SAFETY DATA SHEET

Revision date 18/05/2016 **Version** 5
Date of the previous version 13/01/2015 EN

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

1.1 Product identifier

Product Name **Ammonia, anhydrous, contains less than 0.5% water**

CAS-No 7664-41-7
EC-No 231-635-3
REACH registration number 01-2119488876-14-0040

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

Recommended Use Manufacturing, Formulation, Intermediate Industrial use, Professional use. See annex for more detailed information.
Uses advised against All other uses.

1.3 Details of the supplier of the safety data sheet

OCI Nitrogen BV
Mijnweg 1
P.O. Box 601
6160 AP Geleen, The Netherlands
Tel: +31 (0) 46 7020111
www.ocinitrogen.com

info.agro@ocinitrogen.com

1.4 Emergency telephone number

UK National Health Service (NHS) call 111 or, in life-threatening emergencies, call 999

WAL National Health Service (NHS) call 0845 46 47

IE National Poisons Information Centre
+353 1 809 2566 or +353 1 837 9964 (only for healthcare professionals)

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

SECTION 2: HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Classification (1272/2008/EC)

Acute inhalation toxicity - gas	Category 3 - H331
Skin Corrosion/Irritation	Category 1B - H314
Acute aquatic toxicity	Category 1 - H400
Chronic aquatic toxicity	Category 2 - H411
Flammable gases	Category 2 - H221
Gases Under Pressure	Compressed gas - H280

2.2 Label elements

Signal word
Danger

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

EUH071 - Corrosive to the respiratory tract

Precautionary Statements
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking
P260 - Do not breathe dust/fume/gas/mist/vapours/spray
P273 - Avoid release to the environment
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P303 + P361 + P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
P304 + P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely
P410 + P403 - Protect from sunlight. Store in a well-ventilated place

2.3 Other hazards

Contact with liquid or cold vapor can cause freezing of tissue.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

Chemical name	EC-No	CAS-No	Weight %	Classification (1272/2008/EC)	REACH registration number
Ammonia, anhydrous	231-635-3	7664-41-7	99.5 - 100	Flam. Gas 2 H221 Press. Gas H280 Skin Corr. 1B H314 Acute Tox. 3 H331 Aquatic Acute 1 H400 Aquatic Chronic 2 H411 M factor=1	01-2119488876-14
Water	231-791-2	7732-18-5	0 - 0.5	-	No data available

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

SECTION 4: FIRST AID MEASURES

4.1 Description of first aid measures

General Advice Immediate medical attention is required. If the breathing or the heart has stopped, give cardiopulmonary resuscitation (CPR). It may be dangerous to give mouth-to-mouth resuscitation.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Consult a physician.

Skin Contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. In case of contact with liquefied gas, thaw frosted parts with lukewarm water. Wash contaminated clothing before re-use. Consult a physician.

Ingestion Rinse mouth. If swallowed, do not induce vomiting - seek medical advice. Never give anything by mouth to an unconscious person. Consult a physician.

Inhalation Remove to fresh air and keep at rest in a position comfortable for breathing (Half upright position). Administer oxygen if breathing is difficult, but only if you are trained for this.

Protection of first-aiders Use personal protective equipment. Avoid contact with skin, eyes and clothing.

4.2 Most important symptoms and effects, both acute and delayed

Main symptoms Can burn mouth, throat, and stomach: Burning feeling and temporary redness, Pain. Causes severe damage to eyes. Toxic by inhalation: respiratory distress (May cause delayed pulmonary oedema). May cause frostbite.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically. Symptoms may be delayed.

SECTION 5: FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable Extinguishing Media Carbon dioxide (CO_2), Foam, Dry chemical. Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable Extinguishing Media None known.

5.2 Special hazards arising from the substance or mixture

Special Hazard Contains gas under pressure; may explode if heated. FLAMMABLE GAS. Hazardous decomposition products formed under fire conditions: Nitrogen oxides (NO_x), Hydrogen, Amines.

5.3 Advice for firefighters

Fire fighting measures Keep containers and surroundings cool with water spray. Prevent fire extinguishing water from contaminating surface water or the ground water system. Do not spray water into liquid ammonia, in order to prevent release of gas and heat. Suppress (knock down) gases/vapours/mists with a water spray jet.

Special protective equipment for fire-fighters Wear self-contained breathing apparatus and protective suit.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Evacuate non-essential personnel. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing. Remove all sources of ignition. Use personal protective equipment. Keep people away from and upwind of spill/leak. Do not stay in the gas cloud , stay upwind of the source.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Prevent further leakage or spillage if safe to do so. Remove all sources of ignition. Ventilate the area. Small amounts Dilute with water. Large amounts Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Sweep up and shovel into suitable containers for disposal.

6.4 Reference to other sections

See sections 8 and 13.

SECTION 7: HANDLING AND STORAGE

7.1 Precautions for safe handling

Handle in accordance with good industrial hygiene and safety practice. Ensure adequate ventilation. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid breathing dust/fume/gas/mist/vapours/spray. Keep away from heat, sparks and open flame. - No smoking. Avoid contact with skin, eyes and clothing. See annex for more detailed information.

