PROC's	Indoor
Operating temperature	All PROC's	<= 40 °C
Vapour pressure	All PROC's	288.8 Pa
General measures applicable to all activities Assumes a good basic standard of occupational hygiene is implemented. maximum process temperature: 40°C. Control any potential exposure using measures such as contained or enclosed systems, properly designed and maintained facilities and a good standard of general ventilation. Drain down systems and clear transfer lines prior to breaking containment. Drain down and flush equipment where possible prior to maintenance. Where there is potential for exposure: Ensure relevant staff are informed of the nature of exposure and aware of basic actions to minimise exposures; Ensure suitable personal protective equipment is available; Clear up spills and dispose of waste in accordance with regulatory requirements; monitor effectiveness of control measures; consider the need for health surveillance; identify and implement corrective actions. ***General measures (skin irritants)*** Avoid contact with skin and eyes. Avoid inhalation of vapours.		
Organisational measures		
All PROC's	Occupational Health and Safety Guidelines - Management System: Advanced (industrial) exposure controls assumed	
Technical conditions of use		
PROC1	Use in closed process, no likelihood of exposure. Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Basic Basic general ventilation (1-3 air changes per hour)	
PROC2	Use in closed, continuous process with occasional controlled exposure. Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Basic Basic general ventilation (1-3 air changes per hour)	
PROC8b, PROC16	Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Advanced Basic general ventilation (1-3 air changes per hour)	
PROC8a	Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Basic Enhanced general ventilation (5-10 air changes per hour)	
Risk management measures related to human health		

Respiratory protection	All PROC's	Not required
Hand and/or Skin protection	All PROC's	Not required
Eye Protection	Not required	

2.2 Control of environmental exposure	
Amounts used	
Annual site tonnage (tons/year):	<= 3E5
Maximum daily site tonnage (kg/day):	<= 41
Operational conditions	
Emission days (days/year):	3.7E+02
Release fraction to air from process (initial release prior to RMM):	0.5%
Release fraction to wastewater from process (initial release prior to RMM):	1E-4%
Local release rate (Water) (kg/day)	4.11E-5 kg/day
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Typical measures to maintain workplace concentrations of airborne VOCs and particulates below respective OELs: e.g. thermal wet scrubber, gas removal and/or air filtration, particle removal and/or thermal oxidation and/or vapour recovery, adsorption. Upgrade of the system in place or additional air treatment measures, such as wet scrubber and/or air filtration and/or thermal oxidation and/or vapour recovery systems, in order to achieve a reduction of the air emissions.	
Equipment cleaning and maintenance: Not applicable as there is no release to wastewater.	
Organisational measures to prevent/limit release from site	
Process optimized for efficient use of raw materials.	
Substance release quantities after risk management measures	
Release factor before on-site RMM (Air)	0.5%
Release factor after on-site RMM (Air)	0.5%
Release factor before on-site RMM (Water)	1E-4%
Release factor after on-site RMM (Water)	1E-4%
Release factor after on-site RMM (soil)	0.025%

3. Exposure estimation and reference to its source

3.1 Human exposure prediction

Exposure assessment (method/calculation model)	ECETOC TRA

	Inhalation		Dermal		Combined
Process category [PROC]	**inhalation exposure (mg/m³)**	**Risk characterisation ratio (RCR)**	**dermal exposure(mg/kg bw/day)**	**Risk characterisation ratio (RCR)**	**Risk characterisation ratio (RCR)**
PROC1	0.091	<0.01	0.034	<0.01	<0.01
PROC2	45.41	0.309	1.37	0.033	0.342
PROC8a	68.12	0.463	13.71	0.326	0.79
PROC8b	90.83	0.618	13.71	0.326	0.944
PROC16	9.083	0.062	0.34	<0.01	0.07

3.2 Environmental exposure prediction

Exposure assessment (method/calculation model)	PETRORISK v7.04

environmental exposure	**freshwater**	**marine water**	**soil**	**freshwater sediment**	**marine sediment**
Predicted Environmental Exposure (PEC) (Regional)	9.2E-04	2.3E-06	3.6E-06	1.4E-01	3.8E-04
Risk Characterization Ratio (RCR)	3.4E-01	9.8E-04	2.7E-04	9.8E-02	1.2E-04

Indirect exposure to humans via the environment:

Exposure route	**Exposure estimation (µg/kg/day)**	**Risk characterisation ratio (RCR)**
Oral	6.8E-05	6.8E-05
Inhalation	7.1E-06	7.1E-06
Combined routes	7.5E-05	7.5E-05

4. Evaluation guidance to downstream user

For scaling see	Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

Exposure assessment instrument/tool/method	Workers	TRA Workers 3.0
	Environmental exposure	PETRORISK v7.04

Exposure Scenario 9: Widespread use by professional workers – (Use in coatings)

1.0 Contributing Scenarios	
Sector of uses SU	SU0 Other
Process category [PROC]	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) PROC4 Use in batch and other process (synthesis) where opportunity for exposure arises PROC5 Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) 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 PROC10 Roller application or brushing PROC11 Non industrial spraying PROC13 Treatment of articles by dipping and pouring PROC15 Use as laboratory reagent PROC19 Hand-mixing with intimate contact and only PPE available
Environmental release categories [ERC]	ERC8a Wide dispersive indoor use of processing aids in open systems ERC8d Wide dispersive outdoor use of processing aids in open systems

2.0 Operational conditions and risk management measures		
2.1 Control of worker exposure		
Product characteristics		
Physical form of product	Liquid / Includes: Paste / Slurry / Suspension	
Concentration of substance in product	All PROC's	100
Human factors not influenced by risk management		
Frequency and duration of use		
Exposure duration per day	All PROC's	8hr
Other operational conditions affecting worker exposure		
Area of use	PROC1, PROC2, PROC3, PROC4 (CS9), PROC5 (CS7) (CS10), PROC8a, PROC8b, PROC10 (CAS14), PROC13 (CS16), PROC11 (CS18), PROC15, PROC19 (CS21)	Indoor
	PROC4 (CS8), PROC5 (CS11), PROC10 (CS15), PROC11 (CS19), PROC13 (CS17) (CS20), PROC19 (CS22)	Outdoor
Operating temperature	All PROC's	<= 40 °C
Vapour pressure	All PROC's	288.8 Pa
General measures applicable to all activities Assumes a good basic standard of occupational hygiene is implemented. maximum process temperature: 40°C. Control any potential exposure using measures such as contained or enclosed systems, properly designed and maintained facilities and a good standard of general ventilation. Drain down systems and clear transfer lines prior to breaking containment. Drain down and flush equipment where possible prior to maintenance. Where there is potential for exposure: Ensure relevant staff are informed of the nature of exposure and aware of basic actions to minimise exposures; Ensure suitable personal protective equipment is available; Clear up spills and dispose of waste in accordance with regulatory requirements; monitor effectiveness of control measures; consider the need for health surveillance; identify and implement corrective actions. ***General measures (skin irritants)*** Avoid contact with skin and eyes. Avoid inhalation of vapours.		
Organisational measures		
All PROC's	Occupational Health and Safety Guidelines - Management System: Advanced (industrial) exposure controls assumed	
Technical conditions of use		
PROC1	Use in closed process, no likelihood of exposure. Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Basic Basic general ventilation (1-3 air changes per hour)	

PROC2	Use in closed, continuous process with occasional controlled exposure. Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Basic Basic general ventilation (1-3 air changes per hour)	
PROC3 (CS5)	Use in contained batch processes. Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Basic Basic general ventilation (1-3 air changes per hour)	
PROC3 (CS6), PROC4, PROC5, PROC8b, PROC10 (CS15), PROC11 (CS19), PROC13, PROC15, PROC19 (CS22)	Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Basic Basic general ventilation (1-3 air changes per hour)	
PROC8a, PROC10 (CS14), PROC11 (CS18), PROC19 (CS21)	Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Basic Enhanced general ventilation (5-10 air changes per hour)	
Risk management measures related to human health		
Respiratory protection	PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC10 (CS14), PROC13, PROC15, PROC19 (CS21)	Not required
	PROC10 (CS15), PROC11 (CS19), PROC19 (CS22)	Yes (APF >= 10)
Hand and/or Skin protection	PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC10 (CS15), PROC13, PROC15	Not required
	PROC10 (CS14), PROC11, PROC19	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. Dermal treatment effectiveness: 80%
Eye Protection	Not required	

