

SAFETY DATA SHEET



Pentaethylenehexamine, PEHA

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

1.1 Product identifier

Product name : Pentaethylenehexamine, PEHA**Index number** : 612-064-00-2**EC number** : 223-775-9**REACH Registration number**

Registration number	Legal entity
01-2119485826-22-0000	-

CAS number : 4067-16-7**Other means of identification** : -**Chemical formula** : C10-H28-N6

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

Product use : Intermediate. Chemical synthesis.

Identified uses

ES 1.1: Use of ethylenamines (EA) in closed system with little opportunity for exposure - Use of EA up to 100% - Industrial: SU03; PROC01, PROC02, PROC03, PROC04, PROC05, PROC08a, PROC08b, PROC09, PROC15; ERC01, ERC02, ERC06a

ES 1.2: Use of ethylenamines (EA) in closed system with little opportunity for exposure - Use of preparations containing EA up to 2% - Industrial/Professional: SU03, SU22; PROC05, PROC08a, PROC08b, PROC09; ERC01, ERC02, ERC06a

ES 1.3: Use of ethylenamines (EA) in closed system with little opportunity for exposure - Use of preparations containing EA up to 0.5% - Industrial/Professional: SU03, SU22; PROC05, PROC08a, PROC08b, PROC09; ERC01, ERC02, ERC06a

ES 2.1: Use of preparations containing ethylenamines (EA) in open processes with low exposure potential and evaporation as most likely exposure form - Use of preparations containing EA up to 2% - Industrial/Professional: SU03, SU22; PROC05, PROC06, PROC08a, PROC08b, PROC09, PROC10, PROC13, PROC16; ERC01, ERC04, ERC08a, ERC08b, ERC08d, ERC10b

ES 2.2: Use of preparations containing ethylenamines (EA) in open processes with low exposure potential and evaporation as most likely exposure form - Use of preparations containing EA up to 0.5% - Industrial/Professional: SU03, SU22; PROC05, PROC06, PROC08a, PROC08b, PROC09, PROC10, PROC13, PROC16; ERC01, ERC04, ERC08a, ERC08b, ERC08d, ERC10b

ES 3.1: Use of ethylenamines (EA) in open processes with high exposure potential and evaporation and aerosol formation as possible exposure forms - Use of preparations containing EA up to 25% - Industrial/Professional: SU03, SU22; PROC05, PROC08a, PROC08b, PROC09; ERC01, ERC02, ERC04, ERC05, ERC06a, ERC06b, ERC06c, ERC06d, ERC08a, ERC08b, ERC08c, ERC08e, ERC08f, ERC11a

ES 3.2: Use of ethylenamines (EA) in open processes with high exposure potential and evaporation and aerosol formation as possible exposure forms - Use of preparations containing EA up to 15% - Industrial/Professional: SU03, SU22; PROC05, PROC06, PROC07, PROC08a, PROC08b, PROC09, PROC10, PROC11, PROC13, PROC14; ERC01, ERC02, ERC04, ERC05, ERC06a, ERC06b, ERC06c, ERC06d, ERC08a, ERC08b, ERC08c, ERC08e, ERC08f, ERC11a

ES 3.3: Use of ethylenamines (EA) in open processes with high exposure potential and evaporation and aerosol formation as possible exposure forms - Use of preparations containing EA up to 2% - Industrial: SU03, SU22; PROC05, PROC07, PROC08a, PROC08b, PROC09, PROC10, PROC11, PROC13, PROC14, PROC19; ERC01, ERC02, ERC04, ERC05, ERC06a, ERC06b, ERC06c, ERC06d, ERC08a, ERC08b, ERC08c, ERC08e, ERC08f, ERC11a

ES 3.4: Use of ethylenamines (EA) in open processes with high exposure potential and evaporation and aerosol formation as possible exposure forms - Use of preparations containing EA up to 0.5% - Industrial: SU03, SU22; PROC05, PROC07, PROC08a, PROC08b, PROC09, PROC10, PROC11, PROC13, PROC14, PROC19; ERC01, ERC02, ERC04, ERC05, ERC06a, ERC06b, ERC06c, ERC06d, ERC08a, ERC08b, ERC08c, ERC08e, ERC08f, ERC11a

ES 4.1: Handling of solid products with small amounts of unbound ethylenamines (EA) - Use of preparations containing EA up to 2% - Professional: SU22; PROC21, PROC24; ERC06d

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

ES 4.2: Handling of solid products with small amounts of unbound ethylenamines (EA) - Use of preparations containing EA up to 0.5% - Professional: SU22; PROC21, PROC24; ERC06d

ES 5: Consumer uses of ethyleneamines (EA) - Consumer: SU21; PC01, PC09b; ERC08a, ERC08b, ERC08c, ERC08d, ERC08e, ERC08f

See Annex to the Safety data sheet for additional information in the Exposure Scenario(s).

1.3 Details of the supplier of the safety data sheet

Delamine B.V.
Barchman Wuytierslaan 10
3818 LH Amersfoort
Netherlands
Telephone number: +31-334224600

e-mail address of person responsible for this SDS : sds.delamine@delamine.com

1.4 Emergency telephone number

Supplier

Telephone number : GBK/Infotrac ID 104075 : International (001) 352 323 3500 (24 h)

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Product definition : UVCB

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

Acute Tox. 4, H302
Acute Tox. 4, H312
Skin Corr. 1B, H314
Eye Dam. 1, H318
Skin Sens. 1, H317
Aquatic Acute 1, H400 (M=1)
Aquatic Chronic 1, H410 (M=1)

The product is classified as hazardous according to Regulation (EC) 1272/2008 as amended.

See Section 16 for the full text of the H statements declared above.

See Section 11 for more detailed information on health effects and symptoms.

2.2 Label elements

Hazard pictograms



Signal word : Danger

Hazard statements : H302 + H312 - Harmful if swallowed or in contact with skin.
H314 - Causes severe skin burns and eye damage.
H317 - May cause an allergic skin reaction.
H410 - Very toxic to aquatic life with long lasting effects.

Precautionary statements

Prevention : P280 - Wear protective gloves. Wear eye or face protection. Wear protective clothing.
P260 - Do not breathe vapour.
P273 - Avoid release to the environment.

SECTION 2: Hazards identification

Response	: P391 - Collect spillage. P303 + P361 + P353 + P310 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Immediately call a POISON CENTER or physician. 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 physician.
Storage	: Not applicable.
Disposal	: Not applicable.
Hazardous ingredients	: 3,6,9,12-tetra-azatetradeca-methylenediamine
Supplemental label elements	: Not applicable.
Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles	: Not applicable.

2.3 Other hazards

Substance meets the criteria for PBT according to Regulation (EC) No. 1907/2006, Annex XIII	: No. P: Yes. B: No. T: No.
Substance meets the criteria for vPvB according to Regulation (EC) No. 1907/2006, Annex XIII	: No. vP: No. vB: No.
Other hazards which do not result in classification	: None known.

SECTION 3: Composition/information on ingredients

3.1 Substances : UVCB

Product/ingredient name	Identifiers	%	Regulation (EC) No. 1272/2008 [CLP]	Type
3,6,9,12-tetra-azatetradeca-methylenediamine	REACH #: 01-2119485826-22 EC: 223-775-9 CAS: 4067-16-7 Index: 612-064-00-2	100	Acute Tox. 4, H302 Acute Tox. 4, H312 Skin Corr. 1B, H314 Eye Dam. 1, H318 Skin Sens. 1, H317 Aquatic Acute 1, H400 (M=1) Aquatic Chronic 1, H410 (M=1) See Section 16 for the full text of the H statements declared above.	[A]

There are no additional ingredients present which, within the current knowledge of the supplier, are classified and contribute to the classification of the substance and hence require reporting in this section.

Type

[*] Substance

[A] Constituent

[B] Impurity

[C] Stabilising additive

Occupational exposure limits, if available, are listed in Section 8.

SECTION 4: First aid measures**4.1 Description of first aid measures**

- Eye contact** : Get medical attention immediately. Call a poison center or physician. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician.
- Inhalation** : Get medical attention immediately. Call a poison center or physician. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.
- Skin contact** : Get medical attention immediately. Call a poison center or physician. Wash with plenty of soap and water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician. In the event of any complaints or symptoms, avoid further exposure. Wash clothing before reuse. Clean shoes thoroughly before reuse.
- Ingestion** : Get medical attention immediately. Call a poison center or physician. Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

4.2 Most important symptoms and effects, both acute and delayed**Potential acute health effects**

- Eye contact** : Causes serious eye damage.
- Inhalation** : No known significant effects or critical hazards.
- Skin contact** : Causes severe burns. Harmful in contact with skin. May cause an allergic skin reaction.
- Ingestion** : Harmful if swallowed.

Over-exposure signs/symptoms

- Eye contact** : Adverse symptoms may include the following:
pain
watering
redness
- Inhalation** : No specific data.
- Skin contact** : Adverse symptoms may include the following:
pain or irritation
redness
blistering may occur
- Ingestion** : Adverse symptoms may include the following:
stomach pains

4.3 Indication of any immediate medical attention and special treatment needed

SECTION 4: First aid measures

- Notes to physician** : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.
- Specific treatments** : No specific treatment.

SECTION 5: Firefighting measures

5.1 Extinguishing media

- Suitable extinguishing media** : Use dry chemical, CO₂, water spray (fog) or foam. Dry sand or other suitable absorbent. Use an extinguishing agent suitable for the surrounding fire.
- Unsuitable extinguishing media** : Do not use water jet.

5.2 Special hazards arising from the substance or mixture

- Hazards from the substance or mixture** : In a fire or if heated, a pressure increase will occur and the container may burst. This material is very toxic to aquatic life with long lasting effects. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.
- Hazardous combustion products** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
nitrogen oxides

5.3 Advice for firefighters

- Special protective actions for fire-fighters** : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.
- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Clothing for fire-fighters (including helmets, protective boots and gloves) conforming to European standard EN 469 will provide a basic level of protection for chemical incidents.
- Additional information (Explosibility)** : Not considered to be a product presenting a risk of explosion.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

- For non-emergency personnel** : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Do not breathe vapour or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.
- For emergency responders** : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

6.2 Environmental precautions

- : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities. Collect spillage.

6.3 Methods and material for containment and cleaning up

- Small spill** : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

SECTION 6: Accidental release measures

- Large spill** : Stop leak if without risk. Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilt product.
- 6.4 Reference to other sections** : See Section 1 for emergency contact information.
See Section 8 for information on appropriate personal protective equipment.
See Section 13 for additional waste treatment information.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

- Protective measures** : Put on appropriate personal protective equipment (see Section 8). Persons with a history of skin sensitization problems should not be employed in any process in which this product is used. Do not get in eyes or on skin or clothing. Do not breathe vapour or mist. Do not ingest. Avoid release to the environment. If during normal use the material presents a respiratory hazard, use only with adequate ventilation or wear appropriate respirator. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Keep away from acids. Empty containers retain product residue and can be hazardous. Do not reuse container.
- Advice on general occupational hygiene** : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

7.2 Conditions for safe storage, including any incompatibilities

Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Separate from acids. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination.

Seveso Directive - Reporting thresholds (in tonnes)

Danger criteria

Category	Notification and MAPP threshold	Safety report threshold
E1: Hazardous to the aquatic environment - Acute 1 or Chronic 1	100	200

7.3 Specific end use(s)

Section 7. Handling and storage: The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

SECTION 8: Exposure controls/personal protection

The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

8.1 Control parameters

Occupational exposure limits

No exposure limit value known.

SECTION 8: Exposure controls/personal protection

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment. Reference should be made to monitoring standards, such as the following: 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) European Standard EN 14042 (Workplace atmospheres - Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents) European Standard EN 482 (Workplace atmospheres - General requirements for the performance of procedures for the measurement of chemical agents) Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

DNELs/DMELs

Product/ingredient name	Type	Exposure	Value	Population	Effects	
3,6,9,12-tetra-azatetradeca-methylenediamine	DNEL	Long term Inhalation	1.59 mg/m ³	Workers	Systemic	
	DNEL	Short term Inhalation	8550 mg/m ³	Workers	Systemic	
	DNEL	Long term Dermal	0.91 mg/kg bw/day	Workers	Systemic	
	DNEL	Long term Dermal	0.044 mg/cm ²	Workers	Local	
	DNEL	Long term Inhalation	0.46 mg/m ³	Consumers	Systemic	
	DNEL	Short term Inhalation	2542 mg/m ³	Consumers	Systemic	
	DNEL	Long term Dermal	0.4 mg/kg bw/day	Consumers	Systemic	
	DNEL	Short term Dermal	13 mg/kg bw/day	Consumers	Systemic	
	DNEL	Long term Dermal	0.68 mg/cm ²	Consumers	Local	
	DNEL	Short term Dermal	1.59 mg/cm ²	Consumers	Local	
	DNEL	Long term Oral	0.65 mg/kg bw/day	Consumers	Systemic	
	DNEL	Short term Oral	32 mg/kg bw/day	Consumers	Systemic	
	Used for risk characterisation in exposure assessment:	DNEL	Long term Inhalation	1 mg/m ³	Workers	Systemic
		DNEL	Short term Inhalation	5390 mg/m ³	Workers	Local
		DNEL	Long term Dermal	0.57 mg/kg bw/day	Workers	Systemic
		DNEL	Long term Inhalation	0.23 mg/m ³	Consumers	-
		DNEL	Short term	101 mg/m ³	Consumers	-

SECTION 8: Exposure controls/personal protection

		Inhalation			
	DNEL	Long term Dermal	0.25 mg/kg bw/day	Consumers	Systemic
	DNEL	Long term Oral	2.18 mg/kg bw/day	Consumers	Systemic

PNECs

Product/ingredient name	Compartment Detail	Value	Method Detail
3,6,9,12-tetra-azatetradecamethylenediamine Used for risk characterisation in exposure assessment:	Fresh water	2.5 µg/l	Assessment Factors
	Marine water	2.5 µg/l	Assessment Factors
	Intermittent release	25 µg/l	Assessment Factors
	Fresh water sediment	0.22 mg/kg dwt	-
	Marine water sediment	0.14 mg/kg dwt	-
	Sewage Treatment Plant	1.64 mg/l	Assessment Factors
	Soil	0.18 mg/kg dwt	-
	Secondary Poisoning	0.29 mg/kg	Assessment Factors
	Marine water	0.005 mg/l	-
	Fresh water sediment	8 mg/kg dwt	-
	Marine water sediment	1.6 mg/kg dwt	-
	Sewage Treatment Plant	16.4 mg/l	-
	Soil	1.58 mg/kg dwt	-

8.2 Exposure controls

Appropriate engineering controls

: If user operations generate dust, fumes, gas, vapour or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Individual protection measures

Hygiene measures

: Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Contaminated work clothing should not be allowed out of the workplace. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection

: Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.

Skin protection

SECTION 8: Exposure controls/personal protection

- Hand protection** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
- Recommended: Wear suitable gloves tested to EN374.
> 8 hours (breakthrough time): butyl rubber (thickness ≥ 0.3 mm), nitrile rubber (thickness ≥ 0.4 mm), Chloroprene (thickness ≥ 0.65 mm).
- Body protection** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Other skin protection** : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Respiratory protection** : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.
- Recommended: Combination filtering device (DIN EN 14387), Filter type: AP-2.
- Environmental exposure controls** : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

SECTION 9: Physical and chemical properties**9.1 Information on basic physical and chemical properties****Appearance**

- Physical state** : Liquid. [Clear.]
- Colour** : Yellow. [Light]
- Odour** : Odourless.
- Odour threshold** : Not available.
- pH** : 12.6
- Melting point/freezing point** : $< -70^{\circ}\text{C}$ Pour point: $< -20^{\circ}\text{C}$
- Initial boiling point and boiling range** : 426°C
- Flash point** : Closed cup: 183°C
- Evaporation rate** : Not available.
- Flammability (solid, gas)** : Not applicable.
- Upper/lower flammability or explosive limits** : Not available.
- Vapour pressure** : 0.0000017 kPa [room temperature]
- Vapour density** : Not available.
- Relative density** : Not available.
- Density** : 1.003 g/cm^3 [20°C]
- Solubility(ies)** : Not available.
- Solubility in water** : $>500\text{ g/l}$
- Partition coefficient: n-octanol/ water** : -3.67
- Auto-ignition temperature** : 335°C
- Decomposition temperature** : Not available.

SECTION 9: Physical and chemical properties

- Viscosity** : Kinematic (room temperature): 2.03 cm²/s
Kinematic (40°C): 0.544 cm²/s
- Explosive properties** : Not considered to be a product presenting a risk of explosion.
- Oxidising properties** : None.

9.2 Other information

No additional information.

SECTION 10: Stability and reactivity

- 10.1 Reactivity** : No specific test data related to reactivity available for this product or its ingredients.
- 10.2 Chemical stability** : The product is stable.
- 10.3 Possibility of hazardous reactions** : Under normal conditions of storage and use, hazardous reactions will not occur.
Under normal conditions of storage and use, hazardous polymerisation will not occur.
- 10.4 Conditions to avoid** : aerosol or mist formation.
Keep away from heat, sparks and flame. Do not smoke.
- 10.5 Incompatible materials** : Reactive or incompatible with the following materials: oxidizing materials, metals, acids, Chlorinated hydrocarbon.
- 10.6 Hazardous decomposition products** : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure	Remarks
3,6,9,12-tetra-azatetradeca-methylenediamine	LD50 Dermal [OECD 402]	Rabbit - Male, Female	1465.4 mg/kg	-	test substance: CAS no. 112-24-3 (read-across)
	LD50 Oral	Rat	1600 mg/kg	-	-
	LD50 Oral [OECD 401]	Rat - Male, Female	1716.2 mg/kg	-	test substance: CAS no. 112-24-3 (read-across)

Conclusion/Summary : Harmful if swallowed or in contact with skin.

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation	Remarks
3,6,9,12-tetra-azatetradeca-methylenediamine	Skin - Visible necrosis [OECD 404]	Rabbit	-	4 hours	14 days	test substance: CAS no. 112-24-3 (read-across)
	Eyes - Severe irritant [OECD 405]	Rabbit	-	1 hours	-	test substance: CAS no. 112-24-3 (read-across)

Conclusion/Summary

- Skin** : Causes severe burns.
- Eyes** : Causes serious eye damage.

Sensitisation

SECTION 11: Toxicological information

Product/ingredient name	Route of exposure	Species	Result	Remarks
3,6,9,12-tetra-azatetradeca-methylenediamine	skin	Guinea pig	Sensitising [OECD 406]	test substance: CAS no. 112-24-3 (read-across)

Conclusion/Summary

Skin : May cause an allergic skin reaction.

Mutagenicity

Product/ingredient name	Test	Experiment	Result	Remarks
3,6,9,12-tetra-azatetradeca-methylenediamine	OECD 477	Experiment: In vivo Subject: Insect	Negative	test substance: CAS no. 112-24-3 (read-across)
	OECD 474	Experiment: In vivo Subject: Mammalian-Animal	Negative	test substance: CAS no. 112-24-3 (read-across)

Conclusion/Summary : Based on available data, the classification criteria are not met.

Carcinogenicity

Conclusion/Summary : No known significant effects or critical hazards.

Reproductive toxicity

Conclusion/Summary : No known significant effects or critical hazards.

Teratogenicity

Conclusion/Summary : No known significant effects or critical hazards.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on likely routes of exposure : Not available.

Potential acute health effects

- Eye contact** : Causes serious eye damage.
- Inhalation** : No known significant effects or critical hazards.
- Skin contact** : Causes severe burns. Harmful in contact with skin. May cause an allergic skin reaction.
- Ingestion** : Harmful if swallowed.

Symptoms related to the physical, chemical and toxicological characteristics

- Eye contact** : Adverse symptoms may include the following:
pain
watering
redness
- Inhalation** : No specific data.
- Skin contact** : Adverse symptoms may include the following:
pain or irritation
redness
blistering may occur
- Ingestion** : Adverse symptoms may include the following:
stomach pains

SECTION 11: Toxicological information**Delayed and immediate effects as well as chronic effects from short and long-term exposure****Short term exposure**

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Product/ingredient name	Result	Species	Dose	Exposure	Remarks
3,6,9,12-tetra-azatetradecamethylenediamine	Sub-chronic LOAEL Oral [OECD 408]	Rabbit - Male, Female	50 mg/kg	-	test substance: CAS no. 38260-01-4 (read-across). Based on available data, the classification criteria are not met.

Conclusion/Summary : Based on available data, the classification criteria are not met.

General : Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Other information : Not available.

