ConnectingChemistry

BRENNTAG

SAFETY DATA SHEET according to Regulation (EC) No. 1907/2006

Ammoniak Trocken

Version 6.0 Print Date 05.12.2019

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

1.1. Product identifier

Trade name	:	Ammoniak Trocken
Substance name	:	ammonia, anhydrous
Index-No.	:	007-001-00-5
CAS-No.	:	7664-41-7
EC-No.	:	231-635-3
EU REACH-Reg. No.	:	01-2119488876-14-xxxx

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

Use of the Substance/Mixture	:	Identified use: See table in front of appendix for a complete overview of identified uses.
Uses advised against	:	At this moment we have not identified any uses advised against

1.3. Details of the supplier of the safety data sheet

Company	:	Brenntag GmbH Messeallee 11 DE 45131 Essen
Telephone	:	+49 (0)201 6496-0
Telefax	:	+49 (0)201 6496-2039
E-mail address	:	InfoSDB@brenntag.de
Responsible/issuing person	:	Umwelt / Sicherheit

1.4. Emergency telephone number

Emergency telephone number	:	Emergency telephone number : +49 (0)201-6496-0 Available 24h/7d

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008

REGULATION (EC) No 1272/2008			
Hazard class	**Hazard category**	**Target Organs**	**Hazard statements**

Flammable gases	Category 2	---	H221
Gases under pressure	Liquefied gas	---	H280
Acute toxicity (Inhalation)	Category 3	---	H331
Skin corrosion	Category 1B	---	H314
Serious eye damage	Category 1	---	H318
Short-term (acute) aquatic hazard	Category 1	---	H400
Long-term (chronic) aquatic hazard	Category 2	---	H411

For the full text of the H-Statements mentioned in this Section, see Section 16.

Most important adverse effects

Human Health : See section 11 for toxicological information.

Physical and chemical hazards : See section 9/10 for physicochemical information.

Potential environmental effects : See section 12 for environmental information.

2.2. Label elements

Labelling according to Regulation (EC) No 1272/2008

Hazard symbols :

Signal word : Danger

Hazard statements :

H221	Flammable gas.
H280	Contains gas under pressure; may explode if heated.
H314	Causes severe skin burns and eye damage.
H331	Toxic if inhaled.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary statements

Prevention :

P210	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.

Response	:	P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower.
		P304 + P340 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor.
		P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
		P377	Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
Storage	:	P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
		P410 + P403	Protect from sunlight. Store in a well-ventilated place.

Additional Labelling:

EUH071 Corrosive to the respiratory tract.

Hazardous components which must be listed on the label:

• ammonia, anhydrous

2.3. Other hazards

For Results of PBT and vPvB assessment see section 12.5.

SECTION 3: Composition/information on ingredients

3.1. Substances

Hazardous components	Amount [%]	Classification (REGULATION (EC) No 1272/2008)	
		Hazard class / Hazard category	Hazard statements
ammonia, anhydrous			
Index-No. : 007-001-00-5 CAS-No. : 7664-41-7 EC-No. : 231-635-3 EU REACH-Reg. No. : 01-2119488876-14-xxxx	100	Flam. Gas2 Press. GasCompr. Gas Acute Tox.3 Skin Corr.1B Eye Dam.1 Aquatic Acute1 Aquatic Chronic2	H221 H280 H331 H314 H318 H400 H411

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1. Description of first aid measures

General advice	: Remove from exposure, lie down. Take off all contaminated clothing immediately.
If inhaled	: Remove to fresh air. If breathing is irregular or stopped, administer artificial respiration. Oxygen, if needed. No artificial respiration, mouth-to-mouth or mouth to nose. Use suitable instruments/apparatus. Call a physician immediately.
In case of skin contact	: Wash frost-bitten areas with plenty of water. Do not remove clothing. Wash off immediately with plenty of water for at least 15 minutes. Call a physician immediately.
In case of eye contact	: Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Consult an eye specialist immediately. Go to an ophthalmic hospital if possible.
If swallowed	: Rinse mouth with water. Never give anything by mouth to an unconscious person. Keep patient warm and at rest. If a person vomits when lying on his back, place him in the recovery position. Call a physician immediately.
Protection of First Aid Responders	: First Aid responders should pay attention to self-protection and use the recommended protective clothing.

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

Symptoms	: Eye contact may provoke the following symptoms, eye pain, Lachrymation, Respiratory irritation, Redness, Inhalation may provoke the following symptoms: Asthma, breathlessness, Skin contact may provoke the following symptoms: Skin irritation, Ingestion may provoke the following symptoms: May cause frostbite. See Section 11 for more detailed information on health effects and symptoms.
Effects	: See Section 11 for more detailed information on health effects and symptoms.

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

Treatment	: Treat symptomatically.In case of inhalation of decomposition products in a fire symptoms may be delayed.The exposed person may need to be kept under medical surveillance for 48 hours.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing	: Use extinguishing measures that are appropriate to local

media		circumstances and the surrounding environment. Water spray jet, Suppress (knock down) gases/vapours/mists with a water spray jet.
Unsuitable extinguishing media	:	No information available.

5.2. Special hazards arising from the substance or mixture

Specific hazards during firefighting	:	Vapours are flammable. Hazardous decomposition products formed under fire conditions.
Hazardous combustion products	:	ammonia

5.3. Advice for firefighters

Special protective equipment for firefighters	:	In the event of fire, wear self-contained breathing apparatus.Wear appropriate body protection (full protective suit)
Specific extinguishing methods	:	Control smoke with water spray.
Further advice	:	Collect contaminated fire extinguishing water separately. This must not be discharged into drains.Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.Cool closed containers exposed to fire with water spray.Heating will cause a pressure rise - with risk of bursting.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions	:	Keep away from heat and sources of ignition. Use personal protective equipment. Wear respiratory protection. Keep people away from and upwind of spill/leak. Bottles or containers, place them so that the vanishing point remains high, avoiding going out liquid ammonia. Possible need to alert the neighbourhood. Provide adequate ventilation. Avoid contact with skin and eyes. Do not breathe vapours.

6.2. Environmental precautions

Environmental precautions	:	Do not flush into surface water or sanitary sewer system. Avoid subsoil penetration. If the product contaminates rivers and lakes or drains inform respective authorities. If material reaches soil inform authorities responsible for such cases.

6.3. Methods and materials for containment and cleaning up

Methods and materials for containment and cleaning up	:	Suppress (knock down) gases/vapours/mists with a water spray jet. Dilute with plenty of water.
Further information	:	Treat recovered material as described in the section "Disposal considerations". Vapours may form explosive mixtures with

air.

6.4. Reference to other sections

See Section 1 for emergency contact information.
See Section 8 for information on personal protective equipment.
See Section 13 for waste treatment information.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Advice on safe handling	:	Keep container tightly closed. Use personal protective equipment. Handle product only in closed system or provide appropriate exhaust ventilation at machinery. Avoid contact with skin, eyes and clothing. Do not breathe vapours or spray mist. Use respirator with appropriate filter if vapours or aerosol are released. Emergency eye wash fountains and emergency showers should be available in the immediate vicinity.
Hygiene measures	:	Keep away from food, drink and animal feedingstuffs. Smoking, eating and drinking should be prohibited in the application area. Wash hands before breaks and at the end of workday. Take off all contaminated clothing immediately. Keep working clothes separately.

7.2. Conditions for safe storage, including any incompatibilities

Requirements for storage areas and containers	:	Store in original container. Keep locked up or in an area accessible only to qualified or authorised persons.
Advice on protection against fire and explosion	:	Keep away from sources of ignition - No smoking. Vapours may form explosive mixture with air.
Further information on storage conditions	:	Keep tightly closed in a dry and cool place. Keep in a well-ventilated place. Keep away from direct sunlight.
Advice on common storage	:	Keep away from food, drink and animal feedingstuffs. Do not store together with acids and ammonium salts. Incompatible with: Oxidizing and spontaneously flammable products Oxidizing agents Acids
German storage class	:	2A Gases

7.3. Specific end use(s)

Specific use(s)	:	Identified use: See table in front of appendix for a complete overview of identified uses.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Component:	ammonia, anhydrous	CAS-No. 7664-41-7

Derived No Effect Level (DNEL)/Derived Minimal Effect Level (DMEL)

DNEL
Workers, Acute - systemic effects, Skin contact : 6,8 mg/kg bw/day

DNEL
Workers, Long-term - systemic effects, Skin contact : 6,8 mg/kg bw/day

DNEL
Workers, Acute - systemic effects, Inhalation : 47,6 mg/m3

DNEL
Workers, Acute - local effects, Inhalation : 36 mg/m3

DNEL
Workers, Long-term - systemic effects, Inhalation : 47,6 mg/m3

DNEL
Workers, Long-term - local effects, Inhalation : 14 mg/m3

Predicted No Effect Concentration (PNEC)

Fresh water : 0,001 mg/l

Marine water : 0,001 mg/l

Intermittent releases : 0,089 mg/l

Other Occupational Exposure Limit Values

EU. Indicative Exposure Limit Values in Directives 91/322/EEC, 2000/39/EC, 2006/15/EC, 2009/161/EU, 2017/164/EU, as amended, Time Weighted Average (TWA):
20 ppm, 14 mg/m3
Indicative

EU. Indicative Exposure Limit Values in Directives 91/322/EEC, 2000/39/EC, 2006/15/EC, 2009/161/EU, 2017/164/EU, as amended, Short Term Exposure Limit (STEL):
50 ppm, 36 mg/m3
Indicative

Germany. TRGS 900, Occupational Exposure Limits (AGW), as amended, Exposure limit(s):
20 ppm, 14 mg/m3, (2)
If the AGW and BGW values are complied with, there should be no risk of reproductive damage (see Number 2.7).

