

SAFETY DATA SHEET



N-Aminoethylpiperazine, AEP

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

1.1 Product identifier

Product name : N-Aminoethylpiperazine, AEP**Index number** : 612-105-00-4**EC number** : 205-411-0**REACH Registration number**

Registration number	Legal entity
01-2119471486-30-0003	-

CAS number : 740-31-8**Other means of identification** :

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

Product use : Intermediate. Chemical synthesis.

Identified uses
ES01: Manufacture: Industrial: SU03; PROC01, PROC02, PROC03, PROC08b, PROC15, PROC28; ERC01
ES02: Formulation and (re)packing of substances and mixtures - Industrial: SU03; PROC01, PROC02, PROC03, PROC08b, PROC09, PROC15, PROC28; ERC02
ES03: Industrial Use in Epoxy/PU Curing Industrial - Industrial: SU03; PROC01, PROC02, PROC03, PROC07, PROC08b, PROC10, PROC15, PROC28; ERC05
ES04: Professional Use in Epoxy/PU Curing - Professional: SU22; PROC01, PROC05, PROC06, PROC08a, PROC10, PROC11, PROC19, PROC28; ERC08c, ERC08f
ES05: Monomer in Polymer Manufacture of polyamides and copolymers - Industrial: SU03; PROC01, PROC02, PROC03, PROC06, PROC08b, PROC14, PROC15, PROC28; ERC04
ES06: Gas Sweetening - Industrial: SU03; PROC01, PROC02, PROC03, PROC08b, PROC28; ERC07

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

Stationsplein 121

3818LE Amersfoort

The 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** : 352 323 3500 (24 h)

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Product definition : Mono-constituent substance**Classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]**

SECTION 2: Hazards identification

Acute Tox. 4, H302
 Acute Tox. 3, H311
 Skin Corr. 1B, H314
 Eye Dam. 1, H318
 Skin Sens. 1, H317
 Repr. 2, H361fd (Fertility and Unborn child) (oral)
 STOT RE 1, H372
 Aquatic Chronic 3, H412

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

: H311 - Toxic in contact with skin.
 H302 - Harmful if swallowed.
 H314 - Causes severe skin burns and eye damage.
 H317 - May cause an allergic skin reaction.
 H361fd - Suspected of damaging fertility if swallowed. Suspected of damaging the unborn child if swallowed.
 H372 - Causes damage to organs through prolonged or repeated exposure.
 H412 - Harmful to aquatic life with long lasting effects.

Precautionary statements

Prevention

: P201 - Obtain special instructions before use.
 P280 - Wear protective gloves. Wear protective clothing. Wear eye or face protection.
 P273 - Avoid release to the environment.
 P260 - Do not breathe vapour.

Response

: 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 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
 P310 - Immediately call a POISON CENTER or physician.

Storage

: Not applicable.

Disposal

: Not applicable.

Hazardous ingredients

: 1-piperazin-1-ylethylamine

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

Product meets the criteria for PBT or vPvB according to Regulation (EC) No. 1907/2006, Annex XIII

	PBT	P	B	T	vPvB	vP	vB
	No	Yes	No	Yes	No	No	No

Other hazards which do not result in classification

: None known.

SECTION 3: Composition/information on ingredients

3.1 Substances : Mono-constituent substance

Product/ingredient name	Identifiers	%	Regulation (EC) No. 1272/2008 [CLP]	Type
2-piperazin-1-ylethylamine	REACH #: 01-2119471486-30 EC: 205-411-0 CAS: 140-31-8 Index: 612-105-00-4	98 - 100	Acute Tox. 4, H302 Acute Tox. 3, H311 Skin Corr. 1B, H314 Eye Dam. 1, H318 Skin Sens. 1, H317 Repr. 2, H361fd (Fertility and Unborn child) (oral) STOT RE 1, H372 (respiratory tract) (inhalation) Aquatic Chronic 3, H412	[A]
2-(2-aminoethylamino) ethanol	REACH #: 01-2119456894-24 EC: 203-867-5 CAS: 111-41-1 Index: 603-194-00-0	< 0.3	Skin Corr. 1B, H314 Eye Dam. 1, H318 Skin Sens. 1B, H317 Repr. 1B, H360FD (Fertility and Unborn child) Lact., H362 See Section 16 for the full text of the H statements declared above.	[B]

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

[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.

SECTION 4: First aid measures

- 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. Toxic 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
reduced foetal weight
increase in foetal deaths
skeletal malformations

4.3 Indication of any immediate medical attention and special treatment needed

- 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 harmful 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.

SECTION 5: Firefighting measures

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.

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.

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

SECTION 7: Handling and storage

- 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. Avoid exposure - obtain special instructions before use. Avoid exposure during pregnancy. Do not handle until all safety precautions have been read and understood. 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. 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. 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. See Section 10 for incompatible materials before handling or use.

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.

- 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
2-piperazin-1-ylethylamine	DNEL	Long term Inhalation	10.6 mg/m ³	Workers	Systemic
	DNEL	Short term Inhalation	10.6 mg/m ³	Workers	Systemic
	DNEL	Long term Inhalation	0.015 mg/m ³	Workers	Local
	DNEL	Short term	0.08 mg/m ³	Workers	Local

SECTION 8: Exposure controls/personal protection

		Inhalation			
	DNEL	Long term Dermal	3.33 mg/kg bw/day	Workers	Systemic
	DNEL	Short term Dermal	20 mg/kg bw/day	Workers	Systemic

PNECs

Product/ingredient name	Compartment Detail	Value	Method Detail
2-piperazin-1-ylethylamine	Fresh water	0.058 mg/l	-
	Marine water	0.0058 mg/l	-
	Intermittent release	0.58 mg/l	-
	Fresh water sediment	215 mg/kg dwt	-
	Marine water sediment	21.5 mg/kg dwt	-
	Sewage Treatment Plant	250 mg/l	-
	Soil	1 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

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.

SECTION 8: Exposure controls/personal protection

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Recommended: Combination filtering device (DIN EN 14387), Filter type: A-P2.

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.
Colour	: Clear. Colourless.
Odour	: Ammonia.
Odour threshold	: Not available.
pH	: 11.4
Melting point/freezing point	: -19°C
Initial boiling point and boiling range	: 220.4°C
Flash point	: Closed cup: 99°C
Evaporation rate	: Not available.
Flammability (solid, gas)	: Not applicable.
Upper/lower flammability or explosive limits	: Lower: 1.1% Upper: 9.4%
Vapour pressure	: 0.0052 kPa [room temperature]
Vapour density	: 4.4 [Air = 1]
Relative density	: Not available.
Density	: 0.98 g/cm ³ [20°C]
Solubility(ies)	: Not available.
Solubility in water	: Not available.
Partition coefficient: n-octanol/ water	: -1.48
Auto-ignition temperature	: >300°C
Decomposition temperature	: Not available.
Viscosity	: Dynamic (room temperature): 14.1 mPa·s
Explosive properties	: Not considered to be a product presenting a risk of explosion.
Oxidising properties	: Not applicable.

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.

SECTION 10: Stability and reactivity

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
2-piperazin-1-ylethylamine	LD50 Dermal	Rabbit - Male	866 mg/kg	-	-
	LD50 Oral	Rat	2140 mg/kg	-	-

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

Acute toxicity estimates

Product/ingredient name	Oral (mg/kg)	Dermal (mg/kg)	Inhalation (gases) (ppm)	Inhalation (vapours) (mg/l)	Inhalation (dusts and mists) (mg/l)
2-piperazin-1-ylethylamine	500	866	N/A	N/A	N/A

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation	Remarks
2-piperazin-1-ylethylamine	Skin - Visible necrosis	Rabbit	-	24 hours	24 hours	-
	Eyes - Severe irritant	Rabbit	-	-	7 days	-

Conclusion/Summary

Skin : Causes severe burns.

Eyes : Causes serious eye damage.

Sensitisation

Product/ingredient name	Route of exposure	Species	Result	Remarks
2-piperazin-1-ylethylamine	skin	Guinea pig	Sensitising [OECD 406]	-

Conclusion/Summary

Skin : May cause an allergic skin reaction.

Mutagenicity

Product/ingredient name	Test	Experiment	Result	Remarks
2-piperazin-1-ylethylamine	OECD 471	Experiment: In vitro Subject: Bacteria	Negative	-
	-	Experiment: In vivo Subject: Mammalian-Animal	Negative	-

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

SECTION 11: Toxicological information**Carcinogenicity****Conclusion/Summary** : Not available.**Reproductive toxicity**

Product/ingredient name	Maternal toxicity	Fertility	Developmental toxin	Species	Dose	Exposure	Remarks
2-piperazin-1-ylethylamine	Negative	-	Positive	Rabbit	Oral: 150 mg/kg NOAEL	-	OECD 414

Conclusion/Summary : Suspected of damaging fertility or the unborn child.**Teratogenicity****Conclusion/Summary** : Not available.**Specific target organ toxicity (single exposure)**

Not available.

Specific target organ toxicity (repeated exposure)

Product/ingredient name	Category	Route of exposure	Target organs
2-piperazin-1-ylethylamine	Category 1	Inhalation	respiratory tract

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. Toxic 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
reduced foetal weight
increase in foetal deaths
skeletal malformations

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**

SECTION 11: Toxicological information

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Product/ingredient name	Result	Species	Dose	Exposure	Remarks
2-piperazin-1-ylethylamine	Sub-chronic NOAEL Oral [OECD 422]	Rat	152 mg/kg	-	-
	Sub-chronic NOAEL Dermal	Rat	1000 mg/kg	-	-
	Sub-chronic NOEL Inhalation Dusts and mists [OECD 413]	Rat	53.5 mg/m ³	90 days	-

Conclusion/Summary : Causes damage to organs through prolonged or repeated exposure.

General : Causes damage to organs through prolonged or repeated exposure. 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 : Suspected of damaging the unborn child if swallowed.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : Suspected of damaging fertility if swallowed.

Other information : Not available.

SECTION 12: Ecological information**12.1 Toxicity**

Product/ingredient name	Result	Species	Exposure	Remarks
2-piperazin-1-ylethylamine	Acute EC50 >1000 mg/l Fresh water [OECD 201]	Algae - Pseudokirchnerella subcapitata	72 hours	-
	Acute EC50 58 mg/l [OECD 202]	Daphnia - Daphnia magna	48 hours	-
	Acute LC50 2190 mg/l Fresh water	Fish - Pimephales promelas	96 hours	-

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

12.2 Persistence and degradability

Product/ingredient name	Test	Result	Dose	Inoculum
2-piperazin-1-ylethylamine	OECD 301F	0 % - Not readily - 28 days	-	-

Conclusion/Summary : Not readily biodegradable.

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
2-piperazin-1-ylethylamine	-	-	Not readily

12.3 Bioaccumulative potential

Product/ingredient name	LogP _{ow}	BCF	Potential
2-piperazin-1-ylethylamine	-1.48	-	low

12.4 Mobility in soil

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SECTION 12: Ecological information

- Soil/water partition coefficient (K_{oc})** : Not available.
- Mobility** : Low mobility in soil predicted, based on log Kow < 3.0.

12.5 Results of PBT and vPvB assessment

Product/ingredient name	PBT	P	B	T	vPvB	vP	vB
<input checked="" type="checkbox"/> piperazin-1-ylethylamine	No	Yes	No	Yes	No	No	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.

The allocation of waste identity numbers/waste descriptions must be carried out according to the EWC, specific to the industry and process.





- Hazardous waste** : The classification of the product may meet the criteria for a hazardous waste.

Packaging

- Methods of disposal** : The generation of waste should be avoided or minimised wherever possible.

- 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	UN2815	UN2815	UN2815	UN2815
14.2 UN proper shipping name	N-AMINOETHYLPIPERAZINE	N-AMINOETHYLPIPERAZINE	N-AMINOETHYLPIPERAZINE	N-Aminoethylpiperazine
14.3 Transport hazard class(es)	8 (6.1)	8 (6.1)	8 (6.1)	8 (6.1)
Label				
14.4 Packing group	III	III	III	III
14.5 Environmental hazards	No.	Yes.	Marine Pollutant: No	No.

Additional information

- ADR/RID** : **Hazard identification number** 86
Limited quantity 5 L
Tunnel code (E)

SECTION 14: Transport information

- ADN** : The product is only regulated as an environmentally hazardous substance when transported in tank vessels.
- IATA** : **Quantity limitation** Passenger and Cargo Aircraft: 5 L. Packaging instructions: 852. Cargo Aircraft Only: 60 L. Packaging instructions: 856. Limited Quantities - Passenger Aircraft: 1 L. Packaging instructions: Y841.
Special provisions A803

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

Proper shipping name : N-Aminoethylpiperazine

Ship type : 3

Pollution category : 7

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**Ozone depleting substances (1005/2009/EU)**

Not listed.

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

Not listed.

Seveso Directive

This product is not controlled under the Seveso Directive.

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.

Inventory list

SECTION 15: Regulatory information

Australia inventory (AICS)	: All components are listed or exempted.
Canada	: All components are listed or exempted.
China	: All components are listed or exempted.
Europe	: All components are listed or exempted.
Japan	: Japan inventory (ENCS): <input checked="" type="checkbox"/> All components are listed or exempted.
New Zealand	: All components are listed or exempted.
Philippines	: All components are listed or exempted.
Republic of Korea	: All components are listed or exempted.
Taiwan	: All components are listed or exempted.
Turkey	: All components are listed or exempted.
United States	: All components are 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 :

- ADN = European Provisions concerning the International Carriage of Dangerous Goods by Inland Waterway
- ADR = The European Agreement concerning the International Carriage of Dangerous Goods by Road
- ATE = Acute Toxicity Estimate
- BCF = Bioconcentration Factor
- 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
- EWC = European Waste Catalogue
- IATA = International Air Transport Association
- IBC = Intermediate Bulk Container
- IMDG = International Maritime Dangerous Goods
- LogPow = logarithm of the octanol/water partition coefficient
- MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
- N/A = Not available
- PBT = Persistent, Bioaccumulative and Toxic
- PNEC = Predicted No Effect Concentration
- RID = The Regulations concerning the International Carriage of Dangerous Goods by Rail
- RRN = REACH Registration Number
- SGG = Segregation Group
- vPvB = Very Persistent and Very Bioaccumulative

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

Classification	Justification
<input checked="" type="checkbox"/> Acute Tox. 4, H302	Regulatory data
Acute Tox. 3, H311	Expert judgment
Skin Corr. 1B, H314	Regulatory data
Eye Dam. 1, H318	Expert judgment
Skin Sens. 1, H317	Regulatory data
Repr. 2, H361fd (Fertility and Unborn child) (oral)	Expert judgment
STOT RE 1, H372	Calculation method
Aquatic Chronic 3, H412	Regulatory data

Full text of abbreviated H statements

SECTION 16: Other information

H302 H311 H314 H317 H318 H361fd (oral)	Harmful if swallowed. Toxic in contact with skin. Causes severe skin burns and eye damage. May cause an allergic skin reaction. Causes serious eye damage.
H372 (inhalation)	Suspected of damaging fertility if swallowed. Suspected of damaging the unborn child if swallowed. Causes damage to organs through prolonged or repeated exposure if inhaled.
H372	Causes damage to organs through prolonged or repeated exposure.
H412	Harmful to aquatic life with long lasting effects.

[Full text of classifications \[CLP/GHS\]](#)

Acute Tox. 3, H311 Acute Tox. 4, H302 Aquatic Chronic 3, H412 Eye Dam. 1, H318 Repr. 2, H361fd (oral)	ACUTE TOXICITY (dermal) - Category 3 ACUTE TOXICITY (oral) - Category 4 LONG-TERM (CHRONIC) AQUATIC HAZARD - Category 3 SERIOUS EYE DAMAGE/EYE IRRITATION - Category 1 REPRODUCTIVE TOXICITY (Fertility and Unborn child) (oral) - Category 2
Skin Corr. 1B, H314 Skin Sens. 1, H317 STOT RE 1, H372 (inhalation)	SKIN CORROSION/IRRITATION - Category 1B SKIN SENSITISATION - Category 1 SPECIFIC TARGET ORGAN TOXICITY - REPEATED EXPOSURE (inhalation) - Category 1
STOT RE 1, H372	SPECIFIC TARGET ORGAN TOXICITY - REPEATED EXPOSURE - 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 : Mono-constituent substance
Product name : N-Aminoethylpiperazine, AEP

Section 1 - Title

Short title of the exposure scenario : Manufacture: Industrial

List of use descriptors : **Identified use name: ES01:** Manufacture: Industrial: SU03; PROC01, PROC02, PROC03, PROC08b, PROC15, PROC28; ERC01
Process Category: PROC01, PROC02, PROC03, PROC08b, PROC15, PROC28
Subsequent service life relevant for that use: No.
Environmental Release Category: ERC01

Environmental contributing scenarios : **Manufacture:** - ERC01

Health Contributing scenarios : **Storage** - PROC01
General exposures (closed systems); No sampling - PROC01
General exposures (closed systems); Continuous process; With sample collection - PROC02
General exposures; Use in contained batch processes; With sample collection - PROC03
Bulk transfers; Dedicated facility - PROC08b
Laboratory activities - PROC15
Equipment cleaning and maintenance - PROC28

Number of the ES	: 01
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Section 2 - Exposure controls

Contributing scenario controlling environmental exposure for 1: Manufacture:

Amounts used : Fraction of EU tonnage used in region: 1.
 Fraction of main source to local environment: 1.
 Fraction of substance in end-use products: ≤ 100 %.
 Daily amount per site, M_{SPERC}/M_{site} (kg/day): 2167.

Frequency and duration of use : Continuous release, Emission days: 300 days per year.

Environment factors not influenced by risk management : Local freshwater dilution factor: 10.
 Local marine water dilution factor: 100.

Other conditions affecting environmental exposure : Effluent discharge rate: 2000 m³/d.
 Receiving surface water flow: 18000 m³/d.
 Release to waste water from process: 0 %
 Release to air from process: 0.001 % (ESVOC SPERC 1.1.v1)
 Release to soil from process: 0.01 % (ESVOC SPERC 1.1.v1)

Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil : On-site wastewater treatment, Biological treatment by:
 Anaerobic biological treatment, Substances: Soluble, Biodegradable.
 Aerobic biological treatment, Substances: Soluble, Biodegradable.

Conditions and measures related to sewage treatment plant : On-site wastewater treatment required.
 Do not apply industrial sludge to natural soils.