SECTION 12: Ecological information**12.1 Toxicity**

Product/ingredient name	Result	Species	Exposure	Remarks
3,6,9,12-tetra-azatetradecamethylenediamine	Acute EC50 0.7 mg/l Fresh water [OECD 201]	Algae - Pseudokirchnerella subcapitata	72 hours	-
	Acute EC50 17.5 mg/l Fresh water	Daphnia - Daphnia magna	48 hours	-
	Acute LC50 180 mg/l Fresh water	Fish - Poecilia reticulata	96 hours	-
	Chronic NOEC 0.25 mg/l Fresh water [OECD 201]	Algae - Pseudokirchnerella subcapitata	72 hours	-
	Chronic NOEC 0.8 mg/l Fresh water [OECD 202]	Daphnia - Daphnia magna	21 days	test substance: CAS no. 112-24-3 (read-across)

Conclusion/Summary : Very toxic to aquatic life with long lasting effects.

12.2 Persistence and degradability

SECTION 12: Ecological information

Product/ingredient name	Test	Result	Dose	Inoculum
3,6,9,12-tetra-azatetradecamethylenediamine	OECD 302A	18 % - Not readily - 84 days	-	-
	OECD 301D	0 % - Not readily - 162 days	-	-

Conclusion/Summary : Not readily biodegradable.

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
3,6,9,12-tetra-azatetradecamethylenediamine	-	-	Not readily

12.3 Bioaccumulative potential

Product/ingredient name	LogP _{ow}	BCF	Potential
3,6,9,12-tetra-azatetradecamethylenediamine	-3.67	-	low

12.4 Mobility in soil

Soil/water partition coefficient (K_{oc}) : >3000

Mobility : Low mobility in soil predicted, based on the log K_{oc} value.

12.5 Results of PBT and vPvB assessment

PBT : No.
P: Yes. B: No. T: No.

vPvB : No.
vP: No. vB: No.

12.6 Other adverse effects : No known significant effects or critical hazards.

SECTION 13: Disposal considerations

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

13.1 Waste treatment methods**Product**

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction.





Hazardous waste : The classification of the product may meet the criteria for a hazardous waste. The allocation of waste identity numbers/waste descriptions must be carried out according to the EEC, specific to the industry and process.

Packaging

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

Special precautions : This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

SECTION 14: Transport information

	ADR/RID	ADN	IMDG	IATA
14.1 UN number	UN2735	UN2735	UN2735	UN2735
14.2 UN proper shipping name	POLYAMINES, LIQUID, CORROSIVE, N.O.S. (3,6,9,12-tetra-azatetradecamethylenediamine)	POLYAMINES, LIQUID, CORROSIVE, N.O.S. (3,6,9,12-tetra-azatetradecamethylenediamine)	POLYAMINES, LIQUID, CORROSIVE, N.O.S. (3,6,9,12-tetra-azatetradecamethylenediamine)	Polyamines, liquid, corrosive, n.o.s. (3,6,9,12-tetra-azatetradecamethylenediamine)
14.3 Transport hazard class(es)	8	8	8	8
Label				
14.4 Packing group	III	III	III	III
14.5 Environmental hazards	Yes.	Yes.	Marine Pollutant: Yes	Yes. The environmentally hazardous substance mark is not required.
Additional information	<p>The environmentally hazardous substance mark is not required when transported in sizes of ≤5 L or ≤5 kg.</p> <p>Hazard identification number 80</p> <p>Limited quantity 5 L</p> <p>Special provisions 274</p> <p>Tunnel code (E)</p>	<p>The environmentally hazardous substance mark is not required when transported in sizes of ≤5 L or ≤5 kg.</p> <p>Special provisions 274</p>	<p>The marine pollutant mark is not required when transported in sizes of ≤5 L or ≤5 kg.</p> <p>Emergency schedules (EmS) F-A, S-B</p> <p>Special provisions 223, 274</p>	<p>The environmentally hazardous substance mark may appear if required by other transportation regulations.</p> <p>Passenger and Cargo Aircraft Quantity limitation: 5 L Packaging instructions: 852</p> <p>Cargo Aircraft Only Quantity limitation: 60 L Packaging instructions: 856</p> <p>Limited Quantities - Passenger Aircraft Quantity limitation: 1 L Packaging instructions: Y841</p> <p>Special provisions A3, A803</p>

14.6 Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

14.7 Transport in bulk according to Annex II of Marpol and the IBC Code : Not available.

SECTION 15: Regulatory information

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

EU Regulation (EC) No. 1907/2006 (REACH)

Annex XIV - List of substances subject to authorisation

Annex XIV

None of the components are listed.

Substances of very high concern

None of the components are listed.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles : Not applicable.

Other EU regulations

Europe inventory : This material is listed or exempted.

Ozone depleting substances (1005/2009/EU)

Not listed.

Prior Informed Consent (PIC) (649/2012/EU)

Not listed.

Seveso Directive

This product is controlled under the Seveso Directive.

Danger criteria

Category

E1: Hazardous to the aquatic environment - Acute 1 or Chronic 1

National regulations

Hazchem code : 2X

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol (Annexes A, B, C, E)

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

International lists

National inventory

Australia : This material is listed or exempted.

Canada : This material is listed or exempted.

China : This material is listed or exempted.

Japan : **Japan inventory (ENCS):**
This material is listed or exempted.

Malaysia : This material is listed or exempted.

New Zealand : This material is listed or exempted.

Philippines : This material is listed or exempted.

Republic of Korea : This material is listed or exempted.

SECTION 15: Regulatory information

Taiwan : This material is listed or exempted.
United States : This material is listed or exempted.

15.2 Chemical safety assessment : Complete.

SECTION 16: Other information

✔ Indicates information that has changed from previously issued version.

Abbreviations and acronyms : ATE = Acute Toxicity Estimate
 CLP = Classification, Labelling and Packaging Regulation [Regulation (EC) No. 1272/2008]
 DMEL = Derived Minimal Effect Level
 DNEL = Derived No Effect Level
 EUH statement = CLP-specific Hazard statement
 PBT = Persistent, Bioaccumulative and Toxic
 PNEC = Predicted No Effect Concentration
 RRN = REACH Registration Number
 vPvB = Very Persistent and Very Bioaccumulative

Procedure used to derive the classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]

Classification	Justification
Acute Tox. 4, H302	On basis of test data
Acute Tox. 4, H312	On basis of test data
Skin Corr. 1B, H314	Expert judgment
Eye Dam. 1, H318	On basis of test data
Skin Sens. 1, H317	Expert judgment
Aquatic Acute 1, H400 (M=1)	Expert judgment
Aquatic Chronic 1, H410 (M=1)	Expert judgment

Full text of abbreviated H statements

H302	Harmful if swallowed.
H312	Harmful in contact with skin.
H314	Causes severe skin burns and eye damage.
H317	May cause an allergic skin reaction.
H318	Causes serious eye damage.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

Full text of classifications [CLP/GHS]

Acute Tox. 4, H302	ACUTE TOXICITY (oral) - Category 4
Acute Tox. 4, H312	ACUTE TOXICITY (dermal) - Category 4
Aquatic Acute 1, H400	ACUTE AQUATIC HAZARD - Category 1
Aquatic Chronic 1, H410	LONG-TERM AQUATIC HAZARD - Category 1
Eye Dam. 1, H318	SERIOUS EYE DAMAGE/EYE IRRITATION - Category 1
Skin Corr. 1B, H314	SKIN CORROSION/IRRITATION - Category 1B
Skin Sens. 1, H317	SKIN SENSITISATION - Category 1

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Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Annex to the extended Safety Data Sheet (eSDS)

Industrial

Identification of the substance or mixture

Product definition : UVCB
Product name : Pentaethylenehexamine, PEHA

Section 1 - Title

Short title of the exposure scenario : Use of ethylenamines (EA) in closed system with little opportunity for exposure - Use of EA up to 100% - Industrial.

List of use descriptors : **Identified use name: ES 1.1:** Use of ethylenamines (EA) in closed system with little opportunity for exposure - Use of EA up to 100% - Industrial: SU03; PROC01, PROC02, PROC03, PROC04, PROC05, PROC08a, PROC08b, PROC09, PROC15; ERC01, ERC02, ERC06a
Process Category: PROC01, PROC02, PROC03, PROC04, PROC05, PROC08a, PROC08b, PROC09, PROC15
Substance supplied to that use in form of: As such
Subsequent service life relevant for that use: No.
Environmental Release Category: ERC01, ERC02, ERC06a

Environmental contributing scenarios : **Manufacturing/Use as an intermediate** - ERC01
Formulation - ERC02
Industrial manufacture of coatings and inks - ERC06a

Health Contributing scenarios : **Use in closed process, no likelihood of exposure** - PROC01
Use in closed, continuous process with occasional controlled exposure - PROC02
Use in closed batch process (synthesis or formulation) - PROC03
Use in batch and other process (synthesis) where opportunity for exposure arises - PROC04
Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) - PROC05
Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities - PROC08a
Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities - PROC08b
Transfer of substance or preparation into small containers (dedicated filling line, including weighing) - PROC09
Use as laboratory reagent - PROC15

Number of the ES	: 1.1
Additional information	: Sector of uses [SU]: SU06b, SU08, SU09, SU10 Product categories [PC]: PC02, PC03, PC10, PC19, PC21, PC22, PC24, PC26, PC32 Free short title of the generic exposure scenario: Handling the EA and chemical preparations containing the substance up to 100%, upon manufacturing the EA, chemicals for which the EA is an intermediate and chemical preparations containing the substance.

Section 2 - Exposure controls

Contributing scenario controlling environmental exposure for 1: Manufacturing/Use as an intermediate	
Amounts used	: Annual amount used in the EU: 18600 tonnes/year. Fraction of EU tonnage used in region: 0.2. Regional use tonnage: 3720 tonnes/year. Fraction of Regional tonnage used locally: 1. Daily amount per site: 10192 kg/day. Annual site tonnage: 3720 tonnes/year.
Frequency and duration of use	: Continuous. Emission days: 365 days per year.

Environment factors not influenced by risk management	: Local freshwater dilution factor: 1000. Local marine water dilution factor: 1000.
Other conditions affecting environmental exposure	: Release to waste water from process: 0.00000161 % (Industry Specific Data) Release to air from process: 0.001 % (Industry Specific Data) Release to soil from process: 0.01 % (A&B table approach)
Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil	: No air emission controls required; required removal efficiency is 0%. Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of ≥ 27.7 %. Soil emission controls are not applicable as there is no direct release to soil.
Organisational measures to prevent/limit release from site	: Prevent discharge of undissolved substance to or recover from onsite wastewater.
Conditions and measures related to sewage treatment plant	: Assumed domestic sewage treatment plant flow 2000 m ³ /d.

Contributing scenario controlling environmental exposure for 2: Formulation

Amounts used	: Regional use tonnage: 744 tonnes/year. Fraction of Regional tonnage used locally: 1. Daily amount per site: 2038 kg/day. Annual site tonnage: 744 tonnes/year.
Frequency and duration of use	: Continuous. Emission days: 365 days per year.
Environment factors not influenced by risk management	: Local freshwater dilution factor: 1300. Local marine water dilution factor: 1000.
Other conditions affecting environmental exposure	: Release to waste water from process: 0 % (CEPE 4) Release to air from process: 0 % (Industry Specific Data) Release to soil from process: 0 % (CEPE 4)
Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil	: No air emission controls required; required removal efficiency is 0%. No wastewater treatment required. Soil emission controls are not applicable as there is no direct release to soil.

Contributing scenario controlling environmental exposure for 3: Industrial manufacture of coatings and inks

Amounts used	: Regional use tonnage: 744 tonnes/year. Fraction of Regional tonnage used locally: 1. Daily amount per site: 2038 kg/day. Annual site tonnage: 744 tonnes/year.
Frequency and duration of use	: Continuous. Emission days: 365 days per year.
Environment factors not influenced by risk management	: Local freshwater dilution factor: 1300. Local marine water dilution factor: 1000.
Other conditions affecting environmental exposure	: Release to waste water from process: 0.005 % (CEPE 3) Release to air from process: 0.11 % (Industry Specific Data) Release to soil from process: 0 % (CEPE 3)
Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil	: No air emission controls required; required removal efficiency is 0%. Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of ≥ 27.7 %. Soil emission controls are not applicable as there is no direct release to soil.
Organisational measures to prevent/limit release from site	: Prevent discharge of undissolved substance to or recover from onsite wastewater.

Pentaethylenehexamine, PEHA Exposure Scenario: 1.1 **Use of ethylenamines (EA) in closed system with little opportunity for exposure - Use of EA up to 100% - Industrial.**

Conditions and measures related to sewage treatment plant : Assumed domestic sewage treatment plant flow 2000 m³/d.

Contributing scenario controlling worker exposure for 4: Use in closed process, no likelihood of exposure

Product characteristics : Liquid.

Concentration of substance in mixture or article : Covers concentrations up to 100 %.

Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).

Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.

Other conditions affecting workers exposure : Indoor use.
Industrial.

Organisational measures to prevent/limit releases, dispersion and exposure : Avoid contact with eyes.
Avoid contact with skin.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training.
Wear suitable protective clothing and gloves.
Wash off any skin contamination immediately.

Contributing scenario controlling worker exposure for 5: Use in closed, continuous process with occasional controlled exposure

Product characteristics : Liquid.

Concentration of substance in mixture or article : Covers concentrations up to 100 %.

Frequency and duration of use/exposure : Avoid carrying out activities involving exposure for more than 4 hours.

Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.

Other conditions affecting workers exposure : Indoor use.
Industrial.

Technical conditions and measures to control dispersion from source towards the worker : Local exhaust ventilation - Efficiency of at least 90 %.

Organisational measures to prevent/limit releases, dispersion and exposure : Avoid contact with eyes.
Avoid contact with skin.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training.
Wear suitable protective clothing and gloves.
Wash off any skin contamination immediately.

Contributing scenario controlling worker exposure for 6: Use in closed batch process (synthesis or formulation)**Product characteristics** : Liquid.**Concentration of substance in mixture or article** : Covers concentrations up to 100 %.**Frequency and duration of use/exposure** : Covers exposure up to 8 h (full shift).**Human factors not influenced by risk management** : Breathing volume: 10 m³/day.
Body weight: 70 kg.**Other conditions affecting workers exposure** : Indoor use.
Industrial.**Technical conditions and measures to control dispersion from source towards the worker** : Local exhaust ventilation - Efficiency of at least 90 %.**Organisational measures to prevent/limit releases, dispersion and exposure** : Avoid contact with eyes.
Avoid contact with skin.**Conditions and measures related to personal protection, hygiene and health evaluation****Personal protection** : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training.
Wear suitable protective clothing and gloves.
Wash off any skin contamination immediately.**Respiratory protection** : Wear appropriate respiratory protection. Efficiency of at least 90 %.**Contributing scenario controlling worker exposure for 7: Use in batch and other process (synthesis) where opportunity for exposure arises****Product characteristics** : Liquid.**Concentration of substance in mixture or article** : Covers concentrations up to 100 %.**Frequency and duration of use/exposure** : Covers exposure up to 8 h (full shift).**Human factors not influenced by risk management** : Breathing volume: 10 m³/day.
Body weight: 70 kg.**Other conditions affecting workers exposure** : Indoor use.
Industrial.**Technical conditions and measures to control dispersion from source towards the worker** : Local exhaust ventilation - Efficiency of at least 90 %.**Organisational measures to prevent/limit releases, dispersion and exposure** : Avoid contact with eyes.
Avoid contact with skin.**Conditions and measures related to personal protection, hygiene and health evaluation****Personal protection** : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training.
Wear suitable protective clothing and gloves.
Wash off any skin contamination immediately.**Respiratory protection** : Wear appropriate respiratory protection. Efficiency of at least 90 %.

Contributing scenario controlling worker exposure for 8: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)

Product characteristics	: Liquid.
Concentration of substance in mixture or article	: Covers concentrations up to 100 %.
Frequency and duration of use/exposure	: Covers exposure up to 8 h (full shift).
Human factors not influenced by risk management	: Breathing volume: 10 m ³ /day. Body weight: 70 kg.
Other conditions affecting workers exposure	: Indoor use. Industrial.
Technical conditions and measures to control dispersion from source towards the worker	: Local exhaust ventilation - Efficiency of at least 90 %.
Organisational measures to prevent/limit releases, dispersion and exposure	: Avoid contact with eyes. Avoid contact with skin.
Conditions and measures related to personal protection, hygiene and health evaluation	
Personal protection	: Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls. Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. Wear suitable protective clothing and gloves. Wash off any skin contamination immediately.
Respiratory protection	: Wear appropriate respiratory protection. Efficiency of at least 90 %.

Contributing scenario controlling worker exposure for 9: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

Product characteristics	: Liquid.
Concentration of substance in mixture or article	: Covers concentrations up to 100 %.
Frequency and duration of use/exposure	: Avoid carrying out activities involving exposure for more than 1 hour.
Human factors not influenced by risk management	: Breathing volume: 10 m ³ /day. Body weight: 70 kg.
Other conditions affecting workers exposure	: Indoor use. Industrial.
Technical conditions and measures to control dispersion from source towards the worker	: Local exhaust ventilation - Efficiency of at least 90 %.
Organisational measures to prevent/limit releases, dispersion and exposure	: Avoid contact with eyes. Avoid contact with skin.
Conditions and measures related to personal protection, hygiene and health evaluation	
Personal protection	: Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls. Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. Wear suitable protective clothing and gloves. Wash off any skin contamination immediately.
Respiratory protection	: Wear appropriate respiratory protection. Efficiency of at least 95 %.

Contributing scenario controlling worker exposure for 10: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics	: Liquid.
Concentration of substance in mixture or article	: Covers concentrations up to 100 %.
Frequency and duration of use/exposure	: Avoid carrying out activities involving exposure for more than 4 hours.
Human factors not influenced by risk management	: Breathing volume: 10 m ³ /day. Body weight: 70 kg.
Other conditions affecting workers exposure	: Indoor use. Industrial.
Technical conditions and measures to control dispersion from source towards the worker	: Local exhaust ventilation - Efficiency of at least 90 %.
Organisational measures to prevent/limit releases, dispersion and exposure	: Avoid contact with eyes. Avoid contact with skin.
Conditions and measures related to personal protection, hygiene and health evaluation	
Personal protection	: Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls. Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. Wear suitable protective clothing and gloves. Wash off any skin contamination immediately.

Contributing scenario controlling worker exposure for 11: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Product characteristics	: Liquid.
Concentration of substance in mixture or article	: Covers concentrations up to 100 %.
Frequency and duration of use/exposure	: Covers exposure up to 8 h (full shift).
Human factors not influenced by risk management	: Breathing volume: 10 m ³ /day. Body weight: 70 kg.
Other conditions affecting workers exposure	: Indoor use. Industrial.
Technical conditions and measures to control dispersion from source towards the worker	: Local exhaust ventilation - Efficiency of at least 90 %.
Organisational measures to prevent/limit releases, dispersion and exposure	: Avoid contact with eyes. Avoid contact with skin.
Conditions and measures related to personal protection, hygiene and health evaluation	
Personal protection	: Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls. Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. Wear suitable protective clothing and gloves. Wash off any skin contamination immediately.
Respiratory protection	: Wear appropriate respiratory protection. Efficiency of at least 90 %.

Contributing scenario controlling worker exposure for 12: Use as laboratory reagent

Product characteristics	: Liquid.
Concentration of substance in mixture or article	: Covers concentrations up to 100 %.
Frequency and duration of use/exposure	: Covers exposure up to 8 h (full shift).
Human factors not influenced by risk management	: Breathing volume: 10 m ³ /day. Body weight: 70 kg.
Other conditions affecting workers exposure	: Indoor use. Industrial.
Technical conditions and measures to control dispersion from source towards the worker	: Local exhaust ventilation - Efficiency of at least 90 %.
Organisational measures to prevent/limit releases, dispersion and exposure	: Avoid contact with eyes. Avoid contact with skin.
Conditions and measures related to personal protection, hygiene and health evaluation	
Personal protection	: Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls. Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. Wear suitable protective clothing and gloves. Wash off any skin contamination immediately.
Respiratory protection	: Wear appropriate respiratory protection. Efficiency of at least 90 %.

Section 3 - Exposure estimation and reference to its source**Exposure estimation and reference to its source - Environment: 1: Manufacturing/Use as an intermediate**

Exposure assessment (environment):	: EUSES v2.1
Exposure estimation	: Freshwater: 0.00815 mg/l. Risk characterisation ratio (PEC/PNEC): 0.326. Freshwater sediment: 2.61 mg/kg dwt. Risk characterisation ratio (PEC/PNEC): 0.326. Marine water: 0.000802 mg/l. Risk characterisation ratio (PEC/PNEC): 0.160. Marine water sediment: 0.256 mg/kg dwt. Risk characterisation ratio (PEC/PNEC): 0.160. Sewage Treatment Plant: 0.0000593 mg/l. Risk characterisation ratio (PEC/PNEC): 0.0000362. Soil: 0.00205 mg/kg dwt. Risk characterisation ratio (PEC/PNEC): 0.00129. Air: 0.0000283 mg/m ³ . Risk characterisation ratio (PEC/PNEC): Not applicable.
Remark	: Based on the applied RMMs the risk towards environment is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Environment: 2: Formulation

Exposure assessment (environment): : EUSES v2.1

Exposure estimation : Freshwater: 0.00815 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.326.