2.2 Control of environmental exposure	
Amounts used	
Annual site tonnage (tons/year):	<= 1E4
Maximum daily site tonnage (kg/day):	<= 1.37
Operational conditions	
Emission days (days/year):	3.7E+02
Release fraction to air from process (initial release prior to RMM):	98%
Release fraction to wastewater from process (initial release prior to RMM):	1%
Local release rate (Water) (kg/day)	0.014 kg/day
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Typical measures to maintain workplace concentrations of airborne VOCs and particulates below respective OELs: e.g. thermal wet scrubber, gas removal and/or air filtration, particle removal and/or thermal oxidation and/or vapour recovery, adsorption. Upgrade of the system in place or additional air treatment measures, such as wet scrubber and/or air filtration and/or thermal oxidation and/or vapour recovery systems, in order to achieve a reduction of the air emissions.	
Equipment cleaning and maintenance: Not applicable as there is no release to wastewater.	
Organisational measures to prevent/limit release from site	
Process optimized for efficient use of raw materials.	
Release factor before on-site RMM (Air)	98%
Release factor after on-site RMM (Air)	98%
Release factor before on-site RMM (Water)	1%
Release factor after on-site RMM (Water)	1%
Release factor after on-site RMM (soil)	1%

3. Exposure estimation and reference to its source

3.1 Human exposure prediction

Exposure assessment (method/calculation model)	ECETOC TRA

	Inhalation		Dermal		Combined
Process category [PROC]	**inhalation exposure (mg/m³)**	**Risk characterisation ratio (RCR)**	**dermal exposure(mg/kg bw/day)**	**Risk characterisation ratio (RCR)**	**Risk characterisation ratio (RCR)**
PROC1	0.091	<0.01	0.034	<0.01	<0.01
PROC2	45.41	0.309	1.37	0.033	0.342
PROC3	27.25	0.185	0.69	0.016	0.202
PROC4 (CS8)	63.58	0.433	6.86	0.163	0.596
PROC4 (CS9)	90.83	0.618	6.86	0.163	0.781
PROC5 (CS7) (CS10)	90.83	0.618	13.71	0.326	0.944
PROC5 (CS11)	63.58	0.433	13.71	0.326	0.759
PROC8a	68.12	0.463	13.71	0.326	0.79

PROC8b	90.83	0.618	13.71	0.326	0.944
PROC10 (CS14)	68.12	0.463	5.486	0.131	0.594
PROC10 (CS15)	15.89	0.108	27.43	0.653	0.761
PROC11 (CS18)	54.5	0.371	21.42	0.51	0.881
PROC11 (CS19)	12.71	0.087	21.42	0.51	0.597
PROC13 (CS16)	90.83	0.618	13.71	0.326	0.944
PROC13 (CS17) (CS20)	63.58	0.433	13.71	0.326	0.759
PROC15	45.41	0.309	0.34	<0.01	0.317
PROC19 (CS21)	40.87	0.278	28.28	0.673	0.952
PROC19 (CS22)	9.537	0.065	28.28	0.673	0.738

3.2 Environmental exposure prediction

Exposure assessment (method/calculation model)	PETRORISK v7.04

environmental exposure	freshwater	marine water	soil	freshwater sediment	marine sediment
Predicted Environmental Exposure (PEC) (Regional)	9.4E-04	4.3E-06	1.2E-03	1.5E-01	1.6E-03
Risk Characterization Ratio (RCR)	3.5E-01	1.8E-03	3.1E-03	1.1E-01	9.1E-04

Indirect exposure to humans via the environment:

Exposure route	Exposure estimation (µg/kg/day)	Risk characterisation ratio (RCR)
Oral	6.8E-05	7.0E-05
Inhalation	7.1E-06	7.1E-06
Combined routes	7.5E-05	7.7E-05

4. Evaluation guidance to downstream user

For scaling see	Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.	
Exposure assessment instrument/tool/method	Workers	TRA Workers 3.0
	Environmental exposure	PETRORISK v7.04

Exposure Scenario 10: Widespread use by professional workers (Use in lubricants) - High environmental release

1.0 Contributing Scenarios

Sector of uses SU	SU0 Other
Process category [PROC]	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 PROC11 Non industrial spraying PROC13 Treatment of articles by dipping and pouring PROC17 Lubrication at high energy conditions and in partly open process PROC20 Heat and pressure transfer fluids in dispersive, professional use but closed systems
Environmental release categories [ERC]	ERC8a Wide dispersive indoor use of processing aids in open systems ERC8d Wide dispersive outdoor use of processing aids in open systems

2.0 Operational conditions and risk management measures

2.1 Control of worker exposure

Product characteristics		
Physical form of product	Liquid / Includes: Paste / Slurry / Suspension	
Concentration of substance in product	All PROC's	100

Human factors not influenced by risk management		
Frequency and duration of use		
Exposure duration per day	All PROC's	8hr
Other operational conditions affecting worker exposure		
Area of use	PROC1, PROC2, PROC3, PROC8a, PROC8b, PROC13, PROC11, PROC17 (CS12) (CS13), PROC20	Indoor
	PROC17 (CS14) (CS15)	Outdoor
Operating temperature	All PROC's	<= 40 °C
Vapour pressure	All PROC's	288.8 Pa
General measures applicable to all activities Assumes a good basic standard of occupational hygiene is implemented. maximum process temperature: 40°C. Control any potential exposure using measures such as contained or enclosed systems, properly designed and maintained facilities and a good standard of general ventilation. Drain down systems and clear transfer lines prior to breaking containment. Drain down and flush equipment where possible prior to maintenance. Where there is potential for exposure: Ensure relevant staff are informed of the nature of exposure and aware of basic actions to minimise exposures; Ensure suitable personal protective equipment is available; Clear up spills and dispose of waste in accordance with regulatory requirements; monitor effectiveness of control measures; consider the need for health surveillance; identify and implement corrective actions. ***General measures (skin irritants)*** Avoid contact with skin and eyes. Avoid inhalation of vapours.		
Organisational measures		
All PROC's	Occupational Health and Safety Guidelines - Management System: Advanced (industrial) exposure controls assumed	
Technical conditions of use		
PROC2, PROC3, PROC8b, PROC13, PROC17 (Operation and lubrication of high energy open equipment; Outdoor), PROC17 (Operation and lubrication of high energy open equipment; With potential for aerosol generation; Outdoor), PROC20	Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Basic Basic general ventilation (1-3 air changes per hour)	
PROC8a, PROC11	Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Basic Room Ventilation: Enhanced (5 to10 ACH)	
PROC17 (Operation and lubrication of high energy open equipment; Indoor) (Operation and lubrication of high energy open equipment; With potential for aerosol generation; Indoor)	Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Basic Enhanced general ventilation (5-10 air changes per hour))	
Risk management measures related to human health		
Respiratory protection	PROC1, PROC2, PROC3, PROC8a, PROC8b, PROC13, PROC20	Not required
	PROC11, PROC17	Yes (APF >= 10)
Hand and/or Skin protection	PROC1, PROC2, PROC3, PROC8a, PROC8b, PROC13, PROC17 (CS14) (CS15), PROC20	Not required
	PROC11, PROC17 (CS12) (CS13)	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. Dermal treatment effectiveness: 80%
Eye Protection	Not required	

2.2 Control of environmental exposure

Amounts used	
Annual site tonnage (tons/year):	<= 2E4
Maximum daily site tonnage (kg/day):	<= 2.74
Operational conditions	
Emission days (days/year):	3.7E+02
Release fraction to air from process (initial release prior to RMM):	1.5%
Release fraction to wastewater from process (initial release prior to RMM):	5%
Local release rate (Water) (kg/day)	0.137 kg/day
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Typical measures to maintain workplace concentrations of airborne VOCs and particulates below respective OELs: e.g. thermal wet scrubber, gas removal and/or air filtration, particle removal and/or thermal oxidation and/or vapour recovery, adsorption. Upgrade of the system in place or additional air treatment measures, such as wet scrubber and/or air filtration and/or thermal oxidation and/or vapour recovery systems, in order to achieve a reduction of the air emissions.	
Equipment cleaning and maintenance: Not applicable as there is no release to wastewater.	

Organisational measures to prevent/limit release from site	
Process optimized for efficient use of raw materials.	
Substance release quantities after risk management measures	
Release factor before on-site RMM (Air)	1.5%
Release factor after on-site RMM (Air)	1.5%
Release factor before on-site RMM (Water)	5%
Release factor after on-site RMM (Water)	5%
Release factor after on-site RMM (soil)	5%

3. Exposure estimation and reference to its source

3.1 Human exposure prediction

Exposure assessment (method/calculation model)	ECETOC TRA

	Inhalation		Dermal		Combined
Process category [PROC]	inhalation exposure (mg/m³)	Risk characterisation ratio (RCR)	dermal exposure(mg/kg bw/day)	Risk characterisation ratio (RCR)	Risk characterisation ratio (RCR)
PROC1	0.091	<0.01	0.034	<0.01	<0.01
PROC2	45.41	0.309	1.37	0.033	0.342
PROC3	27.25	0.185	0.69	0.016	0.202
PROC8a	68.12	0.463	13.71	0.326	0.79
PROC8b	90.83	0.618	13.71	0.326	0.944
PROC11	27.25	0.185	21.42	0.51	0.696
PROC13	90.83	0.618	13.71	0.326	0.944
PROC17 (CS12) (CS13)	31.79	0.216	5.486	0.131	0.347
PROC17 (CS14) (CS15)	31.79	0.216	27.43	0.653	0.869
PROC20	45.41	0.309	1.71	0.041	0.35