N-Aminoethylpiperazine, AEP	Exposure Scenario: 01	Manufacture: Industrial
Conditions and measures related to external treatment of waste for disposal	: Disposal should be in accordance with applicable regional, national and local laws and regulations. This product should be treated as a hazardous waste according to EC Directive 2008/98/EC. Prevent entry into sewers, water courses, basements or confined areas.	
Contributing scenario controlling worker exposure for 2: Storage		
Product characteristics	: Liquid. Vapour pressure: 5.2 Pa. Viscosity: low. (ART)	
Concentration of substance in mixture or article	: Covers concentrations up to 100 %.	
Frequency and duration of use/exposure	: Covers daily exposures up to 8 hours. Exposure period, Distance of worker from source > 1 m: 480 minutes. (ART) Non-exposure period: 0 minutes. (ART)	
Other conditions affecting workers exposure	: Process temperature: 20 °C. Indoor use, Room size: Any. (ART) Open surface: > 3 m ² . (ART)	
Technical conditions and measures at process level (source) to prevent release	: Store substance within a closed system. The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART) Demonstrable and effective housekeeping practices are in place. (ART) Containment: high. (ART) Further parameters (ART): Activities with open liquid surfaces or open reservoirs - activity with undisturbed surfaces (no aerosol formation). - Localised controls (secondary): No. Segregation: No. Personal enclosure: No.	
Technical conditions and measures to control dispersion from source towards the worker	: Only good natural ventilation. (ART)	
Organisational measures to prevent/limit releases, dispersion and exposure	: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop. Avoid splashing. Avoid contact with contaminated tools and objects. Regular cleaning of equipment. Regular cleaning of work area. Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed.. Training for staff on good practice. Good standard of personal hygiene.	
Conditions and measures related to personal protection, hygiene and health evaluation		
Advice on general occupational hygiene	: Assumes a good basic standard of occupational hygiene is implemented.	
Personal protection	: Use suitable eye protection and gloves.	
Contributing scenario controlling worker exposure for 3: General exposures (closed systems); No sampling		
Product characteristics	: Liquid. Vapour pressure: 5.2 Pa. Viscosity: low. (ART)	
Concentration of substance in mixture or article	: Covers concentrations up to 100 %.	
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Frequency and duration of use/exposure	: Covers daily exposures up to 8 hours. Exposure period, Distance of worker from source > 1 m: 480 minutes. (ART) Non-exposure period: 0 minutes. (ART)
Other conditions affecting workers exposure	: Process temperature: 20 °C. Indoor use, Room size: 1000 m³. (ART) Open surface: > 3 m². (ART)
Technical conditions and measures at process level (source) to prevent release	: Handle substance within a closed system. The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART) Demonstrable and effective housekeeping practices are in place. (ART) Containment: high. (ART) Further parameters (ART): Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces. - Localised controls (secondary): No. Segregation: No. Personal enclosure: No.
Technical conditions and measures to control dispersion from source towards the worker	: Only good natural ventilation. (ART)
Organisational measures to prevent/limit releases, dispersion and exposure	: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop. Avoid splashing. Avoid contact with contaminated tools and objects. Regular cleaning of equipment. Regular cleaning of work area. Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed.. Training for staff on good practice. Good standard of personal hygiene.
Conditions and measures related to personal protection, hygiene and health evaluation	
Advice on general occupational hygiene	: Assumes a good basic standard of occupational hygiene is implemented.
Personal protection	: Use suitable eye protection and gloves.

Contributing scenario controlling worker exposure for 4: General exposures (closed systems); Continuous process; With sample collection

Product characteristics	: Liquid. Vapour pressure: 5.2 Pa. Viscosity: low. (ART)
Concentration of substance in mixture or article	: Covers concentrations up to 100 %.
Frequency and duration of use/exposure	: Covers daily exposures up to 8 hours. Exposure period, Distance of worker from source < 1 m: 10 minutes (Transfer of liquid products - falling liquids). (ART) Exposure period, Distance of worker from source < 1 m: 50 minutes (Handling of contaminated objects). (ART) Exposure period, Distance of worker from source > 1 m: 420 minutes (Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces). (ART) Non-exposure period: 0 minutes. (ART)
Other conditions affecting workers exposure	: Process temperature: 20 °C. Indoor use, Room size: 1000 m³. (ART) Splash loading. (ART) Activities with treated/contaminated objects (Surfaces: 1 - 3 m²). (ART) Contamination 10 - 90 % of surface. (ART) Open surface: > 3 m³. (ART)

Technical conditions and measures at process level (source) to prevent release

: Handle substance within a closed system.

The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART)

Demonstrable and effective housekeeping practices are in place. (Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces, Handling of contaminated objects) (ART)

General housekeeping practices are in place. (Transfer of liquid products - falling liquids) (ART)

Containment: Handling that reduces contact between product and adjacent air.

(Transfer of liquid products - falling liquids, Handling of contaminated objects) (ART)

Containment: high. (Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces) (ART)

Further parameters (ART):

Transfer of liquid products - falling liquids. - Localised controls (primary, secondary): No.

Transferring < 0.1 L/min.

Handling of contaminated objects. - Localised controls (primary, secondary): No.

Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces. - Localised controls (secondary): No.

Segregation: No.

Personal enclosure: No.

Technical conditions and measures to control dispersion from source towards the worker

: Only good natural ventilation. (ART)

Organisational measures to prevent/limit releases, dispersion and exposure

: Avoid all skin contact with product, clean up contamination/spills as soon as they occur.

Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately.

Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop.

Avoid splashing.

Avoid contact with contaminated tools and objects.

Regular cleaning of equipment.

Regular cleaning of work area.

Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed..

Training for staff on good practice.

Good standard of personal hygiene.

Conditions and measures related to personal protection, hygiene and health evaluation**Advice on general occupational hygiene**

: Assumes a good basic standard of occupational hygiene is implemented.

Personal protection

: Use suitable eye protection.

Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %.

Avoid direct eye contact with product, also via contamination on hands.

Avoid direct skin contact with product.

Identify potential areas for indirect skin contact.

Contributing scenario controlling worker exposure for 5: General exposures; Use in contained batch processes; With sample collection**Product characteristics**

: Liquid.

Vapour pressure: 5.2 Pa.

Viscosity: low. (ART)

Concentration of substance in mixture or article

: Covers concentrations up to 100 %.

Frequency and duration of use/exposure

: Covers daily exposures up to 8 hours.
 Exposure period, Distance of worker from source < 1 m: 20 minutes (Transfer of liquid products - falling liquids). (ART)
 Exposure period, Distance of worker from source < 1 m: 60 minutes (Handling of contaminated objects). (ART)
 Exposure period, Distance of worker from source > 1 m: 380 minutes (Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces). (ART)
 Exposure period, Distance of worker from source < 1 m: 20 minutes (Handling of contaminated objects). (ART)
 Non-exposure period: 0 minutes. (ART)

Other conditions affecting workers exposure

: Process temperature: 20 °C.
 Indoor use, Room size: 1000 m³. (ART)
 Splash loading. (ART)
 Activities with treated/contaminated objects (Surfaces: 1 - 3 m²). (ART)
 Contamination 10 - 90 % of surface. (ART)
 Open surface: > 3 m³. (ART)

Technical conditions and measures at process level (source) to prevent release

: Handle substance within a closed system.

 The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART)
 Demonstrable and effective housekeeping practices are in place. (Handling of contaminated objects, Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces) (ART)
 General housekeeping practices are in place. (Transfer of liquid products - falling liquids) (ART)
 Containment: Handling that reduces contact between product and adjacent air. (Transfer of liquid products - falling liquids) (ART)
 Containment: high. (Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces) (ART)

 Further parameters (ART):
 Transfer of liquid products - falling liquids. - Localised controls (primary, secondary): No.
 Transferring < 0.1 L/min.

 Handling of contaminated objects. - Localised controls (primary, secondary): No.

 Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces. - Localised controls (secondary): No.
 Segregation: No.
 Personal enclosure: No.

Technical conditions and measures to control dispersion from source towards the worker

: Only good natural ventilation. (ART)

Organisational measures to prevent/limit releases, dispersion and exposure

: Avoid all skin contact with product, clean up contamination/spills as soon as they occur.
 Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately.
 Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop.
 Avoid splashing.
 Avoid contact with contaminated tools and objects.
 Regular cleaning of equipment.
 Regular cleaning of work area.
 Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed..
 Training for staff on good practice.
 Good standard of personal hygiene.

Conditions and measures related to personal protection, hygiene and health evaluation**Advice on general occupational hygiene**

: Assumes a good basic standard of occupational hygiene is implemented.

N-Aminoethylpiperazine, AEP	Exposure Scenario: 01	Manufacture: Industrial
Personal protection	: Use suitable eye protection. Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %. Avoid direct eye contact with product, also via contamination on hands. Avoid direct skin contact with product. Identify potential areas for indirect skin contact.	
Contributing scenario controlling worker exposure for 6: Bulk transfers; Dedicated facility		
Product characteristics	: Liquid. Vapour pressure: 5.2 Pa. Viscosity: low. (ART)	
Concentration of substance in mixture or article	: Covers concentrations up to 100 %.	
Frequency and duration of use/exposure	: Covers exposure up to 4 hours. Exposure period, Distance of worker from source < 1 m: 20 minutes (Transfer of liquid products - falling liquids). (ART) Exposure period, Distance of worker from source > 1 m: 200 minutes (Transfer of liquid products - Bottom loading). (ART) Exposure period, Distance of worker from source < 1 m: 20 minutes (Handling of contaminated objects). (ART) Non-exposure period: 240 minutes. (ART)	
Other conditions affecting workers exposure	: Process temperature: 20 °C. Indoor use, Room size: 1000 m ³ . (ART) Splash loading. (ART) Activities with treated/contaminated objects (Surfaces: 1 - 3 m ²). (ART) Contamination 10 - 90 % of surface. (ART)	
Technical conditions and measures at process level (source) to prevent release	: The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART) Demonstrable and effective housekeeping practices are in place. (ART) General housekeeping practices are in place. (Transfer of liquid products - falling liquids) (ART) Containment: Handling that reduces contact between product and adjacent air. (Transfer of liquid products - Bottom loading) (ART) Further parameters (ART): Transfer of liquid products - falling liquids. - Localised controls (primary, secondary): No. Transferring < 0.1 L/min. Transfer of liquid products - Bottom loading. - Localised controls (primary, secondary): No. Transferring > 1000 L/min. Segregation: No. Personal enclosure: No.	
Technical conditions and measures to control dispersion from source towards the worker	: Only good natural ventilation. (ART)	
Organisational measures to prevent/limit releases, dispersion and exposure	: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop. Avoid splashing. Avoid contact with contaminated tools and objects. Regular cleaning of equipment. Regular cleaning of work area. Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed.. Training for staff on good practice. Good standard of personal hygiene.	
Date of issue/Date of revision	: 19/04/2017	
Version	: 2 / en 21/81	

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

Advice on general occupational hygiene : Assumes a good basic standard of occupational hygiene is implemented.

Personal protection : Use suitable eye protection.
Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %.
Avoid direct eye contact with product, also via contamination on hands.
Avoid direct skin contact with product.
Identify potential areas for indirect skin contact.

Contributing scenario controlling worker exposure for 7: Laboratory activities

- Product characteristics** : Liquid.
Vapour pressure: 5.2 Pa.
Viscosity: low. (ART)
- Concentration of substance in mixture or article** : Covers concentrations up to 100 %.
- Frequency and duration of use/exposure** : Covers exposure up to 1 hour.
Exposure period, Distance of worker from source < 1 m: 60 minutes. (ART)
Non-exposure period: 420 minutes. (ART)
- Other conditions affecting workers exposure** : Process temperature: 20 °C.
Indoor use, Room size: Any. (ART)
Splash loading. (ART)
- Technical conditions and measures at process level (source) to prevent release** : The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART)
General housekeeping practices are in place. (ART)
Containment: Open process. (ART)
- Further parameters (ART):
Transfer of liquid products - falling liquids. - Localised controls (secondary): No.
Transferring < 0.1 L/min.
- Technical conditions and measures to control dispersion from source towards the worker** : Localised controls (primary): Handle in a fume cupboard. (ART)
- Ventilation control measures** : Recommended room ventilation rate for handling/application (air changes per hour): 3. (ART)
- Organisational measures to prevent/limit releases, dispersion and exposure** : Avoid all skin contact with product, clean up contamination/spills as soon as they occur.
Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately.
Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop.
Avoid splashing.
Avoid contact with contaminated tools and objects.
Regular cleaning of equipment.
Regular cleaning of work area.
Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed..
Training for staff on good practice.
Good standard of personal hygiene.

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

Advice on general occupational hygiene : Assumes a good basic standard of occupational hygiene is implemented.

Personal protection : Use suitable eye protection.
Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %.
Avoid direct eye contact with product, also via contamination on hands.
Avoid direct skin contact with product.
Identify potential areas for indirect skin contact.

Contributing scenario controlling worker exposure for 8: Equipment cleaning and maintenance

Product characteristics	: Liquid. Vapour pressure: 5.2 Pa. Viscosity: low. (ART)
Concentration of substance in mixture or article	: Covers concentrations up to 100 %.
Frequency and duration of use/exposure	: Covers exposure up to 2 hours. Exposure period, Distance of worker from source < 1 m: 120 minutes. (ART) Non-exposure period: 360 minutes. (ART)
Other conditions affecting workers exposure	: Process temperature: 20 °C. Indoor use, Room size: Any. (ART) Activities with treated/contaminated objects (Surfaces: 1 - 3 m ²). (ART) Contamination 10 - 90 % of surface. (ART)
Technical conditions and measures at process level (source) to prevent release	: The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART) Demonstrable and effective housekeeping practices are in place. (ART) Further parameters (ART): Handling of contaminated objects. - Localised controls (primary, secondary): No.
Technical conditions and measures to control dispersion from source towards the worker	: Only good natural ventilation. (ART)
Organisational measures to prevent/limit releases, dispersion and exposure	: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop. Avoid splashing. Avoid contact with contaminated tools and objects. Regular cleaning of equipment. Regular cleaning of work area. Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed.. Training for staff on good practice. Good standard of personal hygiene.
Conditions and measures related to personal protection, hygiene and health evaluation	
Advice on general occupational hygiene	: Assumes a good basic standard of occupational hygiene is implemented.
Personal protection	: Use suitable eye protection. Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %. Avoid direct eye contact with product, also via contamination on hands. Avoid direct skin contact with product. Identify potential areas for indirect skin contact.

Section 3 - Exposure estimation and reference to its source**Exposure estimation and reference to its source - Environment: 1: Manufacture:**

Exposure assessment (environment):	: ECETOC TRA worker v3 Version 3.1.
Exposure estimation	: Freshwater: 0.0222 mg/l. Risk characterisation ratio (PEC/PNEC): 0.383. Freshwater sediment: 0.0840 mg/kg dwt. Risk characterisation ratio (PEC/PNEC): 0.000391. Marine water: 0.00223 mg/l. Risk characterisation ratio (PEC/PNEC): 0.384.

N-Aminoethylpiperazine, AEP	Exposure Scenario: 01	Manufacture: Industrial
	<p>Marine water sediment: 0.00842 mg/kg dwt. Risk characterisation ratio (PEC/PNEC): 0.000392.</p> <p>Sewage Treatment Plant: 0.202 mg/l. Risk characterisation ratio (PEC/PNEC): 0.000808.</p> <p>Soil: 0.00120 mg/kg dwt. Risk characterisation ratio (PEC/PNEC): 0.00120.</p>	
Remark	: Based on the applied RMMs the risk towards environment is sufficiently controlled (RCR < 1).	
Exposure estimation and reference to its source - Workers: 2: Storage		
Exposure assessment (human):	: Inhalation exposure: Used ART model. Version 1.5. Dermal exposure: ECETOC TRA worker v3 Version 3.	
Exposure estimation	: Worker - inhalative, long-term - local: 0.000036 mg/m ³ . Risk characterisation ratio: 0.002.	
	Worker - dermal, long-term - systemic: 0.034 mg/kg bw/day. Risk characterisation ratio: 0.010.	
Remark	: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).	
Exposure estimation and reference to its source - Workers: 3: General exposures (closed systems); No sampling		
Exposure assessment (human):	: Inhalation exposure: Used ART model. Version 1.5. Dermal exposure: ECETOC TRA worker v3 Version 3.	
Exposure estimation	: Worker - inhalative, long-term - local: 0.0013 mg/m ³ . Risk characterisation ratio: 0.087.	
	Worker - dermal, long-term - systemic: 0.034 mg/kg bw/day. Risk characterisation ratio: 0.010.	
Remark	: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).	
Exposure estimation and reference to its source - Workers: 4: General exposures (closed systems); Continuous process; With sample collection		
Exposure assessment (human):	: Inhalation exposure: Used ART model. Version 1.5. Dermal exposure: ECETOC TRA worker v3 Version 3.	
Exposure estimation	: Worker - inhalative, long-term - local: 0.0027 mg/m ³ . Risk characterisation ratio: 0.180.	
	Worker - dermal, long-term - systemic: 0.137 mg/kg bw/day. Risk characterisation ratio: 0.041.	
Remark	: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).	
Exposure estimation and reference to its source - Workers: 5: General exposures; Use in contained batch processes; With sample collection		
Exposure assessment (human):	: Inhalation exposure: Used ART model. Version 1.5. Dermal exposure: ECETOC TRA worker v3 Version 3.	
Exposure estimation	: Worker - inhalative, long-term - local: 0.0038 mg/m ³ . Risk characterisation ratio: 0.253.	
	Worker - dermal, long-term - systemic: 0.069 mg/kg bw/day. Risk characterisation ratio: 0.021.	
Remark	: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).	

Exposure estimation and reference to its source - Workers: 6: Bulk transfers; Dedicated facility

Exposure assessment (human): : Inhalation exposure: Used ART model. Version 1.5.
Dermal exposure: ECETOC TRA worker v3 Version 3.

Exposure estimation : **Worker - inhalative, long-term - local:** 0.0034 mg/m³.
Risk characterisation ratio: 0.227.

Worker - dermal, long-term - systemic: 1.371 mg/kg bw/day.
Risk characterisation ratio: 0.412.

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

Exposure estimation and reference to its source - Workers: 7: Laboratory activities

Exposure assessment (human): : Inhalation exposure: Used ART model. Version 1.5.
Dermal exposure: ECETOC TRA worker v3 Version 3.

Exposure estimation : **Worker - inhalative, long-term - local:** 0.00017 mg/m³.
Risk characterisation ratio: 0.011.

Worker - dermal, long-term - systemic: 0.034 mg/kg bw/day.
Risk characterisation ratio: 0.010.

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

Exposure estimation and reference to its source - Workers: 8: Equipment cleaning and maintenance

Exposure assessment (human): : Inhalation exposure: Used ART model. Version 1.5.
Dermal exposure: ECETOC TRA worker v3 Version 3.

Exposure estimation : **Worker - inhalative, long-term - local:** 0.0046 mg/m³.
Risk characterisation ratio: 0.307.

Worker - dermal, long-term - systemic: 1.371 mg/kg bw/day.
Risk characterisation ratio: 0.412.
Remarks: Exposure Estimation: 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>).

