Ammonia, anhydrous, contains less than 0.5% water

Safety Data Sheet

according to the REACH Regulation (EC) 1907/2006 amended by Regulation (EU) 2020/878
SDS ID: OC00040
Issue date: 31/07/2025 Version: 1.0

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

1.1. Product identifier

Product form	:	Substance
Name	:	Ammonia, anhydrous, contains less than 0.5% water
Trade name	:	Anhydrous Ammonia Anhydrous Ammonia Novo
EC-No.	:	231-635-3
CAS-No.	:	7664-41-7
REACH registration No.	:	01-2119488876-14-0249

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

1.2.1. Relevant identified uses

Main use category : Manufacture,Formulation,Intermediate,Industrial use,Professional use

1.2.2. Uses advised against

No additional information available

1.3. Details of the supplier of the safety data sheet

OCI Ammonia Distribution B.V.
Wolgaweg 31
3198 LR Europoort Rotterdam
The Netherlands
info.oad@oci-global.com, www.oci-global.com

1.4. Emergency telephone number

Emergency number : Alert & Care Centre Chemelot (Geleen, The Netherlands): +31 (0) 46 4765555 (24/7)

Country/Area	Organisation/Company	Address	Emergency number	Comment
Ireland	National Poisons Information Centre Beaumont Hospital	PO Box 1297 Beaumont Road 9 Dublin	+353 1 809 2566 (Healthcare professionals-24/7) +353 1 809 2166 (public, 8am - 10pm, 7/7)	
United Kingdom	NHS 111/NHS 24/NHS Direct		111 0845 4647	or call a doctor
Wales	National Health Service (NHS)		0845 46 47	

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

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

Flammable gases, Category 2	H221
Gases under pressure : Compressed gas	H280
Acute toxicity (inhal.), Category 3	H331
Skin corrosion/irritation, Category 1, Sub-Category 1B	H314
Hazardous to the aquatic environment – Acute Hazard, Category 1	H400
Hazardous to the aquatic environment – Chronic Hazard, Category 2	H411

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

Adverse physicochemical, human health and environmental effects

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

2.2. Label elements

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

Hazard pictograms (CLP) :

GHS05 GHS06 GHS09 GHS04

Signal word (CLP) : Danger

Hazard statements (CLP) : 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 (CLP) : P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P280 - Wear protective gloves/protective clothing/eye protection/face protection.
P303+P361+P353+P310 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. Immediately call a doctor.
P304+P340+P311 - IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or doctor.
P305+P351+P338+P310 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor.
P403 - Store in a well-ventilated place.

EUH-statements : EUH071 - Corrosive to the respiratory tract.

Extra phrases : Optional measures : Diphoterine®.

2.3. Other hazards

Other hazards not contributing to the classification : Contact with the product may cause cold burns or frostbite.

This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII
This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII
Contains no PBT and/or vPvB substances ≥ 0.1% assessed in accordance with REACH Annex XIII

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

SECTION 3: Composition/information on ingredients

3.1. Substances

Name	Product identifier	Conc. (% w/w)	Classification according to Regulation (EC) No. 1272/2008 [CLP]
Ammonia, anhydrous	CAS-No.: 7664-41-7 EC-No.: 231-635-3 EC Index-No.: 007-001-00-5 REACH-no: 01-2119488876-14-0249	≥ 99.5 – ≤ 100	Flam. Gas 2, H221 Press. Gas Acute Tox. 3 (Inhalation), H331 Skin Corr. 1B, H314 Aquatic Acute 1, H400 Aquatic Chronic 2, H411

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

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : Call a physician immediately. Give first-aid treatment according to the nature of the injury. Large amounts: Rinse with plenty of water. Flush with Diphotherine®. Small amounts: Flush with Diphotherine®. If the breathing or the heart has stopped, give cardiopulmonary resuscitation (CPR). It may be dangerous to give mouth-to-mouth resuscitation.

First-aid measures after inhalation : Call a physician immediately. Remove person to fresh air and keep comfortable for breathing.

First-aid measures after skin contact : Call a physician immediately. Large amounts: Rinse skin with water/shower. Flush clothing with plenty of water. Flush with Diphotherine®. Small amounts: Flush with Diphotherine®. In case of contact with liquefied gas, thaw frosted parts with lukewarm water. Take off immediately all contaminated clothing.

First-aid measures after eye contact : Call a physician immediately. Flush with Diphotherine®. Contact lenses should be removed.

First-aid measures after ingestion : Call a physician immediately. Rinse mouth. Do not induce vomiting.

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

Symptoms/effects : May cause frostbite.

Symptoms/effects after inhalation : May cause respiratory irritation. Coughing, sneezes. Difficulty in breathing.

Symptoms/effects after skin contact : Burns.

Symptoms/effects after eye contact : Serious damage to eyes.

Symptoms/effects after ingestion : Burns.

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

Treat symptomatically. Symptoms may be delayed.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Water spray. Dry powder. Foam. Carbon dioxide.

5.2. Special hazards arising from the substance or mixture

Fire hazard : Flammable gas. Contains gas under pressure; may explode if heated.

Hazardous decomposition products in case of fire : Toxic fumes may be released. Nitrogen oxides. Hydrogen. Amines.

5.3. Advice for firefighters

Firefighting instructions : Use water spray or fog for cooling exposed containers. Eliminate all ignition sources if safe to do so. Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Prevent fire fighting water from entering the environment. Suppress the vapours given off, with vaporised water.

Protection during firefighting : Do not attempt to take action without suitable protective equipment. Self-contained breathing apparatus. Complete protective clothing.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Emergency procedures : Evacuate unnecessary personnel. Ventilate spillage area. No open flames, no sparks and no smoking. Avoid contact with skin and eyes. Do not breathe vapours, mist, spray. Wear personal protective equipment. Stay upwind/keep distance from source.

6.1.2. For emergency responders

Protective equipment : Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".

6.2. Environmental precautions

Avoid release to the environment. Notify authorities if product enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

For containment : Collect spillage. Stop leak without risks if possible.

Methods for cleaning up : Ventilate the area thoroughly. Remove all sources of ignition. Take up liquid spill into absorbent material, e.g.: sand. Shovel or sweep up and put in a closed container for disposal.

Other information : Dispose of materials or solid residues at an authorized site.

6.4. Reference to other sections

See sections 8 and 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Handle in accordance with good industrial hygiene and safety procedures. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Eliminate all ignition sources if safe to do so. Use only outdoors or in a well-ventilated area. Avoid contact with skin and eyes. Do not breathe mist, spray, vapours. Wear personal protective equipment.

Hygiene measures : Wash contaminated clothing before reuse. Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions : Store in accordance with local, regional, national or international regulation. Keep container tightly closed. Keep cool. Store in a dry, well ventilated place away from sources of heat, ignition and direct sunlight.

Incompatible materials : Refer to Section 10 on Incompatible Materials.

Storage temperature : < 25 °C

7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

8.1.1 National occupational exposure and biological limit values

Ammonia, anhydrous (7664-41-7)	
EU - Indicative Occupational Exposure Limit (IOEL)	
Local name	Ammonia, anhydrous
IOELV TWA (mg/m³)	14 mg/m³
IOELV TWA (ppm)	20 ppm
IOELV STEL (mg/m³)	36 mg/m³
IOELV STEL (ppm)	50 ppm
Regulatory reference	COMMISSION DIRECTIVE 2000/39/EC
Ireland - Occupational Exposure Limits	
Local name	Ammonia, anhydrous
OEL (8 hours ref) (mg/m³)	14 mg/m³

Ammonia, anhydrous (7664-41-7)	
OEL (8 hours ref) (ppm)	20 ppm
OEL (15 min ref) (mg/m3)	36 mg/m³
OEL (15 min ref) (ppm)	50 ppm
Remark	IOELV (Indicative Occupational Exposure Limit Values)
Regulatory reference	Chemical Agents Code of Practice 2021
United Kingdom - Occupational Exposure Limits	
Local name	Ammonia, anhydrous
WEL TWA (mg/m³)	18 mg/m³
WEL TWA (ppm)	25 ppm
WEL STEL (mg/m³)	25 mg/m³
WEL STEL (OEL STEL) [ppm]	35 ppm
Regulatory reference	EH40/2005 (Fourth edition, 2020). HSE

8.1.2. Recommended monitoring procedures

No additional information available

8.1.3. Air contaminants formed

No additional information available

8.1.4. DNEL and PNEC

Ammonia, anhydrous, contains less than 0.5% water (7664-41-7)	
DNEL/DMEL (Workers)	
Acute - systemic effects, dermal	6.8 mg/kg bodyweight/day
Acute - systemic effects, inhalation	47.6 mg/m³
Acute - local effects, inhalation	36 mg/m³
Long-term - systemic effects, dermal	6.8 mg/kg bodyweight/day
Long-term - systemic effects, inhalation	47.6 mg/m³
Long-term - local effects, inhalation	14 mg/m³
PNEC (Water)	
PNEC aqua (freshwater)	0.00135 mg/l
PNEC aqua (marine water)	0.00135 mg/l
PNEC aqua (intermittent, freshwater)	0.0083 mg/l
PNEC (Soil)	
PNEC soil	0.0221 mg/kg dwt

8.1.5. Control banding

No additional information available

8.2. Exposure controls

8.2.1. Appropriate engineering controls

Appropriate engineering controls:
Ensure adequate ventilation, especially in confined areas. Use in a closed system. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Portable Diphoterine® eyewashers. Use spark-/explosionproof appliances and lighting system.