3.2 Environmental exposure prediction

Exposure assessment (method/calculation model)	PETRORISK v7.04

environmental exposure	freshwater	marine water	soil	freshwater sediment	marine sediment
Predicted Environmental Exposure (PEC) (Regional)	1.1E-03	2.0E-05	1.2E-02	1.6E-01	1.6E-02
Risk Characterization Ratio (RCR)	4.3E-01	8.1E-03	3.1E-02	9.1E-02	9.1E-03

Indirect exposure to humans via the environment:

Exposure route	Exposure estimation (µg/kg/day)	Risk characterisation ratio (RCR)
Oral	6.8E-05	8.6E-05
Inhalation	7.1E-06	7.3E-06
Combined routes	7.5E-05	9.4E-05

4. Evaluation guidance to downstream user

For scaling see	Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.	
Exposure assessment instrument/tool/method	Workers	TRA Workers 3.0
	Environmental exposure	PETRORISK v7.04

Exposure Scenario 11: Widespread use by professional workers (Use in water treatment)

1.0 Contributing Scenarios

Process category [PROC]	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)

	PROC4 Use in batch and other process (synthesis) where opportunity for exposure arises 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 PROC13 Treatment of articles by dipping and pouring
Environmental release categories [ERC]	ERC8a Wide dispersive indoor use of processing aids in open systems ERC8d Wide dispersive outdoor use of processing aids in open systems

2.0 Operational conditions and risk management measures

2.1 Control of worker exposure

Product characteristics		
Physical form of product	Liquid / Includes: Paste / Slurry / Suspension	
Concentration of substance in product	All PROC's	100
Human factors not influenced by risk management		
Frequency and duration of use		
Exposure duration per day	All PROC's	8hr
Other operational conditions affecting worker exposure		
Area of use	All PROC's	Indoor
Operating temperature	All PROC's	<= 40 °C
Vapour pressure	All PROC's	288.8 Pa

General measures applicable to all activities

Assumes a good basic standard of occupational hygiene is implemented. maximum process temperature: 40°C. Control any potential exposure using measures such as contained or enclosed systems, properly designed and maintained facilities and a good standard of general ventilation. Drain down systems and clear transfer lines prior to breaking containment. Drain down and flush equipment where possible prior to maintenance. Where there is potential for exposure: Ensure relevant staff are informed of the nature of exposure and aware of basic actions to minimise exposures; Ensure suitable personal protective equipment is available; Clear up spills and dispose of waste in accordance with regulatory requirements; monitor effectiveness of control measures; consider the need for health surveillance; identify and implement corrective actions.

General measures (skin irritants)

Avoid contact with skin and eyes. Avoid inhalation of vapours.

Organisational measures	
All PROC's	Occupational Health and Safety Guidelines - Management System: Advanced (industrial) exposure controls assumed
Technical conditions of use	
PROC1, PROC2, PROC3, PROC4, PROC8b, PROC13	Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Basic Basic general ventilation (1-3 air changes per hour)
PROC8a	Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Basic Enhanced general ventilation (5-10 air changes per hour)

Risk management measures related to human health		
Respiratory protection	All PROC's	Not required
Hand and/or Skin protection	All PROC's	Not required
Eye Protection	Not required	

2.2 Control of environmental exposure

Amounts used	
Annual site tonnage (tons/year):	<= 7E3
Maximum daily site tonnage (kg/day):	<= 2.98
Operational conditions	
Emission days (days/year):	3.7E+02
Release fraction to air from process (initial release prior to RMM):	1%
Release fraction to wastewater from process (initial release prior to RMM):	50%
Local release rate (Water) (kg/day)	1.49 kg/day

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

Typical measures to maintain workplace concentrations of airborne VOCs and particulates below respective OELs: e.g. thermal wet scrubber, gas removal and/or air filtration, particle removal and/or thermal oxidation and/or vapour recovery, adsorption. Upgrade of the system in place or additional air treatment measures, such as wet scrubber and/or air filtration and/or thermal oxidation and/or vapour recovery systems, in order to achieve a reduction of the air emissions.

Equipment cleaning and maintenance: Not applicable as there is no release to wastewater.

Organisational measures to prevent/limit release from site

Process optimized for efficient use of raw materials.

Substance release quantities after risk management measures	
Release factor before on-site RMM (Air)	1%

Release factor after on-site RMM (Air)	1%
Release factor before on-site RMM (Water)	50%
Release factor after on-site RMM (Water)	50%
Release factor after on-site RMM (soil)	0%

3. Exposure estimation and reference to its source

3.1 Human exposure prediction

Exposure assessment (method/calculation model)	ECETOC TRA

	Inhalation		Dermal		Combined
Process category [PROC]	**inhalation exposure (mg/m³)**	**Risk characterisation ratio (RCR)**	**dermal exposure(mg/kg bw/day)**	**Risk characterisation ratio (RCR)**	**Risk characterisation ratio (RCR)**
PROC1	0.091	<0.01	0.034	<0.01	<0.01
PROC2	45.41	0.309	1.37	0.033	0.342
PROC3	27.25	0.185	0.69	0.016	0.202
PROC4	98.83	0.618	6.86	0.163	0.781
PROC8a	68.12	0.463	13.71	0.326	0.79
PROC8b	90.83	0.618	13.71	0.326	0.944
PROC13	90.83	0.618	13.71	0.326	0.944

3.2 Environmental exposure prediction

Exposure assessment (method/calculation model)	PETRORISK v7.04

environmental exposure	**freshwater**	**marine water**	**soil**	**freshwater sediment**	**marine sediment**
Predicted Environmental Exposure (PEC) (Regional)	2.2E-03	2.2E-04	1.3E-01	1.7E+00	1.7E-01
Risk Characterization Ratio (RCR)	8.8E-01	8.8E-02	3.4E-01	1.0E+00	1.0E-01

Indirect exposure to humans via the environment:

Exposure route	**Exposure estimation (µg/kg/day)**	**Risk characterisation ratio (RCR)**
Oral	6.8E-05	2.0E-04
Inhalation	7.1E-06	9.0E-06
combined routes	7.5E-05	2.1E-04

4. Evaluation guidance to downstream user

For scaling see	Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.	
Exposure assessment instrument/tool/method	Workers	TRA Workers 3.0
	Environmental exposure	PETRORISK v7.04

Exposure Scenario 12: Widespread use by professional workers (Use in functional fluids)

1.0 Contributing Scenarios

Sector of uses SU	SU0 Other
Process category [PROC]	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 PROC9 Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC20 Heat and pressure transfer fluids in dispersive, professional use but closed systems

Environmental release categories [ERC]	ERC9a Wide dispersive indoor use of substances in closed systems ERC9b Wide dispersive outdoor use of substances in closed systems

2.0 Operational conditions and risk management measures		
2.1 Control of worker exposure		
Product characteristics		
Physical form of product	Liquid / Includes: Paste / Slurry / Suspension	
Concentration of substance in product	All PROC's	100
Human factors not influenced by risk management		
Frequency and duration of use		
Exposure duration per day	All PROC's	8hr
Other operational conditions affecting worker exposure		
Area of use	All PROC's	Indoor
Operating temperature	All PROC's	<= 40 °C
Vapour pressure	All PROC's	288.8 Pa
General measures applicable to all activities Assumes a good basic standard of occupational hygiene is implemented. maximum process temperature: 40°C. Control any potential exposure using measures such as contained or enclosed systems, properly designed and maintained facilities and a good standard of general ventilation. Drain down systems and clear transfer lines prior to breaking containment. Drain down and flush equipment where possible prior to maintenance. Where there is potential for exposure: Ensure relevant staff are informed of the nature of exposure and aware of basic actions to minimise exposures; Ensure suitable personal protective equipment is available; Clear up spills and dispose of waste in accordance with regulatory requirements; monitor effectiveness of control measures; consider the need for health surveillance; identify and implement corrective actions. ***General measures (skin irritants)*** Avoid contact with skin and eyes. Avoid inhalation of vapours.		
Organisational measures		
All PROC's	Occupational Health and Safety Guidelines - Management System: Advanced (industrial) exposure controls assumed	
Technical conditions of use		
PROC1, PROC2, PROC3, PROC9, PROC20	Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Basic Basic general ventilation (1-3 air changes per hour)	
PROC8a	Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Basic Enhanced general ventilation (5-10 air changes per hour)	
Risk management measures related to human health		
Respiratory protection	All PROC's	Not required
Hand and/or Skin protection	All PROC's	Not required
Eye Protection	Not required	
2.2 Control of environmental exposure		
Amounts used		
Annual site tonnage (tons/year):	<= 2E4	
Maximum daily site tonnage (kg/day):	<= 2.74	
Operational conditions		
Emission days (days/year):	3.7E+02	
Release fraction to air from process (initial release prior to RMM):	5%	
Release fraction to wastewater from process (initial release prior to RMM):	5%	
Local release rate (Water) (kg/day)	0.137%	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil		
Typical measures to maintain workplace concentrations of airborne VOCs and particulates below respective OELs: e.g. thermal wet scrubber, gas removal and/or air filtration, particle removal and/or thermal oxidation and/or vapour recovery, adsorption. Upgrade of the system in place or additional air treatment measures, such as wet scrubber and/or air filtration and/or thermal oxidation and/or vapour recovery systems, in order to achieve a reduction of the air emissions.		
Equipment cleaning and maintenance: Not applicable as there is no release to wastewater.		
Organisational measures to prevent/limit release from site		
Process optimized for efficient use of raw materials.		
Substance release quantities after risk management measures		
Release factor before on-site RMM (Air)	5%	
Release factor after on-site RMM (Air)	5%	
Release factor before on-site RMM (Water)	5%	
Release factor after on-site RMM (Water)	5%	
Release factor after on-site RMM (soil)	5%	