Annex to the extended Safety Data Sheet (eSDS)

Industrial

Identification of the substance or mixture

Product definition : Mono-constituent substance
Product name : N-Aminoethylpiperazine, AEP

Section 1 - Title

Short title of the exposure scenario : Formulation and (re)packing of substances and mixtures - Industrial

List of use descriptors : **Identified use name: ES02:** Formulation and (re)packing of substances and mixtures - Industrial: SU03; PROC01, PROC02, PROC03, PROC08b, PROC09, PROC15, PROC28; ERC02
Process Category: PROC01, PROC02, PROC03, PROC08b, PROC09, PROC15, PROC28
Substance supplied to that use in form of: As such
Subsequent service life relevant for that use: No.
Environmental Release Category: ERC02

Environmental contributing scenarios : **Formulation and (re)packing of substances and mixtures - ERC02**

Health Contributing scenarios : **Storage - PROC01**
General exposures (closed systems); No sampling - PROC01
General exposures (closed systems); Continuous process; With sample collection - PROC02
General exposures; Use in contained batch processes; With sample collection - PROC03
Bulk transfers; Dedicated facility - PROC08b
Drum and small package filling; Dedicated facility; Automated task - PROC09
Laboratory activities - PROC15
Equipment cleaning and maintenance - PROC28

Number of the ES	: 02
Additional information	: Information concerning technical function: Intermediate.

Section 2 - Exposure controls

Contributing scenario controlling environmental exposure for 1: Formulation and (re)packing of substances and mixtures	
Amounts used	: Amounts used: Confidential information. Fraction of EU tonnage used in region: 1. Fraction of main source to local environment: 1. Fraction of substance in end-use products: ≤ 100 %. Daily amount per site, Msperc/Msite (kg/day): 22727.
Frequency and duration of use	: Continuous release, Emission days: 220 days per year.
Environment factors not influenced by risk management	: Local freshwater dilution factor: 10. Local marine water dilution factor: 100.
Other conditions affecting environmental exposure	: Effluent discharge rate: 2000 m ³ /d. Receiving surface water flow: 18000 m ³ /d. Release to waste water from process: 0 % (FEICA SPERC 2.1b.v3) Release to air from process: 0.36 % (FEICA SPERC 2.1b.v3) Release to soil from process: 0 % (FEICA SPERC 2.1b.v3)
Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil	: Treat air emission to provide a typical removal efficiency of 80 %. (Use the following recovery and/or abatement technique for cleaning waste gases: Adsorption, Incineration)

<i>N-Aminoethylpiperazine, AEP</i>	Exposure Scenario: 02	<i>Formulation and (re)packing of substances and mixtures - Industrial</i>
Conditions and measures related to sewage treatment plant	: Municipal Sewage Treatment Plant: Yes. (Degradation effectiveness: 0.03 %) Discharge rate: 2000 m ³ /d.	
Conditions and measures related to external treatment of waste for disposal	: Disposal should be in accordance with applicable regional, national and local laws and regulations. This product should be treated as a hazardous waste according to EC Directive 2008/98/EC. Prevent entry into sewers, water courses, basements or confined areas.	
Contributing scenario controlling worker exposure for 2: Storage		
Product characteristics	: Liquid. Vapour pressure: 5.2 Pa. Viscosity: low. (ART)	
Concentration of substance in mixture or article	: Covers concentrations up to 100 %.	
Frequency and duration of use/exposure	: Covers daily exposures up to 8 hours. Exposure period, Distance of worker from source > 1 m: 480 minutes. (ART) Non-exposure period: 0 minutes. (ART)	
Other conditions affecting workers exposure	: Process temperature: 20 °C. Indoor use, Room size: Any. (ART) Open surface: > 3 m ² . (ART)	
Technical conditions and measures at process level (source) to prevent release	: Store substance within a closed system. The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART) Demonstrable and effective housekeeping practices are in place. (ART) Containment: high. (ART) Further parameters (ART): Activities with open liquid surfaces or open reservoirs - activity with undisturbed surfaces (no aerosol formation). - Localised controls (secondary): No. Segregation: No. Personal enclosure: No.	
Technical conditions and measures to control dispersion from source towards the worker	: Only good natural ventilation. (ART)	
Organisational measures to prevent/limit releases, dispersion and exposure	: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop. Avoid splashing. Avoid contact with contaminated tools and objects. Regular cleaning of equipment. Regular cleaning of work area. Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed.. Training for staff on good practice. Good standard of personal hygiene.	
Conditions and measures related to personal protection, hygiene and health evaluation		
Advice on general occupational hygiene	: Assumes a good basic standard of occupational hygiene is implemented.	
Personal protection	: Use suitable eye protection and gloves.	

Contributing scenario controlling worker exposure for 3: General exposures (closed systems); No sampling

Product characteristics	: Liquid. Vapour pressure: 5.2 Pa. Viscosity: low. (ART)
Concentration of substance in mixture or article	: Covers concentrations up to 100 %.
Frequency and duration of use/exposure	: Covers daily exposures up to 8 hours. Exposure period, Distance of worker from source > 1 m: 480 minutes. (ART) Non-exposure period: 0 minutes. (ART)
Other conditions affecting workers exposure	: Process temperature: 20 °C. Indoor use, Room size: 1000 m ³ . (ART) Open surface: > 3 m ² . (ART)
Technical conditions and measures at process level (source) to prevent release	: Handle substance within a closed system. The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART) Demonstrable and effective housekeeping practices are in place. (ART) Containment: high. (ART) Further parameters (ART): Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces. - Localised controls (secondary): No. Segregation: No. Personal enclosure: No.
Technical conditions and measures to control dispersion from source towards the worker	: Only good natural ventilation. (ART)
Organisational measures to prevent/limit releases, dispersion and exposure	: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop. Avoid splashing. Avoid contact with contaminated tools and objects. Regular cleaning of equipment. Regular cleaning of work area. Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed.. Training for staff on good practice. Good standard of personal hygiene.
Conditions and measures related to personal protection, hygiene and health evaluation	
Advice on general occupational hygiene	: Assumes a good basic standard of occupational hygiene is implemented.
Personal protection	: Use suitable eye protection and gloves.

Contributing scenario controlling worker exposure for 4: General exposures (closed systems); Continuous process; With sample collection

Product characteristics	: Liquid. Vapour pressure: 5.2 Pa. Viscosity: low. (ART)
Concentration of substance in mixture or article	: Covers concentrations up to 100 %.

Frequency and duration of use/exposure

: Covers daily exposures up to 8 hours.
 Exposure period, Distance of worker from source < 1 m: 10 minutes (Transfer of liquid products - falling liquids). (ART)
 Exposure period, Distance of worker from source < 1 m: 50 minutes (Handling of contaminated objects). (ART)
 Exposure period, Distance of worker from source > 1 m: 420 minutes (Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces). (ART)
 Non-exposure period: 0 minutes. (ART)

Other conditions affecting workers exposure

: Process temperature: 20 °C.
 Indoor use, Room size: 1000 m³. (ART)
 Splash loading. (ART)
 Activities with treated/contaminated objects (Surfaces: 1 - 3 m²). (ART)
 Contamination 10 - 90 % of surface. (ART)
 Open surface: > 3 m³. (ART)

Technical conditions and measures at process level (source) to prevent release

: Handle substance within a closed system.

 The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART)
 Demonstrable and effective housekeeping practices are in place. (Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces, Handling of contaminated objects) (ART)
 General housekeeping practices are in place. (Transfer of liquid products - falling liquids) (ART)
 Containment: Handling that reduces contact between product and adjacent air. (Transfer of liquid products - falling liquids, Handling of contaminated objects) (ART)
 Containment: high. (Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces) (ART)

 Further parameters (ART):
 Transfer of liquid products - falling liquids. - Localised controls (primary, secondary): No.
 Transferring < 0.1 L/min.

 Handling of contaminated objects. - Localised controls (primary, secondary): No.

 Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces. - Localised controls (secondary): No.
 Segregation: No.
 Personal enclosure: No.

Technical conditions and measures to control dispersion from source towards the worker

: Only good natural ventilation. (ART)

Organisational measures to prevent/limit releases, dispersion and exposure

: Avoid all skin contact with product, clean up contamination/spills as soon as they occur.
 Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately.
 Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop.
 Avoid splashing.
 Avoid contact with contaminated tools and objects.
 Regular cleaning of equipment.
 Regular cleaning of work area.
 Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed..
 Training for staff on good practice.
 Good standard of personal hygiene.

Conditions and measures related to personal protection, hygiene and health evaluation**Advice on general occupational hygiene**

: Assumes a good basic standard of occupational hygiene is implemented.

Personal protection : Use suitable eye protection.
Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %.
Avoid direct eye contact with product, also via contamination on hands.
Avoid direct skin contact with product.
Identify potential areas for indirect skin contact.

Contributing scenario controlling worker exposure for 5: General exposures; Use in contained batch processes; With sample collection

Product characteristics : Liquid.
Vapour pressure: 5.2 Pa.
Viscosity: low. (ART)

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

Frequency and duration of use/exposure : Covers daily exposures up to 8 hours.
Exposure period, Distance of worker from source < 1 m: 20 minutes (Transfer of liquid products - falling liquids). (ART)
Exposure period, Distance of worker from source < 1 m: 60 minutes (Handling of contaminated objects). (ART)
Exposure period, Distance of worker from source > 1 m: 380 minutes (Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces). (ART)
Exposure period, Distance of worker from source < 1 m: 20 minutes (Handling of contaminated objects). (ART)
Non-exposure period: 0 minutes. (ART)

Other conditions affecting workers exposure : Process temperature: 20 °C.
Indoor use, Room size: 1000 m³. (ART)
Splash loading. (ART)
Activities with treated/contaminated objects (Surfaces: 1 - 3 m²). (ART)
Contamination 10 - 90 % of surface. (ART)
Open surface: > 3 m³. (ART)

Technical conditions and measures at process level (source) to prevent release : Handle substance within a closed system.

The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART)
Demonstrable and effective housekeeping practices are in place. (Handling of contaminated objects, Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces) (ART)
General housekeeping practices are in place. (Transfer of liquid products - falling liquids) (ART)
Containment: Handling that reduces contact between product and adjacent air. (Transfer of liquid products - falling liquids) (ART)
Containment: high. (Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces) (ART)

Further parameters (ART):
Transfer of liquid products - falling liquids. - Localised controls (primary, secondary): No.
Transferring < 0.1 L/min.

Handling of contaminated objects. - Localised controls (primary, secondary): No.

Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces. - Localised controls (secondary): No.
Segregation: No.
Personal enclosure: No.

Technical conditions and measures to control dispersion from source towards the worker : Only good natural ventilation. (ART)

Organisational measures to prevent/limit releases, dispersion and exposure : Avoid all skin contact with product, clean up contamination/spills as soon as they occur.
 Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately.
 Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop.
 Avoid splashing.
 Avoid contact with contaminated tools and objects.
 Regular cleaning of equipment.
 Regular cleaning of work area.
 Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed..
 Training for staff on good practice.
 Good standard of personal hygiene.

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

Advice on general occupational hygiene : Assumes a good basic standard of occupational hygiene is implemented.

Personal protection : Use suitable eye protection.
 Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %.
 Avoid direct eye contact with product, also via contamination on hands.
 Avoid direct skin contact with product.
 Identify potential areas for indirect skin contact.

Contributing scenario controlling worker exposure for 6: Bulk transfers; Dedicated facility

Product characteristics : Liquid.
 Vapour pressure: 5.2 Pa.
 Viscosity: low. (ART)

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

Frequency and duration of use/exposure : Covers daily exposures up to 8 hours.
 Exposure period, Distance of worker from source < 1 m: 20 minutes (Transfer of liquid products - falling liquids). (ART)
 Exposure period, Distance of worker from source > 1 m: 200 minutes (Transfer of liquid products - Bottom loading). (ART)
 Exposure period, Distance of worker from source > 1 m: 20 minutes (Handling of contaminated objects). (ART)
 Non-exposure period: 240 minutes. (ART)

Other conditions affecting workers exposure : Process temperature: 20 °C.
 Indoor use, Room size: 1000 m³. (ART)
 Splash loading. (ART)
 Activities with treated/contaminated objects (Surfaces: 1 - 3 m²). (ART)
 Contamination 10 - 90 % of surface. (ART)

Technical conditions and measures at process level (source) to prevent release : The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART)
 Demonstrable and effective housekeeping practices are in place. (ART)
 General housekeeping practices are in place. (Transfer of liquid products - falling liquids) (ART)
 Containment: Handling that reduces contact between product and adjacent air. (Transfer of liquid products - Bottom loading) (ART)

Further parameters (ART):
 Transfer of liquid products - falling liquids. - Localised controls (primary, secondary): No.
 Transferring < 0.1 L/min.

Transfer of liquid products - Bottom loading. - Localised controls (primary, secondary): No.
 Transferring > 1000 L/min.
 Segregation: No.
 Personal enclosure: No.

Handling of contaminated objects. - Localised controls (primary, secondary): No.

Technical conditions and measures to control dispersion from source towards the worker	: Only good natural ventilation. (ART)
Organisational measures to prevent/limit releases, dispersion and exposure	: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop. Avoid splashing. Avoid contact with contaminated tools and objects. Regular cleaning of equipment. Regular cleaning of work area. Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed.. Training for staff on good practice. Good standard of personal hygiene.
Conditions and measures related to personal protection, hygiene and health evaluation	
Advice on general occupational hygiene	: Assumes a good basic standard of occupational hygiene is implemented.
Personal protection	: Use suitable eye protection. Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %. Avoid direct eye contact with product, also via contamination on hands. Avoid direct skin contact with product. Identify potential areas for indirect skin contact.

Contributing scenario controlling worker exposure for 7: Drum and small package filling; Dedicated facility; Automated task

Product characteristics	: Liquid. Vapour pressure: 5.2 Pa. Viscosity: low. (ART)
Concentration of substance in mixture or article	: Covers concentrations up to 100 %.
Frequency and duration of use/exposure	: Covers exposure up to 4 hours. Exposure period, Distance of worker from source > 1 m: 210 minutes (Transfer of liquid products - falling liquids). (ART) Exposure period, Distance of worker from source < 1 m: 30 minutes (Transfer of liquid products - falling liquids). (ART) Non-exposure period: 240 minutes. (ART)
Other conditions affecting workers exposure	: Process temperature: 20 °C. Indoor use, Room size: 1000 m ³ . (ART) Splash loading. (ART)
Technical conditions and measures at process level (source) to prevent release	: The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART) Demonstrable and effective housekeeping practices are in place. (ART) Containment: Handling that reduces contact between product and adjacent air. (ART) Further parameters (ART): Transfer of liquid products - falling liquids. Localised controls (Distance of worker from source > 1 m, secondary): No. Segregation: No. Personal enclosure: No. Localised controls (Distance of worker from source < 1 m, secondary): No. Transferring 100 - 1000 L/min.
Technical conditions and measures to control dispersion from source towards the worker	: Only good natural ventilation. (ART) Fill containers/cans at dedicated fill points supplied with local extract ventilation. Efficiency of at least ≥ 90 %. Localised controls (primary): Ensure fixed capturing hood is used. (ART)

Organisational measures to prevent/limit releases, dispersion and exposure : Avoid all skin contact with product, clean up contamination/spills as soon as they occur.
 Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately.
 Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop.
 Avoid splashing.
 Avoid contact with contaminated tools and objects.
 Regular cleaning of equipment.
 Regular cleaning of work area.
 Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed..
 Training for staff on good practice.
 Good standard of personal hygiene.

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

Advice on general occupational hygiene : Assumes a good basic standard of occupational hygiene is implemented.

Personal protection : Use suitable eye protection.
 Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %.
 Avoid direct eye contact with product, also via contamination on hands.
 Avoid direct skin contact with product.
 Identify potential areas for indirect skin contact.

Contributing scenario controlling worker exposure for 8: Laboratory activities

Product characteristics : Liquid.
 Vapour pressure: 5.2 Pa.
 Viscosity: low. (ART)

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

Frequency and duration of use/exposure : Covers exposure up to 1 hour.
 Exposure period, Distance of worker from source < 1 m: 60 minutes. (ART)
 Non-exposure period: 420 minutes. (ART)

Other conditions affecting workers exposure : Process temperature: 20 °C.
 Indoor use, Room size: Any. (ART)
 Splash loading. (ART)

Technical conditions and measures at process level (source) to prevent release : The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART)
 General housekeeping practices are in place. (ART)
 Containment: Open process. (ART)

Further parameters (ART):
 Transfer of liquid products - falling liquids. - Localised controls (secondary): No.
 Transferring < 0.1 L/min.

Technical conditions and measures to control dispersion from source towards the worker : Localised controls (primary): Handle in a fume cupboard. (ART)

Ventilation control measures : Recommended room ventilation rate for handling/application (air changes per hour): 3. (ART)

Organisational measures to prevent/limit releases, dispersion and exposure : Avoid all skin contact with product, clean up contamination/spills as soon as they occur.
 Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately.
 Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop.
 Avoid splashing.
 Avoid contact with contaminated tools and objects.
 Regular cleaning of equipment.
 Regular cleaning of work area.
 Supervision in place to check that the risk management measures in place are being

used correctly and operational conditions followed..
Training for staff on good practice.
Good standard of personal hygiene.

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

Advice on general occupational hygiene : Assumes a good basic standard of occupational hygiene is implemented.

Personal protection : Use suitable eye protection.
Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %.
Avoid direct eye contact with product, also via contamination on hands.
Avoid direct skin contact with product.
Identify potential areas for indirect skin contact.

Contributing scenario controlling worker exposure for 9: Equipment cleaning and maintenance

Product characteristics : Liquid.
Vapour pressure: 5.2 Pa.
Viscosity: low. (ART)

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

Frequency and duration of use/exposure : Covers exposure up to 2 hours.
Exposure period, Distance of worker from source < 1 m: 120 minutes. (ART)
Non-exposure period: 360 minutes. (ART)

Other conditions affecting workers exposure : Process temperature: 20 °C.
Indoor use, Room size: Any. (ART)
Activities with treated/contaminated objects (Surfaces: 1 - 3 m²). (ART)
Contamination 10 - 90 % of surface. (ART)

Technical conditions and measures at process level (source) to prevent release : The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART)
Demonstrable and effective housekeeping practices are in place. (ART)

Technical conditions and measures to control dispersion from source towards the worker : Further parameters (ART):
Handling of contaminated objects. - Localised controls (primary, secondary): No.
: Only good natural ventilation. (ART)

Organisational measures to prevent/limit releases, dispersion and exposure : Avoid all skin contact with product, clean up contamination/spills as soon as they occur.
Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately.
Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop.
Avoid splashing.
Avoid contact with contaminated tools and objects.
Regular cleaning of equipment.
Regular cleaning of work area.
Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed..
Training for staff on good practice.
Good standard of personal hygiene.

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

Advice on general occupational hygiene : Assumes a good basic standard of occupational hygiene is implemented.

Personal protection : Use suitable eye protection.
Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %.
Avoid direct eye contact with product, also via contamination on hands.
Avoid direct skin contact with product.
Identify potential areas for indirect skin contact.

Section 3 - Exposure estimation and reference to its source

Exposure estimation and reference to its source - Environment: 1: Formulation and (re)packing of substances and mixtures

Exposure assessment (environment): : ECETOC TRA worker v3 Version 3.1.