8.2.2. Personal protection equipment

Personal protective equipment symbol(s):

8.2.2.1. Eye and face protection

Eye protection:
Tightly fitting safety goggles

Eye protection			
Type	**Use**	**Characteristics**	**Standard**
Safety goggles	Splashes		EN 166

8.2.2.2. Skin protection

Skin and body protection:
Wear suitable protective clothing

Skin and body protection	
Type	**Standard**
Long sleeved protective clothing, chemical resistant, Apron, Boots	EN 13034

Hand protection:
Wear protective gloves

Hand protection					
Type	**Material**	**Permeation**	**Thickness (mm)**	**Penetration**	**Standard**
Protective gloves	Butyl rubber	5 (> 240 minutes)	0.56		EN 374
Protective gloves	Viton® II	5 (> 240 minutes)	0.46		EN 374

8.2.2.3. Respiratory protection

Respiratory protection:
[In case of inadequate ventilation] wear respiratory protection.

Respiratory protection			
Device	**Filter type**	**Condition**	**Standard**
Self-contained breathing apparatus (SCBA)	Type K - Ammonia and amines		EN 402

8.2.2.4. Thermal hazards

No additional information available

8.2.3. Environmental exposure controls

Environmental exposure controls:
Avoid release to the environment. No restriction on the extinguishing media to be used.
Other information:
Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Handle in accordance with good industrial hygiene and safety procedures. Do not eat, drink or smoke when using this product. Wash hands immediately after handling the product.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Liquid

Colour	:	Colourless
Appearance	:	Gas under pressure
Odour	:	Characteristic, stinging
Odour threshold	:	5 – 25 ppm
Melting point	:	-78 °C (101.3 kPa)
Freezing point	:	-78 °C (101.3 kPa)
Boiling point	:	-33.4 °C (101.3 kPa)
Flammability (solid, gas)	:	Flammable,Flammable gas.
Explosive properties	:	Not explosive
Oxidising properties	:	Non oxidizing
Lower explosive limit (LEL)	:	Not available
Upper explosive limit (UEL)	:	Not available
Flash point	:	Not available
Auto-ignition temperature	:	651 °C (101.3 kPa)
Decomposition temperature	:	450 °C
pH	:	11.7
Viscosity, kinematic	:	Not available
Viscosity, dynamic	:	0.475 cP (@ -69°C), 0.317 cP (@ -50°C), 0.276 cP (@ -40°C),0.255 cP (@ -33.5°C)
Solubility	:	Soluble in: Methanol. Water: 51 – 53.1 g/100ml
Partition coefficient n-octanol/water (Log Kow)	:	Not available
Vapour pressure	:	8611 hPa (20 °C)
Density	:	0.717 kg/m³ (21 °C)
Relative density	:	0.6386 (-33 °C) Relative density, liquid (water=1)
Relative vapour density at 20°C	:	0.6 Relative density, gas (air=1)
Particle characteristics	:	Not applicable

9.2. Other information

9.2.1. Information with regard to physical hazard classes

Explosion limits	:	15 – 28 vol % 101.3 kPa
Critical temperature	:	133.4 °C

9.2.2. Other safety characteristics

Minimum ignition energy	:	680 mJ
Specific conductivity	:	1.9e+007

SECTION 10: Stability and reactivity

10.1. Reactivity

Flammable gas.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

No dangerous reactions known under normal conditions of use.

10.4. Conditions to avoid

Avoid contact with hot surfaces. Heat. No flames, no sparks. Eliminate all sources of ignition.

10.5. Incompatible materials

Strong acids. Strong bases. Aluminium. Chromates. Copper or copper containing metals. Halogens. Metal oxides. Nickel (Ni). Organic materials. Zinc.

10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced. Hazardous decomposition products in case of fire. Nitrogen oxides. Hydrogen.

SECTION 11: Toxicological information

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

Acute toxicity (oral) : Not classified
Acute toxicity (dermal) : Not classified
Acute toxicity (inhalation) : Toxic if inhaled.

Ammonia, anhydrous (7664-41-7)	
LC50 Inhalation - Rat	9850 mg/m³ Ammonia/air mixture, Exposure: 1h

Skin corrosion/irritation : Causes severe skin burns.
pH: 11.7

Ammonia, anhydrous (7664-41-7)	
pH	11.6 (conc: 1 N at 25 °C (aqueous solution)

Serious eye damage/irritation : Assumed to cause serious eye damage
pH: 11.7

Ammonia, anhydrous (7664-41-7)	
pH	11.6 (conc: 1 N at 25 °C (aqueous solution)

Respiratory or skin sensitisation : Not classified
Germ cell mutagenicity : Not classified
Carcinogenicity : Not classified

Ammonia, anhydrous (7664-41-7)	
NOAEL (chronic, oral, animal/male, 2 years)	256 mg/kg bodyweight Animal: rat, Animal sex: male, Guideline: OECD Guideline 453 (Combined Chronic Toxicity / Carcinogenicity Studies), Remarks on results: other:Effect type: toxicity (migrated information)
NOAEL (chronic, oral, animal/female, 2 years)	284 mg/kg bodyweight Animal: rat, Animal sex: female, Guideline: OECD Guideline 453 (Combined Chronic Toxicity / Carcinogenicity Studies), Remarks on results: other:Effect type: toxicity (migrated information)

Reproductive toxicity : Not classified
STOT-single exposure : Corrosive to respiratory system
STOT-repeated exposure : Not classified
Aspiration hazard : Not classified

11.2. Information on other hazards

11.2.1. Endocrine disrupting properties

Adverse health effects caused by endocrine disrupting properties : Contains no substances identified as having endocrine disrupting properties

11.2.2. Other information

No additional information available

SECTION 12: Ecological information

12.1. Toxicity

Hazardous to the aquatic environment, short–term (acute) : Very toxic to aquatic life.
Hazardous to the aquatic environment, long–term (chronic) : Toxic to aquatic life with long lasting effects.

Ammonia, anhydrous (7664-41-7)	
LC50 fish 1	0.068 mg/l Oncorhynchys gorbuscha (96h)
EC50 Daphnia 1	101 mg/l Daphnia magna (48h)
EC50 72h - Algae [1]	2700 mg/l Chlorella vulgaris (18d)

Ammonia, anhydrous (7664-41-7)	
LOEC (chronic)	1.3 mg/l Test organisms (species): Daphnia magna Duration: '96 h'
NOEC (chronic)	0.79 mg/l Test organisms (species): Daphnia magna Duration: '96 h'
NOEC chronic fish	1.2 mg/l Oncorhynchus gorbuscha (96h)

12.2. Persistence and degradability

Ammonia, anhydrous, contains less than 0.5% water (7664-41-7)	
Persistence and degradability	Not rapidly degradable

Ammonia, anhydrous (7664-41-7)	
Persistence and degradability	Readily biodegradable.

12.3. Bioaccumulative potential

Ammonia, anhydrous (7664-41-7)	
Partition coefficient n-octanol/water (Log Pow)	0.23
Bioaccumulative potential	Bioaccumulation unlikely.

12.4. Mobility in soil

Ammonia, anhydrous, contains less than 0.5% water (7664-41-7)	
Ecology - soil	Mobility in soil is expected to be limited, due to strong adsorption of ammonium ions to clay minerals and the bacterial oxidation to nitrate. Ammonium in soil is in dynamic equilibrium with nitrate and other substrates in the nitrate cycle.

12.5. Results of PBT and vPvB assessment

Ammonia, anhydrous, contains less than 0.5% water (7664-41-7)
This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII
This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII

12.6. Endocrine disrupting properties

Adverse effects on the environment caused by endocrine disrupting properties : Contains no substances identified as having endocrine disrupting properties.

12.7. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

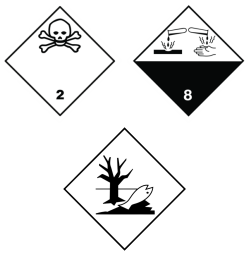
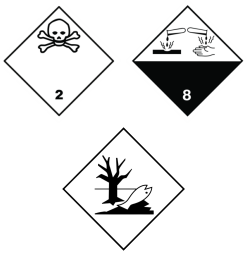
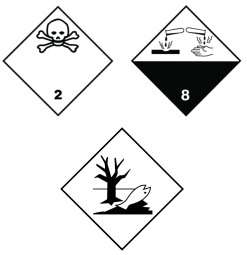
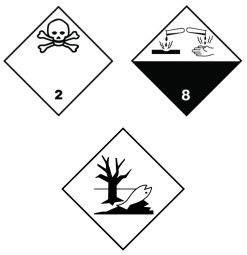
13.1. Waste treatment methods

Waste treatment methods : Dispose of contents/container in accordance with licensed collector's sorting instructions.