3. Exposure estimation and reference to its source

3.1 Human exposure prediction

Exposure assessment (method/calculation model)	ECETOC TRA

	Inhalation		Dermal		Combined
Process category [PROC]	inhalation exposure (mg/m³)	Risk characterisation ratio (RCR)	dermal exposure(mg/kg bw/day)	Risk characterisation ratio (RCR)	Risk characterisation ratio (RCR)
PROC1	0.091	<0.01	0.034	<0.01	<0.01
PROC2	45.41	0.309	1.37	0.033	0.342
PROC3	27.25	0.185	0.69	0.016	0.202
PROC8a	68.12	0.463	13.71	0.326	0.79
PROC9	90.83	0.618	6.86	0.163	0.781
PROC20	45.41	0.309	1.71	0.041	0.35

3.2 Environmental exposure prediction

Exposure assessment (method/calculation model)	PETRORISK v7.04

environmental exposure	freshwater	marine water	soil	freshwater sediment	marine sediment
Predicted Environmental Exposure (PEC) (Regional)	1.1E-03	2.0E-05	1.2E-02	1.6E-01	1.6E-02
Risk Characterization Ratio (RCR)	4.3E-01	8.1E-03	3.1E-02	9.1E-02	9.1E-03

Indirect exposure to humans via the environment:

Exposure route	Exposure estimation (µg/kg/day)	Risk characterisation ratio (RCR)
Oral	6.8E-05	8.6E-05
Inhalation	7.1E-06	7.3E-06
combined routes	7.5E-05	9.4E-05

4. Evaluation guidance to downstream user

For scaling see	Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.	
Exposure assessment instrument/tool/method	Workers	TRA Workers 3.0
	Environmental exposure	PETRORISK v7.04

Exposure Scenario 13: Widespread use by professional workers (Use in functional fluids)

1.0 Contributing Scenarios

Sector of uses SU	SU0 Other
Process category [PROC]	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 PROC10 Roller application or brushing
Environmental release categories [ERC]	ERC8d Wide dispersive outdoor use of processing aids in open systems ERC8f Wide dispersive outdoor use resulting in inclusion into or onto a matrix

2.0 Operational conditions and risk management measures

2.1 Control of worker exposure

Product characteristics	
Physical form of product	Liquid / Includes: Paste / Slurry / Suspension

Concentration of substance in product	All PROC's	100
Human factors not influenced by risk management		
Frequency and duration of use		
Exposure duration per day	All PROC's	8hr
Other operational conditions affecting worker exposure		
Area of use	All PROC's	Indoor
Operating temperature	All PROC's	<= 40 °C
Vapour pressure	All PROC's	288.8 Pa
General measures applicable to all activities Assumes a good basic standard of occupational hygiene is implemented. maximum process temperature: 40°C. Control any potential exposure using measures such as contained or enclosed systems, properly designed and maintained facilities and a good standard of general ventilation. Drain down systems and clear transfer lines prior to breaking containment. Drain down and flush equipment where possible prior to maintenance. Where there is potential for exposure: Ensure relevant staff are informed of the nature of exposure and aware of basic actions to minimise exposures; Ensure suitable personal protective equipment is available; Clear up spills and dispose of waste in accordance with regulatory requirements; monitor effectiveness of control measures; consider the need for health surveillance; identify and implement corrective actions. ***General measures (skin irritants)*** Avoid contact with skin and eyes. Avoid inhalation of vapours.		
Organisational measures		
All PROC's	Occupational Health and Safety Guidelines - Management System: Advanced (industrial) exposure controls assumed	
Technical conditions of use		
PROC3, PROC8b	Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Basic Basic general ventilation (1-3 air changes per hour)	
PROC8a, PROC10	Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Basic Enhanced general ventilation (5-10 air changes per hour)	
Risk management measures related to human health		
Respiratory protection	All PROC's	Not required
Hand and/or Skin protection	PROC3, PROC8a, PROC8b	Not required
	PROC10	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. Dermal treatment effectiveness: 80%
Eye Protection	Not required	

2.2 Control of environmental exposure	
Amounts used	
Annual site tonnage (tons/year):	<= 1E4
Maximum daily site tonnage (kg/day):	<= 1.37
Operational conditions	
Emission days (days/year):	3.7E+02
Release fraction to air from process (initial release prior to RMM):	95%
Release fraction to wastewater from process (initial release prior to RMM):	1%
Local release rate (Water) (kg/day)	0.014 kg/day
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Typical measures to maintain workplace concentrations of airborne VOCs and particulates below respective OELs: e.g. thermal wet scrubber, gas removal and/or air filtration, particle removal and/or thermal oxidation and/or vapour recovery, adsorption. Upgrade of the system in place or additional air treatment measures, such as wet scrubber and/or air filtration and/or thermal oxidation and/or vapour recovery systems, in order to achieve a reduction of the air emissions.	
Equipment cleaning and maintenance: Not applicable as there is no release to wastewater.	
Organisational measures to prevent/limit release from site	
Process optimized for efficient use of raw materials.	
Substance release quantities after risk management measures	
Release factor before on-site RMM (Air)	95%
Release factor after on-site RMM (Air)	95%
Release factor before on-site RMM (Water)	1%
Release factor after on-site RMM (Water)	1%
Release factor after on-site RMM (soil)	4%

3. Exposure estimation and reference to its source

3.1 Human exposure prediction	
Exposure assessment (method/calculation model)	ECETOC TRA

	Inhalation		Dermal		Combined
Process category [PROC]	inhalation exposure (mg/m³)	Risk characterisation ratio (RCR)	dermal exposure(mg/kg bw/day)	Risk characterisation ratio (RCR)	Risk characterisation ratio (RCR)
PROC3	27.25	0.185	0.69	0.016	0.202
PROC8a	68.12	0.463	13.71	0.326	0.79
PROC8b	90.83	0.618	13.71	0.326	0.944
PROC10	68.12	0.463	5.486	0.131	0.594

3.2 Environmental exposure prediction

Exposure assessment (method/calculation model)	PETRORISK v7.04

environmental exposure	freshwater	marine water	soil	freshwater sediment	marine sediment
Predicted Environmental Exposure (PEC) (Regional)	1.1E-03	2.0E-05	1.2E-02	1.6E-01	1.6E-02
Risk Characterization Ratio (RCR)	4.3E-01	8.1E-03	3.1E-02	9.1E-02	9.1E-03

Indirect exposure to humans via the environment:

Exposure route	Exposure estimation (µg/kg/day)	Risk characterisation ratio (RCR)
Oral	6.8E-05	8.6E-05
Inhalation	7.1E-06	7.3E-06
combined routes	7.5E-05	9.4E-05

4. Evaluation guidance to downstream user

For scaling see	Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.	
Exposure assessment instrument/tool/method	Workers	TRA Workers 3.0
	Environmental exposure	PETRORISK v7.04

Exposure Scenario 14: Widespread use by professional workers (Use in explosive manufacturing and use)

1.0 Contributing Scenarios

Sector of uses SU	SU0 Other
Process category [PROC]	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) PROC5 Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) 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
Environmental release categories [ERC]	ERC8e Wide dispersive outdoor use of reactive substances in open systems

2.0 Operational conditions and risk management measures

2.1 Control of worker exposure

Product characteristics		
Physical form of product	Liquid / Includes: Paste / Slurry / Suspension	
Concentration of substance in product	All PROC's	100
Human factors not influenced by risk management		
Frequency and duration of use		
Exposure duration per day	All PROC's	8hr
Other operational conditions affecting worker exposure		

Area of use	All PROC's	Indoor
Operating temperature	All PROC's	<= 40 °C
Vapour pressure	All PROC's	288.8 Pa

General measures applicable to all activities

Assumes a good basic standard of occupational hygiene is implemented. maximum process temperature: 40°C. Control any potential exposure using measures such as contained or enclosed systems, properly designed and maintained facilities and a good standard of general ventilation. Drain down systems and clear transfer lines prior to breaking containment. Drain down and flush equipment where possible prior to maintenance. Where there is potential for exposure: Ensure relevant staff are informed of the nature of exposure and aware of basic actions to minimise exposures; Ensure suitable personal protective equipment is available; Clear up spills and dispose of waste in accordance with regulatory requirements; monitor effectiveness of control measures; consider the need for health surveillance; identify and implement corrective actions.