Exposure estimation : Freshwater: 0.00204 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.0352.

Freshwater sediment: 0.00772 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.0000359.

Marine water: 0.000210 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.0361.

Marine water sediment: 0.000792 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.0000368.

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

Soil: 0.00841 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.00841.

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

Exposure estimation and reference to its source - Workers: 2: Storage

Exposure assessment (human): : Inhalation exposure: Used ART model. Version 1.5.
Dermal exposure: ECETOC TRA worker v3 Version 3.

Exposure estimation : **Worker - inhalative, long-term - local:** 0.000036 mg/m³.
Risk characterisation ratio: 0.002.

Worker - dermal, long-term - systemic: 0.034 mg/kg bw/day.
Risk characterisation ratio: 0.010.

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

Exposure estimation and reference to its source - Workers: 3: General exposures (closed systems); No sampling

Exposure assessment (human): : Inhalation exposure: Used ART model. Version 1.5.
Dermal exposure: ECETOC TRA worker v3 Version 3.

Exposure estimation : **Worker - inhalative, long-term - local:** 0.0013 mg/m³.
Risk characterisation ratio: 0.086.

Worker - dermal, long-term - systemic: 0.034 mg/kg bw/day.
Risk characterisation ratio: 0.010.

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

Exposure estimation and reference to its source - Workers: 4: General exposures (closed systems); Continuous process; With sample collection

Exposure assessment (human): : Inhalation exposure: Used ART model. Version 1.5.
Dermal exposure: ECETOC TRA worker v3 Version 3.

Exposure estimation : **Worker - inhalative, long-term - local:** 0.0027 mg/m³.
Risk characterisation ratio: 0.180.

Worker - dermal, long-term - systemic: 0.137 mg/kg bw/day.
Risk characterisation ratio: 0.041.

<i>N-Aminoethylpiperazine, AEP</i>	Exposure Scenario: 02	Formulation and (re)packing of substances and mixtures - Industrial
Remark	: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).	
Exposure estimation and reference to its source - Workers: 5: General exposures; Use in contained batch processes; With sample collection		
Exposure assessment (human):	: Inhalation exposure: Used ART model. Version 1.5. Dermal exposure: ECETOC TRA worker v3 Version 3.	
Exposure estimation	: Worker - inhalative, long-term - local: 0.0038 mg/m ³ . Risk characterisation ratio: 0.253.	
	: Worker - dermal, long-term - systemic: 0.069 mg/kg bw/day. Risk characterisation ratio: 0.021.	
Remark	: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).	
Exposure estimation and reference to its source - Workers: 6: Bulk transfers; Dedicated facility		
Exposure assessment (human):	: Inhalation exposure: Used ART model. Version 1.5. Dermal exposure: ECETOC TRA worker v3 Version 3.	
Exposure estimation	: Worker - inhalative, long-term - local: 0.0034 mg/m ³ . Risk characterisation ratio: 0.227.	
	: Worker - dermal, long-term - systemic: 1.371 mg/kg bw/day. Risk characterisation ratio: 0.412.	
Remark	: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).	
Exposure estimation and reference to its source - Workers: 7: Drum and small package filling; Dedicated facility; Automated task		
Exposure assessment (human):	: Inhalation exposure: Used ART model. Version 1.5. Dermal exposure: ECETOC TRA worker v3 Version 3.	
Exposure estimation	: Worker - inhalative, long-term - local: 0.01 mg/m ³ . Risk characterisation ratio: 0.667.	
	: Worker - dermal, long-term - systemic: 0.686 mg/kg bw/day. Risk characterisation ratio: 0.206.	
Remark	: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).	
Exposure estimation and reference to its source - Workers: 8: Laboratory activities		
Exposure assessment (human):	: Inhalation exposure: Used ART model. Version 1.5. Dermal exposure: ECETOC TRA worker v3 Version 3.	
Exposure estimation	: Worker - inhalative, long-term - local: 0.00017 mg/m ³ . Risk characterisation ratio: 0.011.	
	: Worker - dermal, long-term - systemic: 0.034 mg/kg bw/day. Risk characterisation ratio: 0.010.	
Remark	: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).	
Exposure estimation and reference to its source - Workers: 9: Equipment cleaning and maintenance		
Exposure assessment (human):	: Inhalation exposure: Used ART model. Version 1.5. Dermal exposure: ECETOC TRA worker v3 Version 3.	
Exposure estimation	: Worker - inhalative, long-term - local: 0.0046 mg/m ³ . Risk characterisation ratio: 0.307.	
	: Worker - dermal, long-term - systemic: 1.371 mg/kg bw/day. Risk characterisation ratio: 0.412.	
	Remarks: Exposure Estimation: PROC08a	
Date of issue/Date of revision	: 19/04/2017	Version : 2 / en 36/81

N-Aminoethylpiperazine, AEP	Exposure Scenario: 02	Formulation and (re)packing of substances and mixtures - Industrial
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).

Annex to the extended Safety Data Sheet (eSDS)

Industrial

Identification of the substance or mixture

Product definition : Mono-constituent substance
Product name : N-Aminoethylpiperazine, AEP

Section 1 - Title

Short title of the exposure scenario : Industrial Use in Epoxy/PU Curing Industrial - Industrial

List of use descriptors : **Identified use name: ES03:** Industrial Use in Epoxy/PU Curing Industrial - Industrial: SU03; PROC01, PROC02, PROC03, PROC07, PROC08b, PROC10, PROC15, PROC28; ERC05
Process Category: PROC01, PROC02, PROC03, PROC07, PROC08b, PROC10, PROC15, PROC28
Substance supplied to that use in form of: As such
Subsequent service life relevant for that use: No.
Environmental Release Category: ERC05

Environmental contributing scenarios : **Industrial Use in Epoxy/PU Curing Industrial - ERC05**

Health Contributing scenarios : **Storage - PROC01**
General exposures (closed systems); Continuous process; With sample collection - PROC02
General exposures; Use in contained batch processes; With sample collection - PROC03
Industrial application of coatings and inks; Spraying; Closed systems - PROC07
Bulk transfers; Dedicated facility - PROC08b
Industrial application of coatings and inks; Rolling, Brushing; Closed systems - PROC10
Laboratory activities - PROC15
Equipment cleaning and maintenance - PROC28

Number of the ES	: 03
Additional information	: Information concerning technical function: Intermediate.

Section 2 - Exposure controls

Contributing scenario controlling environmental exposure for 1: Industrial Use in Epoxy/PU Curing Industrial	
Amounts used	: Amounts used: Confidential information. Fraction of EU tonnage used in region: 1. Fraction of main source to local environment: 1. Fraction of substance in end-use products: ≤ 100 %. Daily amount per site, Msperc/Msite (kg/day): 22727.
Frequency and duration of use	: Continuous release, Emission days: 220 days per year.
Environment factors not influenced by risk management	: Local freshwater dilution factor: 10. Local marine water dilution factor: 100.
Other conditions affecting environmental exposure	: Effluent discharge rate: 2000 m ³ /d. Receiving surface water flow: 18000 m ³ /d.
Conditions and measures related to sewage treatment plant	: Release to waste water from process: 0 % (FEICA SPERC 5.1a.v2) Release to air from process: 1.7 % (FEICA SPERC 5.1a.v2) Release to soil from process: 0 % (FEICA SPERC 5.1a.v2) : Municipal Sewage Treatment Plant: Yes. (Degradation effectiveness: 0.03 %) Discharge rate: 2000 m ³ /d. Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of 0.03 %. Do not apply industrial sludge to natural soils.

N-Aminoethylpiperazine, AEP	Exposure Scenario: 03	Industrial Use in Epoxy/PU Curing Industrial - Industrial
Conditions and measures related to external treatment of waste for disposal	: Disposal should be in accordance with applicable regional, national and local laws and regulations. This product should be treated as a hazardous waste according to EC Directive 2008/98/EC. Prevent entry into sewers, water courses, basements or confined areas.	
Contributing scenario controlling worker exposure for 2: Storage		
Product characteristics	: Liquid. Vapour pressure: 5.2 Pa. Viscosity: low. (ART)	
Concentration of substance in mixture or article	: Covers concentrations up to 100 %.	
Frequency and duration of use/exposure	: Covers daily exposures up to 8 hours. Exposure period, Distance of worker from source > 1 m: 480 minutes. (ART) Non-exposure period: 0 minutes. (ART)	
Other conditions affecting workers exposure	: Process temperature: 20 °C. Indoor use, Room size: Any. (ART) Open surface: > 3 m ² . (ART)	
Technical conditions and measures at process level (source) to prevent release	: Store substance within a closed system. The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART) Demonstrable and effective housekeeping practices are in place. (ART) Containment: high. (ART) Further parameters (ART): Activities with open liquid surfaces or open reservoirs - activity with undisturbed surfaces (no aerosol formation). - Localised controls (secondary): No. Segregation: No. Personal enclosure: No.	
Technical conditions and measures to control dispersion from source towards the worker	: Only good natural ventilation. (ART)	
Organisational measures to prevent/limit releases, dispersion and exposure	: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop. Avoid splashing. Avoid contact with contaminated tools and objects. Regular cleaning of equipment. Regular cleaning of work area. Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed.. Training for staff on good practice. Good standard of personal hygiene.	
Conditions and measures related to personal protection, hygiene and health evaluation		
Advice on general occupational hygiene	: Assumes a good basic standard of occupational hygiene is implemented.	
Personal protection	: Use suitable eye protection and gloves.	

Contributing scenario controlling worker exposure for 3: General exposures (closed systems); Continuous process; With sample collection

Product characteristics	: Liquid. Vapour pressure: 5.2 Pa. Viscosity: low. (ART)
Concentration of substance in mixture or article	: Covers concentrations up to 100 %.
Frequency and duration of use/exposure	: Covers daily exposures up to 8 hours. Exposure period, Distance of worker from source < 1 m: 10 minutes (Transfer of liquid products - falling liquids). (ART) Exposure period, Distance of worker from source < 1 m: 50 minutes (Handling of contaminated objects). (ART) Exposure period, Distance of worker from source > 1 m: 420 minutes (Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces). (ART) Non-exposure period: 0 minutes. (ART)
Other conditions affecting workers exposure	: Process temperature: 20 °C. Indoor use, Room size: 1000 m ³ . (ART) Splash loading. (ART) Activities with treated/contaminated objects (Surfaces: 1 - 3 m ²). (ART) Contamination 10 - 90 % of surface. (ART) Open surface: > 3 m ³ . (ART)
Technical conditions and measures at process level (source) to prevent release	: Handle substance within a closed system. The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART) Demonstrable and effective housekeeping practices are in place. (Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces, Handling of contaminated objects) (ART) General housekeeping practices are in place. (Transfer of liquid products - falling liquids) (ART) Containment: Handling that reduces contact between product and adjacent air. (Transfer of liquid products - falling liquids, Handling of contaminated objects) (ART) Containment: high. (Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces) (ART) Further parameters (ART): Transfer of liquid products - falling liquids. - Localised controls (primary, secondary): No. Transferring < 0.1 L/min. Handling of contaminated objects. - Localised controls (primary, secondary): No. Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces. - Localised controls (secondary): No. Segregation: No. Personal enclosure: No.
Technical conditions and measures to control dispersion from source towards the worker	: Only good natural ventilation. (ART)
Organisational measures to prevent/limit releases, dispersion and exposure	: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop. Avoid splashing. Avoid contact with contaminated tools and objects. Regular cleaning of equipment. Regular cleaning of work area. Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed..

Training for staff on good practice.
Good standard of personal hygiene.

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

Advice on general occupational hygiene

: Assumes a good basic standard of occupational hygiene is implemented.

Personal protection

: Use suitable eye protection.
Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %.
Avoid direct eye contact with product, also via contamination on hands.
Avoid direct skin contact with product.
Identify potential areas for indirect skin contact.

Contributing scenario controlling worker exposure for 4: General exposures; Use in contained batch processes; With sample collection

Product characteristics

: Liquid.
Vapour pressure: 5.2 Pa.
Viscosity: low. (ART)

Concentration of substance in mixture or article

: Covers concentrations up to 100 %.

Frequency and duration of use/exposure

: Covers daily exposures up to 8 hours.
Exposure period, Distance of worker from source < 1 m: 20 minutes (Transfer of liquid products - falling liquids). (ART)
Exposure period, Distance of worker from source < 1 m: 60 minutes (Handling of contaminated objects). (ART)
Exposure period, Distance of worker from source > 1 m: 380 minutes (Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces). (ART)
Exposure period, Distance of worker from source < 1 m: 20 minutes (Handling of contaminated objects). (ART)
Non-exposure period: 0 minutes. (ART)

Other conditions affecting workers exposure

: Process temperature: 20 °C.
Indoor use, Room size: 1000 m³. (ART)
Splash loading. (ART)
Activities with treated/contaminated objects (Surfaces: 1 - 3 m²). (ART)
Contamination 10 - 90 % of surface. (ART)
Open surface: > 3 m³. (ART)

Technical conditions and measures at process level (source) to prevent release

: Handle substance within a closed system.

The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART)
Demonstrable and effective housekeeping practices are in place. (Handling of contaminated objects, Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces) (ART)
General housekeeping practices are in place. (Transfer of liquid products - falling liquids) (ART)
Containment: Handling that reduces contact between product and adjacent air. (Transfer of liquid products - falling liquids) (ART)
Containment: high. (Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces) (ART)

Further parameters (ART):

Transfer of liquid products - falling liquids. - Localised controls (primary, secondary): No.
Transferring < 0.1 L/min.

Handling of contaminated objects. - Localised controls (primary, secondary): No.

Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces. - Localised controls (secondary): No.
Segregation: No.
Personal enclosure: No.

Technical conditions and measures to control dispersion from source towards the worker	: Only good natural ventilation. (ART)
Organisational measures to prevent/limit releases, dispersion and exposure	: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop. Avoid splashing. Avoid contact with contaminated tools and objects. Regular cleaning of equipment. Regular cleaning of work area. Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed.. Training for staff on good practice. Good standard of personal hygiene.
Conditions and measures related to personal protection, hygiene and health evaluation	
Advice on general occupational hygiene	: Assumes a good basic standard of occupational hygiene is implemented.
Personal protection	: Use suitable eye protection. Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %. Avoid direct eye contact with product, also via contamination on hands. Avoid direct skin contact with product. Identify potential areas for indirect skin contact.

Contributing scenario controlling worker exposure for 5: Industrial application of coatings and inks; Spraying; Closed systems

Product characteristics	: Liquid. Surface spraying of liquids.: Vapour pressure: 5.2 Pa. Viscosity: low. (ART) Handling of contaminated objects: Vapour pressure: 126 Pa. activity coefficient: 1. (ART)
Concentration of substance in mixture or article	: Covers concentrations up to 20 %.
Frequency and duration of use/exposure	: Covers daily exposures up to 8 hours. Exposure period, Distance of worker from source > 1 m: 120 minutes (Surface spraying of liquids.). (ART) Exposure period, Distance of worker from source > 1 m: 360 minutes (Handling of contaminated objects). (ART) Non-exposure period: 0 minutes. (ART)
Other conditions affecting workers exposure	: Assumes process temperature up to 60 °C. Indoor use, Room size: 3000 m ³ . (ART) High application rate (> 3 l/minute). (ART) Ensure that direction of application is only horizontal or downward. (ART) Spraying with no or low compressed air use (ART) Activities with treated/contaminated objects (Surfaces > 3 m ²). (ART) Contamination 10 - 90 % of surface. (ART)
Technical conditions and measures at process level (source) to prevent release	: Handle substance within a closed system. The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART) Demonstrable and effective housekeeping practices are in place. (ART) Containment: Localised controls (primary) - Medium. (ART) Further parameters (ART): Surface spraying of liquids. Handling of contaminated objects.

Ventilation control measures	: Segregation: No. Personal enclosure: No. : Recommended room ventilation rate for handling/application (air changes per hour): 3. (ART) Localised controls (secondary): Provide extract ventilation to points where emissions occur. Efficiency of at least $\geq 50\%$. (ART)
Organisational measures to prevent/limit releases, dispersion and exposure	: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop. Avoid splashing. Avoid contact with contaminated tools and objects. Regular cleaning of equipment. Regular cleaning of work area. Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed.. Training for staff on good practice. Good standard of personal hygiene.
Conditions and measures related to personal protection, hygiene and health evaluation	
Advice on general occupational hygiene	: Assumes a good basic standard of occupational hygiene is implemented.
Personal protection	: Use suitable eye protection. Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %. Avoid direct eye contact with product, also via contamination on hands. Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Contributing scenario controlling worker exposure for 6: Bulk transfers; Dedicated facility

Product characteristics	: Liquid. Vapour pressure: 5.2 Pa. Viscosity: low. (ART)
Concentration of substance in mixture or article	: Covers concentrations up to 100 %.
Frequency and duration of use/exposure	: Covers exposure up to 4 hours. Exposure period, Distance of worker from source < 1 m: 20 minutes (Transfer of liquid products - falling liquids). (ART) Exposure period, Distance of worker from source > 1 m: 200 minutes (Transfer of liquid products - Bottom loading). (ART) Exposure period, Distance of worker from source < 1 m: 20 minutes (Handling of contaminated objects). (ART) Non-exposure period: 240 minutes. (ART)
Other conditions affecting workers exposure	: Process temperature: 20 °C. Indoor use, Room size: 1000 m ³ . (ART) Splash loading. (ART) Activities with treated/contaminated objects (Surfaces: 1 - 3 m ²). (ART) Contamination 10 - 90 % of surface. (ART)
Technical conditions and measures at process level (source) to prevent release	: The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART) Demonstrable and effective housekeeping practices are in place. (ART) General housekeeping practices are in place. (Transfer of liquid products - falling liquids) (ART) Containment: Handling that reduces contact between product and adjacent air. (Transfer of liquid products - Bottom loading) (ART) Further parameters (ART): Transfer of liquid products - falling liquids. - Localised controls (primary, secondary):

No.
Transferring < 0.1 L/min.

Transfer of liquid products - Bottom loading. - Localised controls (primary, secondary): No.
Transferring > 1000 L/min.
Segregation: No.
Personal enclosure: No.

Handling of contaminated objects. - Localised controls (primary, secondary): No.

Technical conditions and measures to control dispersion from source towards the worker : Only good natural ventilation. (ART)

Organisational measures to prevent/limit releases, dispersion and exposure : Avoid all skin contact with product, clean up contamination/spills as soon as they occur.
Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately.
Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop.
Avoid splashing.
Avoid contact with contaminated tools and objects.
Regular cleaning of equipment.
Regular cleaning of work area.
Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed..
Training for staff on good practice.
Good standard of personal hygiene.

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

Advice on general occupational hygiene : Assumes a good basic standard of occupational hygiene is implemented.

Personal protection : Use suitable eye protection.
Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %.
Avoid direct eye contact with product, also via contamination on hands.
Avoid direct skin contact with product.
Identify potential areas for indirect skin contact.