Product/Packaging disposal recommendations : Empty containers should be taken for recycling, recovery or waste in accordance with local regulation.

SECTION 14: Transport information

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

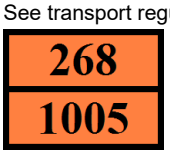
ADR	IMDG	IATA	ADN	RID
14.1. UN number or ID number				
UN 1005	UN 1005	UN 1005	UN 1005	UN 1005
14.2. UN proper shipping name				
AMMONIA, ANHYDROUS	AMMONIA, ANHYDROUS	Ammonia, anhydrous	AMMONIA, ANHYDROUS	AMMONIA, ANHYDROUS
14.3. Transport hazard class(es)				
2.3 (8)	2.3 (8)	2.3 (8)	2.3 (8)	2.3 (8)
				
14.4. Packing group				
Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
14.5. Environmental hazards				
Dangerous for the environment: Yes	Dangerous for the environment: Yes Marine pollutant: Yes	Dangerous for the environment: Yes	Dangerous for the environment: Yes	Dangerous for the environment: Yes
No supplementary information available				

14.6. Special precautions for user

Overland transport

Transport regulations (ADR) : See transport regulations for UN number specific special precautions.

Orange plates :



EAC code : 2RE

APP code : A(c)

Transport by sea

Transport regulations (IMDG) : See transport regulations for UN number specific special precautions.

Air transport

Transport regulations (IATA) : See transport regulations for UN number specific special precautions.

Inland waterway transport

Transport regulations (ADN) : See transport regulations for UN number specific special precautions.

Rail transport

Transport regulations (RID) : See transport regulations for UN number specific special precautions.

14.7. Maritime transport in bulk according to IMO instruments

Not applicable

SECTION 15: Regulatory information

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

15.1.1. EU-Regulations

Other information, restriction and prohibition regulations : For professional users only.

REACH Annex XVII (Restriction List)

Not listed on REACH Annex XVII

REACH Annex XIV (Authorisation List)

Not listed on REACH Annex XIV (Authorisation List)

REACH Candidate List (SVHC)

Contains no substance(s) listed on the REACH Candidate List

PIC Regulation (Prior Informed Consent)

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

POP Regulation (Persistent Organic Pollutants)

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

Ozone Regulation (2024/590)

Not listed on the Ozone Depletion list (Regulation EU 2024/590)

Council Regulation (EC) for the control of dual-use items

Contains no substance subject to the COUNCIL REGULATION (EC) for the control of dual-use items

Explosives Precursors Regulation (EU 2019/1148)

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

Drug Precursors Regulation (EC 273/2004)

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

15.1.2. National regulations

No additional information available

15.2. Chemical safety assessment

A chemical safety assessment has been carried out

SECTION 16: Other information

Indication of changes:
Not applicable.

Abbreviations and acronyms:	
ADN	European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways
ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
ATE	Acute Toxicity Estimate
BCF	Bioconcentration factor
CLP	Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008
DMEL	Derived Minimal Effect level
DNEL	Derived-No Effect Level
EC50	Median effective concentration
IARC	International Agency for Research on Cancer

Abbreviations and acronyms:	
IATA	International Air Transport Association
IMDG	International Maritime Dangerous Goods
LC50	Median lethal concentration
LD50	Median lethal dose
LOAEL	Lowest Observed Adverse Effect Level
NOAEC	No-Observed Adverse Effect Concentration
NOAEL	No-Observed Adverse Effect Level
PNEC	Predicted No-Effect Concentration
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (EC) No 1907/2006
RID	Regulations concerning the International Carriage of Dangerous Goods by Rail
SDS	Safety Data Sheet
STP	Sewage treatment plant
vPvB	Very Persistent and Very Bioaccumulative

Full text of H- and EUH-statements:	
Acute Tox. 3 (Inhalation)	Acute toxicity (inhal.), Category 3
Aquatic Acute 1	Hazardous to the aquatic environment – Acute Hazard, Category 1
Aquatic Chronic 2	Hazardous to the aquatic environment – Chronic Hazard, Category 2
Flam. Gas 2	Flammable gases, Category 2
Press. Gas	Gases under pressure
Press. Gas (Comp.)	Gases under pressure : Compressed gas
Skin Corr. 1B	Skin corrosion/irritation, Category 1, Sub-Category 1B
H221	Flammable gas.
H280	Contains gas under pressure; may explode if heated.
H314	Causes severe skin burns and eye damage.
H331	Toxic if inhaled.
H400	Very toxic to aquatic life.
H411	Toxic to aquatic life with long lasting effects.
EUH071	Corrosive to the respiratory tract.

Safety Data Sheet applicable for regions : IE - Ireland;GB - United Kingdom

SDS EU (REACH Annex II) - RHDHV

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

1. EXPOSURE SCENARIO

Exposure scenario **1**
Title **Manufacturing**

Use descriptors

Process categories
PROC1 - Use in closed process, no likelihood of exposure
PROC2 - Use in closed, continuous process with occasional controlled exposure (e.g. sampling)
PROC 8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC15 - Use as laboratory reagent

Environmental Release Category ERC1 - Manufacture of substances

2. CONDITIONS OF USE AFFECTING EXPOSURE

Product characteristics

Physical state @20°C Liquid (Solution or Compressed gas).
Concentration of substance in product Covers percentage substance in the product up to 100 % (unless stated differently).

Amounts used
Site: 2000-3000 t/d
Region: 950000 t/y
Total: 6591429 t/y
Working area Indoor/outdoor use.
Process Continuous process.
System Handle substance within a closed system.
Frequency and duration of use Manufacturing: 24 h/d, 330-360 d/y. Operator: 8-12 h/d.
General measures
Assumes a good basic standard of occupational hygiene is implemented.
Workers must be trained in the proper use and handling of this product as required under applicable regulations.
Wear protective gloves/protective clothing/eye protection/face protection, Boots, Helmet.

Contributing scenarios

Control of environmental exposure	
Environmental Release Category	ERC1 - Manufacture of substances
Product characteristics	Liquid
Amounts used	Site 2000-3000 t/d Region 950000 t/y Total 6591429 t/y
Frequency and duration of use	Continuous release

Control of worker exposure	
Process category	PROC1 - Use in closed process, no likelihood of exposure
Frequency and duration of use	>4 h
Technical conditions and measures to control dispersion from source towards the worker	Outdoor use Indoor use without local exhaust ventilation (LEV)

Process category	PROC2 - Use in closed, continuous process with occasional controlled exposure
Frequency and duration of use	>4 h
Technical conditions and measures to control dispersion from source towards the worker	Outdoor use with respiratory protection equipment (RPE) Indoor use with local exhaust ventilation (LEV)

Process category	PROC8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Frequency and duration of use	>4 h
Technical conditions and measures to control dispersion from source towards the worker	Outdoor use with respiratory protection equipment (RPE) and gloves Indoor use with local exhaust ventilation (LEV)

Process category	PROC15 - Use as laboratory reagent
Frequency and duration of use	>4 h
Technical conditions and measures to control dispersion from source towards the worker	Indoor use with local exhaust ventilation (LEV)

3. EXPOSURE ESTIMATION AND REFERENCE TO ITS SOURCE

Environment Exposure Estimation	
Environmental Release Category	ERC1 - Manufacture of substances
Release to Air	1.44 x 10^5 kg/d
Release to Soil	0
Release to Water	1.73 x 10^5 kg/d
Freshwater	PEC: 3.48 x 10^{-3} mg/L - Total Ammonia , 1.33 x 10^{-4} mg/L - Free Ammonia PNEC: 0.0011 mg/L - Free Ammonia RCR: 0.121 Discussion Conversion from Total Ammonia to Free Ammonia based on a fraction of 3.82%, given for pH 8 and 25 ºC (Ref data in EPA document EPA-600/3-79-091)
Marine water	PEC: 7.61 x 10^{-4} mg/L - Total Ammonia , 3.15 x 10^{-5} mg/L - Free Ammonia PNEC: 0.0011 mg/L - Free Ammonia RCR: 0.029 Discussion Conversion from Total Ammonia to Free Ammonia based on a fraction of 3.82%, given for pH 8 and 25 ºC (Ref data in EPA document EPA-600/3-79-091)

Health Exposure Estimation	
Process category	PROC1 - Use in closed process, no likelihood of exposure
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use <0.01 mg/m^3, RCR: <0.01 - Respiratory Protection No Indoor use without local exhaust ventilation (LEV) 0.01 mg/m^3, RCR: <0.01 - Respiratory Protection No
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use / Indoor use without local exhaust ventilation (LEV) 0.34 mg/kg bw/d, RCR: 0.05 - No gloves

Process category	PROC2 - Use in closed, continuous process with occasional controlled exposure
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 1.24 mg/m^3, RCR 0.09 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 3.54 mg/m^3, RCR: 0.25 - Respiratory Protection No
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 1.37 mg/kg bw/d, RCR: 0.20 - No gloves Indoor use with local exhaust ventilation (LEV) 0.14 mg/kg bw/d, RCR: 0.02 - No gloves

Process category	PROC8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 3.27 mg/m^3, RCR: 0.27 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 3.19 mg/m^3, RCR: 0.23 - Respiratory Protection No

Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 0.69 mg/kg bw/d, RCR: 0.10 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) 0.69 mg/kg bw/d, RCR: 0.10 - No gloves

Process category	PROC15 - Use as laboratory reagent
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Indoor use with local exhaust ventilation (LEV) 3.54 mg/m^3, RCR: 0.25 Respiratory Protection No
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Indoor use with local exhaust ventilation (LEV) 0.03 mg/kg bw/d, RCR: 0.01 - No gloves

4. GUIDANCE TO DOWNSTREAM USER FOR EVALUATING EMPLOYEE WHETHER HE WORKS INSIDE THE BOUNDARIES SET BY THE ES

Environmental exposure

Used EUSES model: EUSUS v2.1.
Non-standard assumptions: Required removal efficiency (wastewater) 100%.
Risk assessment: Based on Risk Characterisation Ratio (RCR), Calculation method.
Predicted No Effect Concentration (PNEC): Water, 0.0011 mg/L (Free Ammonia). No other PNEC's derived.