8.2. Exposure controls

Appropriate engineering controls

Refer to protective measures listed in sections 7 and 8.

Personal protective equipment

Respiratory protection

Advice	:	Required, if exposure limit is exceeded (e.g. OEL). In case of brief exposure or low pollution use breathing filter apparatus. Respiratory protection complying with EN 141. Recommended Filter type:K In case of intensive or longer exposure use self-contained breathing apparatus.

Hand protection

Advice	:	The glove material has to be impermeable and resistant to the product / the substance / the preparation. Protective gloves should be replaced at first signs of wear. Heat insulating gloves The following materials are suitable: Viton (R)

Eye protection

Advice	:	Tightly fitting safety goggles Face-shield

Skin and body protection

Advice	:	Impervious clothing Chemical resistant apron

Environmental exposure controls

General advice	:	Do not flush into surface water or sanitary sewer system. Avoid subsoil penetration. If the product contaminates rivers and lakes or drains inform respective authorities. If material reaches soil inform authorities responsible for such cases.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Form	:	compressed liquefied gas
Colour	:	colourless
Odour	:	stinging

Odour Threshold	:	5 ppm
pH	:	Not applicable
Melting point/range	:	-78 °C
Boiling point/boiling range	:	-33 °C
Flash point	:	not determined
Evaporation rate	:	not determined
Flammability (solid, gas)	:	gas, flammable
Upper explosion limit	:	27 %(V)
Lower explosion limit	:	15 %(V)
Vapour pressure	:	8611 hPa (20 °C)
Relative vapour density	:	0,682 (-33,4 °C)
Density	:	0,682 g/cm3 (-33,4 °C)
Water solubility	:	510 - 531 g/l (20 °C)
Partition coefficient: n-octanol/water	:	no data available
Auto-ignition temperature	:	651 °C (DIN 51794)
Thermal decomposition	:	no data available
Viscosity, dynamic	:	0,22 mPa.s
Explosivity	:	Product is not explosive.Formation of explosive air/vapour mixtures is possible.
Oxidizing properties	:	not oxidising

9.2. Other information

Molecular weight	:	17,03 g/mol

SECTION 10: Stability and reactivity

10.1. Reactivity

Advice : No decomposition if stored and applied as directed.

10.2. Chemical stability

Advice : Stable under recommended storage conditions.

10.3. Possibility of hazardous reactions

Hazardous reactions	:	Incompatible with oxidizing agents. Exothermic reaction with strong acids. Reacts violently with water.

10.4. Conditions to avoid

Conditions to avoid	:	Heat, flames and sparks.Exposure to sunlight.

10.5. Incompatible materials

Materials to avoid	:	Ammonium salts, Oxidizing agents, Acids, sodium hypochlorite, Halogens, Galvanised metals

10.6. Hazardous decomposition products

Hazardous decomposition products	:	Under fire conditions: Nitrogen oxides (NOx)

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Component:		ammonia, anhydrous	CAS-No. 7664-41-7
Acute toxicity			
Oral			
LD50	:	350 mg/kg (Rat, male) (OECD Test Guideline 401)	
Inhalation			
LC50	:	9,85 mg/l (Rat; 1 h; vapour)	
LC50	:	7,939 mg/l (Rat; 1 h; vapour)	
Dermal			
		no data available	
Irritation			
Skin			
Result	:	corrosive effects (Rabbit) (OECD Test Guideline 404)	
Eyes			
Result	:	Causes serious eye damage. (Rabbit)	

Sensitisation

Result	:	not sensitizing not sensitizing

CMR effects

Carcinogenicity

NOAEL	:	67 mg/kg bw/day (negative, Rat)(Oral)(OECD Test Guideline 453)

CMR Properties

Carcinogenicity	:	Animal testing did not show any carcinogenic effects.
Mutagenicity	:	In vitro tests did not show mutagenic effects In vivo tests did not show mutagenic effects
Teratogenicity	:	Animal testing did not show any effects on foetal development.
Reproductive toxicity	:	Animal testing did not show any effects on fertility.

Genotoxicity in vitro

Result	:	negative (Bacterial Reverse Mutation Test; Salmonella typhimurium; with and without metabolic activation) (OECD Test Guideline 471) negative (Bacterial Reverse Mutation Test; Escherichia coli; with and without metabolic activation) (OECD Test Guideline 471)

Genotoxicity in vivo

Result	:	negative (Micronucleus test; Mouse, male) (intraperitoneal;) (OECD Test Guideline 474)

Teratogenicity

(Rabbit)(Oral; 100 mg/kg bw/day; 28 d)(OECD Test Guideline 414)negative
(Pig)(Inhalation; 25 mg/m³; 6 Weeks)negative

Reproductive toxicity

(Rat)(Oral; 408 mg/kg bw/day; 28 d)Animal testing did not show any effects on fertility.

Specific Target Organ Toxicity

Single exposure

Remarks	:	no data available

Repeated exposure

Remarks	:	no data available

Other toxic properties

Aspiration hazard

No aspiration toxicity classification,

SECTION 12: Ecological information

12.1. Toxicity

Component:	**ammonia, anhydrous**	**CAS-No. 7664-41-7**

Acute toxicity

Fish

LC50	:	0,89 mg/l (fish; 96 h) Fresh water

Toxicity to daphnia and other aquatic invertebrates

LC50	:	101 mg/l (Daphnia magna; 48 h) (static test; ASTM E 729-80)

algae

EC50	:	2700 mg/l (Chlorella vulgaris (Fresh water algae); 18 d) (static test; No guideline followed)Fresh water

Chronic toxicity

Fish

NOEC	:	< 0,048 mg/l (Ictalurus punctatus (channel catfish); 31 d) (OECD Test Guideline 215)Fresh water

Aquatic invertebrates

NOEC	0,79 mg/l (Daphnia magna (Water flea); 96 h) (flow-through test; End point: mortality; OPPTS 850.1300)Read-across (Analogy)

12.2. Persistence and degradability

Component:	ammonia, anhydrous	CAS-No. 7664-41-7
Persistence and degradability		
Persistence		
Result	: The product can be degraded by abiotic (e.g. chemical or photolytic) processes.	
Biodegradability		
Result	: The methods for determining the biological degradability are not applicable to inorganic substances.	

12.3. Bioaccumulative potential

Component:	ammonia, anhydrous	CAS-No. 7664-41-7
Bioaccumulation		
Result	: log Kow 0,23 : The product has low potential bioaccumulation.	

12.4. Mobility in soil

Component:	ammonia, anhydrous	CAS-No. 7664-41-7
Mobility		
	: Reacts with water.	

12.5. Results of PBT and vPvB assessment

Component:	ammonia, anhydrous	CAS-No. 7664-41-7
Results of PBT and vPvB assessment		
Result	: The PBT or vPvB criteria of Annex XIII to the REACH Regulation does not apply to inorganic substances.	

12.6. Other adverse effects

Component:	ammonia, anhydrous	CAS-No. 7664-41-7
Additional ecological information		

Result	:	Should not be released into the environment. Toxic to aquatic life with long lasting effects. Neutralization is normally necessary before waste water is discharged into water treatment plants.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Product	:	Solutions with high pH-value must be neutralized before discharge. Disposal together with normal waste is not allowed. Special disposal required according to local regulations. Do not let product enter drains. Contact waste disposal services.
Contaminated packaging	:	Empty remaining contents. Empty pressure vessels should be returned to the supplier.
European Waste Catalogue Number	:	No waste code according to the European Waste Catalogue can be assigned for this product, as the intended use dictates the assignment. The waste code is established in consultation with the regional waste disposer.