General measures (skin irritants)

Avoid contact with skin and eyes. Avoid inhalation of vapours.

Organisational measures	
All PROC's	Occupational Health and Safety Guidelines - Management System: Advanced (industrial) exposure controls assumed
Technical conditions of use	
PROC1, PROC2, PROC3, PROC5, PROC8b	Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Basic Basic general ventilation (1-3 air changes per hour)
PROC8a	Local exhaust ventilation – Not required. Occupational Health and Safety Management System: Basic Enhanced general ventilation (5-10 air changes per hour)

Risk management measures related to human health		
Respiratory protection	All PROC's	Not required
Hand and/or Skin protection	All PROC's	Not required
Eye Protection	Not required	

2.2 Control of environmental exposure

Amounts used	
Annual site tonnage (tons/year):	<= 2E4
Maximum daily site tonnage (kg/day):	<= 2.74
Operational conditions	
Emission days (days/year):	3.7E+02
Release fraction to air from process (initial release prior to RMM):	0.5%
Release fraction to wastewater from process (initial release prior to RMM):	5E-4 %
Local release rate (Water) (kg/day)	1.37E-5 kg/day

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

Typical measures to maintain workplace concentrations of airborne VOCs and particulates below respective OELs: e.g. thermal wet scrubber, gas removal and/or air filtration, particle removal and/or thermal oxidation and/or vapour recovery, adsorption. Upgrade of the system in place or additional air treatment measures, such as wet scrubber and/or air filtration and/or thermal oxidation and/or vapour recovery systems, in order to achieve a reduction of the air emissions.

Equipment cleaning and maintenance: Not applicable as there is no release to wastewater.

Organisational measures to prevent/limit release from site

Process optimized for efficient use of raw materials.

Substance release quantities after risk management measures	
Release factor before on-site RMM (Air)	0.5%
Release factor after on-site RMM (Air)	0.5%
Release factor before on-site RMM (Water)	5E-4 %
Release factor after on-site RMM (Water)	5E-4 %
Release factor after on-site RMM (soil)	0.01%

3. Exposure estimation and reference to its source

3.1 Human exposure prediction

Exposure assessment (method/calculation model)	ECETOC TRA

	Inhalation		Dermal		Combined
Process category [PROC]	**inhalation exposure (mg/m³)**	**Risk characterisation ratio (RCR)**	**dermal exposure(mg/kg bw/day)**	**Risk characterisation ratio (RCR)**	**Risk characterisation ratio (RCR)**
PROC1	0.091	<0.01	0.034	<0.01	<0.01
PROC2	45.41	0.309	1.37	0.033	0.342
PROC3	27.25	0.185	0.69	0.016	0.202
PROC5	90.83	0.618	13.71	0.326	0.944

PROC8a	68.12	0.463	13.71	0.326	0.79
PROC8b	90.83	0.618	13.71	0.326	0.944

3.2 Environmental exposure prediction

Exposure assessment (method/calculation model)	PETRORISK v7.04

environmental exposure	freshwater	marine water	soil	freshwater sediment	marine sediment
Predicted Environmental Exposure (PEC) (Regional)	9.2E-04	2.3E-06	6.6E-04	1.4E-01	3.7E-04
Risk Characterization Ratio (RCR)	3.4E-01	9.8E-04	2.6E-04	9.8E-02	1.2E-04

Indirect exposure to humans via the environment:

Exposure route	Exposure estimation (µg/kg/day)	Risk characterisation ratio (RCR)
Oral	6.8E-05	6.8E-05
Inhalation	7.1E-06	7.1E-06
combined routes	7.5E-05	7.5E-05

4. Evaluation guidance to downstream user

For scaling see	Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.	
Exposure assessment instrument/tool/method	Workers	TRA Workers 3.0
	Environmental exposure	PETRORISK v7.04

Exposure Scenario 15: – Consumer use - Uses in coatings

1.0 Contributing Scenarios

Chemical product category [PC]	PC1 Adhesives, sealants PC4 Anti-Freeze and de-icing products PC8 Biocidal products (e.g. Disinfectants, pest control) PC9a Coatings and paints, thinners, paint removers PC9b Fillers, putties, plasters, modelling clay PC9c Finger paints PC15 Non-metal-surface treatment products PC18 Ink and toners PC23 Leather tanning, dye, finishing, impregnation and care products PC24 Lubricants, greases, release products PC31 Polishes and wax blends PC34 Textile dyes, finishing and impregnating products; including bleaches and other processing aids
Environmental release categories [ERC]	ERC8a Wide dispersive indoor use of processing aids in open systems ERC8d Wide dispersive outdoor use of processing aids in open systems

2.0 Operational conditions and risk management measures

2.1 Control of worker exposure

Product characteristics

Physical form of product	Liquid PC24 (CS28): Paste

Concentration of substance in product

Chemical product category [PC]	Category	%
PC1	CS2	30
PC4	CS6	<= 1
	CS7	<= 10
	CS8	<= 50
PC8	CS9	<= 5

			CS10	<= 5
			CS11	<= 15
		PC9a	CS12	<= 1.5
			CS13	<= 28
			CS14-CS15	<= 50
		PC9b	CS16-CS17	<= 2
			CS18	<= 1
			CS19	<= 6.5
		PC15	CS20	<= 50
			CS21	<= 28
			CS22	<= 2
			CS23	<= 50
		PC18	CS24	<= 10
		PC23	CS25	<= 50
		PC24	CS27	<= 100
			CS28	<= 20
			CS29	<= 50
		PC31	CS30-CS31	<= 50
		PC34	CS32	<= 10

Human factors not influenced by risk management

Potential exposure area

Chemical product category [PC]	Category	Potential exposure area
PC1	CS2	Fingertips
	CS3	Both hands
	CS4	Fingertips
	CS5	Fingertips
PC4	CS6	-
	CS7	Inside hands / one hand / palm of hands
	CS8	Palm of one hand
PC8	All	Both hands
PC9a	CS12-CS1	Inside hands / one hand / palm of hands
	CS14	-
	CS15	Both hands
PC9b	CS16	Fingertips
	CS17	Both hands
	CS18	-
	CS19	Inside hands / one hand / palm of hands
PC15	CS20	-
	CS21	Inside hands / one hand / palm of hands
	CS22	Inside hands / one hand / palm of hands
	CS23	Both hands
PC18	CS24	Fingertips
PC23	CS25	Inside hands / one hand / palm of hands
	CS26	Both hands
PC24	CS27	Both hands
	CS28	Both hands
	CS29	Palm of hands
PC31	CS30	Palm of one hand
	CS31	Both hands
PC34	CS32	Both hands

Exposure route

Chemical product category [PC]	Category	Exposure route		
		Inhalation	Dermal	Oral
PC1	CS2	Yes	Yes	No
	CS3	Yes	Yes	No
	CS4	Yes	Yes	No
	CS5	Yes	Yes	No
PC4	CS6	Yes	No	No
	CS7	Yes	Yes	No
	CS8	Yes	Yes	No

	PC8	All	Yes	Yes	No
	PC9a	CS12	Yes	Yes	No
		CS13	Yes	Yes	No
		CS14	Yes	No	No
		CS15	Yes	Yes	No
	PC9b	CS16	Yes	Yes	No
		CS17	No	Yes	No
		CS18	No	Yes	Yes
		CS19	No	Yes	Yes
	PC15	CS20	Yes	No	No
		CS21	Yes	Yes	No
		CS22	Yes	Yes	No
		CS23	Yes	Yes	No
	PC18	CS24	Yes	Yes	No
	PC23	CS25	Yes	Yes	No
		CS26	Yes	Yes	No
	PC24	CS27	Yes	Yes	No
		CS28	No	Yes	No
		CS29	Yes	Yes	No
	PC31	CS30	Yes	Yes	No
		CS31	Yes	Yes	No
	PC34	CS32	Yes	Yes	No

Exposed Area (cm²) / Amounts used (cm^3)

Chemical product category [PC]	Category	Inhalation	Dermal Exposed Area	Oral Product swallowed
PC1	CS2	-	<= 35.73 cm²	-
	CS3	-	<= 857.5 cm²	-
	CS4	-	<= 35.7 cm²	-
	CS5		<= 35.7 cm²	
PC4	CS6	-	-	-
	CS7	-	<= 428 cm²	-
	CS8	-	<= 214.4 cm²	-
PC8	CS9	-	<= 857.5 cm²	-
	CS10	-	<= 857.5 cm²	-
	CS11	-	<= 428 cm²	-
PC9a	CS12	-	<= 428.7 cm²	-
	CS13	-	<= 428.7 cm²	
	CS14	-	-	-
	CS15	-	<= 857.5 cm²	-
PC9b	CS16	-	<= 35.7 cm²	-
	CS17	-	<= 857.7 cm²	-
	CS18	-	<= 254.4 cm²	<= 1 cm^3
	CS19	-	-	<= 1.35 cm^3
PC15	CS20	-	-	-
	CS21	-	<= 428.7 cm²	-
	CS22	-	<= 428.7 cm²	-
	CS23	-	<= 857.5 cm²	-
PC18	CS24	-	<= 71.4 cm²	-
PC23	CS25	-	<= 430 cm²	-
	CS26	-	<= 857.5 cm²	-
PC24	CS27	-	<= 857.5 cm²	-
	CS28	-	<= 857.5 cm²	-
	CS29	-	<= 428.7 cm²	-
PC31	CS30	-	<= 430 cm²	-
	CS31	-	<= 857.5 cm²	-
PC34	CS32	-	<= 857.5 cm²	-