Control of worker exposure

The ECETOC TRA tool has been used to estimate consumer exposures unless otherwise indicated.
Risk assessment: Based on Risk Characterisation Ratio (RCR), Calculation method.
Used Derived No Effect Level (DNEL):
Worker - inhalative, long-term - local,
Worker - dermal, short-term - systemic,
Worker - dermal, long-term - systemic.
Other DNEL's were not critical.

Guidance to check compliance with the exposure scenario

If scaling reveals a condition of unsafe use (i.e., RCRs > 1), additional RMMs or a site-specific chemical safety assessment is required.

For scaling see: ECETOC TRA, ART, STOFFENMANAGER, EUSES.

Further information on the assumptions contained in this exposure scenario can be found at: Website Model, ECETOC TRA and RIVM report 601450009, "Emission scenario document for biocides", 2001.

Workplace measurements:
Refer to European Standard EN 14042 (Workplace atmospheres - Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents) or equivalent national standard(s).
Refer to European Standard EN 482 (Workplace atmospheres - General requirements for the performance of procedures for the measurement of chemical agents) or equivalent national standard(s).
Refer to European Standard EN 689 (Workplace atmospheres - Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy) or equivalent national standard(s).
BOHS/NVVA guidance "Testing Compliance with Occupational Exposure Limits for Airborne Substances".
Workplace measurements - Method: http://amcaw.ifa.dguv.de/substance/methoden/096-L-Ammonia.pdf.

1. EXPOSURE SCENARIO

Exposure scenario	**2**
Title	**Formulation**

Use descriptors

Product category	PC1 - Adhesives, sealants PC9a - Coatings and paints, thinners, paint removers PC12 - Fertilisers PC14 - Metal surface treatment products, including galvanic and electroplating products PC16 - Heat transfer fluids PC18 - Ink and toners PC19 - Intermediates PC20 - Products such as pH-regulators, flocculants, precipitants, neutralization agents, other unspecific PC21 - Laboratory chemicals PC26 - Paper and Board dye, finishing and impregnation products including bleaches and other processing aids PC29 - Pharmaceuticals PC30 - Photochemicals PC34 - Textile dyes, finishing and impregnating products including bleaches and other processing aids PC35 - Washing and cleaning products (including solvent based products) PC37 - Water treatment chemicals PC39 - Cosmetics, personal care products PC40 - Extraction agents
Process categories	PROC1 - Use in closed process, no likelihood of exposure PROC2 - Use in closed, continuous process with occasional controlled exposure (e.g. sampling) PROC3 - Use in closed batch process (synthesis or formulation); Industrial setting PROC5 - Mixing or blending in batch processes for formulation of mixtures and articles (multi-stage and/or significant contact) PROC8a - Transfer of substance or mixture (charging/discharging) from/to vessels/large containers at non dedicated facilities PROC 8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC9 - Transfer of substance or mixture into small containers (dedicated filling line, including weighing) PROC15 - Use as laboratory reagent
Environmental Release Category	ERC2 - Formulation of mixtures

2. CONDITIONS OF USE AFFECTING EXPOSURE

Product characteristics

Physical state @20°C	Liquid (Solution or Compressed gas).
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently).

Amounts used	Region 1000000 t/y Total 3829950 t/y
Working area	Indoor/outdoor use.
Process	Continuous process. Batch process.
System	Handle substance within a closed system.
Frequency and duration of use	Distributor: 0.25-2 h/d, 2-3 d/w. Operator: 3-6 h/d, 100 d/y.
General measures	Assumes a good basic standard of occupational hygiene is implemented. Workers must be trained in the proper use and handling of this product as required under applicable regulations. Wear protective gloves/protective clothing/eye protection/face protection, Boots, Helmet.

Contributing scenarios

Control of environmental exposure	
Environmental Release Category	ERC2 - Formulation of preparations (mixtures)
Product characteristics	Liquid
Amounts used	Region 1000000 t/y Total 3829950 t/y
Frequency and duration of use	Continuous release

Control of worker exposure	
Process category	PROC1 - Use in closed process, no likelihood of exposure
Frequency and duration of use	>4 h
Technical conditions and measures to control dispersion from source towards the worker	Outdoor use Indoor use without local exhaust ventilation (LEV)

Process category	PROC2 - Use in closed, continuous process with occasional controlled exposure PROC3 - Use in closed batch process (synthesis or formulation)
Frequency and duration of use	>4 h
Technical conditions and measures to control dispersion from source towards the worker	Outdoor use with respiratory protection equipment (RPE) Indoor use with local exhaust ventilation (LEV)

Process category	PROC5 - Mixing or blending in batch processes for formulation of mixtures and articles (multi-stage and/or significant contact) 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)
Frequency and duration of use	>4 h
Technical conditions and measures to control dispersion from source towards the worker	Outdoor use with respiratory protection equipment (RPE) and gloves Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE)

Process category	PROC8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
Frequency and duration of use	>4 h
Technical conditions and measures to control dispersion from source towards the worker	Outdoor use with respiratory protection equipment (RPE) and gloves Indoor use with local exhaust ventilation (LEV)

Process category	PROC15 - Use as laboratory reagent
Frequency and duration of use	>4 h
Technical conditions and measures to control dispersion from source towards the worker	Indoor use with local exhaust ventilation (LEV)

3. EXPOSURE ESTIMATION AND REFERENCE TO ITS SOURCE

Environment Exposure Estimation	
Environmental Release Category	ERC2 - Formulation of preparations (mixtures)
Release to Air	7.58×10^{4} kg/d
Release to Soil	0
Release to Water	6.06×10^{4} kg/d
Freshwater	PEC: 1.30×10^{-3} mg/L - Total Ammonia , 4.97×10^{-4} mg/L - Free Ammonia PNEC: 0.0011 mg/L - Free Ammonia RCR: 0.045 Discussion Conversion from Total Ammonia to Free Ammonia based on a fraction of 3.82%, given for pH 8 and 25 ºC (Ref data in EPA document EPA-600/3-79-091)

Marine water	PEC: 3.14 x 10^{-4} mg/L - Total Ammonia , 1.20 x 10^{-5} mg/L - Free Ammonia PNEC: 0.0011 mg/L - Free Ammonia RCR: 0.011 Discussion Conversion from Total Ammonia to Free Ammonia based on a fraction of 3.82%, given for pH 8 and 25 ºC (Ref data in EPA document EPA-600/3-79-091)

Health Exposure Estimation	
Process category	PROC1 - Use in closed process, no likelihood of exposure
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use <0.01 mg/m^3, RCR: <0.01 - Respiratory Protection No Indoor use without local exhaust ventilation (LEV) 0.01 mg/m^3, RCR: <0.01 - Respiratory Protection No
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use / Indoor use without local exhaust ventilation (LEV) 0.34 mg/kg bw/d, RCR: 0.05 - No gloves

Process category	PROC2 - Use in closed, continuous process with occasional controlled exposure
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 1.24 mg/m^3, RCR 0.09 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 3.54 mg/m^3, RCR: 0.25 - Respiratory Protection No
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 1.37 mg/kg bw/d, RCR: 0.20 - No gloves Indoor use with local exhaust ventilation (LEV) 0.14 mg/kg bw/d, RCR: 0.02 - No gloves

Process category	PROC3 - Use in closed batch process (synthesis or formulation)
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 2.48 mg/m^3, RCR: 0.18 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 7.08 mg/m^3, RCR: 0.51 - Respiratory Protection No
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 0.34 mg/kg bw/d, RCR: 0.05 - No gloves Indoor use with local exhaust ventilation (LEV) 0.03 mg/kg bw/d, RCR: 0.01 - No gloves

Process category	PROC5 - Mixing or blending in batch processes for formulation of mixtures and articles (multi-stage and/or significant contact)
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 6.20 mg/m^3, RCR: 0.44 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.89 mg/m^3, RCR: 0.06 - Respiratory Protection No
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 1.37 mg/kg bw/d, RCR: 0.20 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 1.37 mg/kg bw/d, RCR: 0.203 - No gloves