Contributing scenario controlling worker exposure for 7: Industrial application of coatings and inks; Rolling, Brushing; Closed systems

Product characteristics : Liquid.
Surface spraying of liquids.:
Vapour pressure: 5.2 Pa.
Viscosity: low. (ART)
Handling of contaminated objects:
Vapour pressure: 126 Pa.
activity coefficient: 1. (ART)

Concentration of substance in mixture or article : Covers concentrations up to 20 %.

Frequency and duration of use/exposure : Covers daily exposures up to 8 hours.
Exposure period, Distance of worker from source > 1 m: 120 minutes (Spreading of liquid products). (ART)
Exposure period, Distance of worker from source > 1 m: 360 minutes (Handling of contaminated objects). (ART)
Non-exposure period: 0 minutes. (ART)

Other conditions affecting workers exposure : Assumes process temperature up to 60 °C.
Indoor use, Room size: 3000 m³. (ART)
Spreading of liquids at surfaces or work pieces > 3 m² / hour. (ART)
Activities with treated/contaminated objects (Surfaces > 3 m²). (ART)
Contamination 10 - 90 % of surface. (ART)

Technical conditions and measures at process level (source) to prevent release	: Handle substance within a closed system. The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART) Demonstrable and effective housekeeping practices are in place. (ART) Containment: Localised controls (primary) - Medium. (ART) Further parameters (ART): Spreading of liquid products. Handling of contaminated objects. Segregation: No. Personal enclosure: No.
Ventilation control measures	: Recommended room ventilation rate for handling/application (air changes per hour): 3. (ART) Localised controls (secondary): Provide extract ventilation to points where emissions occur. Efficiency of at least ≥ 50 %. (ART)
Organisational measures to prevent/limit releases, dispersion and exposure	: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop. Avoid splashing. Avoid contact with contaminated tools and objects. Regular cleaning of equipment. Regular cleaning of work area. Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed.. Good standard of personal hygiene.
Conditions and measures related to personal protection, hygiene and health evaluation	
Advice on general occupational hygiene	: Assumes a good basic standard of occupational hygiene is implemented.
Personal protection	: Use suitable eye protection. Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %. Avoid direct eye contact with product, also via contamination on hands. Avoid direct skin contact with product. Identify potential areas for indirect skin contact.

Contributing scenario controlling worker exposure for 8: Laboratory activities	
Product characteristics	: Liquid. Vapour pressure: 5.2 Pa. Viscosity: low. (ART)
Concentration of substance in mixture or article	: Covers concentrations up to 100 %.
Frequency and duration of use/exposure	: Covers exposure up to 1 hour. Exposure period, Distance of worker from source < 1 m: 60 minutes. (ART) Non-exposure period: 420 minutes. (ART)
Other conditions affecting workers exposure	: Process temperature: 20 °C. Indoor use, Room size: Any. (ART) Splash loading. (ART)
Technical conditions and measures at process level (source) to prevent release	: The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART) General housekeeping practices are in place. (ART) Containment: Open process. (ART) Further parameters (ART): Transfer of liquid products - falling liquids. - Localised controls (secondary): No. Transferring < 0.1 L/min.

Technical conditions and measures to control dispersion from source towards the worker	: Localised controls (primary): Handle in a fume cupboard. (ART)
Ventilation control measures	: Recommended room ventilation rate for handling/application (air changes per hour): 3. (ART)
Organisational measures to prevent/limit releases, dispersion and exposure	: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop. Avoid splashing. Avoid contact with contaminated tools and objects. Regular cleaning of equipment. Regular cleaning of work area. Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed.. Training for staff on good practice. Good standard of personal hygiene.
Conditions and measures related to personal protection, hygiene and health evaluation	
Advice on general occupational hygiene	: Assumes a good basic standard of occupational hygiene is implemented.
Personal protection	: Use suitable eye protection. Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %. Avoid direct eye contact with product, also via contamination on hands. Avoid direct skin contact with product. Identify potential areas for indirect skin contact.

Contributing scenario controlling worker exposure for 9: Equipment cleaning and maintenance

Product characteristics	: Liquid. Vapour pressure: 5.2 Pa. Viscosity: low. (ART)
Concentration of substance in mixture or article	: Covers concentrations up to 100 %.
Frequency and duration of use/exposure	: Covers exposure up to 2 hours. Exposure period, Distance of worker from source < 1 m: 120 minutes. (ART) Non-exposure period: 360 minutes. (ART)
Other conditions affecting workers exposure	: Process temperature: 20 °C. Indoor use, Room size: Any. (ART) Activities with treated/contaminated objects (Surfaces: 1 - 3 m ²). (ART) Contamination 10 - 90 % of surface. (ART)
Technical conditions and measures at process level (source) to prevent release	: The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART) Demonstrable and effective housekeeping practices are in place. (ART) Further parameters (ART): Handling of contaminated objects. - Localised controls (primary, secondary): No.
Technical conditions and measures to control dispersion from source towards the worker	: Only good natural ventilation. (ART)
Organisational measures to prevent/limit releases, dispersion and exposure	: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop. Avoid splashing. Avoid contact with contaminated tools and objects.

Regular cleaning of equipment.
 Regular cleaning of work area.
 Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed..
 Training for staff on good practice.
 Good standard of personal hygiene.

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

Advice on general occupational hygiene

: Assumes a good basic standard of occupational hygiene is implemented.

Personal protection

: Use suitable eye protection.
 Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %.
 Avoid direct eye contact with product, also via contamination on hands.
 Avoid direct skin contact with product.
 Identify potential areas for indirect skin contact.

Section 3 - Exposure estimation and reference to its source

Exposure estimation and reference to its source - Environment: 1: Industrial Use in Epoxy/PU Curing Industrial

Exposure assessment (environment): : ECETOC TRA worker v3 Version 3.1.

Exposure estimation : Freshwater: 0.00204 mg/l.
 Risk characterisation ratio (PEC/PNEC): 0.0352.

Freshwater sediment: 0.00772 mg/kg dwt.
 Risk characterisation ratio (PEC/PNEC): 0.0000359.

Marine water: 0.000210 mg/l.
 Risk characterisation ratio (PEC/PNEC): 0.0361.

Marine water sediment: 0.000792 mg/kg dwt.
 Risk characterisation ratio (PEC/PNEC): 0.0000368.

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

Soil: 0.0353 mg/kg dwt.
 Risk characterisation ratio (PEC/PNEC): 0.0353.

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

Exposure estimation and reference to its source - Workers: 2: Storage

Exposure assessment (human): : Inhalation exposure: Used ART model. Version 1.5.
 Dermal exposure: ECETOC TRA worker v3 Version 3.

Exposure estimation : **Worker - inhalative, long-term - local:** 0.000036 mg/m³.
 Risk characterisation ratio: 0.002.

Worker - dermal, long-term - systemic: 0.034 mg/kg bw/day.
 Risk characterisation ratio: 0.010.

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

Exposure estimation and reference to its source - Workers: 3: General exposures (closed systems); Continuous process; With sample collection

Exposure assessment (human): : Inhalation exposure: Used ART model. Version 1.5.
Dermal exposure: ECETOC TRA worker v3 Version 3.

Exposure estimation : **Worker - inhalative, long-term - local:** 0.0027 mg/m³.
Risk characterisation ratio: 0.180.

Worker - dermal, long-term - systemic: 0.137 mg/kg bw/day.
Risk characterisation ratio: 0.041.

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

Exposure estimation and reference to its source - Workers: 4: General exposures; Use in contained batch processes; With sample collection

Exposure assessment (human): : Inhalation exposure: Used ART model. Version 1.5.
Dermal exposure: ECETOC TRA worker v3 Version 3.

Exposure estimation : **Worker - inhalative, long-term - local:** 0.0038 mg/m³.
Risk characterisation ratio: 0.253.

Worker - dermal, long-term - systemic: 0.069 mg/kg bw/day.
Risk characterisation ratio: 0.021.

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

Exposure estimation and reference to its source - Workers: 5: Industrial application of coatings and inks; Spraying; Closed systems

Exposure assessment (human): : Inhalation exposure: Used ART model. Version 1.5.
Dermal exposure: ECETOC TRA worker v3 Version 3.

Exposure estimation : **Worker - inhalative, long-term - local:** 0.0049 mg/m³.
Risk characterisation ratio: 0.327.

Worker - dermal, long-term - systemic: 0.082 mg/kg bw/day.
Risk characterisation ratio: 0.025.

Remarks: Exposure Estimation: PROC02

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

Exposure estimation and reference to its source - Workers: 6: Bulk transfers; Dedicated facility

Exposure assessment (human): : Inhalation exposure: Used ART model. Version 1.5.
Dermal exposure: ECETOC TRA worker v3 Version 3.

Exposure estimation : **Worker - inhalative, long-term - local:** 0.0034 mg/m³.
Risk characterisation ratio: 0.227.

Worker - dermal, long-term - systemic: 1.371 mg/kg bw/day.
Risk characterisation ratio: 0.412.

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

Exposure estimation and reference to its source - Workers: 7: Industrial application of coatings and inks; Rolling, Brushing; Closed systems

Exposure assessment (human): : Inhalation exposure: Used ART model. Version 1.5.
Dermal exposure: ECETOC TRA worker v3 Version 3.

Exposure estimation : **Worker - inhalative, long-term - local:** 0.0044 mg/m³.
Risk characterisation ratio: 0.293.

Worker - dermal, long-term - systemic: 0.082 mg/kg bw/day.
Risk characterisation ratio: 0.025.

Remarks: Exposure Estimation: PROC02

N-Aminoethylpiperazine, AEP	Exposure Scenario: 03	Industrial Use in Epoxy/PU Curing Industrial - Industrial
Remark	: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).	
Exposure estimation and reference to its source - Workers: 8: Laboratory activities		
Exposure assessment (human):	: Inhalation exposure: Used ART model. Version 1.5. Dermal exposure: ECETOC TRA worker v3 Version 3.	
Exposure estimation	: Worker - inhalative, long-term - local: 0.00017 mg/m ³ . Risk characterisation ratio: 0.011.	
	: Worker - dermal, long-term - systemic: 0.034 mg/kg bw/day. Risk characterisation ratio: 0.010.	
Remark	: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).	
Exposure estimation and reference to its source - Workers: 9: Equipment cleaning and maintenance		
Exposure assessment (human):	: Inhalation exposure: Used ART model. Version 1.5. Dermal exposure: ECETOC TRA worker v3 Version 3.	
Exposure estimation	: Worker - inhalative, long-term - local: 0.0046 mg/m ³ . Risk characterisation ratio: 0.307.	
	: Worker - dermal, long-term - systemic: 1.371 mg/kg bw/day. Risk characterisation ratio: 0.412. Remarks: Exposure Estimation: 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).

Annex to the extended Safety Data Sheet (eSDS)

Professional

Identification of the substance or mixture

Product definition : Mono-constituent substance
Product name : N-Aminoethylpiperazine, AEP

Section 1 - Title

Short title of the exposure scenario : Professional Use in Epoxy/PU Curing - Professional

List of use descriptors : **Identified use name: ES04:** Professional Use in Epoxy/PU Curing - Professional: SU22; PROC01, PROC05, PROC06, PROC08a, PROC10, PROC11, PROC19, PROC28; ERC08c, ERC08f
Process Category: PROC01, PROC05, PROC06, PROC08a, PROC10, PROC11, PROC19, PROC28
Substance supplied to that use in form of: As such
Subsequent service life relevant for that use: No.
Environmental Release Category: ERC08c, ERC08f
Market sector by type of chemical product: PC01, PC09a

Environmental contributing scenarios : **Professional Use in Epoxy/PU Curing** - ERC08c, ERC08f

Health Contributing scenarios : **Storage** - PROC01
Mixing operations - PROC05
Curing - PROC06
Material transfers; Non-dedicated facility - PROC08a
Professional application of coatings and inks; Rolling, Brushing - PROC10
Professional application of coatings and inks; Spraying - PROC11
Manual activities involving hand contact - PROC19
Equipment cleaning and maintenance - PROC28

Number of the ES	: 04
Additional information	: Information concerning technical function: Intermediate.

Section 2 - Exposure controls

Contributing scenario controlling environmental exposure for 1: Professional Use in Epoxy/PU Curing	
Amounts used	: Amounts used: Confidential information. Fraction of EU tonnage used in region: 0.1. Fraction of main source to local environment: 0.002. Fraction of substance in end-use products: ≤ 100 %. Daily amount per site, Mspere/Msite (kg/day): Not applicable.
Frequency and duration of use	: Continuous release, Emission days: 365 days per year
Environment factors not influenced by risk management	: Local freshwater dilution factor: 10 Local marine water dilution factor: 100
Other conditions affecting environmental exposure	: Effluent discharge rate: 2000 m ³ /d Receiving surface water flow: 18000 m ³ /d Release to waste water from process: 1.5 % (FEICA SPERC 8c.3.v3) Release to air from process: 0 % (FEICA SPERC 8c.3.v3) Release to soil from process: 0 % (FEICA SPERC 8c.3.v3)
Conditions and measures related to sewage treatment plant	: Municipal Sewage Treatment Plant: Yes. (Degradation effectiveness: 0.03 %) Discharge rate: 2000 m ³ /d. Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of 0.03 %. Do not apply industrial sludge to natural soils.

N-Aminoethylpiperazine, AEP	Exposure Scenario: 04	Professional Use in Epoxy/PU Curing - Professional
Conditions and measures related to external treatment of waste for disposal	: Disposal should be in accordance with applicable regional, national and local laws and regulations. This product should be treated as a hazardous waste according to EC Directive 2008/98/EC. Prevent entry into sewers, water courses, basements or confined areas.	
Contributing scenario controlling worker exposure for 2: Storage		
Product characteristics	: Liquid. Vapour pressure: 5.2 Pa. Viscosity: low. (ART)	
Concentration of substance in mixture or article	: Covers concentrations up to 100 %.	
Frequency and duration of use/exposure	: Covers daily exposures up to 8 hours. Exposure period, Distance of worker from source > 1 m: 480 minutes. (ART) Non-exposure period: 0 minutes. (ART)	
Other conditions affecting workers exposure	: Process temperature: 20 °C. Indoor use, Room size: Any. (ART) Open surface: > 3 m ² . (ART)	
Technical conditions and measures at process level (source) to prevent release	: Store substance within a closed system. The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART) Demonstrable and effective housekeeping practices are in place. (ART) Containment: high. (ART) Further parameters (ART): Activities with open liquid surfaces or open reservoirs - activity with undisturbed surfaces (no aerosol formation). - Localised controls (secondary): No. Segregation: No. Personal enclosure: No.	
Technical conditions and measures to control dispersion from source towards the worker	: Only good natural ventilation. (ART)	
Organisational measures to prevent/limit releases, dispersion and exposure	: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop. Avoid splashing. Avoid contact with contaminated tools and objects. Regular cleaning of equipment. Regular cleaning of work area. Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed.. Training for staff on good practice. Good standard of personal hygiene.	
Conditions and measures related to personal protection, hygiene and health evaluation		
Advice on general occupational hygiene	: Assumes a good basic standard of occupational hygiene is implemented.	
Personal protection	: Use suitable eye protection and gloves.	

Contributing scenario controlling worker exposure for 3: Mixing operations

Product characteristics	: Liquid. Vapour pressure: 5.2 Pa. Viscosity: low. (ART)
Concentration of substance in mixture or article	: Covers concentrations up to 100 %.
Frequency and duration of use/exposure	: Covers exposure up to 1 hour. Exposure period, Distance of worker from source < 1 m: 60 minutes. (ART) Non-exposure period: 420 minutes. (ART)
Other conditions affecting workers exposure	: Process temperature: 20 °C. Indoor use, Room size: Any. (ART) Open surface: 0.1 - 0.3 m ² . (ART)
Technical conditions and measures at process level (source) to prevent release	: The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART) Demonstrable and effective housekeeping practices are in place. (ART) Further parameters (ART): Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces. - Localised controls (secondary): No.
Technical conditions and measures to control dispersion from source towards the worker	: Only good natural ventilation. (ART)
Ventilation control measures	: Provide extract ventilation to points where emissions occur. Efficiency of at least ≥ 90 %. Localised controls (primary): Ensure fixed capturing hood is used. (ART)
Organisational measures to prevent/limit releases, dispersion and exposure	: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop. Avoid splashing. Avoid contact with contaminated tools and objects. Regular cleaning of equipment. Regular cleaning of work area. Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed.. Training for staff on good practice. Good standard of personal hygiene.
Conditions and measures related to personal protection, hygiene and health evaluation	
Advice on general occupational hygiene	: Assumes a good basic standard of occupational hygiene is implemented.
Personal protection	: Use suitable eye protection. Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %. Avoid direct eye contact with product, also via contamination on hands. Avoid direct skin contact with product. Identify potential areas for indirect skin contact.

Contributing scenario controlling worker exposure for 4: Curing

Product characteristics	: Liquid. Handling of contaminated objects: Vapour pressure: 126 Pa. activity coefficient: 1. (ART)
Concentration of substance in mixture or article	: Covers concentrations up to 20 %.

N-Aminoethylpiperazine, AEP	Exposure Scenario: 04	Professional Use in Epoxy/PU Curing - Professional
Frequency and duration of use/exposure	: Covers daily exposures up to 8 hours. Exposure period, Distance of worker from source > 1 m: 480 minutes. (ART) Non-exposure period: 0 minutes. (ART)	
Other conditions affecting workers exposure	: Assumes process temperature up to 60 °C. Indoor use, Room size: 300 m³. (ART) Activities with treated/contaminated objects (Surfaces 1 - 3 m²). (ART) Contamination 10 - 90 % of surface. (ART)	
Technical conditions and measures at process level (source) to prevent release	: Handle substance within a closed system. The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART) Demonstrable and effective housekeeping practices are in place. (ART) Containment: Localised controls (primary) - Medium. (ART)	
Ventilation control measures	Further parameters (ART): Handling of contaminated objects. Segregation: No. Personal enclosure: No. : Recommended room ventilation rate for handling/application (air changes per hour): 3. (ART) Localised controls (secondary): Provide extract ventilation to points where emissions occur. Efficiency of at least ≥ 50 %. (ART)	
Organisational measures to prevent/limit releases, dispersion and exposure	: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop. Avoid splashing. Avoid contact with contaminated tools and objects. Regular cleaning of equipment. Regular cleaning of work area. Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed.. Training for staff on good practice. Good standard of personal hygiene.	
Conditions and measures related to personal protection, hygiene and health evaluation		
Advice on general occupational hygiene	: Assumes a good basic standard of occupational hygiene is implemented.	
Personal protection	: Use suitable eye protection. Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %. Avoid direct eye contact with product, also via contamination on hands. Avoid direct skin contact with product. Identify potential areas for indirect skin contact.	
Contributing scenario controlling worker exposure for 5: Material transfers; Non-dedicated facility		
Product characteristics	: Liquid. Vapour pressure: 5.2 Pa. Viscosity: low. (ART)	
Concentration of substance in mixture or article	: Covers concentrations up to 100 %.	
Frequency and duration of use/exposure	: Covers exposure up to 1 hour. Exposure period, Distance of worker from source < 1 m: 60 minutes. (ART) Non-exposure period: 420 minutes. (ART)	
Other conditions affecting workers exposure	: Process temperature: 20 °C. Indoor use, Room size: Any. (ART) Splash loading. (ART)	
Date of issue/Date of revision	: 19/04/2017	Version : 2 / en 53/81

Technical conditions and measures at process level (source) to prevent release	: The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART) Demonstrable and effective housekeeping practices are in place. (ART) Containment: Open process. (ART) Further parameters (ART): Transfer of liquid products - falling liquids. - Localised controls (secondary): No. Transferring 1 -10 L/min.
Technical conditions and measures to control dispersion from source towards the worker	: Only good natural ventilation. (ART)
Ventilation control measures	: Provide extract ventilation to points where emissions occur. Efficiency of at least ≥ 90 %. Ensure fixed capturing hood is used. (ART)
Organisational measures to prevent/limit releases, dispersion and exposure	: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop. Avoid splashing. Avoid contact with contaminated tools and objects. Regular cleaning of equipment. Regular cleaning of work area. Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed.. Training for staff on good practice. Good standard of personal hygiene.
Conditions and measures related to personal protection, hygiene and health evaluation	
Advice on general occupational hygiene	: Assumes a good basic standard of occupational hygiene is implemented.
Personal protection	: Use suitable eye protection. Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %. Avoid direct eye contact with product, also via contamination on hands. Avoid direct skin contact with product. Identify potential areas for indirect skin contact.