SECTION 14: Transport information

14.1. UN number

1005

14.2. UN proper shipping name

ADR : AMMONIA, ANHYDROUS
RID : AMMONIA, ANHYDROUS
IMDG : AMMONIA, ANHYDROUS

14.3. Transport hazard class(es)

ADR-Class (Labels; Classification Code; Hazard identification No; Tunnel restriction code)	:	2 2.3, 8; 2TC; 268; (C/D)
RID-Class (Labels; Classification Code; Hazard identification No)	:	2 2.3, 8; 2TC; 268
IMDG-Class (Labels; EmS)	:	2.3 2.3, 8; F-C, S-U

14.4. Packaging group

ADR :
RID :
IMDG :

14.5. Environmental hazards

Environmentally hazardous according to ADR	:	yes
Environmentally hazardous according to RID	:	yes
Marine Pollutant according to IMDG-Code	:	yes

14.6. Special precautions for user

Not applicable.

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

IMDG : Not applicable.

SECTION 15: Regulatory information

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

Data for the product

German Störfallverordnung	:	Falls under the German StörfallV. 2.5* (*named hazardous substances. The resulting quotient may have to be taken into account in the case of further hazard categories additionally.)
Other regulations	:	Take note of Law on the protection of mothers at work, in education and in studies (Maternity Protection Act - MuSchG). Take note of the national regulations on the protection of young people at work.

Component:	**ammonia, anhydrous**	**CAS-No. 7664-41-7**

EU. Regulation EC No. 689/2008	:	; The substance/mixture does not fall under this legislation.
EU. REACH, Annex XVII, Marketing and Use Restrictions (Regulation 1907/2006/EC)	:	Point Nos.: , 3; Listed
EU. Regulation No 1451/2007 [Biocides], Annex I, OJ (L 325)	:	EC Number: , 231-635-3; Listed
EU. Regulation No. 1223/2009 on cosmetic products, Annex III: List of Restricted Substances	:	Maximum concentration in ready for use preparation: 6 %; All cosmetic products; See the text of the regulation for applicable exceptions or provisions.

in Cosmetic Products

EU. Directive 2012/18/EU (SEVESO III) Annex I	:	Lower-tier requirements: 50 tonnes; Part 2: Named dangerous substances; List ID 35: Anhydrous Ammonia Upper-tier requirements: 200 tonnes; Part 2: Named dangerous substances; List ID 35: Anhydrous Ammonia
Germany TA-Luft	:	Base Emission Rate: 0,15 kg/h Maximum concentration: 30 mg/m3
AwSV (DE)	:	WGK 2: obviously hazardous to water: 211

Notification status ammonia, anhydrous:

Regulatory List	Notification	Notification number
AICS	YES	
DSL	YES	
EINECS	YES	231-635-3
ENCS (JP)	YES	(1)-391
IECSC	YES	
ISHL (JP)	YES	(1)-391
KECI (KR)	YES	97-1-184
KECI (KR)	YES	KE-01625
NZIOC	YES	HSR001035
PICCS (PH)	YES	
TSCA	YES	

15.2. Chemical safety assessment

A Chemical Safety Assessment has been carried out for this substance.

SECTION 16: Other information

Full text of H-Statements referred to under sections 2 and 3.

H221	Flammable gas.
H280	Contains gas under pressure; may explode if heated.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H331	Toxic if inhaled.
H400	Very toxic to aquatic life.
H411	Toxic to aquatic life with long lasting effects.

Abbreviations and Acronyms

BCF	bioconcentration factor
BOD	biochemical oxygen demand
CAS	Chemical Abstracts Service
CLP	Classification, Labelling and Packaging
CMR	carcinogenic, mutagenic or toxic to reproduction
COD	chemical oxygen demand
DNEL	derived no-effect level
EINECS	European Inventory of Existing Commercial Chemical Substances
ELINCS	European List of Notified Chemical Substances
GHS	Globally Harmonized System of Classification and Labelling of Chemicals
LC50	median lethal concentration
LOAEC	lowest observed adverse effect concentration
LOAEL	lowest observed adverse effect level
LOEL	lowest observed effect level
NLP	no-longer polymer
NOAEC	no observed adverse effect concentration
NOAEL	no observed adverse effect level
NOEC	no observed effect concentration
NOEL	no observed effect level
OECD	Organisation for Economic Cooperation and Development
OEL	occupational exposure limit
PBT	persistent, bioaccumulative and toxic
REACH Auth. No.:	REACH Authorisation Number
REACH AuthAppC. No.	REACH Authorisation Application Consultation Number
PNEC	predicted no-effect concentration
STOT	specific target organ toxicity
SVHC	substance of very high concern
UVCB	substance of unknown or variable composition, complex reaction products or biological materials
vPvB	very persistent and very bioaccumulative

Further information

Key literature references and sources for data	:	Supplier information and data from the "Database of registered substances" of the European Chemicals Agency (ECHA) were used to create this safety data sheet.
Methods used for product classification	:	The classification for human health, physical and chemical hazards and environmental hazards were derived from a combination of calculation methods and if available test data.
Hints for trainings	:	The workers have to be trained regularly on the safe handling of the products based on the information provided in the Safety Data Sheet and the local conditions of the workplace. National

regulations for the training of workers in the handling of hazardous materials must be adhered to.

Other information : The information provided in this Safety Data Sheet is correct to our knowledge at the date of its revision. The information given only describes the products with regard to safety arrangements and is not to be considered as a warranty or quality specification and does not constitute a legal relationship.

The information contained in this Safety Data Sheet relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

|| Indicates updated section.

Ammoniak Trocken

No.	Short title	Main User Group (SU)	Sector of Use (SU)	Product Category (PC)	Process Category (PROC)	Environmental Release Category (ERC)	Article Category (AC)	Specified
1	Manufacture of substance	3	8	NA	1, 2, 8b, 15	1	NA	ES14639
2	Use as an intermediate	3	NA	NA	1, 2, 3, 4, 8b, 9, 15	6a	NA	ES14653
3	Formulation & (re)packing of substances and mixtures	3	1, 10, 24	NA	1, 2, 3, 4, 5, 8a, 8b, 9, 15	2	NA	ES14651
4	Industrial use	3	NA	NA	1, 2, 3, 4, 5, 8b, 9, 10, 13, 15	4, 5, 6b, 7	NA	ES14655
5	Professional use	22	NA	NA	1, 2, 3, 4, 5, 8a, 8b, 9, 10, 11, 13, 15, 19, 20	8b, 8e, 9a, 9b	NA	ES14657

1. Short title of Exposure Scenario 1: Manufacture of substance		
Main User Groups	SU 3: Industrial uses: Uses of substances as such or in preparations at industrial sites	
Sectors of end-use	SU8: Manufacture of bulk, large scale chemicals (including petroleum products)	
Process categories	PROC1: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions PROC2: Use in closed, continuous process with occasional controlled exposure PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities PROC15: Use as laboratory reagent	
Environmental Release Categories	ERC1: Manufacture of substances	
Activity	Manufacture of the substance or use as a process chemical or extraction agent. Includes recycling/ recovery, material transfers, storage, maintenance and loading (including marine vessel/barge, road/rail car and bulk container), sampling and associated laboratory activities.	
2.1 Contributing scenario controlling environmental exposure for: ERC1		
Amount used	Annual amount per site	950000 tonnes
	Amounts used in the EU (tonnes/year)	6,5 Million tonnes/year
Environment factors not influenced by risk management	Flow rate of receiving surface water	18.000 m3/d
	Dilution Factor (River)	10
Other given operational conditions affecting environmental exposure	Number of emission days per year	330
	Emission or Release Factor: Air	140000 kg/day
	Indoor use	
Technical conditions and measures at process level to prevent release Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Organizational measures to prevent/limit release from the site	Air	Exhaust air purification with scrubber
	Water	Wastewaters are generally treated on site by chemical and/or biological methods before release to the municipal STP or to the environment., Do not release wastewater directly into environment., All contaminated waste water must be processed in an industrial or municipal wastewater treatment plant that incorporates both primary and secondary treatments. (Degradation effectiveness: 100 %)
	All production steps are enclosed and the level of containment is high	
Conditions and measures related to sewage treatment plant	Type of Sewage Treatment Plant	On-site waste water treatment
	Sludge Treatment	Do not apply industrial sludge to natural soils., Do not apply STP sludge on agricultural soil, All sludge is collected and incinerated or sent to landfill.
Conditions and measures related to external treatment of waste for disposal	Waste treatment	Solid wastes should be disposed of via landfill or incineration
Conditions and measures related to external recovery of waste	Recovery Methods	There is no envisaged external recovery of waste.
2.2 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC8b, PROC15		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 %.