Transfer factor

Chemical product category [PC]	Category	Transfer factor		
		Inhalation	Dermal	Oral
PC1	All	1	1	-
PC4	CS6	1	-	-
	CS7	1	1	-
	CS8	1	1	-

	PC8	All	1	1	-
	PC9a	CS12	1	1	-
		CS13	1	1	-
		CS14	1	-	-
		CS15	1	1	-
	PC9b	CS16	1	1	-
		CS17	-	1	-
		CS18	-	1	1
		CS19	-	1	1
	PC15	CS20	1	-	-
		CS21	1	1	-
		CS22	1	1	-
		CS23	1	1	-
	PC18	CS24	1	1	-
	PC23	CS25	1	1	-
		CS26	1	1	-
	PC24	CS27	1	1	-
		CS28	-	-	1
		CS29	1	1	-
	PC31	CS30	1	1	-
		CS31	1	1	-
	PC34	CS32	1	1	-

Frequency and duration of use

Exposure duration (hours/Event)

Chemical product category [PC]	Category	Exposure duration (hours/Event)
PC1	CS2	4
	CS3	6
	CS4	4
	CS5	1
PC4	CS6	0.02
	CS7	0.17
	CS8	0.25
PC8	CS9	0.5
	CS10	0.33
	CS11	0.17
PC9a	CS12	2.2
	CS13	2.2
	CS14	0.3
	CS15	2
PC9b	CS16	4
	CS17	-
	CS18	-
	CS19	-
PC15	CS20	0.3
	CS21	2.2
	CS22	2.2
	CS23	2
PC18	CS24	2.2
PC23	CS25	1.23
	CS26	0.33
PC24	CS27	0.17
	CS28	-
	CS29	0.17
PC31	CS30	1.23
	CS31	0.33
PC34	CS32	1

Frequency of use (event/Day)

Chemical product category [PC]	Category	Use frequency (event/Day)
PC1	All	1
PC4	All	1
PC8	All	1
PC9a	All	1
PC9b	All	1
PC9b	All	1
PC15	All	1

		PC18	All	1
		PC23	All	1
		PC24	All	1
		PC31	All	1
		PC34	All	1

Amounts used (g/Event)		**Chemical product category [PC]**	**Category**	**Amounts used (g/Event))**
		PC1	CS2	<= 9
			CS3	<= 6.39E3
			CS4	<= 85.05
			CS5	<= 75
		PC4	CS6	<= 0.5
			CS7	<= 2E3
			CS8	<= 4
		PC8	CS9	<= 15
			CS10	<= 27
			CS11	<= 35
		PC9a	CS12	<= 2.76E3
			CS13	<= 744
			CS14	<= 215
			CS15	<= 491
		PC9b	CS16	<= 85
			CS17	<= 1.38E4
			CS18	-
			CS19	-
		PC15	CS20	<= 215
			CS21	<= 744
			CS22	<= 2.76E3
			CS23	<= 491
		PC18	CS24	<= 40
		PC23	CS25	<= 56
			CS26	<= 56
		PC24	CS27	<= 2.2E3
			CS28	<= 34
			CS29	<= 73
		PC31	CS30	<= 142
			CS31	<= 135
		PC34	CS32	<= 115

Operational conditions			
Area of use	All PC Codes	Indoor	
Room volume		**Chemical product category [PC]**	**Category**	**Room volume (m^3)**
		PC1	All	>= 20
		PC4	All	>= 34
		PC8	All	>= 20
		PC9a	CS12-CS13	>= 20
			CS14	>= 34
			CS15	>= 20
		PC9b	CS16-CS17	>= 20
			CS18	-
			CS19	-
		PC15	CS20	>= 34
			CS21-CS22	>= 20
			CS23	>= 20
		PC18	CS24	>= 20
		PC23	CS25-CS26	>= 20
		PC24	CS27	>= 34
			CS28	-
			CS29	>= 20
		PC31	CS30-CS31	>= 20
		PC34	CS32	>= 20
Risk management measures			
Respiratory protection	Not required		
Hand/Skin protection	Not required		
Eye Protection	Not required		

2.2 Control of environmental exposure	
Amounts used	
Annual site tonnage (tons/year):	1E4
Maximum daily site tonnage (kg/day):	1.37
Operational conditions	
Emission days (days/year):	3.7E+02
Release fraction to air from process (initial release prior to RMM):	98.5%
Release fraction to wastewater from process (initial release prior to RMM):	1%
Local release rate (Water) (kg/day)	0.014 kg/day
Organisational measures to prevent/limit release from site	
No specific measures identified.	
Substance release quantities after risk management measures	
Release factor before on-site RMM (Air)	98.5%
Release factor after on-site RMM (Air)	98.5%
Release factor before on-site RMM (Water)	1 %
Release factor after on-site RMM (Water)	1 %
Release factor after on-site RMM (soil)	0.5%

3. Exposure estimation and reference to its source

3.1 Human exposure prediction

Exposure assessment (method/calculation model)	TRA Consumers 3.1 (R15)

	Inhalation		Dermal		Oral		
Chemical product category [PC]	inhalation exposure (mg/m³)	Risk characterisation ratio (RCR)	dermal exposure (mg/kg bw/day)	Risk characterisation ratio (RCR)	Oral exposure (mg/kg bw/day)	Risk characterisation ratio (RCR)	Combined routes
PC1 (CS2)	39.70	0.422	1.785	0.099	0	< 0.01	0.522
PC1 (CS3)	25.09	0.267	0.43	0.024	0	< 0.01	0.291
PC1 (CS4)	3.222	0.034	0.07	< 0.01	0	< 0.01	0.038
PC1 (CS5)	35.25	0.375	1.79	0.099	0	< 0.01	0.474
PC4 (CS6)	0	< 0.01	0	< 0.01	0	< 0.01	< 0.01
PC4 (CS7)	1.84	0.02	7.13	0.396	0	< 0.01	0.416
PC4 (CS8)	0.51	< 0.01	17.87	0.993	0	< 0.01	0.998
PC8 (CS9)	0.67	< 0.01	0.07	< 0.01	0	< 0.01	0.011
PC8 (CS10)	0.84	< 0.01	7.15	0.397	0	< 0.01	0.406
PC8 (CS11)	1.77	0.019	10.7	0.594	0	< 0.01	0.613
PC9a (CS12)	4.214	0.045	0.04	< 0.01	0	< 0.01	0.047
PC9a (CS13)	20.82	0.222	0.79	0.044	0	< 0.01	0.265
PC9a (CS14)	1.372	0.015	0	< 0.01	0	< 0.01	0.015
PC9a (CS15)	23.82	0.253	2.86	0.159	0	< 0.01	0.412
PC9b (CS16)	1.073	0.011	0.02	< 0.01	0	< 0.01	0.013
PC9b (CS17)	0	< 0.01	2.86	0.159	0	< 0.01	0.159
PC9b (CS18)	0	< 0.01	2.54	0.141	1	0.056	0.197
PC9b (CS19)	0	< 0.01	8.268	0.459	8.775	0.488	0.947
PC15 (CS20)	1.372	0.015	0	< 0.01	0	< 0.01	0.015
PC15 (CS21)	20.82	0.222	0.79	0.044	0	< 0.01	0.265
PC15 (CS22)	4.214	0.045	0.04	< 0.01	0	< 0.01	0.047
PC15 (CS23)	23.82	0.253	2.86	0.159	0	< 0.01	0.412
PC18 (CS24)	10.18	0.108	1.19	0.066	0	< 0.01	0.174
PC23 (CS25)	10.14	0.108	7.17	0.398	0	< 0.01	0.506
PC23 (CS26)	0.699	< 0.01	2.86	0.159	0	< 0.01	0.166
PC24 (CS27)	0.162	< 0.01	5.72	0.318	0	< 0.01	0.32
PC24 (CS28)	0	< 0.01	1.14	0.063	0	< 0.01	0.063
PC24 (CS29)	0.492	< 0.01	1.43	0.079	0	< 0.01	0.085
PC31 (CS30)	25.73	0.274	7.17	0.398	0	< 0.01	0.672
PC31 (CS31)	1.684	0.018	2.86	0.159	0	< 0.01	0.177
PC34	18.02	0.192	0.14	< 0.01	0	< 0.01	0.199