Process category	PROC8a - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 6.20 mg/m^3, RCR: 0.44 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.89 mg/m^3, RCR: 0.06 - Respiratory Protection Reduction 95%

Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 1.37 mg/kg bw/d, RCR: 0.20 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.14 mg/kg bw/d, RCR: 0.02 - No gloves

Process category	PROC8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 3.72 mg/m^3, RCR: 0.27 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 3.19 mg/m^3, RCR: 0.23 - Respiratory Protection No
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 0.69 mg/kg bw/d, RCR: 0.10 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) 0.69 mg/kg bw/d, RCR: 0.10 - No gloves

Process category	PROC9 - Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 4.96 mg/m^3, RCR: 0.35 - Respiratory Protection 95% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.71 mg/m^3, RCR: 0.05 - Respiratory Protection Reduction 95%
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 0.69 mg/kg bw/d, RCR: 0.10 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.69 mg/kg bw/d, RCR: 0.10 - No gloves

Process category	PROC15 - Use as laboratory reagent
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Indoor use with local exhaust ventilation (LEV) 3.54 mg/m^3, RCR: 0.25 - Respiratory Protection No
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Indoor use without local exhaust ventilation (LEV) 0.03 mg/kg bw/d, RCR: 0.01 - No gloves

4. GUIDANCE TO DOWNSTREAM USER FOR EVALUATING EMPLOYEE WHETHER HE WORKS INSIDE THE BOUNDARIES SET BY THE ES

Environmental exposure

Used EUSES model: EUSUS v2.1.
Non-standard assumptions: Required removal efficiency (wastewater) 100%.
Risk assessment: Based on Risk Characterisation Ratio (RCR), Calculation method.
Predicted No Effect Concentration (PNEC): Water, 0.0011 mg/L (Free Ammonia). No other PNEC's derived.

Control of worker exposure

The ECETOC TRA tool has been used to estimate consumer exposures unless otherwise indicated.
Risk assessment: Based on Risk Characterisation Ratio (RCR), Calculation method.
Used Derived No Effect Level (DNEL):
Worker - inhalative, long-term - local,
Worker - dermal, short-term - systemic,
Worker - dermal, long-term - systemic.
Other DNEL's were not critical.

Guidance to check compliance with the exposure scenario

If scaling reveals a condition of unsafe use (i.e., RCRs > 1), additional RMMs or a site-specific chemical safety assessment is required.

For scaling see: ECETOC TRA, ART, STOFFENMANAGER, EUSES.

Further information on the assumptions contained in this exposure scenario can be found at: Website Model, ECETOC TRA and RIVM report 601450009, "Emission scenario document for biocides", 2001.

Workplace measurements:
Refer to European Standard EN 14042 (Workplace atmospheres - Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents) or equivalent national standard(s).
Refer to European Standard EN 482 (Workplace atmospheres - General requirements for the performance of procedures for the measurement of chemical agents) or equivalent national standard(s).
Refer to European Standard EN 689 (Workplace atmospheres - Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy) or equivalent national standard(s).
BOHS/NVVA guidance "Testing Compliance with Occupational Exposure Limits for Airborne Substances".
Workplace measurements - Method: http://amcaw.ifa.dguv.de/substance/methoden/096-L-Ammonia.pdf.

1. EXPOSURE SCENARIO

Exposure scenario	**3**
Title	**Intermediate**

Use descriptors

Sector of use	SU1 - Agriculture, forestry, fishery SU5 - Manufacture of textiles, leather, fur SU8 - Manufacture of bulk, large scale chemicals (including petroleum products) SU9 - Manufacture of fine chemicals SU12 - Manufacture of plastics products, including compounding and conversion SU24 - Scientific research and development
Product category	PC19 - Intermediates
Process categories	PROC1 - Use in closed process, no likelihood of exposure PROC2 - Use in closed, continuous process with occasional controlled exposure (e.g. sampling) PROC3 - Use in closed batch process (synthesis or formulation); Industrial setting PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises PROC5 - Mixing or blending in batch processes for formulation of mixtures and articles (multi-stage and/or significant contact) PROC 8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC9 - Transfer of substance or mixture into small containers (dedicated filling line, including weighing) PROC15 - Use as laboratory reagent
Environmental Release Category	ERC6a - Industrial use resulting in manufacture of another substance (use of intermediates)

2. CONDITIONS OF USE AFFECTING EXPOSURE

Product characteristics

Physical state @20°C	Liquid (Solution or Compressed gas).
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently).

Amounts used	Region: 800000 t/y Total: 6591429 t/y
Working area	Indoor/outdoor use.
Process	Continuous process.
System	Handle substance within a closed system.
Frequency and duration of use	Manufacturing: 24 h/d, 330-360 d/y. Operator: 8-12 h/d.
General measures	Assumes a good basic standard of occupational hygiene is implemented. Workers must be trained in the proper use and handling of this product as required under applicable regulations. Wear protective gloves/protective clothing/eye protection/face protection, Boots, Helmet.

Contributing scenarios

Control of environmental exposure	
Environmental Release Category	ERC6a - Industrial use resulting in manufacture of another substance (use of intermediates)
Product characteristics	Liquid
Amounts used	Site 2000-3000 t/d Region 950000 t/y Total 6591429 t/y
Frequency and duration of use	Continuous release

Control of worker exposure	
Process category	PROC1 - Use in closed process, no likelihood of exposure
Frequency and duration of use	>4 h
Technical conditions and measures to control dispersion from source towards the worker	Indoor use without local exhaust ventilation (LEV) Outdoor use

Process category	PROC2 - Use in closed, continuous process with occasional controlled exposure PROC3 - Use in closed batch process (synthesis or formulation)
Frequency and duration of use	>4 h
Technical conditions and measures to control dispersion from source towards the worker	Indoor use with local exhaust ventilation (LEV) Outdoor use with respiratory protection equipment (RPE)

Process category	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
Frequency and duration of use	>4 h
Technical conditions and measures to control dispersion from source towards the worker	Outdoor use with respiratory protection equipment (RPE) and gloves Indoor use with local exhaust ventilation (LEV)

Process category	PROC5 - Mixing or blending in batch processes for formulation of mixtures and articles (multi-stage and/or significant contact) PROC9 - Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
Frequency and duration of use	>4 h
Technical conditions and measures to control dispersion from source towards the worker	Outdoor use with respiratory protection equipment (RPE) and gloves Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE)

Process category	PROC15 - Use as laboratory reagent
Frequency and duration of use	>4 h
Technical conditions and measures to control dispersion from source towards the worker	Indoor use with local exhaust ventilation (LEV)

3. EXPOSURE ESTIMATION AND REFERENCE TO ITS SOURCE

Environment Exposure Estimation	
Environmental Release Category	ERC6a - Industrial use resulting in manufacture of another substance (use of intermediates)
Release to Air	1.21 x 10^5 kg/d
Release to Water	4.85 x 10^4 kg/d
Freshwater	PEC: 2.19 x 10^{-3} mg/L - Total Ammonia , 8.37 x 10^{-4} mg/L - Free Ammonia PNEC: 0.0011 mg/L - Free Ammonia RCR: 0.076 Discussion Conversion from Total Ammonia to Free Ammonia based on a fraction of 3.82%, given for pH 8 and 25 ºC (Ref data in EPA document EPA-600/3-79-091)
Marine water	PEC: 5.37 x 10^{-4} mg/L - Total Ammonia , 2.05 x 10^{-5} mg/L - Free Ammonia PNEC: 0.0011 mg/L - Free Ammonia RCR: 0.019 Discussion Conversion from Total Ammonia to Free Ammonia based on a fraction of 3.82%, given for pH 8 and 25 ºC (Ref data in EPA document EPA-600/3-79-091)

Health Exposure Estimation	
Process category	PROC1 - Use in closed process, no likelihood of exposure

Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use <0.01 mg/m³, RCR: <0.01 - Respiratory Protection No Indoor use without local exhaust ventilation (LEV) 0.01 mg/m³, RCR: <0.01 - Respiratory Protection No
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use / Indoor use without local exhaust ventilation (LEV) 0.34 mg/kg bw/d, RCR: 0.05 - No gloves

Process category	PROC2 - Use in closed, continuous process with occasional controlled exposure
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 1.24 mg/m³, RCR 0.09 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 3.54 mg/m³, RCR: 0.25 - Respiratory Protection No
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 1.37 mg/kg bw/d, RCR: 0.20 - No gloves Indoor use without local exhaust ventilation (LEV) 0.14 mg/kg bw/d, RCR: 0.02 - No gloves

Process category	PROC3 - Use in closed batch process (synthesis or formulation)
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 2.48 mg/m³, RCR: 0.18 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 7.08 mg/m³, RCR: 0.51 - Respiratory Protection No
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 0.34 mg/kg bw/d, RCR: 0.05 - No gloves Indoor use with local exhaust ventilation (LEV) 0.03 mg/kg bw/d, RCR: 0.01 - No gloves