	Physical Form (at time of use)	Gaseous
	Vapour pressure	8600 hPa
Frequency and duration of use	Frequency of use	220 days/year
	Avoid carrying out operation for more than 4 hours.	
Human factors not influenced by risk management	Breathing volume	10 m3/8 hours
	Exposed skin surface	480 cm²
Other operational conditions affecting workers exposure	Indoor	
Technical conditions and measures to control dispersion from source towards the worker	Provide local exhaust ventilation (LEV).(except PROC1)	
	Handle substance within a closed system. Transfer via enclosed lines. Pipelines and vessels are sealed and insulated Store substance within a closed system. Provide extraction ventilation at points where emissions occur.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Employees must be trained in the proper use of PPE, and when to use it Ensure control measures are regularly inspected and maintained. Exposure and biological monitoring of operators is regularly performed Monitor effectiveness of control measures	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency: 90 %)	
	Wear respiratory protection (Efficiency: 95 %)	
	Wear suitable protective clothing, aprons, shield and suits	
	Personal measures have to be applied in case of potential exposure only.	

3. Exposure estimation and reference to its source

Environment

ERC1: EUSES 2.1

Contributing Scenario	Specific conditions	Compartment	Value	Level of Exposure	RCR
ERC1	Highest exposure	Fresh water	PEC	0,000133mg/l	0,121
ERC1	Highest exposure	Marine water	PEC	0,0000315mg/l	0,029

Workers

PROC1, PROC2, PROC8b, PROC15: ECETOC TRA

Contributing Scenario	Specific conditions	Exposure routes	Level of Exposure	RCR
PROC1	Indoor use, with gloves, (90% efficiency), liquid, Gaseous form	worker dermal, short and long term - systemic	0,03mg/kg bw/day	0,01
PROC2	Indoor use, with gloves, (90% efficiency), liquid, Gaseous form	worker dermal, short and long term - systemic	0,01mg/kg bw/day	0,02
PROC8b	Indoor use, with gloves, (90% efficiency), liquid, Gaseous form	worker dermal, short and long term - systemic	0,07mg/kg bw/day	0,01
PROC15	Indoor use, with gloves, (90% efficiency), liquid, Gaseous form	worker dermal, short and long term - systemic	< 0,01mg/kg bw/day	0,01
PROC1	Indoor use, without respiratory protection,	worker - inhalation, short-term - local and systemic	0,01mg/m³	< 0,001

	Without Local Exhaust Ventilation, liquid, Gaseous form			
PROC2	Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, liquid, Gaseous form	worker inhalation, acute and long term - systemic	0,11mg/m³	0
PROC2	Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, liquid, Gaseous form	Worker - inhalative, long-term - local	0,11mg/m³	0,01
PROC2	Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, liquid, Gaseous form	Worker - inhalative, short-term - local	0,11mg/m³	< 0,01
PROC8b	Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, liquid, Gaseous form	worker inhalation, acute and long term - systemic	0,10mg/m³	0,00
PROC8b	Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, liquid, Gaseous form	Worker - inhalative, short-term - local	0,10mg/m³	< 0,01
PROC8b	Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, liquid, Gaseous form	Worker - inhalative, long-term - local	0,10mg/m³	0,01
PROC15	Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, liquid, Gaseous form	worker inhalation, acute and long term - systemic	0,11mg/m³	0
PROC15	Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, liquid, Gaseous form	Worker - inhalative, short-term - local	0,11mg/m³	< 0,01
PROC15	Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, liquid, Gaseous form	Worker - inhalative, long-term - local	0,11mg/m³	0,01

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

Environment
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Health
Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

For further information on the assessment method, see: http://www.ecetoc.org/tra

Additional good practice advice beyond the REACH Chemical Safety Assessment

Assumes a good basic standard of occupational hygiene is implemented.

1. Short title of Exposure Scenario 2: Use as an intermediate	
Main User Groups	SU 3: Industrial uses: Uses of substances as such or in preparations at industrial sites
Process categories	PROC1: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions PROC2: Use in closed, continuous process with occasional controlled exposure PROC3: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises 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	ERC6a: Industrial use resulting in manufacture of another substance (use of intermediates)
Activity	Use of substance as an intermediate (not related to Strictly Controlled Conditions). Includes recycling/ recovery, material transfers, storage, sampling, associated laboratory activities, maintenance and loading (including marine vessel/barge, road/rail car and bulk container).

2.1 Contributing scenario controlling environmental exposure for: ERC6a		
Readily biodegradable		
Amount used	Annual amount per site	800000 ton(s)/year
	Amounts used in the EU (tonnes/year)	3,8 Million tonnes/year
Environment factors not influenced by risk management	Flow rate of receiving surface water	18.000 m3/d
	Dilution Factor (River)	10
	Dilution Factor (Coastal Areas)	10
Other given operational conditions affecting environmental exposure	Number of emission days per year	330
	Emission or Release Factor: Air	105000 kg/day
	Indoor use	
Technical conditions and measures at process level to prevent release Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Organizational measures to prevent/limit release from the site	Air	Exhaust air purification with scrubber
	Water	Wastewaters are generally treated on site by chemical and/or biological methods before release to the municipal STP or to the environment., Do not release wastewater directly into environment., All contaminated waste water must be processed in an industrial or municipal wastewater treatment plant that incorporates both primary and secondary treatments. (Degradation effectiveness: 100 %)
	All production steps are enclosed and the level of containment is high	
Conditions and measures related to sewage treatment plant	Type of Sewage Treatment Plant	On-site waste water treatment
	Sludge Treatment	Do not apply industrial sludge to natural soils., Do not apply STP sludge on agricultural soil, All sludge is collected and incinerated or sent to landfill.
	Type of Sewage	Domestic sewage treatment plant

	Treatment Plant	
	Flow rate of sewage treatment plant effluent	2.000 m3/d
	Percentage removed from waste water	100 %
Conditions and measures related to external treatment of waste for disposal	Waste treatment	Solid wastes should be disposed of via landfill or incineration
Conditions and measures related to external recovery of waste	Recovery Methods	There is no envisaged external recovery of waste.
2.2 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC3, PROC4, PROC8b, PROC9, PROC15		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 %.
	Physical Form (at time of use)	liquid, Gaseous
	Vapour pressure	8600 hPa
Frequency and duration of use	Frequency of use	220 days/year
	Avoid carrying out operation for more than 4 hours.	
Human factors not influenced by risk management	Breathing volume	10 m3/8 hours
	Exposed skin surface	480 cm²
Other operational conditions affecting workers exposure	Indoor	
Technical conditions and measures to control dispersion from source towards the worker	Provide local exhaust ventilation (LEV).(except PROC1)	
	Handle substance within a closed system. Transfer via enclosed lines. Pipelines and vessels are sealed and insulated Store substance within a closed system. Provide extraction ventilation at points where emissions occur.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Employees must be trained in the proper use of PPE, and when to use it Ensure control measures are regularly inspected and maintained. Exposure and biological monitoring of operators is regularly performed Monitor effectiveness of control measures	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency: 90 %)	
	Wear respiratory protection (Efficiency: 95 %)	
	Wear suitable protective clothing, aprons, shield and suits	
	Personal measures have to be applied in case of potential exposure only.	
2.3 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC3, PROC4, PROC8b, PROC9, PROC15		
Activity	application as solution	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers the percentage of the substance in the product up to 25 %.
Frequency and duration of use	Frequency of use	220 days/year
	Avoid carrying out operation for more than 4 hours.	
Human factors not influenced by risk management	Breathing volume	10 m3/8 hours
	Exposed skin surface	480 cm²
Technical conditions and measures to control dispersion from source towards the worker	Provide local exhaust ventilation (LEV).(except PROC1)	
	Handle substance within a closed system. Transfer via enclosed lines. Pipelines and vessels are sealed and insulated	

	Store substance within a closed system. Provide extraction ventilation at points where emissions occur.
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Employees must be trained in the proper use of PPE, and when to use it Ensure control measures are regularly inspected and maintained. Exposure and biological monitoring of operators is regularly performed Monitor effectiveness of control measures
Conditions and measures related to personal protection, hygiene and health evaluation	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency: 90 %)
	Wear respiratory protection (Efficiency: 95 %)
	Wear suitable protective clothing, aprons, shield and suits
	Personal measures have to be applied in case of potential exposure only.