3.2 Environmental exposure prediction

Exposure assessment (method/calculation model)	PETRORISK v7.04

environmental exposure	freshwater	marine water	soil	freshwater sediment	marine sediment
Predicted Environmental Exposure (PEC) (Regional)	9.4E-04	4.3E-06	1.2E-03	1.5E-01	1.6E-03
Risk Characterization Ratio (RCR)	3.5E-01	1.8E-03	3.1E-03	1.1E-01	9.1E-04

Indirect exposure to humans via the environment:

Exposure route	Exposure estimation (µg/kg/day)	Risk characterisation ratio (RCR)
Oral	6.8E-05	7.0E-05
Inhalation	7.1E-06	7.1E-06
combined routes	7.5E-05	7.7E-05

4. Evaluation guidance to downstream user		
For scaling see	Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. Available hazard data do not support the need for a DNEL to be established for other health effects. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html).	
Exposure assessment instrument/tool/method	Consumer	EGRET 2, TRA Consumers 3.1 (R15)
	environmental exposure	PETRORISK v7.04

Exposure Scenario 16: – Consumer use - Use as a fuel

1.0 Contributing Scenarios	
Chemical product category [PC]	PC13 Fuels
Environmental release categories [ERC]	ERC9a Wide dispersive indoor use of substances in closed systems ERC9b Wide dispersive outdoor use of substances in closed systems

2.0 Operational conditions and risk management measures

2.1 Control of worker exposure

Product characteristics

Physical form of product: Liquid

Concentration of substance in product

Chemical product category [PC]	Category	%
PC13	CS2	<= 10
	CS3	<= 10
	CS4	<= 5
	CS5	<= 10
	CS6	<= 2
	CS7	<= 10

Human factors not influenced by risk management

Potential exposure area

Chemical product category [PC]	Category	Potential exposure area
PC13	CS2	Palm of one hand
	CS3	Palm of one hand
	CS4	Inside hands / one hand / palm of hands
	CS5	Palm of one hand
	CS6	Palm of one hand
	CS7	Palm of one hand

Exposure route		Category	Exposure route

	Chemical product category [PC]		Inhalation	Dermal	Oral
	PC13	CS2	Yes	Yes	No
		CS3	Yes	Yes	No
		CS4	Yes	Yes	No
		CS5	Yes	Yes	No
		CS6	Yes	Yes	No
		CS7	Yes	Yes	No

	Chemical product category [PC]	Category	Transfer factor		
			Inhalation	Dermal	Oral
Transfer factor	PC13	CS2	2E-3	5E-3	-
		CS3	0.01	0.01	-
		CS4	0.03	1E-3	-
		CS5	0.05	5E-3	-
		CS6	0.02	1E-3	-
		CS7	2E-3	5E-3	-

Frequency and duration of use

	Chemical product category [PC]	Category	Exposure duration (hours/Event)
Exposure duration (hours/Event)	PC13	CS2	0.05
		CS3	0.017
		CS4	0.033
		CS5	0.017
		CS6	0.033
		CS7	0.513

	Chemical product category [PC]	Category	Use frequency (event/Day)
Frequency of use (event/Day)	PC13	All	1

	Chemical product category [PC]	Category	Amounts used (g/Event))
Amounts used (g/Event)	PC13	CS2	<= 4.4E4
		CS3	<= 7.5E3
		CS4	<= 750
		CS5	<= 255
		CS6	<= 3.32E3
		CS7	<= 3.2E5

Operational conditions

Area of use	PC13 (CS2) (CS3) (CS7)	Outdoor
	PC13 (CS4) (CS5) (CS6)	Indoor

Risk management measures

Respiratory protection	Not required
Hand/Skin protection	Not required
Eye Protection	Not required

2.2 Control of environmental exposure

Amounts used

Annual site tonnage (tons/year):	1E6
Maximum daily site tonnage (kg/day):	14

Operational conditions

Emission days (days/year):	3.7E+02
Release fraction to air from process (initial release prior to RMM):	0.01%
Release fraction to wastewater from process (initial release prior to RMM):	2E-5%
Local release rate (Water) (kg/day)	2.74E-6 kg/day

Organisational measures to prevent/limit release from site

No specific measures identified.

Substance release quantities after risk management measures

Release factor before on-site RMM (Air)	0.01%
Release factor after on-site RMM (Air)	0.01%
Release factor before on-site RMM (Water)	2E-5%
Release factor after on-site RMM (Water)	2E-5%

Release factor after on-site RMM (soil)	5E-3%

3. Exposure estimation and reference to its source

3.1 Human exposure prediction

Exposure assessment (method/calculation model)	TRA Consumers 3.1 (R15)

Chemical product category [PC]	Inhalation		Dermal		Oral		Combined routes
	inhalation exposure (mg/m³)	Risk characterisation ratio (RCR)	dermal exposure (mg/kg bw/day)	Risk characterisation ratio (RCR)	Oral exposure (mg/kg bw/day)	Risk characterisation ratio (RCR)	
PC13 (CS2)	78.22	0.832	0.018	< 0.01	0	< 0.01	0.833
PC13 (CS3)	71.94	0.765	0.035	< 0.01	0	< 0.01	0.767
PC13 (CS4)	55.15	0.587	3.57E-3	< 0.01	0	< 0.01	0.587
PC13 (CS5)	63.10	0.671	0.018	< 0.01	0	< 0.01	0.672
PC13 (CS6)	65.11	0.693	7E-4	< 0.01	0	< 0.01	0.693
PC13 (CS7)	93.46	0.994	0.018	< 0.01	0	< 0.01	0.995

3.2 Environmental exposure prediction

Exposure assessment (method/calculation model)	PETRORISK v7.04

environmental exposure	freshwater	marine water	soil	freshwater sediment	marine sediment
Predicted Environmental Exposure (PEC) (Regional)	9.2E-04	2.3E-06	6.7E-04	1.4E-01	3.7E-04
Risk Characterization Ratio (RCR)	3.4E-01	9.8E-04	2.7E-04	9.8E-02	1.2E-04

Indirect exposure to humans via the environment:

Exposure route	Exposure estimation (µg/kg/day)	Risk characterisation ratio (RCR)
Oral	6.8E-05	6.8E-05
Inhalation	7.1E-06	7.1E-06
combined routes	7.5E-05	7.5E-05

4. Evaluation guidance to downstream user

For scaling see	Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. Available hazard data do not support the need for a DNEL to be established for other health effects. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html).	
Exposure assessment instrument/tool/method	Consumer	EGRET 2, TRA Consumers 3.1 (R15)
	environmental exposure	PETRORISK v7.04

Exposure Scenario 17: – Consumer use – Use in Functional

1.0 Contributing Scenarios

Chemical product category [PC]	PC16 Heat transfer fluids PC17 Hydraulic fluids
Environmental release categories [ERC]	ERC9a Wide dispersive indoor use of substances in closed systems ERC9b Wide dispersive outdoor use of substances in closed systems

2.0 Operational conditions and risk management measures

2.1 Control of worker exposure

Product characteristics

Physical form of product	Liquid		
Concentration of substance in product	**Chemical product category [PC]**	**Category**	**%**
	PC16	CS2	<= 100
	PC17	CS3	<= 100
Human factors not influenced by risk management			
Potential exposure area	**Chemical product category [PC]**	**Category**	**Potential exposure area**
	PC16	CS2	Inside hands / one hand / palm of hands
	PC17	CS3	Inside hands / one hand / palm of hands

Exposure route	**Chemical product category [PC]**	**Category**	**Exposure route**		
			Inhalation	**Dermal**	**Oral**
	PC16	CS2	Yes	Yes	No
	PC17	CS3	Yes	Yes	No

Exposed Area (cm²) / Amounts used (cm³)	**Chemical product category [PC]**	**Category**			
			Inhalation	**Dermal Exposed Area**	**Oral Product swallowed**
	PC1	CS2	-	<= 468 cm²	-
	PC4	CS6	-	<= 468 cm²	-

Transfer factor	**Chemical product category [PC]**	**Category**	**Transfer factor**		
			Inhalation	**Dermal**	**Oral**
	PC16	CS2	1	1	-
	PC17	CS3	1	-	-
Frequency and duration of use					
Exposure duration (hours/Event)	**Chemical product category [PC]**	**Category**	**Exposure duration (hours/Event)**		
	PC16	CS2	0.17		
	PC17	CS3	0.17		
Frequency of use (event/Day)	**Chemical product category [PC]**	**Category**	**Use frequency (event/Day)**		
	PC16	CS2	1		
	PC17	CS3	1		
Amounts used (g/Event)	**Chemical product category [PC]**	**Category**	**Amounts used (g/Event))**		
	PC16	CS2	<= 2.2E3		
	PC17	CS3	<= 2.2E3		
Operational conditions					
Area of use	All PC Codes		Indoor		
Room volume	**Chemical product category [PC]**	**Category**	**Room volume (m^3)**		
	PC16	CS2	>= 34		
	PC17	CS3	>= 34		
Risk management measures					
Respiratory protection	Not required				
Hand/Skin protection	Not required				
Eye Protection	Not required				
2.2 Control of environmental exposure					
Amounts used					
Annual site tonnage (tons/year):	5E3				
Maximum daily site tonnage (kg/day):	0.684				
Operational conditions					
Emission days (days/year):	3.7E+02				
Release fraction to air from process (initial release prior to RMM):	5%				
Release fraction to wastewater from process (initial release prior to RMM):	5%				