Contributing scenario controlling worker exposure for 6: Professional application of coatings and inks; Rolling, Brushing	
Product characteristics	: Liquid. Vapour pressure: 5.2 Pa. Viscosity: low. (ART)
Concentration of substance in mixture or article	: Covers concentrations up to 20 %.
Frequency and duration of use/exposure	: Covers exposure up to 4 hour. Exposure period, Distance of worker from source < 1 m: 240 minutes. (ART) Non-exposure period: 240 minutes. (ART)
Other conditions affecting workers exposure	: Process temperature: 20 °C. Indoor use, Room size: Any. (ART) Spreading of liquids at surfaces or work pieces 1 - 3 m ² /hour. (ART)
Technical conditions and measures at process level (source) to prevent release	: The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART) Demonstrable and effective housekeeping practices are in place. (ART) Further parameters (ART): Spreading of liquid products. - Localised controls (primary, secondary): No. No barriers or screens (Efficiency of at least 80 %).

Technical conditions and measures to control dispersion from source towards the worker	: Only good natural ventilation. (ART) Use vertical laminar flow booth.
Organisational measures to prevent/limit releases, dispersion and exposure	: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop. Avoid splashing. Avoid contact with contaminated tools and objects. Regular cleaning of equipment. Regular cleaning of work area. Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed.. Training for staff on good practice. Good standard of personal hygiene.
Conditions and measures related to personal protection, hygiene and health evaluation	
Advice on general occupational hygiene	: Assumes a good basic standard of occupational hygiene is implemented.
Personal protection	: Use suitable eye protection. Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %. Avoid direct eye contact with product, also via contamination on hands. Avoid direct skin contact with product. Identify potential areas for indirect skin contact.
Respiratory protection	: Wear appropriate respiratory protection. (EN140) Efficiency of at least 90 %.

Contributing scenario controlling worker exposure for 7: Professional application of coatings and inks; Spraying

Product characteristics	: Liquid. Vapour pressure: 5.2 Pa. Viscosity: low. (ART)
Concentration of substance in mixture or article	: Covers concentrations up to 20 %.
Frequency and duration of use/exposure	: Covers exposure up to 2 hour. Exposure period, Distance of worker from source < 1 m: 120 minutes. (ART) Non-exposure period: 360 minutes. (ART)
Other conditions affecting workers exposure	: Process temperature: 20 °C. Indoor use, Room size: Any. (ART) Moderate application rate (0.3 - 3 l/minute). (ART) Ensure that direction of application is only horizontal or downward. (ART) Spraying with no or low compressed air use (ART)
Technical conditions and measures at process level (source) to prevent release	: The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART) Demonstrable and effective housekeeping practices are in place. (ART) Further parameters (ART): Surface spraying of liquids. - Localised controls (primary, secondary): No.
Technical conditions and measures to control dispersion from source towards the worker	: Down-flow spray room. Efficiency of at least 80 %. (ART)

Organisational measures to prevent/limit releases, dispersion and exposure	: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop. Avoid splashing. Avoid contact with contaminated tools and objects. Regular cleaning of equipment. Regular cleaning of work area. Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed.. Training for staff on good practice. Good standard of personal hygiene.
Conditions and measures related to personal protection, hygiene and health evaluation	
Advice on general occupational hygiene	: Assumes a good basic standard of occupational hygiene is implemented.
Personal protection	: Use suitable eye protection. Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %. Avoid direct eye contact with product, also via contamination on hands. Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.
Respiratory protection	: Ensure that the worker is in a separated (control) room with independent air supply. Apply within a vented cab supplied with filtered air under positive pressure and with a protection factor of >40. Efficiency of at least 97.5 %.

Contributing scenario controlling worker exposure for 8: Manual activities involving hand contact

Product characteristics	: Liquid. Vapour pressure: 5.2 Pa. Viscosity: low. (ART)
Concentration of substance in mixture or article	: Covers concentrations up to 100 %.
Frequency and duration of use/exposure	: Covers exposure up to 1 hour. Exposure period, Distance of worker from source < 1 m: 60 minutes. (ART) Non-exposure period: 420 minutes. (ART)
Human factors not influenced by risk management	: Body weight: 70 kg.
Other conditions affecting workers exposure	: Process temperature: 20 °C. Indoor use, Room size: Any. (ART) Open surface: 0.1 - 0.3 m ² . (ART) Application rate: 0.15 L/min. Tools with handles < 30 m. Downward application.
Technical conditions and measures at process level (source) to prevent release	: The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART) Demonstrable and effective housekeeping practices are in place. (ART) Further parameters (ART): Activities with open liquid surfaces or open reservoirs - activity with undisturbed surfaces (no aerosol formation). - Localised controls (primary, secondary): No.
Technical conditions and measures to control dispersion from source towards the worker	: Only good natural ventilation. (ART)

Organisational measures to prevent/limit releases, dispersion and exposure : Avoid all skin contact with product, clean up contamination/spills as soon as they occur.
Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately.
Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop.
Avoid splashing.
Avoid contact with contaminated tools and objects.
Regular cleaning of equipment.
Regular cleaning of work area.
Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed..
Training for staff on good practice.
Good standard of personal hygiene.

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

Advice on general occupational hygiene : Assumes a good basic standard of occupational hygiene is implemented.

Personal protection : Use suitable eye protection.
Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %.
Avoid direct eye contact with product, also via contamination on hands.
Avoid direct skin contact with product.
Identify potential areas for indirect skin contact.

Contributing scenario controlling worker exposure for 9: Equipment cleaning and maintenance

Product characteristics : Liquid.
Vapour pressure: 5.2 Pa.
Viscosity: low. (ART)

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

Frequency and duration of use/exposure : Covers exposure up to 1 hour.
Exposure period, Distance of worker from source < 1 m: 60 minutes. (ART)
Non-exposure period: 420 minutes. (ART)

Other conditions affecting workers exposure : Process temperature: 20 °C.
Indoor use, Room size: Any. (ART)
Activities with treated/contaminated objects (Surfaces: 1 - 3 m²). (ART)
Contamination > 90 % of surface. (ART)

Technical conditions and measures at process level (source) to prevent release : The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART)
Demonstrable and effective housekeeping practices are in place. (ART)

Technical conditions and measures to control dispersion from source towards the worker : Further parameters (ART):
Handling of contaminated objects. - Localised controls (primary, secondary): No.
: Only good natural ventilation. (ART)

Organisational measures to prevent/limit releases, dispersion and exposure : Avoid all skin contact with product, clean up contamination/spills as soon as they occur.
Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately.
Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop.
Avoid splashing.
Avoid contact with contaminated tools and objects.
Regular cleaning of equipment.
Regular cleaning of work area.
Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed..
Training for staff on good practice.
Good standard of personal hygiene.

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

Advice on general occupational hygiene	: Assumes a good basic standard of occupational hygiene is implemented.
Personal protection	: Use suitable eye protection. Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %. Avoid direct eye contact with product, also via contamination on hands. Avoid direct skin contact with product. Identify potential areas for indirect skin contact.

Section 3 - Exposure estimation and reference to its source**Exposure estimation and reference to its source - Environment: 1: Professional Use in Epoxy/PU Curing**

Exposure assessment (environment):	: ECETOC TRA worker v3 Version 3.1.
Exposure estimation	: Freshwater: 0.00410 mg/l. Risk characterisation ratio (PEC/PNEC): 0.0706. Freshwater sediment: 0.0155 mg/kg dwt. Risk characterisation ratio (PEC/PNEC): 0.0000720. Marine water: 0.000415 mg/l. Risk characterisation ratio (PEC/PNEC): 0.0716. Marine water sediment: 0.00157 mg/kg dwt. Risk characterisation ratio (PEC/PNEC): 0.0000729. Sewage Treatment Plant: 0.0205 mg/l. Risk characterisation ratio (PEC/PNEC): 0.0000822. Soil: 0.00122 mg/kg dwt. Risk characterisation ratio (PEC/PNEC): 0.0122.
Remark	: Based on the applied RMMs the risk towards environment is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 2: Storage

Exposure assessment (human):	: Inhalation exposure: Used ART model. Version 1.5. Dermal exposure: ECETOC TRA worker v3 Version 3.
Exposure estimation	: Worker - inhalative, long-term - local: 0.000036 mg/m ³ . Risk characterisation ratio: 0.002. Worker - dermal, long-term - systemic: 0.034 mg/kg bw/day. Risk characterisation ratio: 0.010.
Remark	: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

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

Exposure assessment (human):	: Inhalation exposure: Used ART model. Version 1.5. Dermal exposure: ECETOC TRA worker v3 Version 3.
Exposure estimation	: Worker - inhalative, long-term - local: 0.0077 mg/m ³ . Risk characterisation ratio: 0.513. Worker - dermal, long-term - systemic: 1.371 mg/kg bw/day. Risk characterisation ratio: 0.412.
Remark	: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).

Exposure estimation and reference to its source - Workers: 4: Curing

Exposure assessment (human): : Inhalation exposure: Used ART model. Version 1.5.
Dermal exposure: ECETOC TRA worker v3 Version 3.

Exposure estimation : **Worker - inhalative, long-term - local:** 0.0091 mg/m³.
Risk characterisation ratio: 0.607.

Worker - dermal, long-term - systemic: 1.646 mg/kg bw/day.
Risk characterisation ratio: 0.494.

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

Exposure estimation and reference to its source - Workers: 5: Material transfers; Non-dedicated facility

Exposure assessment (human): : Inhalation exposure: Used ART model. Version 1.5.
Dermal exposure: ECETOC TRA worker v3 Version 3.

Exposure estimation : **Worker - inhalative, long-term - local:** 0.0068 mg/m³.
Risk characterisation ratio: 0.453.

Worker - dermal, long-term - systemic: 1.371 mg/kg bw/day.
Risk characterisation ratio: 0.412.

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

Exposure estimation and reference to its source - Workers: 6: Professional application of coatings and inks; Rolling, Brushing

Exposure assessment (human): : Inhalation exposure: Used ART model. Version 1.5.
Dermal exposure: ECETOC TRA worker v3 Version 3.

Exposure estimation : **Worker - inhalative, long-term - local:** 0.0073 mg/m³.
Risk characterisation ratio: 0.487.

Worker - dermal, long-term - systemic: 1.646 mg/kg bw/day.
Risk characterisation ratio: 0.494.

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

Exposure estimation and reference to its source - Workers: 7: Professional application of coatings and inks; Spraying

Exposure assessment (human): : Inhalation exposure: Used ART model. Version 1.5.
Dermal exposure: ECETOC TRA worker v3 Version 3.

Exposure estimation : **Worker - inhalative, long-term - local:** 0.012 mg/m³.
Risk characterisation ratio: 0.817.

Worker - dermal, long-term - systemic: 1.607 mg/kg bw/day.
Risk characterisation ratio: 0.483.

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

Exposure estimation and reference to its source - Workers: 8: Manual activities involving hand contact

Exposure assessment (human): : Inhalation exposure: Used ART model. Version 1.5.
Dermal exposure: Used Riskofderm model. Version 2.1.

Exposure estimation : **Worker - inhalative, long-term - local:** 0.0076 mg/m³.
Risk characterisation ratio: 0.507.

Worker - dermal, long-term - systemic: 2.274 mg/kg bw/day.
Risk characterisation ratio: 0.683.

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

Exposure estimation and reference to its source - Workers: 9: Equipment cleaning and maintenance**Exposure assessment (human):**

: Inhalation exposure: Used ART model. Version 1.5.
Dermal exposure: ECETOC TRA worker v3 Version 3.

Exposure estimation

: **Worker - inhalative, long-term - local:** 0.0076 mg/m³.
Risk characterisation ratio: 0.507.

Worker - dermal, long-term - systemic: 1.371 mg/kg bw/day.
Risk characterisation ratio: 0.412.
Remarks: Exposure Estimation: 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>).

Annex to the extended Safety Data Sheet (eSDS)

Industrial

Identification of the substance or mixture

Product definition : Mono-constituent substance
Product name : N-Aminoethylpiperazine, AEP

Section 1 - Title

Short title of the exposure scenario : Monomer in Polymer Manufacture of polyamides and copolymers - Industrial

List of use descriptors : **Identified use name: ES05:** Monomer in Polymer Manufacture of polyamides and copolymers - Industrial: SU03; PROC01, PROC02, PROC03, PROC06, PROC08b, PROC14, PROC15, PROC28; ERC04
Process Category: PROC01, PROC02, PROC03, PROC06, PROC08b, PROC14, PROC15, PROC28
Substance supplied to that use in form of: As such
Subsequent service life relevant for that use: No.
Environmental Release Category: ERC04

Environmental contributing scenarios : **Monomer in Polymer Manufacture of polyamides and copolymers - ERC04**

Health Contributing scenarios : **Storage - PROC01**
General exposures (closed systems); No sampling - PROC01
Polymerisation (closed systems); Continuous process; With sample collection - PROC02
Polymerisation; Use in contained batch processes; With sample collection - PROC03
Pelletisation (extrusion); elevated temperature - PROC06
Bulk transfers; Dedicated facility - PROC08b
Pelletisation (extrusion) - PROC14
Laboratory activities - PROC15
Equipment cleaning and maintenance - PROC28

Number of the ES	: 05
Additional information	: Information concerning technical function: Intermediate.

Section 2 - Exposure controls

Contributing scenario controlling environmental exposure for 1: Monomer in Polymer Manufacture of polyamides and copolymers	
Amounts used	: Amounts used: Confidential information. Fraction of EU tonnage used in region: 1. Fraction of main source to local environment: 1. Fraction of substance in end-use products: ≤ 100 %. Daily amount per site, Msperc/Msite (kg/day): 16667.
Frequency and duration of use	: Continuous release, Emission days: 300 days per year.
Environment factors not influenced by risk management	: Local freshwater dilution factor: 10. Local marine water dilution factor: 100.
Other conditions affecting environmental exposure	: Effluent discharge rate: 2000 m ³ /d. Receiving surface water flow: 18000 m ³ /d.
Conditions and measures related to sewage treatment plant	: Release to waste water from process: 0 % (ESVOC SPERC 4.21a.v1) Release to air from process: 2 % (ESVOC SPERC 4.21a.v1) Release to soil from process: 0.001 % (ESVOC SPERC 4.21a.v1) Municipal Sewage Treatment Plant: Yes. (Degradation effectiveness: 0.03 %) Discharge rate: 2000 m ³ /d. Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of 0.03 %.

Conditions and measures related to external treatment of waste for disposal	: Disposal should be in accordance with applicable regional, national and local laws and regulations. This product should be treated as a hazardous waste according to EC Directive 2008/98/EC. Prevent entry into sewers, water courses, basements or confined areas.
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Contributing scenario controlling worker exposure for 2: Storage	
Product characteristics	: Liquid. Vapour pressure: 5.2 Pa. Viscosity: low. (ART)
Concentration of substance in mixture or article	: Covers concentrations up to 100 %.
Frequency and duration of use/exposure	: Covers daily exposures up to 8 hours. Exposure period, Distance of worker from source > 1 m: 480 minutes. (ART) Non-exposure period: 0 minutes. (ART)
Other conditions affecting workers exposure	: Process temperature: 20 °C. Indoor use, Room size: Any. (ART) Open surface: > 3 m ² . (ART)
Technical conditions and measures at process level (source) to prevent release	: Store substance within a closed system. The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART) Demonstrable and effective housekeeping practices are in place. (ART) Containment: high. (ART) Further parameters (ART): Activities with open liquid surfaces or open reservoirs - activity with undisturbed surfaces (no aerosol formation). - Localised controls (secondary): No. Segregation: No. Personal enclosure: No.
Technical conditions and measures to control dispersion from source towards the worker	: Only good natural ventilation. (ART)
Organisational measures to prevent/limit releases, dispersion and exposure	: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop. Avoid splashing. Avoid contact with contaminated tools and objects. Regular cleaning of equipment. Regular cleaning of work area. Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed.. Training for staff on good practice. Good standard of personal hygiene.
Conditions and measures related to personal protection, hygiene and health evaluation	
Advice on general occupational hygiene	: Assumes a good basic standard of occupational hygiene is implemented.
Personal protection	: Use suitable eye protection and gloves.

Contributing scenario controlling worker exposure for 3: General exposures (closed systems); No sampling

Product characteristics	: Liquid. Vapour pressure: 5.2 Pa. Viscosity: low. (ART)
Concentration of substance in mixture or article	: Covers concentrations up to 100 %.
Frequency and duration of use/exposure	: Covers daily exposures up to 8 hours. Exposure period, Distance of worker from source > 1 m: 480 minutes. (ART) Non-exposure period: 0 minutes. (ART)
Other conditions affecting workers exposure	: Process temperature: 20 °C. Indoor use, Room size: 1000 m ³ . (ART) Open surface: > 3 m ² . (ART)
Technical conditions and measures at process level (source) to prevent release	: Handle substance within a closed system. The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART) Demonstrable and effective housekeeping practices are in place. (ART) Containment: high. (ART) Further parameters (ART): Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces. - Localised controls (secondary): No. Segregation: No. Personal enclosure: No.
Technical conditions and measures to control dispersion from source towards the worker	: Only good natural ventilation. (ART)
Organisational measures to prevent/limit releases, dispersion and exposure	: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop. Avoid splashing. Avoid contact with contaminated tools and objects. Regular cleaning of equipment. Regular cleaning of work area. Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed.. Training for staff on good practice. Good standard of personal hygiene.
Conditions and measures related to personal protection, hygiene and health evaluation	
Advice on general occupational hygiene	: Assumes a good basic standard of occupational hygiene is implemented.
Personal protection	: Use suitable eye protection and gloves.