7.2 Conditions for safe storage, including any incompatibilities

Store in accordance with local regulations. Keep containers tightly closed in a dry, cool and well-ventilated place. Do not puncture or incinerate cans. Keep away from direct sunlight, Heat, flames and sparks. Protect from moisture. Incompatible with strong acids and bases, Organic materials, Chromates, Zinc, Tin, copper, Nickel, Halogenated compounds, Aluminium, Metal oxides.

7.3 Specific end use(s)

Exposure scenario See annex.

Other information Not available.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Exposure Limits

Chemical name	European Union	The United Kingdom	France	Spain	Germany
Ammonia, anhydrous	TWA 14 mg/m³ STEL 36 mg/m³	TWA: 18 mg/m³ STEL: 25 mg/m³	VME: 7 mg/m³ VLCT: 14 mg/m³	VLA-ED: 14 mg/m³ VLA-EC: 36 mg/m³	TWA: 14 mg/m³ STEL: 28 mg/m³

Chemical name	Italy	Portugal	Netherlands	Denmark	Poland
Ammonia, anhydrous	TWA: 14 mg/m³ STEL: 36 mg/m³	VME MP: 25 ppm VME CD: 35 ppm	TGG 8u: 14 mg/m³ TGG 15min: 36 mg/m³	GV: 14 mg/m	

Chemical name	Belgium	Sweden	Hungary	Finland	Czech Republic
Ammonia, anhydrous	TWA: 14 mg/m³ STEL: 36 mg/m³	NGV: 14 mg/m³ TGV: 36 mg/m³	TWA: 14 mg/m³ STEL: 36 mg/m³	TWA: 14 mg/m³ STEL: 36 mg/m³	

Recommended monitoring procedures No information available.

Derived No Effect Level (DNEL) For: Workers.

Chemical name	Long-term exposure - Local effects - Inhalation	Long-term exposure - Local effects - Dermal	Acute / short-term exposure - Local effects - Inhalation	Acute / short-term exposure - Local effects - Dermal
Ammonia, anhydrous	14 mg/m³		36 mg/m³	

Chemical name	Long-term exposure - Systemic effects - Inhalation	Long-term exposure - Systemic effects - Dermal	Acute / short-term exposure - Systemic effects - Inhalation	Acute / short-term exposure - Systemic effects - Dermal
Ammonia, anhydrous	47.6 mg/m³	6.8 mg/kg bw/d	47.6 mg/m³	

Predicted No Effect Concentration (PNEC)

Chemical name	Freshwater	Marine water	Intermittent release	Sewage treatment plant	Freshwater sediment	Marine sediment	Soil	Oral
Ammonia, anhydrous	0.0011 mg/L	0.0011 mg/L	0.089 mg/L					

8.2 Exposure controls

Appropriate Engineering Controls Ensure adequate ventilation, especially in confined areas. Handle substance within a closed system. Ensure that eyewash stations and safety showers are close to the workstation location. Use spark-proof tools and explosion-proof equipment. See annex for more detailed information.

Individual protection measures, such as personal protective equipment

Eye Protection Tightly fitting safety goggles (EN166). If splashes are likely to occur, wear: Face-shield (DIN EN136).

Hand Protection Protective gloves (EN374): Butyl rubber (0.56 mm), PTFE (0.38 mm), Viton® (0.46 mm). Break through time: hours.

Skin and Body Protection Chemical resistant apron, Boots (EN14605).

Respiratory Protection Use self-contained breathing apparatus (EN402).

Recommended Filter Type K (Ammonia)

Hygiene Measures Workers must be trained in the proper use and handling of this product as required under applicable regulations. Handle in accordance with good industrial hygiene and safety practice. Do not eat, drink or smoke when using this product. Wash hands before breaks and immediately after handling the product.

Environmental exposure controls The product should not be allowed to enter drains, water courses or the soil.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Physical state @20°C	Liquid
Appearance	Gas under pressure
Colour	Colourless
Odour	Characteristic, Stinging
odour threshold	5-25 ppm
pH	11.7 (conc. 1% w/w)
Melting/freezing point	-78 °C
Boiling point/boiling range	°C (@101.3 kPa) -33.4
Flash point	No information available
Evaporation rate	No information available
Flammability (solid, gas)	Flammable (air)
Flammability Limits in Air	
Upper	27%
Lower	15%
Vapour pressure	861 kPa
Vapour density	0.6 (air = 1)
Relative density	0.6386 (@ -33ºC, 101.3 kPa) (water = 1)
Solubility	
Water solubility	Soluble in water 51-53.1 g/100 mL (20°C)
Solubility in Other Solvents	Methanol
Partition coefficient (n-octanol/water)	0.23
Autoignition temperature	651 °C
Decomposition temperature	450 °C
Viscosity, dynamic	0.475 cP (@ -69°C), 0.317 cP (@ -50°C), 0.276 cP (@ -40°C), 0.255 cP (@ -33.5°C)
Explosive properties	Not explosive
Oxidising properties	Not oxidizing

9.2 Other information

Density	0.717 g/cm³ (@ 21°C)
Critical temperature	133.4 ºC
Conductivity	1.9e+007 pS/m
Minimum ignition energy	680 mJ

SECTION 10: STABILITY AND REACTIVITY

10.1 Reactivity

No information available.