Local release rate (Air) (kg/day)	0.034 kg/day
Organisational measures to prevent/limit release from site	
No specific measures identified.	
Substance release quantities after risk management measures	
Release factor before on-site RMM (Air)	5%
Release factor after on-site RMM (Air)	5%
Release factor before on-site RMM (Water)	5%
Release factor after on-site RMM (Water)	5%
Release factor after on-site RMM (soil)	5%

3. Exposure estimation and reference to its source

3.1 Human exposure prediction

Exposure assessment (method/calculation model)	TRA Consumers 3.1 (R15)

	Inhalation		Dermal		Oral		
Chemical product category [PC]	inhalation exposure (mg/m³)	Risk characterisation ratio (RCR)	dermal exposure (mg/kg bw/day)	Risk characterisation ratio (RCR)	Oral exposure (mg/kg bw/day)	Risk characterisation ratio (RCR)	Combined routes
PC16	0.162	< 0.01	3.12	0.173	0	< 0.01	0.175
PC17	0.162	< 0.01	3.12	0.173	0	< 0.01	0.175

3.2 Environmental exposure prediction

Exposure assessment (method/calculation model)	PETRORISK v7.04

environmental exposure	freshwater	marine water	soil	freshwater sediment	marine sediment
Predicted Environmental Exposure (PEC) (Regional)	9.7E-04	5.0E-06	3.0E-03	1.8E-01	3.9E-03
Risk Characterization Ratio (RCR)	3.6E-01	2.0E-03	7.9E-03	1.2E-01	2.3E-03

Indirect exposure to humans via the environment:

Exposure route	Exposure estimation (µg/kg/day)	Risk characterisation ratio (RCR)
Oral	6.8E-05	7.3E-05
Inhalation	7.1E-06	7.1E-06
combined routes	7.5E-05	8.0E-05

4. Evaluation guidance to downstream user

For scaling see	Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. Available hazard data do not support the need for a DNEL to be established for other health effects. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html).	
Exposure assessment instrument/tool/method	Consumer	EGRET 2, TRA Consumers 3.1 (R15)
	environmental exposure	PETRORISK v7.04

Exposure Scenario 18: – Consumer use - Use in lubricants

1.0 Contributing Scenarios	
Chemical product category [PC]	PC24 Lubricants, greases, release products PC31 Polishes and wax blends PC35 Washing and cleaning products (including solvent based products)
Environmental release categories [ERC]	ERC8a Wide dispersive indoor use of processing aids in open systems ERC8d Wide dispersive outdoor use of processing aids in open systems

2.0 Operational conditions and risk management measures

2.1 Control of worker exposure

Product characteristics

Physical form of product: Liquid

Concentration of substance in product

Chemical product category [PC]	Category	%
PC24	CS2	<= 100
	CS3	<= 20
	CS4	<= 50
PC31	CS5	<= 50
	CS6	<= 50
PC35	CS7	<= 20

Human factors not influenced by risk management

Potential exposure area

Chemical product category [PC]	Category	Potential exposure area
PC24	CS2	Both hands
	CS3	Both hands
	CS4	Inside hands / one hand / palm of hands
PC31	CS5	Inside hands / one hand / palm of hands
	CS6	Both hands
PC35	CS7	Inside hands / one hand / palm of hands

Exposure route

Chemical product category [PC]	Category	Exposure route		
		Inhalation	Dermal	Oral
PC24	CS2	Yes	Yes	No
	CS3	No	Yes	No
	CS4	Yes	Yes	No
PC31	CS5	Yes	Yes	No
	CS6	Yes	Yes	No
PC35	CS7	Yes	Yes	No

Exposed Area (cm^2) / Amounts used (cm^3)

Chemical product category [PC]	Category	Inhalation	Dermal Exposed Area	Oral Product swallowed
PC24	CS2	-	<= 857.5 cm^2	-
	CS3	-	<= 857.5 cm^2	-
	CS4	-	<= 428.7 cm^2	-
PC31	CS5	-	<= 430 cm^2	-
	CS6	-	<= 857.5 cm^2	-
PC35	CS7	-	<= 428 cm^2	-

Transfer factor

Chemical product category [PC]	Category	Transfer factor		
		Inhalation	Dermal	Oral
PC24	CS2	1	1	-
	CS3	-	1	-
	CS4	1	1	-
PC31	CS5	1	1	-
	CS6	1	1	-
PC35	CS7	1	1	-

Frequency and duration of use

Exposure duration (hours/Event)

Chemical product category [PC]	Category	Exposure duration (hours/Event)
PC24	CS2	0.17
	CS3	-
	CS4	0.17
PC31	CS5	1.23
	CS6	0.33
PC35	CS7	0.17

Frequency of use (event/Day)		**Chemical product category [PC]**	**Category**	**Use frequency (event/Day)**
		PC24	All	1
		PC31	All	1
		PC35	All	1

Amounts used (g/Event)		**Chemical product category [PC]**	**Category**	**Amounts used (g/Event))**
		PC24	CS2	<= 2.2E3
			CS3	<= 34
			CS4	0.17
		PC31	CS5	<= 142
			CS6	<= 135
		PC35	CS7	<= 35

Operational conditions				
Area of use	All PC Codes		Indoor	
Room volume		**Chemical product category [PC]**	**Category**	**Room volume (m^3)**
		PC24	CS2	>= 34
			CS3	>= 34
			CS4	>= 20
		PC31	CS5	>= 20
			CS6	>= 20
		PC35	CS7	>= 20

Risk management measures	
Respiratory protection	Not required
Hand/Skin protection	Not required
Eye Protection	Not required
2.2 Control of environmental exposure	
Amounts used	
Annual site tonnage (tons/year):	5E3
Maximum daily site tonnage (kg/day):	0.685
Operational conditions	
Emission days (days/year):	3.7E+02
Release fraction to air from process (initial release prior to RMM):	1.5%
Release fraction to wastewater from process (initial release prior to RMM):	5%
Local release rate (Air) (kg/day)	0.034 kg/day
Organisational measures to prevent/limit release from site	
No specific measures identified.	
Substance release quantities after risk management measures	
Release factor before on-site RMM (Air)	1.5%
Release factor after on-site RMM (Air)	1.5%
Release factor before on-site RMM (Water)	5%
Release factor after on-site RMM (Water)	5%
Release factor after on-site RMM (soil)	5%

3. Exposure estimation and reference to its source

3.1 Human exposure prediction

Exposure assessment (method/calculation model)	TRA Consumers 3.1 (R15)

	Inhalation		**Dermal**		**Oral**		
Chemical product category [PC]	**inhalation exposure (mg/m^3)**	**Risk characterisation ratio (RCR)**	**dermal exposure (mg/kg bw/day)**	**Risk characterisation ratio (RCR)**	**Oral exposure (mg/kg bw/day)**	**Risk characterisation ratio (RCR)**	**Combined routes**
PC24 (CS2)	0.162	< 0.01	5.72	0.318	0	< 0.01	0.32
PC24 (CS3)	0	< 0.01	1.14	0.063	0	< 0.01	0.063
PC24 (CS4)	0.492	< 0.01	1.43	0.079	0	< 0.01	0.085
PC31 (CS5)	25.73	0.274	7.17	0.398	0	< 0.01	0.672
PC31 (CS6)	1.684	0.018	2.86	0.159	0	< 0.01	0.177
PC35 (CS7)	2.357	0.025	14.27	0.793	0	< 0.01	0.818

3.2 Environmental exposure prediction	
Exposure assessment (method/calculation model)	PETRORISK v7.04

environmental exposure	freshwater	marine water	soil	freshwater sediment	marine sediment
Predicted Environmental Exposure (PEC) (Regional)	9.7E-04	5.0E-06	3.0E-03	1.8E-01	3.9E-03
Risk Characterization Ratio (RCR)	3.6E-01	2.0E-03	7.9E-03	1.2E-01	2.3E-03

Indirect exposure to humans via the environment:

Exposure route	Exposure estimation (µg/kg/day)	Risk characterisation ratio (RCR)
Oral	6.8E-05	7.3E-05
Inhalation	7.1E-06	7.1E-06
combined routes	7.5E-05	8.0E-05

4. Evaluation guidance to downstream user		
For scaling see	Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. Available hazard data do not support the need for a DNEL to be established for other health effects. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html).	
Exposure assessment instrument/tool/method	Consumer	EGRET 2, TRA Consumers 3.1 (R15)
	environmental exposure	PETRORISK v7.04