Contributing scenario controlling worker exposure for 4: Polymerisation (closed systems); Continuous process; With sample collection

Product characteristics	: Liquid. Vapour pressure: 5.2 Pa. Viscosity: low. (ART)
Concentration of substance in mixture or article	: Covers concentrations up to 100 %.

Frequency and duration of use/exposure	: Covers daily exposures up to 8 hours. Exposure period, Distance of worker from source < 1 m: 10 minutes (Transfer of liquid products - falling liquids). (ART) Exposure period, Distance of worker from source < 1 m: 50 minutes (Handling of contaminated objects). (ART) Exposure period, Distance of worker from source > 1 m: 420 minutes (Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces). (ART) Non-exposure period: 0 minutes. (ART)
Other conditions affecting workers exposure	: Process temperature: 20 °C. Indoor use, Room size: 1000 m ³ . (ART) Splash loading. (ART) Activities with treated/contaminated objects (Surfaces: 1 - 3 m ²). (ART) Contamination 10 - 90 % of surface. (ART) Open surface: > 3 m ³ . (ART)
Technical conditions and measures at process level (source) to prevent release	: Handle substance within a closed system. The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART) Demonstrable and effective housekeeping practices are in place. (Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces, Handling of contaminated objects) (ART) General housekeeping practices are in place. (Transfer of liquid products - falling liquids) (ART) Containment: Handling that reduces contact between product and adjacent air. (Transfer of liquid products - falling liquids, Handling of contaminated objects) (ART) Containment: high. (Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces) (ART) Further parameters (ART): Transfer of liquid products - falling liquids. - Localised controls (primary, secondary): No. Transferring < 0.1 L/min. Handling of contaminated objects. - Localised controls (primary, secondary): No. Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces. - Localised controls (secondary): No. Segregation: No. Personal enclosure: No.
Technical conditions and measures to control dispersion from source towards the worker	: Only good natural ventilation. (ART)
Organisational measures to prevent/limit releases, dispersion and exposure	: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop. Avoid splashing. Avoid contact with contaminated tools and objects. Regular cleaning of equipment. Regular cleaning of work area. Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed.. Training for staff on good practice. Good standard of personal hygiene.
Conditions and measures related to personal protection, hygiene and health evaluation	: Assumes a good basic standard of occupational hygiene is implemented.
Advice on general occupational hygiene	: Assumes a good basic standard of occupational hygiene is implemented.

Personal protection	: Use suitable eye protection. Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %. Avoid direct eye contact with product, also via contamination on hands. Avoid direct skin contact with product. Identify potential areas for indirect skin contact.
Contributing scenario controlling worker exposure for 5: Polymerisation; Use in contained batch processes; With sample collection	
Product characteristics	: Liquid. Vapour pressure: 5.2 Pa. Viscosity: low. (ART)
Concentration of substance in mixture or article	: Covers concentrations up to 100 %.
Frequency and duration of use/exposure	: Covers daily exposures up to 8 hours. Exposure period, Distance of worker from source < 1 m: 20 minutes (Transfer of liquid products - falling liquids). (ART) Exposure period, Distance of worker from source < 1 m: 60 minutes (Handling of contaminated objects). (ART) Exposure period, Distance of worker from source > 1 m: 380 minutes (Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces). (ART) Exposure period, Distance of worker from source < 1 m: 20 minutes (Handling of contaminated objects). (ART) Non-exposure period: 0 minutes. (ART)
Other conditions affecting workers exposure	: Process temperature: 20 °C. Indoor use, Room size: 1000 m ³ . (ART) Splash loading. (ART) Activities with treated/contaminated objects (Surfaces: 1 - 3 m ²). (ART) Contamination 10 - 90 % of surface. (ART) Open surface: > 3 m ³ . (ART)
Technical conditions and measures at process level (source) to prevent release	: Handle substance within a closed system. The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART) Demonstrable and effective housekeeping practices are in place. (Handling of contaminated objects, Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces) (ART) General housekeeping practices are in place. (Transfer of liquid products - falling liquids) (ART) Containment: Handling that reduces contact between product and adjacent air. (Transfer of liquid products - falling liquids) (ART) Containment: high. (Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces) (ART) Further parameters (ART): Transfer of liquid products - falling liquids. - Localised controls (primary, secondary): No. Transferring < 0.1 L/min. Handling of contaminated objects. - Localised controls (primary, secondary): No. Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces. - Localised controls (secondary): No. Segregation: No. Personal enclosure: No.
Technical conditions and measures to control dispersion from source towards the worker	: Only good natural ventilation. (ART)

Organisational measures to prevent/limit releases, dispersion and exposure :

- Avoid all skin contact with product, clean up contamination/spills as soon as they occur.
- Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately.
- Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop.
- Avoid splashing.
- Avoid contact with contaminated tools and objects.
- Regular cleaning of equipment.
- Regular cleaning of work area.
- Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed..
- Training for staff on good practice.
- Good standard of personal hygiene.

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

Advice on general occupational hygiene : Assumes a good basic standard of occupational hygiene is implemented.

Personal protection :

- Use suitable eye protection.
- Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %.
- Avoid direct eye contact with product, also via contamination on hands.
- Avoid direct skin contact with product.
- Identify potential areas for indirect skin contact.

Contributing scenario controlling worker exposure for 6: Pelletisation (extrusion); elevated temperature

In accordance with Article 14 (2a-f) of the REACH Regulation (EC) No 1907/2006, exposure estimation and risk characterisation does not need to be performed if the substance in a mixture is less than 0.1%.

Product characteristics :

- Liquid.
- Vapour pressure: 5.2 Pa.
- Viscosity: low. (ART)

Frequency and duration of use/exposure : Covers daily exposures up to 8 hours.

Other conditions affecting workers exposure :

- Process temperature: Elevated temperature.
- Indoor use, Room size: Any.

Technical conditions and measures to control dispersion from source towards the worker :

- Only good natural ventilation.

Organisational measures to prevent/limit releases, dispersion and exposure :

- Avoid all skin contact with product, clean up contamination/spills as soon as they occur.
- Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately.
- Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop.
- Avoid splashing.
- Avoid contact with contaminated tools and objects.
- Regular cleaning of equipment.
- Regular cleaning of work area.
- Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed..
- Training for staff on good practice.
- Good standard of personal hygiene.

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

Advice on general occupational hygiene : Assumes a good basic standard of occupational hygiene is implemented.

Personal protection :

- Use suitable eye protection.
- Avoid direct eye contact with product, also via contamination on hands.
- Avoid direct skin contact with product.
- Identify potential areas for indirect skin contact.

Contributing scenario controlling worker exposure for 7: Bulk transfers; Dedicated facility

Product characteristics	: Liquid. Vapour pressure: 5.2 Pa. Viscosity: low. (ART)
Concentration of substance in mixture or article	: Covers concentrations up to 100 %.
Frequency and duration of use/exposure	: Covers exposure up to 4 hours. Exposure period, Distance of worker from source < 1 m: 20 minutes (Transfer of liquid products - falling liquids). (ART) Exposure period, Distance of worker from source > 1 m: 200 minutes (Transfer of liquid products - Bottom loading). (ART) Exposure period, Distance of worker from source < 1 m: 20 minutes (Handling of contaminated objects). (ART) Non-exposure period: 240 minutes. (ART)
Other conditions affecting workers exposure	: Process temperature: 20 °C. Indoor use, Room size: 1000 m ³ . (ART) Splash loading. (ART) Activities with treated/contaminated objects (Surfaces: 1 - 3 m ²). (ART) Contamination 10 - 90 % of surface. (ART)
Technical conditions and measures at process level (source) to prevent release	: The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART) Demonstrable and effective housekeeping practices are in place. (ART) General housekeeping practices are in place. (Transfer of liquid products - falling liquids) (ART) Containment: Handling that reduces contact between product and adjacent air. (Transfer of liquid products - Bottom loading) (ART) Further parameters (ART): Transfer of liquid products - falling liquids. - Localised controls (primary, secondary): No. Transferring < 0.1 L/min. Transfer of liquid products - Bottom loading. - Localised controls (primary, secondary): No. Transferring > 1000 L/min. Segregation: No. Personal enclosure: No. Handling of contaminated objects. - Localised controls (primary, secondary): No.
Technical conditions and measures to control dispersion from source towards the worker	: Only good natural ventilation. (ART)
Organisational measures to prevent/limit releases, dispersion and exposure	: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop. Avoid splashing. Avoid contact with contaminated tools and objects. Regular cleaning of equipment. Regular cleaning of work area. Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed.. Training for staff on good practice. Good standard of personal hygiene.
Conditions and measures related to personal protection, hygiene and health evaluation	
Advice on general occupational hygiene	: Assumes a good basic standard of occupational hygiene is implemented.

Personal protection : Use suitable eye protection.
Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %.
Avoid direct eye contact with product, also via contamination on hands.
Avoid direct skin contact with product.
Identify potential areas for indirect skin contact.

Contributing scenario controlling worker exposure for 8: Pelletisation (extrusion)

In accordance with Article 14 (2a-f) of the REACH Regulation (EC) No 1907/2006, exposure estimation and risk characterisation does not need to be performed if the substance in a mixture is less than 0.1%.

Product characteristics : Liquid.
Vapour pressure: 5.2 Pa.
Viscosity: low. (ART)

Frequency and duration of use/exposure : Covers daily exposures up to 8 hours.

Other conditions affecting workers exposure : Process temperature: 20 °C.
Indoor use, Room size: Any.

Technical conditions and measures to control dispersion from source towards the worker : Only good natural ventilation.

Organisational measures to prevent/limit releases, dispersion and exposure : Avoid all skin contact with product, clean up contamination/spills as soon as they occur.
Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately.
Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop.
Avoid splashing.
Avoid contact with contaminated tools and objects.
Regular cleaning of equipment.
Regular cleaning of work area.
Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed..
Training for staff on good practice.
Good standard of personal hygiene.

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

Advice on general occupational hygiene : Assumes a good basic standard of occupational hygiene is implemented.

Personal protection : Use suitable eye protection.
Avoid direct eye contact with product, also via contamination on hands.
Avoid direct skin contact with product.
Identify potential areas for indirect skin contact.

Contributing scenario controlling worker exposure for 9: Laboratory activities

Product characteristics : Liquid.
Vapour pressure: 5.2 Pa.
Viscosity: low. (ART)

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

Frequency and duration of use/exposure : Covers exposure up to 1 hour.
Exposure period, Distance of worker from source < 1 m: 60 minutes. (ART)
Non-exposure period: 420 minutes. (ART)

Other conditions affecting workers exposure : Process temperature: 20 °C.
Indoor use, Room size: Any. (ART)
Splash loading. (ART)

Technical conditions and measures at process level (source) to prevent release	: The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART) General housekeeping practices are in place. (ART) Containment: Open process. (ART) Further parameters (ART): Transfer of liquid products - falling liquids. - Localised controls (secondary): No. Transferring < 0.1 L/min.
Technical conditions and measures to control dispersion from source towards the worker	: Localised controls (primary): Handle in a fume cupboard. (ART)
Ventilation control measures	: Recommended room ventilation rate for handling/application (air changes per hour): 3. (ART)
Organisational measures to prevent/limit releases, dispersion and exposure	: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop. Avoid splashing. Avoid contact with contaminated tools and objects. Regular cleaning of equipment. Regular cleaning of work area. Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed.. Training for staff on good practice. Good standard of personal hygiene.
Conditions and measures related to personal protection, hygiene and health evaluation	
Advice on general occupational hygiene	: Assumes a good basic standard of occupational hygiene is implemented.
Personal protection	: Use suitable eye protection. Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %. Avoid direct eye contact with product, also via contamination on hands. Avoid direct skin contact with product. Identify potential areas for indirect skin contact.

Contributing scenario controlling worker exposure for 10: Equipment cleaning and maintenance	
Product characteristics	: Liquid. Vapour pressure: 5.2 Pa. Viscosity: low. (ART)
Concentration of substance in mixture or article	: Covers concentrations up to 100 %.
Frequency and duration of use/exposure	: Covers exposure up to 2 hour. Exposure period, Distance of worker from source < 1 m: 120 minutes. (ART) Non-exposure period: 360 minutes. (ART)
Other conditions affecting workers exposure	: Process temperature: 20 °C. Indoor use, Room size: Any. (ART) Activities with treated/contaminated objects (Surfaces: 1 - 3 m ²). (ART) Contamination 10 - 90 % of surface. (ART)
Technical conditions and measures at process level (source) to prevent release	: The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART) Demonstrable and effective housekeeping practices are in place. (ART) Further parameters (ART): Handling of contaminated objects. - Localised controls (primary, secondary): No.
Technical conditions and measures to control dispersion from source towards the worker	: Only good natural ventilation. (ART)

N-Aminoethylpiperazine, AEP	Exposure Scenario: 05	Monomer in Polymer Manufacture of polyamides and copolymers - Industrial
Organisational measures to prevent/limit releases, dispersion and exposure	<p>: Avoid all skin contact with product, clean up contamination/spills as soon as they occur.</p> <p>Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately.</p> <p>Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop.</p> <p>Avoid splashing.</p> <p>Avoid contact with contaminated tools and objects.</p> <p>Regular cleaning of equipment.</p> <p>Regular cleaning of work area.</p> <p>Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed..</p> <p>Training for staff on good practice.</p> <p>Good standard of personal hygiene.</p>	
Conditions and measures related to personal protection, hygiene and health evaluation		
Advice on general occupational hygiene	: Assumes a good basic standard of occupational hygiene is implemented.	
Personal protection	<p>: Use suitable eye protection.</p> <p>Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %.</p> <p>Avoid direct eye contact with product, also via contamination on hands.</p> <p>Avoid direct skin contact with product.</p> <p>Identify potential areas for indirect skin contact.</p>	

Section 3 - Exposure estimation and reference to its source

Exposure estimation and reference to its source - Environment: 1: Monomer in Polymer Manufacture of polyamides and copolymers		
Exposure assessment (environment):	: ECETOC TRA worker v3 Version 3.1.	
Exposure estimation	<p>: Freshwater: 0.00204 mg/l. Risk characterisation ratio (PEC/PNEC): 0.0352.</p> <p>Freshwater sediment: 0.00772 mg/kg dwt. Risk characterisation ratio (PEC/PNEC): 0.0000359.</p> <p>Marine water: 0.000210 mg/l. Risk characterisation ratio (PEC/PNEC): 0.0361.</p> <p>Marine water sediment: 0.000792 mg/kg dwt. Risk characterisation ratio (PEC/PNEC): 0.0000368.</p> <p>Sewage Treatment Plant: 0 mg/l. Risk characterisation ratio (PEC/PNEC): 0.</p> <p>Soil: 0.0413 mg/kg dwt. Risk characterisation ratio (PEC/PNEC): 0.0413.</p>	
Remark	: Based on the applied RMMs the risk towards environment is sufficiently controlled (RCR < 1).	

Exposure estimation and reference to its source - Workers: 2: Storage		
Exposure assessment (human):	: Inhalation exposure: Used ART model. Version 1.5. Dermal exposure: ECETOC TRA worker v3 Version 3.	
Exposure estimation	<p>: Worker - inhalative, long-term - local: 0.000036 mg/m³. Risk characterisation ratio: 0.002.</p> <p>Worker - dermal, long-term - systemic: 0.034 mg/kg bw/day. Risk characterisation ratio: 0.010.</p>	
Remark	: Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR < 1).	

Exposure estimation and reference to its source - Workers: 3: General exposures (closed systems); No sampling

Exposure assessment (human): : Inhalation exposure: Used ART model. Version 1.5.
Dermal exposure: ECETOC TRA worker v3 Version 3.

Exposure estimation : **Worker - inhalative, long-term - local:** 0.0013 mg/m³.
Risk characterisation ratio: 0.087.

Worker - dermal, long-term - systemic: 0.034 mg/kg bw/day.
Risk characterisation ratio: 0.010.

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

Exposure estimation and reference to its source - Workers: 4: Polymerisation (closed systems); Continuous process; With sample collection

Exposure assessment (human): : Inhalation exposure: Used ART model. Version 1.5.
Dermal exposure: ECETOC TRA worker v3 Version 3.

Exposure estimation : **Worker - inhalative, long-term - local:** 0.0027 mg/m³.
Risk characterisation ratio: 0.180.

Worker - dermal, long-term - systemic: 0.137 mg/kg bw/day.
Risk characterisation ratio: 0.041.

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

Exposure estimation and reference to its source - Workers: 5: Polymerisation; Use in contained batch processes; With sample collection

Exposure assessment (human): : Inhalation exposure: Used ART model. Version 1.5.
Dermal exposure: ECETOC TRA worker v3 Version 3.

Exposure estimation : **Worker - inhalative, long-term - local:** 0.0038 mg/m³.
Risk characterisation ratio: 0.253.

Worker - dermal, long-term - systemic: 0.069 mg/kg bw/day.
Risk characterisation ratio: 0.021.

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

Exposure estimation and reference to its source - Workers: 6: Pelletisation (extrusion); elevated temperature

Exposure assessment (human): : In accordance with Article 14 (2a-f) of the REACH Regulation (EC) No 1907/2006, exposure estimation and risk characterisation does not need to be performed if the substance in a mixture is less than 0.1%.

Exposure estimation : Not applicable.

Exposure estimation and reference to its source - Workers: 7: Bulk transfers; Dedicated facility

Exposure assessment (human): : Inhalation exposure: Used ART model. Version 1.5.
Dermal exposure: ECETOC TRA worker v3 Version 3.

Exposure estimation : **Worker - inhalative, long-term - local:** 0.0034 mg/m³.
Risk characterisation ratio: 0.227.

Worker - dermal, long-term - systemic: 1.371 mg/kg bw/day.
Risk characterisation ratio: 0.412.

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

Exposure estimation and reference to its source - Workers: 8: Pelletisation (extrusion)

Exposure assessment (human): : In accordance with Article 14 (2a-f) of the REACH Regulation (EC) No 1907/2006, exposure estimation and risk characterisation does not need to be performed if the substance in a mixture is less than 0.1%.

Exposure estimation : Not applicable.

Exposure estimation and reference to its source - Workers: 9: Laboratory activities

Exposure assessment (human): : Inhalation exposure: Used ART model. Version 1.5.
Dermal exposure: ECETOC TRA worker v3 Version 3.

Exposure estimation : **Worker - inhalative, long-term - local:** 0.00017 mg/m³.
Risk characterisation ratio: 0.011.

Worker - dermal, long-term - systemic: 0.034 mg/kg bw/day.
Risk characterisation ratio: 0.010.

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

Exposure estimation and reference to its source - Workers: 10: Equipment cleaning and maintenance

Exposure assessment (human): : Inhalation exposure: Used ART model. Version 1.5.
Dermal exposure: ECETOC TRA worker v3 Version 3.

Exposure estimation : **Worker - inhalative, long-term - local:** 0.0046 mg/m³.
Risk characterisation ratio: 0.307.