Freshwater sediment: 2.61 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.326.

Marine water: 0.000802 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.160.

Marine water sediment: 0.256 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.160.

Sewage Treatment Plant: 0 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.

Soil: 0.000710 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.000448.

Air: 0.00000567 mg/m³.
Risk characterisation ratio (PEC/PNEC): Not applicable.

Remark : Based on the applied RMMs the risk towards environment is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Environment: 3: Industrial manufacture of coatings and inks

Exposure assessment (environment): : EUSES v2.1

Exposure estimation : Freshwater: 0.00817 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.327.

Freshwater sediment: 2.61 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.327.

Marine water: 0.000839 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.168.

Marine water sediment: 0.268 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.168.

Sewage Treatment Plant: 0.037 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.00225.

Soil: 0.00071 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.000448.

Air: 0.00000567 mg/m³.
Risk characterisation ratio (PEC/PNEC): Not applicable.

Remark : Based on the applied RMMs the risk towards environment is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 4: Use in closed process, no likelihood of exposure

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Pentaethylenehexamine, PEHA	Exposure Scenario: 1.1	Use of ethylenamines (EA) in closed system with little opportunity for exposure - Use of EA up to 100% - Industrial.
Exposure estimation	<p>Worker - inhalative, long-term - systemic: 0.06 mg/m³. Risk characterisation ratio: 0.0609.</p> <p>Worker - dermal, long-term - systemic: 0.007 mg/kg bw/day. Risk characterisation ratio: 0.0120.</p> <p>Worker - combined, long-term - systemic: 0.073.</p> <p>Worker - inhalative, short-term - local: 0.12 mg/m³. Risk characterisation ratio: 0.000023.</p>	
Remark	: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).	
Exposure estimation and reference to its source - Workers: 5: Use in closed, continuous process with occasional controlled exposure		
Exposure assessment (human):	: ECETOC TRA, Version 2 (Modified version).	
Exposure estimation	: Risk characterisations have only been calculated for the highest exposure level. (Worst case assumption) see PROC08b.	
Remark	: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).	
Exposure estimation and reference to its source - Workers: 6: Use in closed batch process (synthesis or formulation)		
Exposure assessment (human):	: ECETOC TRA, Version 2 (Modified version).	
Exposure estimation	: Risk characterisations have only been calculated for the highest exposure level. (Worst case assumption) see PROC04, PROC09.	
Remark	: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).	
Exposure estimation and reference to its source - Workers: 7: Use in batch and other process (synthesis) where opportunity for exposure arises		
Exposure assessment (human):	: ECETOC TRA, Version 2 (Modified version).	
Exposure estimation	<p>Worker - inhalative, long-term - systemic: 0.3 mg/m³. Risk characterisation ratio: 0.3046.</p> <p>Worker - dermal, long-term - systemic: 0.14 mg/kg bw/day. Risk characterisation ratio: 0.2406.</p> <p>Worker - combined, long-term - systemic: 0.545.</p> <p>Worker - inhalative, short-term - local: 0.62 mg/m³. Risk characterisation ratio: 0.000113.</p>	
Remark	: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).	
Exposure estimation and reference to its source - Workers: 8: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)		
Exposure assessment (human):	: ECETOC TRA, Version 2 (Modified version).	
Exposure estimation	<p>Worker - inhalative, long-term - systemic: 0.3 mg/m³. Risk characterisation ratio: 0.3046.</p> <p>Worker - dermal, long-term - systemic: 0.27 mg/kg bw/day. Risk characterisation ratio: 0.4812.</p> <p>Worker - combined, long-term - systemic: 0.786.</p>	
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Worker - inhalative, short-term - local: 0.60 mg/m³.
Risk characterisation ratio: 0.000113.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 9: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : **Worker - inhalative, long-term - systemic:** 0.37 mg/m³.
Risk characterisation ratio: 0.3656.

Worker - dermal, long-term - systemic: 0.27 mg/kg bw/day.
Risk characterisation ratio: 0.4812.

Worker - combined, long-term - systemic: 0.847.

Worker - inhalative, short-term - local: 0.74 mg/m³.
Risk characterisation ratio: 0.000136.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 10: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : **Worker - inhalative, long-term - systemic:** 0.548 mg/m³.
Risk characterisation ratio: 0.5484.

Worker - dermal, long-term - systemic: 0.14 mg/kg bw/day.
Risk characterisation ratio: 0.2406.

Worker - combined, long-term - systemic: 0.789.

Worker - inhalative, short-term - local: 0.55 mg/m³.
Risk characterisation ratio: 0.000204.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 11: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : **Worker - inhalative, long-term - systemic:** 0.3 mg/m³.
Risk characterisation ratio: 0.3046.

Worker - dermal, long-term - systemic: 0.14 mg/kg bw/day.
Risk characterisation ratio: 0.2406.

Worker - combined, long-term - systemic: 0.545.

Worker - inhalative, short-term - local: 0.62 mg/m³.
Risk characterisation ratio: 0.000113.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 12: Use as laboratory reagent

- Exposure assessment (human):** : ECETOC TRA, Version 2 (Modified version).
- Exposure estimation** : Risk characterisations have only been calculated for the highest exposure level. (Worst case assumption) see PROC04, PROC09.
- Remark** : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

- General** : The immediate downstream user is required to evaluate whether the operational conditions and risk management measures described in the exposure scenario fit to his use. If other OC/RMM are adopted, the user has to ensure that risks are managed to at least equivalent levels. The risk assessment methods/tools given in section 3 may be used for this evaluation.
- Environment** : Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Further details on scaling and control technologies are provided in SpERC factsheet (<http://cefic.org/en/reach-for-industries-libraries.html>).
- Health** : ECETOC TRA, Version 2 (Modified version):
- adjusted efficacy values for gloves as adopted by CEFIC
- use of factor 2 to calculate peak exposure from long term exposure
- use of exact percentage (2%, 0.5%) in product instead of broad TRA categories

Annex to the extended Safety Data Sheet (eSDS)

Industrial

Identification of the substance or mixture

Product definition : UVCB
Product name : Pentaethylenehexamine, PEHA

Section 1 - Title

Short title of the exposure scenario : Use of ethylenamines (EA) in closed system with little opportunity for exposure - Use of preparations containing EA up to 2% - Industrial/Professional.

List of use descriptors : **Identified use name: ES 1.2:** Use of ethylenamines (EA) in closed system with little opportunity for exposure - Use of preparations containing EA up to 2% - Industrial/Professional: SU03, SU22; PROC05, PROC08a, PROC08b, PROC09; ERC01, ERC02, ERC06a
Process Category: PROC05, PROC08a, PROC08b, PROC09
Substance supplied to that use in form of: As such
Subsequent service life relevant for that use: No.
Environmental Release Category: ERC01, ERC02, ERC06a

Environmental contributing scenarios : **All ERCs (see above)**

Health Contributing scenarios : **Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) - PROC05**
Transfer of substance or preparation (charging/discharging) from/to vessels/ large containers at non-dedicated facilities - PROC08a
Transfer of substance or preparation (charging/discharging) from/to vessels/ large containers at dedicated facilities - PROC08b
Transfer of substance or preparation into small containers (dedicated filling line, including weighing) - PROC09

Number of the ES	: 1.2
Additional information	: Sector of uses [SU]: SU06b, SU08, SU09, SU10 Product categories [PC]: PC02, PC03, PC10, PC19, PC21, PC22, PC24, PC26, PC32
	Free short title of the generic exposure scenario: Use of the diluted product (up to 2% content) upon manufacturing of chemicals for which the EA is an intermediate and chemical preparations containing the substance.

Section 2 - Exposure controls

Contributing scenario controlling environmental exposure for 1: All ERCs (see above)
see ES 1.1.

Contributing scenario controlling worker exposure for 2: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)

Product characteristics : Liquid.
Concentration of substance in mixture or article : Covers concentrations up to 2 %.
Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).
Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.
Other conditions affecting workers exposure : Indoor use.
Industrial.

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

Pentaethylenehexamine, PEHA Exposure Scenario: 1.2 **Use of ethylenamines (EA) in closed system with little opportunity for exposure - Use of preparations containing EA up to 2% - Industrial/ Professional.**

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 3: Transfer of substance or preparation (charging/ discharging) from/to vessels/large containers at non-dedicated facilities

Product characteristics : Liquid.

Concentration of substance in mixture or article : Covers concentrations up to 2 %.

Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).

Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.

Other conditions affecting workers exposure : Indoor use.
Industrial.
Professional.

Technical conditions and measures to control dispersion from source towards the worker : Local exhaust ventilation - Efficiency of at least 90 %.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 4: Transfer of substance or preparation (charging/ discharging) from/to vessels/large containers at dedicated facilities

Product characteristics : Liquid.

Concentration of substance in mixture or article : Covers concentrations up to 2 %.

Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).

Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.

Other conditions affecting workers exposure : Indoor use.
Industrial.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 5: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Product characteristics : Liquid.

Concentration of substance in mixture or article : Covers concentrations up to 2 %.

Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).

Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.

Pentaethylenehexamine, PEHA Exposure Scenario: 1.2 *Use of ethylenamines (EA) in closed system with little opportunity for exposure - Use of preparations containing EA up to 2% - Industrial/ Professional.*

Other conditions affecting workers exposure : Indoor use.
Industrial.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Section 3 - Exposure estimation and reference to its source

Exposure estimation and reference to its source - Environment: 1: All ERCs (see above)

Exposure assessment (environment): : see ES 1.1.

Exposure estimation : see ES 1.1.

Exposure estimation and reference to its source - Workers: 2: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : **Worker - inhalative, long-term - systemic:** 0.61 mg/m³.
Risk characterisation ratio: 0.6093.

Worker - dermal, long-term - systemic: 0.005 mg/kg bw/day.
Risk characterisation ratio: 0.0481.

Worker - combined, long-term - systemic: 0.657.

Worker - inhalative, short-term - local: 1.22 mg/m³.
Risk characterisation ratio: 0.00023.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 3: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : **Worker - inhalative, long-term - systemic:** 0.31 mg/m³.
Risk characterisation ratio: 0.3046.

Worker - dermal, long-term - systemic: 0.005 mg/kg bw/day.
Risk characterisation ratio: 0.0962.

Worker - combined, long-term - systemic: 0.401.

Worker - inhalative, short-term - local: 0.61 mg/m³.
Risk characterisation ratio: 0.00011.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 4: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : Risk characterisations have only been calculated for the highest exposure level. (Worst case assumption)
see PROC05.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 5: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

- Exposure assessment (human):** : ECETOC TRA, Version 2 (Modified version).
- Exposure estimation** : Risk characterisations have only been calculated for the highest exposure level. (Worst case assumption) see PROC05.
- Remark** : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

- General** : The immediate downstream user is required to evaluate whether the operational conditions and risk management measures described in the exposure scenario fit to his use. If other OC/RMM are adopted, the user has to ensure that risks are managed to at least equivalent levels. The risk assessment methods/tools given in section 3 may be used for this evaluation.
- Environment** : Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Further details on scaling and control technologies are provided in SpERC factsheet (<http://cefic.org/en/reach-for-industries-libraries.html>).
- Health** : ECETOC TRA, Version 2 (Modified version):
- adjusted efficacy values for gloves as adopted by CEFIC
- use of factor 2 to calculate peak exposure from long term exposure
- use of exact percentage (2%, 0.5%) in product instead of broad TRA categories

Annex to the extended Safety Data Sheet (eSDS)

Industrial

Identification of the substance or mixture

Product definition : UVCB
Product name : Pentaethylenehexamine, PEHA

Section 1 - Title

Short title of the exposure scenario : Use of ethylenamines (EA) in closed system with little opportunity for exposure - Use of preparations containing EA up to 0.5% - Industrial/Professional.

List of use descriptors : **Identified use name: ES 1.3:** Use of ethylenamines (EA) in closed system with little opportunity for exposure - Use of preparations containing EA up to 0.5% - Industrial/Professional: SU03, SU22; PROC05, PROC08a, PROC08b, PROC09; ERC01, ERC02, ERC06a
Process Category: PROC05, PROC08a, PROC08b, PROC09
Substance supplied to that use in form of: As such
Subsequent service life relevant for that use: No.
Environmental Release Category: ERC01, ERC02, ERC06a

Environmental contributing scenarios : **All ERCs (see above)**

Health Contributing scenarios : **Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) - PROC05**
Transfer of substance or preparation (charging/discharging) from/to vessels/ large containers at non-dedicated facilities - PROC08a
Transfer of substance or preparation (charging/discharging) from/to vessels/ large containers at dedicated facilities - PROC08b
Transfer of substance or preparation into small containers (dedicated filling line, including weighing) - PROC09

Number of the ES	: 1.3
Additional information	: Sector of uses [SU]: SU06b, SU08, SU09, SU10 Product categories [PC]: PC02, PC03, PC10, PC19, PC21, PC22, PC24, PC26, PC32 Free short title of the generic exposure scenario: Use of diluted product (up to 0.5% content) upon manufacturing of chemicals for which the EA is an intermediate and chemical preparations containing the substance.

Section 2 - Exposure controls

Contributing scenario controlling environmental exposure for 1: All ERCs (see above)
see ES 1.1.

Contributing scenario controlling worker exposure for 2: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)

Product characteristics	: Liquid.
Concentration of substance in mixture or article	: Covers concentrations up to 0.5 %.
Frequency and duration of use/exposure	: Covers exposure up to 8 h (full shift).
Human factors not influenced by risk management	: Breathing volume: 10 m ³ /day. Body weight: 70 kg.
Other conditions affecting workers exposure	: Indoor use. Industrial.

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

Pentaethylenehexamine, PEHA Exposure Scenario: 1.3 **Use of ethylenamines (EA) in closed system with little opportunity for exposure - Use of preparations containing EA up to 0.5% - Industrial/ Professional.**

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 3: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

Product characteristics : Liquid.
Concentration of substance in mixture or article : Covers concentrations up to 0.5 %.
Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).
Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.
Other conditions affecting workers exposure : Indoor use.
Industrial.
Professional.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 4: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics : Liquid.
Concentration of substance in mixture or article : Covers concentrations up to 0.5 %.
Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).
Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.
Other conditions affecting workers exposure : Indoor use.
Industrial.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 5: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Product characteristics : Liquid.
Concentration of substance in mixture or article : Covers concentrations up to 0.5 %.
Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).
Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.
Other conditions affecting workers exposure : Indoor use.
Industrial.

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

Pentaethylenehexamine, PEHA Exposure Scenario: 1.3 *Use of ethylenamines (EA) in closed system with little opportunity for exposure - Use of preparations containing EA up to 0.5% - Industrial/ Professional.*

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Section 3 - Exposure estimation and reference to its source

Exposure estimation and reference to its source - Environment: 1: All ERCs (see above)

Exposure assessment (environment): : see ES 1.1.

Exposure estimation : see ES 1.1.

Exposure estimation and reference to its source - Workers: 2: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : Risk characterisations have only been calculated for the highest exposure level. (Worst case assumption)
see PROC08a.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 3: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : **Worker - inhalative, long-term - systemic:** 0.76 mg/m³.
Risk characterisation ratio: 0.7616.

Worker - dermal, long-term - systemic: 0.001 mg/kg bw/day.
Risk characterisation ratio: 0.0241.

Worker - combined, long-term - systemic: 0.786.

Worker - inhalative, short-term - local: 1.52 mg/m³.
Risk characterisation ratio: 0.00028.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 4: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : Risk characterisations have only been calculated for the highest exposure level. (Worst case assumption)
see PROC08a.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 5: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : Risk characterisations have only been calculated for the highest exposure level. (Worst case assumption)
see PROC08a.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

General

: The immediate downstream user is required to evaluate whether the operational conditions and risk management measures described in the exposure scenario fit to his use. If other OC/RMM are adopted, the user has to ensure that risks are managed to at least equivalent levels. The risk assessment methods/tools given in section 3 may be used for this evaluation.

Environment

: Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Further details on scaling and control technologies are provided in SpERC factsheet (<http://cefic.org/en/reach-for-industries-libraries.html>).

Health

: ECETOC TRA, Version 2 (Modified version):
- adjusted efficacy values for gloves as adopted by CEFIC
- use of factor 2 to calculate peak exposure from long term exposure
- use of exact percentage (2%, 0.5%) in product instead of broad TRA categories

Annex to the extended Safety Data Sheet (eSDS)

Industrial

Identification of the substance or mixture

Product definition : UVCB
Product name : Pentaethylenehexamine, PEHA

Section 1 - Title

Short title of the exposure scenario : Use of preparations containing ethylenamines (EA) in open processes with low exposure potential and evaporation as most likely exposure form - Use of preparations containing EA up to 2% - Industrial/Professional.

List of use descriptors : **Identified use name: ES 2.1:** Use of preparations containing ethylenamines (EA) in open processes with low exposure potential and evaporation as most likely exposure form - Use of preparations containing EA up to 2% - Industrial/Professional: SU03, SU22; PROC05, PROC06, PROC08a, PROC08b, PROC09, PROC10, PROC13, PROC16; ERC01, ERC04, ERC08a, ERC08b, ERC08d, ERC10b
Process Category: PROC05, PROC06, PROC08a, PROC08b, PROC09, PROC10, PROC13, PROC16
Substance supplied to that use in form of: In a mixture
Subsequent service life relevant for that use: No.
Environmental Release Category: ERC01, ERC04, ERC08a, ERC08b, ERC08d, ERC10b

Environmental contributing scenarios : **Fuel additive.**
Detergents
Wood preservative.

Health Contributing scenarios : **Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) - PROC05**
Calendering operations - PROC06
Transfer of substance or preparation (charging/discharging) from/to vessels/ large containers at non-dedicated facilities - PROC08a
Transfer of substance or preparation (charging/discharging) from/to vessels/ large containers at dedicated facilities - PROC08b
Transfer of substance or preparation into small containers (dedicated filling line, including weighing) - PROC09
Roller application or brushing of adhesive and other coating - PROC10
Treatment of articles by dipping and pouring - PROC13
Using material as fuel sources, limited exposure to unburned product to be expected - PROC16

Number of the ES	: 2.1
Additional information	: Product categories [PC]: PC08, PC23
	Free short title of the generic exposure scenario: Use of the diluted product (up to 2% content) upon manufacturing of chemicals for which the EA is an intermediate and chemical preparations containing the substance.

Section 2 - Exposure controls

Contributing scenario controlling environmental exposure for 1: Fuel additive.	
Amounts used	: Annual amount used in the EU: 372 tonnes/year. Fraction of EU tonnage used in region: 0.0005. Daily amount per site: 0.51 kg/day. Annual site tonnage: 0.19 tonnes/year.
Frequency and duration of use	: Continuous. Emission days: 365 days per year.
Environment factors not influenced by risk management	: Local freshwater dilution factor: 1300. Local marine water dilution factor: 1000.

Pentaethylenehexamine, PEHA	Exposure Scenario: 2.1	Use of preparations containing ethylenamines (EA) in open processes with low exposure potential and evaporation as most likely exposure form - Use of preparations containing EA up to 2% - Industrial/Professional.
Other conditions affecting environmental exposure	: Release to waste water from process: 0 % (ESVOC 29) Release to air from process: 0.001 % (Industry Specific Data) Release to soil from process: 0 % (ESVOC 29)	
Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil	: No air emission controls required; required removal efficiency is 0%. No wastewater treatment required. Soil emission controls are not applicable as there is no direct release to soil.	
Contributing scenario controlling environmental exposure for 2: Detergents		
Amounts used	: Annual amount used in the EU: 372 tonnes/year. Fraction of EU tonnage used in region: 0.9. Daily amount per site: 917 kg/day. Annual site tonnage: 335 tonnes/year.	
Frequency and duration of use	: Continuous. Emission days: 365 days per year.	
Environment factors not influenced by risk management	: Local freshwater dilution factor: 1300. Local marine water dilution factor: 1000.	
Other conditions affecting environmental exposure	: Release to waste water from process: 18.5 % (A&B table approach) Release to air from process: 0.001 % (Industry Specific Data) Release to soil from process: 0.01 % (A&B table approach)	
Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil	: No air emission controls required; required removal efficiency is 0%. Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of ≥ 27.7 %. Soil emission controls are not applicable as there is no direct release to soil.	
Contributing scenario controlling environmental exposure for 3: Wood preservative.		
Amounts used	: Annual amount used in the EU: 484 tonnes/year. Fraction of EU tonnage used in region: 0.0091. Daily amount per site: 12.1 kg/day. Annual site tonnage: 4.4 tonnes/year.	
Frequency and duration of use	: Continuous. Emission days: 365 days per year.	
Environment factors not influenced by risk management	: Local freshwater dilution factor: 1000. Local marine water dilution factor: 1000.	
Other conditions affecting environmental exposure	: Release to waste water from process: 2 % (Industry Specific Data) Release to air from process: 0.001 % (Industry Specific Data) Release to soil from process: 0 % (EFCC 5)	
Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil	: No air emission controls required; required removal efficiency is 0%. Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of ≥ 27.7 %. Soil emission controls are not applicable as there is no direct release to soil.	
Contributing scenario controlling worker exposure for 4: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)		
Product characteristics	: Liquid.	
Concentration of substance in mixture or article	: Covers concentrations up to 2 %.	
Frequency and duration of use/exposure	: Covers exposure up to 8 h (full shift).	
Human factors not influenced by risk management	: Breathing volume: 10 m ³ /day. Body weight: 70 kg.	
Date of issue/Date of revision	: 05/10/2017	Version : 8 / en 37/100

Other conditions affecting workers exposure : Indoor use.
Industrial.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 5: Calendering operations

Product characteristics : Liquid.