Process category	PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 2.48 mg/m³, RCR: 0.18 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 7.08 mg/m³, RCR: 0.51 - Respiratory Protection No
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 0.69 mg/kg bw/d, RCR: 0.10 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) 0.69 mg/kg bw/d, RCR: 0.10 - No gloves

Process category	PROC5 - Mixing or blending in batch processes for formulation of mixtures and articles (multi-stage and/or significant contact)
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 6.20 mg/m³, RCR: 0.44 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.89 mg/m³, RCR: 0.06 - Respiratory Protection Reduction 95%
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 1.37 mg/kg bw/d, RCR: 0.20 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.07 mg/kg bw/d, RCR: 0.01 - No gloves

Process category	PROC8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 3.72 mg/m³, RCR: 0.27 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 3.19 mg/m³, RCR: 0.23 - Respiratory Protection No
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 0.69 mg/kg bw/d, RCR: 0.10 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) 0.69 mg/kg bw/d, RCR: 0.10 - No gloves

Process category	PROC9 - Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 4.69 mg/m³, RCR: 0.35 - Respiratory Protection 95% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.71 mg/m³, RCR: 0.05 - Respiratory Protection Reduction 95%
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 0.69 mg/kg bw/d, RCR: 0.10 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.69 mg/kg bw/d, RCR: 0.10 - No gloves

Process category	PROC15 - Use as laboratory reagent
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Indoor use without local exhaust ventilation (LEV) 3.54 mg/m³, RCR: 0.25 - Respiratory Protection No
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Indoor use without local exhaust ventilation (LEV) 0.03 mg/kg bw/d, RCR: 0.01 - No gloves

4. GUIDANCE TO DOWNSTREAM USER FOR EVALUATING EMPLOYEE WHETHER HE WORKS INSIDE THE BOUNDARIES SET BY THE ES

Environmental exposure

Used EUSES model: EUSUS v2.1.
Non-standard assumptions: Required removal efficiency (wastewater) 100%.
Risk assessment: Based on Risk Characterisation Ratio (RCR), Calculation method.
Predicted No Effect Concentration (PNEC): Water, 0.0011 mg/L (Free Ammonia). No other PNEC's derived.

Control of worker exposure

The ECETOC TRA tool has been used to estimate consumer exposures unless otherwise indicated.
Risk assessment: Based on Risk Characterisation Ratio (RCR), Calculation method.
Used Derived No Effect Level (DNEL):
Worker - inhalative, long-term - local,
Worker - dermal, short-term - systemic,
Worker - dermal, long-term - systemic.
Other DNEL's were not critical.

Guidance to check compliance with the exposure scenario

If scaling reveals a condition of unsafe use (i.e., RCRs > 1), additional RMMs or a site-specific chemical safety assessment is required.

For scaling see: ECETOC TRA, ART, STOFFENMANAGER, EUSES.

Further information on the assumptions contained in this exposure scenario can be found at: Website Model, ECETOC TRA and RIVM report 601450009, "Emission scenario document for biocides", 2001.

Workplace measurements:
Refer to European Standard EN 14042 (Workplace atmospheres - Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents) or equivalent national standard(s).
Refer to European Standard EN 482 (Workplace atmospheres - General requirements for the performance of procedures for the measurement of chemical agents) or equivalent national standard(s).
Refer to European Standard EN 689 (Workplace atmospheres - Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy) or equivalent national standard(s).
BOHS/NVVA guidance "Testing Compliance with Occupational Exposure Limits for Airborne Substances".
Workplace measurements - Method: http://amcaw.ifa.dguv.de/substance/methoden/096-L-Ammonia.pdf.

1. EXPOSURE SCENARIO

Exposure scenario	**4**
Title	**Industrial use**

Use descriptors

Sector of use	SU4 - Manufacture of food products SU5 - Manufacture of textiles, leather, fur SU6a - Manufacture of wood and wood products SU6b - Manufacture of pulp, paper and paper products SU8 - Manufacture of bulk, large scale chemicals (including petroleum products) SU9 - Manufacture of fine chemicals SU13 - Manufacture of other non-metallic mineral products, e.g. plasters, cement SU15 - Manufacture of fabricated metal products, except machinery and equipment SU16 - Manufacture of computer, electronic and optical products, electrical equipment SU23 - Recycling SU0 - Other
Product category	PC0 - Other: Other products (production of life microorganism) PC1 - Adhesives, sealants PC9a - Coatings and paints, thinners, paint removers PC14 - Metal surface treatment products, including galvanic and electroplating products PC15 - Non-metal-surface treatment products PC16 - Heat transfer fluids PC20 - Products such as pH-regulators, flocculants, precipitants, neutralization agents, other unspecific PC26 - Paper and Board dye, finishing and impregnation products including bleaches and other processing aids PC29 - Pharmaceuticals PC30 - Photochemicals PC34 - Textile dyes, finishing and impregnating products including bleaches and other processing aids PC35 - Washing and cleaning products (including solvent based products) PC37 - Water treatment chemicals PC39 - Cosmetics, personal care products PC40 - Extraction agents
Process categories	PROC1 - Use in closed process, no likelihood of exposure PROC2 - Use in closed, continuous process with occasional controlled exposure (e.g. sampling) PROC3 - Use in closed batch process (synthesis or formulation); Industrial setting PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises PROC5 - Mixing or blending in batch processes for formulation of mixtures and articles (multi-stage and/or significant contact) PROC 8b - Transfer of substance or preparation (charging/discharging) from/to vessels/ large containers at dedicated facilities PROC9 - Transfer of substance or mixture into small containers (dedicated filling line, including weighing) PROC13 - Treatment of articles by dipping and pouring
Environmental Release Category	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. CONDITIONS OF USE AFFECTING EXPOSURE

Product characteristics

Physical state @20°C	Liquid (Solution or Compressed gas).

Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently).
Amounts used	Region: 25000 t/y Total: 354631 t/y
Working area	Indoor/outdoor use.
Process	Continuous process. Batch process.
System	Handle substance within a closed system.
General measures	Assumes a good basic standard of occupational hygiene is implemented. Workers must be trained in the proper use and handling of this product as required under applicable regulations. Wear protective gloves/protective clothing/eye protection/face protection, Boots, Helmet.

Contributing scenarios

Control of environmental exposure	
Environmental Release Category	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
Product characteristics	Liquid
Amounts used	Region 25000 t/y Total 354631 t/y
Frequency and duration of use	Continuous release

Control of worker exposure	
Process category	PROC1 - Use in closed process, no likelihood of exposure
Frequency and duration of use	>4 h
Technical conditions and measures to control dispersion from source towards the worker	Outdoor use Indoor use without local exhaust ventilation (LEV)

Process category	PROC2 - Use in closed, continuous process with occasional controlled exposure PROC3 - Use in closed batch process (synthesis or formulation)
Frequency and duration of use	>4 h
Technical conditions and measures to control dispersion from source towards the worker	Outdoor use with respiratory protection equipment (RPE) Indoor use with local exhaust ventilation (LEV)

Process category	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
Frequency and duration of use	>4 h
Technical conditions and measures to control dispersion from source towards the worker	Outdoor use with respiratory protection equipment (RPE) and gloves Indoor use with local exhaust ventilation (LEV)

Process category	PROC5 - Mixing or blending in batch processes for formulation of mixtures and articles (multi-stage and/or significant contact) PROC9 - Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC13 - Treatment of articles by dipping and pouring
Frequency and duration of use	>4 h
Technical conditions and measures to control dispersion from source towards the worker	Outdoor use with respiratory protection equipment (RPE) and gloves Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE)

3. EXPOSURE ESTIMATION AND REFERENCE TO ITS SOURCE

Environment Exposure Estimation	
Environmental Release Category	ERC4 - Industrial use of processing aids in processes and products, not becoming part of articles
Release to Air	7.15 x 10^4 kg/d
Release to Water	7.52 x 10^4 kg/d
Freshwater	PEC: 2.82 x 10^{-3} mg/L - Total Ammonia , 1.08 x 10^{-4} - Free Ammonia PNEC: 0.0011 mg/L - Free Ammonia RCR: 0.098 Discussion Conversion from Total Ammonia to Free Ammonia based on a fraction of 3.82%, given for pH 8 and 25 ºC (Ref data in EPA document EPA-600/3-79-091)
Marine water	PEC: 6.06 x 10^{-4} mg/L - Total Ammonia , 2.31 x 10^{-5} - Free Ammonia PNEC: 0.0011 mg/L - Free Ammonia RCR: 0.021 Discussion Conversion from Total Ammonia to Free Ammonia based on a fraction of 3.82%, given for pH 8 and 25 ºC (Ref data in EPA document EPA-600/3-79-091)

Environmental Release Category	ERC5 - Industrial use resulting in inclusion into or onto a matrix
Release to Air	3.76 x 10^4 kg/d
Release to Water	3.76 x 10^4 kg/d
Freshwater	PEC: 1.46 x 10^{-3} mg/L - Total Ammonia , 5.58 x 10^{-5} - Free Ammonia PNEC: 0.0011 mg/L - Free Ammonia RCR: 0.051 Discussion Conversion from Total Ammonia to Free Ammonia based on a fraction of 3.82%, given for pH 8 and 25 ºC (Ref data in EPA document EPA-600/3-79-091)
Marine water	PEC: 3.17 x 10^{-4} mg/L - Total Ammonia , 1.21 x 10^{-5} - Free Ammonia PNEC: 0.0011 mg/L - Free Ammonia RCR: 0.011 Discussion Conversion from Total Ammonia to Free Ammonia based on a fraction of 3.82%, given for pH 8 and 25 ºC (Ref data in EPA document EPA-600/3-79-091)