Worker - dermal, long-term - systemic: 1.371 mg/kg bw/day.
Risk characterisation ratio: 0.412.
Remarks: Exposure Estimation: 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>).

Annex to the extended Safety Data Sheet (eSDS)

Industrial

Identification of the substance or mixture

Product definition : Mono-constituent substance
Product name : N-Aminoethylpiperazine, AEP

Section 1 - Title

Short title of the exposure scenario : Gas Sweetening - Industrial

List of use descriptors : **Identified use name: ES06:** Gas Sweetening - Industrial: SU03; PROC01, PROC02, PROC03, PROC08b, PROC28; ERC07
Process Category: PROC01, PROC02, PROC03, PROC08b, PROC28
Substance supplied to that use in form of: As such
Subsequent service life relevant for that use: No.
Environmental Release Category: ERC07

Environmental contributing scenarios : **Gas Sweetening** - ERC07

Health Contributing scenarios : **Storage** - PROC01
General exposures (closed systems); No sampling - PROC01
Polymerisation (closed systems); Continuous process; With sample collection - PROC02
Polymerisation; Use in contained batch processes; With sample collection - PROC03
Bulk transfers; Dedicated facility - PROC08b
Equipment cleaning and maintenance - PROC28

Number of the ES	: 06
Additional information	: Information concerning technical function: Intermediate.

Section 2 - Exposure controls

Contributing scenario controlling environmental exposure for 1: Gas Sweetening	
Amounts used	: Amounts used: Confidential information. Fraction of EU tonnage used in region: 1. Fraction of main source to local environment: 0.01. Fraction of substance in end-use products: ≤ 100 %. Daily amount per site, Msperc/Msite (kg/day): 500.
Frequency and duration of use	: Continuous release, Emission days: 20 days per year.
Environment factors not influenced by risk management	: Local freshwater dilution factor: 10. Local marine water dilution factor: 100.
Other conditions affecting environmental exposure	: Effluent discharge rate: 2000 m ³ /d. Receiving surface water flow: 18000 m ³ /d. Release to waste water from process: 0.1 % (ESVOC SPERC 7.13a.v1) Release to air from process: 0.05 % (ESVOC SPERC 7.13a.v1) Release to soil from process: 0.1 % (ESVOC SPERC 7.13a.v1)
Conditions and measures related to sewage treatment plant	: Municipal Sewage Treatment Plant: Yes. (Degradation effectiveness: 0.03 %) Discharge rate: 2000 m ³ /d. Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of 0.03 %.
Conditions and measures related to external treatment of waste for disposal	: Disposal should be in accordance with applicable regional, national and local laws and regulations. This product should be treated as a hazardous waste according to EC Directive 2008/98/EC. Prevent entry into sewers, water courses, basements or confined areas.

Contributing scenario controlling worker exposure for 2: Storage

Product characteristics	: Liquid. Vapour pressure: 5.2 Pa. Viscosity: low. (ART)
Concentration of substance in mixture or article	: Covers concentrations up to 100 %.
Frequency and duration of use/exposure	: Covers daily exposures up to 8 hours. Exposure period, Distance of worker from source > 1 m: 480 minutes. (ART) Non-exposure period: 0 minutes. (ART)
Other conditions affecting workers exposure	: Process temperature: 20 °C. Indoor use, Room size: Any. (ART) Open surface: > 3 m ² . (ART)
Technical conditions and measures at process level (source) to prevent release	: Store substance within a closed system. The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART) Demonstrable and effective housekeeping practices are in place. (ART) Containment: high. (ART) Further parameters (ART): Activities with open liquid surfaces or open reservoirs - activity with undisturbed surfaces (no aerosol formation). - Localised controls (secondary): No. Segregation: No. Personal enclosure: No.
Technical conditions and measures to control dispersion from source towards the worker	: Only good natural ventilation. (ART)
Organisational measures to prevent/limit releases, dispersion and exposure	: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop. Avoid splashing. Avoid contact with contaminated tools and objects. Regular cleaning of equipment. Regular cleaning of work area. Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed.. Training for staff on good practice. Good standard of personal hygiene.
Conditions and measures related to personal protection, hygiene and health evaluation	
Advice on general occupational hygiene	: Assumes a good basic standard of occupational hygiene is implemented.
Personal protection	: Use suitable eye protection and gloves.

Contributing scenario controlling worker exposure for 3: General exposures (closed systems); No sampling

Product characteristics	: Liquid. Vapour pressure: 5.2 Pa. Viscosity: low. (ART)
Concentration of substance in mixture or article	: Covers concentrations up to 100 %.
Frequency and duration of use/exposure	: Covers daily exposures up to 8 hours. Exposure period, Distance of worker from source > 1 m: 480 minutes. (ART) Non-exposure period: 0 minutes. (ART)
Other conditions affecting workers exposure	: Process temperature: 20 °C. Indoor use, Room size: 1000 m ³ . (ART) Open surface: > 3 m ² . (ART)

Technical conditions and measures at process level (source) to prevent release

: Handle substance within a closed system.

The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART)

Demonstrable and effective housekeeping practices are in place. (ART)

Containment: high. (ART)

Further parameters (ART):

Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces. -

Localised controls (secondary): No.

Segregation: No.

Personal enclosure: No.

Technical conditions and measures to control dispersion from source towards the worker

: Only good natural ventilation. (ART)

Organisational measures to prevent/limit releases, dispersion and exposure

: Avoid all skin contact with product, clean up contamination/spills as soon as they occur.

Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately.

Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop.

Avoid splashing.

Avoid contact with contaminated tools and objects.

Regular cleaning of equipment.

Regular cleaning of work area.

Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed..

Training for staff on good practice.

Good standard of personal hygiene.

Conditions and measures related to personal protection, hygiene and health evaluation**Advice on general occupational hygiene**

: Assumes a good basic standard of occupational hygiene is implemented.

Personal protection

: Use suitable eye protection and gloves.

Contributing scenario controlling worker exposure for 4: Polymerisation (closed systems); Continuous process; With sample collection**Product characteristics**

: Liquid.

Vapour pressure: 5.2 Pa.

Viscosity: low. (ART)

Concentration of substance in mixture or article

: Covers concentrations up to 100 %.

Frequency and duration of use/exposure

: Covers daily exposures up to 8 hours.

Exposure period, Distance of worker from source < 1 m: 10 minutes (Transfer of liquid products - falling liquids). (ART)

Exposure period, Distance of worker from source < 1 m: 50 minutes (Handling of contaminated objects). (ART)

Exposure period, Distance of worker from source > 1 m: 420 minutes (Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces). (ART)

Non-exposure period: 0 minutes. (ART)

Other conditions affecting workers exposure

: Process temperature: 20 °C.

Indoor use, Room size: 1000 m³. (ART)

Splash loading. (ART)

Activities with treated/contaminated objects (Surfaces: 1 - 3 m²). (ART)

Contamination 10 - 90 % of surface. (ART)

Open surface: > 3 m³. (ART)

Technical conditions and measures at process level (source) to prevent release

: Handle substance within a closed system.

The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART)

Demonstrable and effective housekeeping practices are in place. (Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces, Handling of contaminated objects) (ART)

General housekeeping practices are in place. (Transfer of liquid products - falling liquids) (ART)

Containment: Handling that reduces contact between product and adjacent air.

(Transfer of liquid products - falling liquids, Handling of contaminated objects) (ART)

Containment: high. (Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces) (ART)

Further parameters (ART):

Transfer of liquid products - falling liquids. - Localised controls (primary, secondary): No.

Transferring < 0.1 L/min.

Handling of contaminated objects. - Localised controls (primary, secondary): No.

Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces. - Localised controls (secondary): No.

Segregation: No.

Personal enclosure: No.

Technical conditions and measures to control dispersion from source towards the worker

: Only good natural ventilation. (ART)

Organisational measures to prevent/limit releases, dispersion and exposure

: Avoid all skin contact with product, clean up contamination/spills as soon as they occur.

Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately.

Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop.

Avoid splashing.

Avoid contact with contaminated tools and objects.

Regular cleaning of equipment.

Regular cleaning of work area.

Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed..

Training for staff on good practice.

Good standard of personal hygiene.

Conditions and measures related to personal protection, hygiene and health evaluation**Advice on general occupational hygiene**

: Assumes a good basic standard of occupational hygiene is implemented.

Personal protection

: Use suitable eye protection.

Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %.

Avoid direct eye contact with product, also via contamination on hands.

Avoid direct skin contact with product.

Identify potential areas for indirect skin contact.

Contributing scenario controlling worker exposure for 5: Polymerisation; Use in contained batch processes; With sample collection**Product characteristics**

: Liquid.

Vapour pressure: 5.2 Pa.

Viscosity: low. (ART)

Concentration of substance in mixture or article

: Covers concentrations up to 100 %.

Frequency and duration of use/exposure

: Covers daily exposures up to 8 hours.
 Exposure period, Distance of worker from source < 1 m: 20 minutes (Transfer of liquid products - falling liquids). (ART)
 Exposure period, Distance of worker from source < 1 m: 60 minutes (Handling of contaminated objects). (ART)
 Exposure period, Distance of worker from source > 1 m: 380 minutes (Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces). (ART)
 Exposure period, Distance of worker from source < 1 m: 20 minutes (Handling of contaminated objects). (ART)
 Non-exposure period: 0 minutes. (ART)

Other conditions affecting workers exposure

: Process temperature: 20 °C.
 Indoor use, Room size: 1000 m³. (ART)
 Splash loading. (ART)
 Activities with treated/contaminated objects (Surfaces: 1 - 3 m²). (ART)
 Contamination 10 - 90 % of surface. (ART)
 Open surface: > 3 m³. (ART)

Technical conditions and measures at process level (source) to prevent release

: Handle substance within a closed system.

 The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART)
 Demonstrable and effective housekeeping practices are in place. (Handling of contaminated objects, Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces) (ART)
 General housekeeping practices are in place. (Transfer of liquid products - falling liquids) (ART)
 Containment: Handling that reduces contact between product and adjacent air. (Transfer of liquid products - falling liquids) (ART)
 Containment: high. (Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces) (ART)

 Further parameters (ART):
 Transfer of liquid products - falling liquids. - Localised controls (primary, secondary): No.
 Transferring < 0.1 L/min.

 Handling of contaminated objects. - Localised controls (primary, secondary): No.

 Activities with open liquid surfaces or open reservoirs - activity with agitated surfaces. - Localised controls (secondary): No.
 Segregation: No.
 Personal enclosure: No.

Technical conditions and measures to control dispersion from source towards the worker

: Only good natural ventilation. (ART)

Organisational measures to prevent/limit releases, dispersion and exposure

: Avoid all skin contact with product, clean up contamination/spills as soon as they occur.
 Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately.
 Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop.
 Avoid splashing.
 Avoid contact with contaminated tools and objects.
 Regular cleaning of equipment.
 Regular cleaning of work area.
 Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed..
 Training for staff on good practice.
 Good standard of personal hygiene.

Conditions and measures related to personal protection, hygiene and health evaluation**Advice on general occupational hygiene**

: Assumes a good basic standard of occupational hygiene is implemented.

Personal protection : Use suitable eye protection.
Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %.
Avoid direct eye contact with product, also via contamination on hands.
Avoid direct skin contact with product.
Identify potential areas for indirect skin contact.

Contributing scenario controlling worker exposure for 6: Bulk transfers; Dedicated facility

Product characteristics : Liquid.
Vapour pressure: 5.2 Pa.
Viscosity: low. (ART)

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

Frequency and duration of use/exposure : Covers exposure up to 4 hours.
Exposure period, Distance of worker from source < 1 m: 20 minutes (Transfer of liquid products - falling liquids). (ART)
Exposure period, Distance of worker from source > 1 m: 200 minutes (Transfer of liquid products - Bottom loading). (ART)
Exposure period, Distance of worker from source < 1 m: 20 minutes (Handling of contaminated objects). (ART)
Non-exposure period: 240 minutes. (ART)

Other conditions affecting workers exposure : Process temperature: 20 °C.
Indoor use, Room size: 1000 m³. (ART)
Splash loading. (ART)
Activities with treated/contaminated objects (Surfaces: 1 - 3 m²). (ART)
Contamination 10 - 90 % of surface. (ART)

Technical conditions and measures at process level (source) to prevent release : The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART)
Demonstrable and effective housekeeping practices are in place. (ART)
General housekeeping practices are in place. (Transfer of liquid products - falling liquids) (ART)
Containment: Handling that reduces contact between product and adjacent air. (Transfer of liquid products - Bottom loading) (ART)

Further parameters (ART):
Transfer of liquid products - falling liquids. - Localised controls (primary, secondary): No.
Transferring < 0.1 L/min.

Transfer of liquid products - Bottom loading. - Localised controls (primary, secondary): No.
Transferring > 1000 L/min.
Segregation: No.
Personal enclosure: No.

Handling of contaminated objects. - Localised controls (primary, secondary): No.

Technical conditions and measures to control dispersion from source towards the worker : Only good natural ventilation. (ART)

Organisational measures to prevent/limit releases, dispersion and exposure : Avoid all skin contact with product, clean up contamination/spills as soon as they occur.
Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately.
Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop.
Avoid splashing.
Avoid contact with contaminated tools and objects.
Regular cleaning of equipment.
Regular cleaning of work area.
Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed..
Training for staff on good practice.

Good standard of personal hygiene.

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

Advice on general occupational hygiene : Assumes a good basic standard of occupational hygiene is implemented.

Personal protection : Use suitable eye protection.
Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %.
Avoid direct eye contact with product, also via contamination on hands.
Avoid direct skin contact with product.
Identify potential areas for indirect skin contact.

Contributing scenario controlling worker exposure for 7: Equipment cleaning and maintenance

Product characteristics : Liquid.

Vapour pressure: 5.2 Pa.

Viscosity: low. (ART)

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

Frequency and duration of use/exposure : Covers exposure up to 2 hour.
Exposure period, Distance of worker from source < 1 m: 120 minutes. (ART)
Non-exposure period: 360 minutes. (ART)

Other conditions affecting workers exposure : Process temperature: 20 °C.
Indoor use, Room size: Any. (ART)
Activities with treated/contaminated objects (Surfaces: 1 - 3 m²). (ART)
Contamination 10 - 90 % of surface. (ART)

Technical conditions and measures at process level (source) to prevent release : The process is not fully enclosed or the integrity of that enclosure is not regularly monitored. (ART)
Demonstrable and effective housekeeping practices are in place. (ART)

Further parameters (ART):

Handling of contaminated objects. - Localised controls (primary, secondary): No.

Technical conditions and measures to control dispersion from source towards the worker : Only good natural ventilation. (ART)

Organisational measures to prevent/limit releases, dispersion and exposure : Avoid all skin contact with product, clean up contamination/spills as soon as they occur.
Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately.
Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop.
Avoid splashing.
Avoid contact with contaminated tools and objects.
Regular cleaning of equipment.
Regular cleaning of work area.
Supervision in place to check that the risk management measures in place are being used correctly and operational conditions followed..
Training for staff on good practice.
Good standard of personal hygiene.

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

Advice on general occupational hygiene : Assumes a good basic standard of occupational hygiene is implemented.

Personal protection : Use suitable eye protection.
Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training. Efficiency of at least 90 %.
Avoid direct eye contact with product, also via contamination on hands.
Avoid direct skin contact with product.
Identify potential areas for indirect skin contact.

Section 3 - Exposure estimation and reference to its source

Exposure estimation and reference to its source - Environment: 1: Gas Sweetening

Exposure assessment (environment): : ECETOC TRA worker v3 Version 3.1.

Exposure estimation : Freshwater: 0.0270 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.466.

Freshwater sediment: 0.102 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.000475.

Marine water: 0.00271 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.467.

Marine water sediment: 0.0102 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.000476.

Sewage Treatment Plant: 0.250 mg/l.
Risk characterisation ratio (PEC/PNEC): 0.001.

Soil: 0.00140 mg/kg dwt.
Risk characterisation ratio (PEC/PNEC): 0.00140.

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

Exposure estimation and reference to its source - Workers: 2: Storage

Exposure assessment (human): : Inhalation exposure: Used ART model. Version 1.5.
Dermal exposure: ECETOC TRA worker v3 Version 3.

Exposure estimation : **Worker - inhalative, long-term - local:** 0.000036 mg/m³.
Risk characterisation ratio: 0.002.

Worker - dermal, long-term - systemic: 0.034 mg/kg bw/day.
Risk characterisation ratio: 0.010.

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

Exposure estimation and reference to its source - Workers: 3: General exposures (closed systems); No sampling

Exposure assessment (human): : Inhalation exposure: Used ART model. Version 1.5.
Dermal exposure: ECETOC TRA worker v3 Version 3.

Exposure estimation : **Worker - inhalative, long-term - local:** 0.0013 mg/m³.
Risk characterisation ratio: 0.087.

Worker - dermal, long-term - systemic: 0.034 mg/kg bw/day.
Risk characterisation ratio: 0.010.

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

Exposure estimation and reference to its source - Workers: 4: Polymerisation (closed systems); Continuous process; With sample collection

Exposure assessment (human): : Inhalation exposure: Used ART model. Version 1.5.
Dermal exposure: ECETOC TRA worker v3 Version 3.

Exposure estimation : **Worker - inhalative, long-term - local:** 0.0027 mg/m³.
Risk characterisation ratio: 0.180.

Worker - dermal, long-term - systemic: 0.137 mg/kg bw/day.
Risk characterisation ratio: 0.041.

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

Exposure estimation and reference to its source - Workers: 5: Polymerisation; Use in contained batch processes; With sample collection

Exposure assessment (human): : Inhalation exposure: Used ART model. Version 1.5.
Dermal exposure: ECETOC TRA worker v3 Version 3.

Exposure estimation : **Worker - inhalative, long-term - local:** 0.0038 mg/m³.
Risk characterisation ratio: 0.253.

Worker - dermal, long-term - systemic: 0.069 mg/kg bw/day.
Risk characterisation ratio: 0.021.

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

Exposure estimation and reference to its source - Workers: 6: Bulk transfers; Dedicated facility

Exposure assessment (human): : Inhalation exposure: Used ART model. Version 1.5.
Dermal exposure: ECETOC TRA worker v3 Version 3.

Exposure estimation : **Worker - inhalative, long-term - local:** 0.0034 mg/m³.
Risk characterisation ratio: 0.227.

Worker - dermal, long-term - systemic: 1.371 mg/kg bw/day.
Risk characterisation ratio: 0.412.

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

Exposure estimation and reference to its source - Workers: 7: Equipment cleaning and maintenance

Exposure assessment (human): : Inhalation exposure: Used ART model. Version 1.5.
Dermal exposure: ECETOC TRA worker v3 Version 3.

Exposure estimation : **Worker - inhalative, long-term - local:** 0.0046 mg/m³.
Risk characterisation ratio: 0.307.

Worker - dermal, long-term - systemic: 1.371 mg/kg bw/day.
Risk characterisation ratio: 0.412.

Remarks: Exposure Estimation: 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>).