Concentration of substance in mixture or article : Covers concentrations up to 2 %.

Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).

Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.

Other conditions affecting workers exposure : Indoor use.
Industrial.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 6: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

Product characteristics : Liquid.

Concentration of substance in mixture or article : Covers concentrations up to 2 %.

Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).

Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.

Other conditions affecting workers exposure : Indoor use.
Industrial.
Professional.

Technical conditions and measures to control dispersion from source towards the worker : Local exhaust ventilation - Efficiency of at least 90 %.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 7: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics	: Liquid.
Concentration of substance in mixture or article	: Covers concentrations up to 2 %.
Frequency and duration of use/exposure	: Covers exposure up to 8 h (full shift).
Human factors not influenced by risk management	: Breathing volume: 10 m ³ /day. Body weight: 70 kg.
Other conditions affecting workers exposure	: Indoor use. Industrial.
Conditions and measures related to personal protection, hygiene and health evaluation	
Personal protection	: Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls. Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 8: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Product characteristics	: Liquid.
Concentration of substance in mixture or article	: Covers concentrations up to 2 %.
Frequency and duration of use/exposure	: Covers exposure up to 8 h (full shift).
Human factors not influenced by risk management	: Breathing volume: 10 m ³ /day. Body weight: 70 kg.
Other conditions affecting workers exposure	: Indoor use. Industrial.
Conditions and measures related to personal protection, hygiene and health evaluation	
Personal protection	: Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls. Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 9: Roller application or brushing of adhesive and other coating

Product characteristics	: Liquid.
Concentration of substance in mixture or article	: Covers concentrations up to 2 %.
Frequency and duration of use/exposure	: Covers exposure up to 8 h (full shift).
Human factors not influenced by risk management	: Breathing volume: 10 m ³ /day. Body weight: 70 kg.
Other conditions affecting workers exposure	: Indoor use. Professional.
Technical conditions and measures to control dispersion from source towards the worker	: Local exhaust ventilation - Efficiency of at least 90 %.

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

Pentaethylenehexamine, PEHA Exposure Scenario: 2.1 *Use of preparations containing ethylenamines (EA) in open processes with low exposure potential and evaporation as most likely exposure form - Use of preparations containing EA up to 2% - Industrial/Professional.*

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 10: Treatment of articles by dipping and pouring

Product characteristics : Liquid.
Concentration of substance in mixture or article : Covers concentrations up to 2 %.
Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).
Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.
Other conditions affecting workers exposure : Indoor use.
Industrial.
Technical conditions and measures to control dispersion from source towards the worker : Local exhaust ventilation - Efficiency of at least 90 %.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 11: Using material as fuel sources, limited exposure to unburned product to be expected

Product characteristics : Liquid.
Concentration of substance in mixture or article : Covers concentrations up to 2 %.
Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).
Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.
Other conditions affecting workers exposure : Indoor use.
Industrial.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Section 3 - Exposure estimation and reference to its source

Exposure estimation and reference to its source - Environment: 1: Fuel additive.

Exposure assessment (environment): : EUSES v2.1

Exposure estimation : Freshwater: 0.00815 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.326.

Freshwater sediment: 2.61 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.326.

Marine water: 0.000802 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.160.

Marine water sediment: 0.256 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.160.

Sewage Treatment Plant: Not applicable.
Risk characterisation ratio (PEC/PNEC): Not applicable.

Soil: 0.000375 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.000237.

Air: 0.0000000142 mg/m³.
Risk characterisation ratio (PEC/PNEC): Not applicable.

Remark : Based on the applied RMMs the risk towards environment is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Environment: 2: Detergents

Exposure assessment (environment): : EUSES v2.1

Exposure estimation : Freshwater: 0.0095 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.379.

Freshwater sediment: 2.63 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.379.

Marine water: 0.00475 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.95.

Marine water sediment: 0.284 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.95.

Sewage Treatment Plant: 4.14 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.253.

Soil: 0.000377 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.00024.

Air: 0.00000013 mg/m³.
Risk characterisation ratio (PEC/PNEC): Not applicable.

Remark : Based on the applied RMMs the risk towards environment is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Environment: 3: Wood preservative.

Exposure assessment (environment): : EUSES v2.1

Exposure estimation : Freshwater: 0.00821 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.329.

Freshwater sediment: 2.63 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.329.

Marine water: 0.000889 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.178.

Marine water sediment: 0.284 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.178.

Sewage Treatment Plant: 0.087 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.00531.

Soil: 0.000377 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.000238.

Air: 0.000000335 mg/m³.
Risk characterisation ratio (PEC/PNEC): Not applicable.

Remark : Based on the applied RMMs the risk towards environment is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 4: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : **Worker - inhalative, long-term - systemic:** 0.61 mg/m³.
Risk characterisation ratio: 0.6093.

Worker - dermal, long-term - systemic: 0.055 mg/kg bw/day.
Risk characterisation ratio: 0.0962.

Worker - combined, long-term - systemic: 0.70553.

Worker - inhalative, short-term - local: 1.22 mg/m³.
Risk characterisation ratio: 0.00023.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 5: Calendering operations

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : **Worker - inhalative, long-term - systemic:** 0.61 mg/m³.
Risk characterisation ratio: 0.6093.

Worker - dermal, long-term - systemic: 0.055 mg/kg bw/day.
Risk characterisation ratio: 0.0962.

Worker - combined, long-term - systemic: 0.70553.

Worker - inhalative, short-term - local: 1.22 mg/m³.
Risk characterisation ratio: 0.00023.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 6: Transfer of substance or preparation (charging/ discharging) from/to vessels/large containers at non-dedicated facilities

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : **Worker - inhalative, long-term - systemic:** 0.305 mg/m³.
Risk characterisation ratio: 0.3046.

Worker - dermal, long-term - systemic: 0.110 mg/kg bw/day.
Risk characterisation ratio: 0.1925.

Worker - combined, long-term - systemic: 0.49713.

Worker - inhalative, short-term - local: 0.61 mg/m³.
Risk characterisation ratio: 0.00011.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 7: Transfer of substance or preparation (charging/ discharging) from/to vessels/large containers at dedicated facilities

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : **Worker - inhalative, long-term - systemic:** 0.61 mg/m³.
Risk characterisation ratio: 0.6093.

Worker - dermal, long-term - systemic: 0.055 mg/kg bw/day.
Risk characterisation ratio: 0.0962.

Worker - combined, long-term - systemic: 0.70553.

Worker - inhalative, short-term - local: 1.22 mg/m³.
Risk characterisation ratio: 0.00023.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 8: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : **Worker - inhalative, long-term - systemic:** 0.61 mg/m³.
Risk characterisation ratio: 0.6093.

Worker - dermal, long-term - systemic: 0.055 mg/kg bw/day.
Risk characterisation ratio: 0.0962.

Worker - combined, long-term - systemic: 0.70553.

Worker - inhalative, short-term - local: 1.22 mg/m³.
Risk characterisation ratio: 0.00023.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 9: Roller application or brushing of adhesive and other coating

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : **Worker - inhalative, long-term - systemic:** 0.305 mg/m³.
Risk characterisation ratio: 0.3046.

Worker - dermal, long-term - systemic: 0.110 mg/kg bw/day.
Risk characterisation ratio: 0.1925.

Worker - combined, long-term - systemic: 0.49713.

Pentaethylenehexamine, PEHA Exposure Scenario: 2.1 *Use of preparations containing ethylenamines (EA) in open processes with low exposure potential and evaporation as most likely exposure form - Use of preparations containing EA up to 2% - Industrial/Professional.*

Worker - inhalative, short-term - local: 0.61 mg/m³.
Risk characterisation ratio: 0.00011.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 10: Treatment of articles by dipping and pouring

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : **Worker - inhalative, long-term - systemic:** 0.305 mg/m³.
Risk characterisation ratio: 0.3046.

Worker - dermal, long-term - systemic: 0.110 mg/kg bw/day.
Risk characterisation ratio: 0.1925.

Worker - combined, long-term - systemic: 0.49713.

Worker - inhalative, short-term - local: 0.61 mg/m³.
Risk characterisation ratio: 0.00011.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 11: Using material as fuel sources, limited exposure to unburned product to be expected

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : Risk characterisations have only been calculated for the highest exposure level. (Worst case assumption)
see PROC005/PROC06/PROC08b/PROC09/PROC16.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

General	: The immediate downstream user is required to evaluate whether the operational conditions and risk management measures described in the exposure scenario fit to his use. If other OC/RMM are adopted, the user has to ensure that risks are managed to at least equivalent levels. The risk assessment methods/tools given in section 3 may be used for this evaluation.
Environment	: Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html).
Health	: ECETOC TRA, Version 2 (Modified version): - adjusted efficacy values for gloves as adopted by CEFIC - use of factor 2 to calculate peak exposure from long term exposure - use of exact percentage (2%, 0.5%) in product instead of broad TRA categories

Annex to the extended Safety Data Sheet (eSDS)

Industrial

Identification of the substance or mixture

Product definition : UVCB
Product name : Pentaethylenehexamine, PEHA

Section 1 - Title

Short title of the exposure scenario : Use of preparations containing ethylenamines (EA) in open processes with low exposure potential and evaporation as most likely exposure form - Use of preparations containing EA up to 0.5% - Industrial/Professional.

List of use descriptors : **Identified use name: ES 2.2:** Use of preparations containing ethylenamines (EA) in open processes with low exposure potential and evaporation as most likely exposure form - Use of preparations containing EA up to 0.5% - Industrial/Professional: SU03, SU22; PROC05, PROC06, PROC08a, PROC08b, PROC09, PROC10, PROC13, PROC16; ERC01, ERC04, ERC08a, ERC08b, ERC08d, ERC10b
Process Category: PROC05, PROC06, PROC08a, PROC08b, PROC09, PROC10, PROC13, PROC16
Substance supplied to that use in form of: In a mixture
Subsequent service life relevant for that use: No.
Environmental Release Category: ERC01, ERC04, ERC08a, ERC08b, ERC08d, ERC10b

Environmental contributing scenarios : **All ERCs (see above)**

Health Contributing scenarios : **Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) - PROC05**
Calendering operations - PROC06
Transfer of substance or preparation (charging/discharging) from/to vessels/ large containers at non-dedicated facilities - PROC08a
Transfer of substance or preparation (charging/discharging) from/to vessels/ large containers at dedicated facilities - PROC08b
Transfer of substance or preparation into small containers (dedicated filling line, including weighing) - PROC09
Roller application or brushing of adhesive and other coating - PROC10
Treatment of articles by dipping and pouring - PROC13
Using material as fuel sources, limited exposure to unburned product to be expected - PROC16

Number of the ES	: 2.2
Additional information	: Product categories [PC]: PC08, PC23
	Free short title of the generic exposure scenario: Use of diluted product (up to 0.5% content) upon manufacturing of chemicals for which the EA is an intermediate and chemical preparations containing the substance.

Section 2 - Exposure controls

Contributing scenario controlling environmental exposure for 1: All ERCs (see above) see ES 2.1.	
Contributing scenario controlling worker exposure for 2: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)	
Product characteristics	: Liquid.
Concentration of substance in mixture or article	: Covers concentrations up to 0.5 %.
Frequency and duration of use/exposure	: Covers exposure up to 8 h (full shift).
Date of issue/Date of revision	: 05/10/2017
Version	: 8 / en 45/100

Pentaethylenehexamine, PEHA Exposure Scenario: 2.2 *Use of preparations containing ethylenamines (EA) in open processes with low exposure potential and evaporation as most likely exposure form - Use of preparations containing EA up to 0.5% - Industrial/Professional.*

Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.

Other conditions affecting workers exposure : Indoor use.
Industrial.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 3: Calendering operations

Product characteristics : Liquid.

Concentration of substance in mixture or article : Covers concentrations up to 0.5 %.

Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).

Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.

Other conditions affecting workers exposure : Indoor use.
Industrial.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 4: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

Product characteristics : Liquid.

Concentration of substance in mixture or article : Covers concentrations up to 0.5 %.

Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).

Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.

Other conditions affecting workers exposure : Indoor use.
Industrial.
Professional.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 5: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics : Liquid.

Concentration of substance in mixture or article : Covers concentrations up to 0.5 %.

Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).

Pentaethylenehexamine, PEHA Exposure Scenario: 2.2 *Use of preparations containing ethylenamines (EA) in open processes with low exposure potential and evaporation as most likely exposure form - Use of preparations containing EA up to 0.5% - Industrial/Professional.*

Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.

Other conditions affecting workers exposure : Indoor use.
Industrial.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 6: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Product characteristics : Liquid.

Concentration of substance in mixture or article : Covers concentrations up to 0.5 %.

Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).

Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.

Other conditions affecting workers exposure : Indoor use.
Industrial.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 7: Roller application or brushing of adhesive and other coating

Product characteristics : Liquid.

Concentration of substance in mixture or article : Covers concentrations up to 0.5 %.

Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).

Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.

Other conditions affecting workers exposure : Indoor use.
Professional.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 8: Treatment of articles by dipping and pouring

Product characteristics : Liquid.

Concentration of substance in mixture or article : Covers concentrations up to 0.5 %.

Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).

Pentaethylenehexamine, PEHA	Exposure Scenario: 2.2	Use of preparations containing ethylenamines (EA) in open processes with low exposure potential and evaporation as most likely exposure form - Use of preparations containing EA up to 0.5% - Industrial/Professional.
Human factors not influenced by risk management	: Breathing volume: 10 m ³ /day. Body weight: 70 kg.	
Other conditions affecting workers exposure	: Indoor use. Industrial.	
Conditions and measures related to personal protection, hygiene and health evaluation		
Personal protection	: Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls. Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).	

Contributing scenario controlling worker exposure for 9: Using material as fuel sources, limited exposure to unburned product to be expected		
Product characteristics	: Liquid.	
Concentration of substance in mixture or article	: Covers concentrations up to 0.5 %.	
Frequency and duration of use/exposure	: Covers exposure up to 8 h (full shift).	
Human factors not influenced by risk management	: Breathing volume: 10 m ³ /day. Body weight: 70 kg.	
Other conditions affecting workers exposure	: Indoor use. Industrial.	
Conditions and measures related to personal protection, hygiene and health evaluation		
Personal protection	: Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls. Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).	

Section 3 - Exposure estimation and reference to its source

Exposure estimation and reference to its source - Environment: 1: All ERCs (see above)		
Exposure assessment (environment):	: see ES 2.1.	
Exposure estimation	: see ES 2.1.	

Exposure estimation and reference to its source - Workers: 2: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)		
Exposure assessment (human):	: ECETOC TRA, Version 2 (Modified version).	
Exposure estimation	: Risk characterisations have only been calculated for the highest exposure level. (Worst case assumption) see PROC08a/PROC10.	
Remark	: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).	

Exposure estimation and reference to its source - Workers: 3: Calendring operations		
Exposure assessment (human):	: ECETOC TRA, Version 2 (Modified version).	
Exposure estimation	: Risk characterisations have only been calculated for the highest exposure level. (Worst case assumption) see PROC08a/PROC10.	
Remark	: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).	

Exposure estimation and reference to its source - Workers: 4: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : **Worker - inhalative, long-term - systemic:** 0.76 mg/m³.
Risk characterisation ratio: 0.7616.

Worker - dermal, long-term - systemic: 0.027 mg/kg bw/day.
Risk characterisation ratio: 0.0241.

Worker - combined, long-term - systemic: 0.786.

Worker - inhalative, short-term - local: 1.52 mg/m³.
Risk characterisation ratio: 0.0003.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 5: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : Risk characterisations have only been calculated for the highest exposure level. (Worst case assumption)
see PROC08a/PROC10.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 6: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : Risk characterisations have only been calculated for the highest exposure level. (Worst case assumption)
see PROC08a/PROC10.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 7: Roller application or brushing of adhesive and other coating

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : **Worker - inhalative, long-term - systemic:** 0.76 mg/m³.
Risk characterisation ratio: 0.7616.

Worker - dermal, long-term - systemic: 0.027 mg/kg bw/day.
Risk characterisation ratio: 0.0241.

Worker - combined, long-term - systemic: 0.786.

Worker - inhalative, short-term - local: 1.52 mg/m³.
Risk characterisation ratio: 0.0003.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 8: Treatment of articles by dipping and pouring

- Exposure assessment (human):** : ECETOC TRA, Version 2 (Modified version).
- Exposure estimation** : Risk characterisations have only been calculated for the highest exposure level. (Worst case assumption)
see PROC08a/PROC10.
- Remark** : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 9: Using material as fuel sources, limited exposure to unburned product to be expected

- Exposure assessment (human):** : ECETOC TRA, Version 2 (Modified version).
- Exposure estimation** : Risk characterisations have only been calculated for the highest exposure level. (Worst case assumption)
see PROC08a/PROC10.
- Remark** : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

- General** : The immediate downstream user is required to evaluate whether the operational conditions and risk management measures described in the exposure scenario fit to his use. If other OC/RMM are adopted, the user has to ensure that risks are managed to at least equivalent levels. The risk assessment methods/tools given in section 3 may be used for this evaluation.
- Environment** : Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Further details on scaling and control technologies are provided in SpERC factsheet (<http://cefic.org/en/reach-for-industries-libraries.html>).
- Health** : ECETOC TRA, Version 2 (Modified version):
- adjusted efficacy values for gloves as adopted by CEFIC
- use of factor 2 to calculate peak exposure from long term exposure
- use of exact percentage (2%, 0.5%) in product instead of broad TRA categories

Annex to the extended Safety Data Sheet (eSDS)

Industrial

Identification of the substance or mixture

Product definition : UVCB
Product name : Pentaethylenehexamine, PEHA

Section 1 - Title

Short title of the exposure scenario : Use of ethylenamines (EA) in open processes with high exposure potential and evaporation and aerosol formation as possible exposure forms - Use of preparations containing EA up to 25% - Industrial/Professional.

List of use descriptors : **Identified use name: ES 3.1:** Use of ethylenamines (EA) in open processes with high exposure potential and evaporation and aerosol formation as possible exposure forms - Use of preparations containing EA up to 25% - Industrial/Professional: SU03, SU22; PROC05, PROC08a, PROC08b, PROC09; ERC01, ERC02, ERC04, ERC05, ERC06a, ERC06b, ERC06c, ERC06d, ERC08a, ERC08b, ERC08c, ERC08e, ERC08f, ERC11a
Process Category: PROC05, PROC08a, PROC08b, PROC09
Substance supplied to that use in form of: In a mixture
Subsequent service life relevant for that use: No.
Environmental Release Category: ERC01, ERC02, ERC04, ERC05, ERC06a, ERC06b, ERC06c, ERC06d, ERC08a, ERC08b, ERC08c, ERC08e, ERC08f, ERC11a

Environmental contributing scenarios : **Ashless dispersant**
Epoxy curing agent
Epoxy curing agent in paint
Lube oil use, industrial
Use in laboratories
Use in coatings; adhesive - Industrial
Use in coatings; adhesive - Professional

Health Contributing scenarios : **Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) - PROC05**
Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) - PROC05
Transfer of substance or preparation (charging/discharging) from/to vessels/ large containers at non-dedicated facilities - PROC08a
Transfer of substance or preparation (charging/discharging) from/to vessels/ large containers at non-dedicated facilities - PROC08a
Transfer of substance or preparation (charging/discharging) from/to vessels/ large containers at dedicated facilities - PROC08b
Transfer of substance or preparation into small containers (dedicated filling line, including weighing) - PROC09

Number of the ES	: 3.1
Additional information	: Sector of uses [SU]: SU01, SU06, SU08, SU09, SU10, SU11, SU12, SU13, SU14, SU16, SU17, SU19, SU23 Product categories [PC]: PC01, PC02, PC03, PC05, PC08, PC09a, PC09b, PC09, PC14, PC15, PC18, PC19, PC20, PC21, PC23, PC26, PC27, PC28, PC31, PC32, PC33, PC35, PC39 Free short title of the generic exposure scenario: Mixing or blending in batch processes for formulation of preparations and articles; Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities; Transfer of substance or preparation into small containers (dedicated filling line, including weighing); Industrial; Professional

Section 2 - Exposure controls

Contributing scenario controlling environmental exposure for 1: Ashless dispersant

Amounts used	: Annual amount used in the EU: 967 tonnes/year. Fraction of EU tonnage used in region: 1. Daily amount per site: 2649 kg/day. Annual site tonnage: 967 tonnes/year.
Frequency and duration of use	: Continuous. Emission days: 365 days per year.
Environment factors not influenced by risk management	: Local freshwater dilution factor: 1300. Local marine water dilution factor: 1000.
Other conditions affecting environmental exposure	: Release to waste water from process: 0 % (ESVOC 50) Release to air from process: 0.001 % (Industry Specific Data) Release to soil from process: 0 % (ESVOC 50)
Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil	: No air emission controls required; required removal efficiency is 0%. No wastewater treatment required. Soil emission controls are not applicable as there is no direct release to soil.