3. Exposure estimation and reference to its source

Environment

ERC6a: EUSES 2.1

Contributing Scenario	Specific conditions	Compartment	Value	Level of Exposure	RCR
ERC6a	Highest exposure	Fresh water	PEC	0,00219mg/l	0,076
ERC6a	Highest exposure	Marine water	PEC	0,0000205mg/l	0,019

Workers

PROC1, PROC2, PROC3, PROC4, PROC8b, PROC9, PROC15, Relevant for all PROCs: ECETOC TRA

Contributing Scenario	Specific conditions	Exposure routes	Level of Exposure	RCR
PROC1	Indoor use, with gloves, (90% efficiency), Without Local Exhaust Ventilation, liquid, Gaseous form	worker dermal, short and long term - systemic	0,03mg/kg bw/day	0,01
PROC2, PROC3, PROC15	Indoor use, with gloves, (90% efficiency), With Local Exhaust Ventilation, liquid, Gaseous form	worker dermal, short and long term - systemic	0,01mg/kg bw/day	< 0,01
PROC4, PROC8b, PROC9	Indoor use, with gloves, (90% efficiency), With Local Exhaust Ventilation, liquid, Gaseous form	worker dermal, short and long term - systemic	0,07mg/kg bw/day	0,01
PROC1	Indoor use, Without Local Exhaust Ventilation, without respiratory protection, liquid, Gaseous form	worker inhalation, acute and long term - systemic	0,01mg/m³	< 0,01
PROC1	Indoor use, Without Local Exhaust Ventilation, without respiratory protection, liquid, Gaseous form	Worker - inhalative, short-term - local	0,01mg/m³	< 0,01
PROC1	Indoor use, Without Local Exhaust Ventilation, without respiratory protection, liquid,	Worker - inhalative, long-term - local	0,01mg/m³	< 0,01

	Gaseous form			
PROC2, PROC3, PROC4, PROC8b, PROC15	Highest exposure, Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, liquid, Gaseous form	worker inhalation, acute and long term - systemic	0,21mg/m³	0
PROC9	Highest exposure, Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, liquid, Gaseous form	worker inhalation, acute and long term - systemic	0,53mg/m³	0,01
Relevant for all PROCs	Highest exposure, Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, liquid, Gaseous form	Worker - inhalative, short-term - local	0,53mg/m³	0,01
PROC2, PROC8b, PROC15	Highest exposure, Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, liquid, Gaseous form	Worker - inhalative, long-term - local	0,11mg/m³	0,01
PROC3, PROC4	Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, liquid, Gaseous form	Worker - inhalative, long-term - local	0,21mg/m³	0,02
PROC9	Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, liquid, Gaseous form	Worker - inhalative, long-term - local	0,43mg/m³	0,03
PROC1	Indoor use, with gloves, (90% efficiency), Without Local Exhaust Ventilation, Aqueous form, Concentrations >= 0% - <= 25%	worker dermal, short and long term - systemic	0,03mg/kg bw/day	0,01
PROC2, PROC3, PROC15	Indoor use, with gloves, (90% efficiency), With Local Exhaust Ventilation, Aqueous form, Concentrations >= 0% - <= 25%	worker dermal, short and long term - systemic	0,01mg/kg bw/day	< 0,01
PROC4, PROC8b, PROC9	Indoor use, with gloves, (90% efficiency), With Local Exhaust Ventilation, Aqueous form, Concentrations >= 0% - <= 25%	worker dermal, short and long term - systemic	0,07mg/kg bw/day	0,01
PROC1	Indoor use, Without Local Exhaust Ventilation, without respiratory protection, Aqueous form, Concentrations >=	worker inhalation, acute and long term - systemic	0,01mg/m³	< 0,01

	0% - <= 25%			
PROC1	Indoor use, Without Local Exhaust Ventilation, without respiratory protection, Aqueous form, Concentrations >= 0% - <= 25%	Worker - inhalative, short-term - local	0,01mg/m³	< 0,01
PROC1	Indoor use, Without Local Exhaust Ventilation, without respiratory protection, Aqueous form, Concentrations >= 0% - <= 25%	Worker - inhalative, long-term - local	0,01mg/m³	< 0,01
PROC2, PROC3, PROC4, PROC8b, PROC15	Highest exposure, Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, Aqueous form, Concentrations >= 0% - <= 25%	worker inhalation, acute and long term - systemic	0,21mg/m³	0
PROC9	Highest exposure, Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours	worker inhalation, acute and long term - systemic	0,53mg/m³	0,01
Relevant for all PROCs	Highest exposure, Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, Aqueous form, Concentrations >= 0% - <= 25%	Worker - inhalative, short-term - local	0,53mg/m³	0,01
PROC2, PROC8b, PROC15	Highest exposure, Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, Aqueous form, Concentrations >= 0% - <= 25%	Worker - inhalative, long-term - local	0,11mg/m³	0,01
PROC3, PROC4	Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, Aqueous form, Concentrations >= 0% - <= 25%	Worker - inhalative, long-term - local	0,21mg/m³	0,02
PROC9	Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, Aqueous form, Concentrations >= 0% - <= 25%	Worker - inhalative, long-term - local	0,43mg/m³	0,03

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

Environment

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Health
Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
For further information on the assessment method, see: http://www.ecetoc.org/tra

Additional good practice advice beyond the REACH Chemical Safety Assessment

Assumes a good basic standard of occupational hygiene is implemented.

1. Short title of Exposure Scenario 3: Formulation & (re)packing of substances and mixtures	
Main User Groups	SU 3: Industrial uses: Uses of substances as such or in preparations at industrial sites
Sectors of end-use	SU1: Agriculture, forestry, fishery SU 10: Formulation [mixing] of preparations and/ or re-packaging (excluding alloys) SU24: Scientific research and development
Process categories	PROC1: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions PROC2: Use in closed, continuous process with occasional controlled exposure PROC3: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition 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 PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC15: Use as laboratory reagent
Environmental Release Categories	ERC2: Formulation of preparations
Activity	Formulation, mixing/ blending in batch or continuous processes, pelletting, compression, transfer and packaging, Loading (including marine vessel/barge, rail/road car and IBC loading) including its distribution

2.1 Contributing scenario controlling environmental exposure for: ERC2		
Readily biodegradable		
Amount used	Annual amount per site	1 Million tonnes/year
	Amounts used in the EU (tonnes/year)	3,8 Million tonnes/year
Environment factors not influenced by risk management	Flow rate of receiving surface water	18.000 m3/d
	Dilution Factor (River)	10
	Dilution Factor (Coastal Areas)	10
Other given operational conditions affecting environmental exposure	Number of emission days per year	330
	Emission or Release Factor: Air	2,5 % 74000 kg/day
	Emission or Release Factor: Water	2 %
	Indoor use	
Technical conditions and measures at process level to prevent release Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Organizational measures to	Air	Exhaust air purification with scrubber
	Water	Wastewaters are generally treated on site by chemical and/or biological methods before release to the municipal STP or to the environment., Do not release wastewater directly into environment., All contaminated waste water must be processed in an industrial or municipal wastewater treatment plant that incorporates both primary and secondary

prevent/limit release from the site		treatments. (Degradation effectiveness: 100 %)
	All production steps are enclosed and the level of containment is high	
Conditions and measures related to sewage treatment plant	Type of Sewage Treatment Plant	On-site waste water treatment
	Sludge Treatment	Do not apply industrial sludge to natural soils., Do not apply STP sludge on agricultural soil, All sludge is collected and incinerated or sent to landfill.
	Type of Sewage Treatment Plant	Domestic sewage treatment plant
	Flow rate of sewage treatment plant effluent	2.000 m3/d
	Percentage removed from waste water	100 %
Conditions and measures related to external treatment of waste for disposal	Waste treatment	Solid wastes should be disposed of via landfill or incineration
Conditions and measures related to external recovery of waste	Recovery Methods	There is no envisaged external recovery of waste.
2.2 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC15		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 %.
	Physical Form (at time of use)	liquid, Gaseous
	Vapour pressure	8600 hPa
Frequency and duration of use	Frequency of use	220 days/year
	Covers daily exposures up to 8 hours	
Human factors not influenced by risk management	Breathing volume	10 m3/8 hours
	Exposed skin surface	480 cm²
Technical conditions and measures to control dispersion from source towards the worker	Provide local exhaust ventilation (LEV).(except PROC1)	
	Handle substance within a closed system. Transfer via enclosed lines. Pipelines and vessels are sealed and insulated Store substance within a closed system. Provide extraction ventilation at points where emissions occur.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Employees must be trained in the proper use of PPE, and when to use it Ensure control measures are regularly inspected and maintained. Exposure and biological monitoring of operators is regularly performed Monitor effectiveness of control measures	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency: 90 %)	
	Wear respiratory protection (Efficiency: 95 %)	
	Wear suitable protective clothing, aprons, shield and suits	
	Personal measures have to be applied in case of potential exposure only.	
2.3 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC15		
Activity	application as solution	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 25 %.
Frequency and duration of use	Frequency of use	220 days/year

	Covers daily exposures up to 8 hours	
Human factors not influenced by risk management	Breathing volume	10 m3/8 hours
	Exposed skin surface	480 cm²
Other operational conditions affecting workers exposure	Indoor	
Technical conditions and measures to control dispersion from source towards the worker	Provide local exhaust ventilation (LEV). (Efficiency: 90 %)(except PROC1)	
	Handle substance within a closed system. Transfer via enclosed lines. Pipelines and vessels are sealed and insulated Store substance within a closed system. Provide extraction ventilation at points where emissions occur.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Employees must be trained in the proper use of PPE, and when to use it Ensure control measures are regularly inspected and maintained. Exposure and biological monitoring of operators is regularly performed Monitor effectiveness of control measures	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency: > 90 %)	
	Wear respiratory protection (Efficiency: > 95 %)	
	Wear suitable protective clothing, aprons, shield and suits	
	Personal measures have to be applied in case of potential exposure only.	