Environmental Release Category	ERC6b - Industrial use of reactive processing aids
Release to Air	75.2 kg/d
Release to Water	3760 kg/d
Freshwater	PEC: 4.54 x 10^{-5} mg/L - Total Ammonia , 1.73 x 10^{-6} - Free Ammonia PNEC: 0.0011 mg/L - Free Ammonia RCR: 1.58 x 10^{-3} Discussion Conversion from Total Ammonia to Free Ammonia based on a fraction of 3.82%, given for pH 8 and 25 ºC (Ref data in EPA document EPA-600/3-79-091)
Marine water	PEC: 5.19 x 10^{-6} mg/L - Total Ammonia , 1.98 x 10^{-7} - Free Ammonia PNEC: 0.0011 mg/L - Free Ammonia RCR: 1.80 x 10^{-4} Discussion Conversion from Total Ammonia to Free Ammonia based on a fraction of 3.82%, given for pH 8 and 25 ºC (Ref data in EPA document EPA-600/3-79-091)

Environmental Release Category	ERC7 - Industrial use of substances in closed systems
Release to Air	3760 kg/d
Release to Water	3760 kg/d
Freshwater	PEC: 1.46 x 10^{-4} mg/L - Total Ammonia , 5.58 x 10^{-6} - Free Ammonia PNEC: 0.0011 mg/L - Free Ammonia RCR: 5.07 x 10^{-3} Discussion Conversion from Total Ammonia to Free Ammonia based on a fraction of 3.82%, given for pH 8 and 25 ºC (Ref data in EPA document EPA-600/3-79-091)
Marine water	PEC: 3.17 x 10^{-5} mg/L - Total Ammonia , 1.21 x 10^{-6} - Free Ammonia PNEC: 0.0011 mg/L - Free Ammonia RCR: 1.10 x 10^{-3} Discussion Conversion from Total Ammonia to Free Ammonia based on a fraction of 3.82%, given for pH 8 and 25 ºC (Ref data in EPA document EPA-600/3-79-091)

Health Exposure Estimation	
Process category	PROC1 - Use in closed process, no likelihood of exposure

Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use <0.01 mg/m³, RCR: <0.01 - Respiratory Protection No Indoor use without local exhaust ventilation (LEV) 0.01 mg/m³, RCR: <0.01 - Respiratory Protection No
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use / Indoor use without local exhaust ventilation (LEV) 0.34 mg/kg bw/d, RCR: 0.05 - No gloves

Process category	PROC2 - Use in closed, continuous process with occasional controlled exposure
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 1.24 mg/m³, RCR 0.09 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 3.54 mg/m³, RCR: 0.25 - Respiratory Protection No
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 1.37 mg/kg bw/d, RCR: 0.20 - No gloves Indoor use with local exhaust ventilation (LEV) 0.14 mg/kg bw/d, RCR: 0.02 - No gloves

Process category	PROC3 - Use in closed batch process (synthesis or formulation)
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 2.48 mg/m³, RCR: 0.18 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 7.08 mg/m³, RCR: 0.51 - Respiratory Protection No
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 0.34 mg/kg bw/d, RCR: 0.05 - No gloves Indoor use with local exhaust ventilation (LEV) 0.03 mg/kg bw/d, RCR: 0.01 - No gloves

Process category	PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 2.48 mg/m³, RCR: 0.18 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 7.08 mg/m³, RCR: 0.51 - Respiratory Protection No
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 0.69 mg/kg bw/d, RCR: 0.10 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) 0.69 mg/kg bw/d, RCR: 0.10 - No gloves

Process category	PROC5 - Mixing or blending in batch processes for formulation of mixtures and articles (multi-stage and/or significant contact)
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 6.20 mg/m³, RCR: 0.44 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.89 mg/m³, RCR: 0.06 - Respiratory Protection Reduction 95%
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 1.37 mg/kg bw/d, RCR: 0.20 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.07 mg/kg bw/d, RCR: 0.01 - No gloves

Process category	PROC8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 3.72 mg/m³, RCR: 0.27 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 3.19 mg/m³, RCR: 0.23 - Respiratory Protection No
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 0.69 mg/kg bw/d, RCR: 0.10 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) 0.69 mg/kg bw/d, RCR: 0.10 - No gloves

Process category	PROC9 - Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 4.96 mg/m³, RCR: 0.35 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.71 mg/m³, RCR: 0.05 - Respiratory Protection 95%
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 0.69 mg/kg bw/d, RCR: 0.10 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.69 mg/kg bw/d, RCR: 0.10 - No gloves

Process category	PROC13 - Treatment of articles by dipping and pouring
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 6.20 mg/m³, RCR: 0.44 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.89 mg/m³, RCR: 0.06 - Respiratory Protection No
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 1.37 mg/kg bw/d, RCR: 0.20 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.69 mg/kg bw/d, RCR: 0.10 - No gloves

4. GUIDANCE TO DOWNSTREAM USER FOR EVALUATING EMPLOYEE WHETHER HE WORKS INSIDE THE BOUNDARIES SET BY THE ES

Environmental exposure

Used EUSES model: EUSUS v2.1.
Non-standard assumptions: Required removal efficiency (wastewater) 100%.
Risk assessment: Based on Risk Characterisation Ratio (RCR), Calculation method.
Predicted No Effect Concentration (PNEC): Water, 0.0011 mg/L (Free Ammonia). No other PNEC's derived.

Control of worker exposure

The ECETOC TRA tool has been used to estimate consumer exposures unless otherwise indicated.
Risk assessment: Based on Risk Characterisation Ratio (RCR), Calculation method.
Used Derived No Effect Level (DNEL):
Worker - inhalative, long-term - local,
Worker - dermal, short-term - systemic,
Worker - dermal, long-term - systemic.
Other DNEL's were not critical.

Guidance to check compliance with the exposure scenario

If scaling reveals a condition of unsafe use (i.e., RCRs > 1), additional RMMs or a site-specific chemical safety assessment is required.

For scaling see: ECETOC TRA, ART, STOFFENMANAGER, EUSES.

Further information on the assumptions contained in this exposure scenario can be found at: Website Model, ECETOC TRA and RIVM report 601450009, "Emission scenario document for biocides", 2001.

Workplace measurements:
Refer to European Standard EN 14042 (Workplace atmospheres - Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents) or equivalent national standard(s).
Refer to European Standard EN 482 (Workplace atmospheres - General requirements for the performance of procedures for the measurement of chemical agents) or equivalent national standard(s).
Refer to European Standard EN 689 (Workplace atmospheres - Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy) or equivalent national standard(s).
BOHS/NVVA guidance "Testing Compliance with Occupational Exposure Limits for Airborne Substances".
Workplace measurements - Method: http://amcaw.ifa.dguv.de/substance/methoden/096-L-Ammonia.pdf.

1. EXPOSURE SCENARIO

Exposure scenario	**5**
Title	**Professional use**

Use descriptors

Sector of use	SU1 - Agriculture, forestry, fishery SU4 - Manufacture of food products SU5 - Manufacture of textiles, leather, fur SU6a - Manufacture of wood and wood products SU6b - Manufacture of pulp, paper and paper products SU8 - Manufacture of bulk, large scale chemicals (including petroleum products) SU9 - Manufacture of fine chemicals SU10 - Formulation [mixing] of preparations and/or re-packaging SU11 - Manufacture of rubber products SU12 - Manufacture of plastics products, including compounding and conversion SU15 - Manufacture of fabricated metal products, except machinery and equipment SU16 - Manufacture of computer, electronic and optical products, electrical equipment SU23 - Recycling SU24 - Scientific research and development SU0 - Other
Product category	PC9a - Coatings and paints, thinners, paint removers PC12 - Fertilisers PC14 - Metal surface treatment products, including galvanic and electroplating products PC15 - Non-metal-surface treatment products PC16 - Heat transfer fluids PC19 - Intermediates PC20 - Products such as pH-regulators, flocculants, precipitants, neutralization agents, other unspecific PC21 - Laboratory chemicals PC29 - Pharmaceuticals PC30 - Photochemicals PC37 - Water treatment chemicals PC40 - Extraction agents
Process categories	PROC1 - Use in closed process, no likelihood of exposure PROC2 - Use in closed, continuous process with occasional controlled exposure (e.g. sampling) PROC3 - Use in closed batch process (synthesis or formulation); Industrial setting PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises PROC5 - Mixing or blending in batch processes for formulation of mixtures and articles (multi-stage and/or significant contact) PROC8a - Transfer of substance or mixture (charging/discharging) from/to vessels/large containers at non dedicated facilities PROC 8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC9 - Transfer of substance or mixture into small containers (dedicated filling line, including weighing) PROC13 - Treatment of articles by dipping and pouring PROC15 - Use as laboratory reagent PROC20 - Heat and pressure transfer fluids in dispersive use but closed systems
Environmental Release Category	ERC8b - Wide dispersive indoor use of reactive substances in open systems ERC8e - Wide dispersive outdoor use of reactive substances in open systems ERC8f - Wide dispersive outdoor use resulting in inclusion into or onto a matrix ERC9a - Wide dispersive indoor use of substances in closed systems ERC9b - Wide dispersive outdoor use of substances in closed systems

2. CONDITIONS OF USE AFFECTING EXPOSURE

Product characteristics

Physical state @20°C	Liquid (Solution or Compressed gas).
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently).
Working area	Indoor/outdoor use.
Process	Continuous process. Batch process.
System	Handle substance within a closed system.
General measures	Assumes a good basic standard of occupational hygiene is implemented. Workers must be trained in the proper use and handling of this product as required under applicable regulations. Wear protective gloves/protective clothing/eye protection/face protection, Boots, Helmet.