Contributing scenario controlling environmental exposure for 2: Epoxy curing agent

Amounts used	: Annual amount used in the EU: 372 tonnes/year. Fraction of EU tonnage used in region: 0.038. Daily amount per site: 47.1 kg/day. Annual site tonnage: 14.1 tonnes/year.
Frequency and duration of use	: Continuous. Emission days: 300 days per year.
Environment factors not influenced by risk management	: Local freshwater dilution factor: 1300. Local marine water dilution factor: 1000.
Other conditions affecting environmental exposure	: Release to waste water from process: 0 % (FEICA 7) Release to air from process: 0.001 % (Industry Specific Data) Release to soil from process: 0 % (FEICA 7)
Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil	: No air emission controls required; required removal efficiency is 0%. No wastewater treatment required. Soil emission controls are not applicable as there is no direct release to soil.

Contributing scenario controlling environmental exposure for 3: Epoxy curing agent in paint

Amounts used	: Annual amount used in the EU: 372 tonnes/year. Fraction of EU tonnage used in region: 0.095. Daily amount per site: 118 kg/day. Annual site tonnage: 35.3 tonnes/year.
Frequency and duration of use	: Continuous. Emission days: 300 days per year.
Environment factors not influenced by risk management	: Local freshwater dilution factor: 1300. Local marine water dilution factor: 1000.
Other conditions affecting environmental exposure	: Release to waste water from process: 0 % (FEICA 7) Release to air from process: 0.001 % (Industry Specific Data) Release to soil from process: 0 % (FEICA 7)

Pentaethylenehexamine, PEHA Exposure Scenario: 3.1 **Use of ethylenamines (EA) in open processes with high exposure potential and evaporation and aerosol formation as possible exposure forms - Use of preparations containing EA up to 25% - Industrial/Professional.**

Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil : No air emission controls required; required removal efficiency is 0%.
No wastewater treatment required.
Soil emission controls are not applicable as there is no direct release to soil.

Contributing scenario controlling environmental exposure for 4: Lube oil use, industrial

Amounts used : Annual amount used in the EU: 260 tonnes/year.
Fraction of EU tonnage used in region: 0.000717.
Daily amount per site: 0.85 kg/day.
Annual site tonnage: 0.19 tonnes/year.

Frequency and duration of use : Continuous. Emission days: 220 days per year.

Environment factors not influenced by risk management : Local freshwater dilution factor: 1300.
Local marine water dilution factor: 1000.

Other conditions affecting environmental exposure : Release to waste water from process: 0.1 % (ESVOC 31)
Release to air from process: 0.001 % (Industry Specific Data)
Release to soil from process: 0.1 % (ESVOC 31)

Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil : No air emission controls required; required removal efficiency is 0%.
Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of ≥ 27.7 %.
Soil emission controls are not applicable as there is no direct release to soil.

Contributing scenario controlling environmental exposure for 5: Use in laboratories

Amounts used : Annual amount used in the EU: 20.1 tonnes/year.
Fraction of EU tonnage used in region: 0.02.
Daily amount per site: 1.1 kg/day.
Annual site tonnage: 0.40 tonnes/year.

Frequency and duration of use : Continuous. Emission days: 365 days per year.

Environment factors not influenced by risk management : Local freshwater dilution factor: 1300.
Local marine water dilution factor: 1000.

Other conditions affecting environmental exposure : Release to waste water from process: 2 % (ESVOC 38)
Release to air from process: 0.001 % (Industry Specific Data)
Release to soil from process: 0.01 % (ESVOC 38)

Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil : No air emission controls required; required removal efficiency is 0%.
Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of ≥ 27.7 %.
Soil emission controls are not applicable as there is no direct release to soil.

Contributing scenario controlling environmental exposure for 6: Use in coatings; adhesive - Industrial

Amounts used : Annual amount used in the EU: 372 tonnes/year.
Fraction of EU tonnage used in region: 1.
Daily amount per site: 1019 kg/day.
Annual site tonnage: 372 tonnes/year.

Frequency and duration of use : Continuous. Emission days: 365 days per year.

Environment factors not influenced by risk management : Local freshwater dilution factor: 1300.
Local marine water dilution factor: 1000.

Other conditions affecting environmental exposure : Release to waste water from process: 0 % (CEPE 17a)
Release to air from process: 0.001 % (Industry Specific Data)
Release to soil from process: 0 % (CEPE 17a)

Pentaethylenehexamine, PEHA Exposure Scenario: 3.1 **Use of ethylenamines (EA) in open processes with high exposure potential and evaporation and aerosol formation as possible exposure forms - Use of preparations containing EA up to 25% - Industrial/Professional.**

Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil : No air emission controls required; required removal efficiency is 0%.
No wastewater treatment required.
Soil emission controls are not applicable as there is no direct release to soil.

Contributing scenario controlling environmental exposure for 7: Use in coatings; adhesive - Professional

Amounts used : Daily amount per site: 2.0 kg/day.

Frequency and duration of use : Continuous. Emission days: 365 days per year.

Environment factors not influenced by risk management : Local freshwater dilution factor: 1300.
Local marine water dilution factor: 1000.

Other conditions affecting environmental exposure : Release to waste water from process: 1 % (CEPE 14)
Release to air from process: 0 % (Industry Specific Data)
Release to soil from process: 0.500 % (CEPE 14)

Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil : No air emission controls required; required removal efficiency is 0%.
No wastewater treatment required.
Soil emission controls are not applicable as there is no direct release to soil.

Conditions and measures related to sewage treatment plant : Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of ≥ 27.7 %.

Contributing scenario controlling worker exposure for 8: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)

Product characteristics : Liquid.

Concentration of substance in mixture or article : Covers concentrations up to 25 %.

Frequency and duration of use/exposure : Avoid carrying out activities involving exposure for more than 1 hour.

Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.

Other conditions affecting workers exposure : Indoor use.
Industrial.

Technical conditions and measures to control dispersion from source towards the worker : Local exhaust ventilation - Efficiency of at least 90 %.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 9: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)

Product characteristics : Liquid.

Concentration of substance in mixture or article : Covers concentrations up to 25 %.

Frequency and duration of use/exposure : Avoid carrying out activities involving exposure for more than 1 hour.

Pentaethylenehexamine, PEHA Exposure Scenario: 3.1 *Use of ethylenamines (EA) in open processes with high exposure potential and evaporation and aerosol formation as possible exposure forms - Use of preparations containing EA up to 25% - Industrial/Professional.*

Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.

Other conditions affecting workers exposure : Indoor use.
Professional.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Respiratory protection : Wear appropriate respiratory protection. Efficiency of at least 95 %.

Contributing scenario controlling worker exposure for 10: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

Product characteristics : Liquid.

Concentration of substance in mixture or article : Covers concentrations up to 25 %.

Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).

Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.

Other conditions affecting workers exposure : Indoor use.
Industrial.

Technical conditions and measures to control dispersion from source towards the worker : Local exhaust ventilation - Efficiency of at least 90 %.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 11: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

Product characteristics : Liquid.

Concentration of substance in mixture or article : Covers concentrations up to 25 %.

Frequency and duration of use/exposure : Avoid carrying out activities involving exposure for more than 15 minutes.

Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.

Other conditions affecting workers exposure : Indoor use.
Professional.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Respiratory protection : Wear appropriate respiratory protection. Efficiency of at least 95 %.

Contributing scenario controlling worker exposure for 12: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

- Product characteristics** : Liquid.
- Concentration of substance in mixture or article** : Covers concentrations up to 25 %.
- Frequency and duration of use/exposure** : Avoid carrying out activities involving exposure for more than 1 hour.
- Human factors not influenced by risk management** : Breathing volume: 10 m³/day.
Body weight: 70 kg.
- Other conditions affecting workers exposure** : Indoor use.
Industrial.
- Technical conditions and measures to control dispersion from source towards the worker** : Local exhaust ventilation - Efficiency of at least 90 %.

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

- Personal protection** : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 13: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

- Product characteristics** : Liquid.
- Concentration of substance in mixture or article** : Covers concentrations up to 25 %.
- Frequency and duration of use/exposure** : Covers exposure up to 8 h (full shift).
- Human factors not influenced by risk management** : Breathing volume: 10 m³/day.
Body weight: 70 kg.
- Other conditions affecting workers exposure** : Indoor use.
Industrial.
- Technical conditions and measures to control dispersion from source towards the worker** : Local exhaust ventilation - Efficiency of at least 90 %.

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

- Personal protection** : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Section 3 - Exposure estimation and reference to its source

Exposure estimation and reference to its source - Environment: 1: Ashless dispersant

Exposure assessment (environment): : EUSES v2.1

Exposure estimation : Freshwater: 0.00815 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.326.

Freshwater sediment: 2.61 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.326.

Marine water: 0.000802 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.160.

Marine water sediment: 0.256 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.160.

Sewage Treatment Plant: Not applicable.
Risk characterisation ratio (PEC/PNEC): Not applicable.

Soil: 0.000810 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.000511.

Air: 0.00000737 mg/m³.
Risk characterisation ratio (PEC/PNEC): Not applicable.

Remark : Based on the applied RMMs the risk towards environment is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Environment: 2: Epoxy curing agent

Exposure assessment (environment): : EUSES v2.1

Exposure estimation : Freshwater: 0.00815 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.326.

Freshwater sediment: 2.61 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.326.

Marine water: 0.000802 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.160.

Marine water sediment: 0.256 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.160.

Sewage Treatment Plant: Not applicable.
Risk characterisation ratio (PEC/PNEC): Not applicable.

Soil: 0.000375 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.000236.

Air: 0.000000000000687 mg/m³.
Risk characterisation ratio (PEC/PNEC): Not applicable.

Remark : Based on the applied RMMs the risk towards environment is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Environment: 3: Epoxy curing agent in paint

Exposure assessment (environment): : EUSES v2.1

Exposure estimation : Freshwater: 0.00815 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.326.

Freshwater sediment: 2.61 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.326.

Marine water: 0.000802 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.160.

Marine water sediment: 0.256 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.160.

Sewage Treatment Plant: Not applicable.
Risk characterisation ratio (PEC/PNEC): Not applicable.

Soil: 0.000375 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.000236.

Air: 0.000000000000687 mg/m³.
Risk characterisation ratio (PEC/PNEC): Not applicable.

Remark : Based on the applied RMMs the risk towards environment is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Environment: 4: Lube oil use, industrial

Exposure assessment (environment): : EUSES v2.1

Exposure estimation : Freshwater: 0.00815 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.326.

Freshwater sediment: 2.61 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.326.

Marine water: 0.000802 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.160.

Marine water sediment: 0.257 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.160.

Sewage Treatment Plant: 0.000307 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.0000187.

Soil: 0.000375 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.000236.

Air: 0.00000000142 mg/m³.
Risk characterisation ratio (PEC/PNEC): Not applicable.

Remark : Based on the applied RMMs the risk towards environment is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Environment: 5: Use in laboratories

Exposure assessment (environment): : EUSES v2.1

Exposure estimation : Freshwater: 0.00815 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.326.

Freshwater sediment: 2.61 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.326.

Marine water: 0.000810 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.162.

Marine water sediment: 0.259 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.162.

Sewage Treatment Plant: 0.00796 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.000485.

Soil: 0.000375 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.000236.

Air: 0.00000000306 mg/m³.
Risk characterisation ratio (PEC/PNEC): Not applicable.

Remark : Based on the applied RMMs the risk towards environment is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Environment: 6: Use in coatings; adhesive - Industrial

Exposure assessment (environment): : EUSES v2.1

Exposure estimation : Freshwater: 0.00815 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.326.

Freshwater sediment: 2.61 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.326.

Marine water: 0.000802 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.160.

Marine water sediment: 0.256 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.160.

Sewage Treatment Plant: Not applicable.
Risk characterisation ratio (PEC/PNEC): Not applicable.

Soil: 0.000542 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.000342.

Air: 0.00000283 mg/m³.
Risk characterisation ratio (PEC/PNEC): Not applicable.

Remark : Based on the applied RMMs the risk towards environment is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Environment: 7: Use in coatings; adhesive - Professional

Exposure assessment (environment): : EUSES v2.1

Exposure estimation : Freshwater: 0.00815 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.326.

Freshwater sediment: 2.61 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.326.

Marine water: 0.000806 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.161.

Marine water sediment: 0.258 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.161.

Sewage Treatment Plant: 0.00368 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.000225.

Soil: 0.000375 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.000236.

Air: 0.000000000000707 mg/m³.
Risk characterisation ratio (PEC/PNEC): Not applicable.

Remark : Based on the applied RMMs the risk towards environment is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 8: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : **Worker - inhalative, long-term - systemic:** 0.366 mg/m³.
Risk characterisation ratio: 0.3656.

Worker - dermal, long-term - systemic: 0.069 mg/kg bw/day.
Risk characterisation ratio: 0.1203.

Worker - combined, long-term - systemic: 0.485876.

Worker - inhalative, short-term - local: 0.731 mg/m³.
Risk characterisation ratio: 0.000136.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 9: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : **Worker - inhalative, long-term - systemic:** 0.366 mg/m³.
Risk characterisation ratio: 0.3656.

Worker - dermal, long-term - systemic: 0.069 mg/kg bw/day.
Risk characterisation ratio: 0.1203.

Worker - combined, long-term - systemic: 0.485876.

Worker - inhalative, short-term - local: 0.731 mg/m³.
Risk characterisation ratio: 0.000136.

<p>Pentaethylenehexamine, PEHA</p>	<p>Exposure Scenario: 3.1</p>	<p>Use of ethylenamines (EA) in open processes with high exposure potential and evaporation and aerosol formation as possible exposure forms - Use of preparations containing EA up to 25% - Industrial/Professional.</p>
<p>Remark</p>	<p>: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).</p>	
<p>Exposure estimation and reference to its source - Workers: 10: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities</p>		
<p>Exposure assessment (human):</p>	<p>: ECETOC TRA, Version 2 (Modified version).</p>	
<p>Exposure estimation</p>	<p>: Worker - inhalative, long-term - systemic: 0.366 mg/m³. Risk characterisation ratio: 0.3656.</p>	
	<p>Worker - dermal, long-term - systemic: 0.069 mg/kg bw/day. Risk characterisation ratio: 0.1203.</p>	
	<p>Worker - combined, long-term - systemic: 0.485876.</p>	
	<p>Worker - inhalative, short-term - local: 0.731 mg/m³. Risk characterisation ratio: 0.000136.</p>	
<p>Remark</p>	<p>: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).</p>	
<p>Exposure estimation and reference to its source - Workers: 11: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities</p>		
<p>Exposure assessment (human):</p>	<p>: ECETOC TRA, Version 2 (Modified version).</p>	
<p>Exposure estimation</p>	<p>: Worker - inhalative, long-term - systemic: 0.457 mg/m³. Risk characterisation ratio: 0.4570.</p>	
	<p>Worker - dermal, long-term - systemic: 0.069 mg/kg bw/day. Risk characterisation ratio: 0.1203.</p>	
	<p>Worker - combined, long-term - systemic: 0.577270.</p>	
	<p>Worker - inhalative, short-term - local: 0.914 mg/m³. Risk characterisation ratio: 0.000170.</p>	
<p>Remark</p>	<p>: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).</p>	
<p>Exposure estimation and reference to its source - Workers: 12: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities</p>		
<p>Exposure assessment (human):</p>	<p>: ECETOC TRA, Version 2 (Modified version).</p>	
<p>Exposure estimation</p>	<p>: Worker - inhalative, long-term - systemic: 0.545 mg/m³. Risk characterisation ratio: 0.5484.</p>	
	<p>Worker - dermal, long-term - systemic: 0.034 mg/kg bw/day. Risk characterisation ratio: 0.0602.</p>	
	<p>Worker - combined, long-term - systemic: 0.608513.</p>	
	<p>Worker - inhalative, short-term - local: 1.098 mg/m³. Risk characterisation ratio: 0.000203.</p>	
<p>Remark</p>	<p>: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).</p>	

Exposure estimation and reference to its source - Workers: 13: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : **Worker - inhalative, long-term - systemic:** 0.366 mg/m³.
Risk characterisation ratio: 0.3656.

Worker - dermal, long-term - systemic: 0.069 mg/kg bw/day.
Risk characterisation ratio: 0.1203.

Worker - combined, long-term - systemic: 0.485876.

Worker - inhalative, short-term - local: 0.731 mg/m³.
Risk characterisation ratio: 0.000136.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

General : The immediate downstream user is required to evaluate whether the operational conditions and risk management measures described in the exposure scenario fit to his use. If other OC/RMM are adopted, the user has to ensure that risks are managed to at least equivalent levels. The risk assessment methods/tools given in section 3 may be used for this evaluation.

Environment : Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Further details on scaling and control technologies are provided in SpERC factsheet (<http://cefic.org/en/reach-for-industries-libraries.html>).

Health : ECETOC TRA, Version 2 (Modified version):
- adjusted efficacy values for gloves as adopted by CEFIC
- use of factor 2 to calculate peak exposure from long term exposure
- use of exact percentage (2%, 0.5%) in product instead of broad TRA categories

Annex to the extended Safety Data Sheet (eSDS)

Industrial

Identification of the substance or mixture

Product definition : UVCB
Product name : Pentaethylenehexamine, PEHA

Section 1 - Title

Short title of the exposure scenario : Use of ethylenamines (EA) in open processes with high exposure potential and evaporation and aerosol formation as possible exposure forms - Use of preparations containing EA up to 15% - Industrial/Professional.

List of use descriptors : **Identified use name: ES 3.2:** Use of ethylenamines (EA) in open processes with high exposure potential and evaporation and aerosol formation as possible exposure forms - Use of preparations containing EA up to 15% - Industrial/Professional: SU03, SU22; PROC05, PROC06, PROC07, PROC08a, PROC08b, PROC09, PROC10, PROC11, PROC13, PROC14; ERC01, ERC02, ERC04, ERC05, ERC06a, ERC06b, ERC06c, ERC06d, ERC08a, ERC08b, ERC08c, ERC08e, ERC08f, ERC11a
Process Category: PROC05, PROC06, PROC07, PROC08a, PROC08b, PROC09, PROC10, PROC11, PROC13, PROC14
Substance supplied to that use in form of: In a mixture
Subsequent service life relevant for that use: No.
Environmental Release Category: ERC01, ERC02, ERC04, ERC05, ERC06a, ERC06b, ERC06c, ERC06d, ERC08a, ERC08b, ERC08c, ERC08e, ERC08f, ERC11a

Environmental contributing scenarios : **All ERCs (see above)**

Health Contributing scenarios : **Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) - PROC05**
Calendering operations - PROC06
Spraying in industrial settings and applications - PROC07
Transfer of substance or preparation (charging/discharging) from/to vessels/ large containers at non-dedicated facilities - PROC08a
Transfer of substance or preparation (charging/discharging) from/to vessels/ large containers at non-dedicated facilities - PROC08a
Transfer of substance or preparation (charging/discharging) from/to vessels/ large containers at dedicated facilities - PROC08b
Transfer of substance or preparation into small containers (dedicated filling line, including weighing) - PROC09
Roller application or brushing of adhesive and other coating - PROC10
Spraying outside industrial settings and/or applications - PROC11
Treatment of articles by dipping and pouring - PROC13
Production of preparations or articles by tableting, compression, extrusion, pelletisation - PROC14

Number of the ES : 3.2
Additional information : Sector of uses [SU]: SU01, SU06, SU08, SU09, SU10, SU11, SU12, SU13, SU14, SU16, SU17, SU19, SU23
Product categories [PC]: PC01, PC02, PC03, PC05, PC08, PC09a, PC09b, PC09, PC14, PC15, PC18, PC19, PC20, PC21, PC23, PC26, PC27, PC28, PC31, PC32, PC33, PC35, PC39

Free short title of the generic exposure scenario: Mixing, blending, transfer and use of liquid substance containing up to 15% EA.