3. Exposure estimation and reference to its source

Environment

ERC2: EUSES 2.1

Contributing Scenario	Specific conditions	Compartment	Value	Level of Exposure	RCR
ERC2	Highest exposure	Fresh water	PEC	0,00013mg/l	0,045
ERC2	Highest exposure	Marine water	PEC	0,0000120mg/l	0,011

Workers

PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC15, Relevant for all PROCs: ECETOC TRA

Contributing Scenario	Specific conditions	Exposure routes	Level of Exposure	RCR
PROC1	Indoor use, with gloves, (90% efficiency), Without Local Exhaust Ventilation, liquid, Gaseous form	worker dermal, short and long term - systemic	0,03mg/kg bw/day	0,01
PROC2, PROC3, PROC5, PROC8a, PROC15	Indoor use, with gloves, (90% efficiency), With Local Exhaust Ventilation, liquid, Gaseous form	worker dermal, short and long term - systemic	0,01mg/kg bw/day	< 0,01
PROC4, PROC8b, PROC9	Indoor use, with gloves, (90% efficiency), With Local Exhaust Ventilation, liquid, Gaseous form	worker dermal, short and long term - systemic	0,07mg/kg bw/day	0,01
PROC1	Indoor use, Without Local Exhaust Ventilation, without respiratory protection, liquid,	worker inhalation, acute and long term - systemic	0,01mg/m³	< 0,01

	Gaseous form			
PROC1	Indoor use, Without Local Exhaust Ventilation, without respiratory protection, liquid, Gaseous form	Worker - inhalative, short-term - local	0,01mg/m³	< 0,01
PROC1	Indoor use, Without Local Exhaust Ventilation, without respiratory protection, liquid, Gaseous form	Worker - inhalative, long-term - local	0,01mg/m³	< 0,01
PROC2, PROC3, PROC4, PROC5, PROC8b, PROC15	Highest exposure, Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, liquid, Gaseous form	worker inhalation, acute and long term - systemic	0,21mg/m³	0
PROC5, PROC8a, PROC9	Highest exposure, Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, liquid, Gaseous form	worker inhalation, acute and long term - systemic	0,53mg/m³	0,01
Relevant for all PROCs	Highest exposure, Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, liquid, Gaseous form	Worker - inhalative, short-term - local	0,53mg/m³	0,01
PROC2, PROC8b, PROC15	Highest exposure, Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours	Worker - inhalative, long-term - local	0,11mg/m³	0,01
PROC3, PROC4	Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, liquid, Gaseous form	Worker - inhalative, long-term - local	0,21mg/m³	0,02
PROC5, PROC8a	Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, liquid, Gaseous form	Worker - inhalative, long-term - local	0,53mg/m³	0,04
PROC9	Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, liquid, Gaseous form	Worker - inhalative, long-term - local	0,43mg/m³	0,03
PROC1	Indoor use, with gloves, (90% efficiency), Without Local Exhaust Ventilation, Aqueous form, Concentrations >= 0% - <= 25%	worker dermal, short and long term - systemic	0,03mg/kg bw/day	0,01
PROC2, PROC3, PROC5, PROC8a,	Indoor use, with gloves, (90% efficiency), With Local Exhaust	worker dermal, short and long term - systemic	0,01mg/kg bw/day	< 0,01

PROC15	Ventilation, Aqueous form, Concentrations >= 0% - <= 25%			
PROC4, PROC8b, PROC9	Indoor use, with gloves, (90% efficiency), With Local Exhaust Ventilation, Aqueous form, Concentrations >= 0% - <= 25%	worker dermal, short and long term - systemic	0,07mg/kg bw/day	0,01
PROC1	Indoor use, Without Local Exhaust Ventilation, without respiratory protection, Aqueous form, Concentrations >= 0% - <= 25%	worker inhalation, acute and long term - systemic	0,01mg/m³	< 0,01
PROC1	Indoor use, Without Local Exhaust Ventilation, without respiratory protection, Aqueous form, Concentrations >= 0% - <= 25%	Worker - inhalative, short-term - local	0,01mg/m³	< 0,01
PROC1	Indoor use, Without Local Exhaust Ventilation, without respiratory protection, Aqueous form, Concentrations >= 0% - <= 25%	Worker - inhalative, long-term - local	0,01mg/m³	< 0,01
PROC2, PROC3, PROC4, PROC5, PROC8b, PROC15	Highest exposure, Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, Aqueous form, Concentrations >= 0% - <= 25%	worker inhalation, acute and long term - systemic	0,21mg/m³	0
PROC5, PROC8a, PROC9	Highest exposure, Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, Aqueous form, Concentrations >= 0% - <= 25%	worker inhalation, acute and long term - systemic	0,53mg/m³	0,01
Relevant for all PROCs	Highest exposure, Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, Aqueous form, Concentrations >= 0% - <= 25%	Worker - inhalative, short-term - local	0,53mg/m³	0,01
PROC2, PROC8b, PROC15	Highest exposure, Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, Aqueous form, Concentrations >= 0% - <= 25%	Worker - inhalative, long-term - local	0,11mg/m³	0,01
PROC3, PROC4	Indoor use, with RPE (95%), With Local Exhaust Ventilation,	Worker - inhalative, long-term - local	0,21mg/m³	0,02

	during 1 - 4 hours, Aqueous form, Concentrations >= 0% - <= 25%			
PROC5, PROC8a	Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, Aqueous form, Concentrations >= 0% - <= 25%	Worker - inhalative, long-term	0,53mg/m³	0,04
PROC9	Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, Aqueous form, Concentrations >= 0% - <= 25%	Worker - inhalative, long-term	0,43mg/m³	0,03

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

Environment
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Health
Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
For further information on the assessment method, see: http://www.ecetoc.org/tra

Additional good practice advice beyond the REACH Chemical Safety Assessment

Assumes a good basic standard of occupational hygiene is implemented.

Additional good practice advice beyond the REACH Chemical Safety Assessment

Assumes a good basic standard of occupational hygiene is implemented.

1. Short title of Exposure Scenario 4: Industrial use	
Main User Groups	SU 3: Industrial uses: Uses of substances as such or in preparations at industrial sites
Process categories	PROC1: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions PROC2: Use in closed, continuous process with occasional controlled exposure PROC3: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition 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) 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 PROC15: Use as laboratory reagent
Environmental Release Categories	ERC4: Industrial use of processing aids in processes and products, not becoming part of articles ERC5: Industrial use resulting in inclusion into or onto a matrix ERC6b: Industrial use of reactive processing aids ERC7: Industrial use of substances in closed systems

2.1 Contributing scenario controlling environmental exposure for: **ERC4**, **ERC5**, **ERC6b**, **ERC7**		
Readily biodegradable		
Amount used	Annual amount per site	25000 ton(s)/year
	Amounts used in the EU (tonnes/year)	354000 ton(s)/year
Environment factors not influenced by risk management	Flow rate of receiving surface water	18.000 m3/d
	Dilution Factor (River)	10
Other given operational conditions affecting environmental exposure	Number of emission days per year	330
	Emission or Release Factor: Air	70000 kg/day
	Indoor use	
Technical conditions and measures at process level to prevent release Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Organizational measures to prevent/limit release from the site	Air	Exhaust air purification with scrubber
	Water	Wastewaters are generally treated on site by chemical and/or biological methods before release to the municipal STP or to the environment., Do not release wastewater directly into environment., All contaminated waste water must be processed in an industrial or municipal wastewater treatment plant that incorporates both primary and secondary treatments. (Degradation effectiveness: 100 %)
	All production steps are enclosed and the level of containment is high	
Conditions and measures related to sewage treatment plant	Type of Sewage Treatment Plant	On-site waste water treatment
	Sludge Treatment	Do not apply industrial sludge to natural soils., Do not apply STP sludge on agricultural soil, All sludge is collected and incinerated or sent to landfill.