10.2 Chemical stability

Stable under normal conditions.

10.3 Possibility of hazardous reactions

Hazardous polymerisation does not occur.

10.4 Conditions to avoid

Keep away from direct sunlight, Heat, flames and sparks. Protect from moisture. Do not puncture or incinerate cans.

10.5 Incompatible materials

Incompatible with strong acids and bases, Organic materials, Chromates, Zinc, Tin, copper, Nickel, Halogens, Aluminium, Metal oxides.

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions: Nitrogen oxides (NO_x), Hydrogen gas.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute Toxicity

Ingestion No known effect.
Skin Contact No known effect.
Inhalation Toxic by inhalation. May cause pulmonary oedema, respiratory distress.

Chemical name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Ammonia, anhydrous	350 mg/kg bw (Rat, OECD 401)		9850 mg/m³ (Rat, 1h) 13770 mg/m³ (Rat, 1h)

Skin Corrosion/Irritation Corrosive to skin (Rabbit, OECD 404).

Serious eye damage/irritation Corrosive to eyes. Causes severe damage to eyes.

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

Germ Cell Mutagenicity Not known to cause heritable genetic damage.
Ames test: Negative (OECD 471).

Carcinogenicity Contains no ingredient listed as a carcinogen.

Reproductive Toxicity Not known to cause birth defects or have a deleterious effect on a developing fetus.
Not known to adversely affect reproductive functions and organs.

STOT-single exposure Corrosive to respiratory system.

STOT-repeated exposure No known effect.

Aspiration Hazard No known effect.

SECTION 12: ECOLOGICAL INFORMATION

12.1 Toxicity

Very toxic to aquatic organisms. May cause long-term adverse effects in the environment.

Chemical name	Toxicity to Algae	Toxicity to Fish	Toxicity to Micro-organisms	Toxicity to daphnia and other aquatic invertebrates
Ammonia, anhydrous	EC50: 2700 mg/L 18d Chlorella vulgaris	LC50: 11-48 mg/L 96h (ammonia nitrogen) Oncorhynchus mykiss LC50: 0.5-1.73 mg/L 96h (non-ionised ammonia) Lepomis cyanella		LC50: 101 mg/L 48h Daphnia magna (ASTM E729-80)

12.2 Persistence and degradability

Readily biodegradable.

12.3 Bioaccumulative potential

Bioaccumulation is unlikely.

Chemical name	Log P_{ow}	Bioconcentration factor (BCF)
Ammonia, anhydrous	0.23	

12.4 Mobility in 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

This substance is not considered to be persistent, bioaccumulative and toxic (PBT) or very persistent and very bioaccumulative (vPvB).

12.6 Other adverse effects

No information available.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Waste from residues / unused products Where possible, recycling is preferable to disposal. Can be disposed of in compliance with local regulations.

Contaminated Packaging Empty containers should be taken to an approved waste handling site for recycling or disposal.

SECTION 14: TRANSPORT INFORMATION

According to: ADR, RID, ADN, IMDG, IATA/ICAO.

14.1 UN number

1005

14.2 UN proper shipping name

AMMONIA, ANHYDROUS

14.3 Transport hazard class(es)

Hazard class including sub class ADR/RIC/AND/IMDG,IATA/ICAO: 2.3 (8)

14.4 Packing group

Not applicable

14.5 Environmental hazards

Yes: Marine pollutant. Harmful to aquatic life with long lasting effects.

14.6 Special precautions for user

See transport regulations for UN number specific special precautions.

14.7 Transport in bulk according to Annex II of MARPOL and the IBC Code

See section 14.5.

SECTION 15: REGULATORY INFORMATION

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

Restrictions on use Restricted to professional users.

Other Regulations None.

15.2 Chemical safety assessment

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

SECTION 16: OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3
H221 - Flammable gas
H280 - Contains gas under pressure; may explode if heated
H314 - Causes severe skin burns and eye damage
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

Abbreviations and acronyms

ES: Exposure Scenario
EC: European Commission
REACH: Registration, Evaluation, Authorisation and Restriction of Chemical substances
STOT: Specific Target Organ Toxicity
PBT: Persistent, Bioaccumulative, Toxic
vPvB: very Persistent and very Bioaccumulating
ADR: Accord européen relatif au transport international des marchandises Dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
RID: Règlement concernant le transport international ferroviaire des marchandises dangereuses (Regulations for the International Transport of Dangerous Goods by Rail)
ADN: Accord européen relatif au transport international des marchandises Dangereuses par voies de Navigation intérieures (European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways)
ICAO: International Civil Aviation Organization
ERC: Environmental Release Category

Revision note

Transport information.

Training Advice

Workers must be trained in the proper use and handling of this product as required under applicable regulations.

Disclaimer

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
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.

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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.