Section 2 - Exposure controls

Contributing scenario controlling environmental exposure for 1: All ERCs (see above)

see ES 3.1.

Contributing scenario controlling worker exposure for 2: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)

Product characteristics : Liquid.

Concentration of substance in mixture or article : Covers concentrations up to 15 %.

Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).

Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.

Other conditions affecting workers exposure : Indoor use.
Industrial.

Technical conditions and measures to control dispersion from source towards the worker : Local exhaust ventilation - Efficiency of at least 90 %.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 3: Calendering operations

Product characteristics : Liquid.

Concentration of substance in mixture or article : Covers concentrations up to 15 %.

Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).

Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.

Other conditions affecting workers exposure : Indoor use.
Industrial.

Technical conditions and measures to control dispersion from source towards the worker : Local exhaust ventilation - Efficiency of at least 90 %.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 4: Spraying in industrial settings and applications

- Product characteristics** : Liquid.
- Concentration of substance in mixture or article** : Covers concentrations up to 15 %.
- Frequency and duration of use/exposure** : Covers exposure up to 8 h (full shift).
- Human factors not influenced by risk management** : Breathing volume: 10 m³/day.
Body weight: 70 kg.
- Other conditions affecting workers exposure** : Indoor use.
Industrial.
- Technical conditions and measures to control dispersion from source towards the worker** : Local exhaust ventilation - Efficiency of at least 90 %.

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

- Personal protection** : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).
- Respiratory protection** : Wear appropriate respiratory protection. Efficiency of at least 90 %.

Contributing scenario controlling worker exposure for 5: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

- Product characteristics** : Liquid.
- Concentration of substance in mixture or article** : Covers concentrations up to 15 %.
- Frequency and duration of use/exposure** : Covers exposure up to 8 h (full shift).
- Human factors not influenced by risk management** : Breathing volume: 10 m³/day.
Body weight: 70 kg.
- Other conditions affecting workers exposure** : Indoor use.
Industrial.
- Technical conditions and measures to control dispersion from source towards the worker** : Local exhaust ventilation - Efficiency of at least 90 %.

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

- Personal protection** : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 6: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

- Product characteristics** : Liquid.
- Concentration of substance in mixture or article** : Covers concentrations up to 15 %.
- Frequency and duration of use/exposure** : Avoid carrying out activities involving exposure for more than 1 hour.
- Human factors not influenced by risk management** : Breathing volume: 10 m³/day.
Body weight: 70 kg.

<p>Pentaethylenehexamine, PEHA</p>	<p>Exposure Scenario: 3.2</p>	<p>Use of ethylenamines (EA) in open processes with high exposure potential and evaporation and aerosol formation as possible exposure forms - Use of preparations containing EA up to 15% - Industrial/Professional.</p>
<p>Other conditions affecting workers exposure : Indoor use. Professional.</p> <p>Technical conditions and measures to control dispersion from source towards the worker : Local exhaust ventilation - Efficiency of at least 90 %.</p> <p>Conditions and measures related to personal protection, hygiene and health evaluation</p> <p>Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls. Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).</p>		
<p>Contributing scenario controlling worker exposure for 7: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities</p> <p>Product characteristics : Liquid.</p> <p>Concentration of substance in mixture or article : Covers concentrations up to 15 %.</p> <p>Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).</p> <p>Human factors not influenced by risk management : Breathing volume: 10 m³/day. Body weight: 70 kg.</p> <p>Other conditions affecting workers exposure : Indoor use. Industrial.</p> <p>Technical conditions and measures to control dispersion from source towards the worker : Local exhaust ventilation - Efficiency of at least 90 %.</p> <p>Conditions and measures related to personal protection, hygiene and health evaluation</p> <p>Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls. Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).</p>		
<p>Contributing scenario controlling worker exposure for 8: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)</p> <p>Product characteristics : Liquid.</p> <p>Concentration of substance in mixture or article : Covers concentrations up to 15 %.</p> <p>Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).</p> <p>Human factors not influenced by risk management : Breathing volume: 10 m³/day. Body weight: 70 kg.</p> <p>Other conditions affecting workers exposure : Indoor use. Industrial.</p> <p>Technical conditions and measures to control dispersion from source towards the worker : Local exhaust ventilation - Efficiency of at least 90 %.</p> <p>Conditions and measures related to personal protection, hygiene and health evaluation</p> <p>Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls. Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).</p>		

Contributing scenario controlling worker exposure for 9: Roller application or brushing of adhesive and other coating

- Product characteristics** : Liquid.
- Concentration of substance in mixture or article** : Covers concentrations up to 15 %.
- Frequency and duration of use/exposure** : Avoid carrying out activities involving exposure for more than 1 hour.
- Human factors not influenced by risk management** : Breathing volume: 10 m³/day.
Body weight: 70 kg.
- Other conditions affecting workers exposure** : Indoor use.
Professional.

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

- Personal protection** : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).
- Respiratory protection** : Wear appropriate respiratory protection. Efficiency of at least 95 %.

Contributing scenario controlling worker exposure for 10: Spraying outside industrial settings and/or applications

- Product characteristics** : Liquid.
- Concentration of substance in mixture or article** : Covers concentrations up to 10 %.
- Frequency and duration of use/exposure** : Avoid carrying out activities involving exposure for more than 1 hour.
- Human factors not influenced by risk management** : Breathing volume: 10 m³/day.
Body weight: 70 kg.
- Other conditions affecting workers exposure** : Indoor use.
Professional.

Technical conditions and measures to control dispersion from source towards the worker : Local exhaust ventilation - Efficiency of at least 90 %.

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

- Personal protection** : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 11: Treatment of articles by dipping and pouring

- Product characteristics** : Liquid.
- Concentration of substance in mixture or article** : Covers concentrations up to 15 %.
- Frequency and duration of use/exposure** : Covers exposure up to 8 h (full shift).
- Human factors not influenced by risk management** : Breathing volume: 10 m³/day.
Body weight: 70 kg.
- Other conditions affecting workers exposure** : Indoor use.
Industrial.

Pentaethylenehexamine, PEHA Exposure Scenario: 3.2 *Use of ethylenamines (EA) in open processes with high exposure potential and evaporation and aerosol formation as possible exposure forms - Use of preparations containing EA up to 15% - Industrial/Professional.*

Technical conditions and measures to control dispersion from source towards the worker : Local exhaust ventilation - Efficiency of at least 90 %.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 12: Production of preparations or articles by tableting, compression, extrusion, pelletisation

Product characteristics : Liquid.

Concentration of substance in mixture or article : Covers concentrations up to 15 %.

Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).

Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.

Other conditions affecting workers exposure : Indoor use.
Industrial.

Technical conditions and measures to control dispersion from source towards the worker : Local exhaust ventilation - Efficiency of at least 90 %.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Section 3 - Exposure estimation and reference to its source

Exposure estimation and reference to its source - Environment: 1: All ERCs (see above)

Exposure assessment (environment): : see ES 3.1.

Exposure estimation : see ES 3.1.

Exposure estimation and reference to its source - Workers: 2: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : **Worker - inhalative, long-term - systemic:** 0.457 mg/m³.
Risk characterisation ratio: 0.4570.

Worker - dermal, long-term - systemic: 0.082 mg/kg bw/day.
Risk characterisation ratio: 0.1444.

Worker - combined, long-term - systemic: 0.601330.

Worker - inhalative, short-term - local: 0.914 mg/m³.
Risk characterisation ratio: 0.000170.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 3: Calendering operations

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : **Worker - inhalative, long-term - systemic:** 0.457 mg/m³.
Risk characterisation ratio: 0.4570.

Worker - dermal, long-term - systemic: 0.082 mg/kg bw/day.
Risk characterisation ratio: 0.1444.

Worker - combined, long-term - systemic: 0.601330.

Worker - inhalative, short-term - local: 0.914 mg/m³.
Risk characterisation ratio: 0.000170.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 4: Spraying in industrial settings and applications

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : **Worker - inhalative, long-term - systemic:** 0.457 mg/m³.
Risk characterisation ratio: 0.4570.

Worker - dermal, long-term - systemic: 0.129 mg/kg bw/day.
Risk characterisation ratio: 0.2256.

Worker - combined, long-term - systemic: 0.682533.

Worker - inhalative, short-term - local: 0.914 mg/m³.
Risk characterisation ratio: 0.000170.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 5: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : **Worker - inhalative, long-term - systemic:** 0.548 mg/m³.
Risk characterisation ratio: 0.5484.

Worker - dermal, long-term - systemic: 0.041 mg/kg bw/day.
Risk characterisation ratio: 0.0722.

Worker - combined, long-term - systemic: 0.620543.

Worker - inhalative, short-term - local: 1.097 mg/m³.
Risk characterisation ratio: 0.000203.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 6: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

<p>Pentaethylenehexamine, PEHA</p>	<p>Exposure Scenario: 3.2</p>	<p>Use of ethylenamines (EA) in open processes with high exposure potential and evaporation and aerosol formation as possible exposure forms - Use of preparations containing EA up to 15% - Industrial/Professional.</p>
<p>Exposure estimation</p>	<p>Worker - inhalative, long-term - systemic: 0.457 mg/m³. Risk characterisation ratio: 0.4570.</p> <p>Worker - dermal, long-term - systemic: 0.041 mg/kg bw/day. Risk characterisation ratio: 0.0722.</p> <p>Worker - combined, long-term - systemic: 0.529149.</p> <p>Worker - inhalative, short-term - local: 0.914 mg/m³. Risk characterisation ratio: 0.000170.</p>	
<p>Remark</p>	<p>: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).</p>	
<p>Exposure estimation and reference to its source - Workers: 7: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities</p>		
<p>Exposure assessment (human):</p>	<p>: ECETOC TRA, Version 2 (Modified version).</p>	
<p>Exposure estimation</p>	<p>Worker - inhalative, long-term - systemic: 0.457 mg/m³. Risk characterisation ratio: 0.4570.</p> <p>Worker - dermal, long-term - systemic: 0.082 mg/kg bw/day. Risk characterisation ratio: 0.1444.</p> <p>Worker - combined, long-term - systemic: 0.601330.</p> <p>Worker - inhalative, short-term - local: 0.914 mg/m³. Risk characterisation ratio: 0.000170.</p>	
<p>Remark</p>	<p>: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).</p>	
<p>Exposure estimation and reference to its source - Workers: 8: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)</p>		
<p>Exposure assessment (human):</p>	<p>: ECETOC TRA, Version 2 (Modified version).</p>	
<p>Exposure estimation</p>	<p>Worker - inhalative, long-term - systemic: 0.457 mg/m³. Risk characterisation ratio: 0.4570.</p> <p>Worker - dermal, long-term - systemic: 0.082 mg/kg bw/day. Risk characterisation ratio: 0.1444.</p> <p>Worker - combined, long-term - systemic: 0.601330.</p> <p>Worker - inhalative, short-term - local: 0.914 mg/m³. Risk characterisation ratio: 0.000170.</p>	
<p>Remark</p>	<p>: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).</p>	
<p>Exposure estimation and reference to its source - Workers: 9: Roller application or brushing of adhesive and other coating</p>		
<p>Exposure assessment (human):</p>	<p>: ECETOC TRA, Version 2 (Modified version).</p>	
<p>Exposure estimation</p>	<p>Worker - inhalative, long-term - systemic: 0.457 mg/m³. Risk characterisation ratio: 0.2285.</p> <p>Worker - dermal, long-term - systemic: 0.082 mg/kg bw/day. Risk characterisation ratio: 0.1444.</p> <p>Worker - combined, long-term - systemic: 0.372845.</p>	
<p>Date of issue/Date of revision : 05/10/2017 Version : 8 / en 70/100</p>		

<p>Pentaethylenehexamine, PEHA</p>	<p>Exposure Scenario: 3.2</p>	<p>Use of ethylenamines (EA) in open processes with high exposure potential and evaporation and aerosol formation as possible exposure forms - Use of preparations containing EA up to 15% - Industrial/Professional.</p>
<p>Worker - inhalative, short-term - local: 0.914 mg/m³. Risk characterisation ratio: 0.000085.</p> <p>Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).</p>		
<p>Exposure estimation and reference to its source - Workers: 10: Spraying outside industrial settings and/or applications</p> <p>Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).</p> <p>Exposure estimation : Worker - inhalative, long-term - systemic: 0.121 mg/m³. Risk characterisation ratio: 0.1219.</p> <p>Worker - dermal, long-term - systemic: 0.214 mg/kg bw/day. Risk characterisation ratio: 0.3759.</p> <p>Worker - combined, long-term - systemic: 0.497798.</p> <p>Worker - inhalative, short-term - local: 0.243 mg/m³. Risk characterisation ratio: 0.000045.</p> <p>Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).</p>		
<p>Exposure estimation and reference to its source - Workers: 11: Treatment of articles by dipping and pouring</p> <p>Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).</p> <p>Exposure estimation : Worker - inhalative, long-term - systemic: 0.548 mg/m³. Risk characterisation ratio: 0.5484.</p> <p>Worker - dermal, long-term - systemic: 0.041 mg/kg bw/day. Risk characterisation ratio: 0.0722.</p> <p>Worker - combined, long-term - systemic: 0.620543.</p> <p>Worker - inhalative, short-term - local: 1.097 mg/m³. Risk characterisation ratio: 0.000203.</p> <p>Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).</p>		
<p>Exposure estimation and reference to its source - Workers: 12: Production of preparations or articles by tableting, compression, extrusion, pelletisation</p> <p>Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).</p> <p>Exposure estimation : Worker - inhalative, long-term - systemic: 0.457 mg/m³. Risk characterisation ratio: 0.4570.</p> <p>Worker - dermal, long-term - systemic: 0.082 mg/kg bw/day. Risk characterisation ratio: 0.1444.</p> <p>Worker - combined, long-term - systemic: 0.601330.</p> <p>Worker - inhalative, short-term - local: 0.914 mg/m³. Risk characterisation ratio: 0.000170.</p> <p>Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).</p>		

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

General	: The immediate downstream user is required to evaluate whether the operational conditions and risk management measures described in the exposure scenario fit to his use. If other OC/RMM are adopted, the user has to ensure that risks are managed to at least equivalent levels. The risk assessment methods/tools given in section 3 may be used for this evaluation.
Environment	: Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html).
Health	: ECETOC TRA, Version 2 (Modified version): <ul style="list-style-type: none">- adjusted efficacy values for gloves as adopted by CEFIC- use of factor 2 to calculate peak exposure from long term exposure- use of exact percentage (2%, 0.5%) in product instead of broad TRA categories

Annex to the extended Safety Data Sheet (eSDS)

Industrial

Identification of the substance or mixture

Product definition : UVCB
Product name : Pentaethylenehexamine, PEHA

Section 1 - Title

Short title of the exposure scenario : Use of ethylenamines (EA) in open processes with high exposure potential and evaporation and aerosol formation as possible exposure forms - Use of preparations containing EA up to 2% - Industrial/Professional.

List of use descriptors : **Identified use name: ES 3.3:** Use of ethylenamines (EA) in open processes with high exposure potential and evaporation and aerosol formation as possible exposure forms - Use of preparations containing EA up to 2% - Industrial: SU03, SU22; PROC05, PROC07, PROC08a, PROC08b, PROC09, PROC10, PROC11, PROC13, PROC14, PROC19; ERC01, ERC02, ERC04, ERC05, ERC06a, ERC06b, ERC06c, ERC06d, ERC08a, ERC08b, ERC08c, ERC08e, ERC08f, ERC11a
Process Category: PROC05, PROC07, PROC08a, PROC08b, PROC09, PROC10, PROC11, PROC13, PROC14, PROC19
Substance supplied to that use in form of: In a mixture
Subsequent service life relevant for that use: No.
Environmental Release Category: ERC01, ERC02, ERC04, ERC05, ERC06a, ERC06b, ERC06c, ERC06d, ERC08a, ERC08b, ERC08c, ERC08e, ERC08f, ERC11a

Environmental contributing scenarios : **All ERCs (see above)**

Health Contributing scenarios : **Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) - PROC05**
Spraying in industrial settings and applications - PROC07
Transfer of substance or preparation (charging/discharging) from/to vessels/ large containers at non-dedicated facilities - PROC08a
Transfer of substance or preparation (charging/discharging) from/to vessels/ large containers at dedicated facilities - PROC08b
Transfer of substance or preparation into small containers (dedicated filling line, including weighing) - PROC09
Roller application or brushing of adhesive and other coating - PROC10
Spraying outside industrial settings and/or applications - PROC11
Treatment of articles by dipping and pouring - PROC13
Production of preparations or articles by tableting, compression, extrusion, pelletisation - PROC14
Hand-mixing with intimate contact and only PPE available - PROC19

Number of the ES	: 3.3
Additional information	: Sector of uses [SU]: SU01, SU06, SU08, SU09, SU10, SU11, SU12, SU13, SU14, SU16, SU17, SU19, SU23 Product categories [PC]: PC01, PC02, PC03, PC05, PC08, PC09a, PC09b, PC09, PC14, PC15, PC18, PC19, PC20, PC21, PC23, PC26, PC27, PC28, PC31, PC32, PC33, PC35, PC39 Free short title of the generic exposure scenario: Use of the diluted product (up to 2% content) upon manufacturing of chemicals for which the EA is an intermediate and chemical preparations containing the substance.

Section 2 - Exposure controls

Contributing scenario controlling environmental exposure for 1: All ERCs (see above)
see ES 3.1.

Contributing scenario controlling worker exposure for 2: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)

- Product characteristics** : Liquid.
- Concentration of substance in mixture or article** : Covers concentrations up to 2 %.
- Frequency and duration of use/exposure** : Covers exposure up to 8 h (full shift).
- Human factors not influenced by risk management** : Breathing volume: 10 m³/day.
Body weight: 70 kg.
- Other conditions affecting workers exposure** : Indoor use.
Industrial.

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

- Personal protection** : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 3: Spraying in industrial settings and applications

- Product characteristics** : Liquid.
- Concentration of substance in mixture or article** : Covers concentrations up to 2 %.
- Frequency and duration of use/exposure** : Covers exposure up to 8 h (full shift).
- Human factors not influenced by risk management** : Breathing volume: 10 m³/day.
Body weight: 70 kg.
- Other conditions affecting workers exposure** : Indoor use.
Industrial.
- Technical conditions and measures to control dispersion from source towards the worker** : Local exhaust ventilation - Efficiency of at least 90 %.

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

- Personal protection** : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 4: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

- Product characteristics** : Liquid.
- Concentration of substance in mixture or article** : Covers concentrations up to 2 %.
- Frequency and duration of use/exposure** : Covers exposure up to 8 h (full shift).
- Human factors not influenced by risk management** : Breathing volume: 10 m³/day.
Body weight: 70 kg.
- Other conditions affecting workers exposure** : Indoor use.
Industrial.
Professional.

Technical conditions and measures to control dispersion from source towards the worker : Local exhaust ventilation - Efficiency of at least 90 %.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 5: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics : Liquid.
Concentration of substance in mixture or article : Covers concentrations up to 2 %.
Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).
Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.
Other conditions affecting workers exposure : Indoor use.
Industrial.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 6: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Product characteristics : Liquid.
Concentration of substance in mixture or article : Covers concentrations up to 2 %.
Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).
Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.
Other conditions affecting workers exposure : Indoor use.
Industrial.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 7: Roller application or brushing of adhesive and other coating

Product characteristics : Liquid.
Concentration of substance in mixture or article : Covers concentrations up to 2 %.
Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).

Human factors not influenced by risk management	: Breathing volume: 10 m ³ /day. Body weight: 70 kg.
Other conditions affecting workers exposure	: Indoor use. Industrial.
Technical conditions and measures to control dispersion from source towards the worker	: Local exhaust ventilation - Efficiency of at least 90 %.
Conditions and measures related to personal protection, hygiene and health evaluation	
Personal protection	: Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls. Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 8: Spraying outside industrial settings and/or applications

Product characteristics	: Liquid.
Concentration of substance in mixture or article	: Covers concentrations up to 2 %.
Frequency and duration of use/exposure	: Avoid carrying out activities involving exposure for more than 4 hours.
Human factors not influenced by risk management	: Breathing volume: 10 m ³ /day. Body weight: 70 kg.
Other conditions affecting workers exposure	: Indoor use. Professional.
Technical conditions and measures to control dispersion from source towards the worker	: Local exhaust ventilation - Efficiency of at least 90 %.
Conditions and measures related to personal protection, hygiene and health evaluation	
Personal protection	: Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls. Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).
Respiratory protection	: Wear appropriate respiratory protection. Efficiency of at least 90 %.