Conditions and measures related to external treatment of waste for disposal	Waste treatment	Solid wastes should be disposed of via landfill or incineration
Conditions and measures related to external recovery of waste	Recovery Methods	There is no envisaged external recovery of waste.
2.2 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC3, PROC4, PROC5, PROC8b, PROC9, PROC13, PROC15		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 %.
	Physical Form (at time of use)	liquid, Gaseous
	Vapour pressure	8600 hPa
Frequency and duration of use	Frequency of use	220 days/year
	Avoid carrying out operation for more than 4 hours.	
Human factors not influenced by risk management	Breathing volume	10 m3/8 hours
	Exposed skin surface	480 cm²
Other operational conditions affecting workers exposure	Indoor	
Technical conditions and measures to control dispersion from source towards the worker	Provide local exhaust ventilation (LEV).(except PROC1)	
	Handle substance within a closed system. Transfer via enclosed lines. Pipelines and vessels are sealed and insulated Store substance within a closed system. Provide extraction ventilation at points where emissions occur.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Employees must be trained in the proper use of PPE, and when to use it Ensure control measures are regularly inspected and maintained. Exposure and biological monitoring of operators is regularly performed Monitor effectiveness of control measures	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency: 90 %)	
	Wear respiratory protection (Efficiency: 95 %)	
	Wear suitable protective clothing, aprons, shield and suits	
	Personal measures have to be applied in case of potential exposure only.	
2.3 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC3, PROC4, PROC5, PROC8b, PROC9, PROC10, PROC13, PROC15, PROC19		
Activity	application as solution	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers the percentage of the substance in the product up to 25 %.
Frequency and duration of use	Frequency of use	220 days/year
	Avoid carrying out operation for more than 4 hours.	
Human factors not influenced by risk management	Breathing volume	10 m3/8 hours
	Exposed skin surface	480 cm²
Other operational conditions affecting workers exposure	Indoor	
	Limit the substance content in the product to 10 %.(PROC19)	
Technical conditions and measures to control dispersion from source towards the worker	Provide local exhaust ventilation (LEV).(except PROC1)	
	Handle substance within a closed system. Transfer via enclosed lines. Pipelines and vessels are sealed and insulated Store substance within a closed system. Provide extraction ventilation at points where emissions occur.	
Organisational measures to	Ensure operatives are trained to minimise exposures.	

prevent /limit releases, dispersion and exposure	Employees must be trained in the proper use of PPE, and when to use it Ensure control measures are regularly inspected and maintained. Exposure and biological monitoring of operators is regularly performed Monitor effectiveness of control measures
Conditions and measures related to personal protection, hygiene and health evaluation	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency: > 90 %)
	Wear respiratory protection (Efficiency: > 95 %)
	Wear suitable protective clothing, aprons, shield and suits
	Personal measures have to be applied in case of potential exposure only.

3. Exposure estimation and reference to its source

Environment

ERC4, ERC5, ERC6b, ERC7: EUSES 2.1

Contributing Scenario	Specific conditions	Compartment	Value	Level of Exposure	RCR
ERC4	Highest exposure	Fresh water	PEC	0,000108mg/l	0,098
ERC4	Highest exposure	Marine water	PEC	0,0000231mg/l	0,021
ERC5	Highest exposure	Fresh water	PEC	0,0000558mg/l	0,051
ERC5	Highest exposure	Marine water	PEC	0,0000121mg/l	0,011
ERC6b	Highest exposure	Fresh water	PEC	< 0,000001mg/l	0,0001
ERC6b	Highest exposure	Marine water	PEC	< 0,000001mg/l	0,0002
ERC7	Highest exposure	Fresh water	PEC	< 0,000001mg/l	0,005
ERC7	Highest exposure	Marine water	PEC	< 0,000001mg/l	0,0011

Workers

PROC1, PROC2, PROC3, PROC4, PROC5, PROC7, PROC8a, PROC8b, PROC9, PROC10, PROC13, PROC15, PROC19, Relevant for all PROCs: ECETOC TRA

Contributing Scenario	Specific conditions	Exposure routes	Level of Exposure	RCR
PROC1	Indoor use, with gloves, (90% efficiency), Without Local Exhaust Ventilation	worker dermal, short and long term - systemic	0,03mg/kg bw/day	0,01
PROC2, PROC3, PROC5, PROC15	Indoor use, with gloves, (90% efficiency), With Local Exhaust Ventilation	worker dermal, short and long term - systemic	0,01mg/kg bw/day	< 0,01
PROC4, PROC8b, PROC9	Indoor use, with gloves, (90% efficiency), With Local Exhaust Ventilation	worker dermal, short and long term - systemic	0,07mg/kg bw/day	0,01
PROC1	Indoor use, Without Local Exhaust Ventilation, without respiratory protection, liquid, Gaseous form	worker inhalation, acute and long term - systemic	0,01mg/m³	< 0,01
PROC1	Indoor use, Without Local Exhaust Ventilation, without respiratory protection, liquid, Gaseous form	Worker - inhalative, short-term - local	0,01mg/m³	< 0,01
PROC1	Indoor use, Without Local	Worker - inhalative, long-	0,01mg/m³	< 0,01

	Exhaust Ventilation, without respiratory protection, liquid, Gaseous form	term - local		
PROC2, PROC3, PROC4, PROC8b, PROC15	Highest exposure, Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, liquid, Gaseous form	worker inhalation, acute and long term - systemic	0,21mg/m³	0
PROC5, PROC9, PROC13	Highest exposure, Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, liquid, Gaseous form	worker inhalation, acute and long term - systemic	0,53mg/m³	0,01
Relevant for all PROCs	Highest exposure, Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, liquid, Gaseous form	Worker - inhalative, short-term - local	0,53mg/m³	0,01
PROC2, PROC8b, PROC15	Highest exposure, Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, liquid, Gaseous form	Worker - inhalative, long-term - local	0,11mg/m³	0,01
PROC3, PROC4	Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, liquid, Gaseous form	Worker - inhalative, long-term - local	0,21mg/m³	0,02
PROC5, PROC13	Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, liquid, Gaseous form	Worker - inhalative, long-term - local	0,53mg/m³	0,04
PROC9	Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, liquid, Gaseous form	Worker - inhalative, long-term - local	0,43mg/m³	0,03
PROC19	Reduced concentration, 10% w/w, with gloves, (90% efficiency)	worker dermal, short and long term - systemic	1,41mg/kg bw/day	0,2
PROC2, PROC8b, PROC15	Highest exposure, Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, Aqueous form, Concentrations >= 0% - <= 25%	worker inhalation, acute and long term - systemic	0,13mg/m³	0
PROC3, PROC4	Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, Aqueous form,	worker inhalation, acute and long term - systemic	0,26mg/m³	0,01

	Concentrations >= 0% - <= 25%			
PROC5, PROC7, PROC8a, PROC9, PROC10, PROC13	Highest exposure, Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, Aqueous form, Concentrations >= 0% - <= 25%	worker inhalation, acute and long term - systemic	0,66mg/m³	0,01
PROC1, PROC2, PROC3, PROC4, PROC8b, PROC9, PROC15	Highest exposure, Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, Aqueous form, Concentrations >= 0% - <= 25%	Worker - inhalative, short-term - local	0,53mg/m³	0,01
PROC5, PROC7, PROC8a, PROC10, PROC13	Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, Aqueous form, Concentrations >= 0% - <= 25%	Worker - inhalative, short-term - local	0,66mg/m³	0,02
PROC2, PROC8b, PROC15	Highest exposure, Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, Aqueous form, Concentrations >= 0% - <= 25%	Worker - inhalative, long-term - local	0,13mg/m³	0,01
PROC3, PROC4	Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, Aqueous form, Concentrations >= 0% - <= 25%	Worker - inhalative, long-term - local	0,26mg/m³	0,02
PROC5, PROC7, PROC8a, PROC10, PROC13	Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, Aqueous form, Concentrations >= 0% - <= 25%	Worker - inhalative, long-term - local	0,66mg/m³	0,05
PROC9	Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, Aqueous form, Concentrations >= 0% - <= 25%	Worker - inhalative, long-term - local	0,53mg/m³	0,04
PROC19	Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, Aqueous form, Reduced concentration, (max. 10% solution)	worker inhalation, acute and long term - systemic	6,56mg/m³	0,14

PROC19	Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, Aqueous form, Reduced concentration, (max. 10% solution)	Worker - inhalative, short-term - local	6,56mg/m³	0,18
PROC19	Indoor use, with RPE (95%), With Local Exhaust Ventilation, during 1 - 4 hours, Aqueous form, Reduced concentration, (max. 10% solution)	Worker - inhalative, long-term	6,56mg/m³	0,47

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

Environment
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Health
Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
For further information on the assessment method, see: http://www.ecetoc.org/tra

Additional good practice advice beyond the REACH Chemical Safety Assessment

Assumes a good basic standard of occupational hygiene is implemented.