Contributing scenarios

Control of environmental exposure	
Environmental Release Category	ERC8b - Wide dispersive indoor use of reactive substances in open systems ERC8e - Wide dispersive outdoor use of reactive substances in open systems ERC8f - Wide dispersive outdoor use resulting in inclusion into or onto a matrix ERC9a - Wide dispersive indoor use of substances in closed systems ERC9b - Wide dispersive outdoor use of substances in closed systems
Frequency and duration of use	No significant effect

Control of worker exposure	
Process category	PROC1 - Use in closed process, no likelihood of exposure
Frequency and duration of use	>4 h
Technical conditions and measures to control dispersion from source towards the worker	Outdoor use Indoor use without local exhaust ventilation (LEV)

Process category	PROC2 - Use in closed, continuous process with occasional controlled exposure PROC3 - Use in closed batch process (synthesis or formulation) PROC20 - Heat and pressure transfer fluids in dispersive, professional use but closed systems
Frequency and duration of use	>4 h
Technical conditions and measures to control dispersion from source towards the worker	Outdoor use with respiratory protection equipment (RPE) Indoor use with local exhaust ventilation (LEV)

Process category	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
Frequency and duration of use	>4 h
Technical conditions and measures to control dispersion from source towards the worker	Outdoor use with respiratory protection equipment (RPE) and gloves Indoor use with local exhaust ventilation (LEV)

Process category	PROC5 - Mixing or blending in batch processes for formulation of mixtures and articles (multi-stage and/or significant contact) 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) PROC13 - Treatment of articles by dipping and pouring
Frequency and duration of use	>4 h
Technical conditions and measures to control dispersion from source towards the worker	Outdoor use with respiratory protection equipment (RPE) and gloves Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE)

Process category	PROC15 - Use as laboratory reagent
Frequency and duration of use	>4 h
Technical conditions and measures to control dispersion from source towards the worker	Indoor use with local exhaust ventilation (LEV)

3. EXPOSURE ESTIMATION AND REFERENCE TO ITS SOURCE

Health Exposure Estimation	
Process category	PROC1 - Use in closed process, no likelihood of exposure
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use <0.01 mg/m³, RCR: <0.01 - Respiratory Protection No Indoor use without local exhaust ventilation (LEV) 0.01 mg/m³, RCR: <0.01 - Respiratory Protection No
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use / Indoor use without local exhaust ventilation (LEV) 0.34 mg/kg bw/d, RCR: 0.05 - No gloves

Process category	PROC2 - Use in closed, continuous process with occasional controlled exposure
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 1.24 mg/m³, RCR 0.09 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 3.54 mg/m³, RCR: 0.25 - Respiratory Protection No
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 1.37 mg/kg bw/d, RCR: 0.20 - No gloves Indoor use with local exhaust ventilation (LEV) 0.14 mg/kg bw/d, RCR: 0.02 - No gloves

Process category	PROC3 - Use in closed batch process (synthesis or formulation)
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 2.48 mg/m³, RCR: 0.18 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 7.08 mg/m³, RCR: 0.51 - Respiratory Protection No
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 0.34 mg/kg bw/d, RCR: 0.05 - No gloves Indoor use with local exhaust ventilation (LEV) 0.03 mg/kg bw/d, RCR: 0.01 - No gloves

Process category	PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 2.48 mg/m³, RCR: 0.18 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 7.08 mg/m³, RCR: 0.51 - Respiratory Protection No
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 0.69 mg/kg bw/d, RCR: 0.10 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) 0.69 mg/kg bw/d, RCR: 0.10 - No gloves

Process category	PROC5 - Mixing or blending in batch processes for formulation of mixtures and articles (multi-stage and/or significant contact)
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 6.20 mg/m³, RCR: 0.44 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.89 mg/m³, RCR: 0.06 - Respiratory Protection Reduction 95%
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 1.37 mg/kg bw/d, RCR: 0.20 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment

	(RPE) 0.07 mg/kg bw/d, RCR: 0.01 - No gloves

Process category	PROC8a - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 6.20 mg/m³, RCR: 0.44 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.89 mg/m³, RCR: 0.06 - Respiratory Protection Reduction 95%
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 1.37 mg/kg bw/d, RCR: 0.20 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.14 mg/kg bw/d, RCR: 0.02 - No gloves

Process category	PROC8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 3.72 mg/m³, RCR: 0.27 - Respiratory Protection 95% Indoor use with local exhaust ventilation (LEV) 3.19 mg/m³, RCR: 0.23 - Respiratory Protection No
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 0.69 mg/kg bw/d, RCR: 0.10 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) 0.69 mg/kg bw/d, RCR: 0.10 - No gloves

Process category	PROC9 - Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 4.96 mg/m³, RCR: 0.35 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.71 mg/m³, RCR: 0.05 - Respiratory Protection Reduction 95%
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 0.69 mg/kg bw/d, RCR: 0.10 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.69 mg/kg bw/d, RCR: 0.10 - No gloves

Process category	PROC13 - Treatment of articles by dipping and pouring
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 6.20 mg/m³, RCR: 0.44 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.89 mg/m³, RCR: 0.06 - Respiratory Protection 95%
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 1.37 mg/kg bw/d, RCR: 0.20 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.69 mg/kg bw/d, RCR: 0.10 - No gloves

Process category	PROC15 - Use as laboratory reagent
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Indoor use with local exhaust ventilation (LEV) 3.54 mg/m³, RCR: 0.25 - Respiratory Protection No
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Indoor use without local exhaust ventilation (LEV) 0.03 mg/kg bw/d, RCR: 0.01 - No gloves

Process category	PROC20 - Heat and pressure transfer fluids in dispersive, professional use but closed systems
Long-term exposure - Local effects - Inhalation	>4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 1.24 mg/m^3, RCR: 0.09 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 7.08 mg/m^3, RCR: 0.51 - Respiratory Protection No
Acute / short-term exposure - Systemic effects - Dermal	Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 1.71 mg/kg bw/d, RCR: 0.25 - No gloves Indoor use with local exhaust ventilation (LEV) 0.14 mg/kg bw/d, RCR: 0.02 - No gloves

4. GUIDANCE TO DOWNSTREAM USER FOR EVALUATING EMPLOYEE WHETHER HE WORKS INSIDE THE BOUNDARIES SET BY THE ES

Environmental exposure

Used EUSES model: EUSUS v2.1.
Non-standard assumptions: Required removal efficiency (wastewater) 100%.
Risk assessment: Based on Risk Characterisation Ratio (RCR), Calculation method.
Predicted No Effect Concentration (PNEC): Water, 0.0011 mg/L (Free Ammonia). No other PNEC's derived.

Control of worker exposure

The ECETOC TRA tool has been used to estimate consumer exposures unless otherwise indicated.
Risk assessment: Based on Risk Characterisation Ratio (RCR), Calculation method.
Used Derived No Effect Level (DNEL):
Worker - inhalative, long-term - local,
Worker - dermal, short-term - systemic,
Worker - dermal, long-term - systemic.
Other DNEL's were not critical.

Guidance to check compliance with the exposure scenario

If scaling reveals a condition of unsafe use (i.e., RCRs > 1), additional RMMs or a site-specific chemical safety assessment is required.

For scaling see: ECETOC TRA, ART, STOFFENMANAGER, EUSES.

Further information on the assumptions contained in this exposure scenario can be found at: Website Model, ECETOC TRA and RIVM report 601450009, "Emission scenario document for biocides", 2001.

Workplace measurements:
Refer to European Standard EN 14042 (Workplace atmospheres - Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents) or equivalent national standard(s).
Refer to European Standard EN 482 (Workplace atmospheres - General requirements for the performance of procedures for the measurement of chemical agents) or equivalent national standard(s).
Refer to European Standard EN 689 (Workplace atmospheres - Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy) or equivalent national standard(s).
BOHS/NVVA guidance "Testing Compliance with Occupational Exposure Limits for Airborne Substances".
Workplace measurements - Method: http://amcaw.ifa.dguv.de/substance/methoden/096-L-Ammonia.pdf.