Contributing scenario controlling worker exposure for 9: Treatment of articles by dipping and pouring

Product characteristics	: Liquid.
Concentration of substance in mixture or article	: Covers concentrations up to 2 %.
Frequency and duration of use/exposure	: Covers exposure up to 8 h (full shift).
Human factors not influenced by risk management	: Breathing volume: 10 m ³ /day. Body weight: 70 kg.
Other conditions affecting workers exposure	: Indoor use. Industrial.
Technical conditions and measures to control dispersion from source towards the worker	: Local exhaust ventilation - Efficiency of at least 90 %.
Conditions and measures related to personal protection, hygiene and health evaluation	

Pentaethylenehexamine, PEHA Exposure Scenario: 3.3 **Use of ethylenamines (EA) in open processes with high exposure potential and evaporation and aerosol formation as possible exposure forms - Use of preparations containing EA up to 2% - Industrial/Professional.**

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 10: Production of preparations or articles by tableting, compression, extrusion, pelletisation

Product characteristics : Liquid.
Concentration of substance in mixture or article : Covers concentrations up to 2 %.
Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).
Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.
Other conditions affecting workers exposure : Indoor use.
Industrial.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 11: Hand-mixing with intimate contact and only PPE available

Product characteristics : Liquid.
Concentration of substance in mixture or article : Covers concentrations up to 2 %.
Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).
Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.
Other conditions affecting workers exposure : Indoor use.
Industrial.
Technical conditions and measures to control dispersion from source towards the worker : Local exhaust ventilation - Efficiency of at least 90 %.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Section 3 - Exposure estimation and reference to its source

Exposure estimation and reference to its source - Environment: 1: All ERCs (see above)

Exposure assessment (environment): : see ES 3.1.
Exposure estimation : see ES 3.1.

Exposure estimation and reference to its source - Workers: 2: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : **Worker - inhalative, long-term - systemic:** 0.61 mg/m³.
Risk characterisation ratio: 0.6093.

Worker - dermal, long-term - systemic: 0.05 mg/kg bw/day.
Risk characterisation ratio: 0.0962.

Worker - combined, long-term - systemic: 0.7055.

Worker - inhalative, short-term - local: 1.22 mg/m³.
Risk characterisation ratio: 0.00023.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 3: Spraying in industrial settings and applications

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : **Worker - inhalative, long-term - systemic:** 0.61 mg/m³.
Risk characterisation ratio: 0.6093.

Worker - dermal, long-term - systemic: 0.09 mg/kg bw/day.
Risk characterisation ratio: 0.1504.

Worker - combined, long-term - systemic: 0.7597.

Worker - inhalative, short-term - local: 1.22 mg/m³.
Risk characterisation ratio: 0.00023.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 4: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : Risk characterisations have only been calculated for the highest exposure level. (Worst case assumption)
see PROC07, PROC10.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 5: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : **Worker - inhalative, long-term - systemic:** 0.61 mg/m³.
Risk characterisation ratio: 0.6093.

Worker - dermal, long-term - systemic: 0.05 mg/kg bw/day.
Risk characterisation ratio: 0.0962.

Worker - combined, long-term - systemic: 0.7055.

Worker - inhalative, short-term - local: 1.22 mg/m³.
Risk characterisation ratio: 0.00023.

Pentaethylenehexamine, PEHA	Exposure Scenario: 3.3	Use of ethylenamines (EA) in open processes with high exposure potential and evaporation and aerosol formation as possible exposure forms - Use of preparations containing EA up to 2% - Industrial/Professional.
Remark	: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).	
Exposure estimation and reference to its source - Workers: 6: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)		
Exposure assessment (human):	: ECETOC TRA, Version 2 (Modified version).	
Exposure estimation	: Worker - inhalative, long-term - systemic: 0.61 mg/m ³ . Risk characterisation ratio: 0.6093.	
	: Worker - dermal, long-term - systemic: 0.05 mg/kg bw/day. Risk characterisation ratio: 0.0962.	
	: Worker - combined, long-term - systemic: 0.7055.	
	: Worker - inhalative, short-term - local: 1.22 mg/m ³ . Risk characterisation ratio: 0.00023.	
Remark	: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).	
Exposure estimation and reference to its source - Workers: 7: Roller application or brushing of adhesive and other coating		
Exposure assessment (human):	: ECETOC TRA, Version 2 (Modified version).	
Exposure estimation	: Worker - inhalative, long-term - systemic: 0.61 mg/m ³ . Risk characterisation ratio: 0.6093.	
	: Worker - dermal, long-term - systemic: 0.09 mg/kg bw/day. Risk characterisation ratio: 0.1504.	
	: Worker - combined, long-term - systemic: 0.7597.	
	: Worker - inhalative, short-term - local: 1.22 mg/m ³ . Risk characterisation ratio: 0.00023.	
Remark	: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).	
Exposure estimation and reference to its source - Workers: 8: Spraying outside industrial settings and/or applications		
Exposure assessment (human):	: ECETOC TRA, Version 2 (Modified version).	
Exposure estimation	: Worker - inhalative, long-term - systemic: 0.15 mg/m ³ . Risk characterisation ratio: 0.1219.	
	: Worker - dermal, long-term - systemic: 0.21 mg/kg bw/day. Risk characterisation ratio: 0.3759.	
	: Worker - combined, long-term - systemic: 0.4978.	
	: Worker - inhalative, short-term - local: 0.3 mg/m ³ . Risk characterisation ratio: 0.0000452.	
Remark	: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).	

Pentaethylenehexamine, PEHA Exposure Scenario: 3.3 *Use of ethylenamines (EA) in open processes with high exposure potential and evaporation and aerosol formation as possible exposure forms - Use of preparations containing EA up to 2% - Industrial/Professional.*

Exposure estimation and reference to its source - Workers: 9: Treatment of articles by dipping and pouring

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).
Exposure estimation : Risk characterisations have only been calculated for the highest exposure level. (Worst case assumption) see PROC07, PROC10.
Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 10: Production of preparations or articles by tableting, compression, extrusion, pelletisation

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).
Exposure estimation : Risk characterisations have only been calculated for the highest exposure level. (Worst case assumption) see PROC05, PROC08b, PROC09.
Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 11: Hand-mixing with intimate contact and only PPE available

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).
Exposure estimation : Risk characterisations have only been calculated for the highest exposure level. (Worst case assumption) see PROC07, PROC10.
Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

General : The immediate downstream user is required to evaluate whether the operational conditions and risk management measures described in the exposure scenario fit to his use. If other OC/RMM are adopted, the user has to ensure that risks are managed to at least equivalent levels. The risk assessment methods/tools given in section 3 may be used for this evaluation.

Environment : Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Further details on scaling and control technologies are provided in SpERC factsheet (<http://cefic.org/en/reach-for-industries-libraries.html>).

Health : ECETOC TRA, Version 2 (Modified version):
 - adjusted efficacy values for gloves as adopted by CEFIC
 - use of factor 2 to calculate peak exposure from long term exposure
 - use of exact percentage (2%, 0.5%) in product instead of broad TRA categories

Annex to the extended Safety Data Sheet (eSDS)

Industrial

Identification of the substance or mixture

Product definition : UVCB
Product name : Pentaethylenehexamine, PEHA

Section 1 - Title

Short title of the exposure scenario : Use of ethylenamines (EA) in open processes with high exposure potential and evaporation and aerosol formation as possible exposure forms - Use of preparations containing EA up to 0.5% - Industrial/Professional.

List of use descriptors : **Identified use name: ES 3.4:** Use of ethylenamines (EA) in open processes with high exposure potential and evaporation and aerosol formation as possible exposure forms - Use of preparations containing EA up to 0.5% - Industrial: SU03, SU22; PROC05, PROC07, PROC08a, PROC08b, PROC09, PROC10, PROC11, PROC13, PROC14, PROC19; ERC01, ERC02, ERC04, ERC05, ERC06a, ERC06b, ERC06c, ERC06d, ERC08a, ERC08b, ERC08c, ERC08e, ERC08f, ERC11a
Process Category: PROC05, PROC07, PROC08a, PROC08b, PROC09, PROC10, PROC11, PROC13, PROC14, PROC19
Substance supplied to that use in form of: In a mixture
Subsequent service life relevant for that use: No.
Environmental Release Category: ERC01, ERC02, ERC04, ERC05, ERC06a, ERC06b, ERC06c, ERC06d, ERC08a, ERC08b, ERC08c, ERC08e, ERC08f, ERC11a

Environmental contributing scenarios : **All ERCs (see above)**

Health Contributing scenarios : **Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) - PROC05**
Spraying in industrial settings and applications - PROC07
Transfer of substance or preparation (charging/discharging) from/to vessels/ large containers at non-dedicated facilities - PROC08a
Transfer of substance or preparation (charging/discharging) from/to vessels/ large containers at dedicated facilities - PROC08b
Transfer of substance or preparation into small containers (dedicated filling line, including weighing) - PROC09
Roller application or brushing of adhesive and other coating - PROC10
Spraying outside industrial settings and/or applications - PROC11
Treatment of articles by dipping and pouring - PROC13
Production of preparations or articles by tableting, compression, extrusion, pelletisation - PROC14
Hand-mixing with intimate contact and only PPE available - PROC19

Number of the ES	: 3.4
Additional information	: Sector of uses [SU]: SU01, SU06, SU08, SU09, SU10, SU11, SU12, SU13, SU14, SU16, SU17, SU19, SU23 Product categories [PC]: PC01, PC02, PC03, PC05, PC08, PC09a, PC09b, PC09, PC14, PC15, PC18, PC19, PC20, PC21, PC23, PC26, PC27, PC28, PC31, PC32, PC33, PC35, PC39 Free short title of the generic exposure scenario: Use of diluted product (up to 0.5% content) upon manufacturing of chemicals for which the EA is an intermediate and chemical preparations containing the substance.

Section 2 - Exposure controls

Contributing scenario controlling environmental exposure for 1: All ERCs (see above)
see ES 3.1.

Contributing scenario controlling worker exposure for 2: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)

- Product characteristics** : Liquid.
- Concentration of substance in mixture or article** : Covers concentrations up to 0.5 %.
- Frequency and duration of use/exposure** : Covers exposure up to 8 h (full shift).
- Human factors not influenced by risk management** : Breathing volume: 10 m³/day.
Body weight: 70 kg.
- Other conditions affecting workers exposure** : Indoor use.
Industrial.

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

- Personal protection** : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 3: Spraying in industrial settings and applications

- Product characteristics** : Liquid.
- Concentration of substance in mixture or article** : Covers concentrations up to 0.5 %.
- Frequency and duration of use/exposure** : Covers exposure up to 8 h (full shift).
- Human factors not influenced by risk management** : Breathing volume: 10 m³/day.
Body weight: 70 kg.
- Other conditions affecting workers exposure** : Indoor use.
Industrial.
- Technical conditions and measures to control dispersion from source towards the worker** : Local exhaust ventilation - Efficiency of at least 90 %.

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

- Personal protection** : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 4: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

- Product characteristics** : Liquid.
- Concentration of substance in mixture or article** : Covers concentrations up to 0.5 %.
- Frequency and duration of use/exposure** : Covers exposure up to 8 h (full shift).
- Human factors not influenced by risk management** : Breathing volume: 10 m³/day.
Body weight: 70 kg.
- Other conditions affecting workers exposure** : Indoor use.
Industrial.

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

Pentaethylenehexamine, PEHA Exposure Scenario: 3.4 **Use of ethylenamines (EA) in open processes with high exposure potential and evaporation and aerosol formation as possible exposure forms - Use of preparations containing EA up to 0.5% - Industrial/Professional.**

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 5: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics : Liquid.
Concentration of substance in mixture or article : Covers concentrations up to 0.5 %.
Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).
Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.
Other conditions affecting workers exposure : Indoor use.
Industrial.
Conditions and measures related to personal protection, hygiene and health evaluation
Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 6: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Product characteristics : Liquid.
Concentration of substance in mixture or article : Covers concentrations up to 0.5 %.
Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).
Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.
Other conditions affecting workers exposure : Indoor use.
Industrial.
Conditions and measures related to personal protection, hygiene and health evaluation
Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 7: Roller application or brushing of adhesive and other coating

Product characteristics : Liquid.
Concentration of substance in mixture or article : Covers concentrations up to 0.5 %.
Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).
Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.
Other conditions affecting workers exposure : Indoor use.
Industrial.
Conditions and measures related to personal protection, hygiene and health evaluation

Pentaethylenehexamine, PEHA Exposure Scenario: 3.4 **Use of ethylenamines (EA) in open processes with high exposure potential and evaporation and aerosol formation as possible exposure forms - Use of preparations containing EA up to 0.5% - Industrial/Professional.**

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 8: Spraying outside industrial settings and/or applications

Product characteristics : Liquid.
Concentration of substance in mixture or article : Covers concentrations up to 0.5 %.
Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).
Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.
Other conditions affecting workers exposure : Indoor use.
Professional.
Technical conditions and measures to control dispersion from source towards the worker : Local exhaust ventilation - Efficiency of at least 90 %.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 9: Treatment of articles by dipping and pouring

Product characteristics : Liquid.
Concentration of substance in mixture or article : Covers concentrations up to 0.5 %.
Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).
Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.
Other conditions affecting workers exposure : Indoor use.
Industrial.

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

Personal protection : Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls.
Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 10: Production of preparations or articles by tableting, compression, extrusion, pelletisation

Product characteristics : Liquid.
Concentration of substance in mixture or article : Covers concentrations up to 0.5 %.
Frequency and duration of use/exposure : Covers exposure up to 8 h (full shift).
Human factors not influenced by risk management : Breathing volume: 10 m³/day.
Body weight: 70 kg.

Pentaethylenehexamine, PEHA	Exposure Scenario: 3.4	Use of ethylenamines (EA) in open processes with high exposure potential and evaporation and aerosol formation as possible exposure forms - Use of preparations containing EA up to 0.5% - Industrial/Professional.
Other conditions affecting workers exposure	: Indoor use. Industrial.	
Conditions and measures related to personal protection, hygiene and health evaluation		
Personal protection	: Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls. Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).	
Contributing scenario controlling worker exposure for 11: Hand-mixing with intimate contact and only PPE available		
Product characteristics	: Liquid.	
Concentration of substance in mixture or article	: Covers concentrations up to 0.5 %.	
Frequency and duration of use/exposure	: Covers exposure up to 8 h (full shift).	
Human factors not influenced by risk management	: Breathing volume: 10 m ³ /day. Body weight: 70 kg.	
Other conditions affecting workers exposure	: Indoor use. Industrial.	
Conditions and measures related to personal protection, hygiene and health evaluation		
Personal protection	: Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls. Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).	

Section 3 - Exposure estimation and reference to its source

Exposure estimation and reference to its source - Environment: 1: All ERCs (see above)		
Exposure assessment (environment):	: see ES 3.1.	
Exposure estimation	: see ES 3.1.	
Exposure estimation and reference to its source - Workers: 2: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)		
Exposure assessment (human):	: ECETOC TRA, Version 2 (Modified version).	
Exposure estimation	: Risk characterisations have only been calculated for the highest exposure level. (Worst case assumption) see PROC19.	
Remark	: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).	
Exposure estimation and reference to its source - Workers: 3: Spraying in industrial settings and applications		
Exposure assessment (human):	: ECETOC TRA, Version 2 (Modified version).	
Exposure estimation	: Risk characterisations have only been calculated for the highest exposure level. (Worst case assumption) see PROC11.	
Remark	: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).	

Exposure estimation and reference to its source - Workers: 4: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : Risk characterisations have only been calculated for the highest exposure level. (Worst case assumption)
see PROC19.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 5: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : Risk characterisations have only been calculated for the highest exposure level. (Worst case assumption)
see PROC19.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 6: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : Risk characterisations have only been calculated for the highest exposure level. (Worst case assumption)
see PROC19.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 7: Roller application or brushing of adhesive and other coating

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : Risk characterisations have only been calculated for the highest exposure level. (Worst case assumption)
see PROC19.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 8: Spraying outside industrial settings and/or applications

Exposure assessment (human): : ECETOC TRA, Version 2 (Modified version).

Exposure estimation : **Worker - inhalative, long-term - systemic:** 0.30 mg/m³.
Risk characterisation ratio: 0.3046.

Worker - dermal, long-term - systemic: 0.11 mg/kg bw/day.
Risk characterisation ratio: 0.1880.

Worker - combined, long-term - systemic: 0.4926.

Worker - inhalative, short-term - local: 1.22 mg/m³.
Risk characterisation ratio: 0.000113.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 9: Treatment of articles by dipping and pouring

- Exposure assessment (human):** : ECETOC TRA, Version 2 (Modified version).
- Exposure estimation** : Risk characterisations have only been calculated for the highest exposure level. (Worst case assumption) see PROC19.
- Remark** : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 10: Production of preparations or articles by tableting, compression, extrusion, pelletisation

- Exposure assessment (human):** : ECETOC TRA, Version 2 (Modified version).
- Exposure estimation** : Risk characterisations have only been calculated for the highest exposure level. (Worst case assumption) see PROC19.
- Remark** : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 11: Hand-mixing with intimate contact and only PPE available

- Exposure assessment (human):** : ECETOC TRA, Version 2 (Modified version).
- Exposure estimation** :
 - Worker - inhalative, long-term - systemic:** 0.76 mg/m³.
Risk characterisation ratio: 0.0762.
 - Worker - dermal, long-term - systemic:** 0.14 mg/kg bw/day.
Risk characterisation ratio: 0.2481.
 - Worker - combined, long-term - systemic:** 0.3243.
 - Worker - inhalative, short-term - local:** 1.52 mg/m³.
Risk characterisation ratio: 0.000028.
- Remark** : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

- General** : The immediate downstream user is required to evaluate whether the operational conditions and risk management measures described in the exposure scenario fit to his use. If other OC/RMM are adopted, the user has to ensure that risks are managed to at least equivalent levels. The risk assessment methods/tools given in section 3 may be used for this evaluation.
- Environment** : Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Further details on scaling and control technologies are provided in SpERC factsheet (<http://cefic.org/en/reach-for-industries-libraries.html>).
- Health** : ECETOC TRA, Version 2 (Modified version):
 - adjusted efficacy values for gloves as adopted by CEFIC
 - use of factor 2 to calculate peak exposure from long term exposure
 - use of exact percentage (2%, 0.5%) in product instead of broad TRA categories

Annex to the extended Safety Data Sheet (eSDS)

Industrial

Identification of the substance or mixture

Product definition : UVCB
Product name : Pentaethylenehexamine, PEHA

Section 1 - Title

Short title of the exposure scenario : Handling of solid products with small amounts of unbound ethylenamines (EA) - Use of preparations containing EA up to 2% - Professional.

List of use descriptors : **Identified use name: ES 4.1:** Handling of solid products with small amounts of unbound ethylenamines (EA) - Use of preparations containing EA up to 2% - Professional: SU22; PROC21, PROC24; ERC06d
Process Category: PROC21, PROC24
Subsequent service life relevant for that use: No.
Environmental Release Category: ERC06d

Environmental contributing scenarios : **All ERCs (see above)**

Health Contributing scenarios : **Low energy manipulation of substances bound in materials and/or articles - PROC21**
High (mechanical) energy work-up of substances bound in materials and/or articles - PROC24

Number of the ES	: 4.1
Additional information	: Product categories [PC]: PC14, PC23, PC26, PC31
Free short title of the generic exposure scenario: Manipulation and high energy workup of solid product containing up to 2% of EA.	

Section 2 - Exposure controls

Contributing scenario controlling environmental exposure for 1: All ERCs (see above) see ES 3.1. The emission assessments for professional use are covered under the risk characterisation for wide-dispersive use.

Contributing scenario controlling worker exposure for 2: Low energy manipulation of substances bound in materials and/or articles	
Product characteristics	: Solid.
Concentration of substance in mixture or article	: Covers concentrations up to 2 %.
Human factors not influenced by risk management	: Breathing volume: 10 m ³ /day. Body weight: 70 kg.
Other conditions affecting workers exposure	: Indoor use. Professional.
Conditions and measures related to personal protection, hygiene and health evaluation	
Personal protection	: Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls. Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 3: High (mechanical) energy work-up of substances bound in materials and/or articles

Product characteristics	: Solid.
Concentration of substance in mixture or article	: Covers concentrations up to 2 %.
Human factors not influenced by risk management	: Breathing volume: 10 m ³ /day. Body weight: 70 kg.
Other conditions affecting workers exposure	: Indoor use. Professional.
Conditions and measures related to personal protection, hygiene and health evaluation	
Personal protection	: Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls. Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Section 3 - Exposure estimation and reference to its source

Exposure estimation and reference to its source - Environment: 1: All ERCs (see above)

Exposure assessment (environment):	: see ES 3.1.
Exposure estimation	: see ES 3.1.