1. Short title of Exposure Scenario 5: Professional use	
Main User Groups	SU 22: Professional uses: Public domain (administration, education, entertainment, services, craftsmen)
Process categories	PROC1: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions PROC2: Use in closed, continuous process with occasional controlled exposure PROC3: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition 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 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 PROC19: Hand-mixing with intimate contact and only PPE available PROC20: Heat and pressure transfer fluids in dispersive, professional use but closed systems
Environmental Release Categories	ERC8b: Wide dispersive indoor use of reactive substances in open systems ERC8e: Wide dispersive outdoor use of reactive substances in open systems ERC9a: Wide dispersive indoor use of substances in closed systems ERC9b: Wide dispersive outdoor use of substances in closed systems

2.1 Contributing scenario controlling environmental exposure for: ERC8b, ERC8e, ERC9a, ERC9b		
Readily biodegradable		
Frequency and duration of use	Continuous exposure	Wide dispersive use
Technical conditions and measures at process level to prevent release Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Organizational measures to prevent/limit release from the site	Air	Exhaust air purification with scrubber
	Water	Ensure proper process control to avoid excess waste discharge (temperature, concentration, pH, time)., All contaminated waste water must be processed in an industrial or municipal wastewater treatment plant that incorporates both primary and secondary treatments.
Conditions and measures related to sewage treatment plant	Type of Sewage Treatment Plant	On-site waste water treatment
	Percentage removed from waste water	90 %
	Type of Sewage Treatment Plant	Municipal sewage treatment plant
	Percentage removed from waste water	90 %

2.2 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC10, PROC11, PROC13, PROC15, PROC19, PROC20		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 %.

	Physical Form (at time of use)	liquid, Gaseous
	Vapour pressure	8600 hPa
Frequency and duration of use	Frequency of use	220 days/year
	Avoid carrying out operation for more than 4 hours.	
Human factors not influenced by risk management	Breathing volume	10 m3/8 hours
	Exposed skin surface	480 cm²
Technical conditions and measures to control dispersion from source towards the worker	Provide local exhaust ventilation (LEV).(except PROC1)	
	Handle substance within a closed system. Transfer via enclosed lines. Pipelines and vessels are sealed and insulated Store substance within a closed system. Provide extraction ventilation at points where emissions occur.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Employees must be trained in the proper use of PPE, and when to use it Ensure control measures are regularly inspected and maintained. Exposure and biological monitoring of operators is regularly performed Monitor effectiveness of control measures	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency: 90 %)	
	Wear respiratory protection (Efficiency: 95 %)	
	Wear suitable protective clothing, aprons, shield and suits	
	Personal measures have to be applied in case of potential exposure only.	

2.3 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC10, PROC11, PROC13, PROC15, PROC19, PROC20

Activity	application as solution	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers the percentage of the substance in the product up to 25 %.
Frequency and duration of use	Frequency of use	220 days/year
	Avoid carrying out operation for more than 4 hours.	
Human factors not influenced by risk management	Breathing volume	10 m3/8 hours
	Exposed skin surface	480 cm²
Technical conditions and measures to control dispersion from source towards the worker	Provide local exhaust ventilation (LEV).(except PROC1)	
	Handle substance within a closed system. Transfer via enclosed lines. Pipelines and vessels are sealed and insulated Store substance within a closed system. Provide extraction ventilation at points where emissions occur.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Employees must be trained in the proper use of PPE, and when to use it Ensure control measures are regularly inspected and maintained. Exposure and biological monitoring of operators is regularly performed Monitor effectiveness of control measures	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency: 90 %)	
	Wear respiratory protection (Efficiency: 95 %)	
	Wear suitable protective clothing, aprons, shield and suits	
	Personal measures have to be applied in case of potential exposure only.	

3. Exposure estimation and reference to its source

Environment

EUSES. The use is assessed to be safe.

Workers

PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC10, PROC11, PROC13, PROC15, PROC19, PROC20: ECETOC TRA

Contributing Scenario	Specific conditions	Exposure routes	Level of Exposure	RCR
PROC1	Indoor use, with gloves, (90% efficiency), Without Local Exhaust Ventilation	worker dermal, short and long term - systemic	0,03mg/kg bw/day	0,01
PROC2, PROC3, PROC5, PROC8a, PROC15, PROC20	Indoor use, with gloves, (90% efficiency), With Local Exhaust Ventilation	worker dermal, short and long term - systemic	0,01mg/kg bw/day	< 0,01
PROC4, PROC8b, PROC9, PROC13	Indoor use, with gloves, (90% efficiency), With Local Exhaust Ventilation	worker dermal, short and long term - systemic	0,07mg/kg bw/day	0,01
PROC11	Indoor use, with gloves, (90% efficiency), With Local Exhaust Ventilation	worker dermal, short and long term - systemic	0,21mg/kg bw/day	0,03
PROC10	Indoor use, with gloves, (90% efficiency), With Local Exhaust Ventilation	worker dermal, short and long term - systemic	0,14mg/kg bw/day	0,02
PROC19	Indoor use, with gloves, (90% efficiency), With Local Exhaust Ventilation, 10% dermal uptake	worker dermal, short and long term - systemic	1,41mg/kg bw/day	0,2
PROC2, PROC15, PROC8b	Highest exposure, Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, liquid, Gaseous form	worker inhalation, acute and long term - systemic	0,13mg/m³	0
PROC2, PROC15, PROC8b	Highest exposure, Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, liquid, Gaseous form	Worker - inhalative, short-term - local	0,13mg/m³	< 0,01
PROC2, PROC15, PROC8b	Highest exposure, Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, liquid, Gaseous form	Worker - inhalative, long-term - local	0,13mg/m³	0,01
PROC3, PROC4, PROC20	Highest exposure, Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, liquid, Gaseous form	worker inhalation, acute and long term - systemic	0,26mg/m³	0,01
PROC3, PROC4, PROC20	Highest exposure, Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, liquid, Gaseous form	Worker - inhalative, short-term - local	0,26mg/m³	0,01
PROC3, PROC4, PROC20	Highest exposure, Indoor use, With Local Exhaust	Worker - inhalative, long-term - local	0,26mg/m³	0,02

	Ventilation, with RPE (95%), during 1 - 4 hours, liquid, Gaseous form			
PROC5, PROC8a, PROC13	Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, liquid, Gaseous form	worker inhalation, acute and long term - systemic	0,53mg/m³	0,01
PROC5, PROC8a, PROC13	Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, liquid, Gaseous form	Worker - inhalative, short-term - local	0,53mg/m³	0,01
PROC5, PROC8a, PROC13	Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, liquid, Gaseous form	Worker - inhalative, long-term - local	0,53mg/m³	0,04
PROC9	Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, liquid, Gaseous form	worker inhalation, acute and long term - systemic	0,43mg/m³	0,01
PROC9	Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, liquid, Gaseous form	Worker - inhalative, short-term - local	0,43mg/m³	0,01
PROC9	Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, liquid, Gaseous form	Worker - inhalative, long-term - local	0,43mg/m³	0,03
PROC5, PROC8a, PROC10, PROC13	Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, Concentrations >= 0% - <= 25%	worker inhalation, acute and long term - systemic	0,66mg/m³	0,01
PROC5, PROC8a, PROC10, PROC13	Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, Concentrations >= 0% - <= 25%	Worker - inhalative, short-term - local	0,66mg/m³	0,02
PROC5, PROC8a, PROC10, PROC13	Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, Concentrations >= 0% - <= 25%	Worker - inhalative, long-term - local	0,66mg/m³	0,05
PROC9	Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, Concentrations >= 0% - <= 25%	worker inhalation, acute and long term - systemic	0,53mg/m³	0,01
PROC9	Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, Concentrations >= 0% - <= 25%	Worker - inhalative, short-term - local	0,53mg/m³	0,01

PROC9	Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, Concentrations >= 0% - <= 25%	Worker - inhalative, long-term - local	0,53mg/m³	0,04
PROC11	Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, Concentrations >= 0% - <= 25%	worker inhalation, acute and long term - systemic	5,26mg/m³	0,11
PROC11	Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, Concentrations >= 0% - <= 25%	Worker - inhalative, short-term - local	5,26mg/m³	0,15
PROC11	Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, Concentrations >= 0% - <= 25%	Worker - inhalative, long-term - local	5,26mg/m³	0,38
PROC19	Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, Concentrations >= 0% - <= 25%	worker inhalation, acute and long term - systemic	6,56mg/m³	0,14
PROC19	Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, Concentrations >= 0% - <= 25%	Worker - inhalative, short-term - local	6,56mg/m³	0,18
PROC19	Indoor use, With Local Exhaust Ventilation, with RPE (95%), during 1 - 4 hours, Concentrations >= 0% - <= 25%	Worker - inhalative, long-term - local	6,56mg/m³	0,47

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

Environment
The product is not expected to harm the environment when used properly according to directions
Health
Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
For further information on the assessment method, see: http://www.ecetoc.org/tra

Additional good practice advice beyond the REACH Chemical Safety Assessment

Assumes a good basic standard of occupational hygiene is implemented.