Exposure estimation and reference to its source - Workers: 2: Low energy manipulation of substances bound in materials and/or articles

Exposure assessment (human):	: ECETOC TRA, Version 2 (Modified version).
Exposure estimation	: Worker - inhalative, long-term - systemic: 0.06 mg/m ³ . Risk characterisation ratio: 0.06. Worker - dermal, long-term - systemic: 0.0566 mg/kg bw/day. Risk characterisation ratio: 0.0992. Worker - combined, long-term - systemic: 0.1593. Worker - inhalative, short-term - local: 0.12 mg/m ³ . Risk characterisation ratio: 0.0000223.
Remark	: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 3: High (mechanical) energy work-up of substances bound in materials and/or articles

Exposure assessment (human):	: ECETOC TRA, Version 2 (Modified version).
Exposure estimation	: Worker - inhalative, long-term - systemic: 0.06 mg/m ³ . Risk characterisation ratio: 0.06. Worker - dermal, long-term - systemic: 0.0566 mg/kg bw/day. Risk characterisation ratio: 0.0992. Worker - combined, long-term - systemic: 0.1593. Worker - inhalative, short-term - local: 0.12 mg/m ³ . Risk characterisation ratio: 0.0000223.
Remark	: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

General	: The immediate downstream user is required to evaluate whether the operational conditions and risk management measures described in the exposure scenario fit to his use. If other OC/RMM are adopted, the user has to ensure that risks are managed to at least equivalent levels. The risk assessment methods/tools given in section 3 may be used for this evaluation.
Environment	: Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html).
Health	: ECETOC TRA, Version 2 (Modified version): <ul style="list-style-type: none">- adjusted efficacy values for gloves as adopted by CEFIC- use of factor 2 to calculate peak exposure from long term exposure- use of exact percentage (2%, 0.5%) in product instead of broad TRA categories

Annex to the extended Safety Data Sheet (eSDS)

Industrial

Identification of the substance or mixture

Product definition : UVCB
Product name : Pentaethylenehexamine, PEHA

Section 1 - Title

Short title of the exposure scenario : Handling of solid products with small amounts of unbound ethylenamines (EA) - Use of preparations containing EA up to 0.5% - Professional.

List of use descriptors : **Identified use name: ES 4.2:** Handling of solid products with small amounts of unbound ethylenamines (EA) - Use of preparations containing EA up to 0.5% - Professional: SU22; PROC21, PROC24; ERC06d
Process Category: PROC21, PROC24
Subsequent service life relevant for that use: No.
Environmental Release Category: ERC06d

Environmental contributing scenarios : **All ERCs (see above)**

Health Contributing scenarios : **Low energy manipulation of substances bound in materials and/or articles - PROC21**
High (mechanical) energy work-up of substances bound in materials and/or articles - PROC24

Number of the ES	: 4.2
Additional information	: Product categories [PC]: PC14, PC23, PC26, PC31
Free short title of the generic exposure scenario: Manipulation and high energy workup of solid product containing up to 0.5% of EA.	

Section 2 - Exposure controls

Contributing scenario controlling environmental exposure for 1: All ERCs (see above) see ES 3.1. The emission assessments for professional use are covered under the risk characterisation for wide-dispersive use.

Contributing scenario controlling worker exposure for 2: Low energy manipulation of substances bound in materials and/or articles	
Product characteristics	: Solid.
Concentration of substance in mixture or article	: Covers concentrations up to 0.5 %.
Human factors not influenced by risk management	: Breathing volume: 10 m ³ /day. Body weight: 70 kg.
Other conditions affecting workers exposure	: Indoor use. Professional.
Conditions and measures related to personal protection, hygiene and health evaluation	
Personal protection	: Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls. Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Contributing scenario controlling worker exposure for 3: High (mechanical) energy work-up of substances bound in materials and/or articles

Product characteristics	: Solid.
Concentration of substance in mixture or article	: Covers concentrations up to 0.5 %.
Human factors not influenced by risk management	: Breathing volume: 10 m ³ /day. Body weight: 70 kg.
Other conditions affecting workers exposure	: Indoor use. Professional.
Conditions and measures related to personal protection, hygiene and health evaluation	
Personal protection	: Wear chemical-resistant gloves (tested to EN374) in combination with intensive management supervision controls. Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 98%).

Section 3 - Exposure estimation and reference to its source

Exposure estimation and reference to its source - Environment: 1: All ERCs (see above)

Exposure assessment (environment):	: see ES 3.1.
Exposure estimation	: see ES 3.1.

Exposure estimation and reference to its source - Workers: 2: Low energy manipulation of substances bound in materials and/or articles

Exposure assessment (human):	: ECETOC TRA, Version 2 (Modified version).
Exposure estimation	: Worker - inhalative, long-term - systemic: 0.02 mg/m ³ . Risk characterisation ratio: 0.015.
	Worker - dermal, long-term - systemic: 0.0141 mg/kg bw/day. Risk characterisation ratio: 0.0248.
	Worker - combined, long-term - systemic: 0.0398.
	Worker - inhalative, short-term - local: 0.03 mg/m ³ . Risk characterisation ratio: 0.00000557.
Remark	: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 3: High (mechanical) energy work-up of substances bound in materials and/or articles

Exposure assessment (human):	: ECETOC TRA, Version 2 (Modified version).
Exposure estimation	: Worker - inhalative, long-term - systemic: 0.02 mg/m ³ . Risk characterisation ratio: 0.015.
	Worker - dermal, long-term - systemic: 0.0141 mg/kg bw/day. Risk characterisation ratio: 0.0248.
	Worker - combined, long-term - systemic: 0.0398.
	Worker - inhalative, short-term - local: 0.03 mg/m ³ . Risk characterisation ratio: 0.00000557.
Remark	: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

General	: The immediate downstream user is required to evaluate whether the operational conditions and risk management measures described in the exposure scenario fit to his use. If other OC/RMM are adopted, the user has to ensure that risks are managed to at least equivalent levels. The risk assessment methods/tools given in section 3 may be used for this evaluation.
Environment	: Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html).
Health	: ECETOC TRA, Version 2 (Modified version): <ul style="list-style-type: none">- adjusted efficacy values for gloves as adopted by CEFIC- use of factor 2 to calculate peak exposure from long term exposure- use of exact percentage (2%, 0.5%) in product instead of broad TRA categories

Annex to the extended Safety Data Sheet (eSDS)

Consumer

Identification of the substance or mixture

Product definition : UVCB
Product name : Pentaethylenehexamine, PEHA

Section 1 - Title

Short title of the exposure scenario : Consumer uses of ethyleneamines (EA) - Consumer

List of use descriptors : **Identified use name: ES 5:** Consumer uses of ethyleneamines (EA) - Consumer: SU21; PC01, PC09b; ERC08a, ERC08b, ERC08c, ERC08d, ERC08e, ERC08f
Substance supplied to that use in form of: In a mixture
Subsequent service life relevant for that use: No.
Environmental Release Category: ERC08a, ERC08b, ERC08c, ERC08d, ERC08e, ERC08f
Market sector by type of chemical product: PC01, PC09b

Environmental contributing scenarios : **Detergents**
Use in coatings; adhesive
Lube oil use, consumer

Health Contributing scenarios : **Adhesives, sealants; Mixing and loading** - PC01
Adhesives, sealants; Application - PC01
Fillers, putties, plasters, modelling clay - PC09b
Fillers, putties, plasters, modelling clay; Application - PC09b

Number of the ES	: 5
Additional information	: Exposure Scenarios: <ul style="list-style-type: none"> • two component epoxy glue • two component wood repair filler. For each situation two scenarios are applicable; <ul style="list-style-type: none"> • Mixing of the epoxy curing agent with the epoxy polymer • Application of the mixture

Section 2 - Exposure controls

Contributing scenario controlling environmental exposure for 1: Detergents	
Amounts used	: Daily amount per site: 0.76 kg/day.
Frequency and duration of use	: Continuous. Emission days: 365 days per year.
Environment factors not influenced by risk management	: Local freshwater dilution factor: 1300. Local marine water dilution factor: 1000.
Other conditions affecting environmental exposure	: Release to waste water from process: 100 % (AISE 16) Release to air from process: 0 % (AISE 16) Release to soil from process: 0 % (AISE 16)
Conditions and measures related to sewage treatment plant	: Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of ≥ 27.7 %.
Contributing scenario controlling environmental exposure for 2: Use in coatings; adhesive	
Amounts used	: Daily amount per site: 2.0 kg/day.
Frequency and duration of use	: Continuous. Emission days: 365 days per year.
Environment factors not influenced by risk management	: Local freshwater dilution factor: 1300. Local marine water dilution factor: 1000.
Date of issue/Date of revision : 05/10/2017	
Version : 8 / en 94/100	

Pentaethylenehexamine, PEHA	Exposure Scenario: 5	Consumer uses of ethyleneamines (EA) - Consumer
Other conditions affecting environmental exposure	: Release to waste water from process: 1 % (CEPE 14) Release to air from process: 0 % (CEPE 14) Release to soil from process: 0.5 % (CEPE 14)	
Conditions and measures related to sewage treatment plant	: Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of ≥ 27.7 %.	
Contributing scenario controlling environmental exposure for 3: Lube oil use, consumer		
Amounts used	: Daily amount per site: 0.00000815 kg/day.	
Frequency and duration of use	: Continuous. Emission days: 365 days per year.	
Environment factors not influenced by risk management	: Local freshwater dilution factor: 1300. Local marine water dilution factor: 1000.	
Other conditions affecting environmental exposure	: Release to waste water from process: 0 % Release to air from process: 0 % Release to soil from process: 0 %	
Conditions and measures related to sewage treatment plant	: Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of ≥ 27.7 %.	
Contributing scenario controlling consumer exposure for 4: Adhesives, sealants; Mixing and loading		
Product characteristics	: Physical state: Liquid. Molecular weight: 146.23 g/mol. Vapour pressure: 0.346 Pa (25 °C).	
Amounts used	: Covers use up to 25 %. For each use event, covers use amounts up to 20 g.	
Frequency and duration of use/exposure	: Covers use up to 3 days per year. Covers exposure up to 5 min/event.	
Human factors not influenced by risk management	: Breathing volume: 32.9 m ³ /day. Body weight: 60 kg.	
Other given operational conditions affecting consumers exposure	: Inhalation exposure: Inhalation model: exposure to vapour - evaporation. Application duration: 5 min. Room volume: 1 m ³ . Ventilation rate: 0.6 L/h. Release area: 20 cm ² . Temperature: 20 °C. Mass transfer rate: 3090 m/min. Mol. Weight Matrix: 550 g/mol. Uptake fraction (uptake model): 1. Dermal exposure: Dermal model: instant application. Exposed skin surface assumed: 2 cm ² . Amount/concentration applied: 0.05 g. Uptake fraction (uptake model): 1.	
Conditions and measures related to information and behavioural advice to consumers	: Avoid using at a product concentration greater than 25 %. Avoid contact with eyes. Ensure spraying away from persons.	
Conditions and measures related to personal protection and hygiene		
Personal protection	: Wear suitable gloves. Efficiency of at least 90 %.	

Contributing scenario controlling consumer exposure for 5: Adhesives, sealants; Application

Product characteristics	: Physical state: Liquid. Molecular weight: 146.23 g/mol. Vapour pressure: 0.346 Pa (25 °C).
Amounts used	: Covers use up to 5 %. For each use event, covers use amounts up to 20 g.
Frequency and duration of use/exposure	: Covers use up to 3 days per year. Covers exposure up to 90 min/event.
Human factors not influenced by risk management	: Breathing volume: 32.9 m ³ /day. Body weight: 60 kg.
Other given operational conditions affecting consumers exposure	: Covers use in room size of 20 m ³ . Inhalation exposure: Inhalation model: exposure to vapour - evaporation. Application duration: 30 min. Room volume: 20 m ³ . Ventilation rate: 0.6 L/h. Release area: 500 cm ² . Temperature: 20 °C. Mass transfer rate: 3090 m/min. Mol. Weight Matrix: 550 g/mol. Uptake fraction (uptake model): 1. Dermal exposure: Dermal model: instant application. Exposed skin surface assumed: 43 cm ² . Amount/concentration applied: 0.1 g. Uptake fraction (uptake model): 1.
Conditions and measures related to information and behavioural advice to consumers	: Avoid using at a product concentration greater than 5 %. Avoid contact with eyes. Ensure spraying away from persons.
Conditions and measures related to personal protection and hygiene	
Personal protection	: Wear suitable gloves. Efficiency of at least 90 %.

Contributing scenario controlling consumer exposure for 6: Fillers, putties, plasters, modelling clay

Product characteristics	: Physical state: Liquid. Molecular weight: 146.23 g/mol. Vapour pressure: 0.346 Pa (25 °C).
Amounts used	: Covers use up to 25 %. For each use event, covers use amounts up to 200 g.
Frequency and duration of use/exposure	: Covers use up to 2 days per year. Covers exposure up to 5 min/event.
Human factors not influenced by risk management	: Breathing volume: 32.9 m ³ /day. Body weight: 60 kg.
Other given operational conditions affecting consumers exposure	: Inhalation exposure: Inhalation model: exposure to vapour - evaporation. Application duration: 5 min. Room volume: 1 m ³ . Ventilation rate: 0.6 L/h. Release area: 100 cm ² . Temperature: 20 °C. Mass transfer rate: 3090 m/min. Mol. Weight Matrix: 550 g/mol. Uptake fraction (uptake model): 1. Dermal exposure: Dermal model: instant application. Exposed skin surface assumed: 2 cm ² . Amount/concentration applied: 0.02 g.

Pentaethylenehexamine, PEHA	Exposure Scenario: 5	Consumer uses of ethyleneamines (EA) - Consumer
Conditions and measures related to information and behavioural advice to consumers	Uptake fraction (uptake model): 1. : Avoid using at a product concentration greater than 25 %. Avoid contact with eyes. Ensure spraying away from persons.	
Conditions and measures related to personal protection and hygiene	Personal protection : Wear suitable gloves. Efficiency of at least 90 %.	
Contributing scenario controlling consumer exposure for 7: Fillers, putties, plasters, modelling clay; Application		
Product characteristics	: Physical state: Liquid. Molecular weight: 146.23 g/mol. Vapour pressure: 0.346 Pa (25 °C).	
Amounts used	: Covers use up to 5 %. For each use event, covers use amounts up to 200 g.	
Frequency and duration of use/exposure	: Covers use up to 2 days per year. Covers exposure up to 90 min/event.	
Human factors not influenced by risk management	: Breathing volume: 32.9 m ³ /day. Body weight: 60 kg.	
Other given operational conditions affecting consumers exposure	: Covers use in room size of 20 m ³ . Inhalation exposure: Inhalation model: exposure to vapour - evaporation. Application duration: 30 min. Room volume: 20 m ³ . Ventilation rate: 0.6 L/h. Release area: 50 cm ² . Temperature: 20 °C. Mass transfer rate: 3090 m/min. Mol. Weight Matrix: 550 g/mol. Uptake fraction (uptake model): 1. Dermal exposure: Dermal model: instant application. Exposed skin surface assumed: 22 cm ² . Amount/concentration applied: 1 g. Uptake fraction (uptake model): 1.	
Conditions and measures related to information and behavioural advice to consumers	: Avoid using at a product concentration greater than 5 %. Avoid contact with eyes. Ensure spraying away from persons.	
Conditions and measures related to personal protection and hygiene	Personal protection : Wear suitable gloves. Efficiency of at least 90 %.	

Section 3 - Exposure estimation and reference to its source

Exposure estimation and reference to its source - Environment: 1: Detergents		
Exposure assessment (environment):	: EUSES v2.1	
Exposure estimation	: Freshwater: 0.00825 mg/l. Risk characterisation ratio (PEC/PNEC): 0.330. Freshwater sediment: 2.64 mg/kg dwt. Risk characterisation ratio (PEC/PNEC): 0.330. Marine water: 0.000939 mg/l. Risk characterisation ratio (PEC/PNEC): 0.188. Marine water sediment: 0.300 mg/kg dwt. Risk characterisation ratio (PEC/PNEC): 0.188.	

Sewage Treatment Plant: 0.138 mg/l.
 Risk characterisation ratio (PEC/PNEC): 0.00842.

Soil: 0.000375 mg/kg dwt.
 Risk characterisation ratio (PEC/PNEC): 0.000236.

Air: 0.000000000000142 mg/m³.
 Risk characterisation ratio (PEC/PNEC): Not applicable.

Remark : Based on the applied RMMs the risk towards environment is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Environment: 2: Use in coatings; adhesive

Exposure assessment (environment): : EUSES v2.1

Exposure estimation : Freshwater: 0.00815 mg/l.
 Risk characterisation ratio (PEC/PNEC): 0.326.

Freshwater sediment: 2.61 mg/kg dwt.
 Risk characterisation ratio (PEC/PNEC): 0.326.

Marine water: 0.000806 mg/l.
 Risk characterisation ratio (PEC/PNEC): 0.161.

Marine water sediment: 0.258 mg/kg dwt.
 Risk characterisation ratio (PEC/PNEC): 0.161.

Sewage Treatment Plant: 0.00368 mg/l.
 Risk characterisation ratio (PEC/PNEC): 0.000225.

Soil: 0.000375 mg/kg dwt.
 Risk characterisation ratio (PEC/PNEC): 0.000236.

Air: 0.000000000000707 mg/m³.
 Risk characterisation ratio (PEC/PNEC): Not applicable.

Remark : Based on the applied RMMs the risk towards environment is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Environment: 3: Lube oil use, consumer

Exposure assessment (environment): : EUSES v2.1

Exposure estimation : Freshwater: 0.00815 mg/l.
 Risk characterisation ratio (PEC/PNEC): 0.326.

Freshwater sediment: 2.61 mg/kg dwt.
 Risk characterisation ratio (PEC/PNEC): 0.326.

Marine water: 0.000802 mg/l.
 Risk characterisation ratio (PEC/PNEC): 0.160.

Marine water sediment: 0.256 mg/kg dwt.
 Risk characterisation ratio (PEC/PNEC): 0.160.

Sewage Treatment Plant: Not applicable.
 Risk characterisation ratio (PEC/PNEC): Not applicable.

Soil: 0.000375 mg/kg dwt.
 Risk characterisation ratio (PEC/PNEC): 0.000236.

Air: 0.000000000000687 mg/m³.
 Risk characterisation ratio (PEC/PNEC): Not applicable.

Remark : Based on the applied RMMs the risk towards environment is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Consumers: 4: Adhesives, sealants; Mixing and loading

Exposure assessment (human): : Consexpo V4.1

Exposure estimation : **Consumer - inhalative, long-term - systemic:** 0.039 mg/m³.
Risk characterisation ratio: 0.17.

Consumer - dermal, long-term - systemic: 0.0002 mg/kg bw/day.
Risk characterisation ratio: <0.001.

Consumer - combined, long-term - systemic: 0.17.

Consumer - inhalative, short-term - systemic: 11.2 mg/m³.
Risk characterisation ratio: 0.11.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Consumers: 5: Adhesives, sealants; Application

Exposure assessment (human): : Consexpo V4.1

Exposure estimation : **Consumer - inhalative, long-term - systemic:** 0.188 mg/m³.
Risk characterisation ratio: 0.82.

Consumer - dermal, long-term - systemic: 0.0001 mg/kg bw/day.
Risk characterisation ratio: <0.001.

Consumer - combined, long-term - systemic: 0.82.

Consumer - inhalative, short-term - systemic: 3.0 mg/m³.
Risk characterisation ratio: 0.03.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Consumers: 6: Fillers, putties, plasters, modelling clay

Exposure assessment (human): : Consexpo V4.1

Exposure estimation : **Consumer - inhalative, long-term - systemic:** 0.040 mg/m³.
Risk characterisation ratio: 0.17.

Consumer - dermal, long-term - systemic: 0.00005 mg/kg bw/day.
Risk characterisation ratio: <0.001.

Consumer - combined, long-term - systemic: 0.17.

Consumer - inhalative, short-term - systemic: 11.5 mg/m³.
Risk characterisation ratio: 0.11.

Remark : Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Consumers: 7: Fillers, putties, plasters, modelling clay; Application

Exposure assessment (human): : Consexpo V4.1

Pentaethylenhexamine, PEHA	Exposure Scenario: 5	Consumer uses of ethyleneamines (EA) - Consumer
Exposure estimation	<p>Consumer - inhalative, long-term - systemic: 0.191 mg/m³. Risk characterisation ratio: 0.83.</p> <p>Consumer - dermal, long-term - systemic: 0.0001 mg/kg bw/day. Risk characterisation ratio: <0.001.</p> <p>Consumer - combined, long-term - systemic: 0.83.</p> <p>Consumer - inhalative, short-term - systemic: 3.1 mg/m³. Risk characterisation ratio: 0.03.</p>	
Remark	: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).	

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

General	: Not applicable.
Environment	: Not applicable.