

# MATERIAL SAFETY DATA SHEET

Date Printed:  
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 Version:  
 Regulation: EC No 1272/2008

## SECTION 1: SUBSTANCE IDENTIFICATION

Name of Substance: 2-ethylhexyl acrylate  
 Synonyms: 2-Propenoic acid, 2-ethylhexyl ester  
 CAS #: 103-11-7  
 EC #: 203-080-7  
 Registration #: 01-2119453158-37-0006

## PRIMARY / COMMON USES

Identified Uses	Process Category (PROC)	Product Category (PC)	Environmental release category (ERC)	Sector of Use (SU)
Manufacture and distribution of the substance	<p>PROC 1: Use in closed process, no likelihood of exposure</p> <p>PROC 2: Use in closed, continuous process with occasional controlled exposure</p> <p>PROC 3: Use in closed batch process (synthesis or formulation)</p> <p>PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities</p> <p>PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities</p> <p>PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)</p>	PC 19: Intermediate	ERC 1: Manufacture of substances	<p>SU 8: Manufacture of bulk, large scale chemicals (including petroleum products)</p> <p>SU 9: Manufacture of fine chemicals</p>
Polymerisation and formulation	<p>PROC 1: Use in closed process, no likelihood of exposure</p> <p>PROC 2: Use in closed, continuous process with occasional controlled exposure</p> <p>PROC 3: Use in closed batch process</p>	<p>PC 19: Intermediate</p> <p>PC 32: Polymer preparations and</p>	ERC 6c: Industrial use of monomers for manufacture of thermopl	SU 8: Manufacture of bulk, large scale chemical

Identified Uses	Process Category (PROC)	Product Category (PC)	Environmental release category (ERC)	Sector of Use (SU)
	<p>(synthesis or formulation)</p> <p>PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises</p> <p>PROC 5 : Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)</p> <p>PROC 8a : Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities</p> <p>PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities</p> <p>PROC 9 : Transfer of substance or preparation into small containers (dedicated filling line, including weighing)</p>	compounds	<p>astics</p> <p>ERC 6d: Industrial use of process regulators for polymerisation processes in production of resins, rubbers, polymers</p>	<p>s(including petroleum products)</p> <p>SU 9: Manufacture of fine chemicals</p> <p>SU 12: Manufacture of plastics products ,including compounding and conversion</p>
Use of formulated monomeric 2-EHA up to 21% in paints and adhesives	<p>PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)</p> <p>PROC 7: Industrial spraying</p> <p>PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)</p> <p>PROC 10: Roller application or brushing</p> <p>PROC 19: Hand-mixing with intimate contact and only PPE available.</p>	<p>PC 1: Adhesives, sealants</p> <p>PC 9a: Coatings and paints, thinners, paint removes</p> <p>PC 32: Polymer preparations and compounds</p>	<p>ERC 6c: Industrial use of monomers for manufacture of thermoplastics</p> <p>ERC 6d: Industrial use of process regulators for polymerisation processes in production of</p>	<p>SU 10: Formulation [mixing] of preparations and/or re-packaging(excluding alloys)</p> <p>SU 12: Manufacture of plastics products ,including</p>

Identified Uses	Process Category (PROC)	Product Category (PC)	Environmental release category (ERC)	Sector of Use (SU)
			resins, rubbers, polymers	g compounding and conversion  SU 19: Building and construction work
Use as laboratory reagent	PROC 15: Use as laboratory reagent	PC 19: Intermediate  PC 21: Laboratory chemicals	ERC 1: Manufacture of substances	SU 8: Manufacture of bulk, large scale chemicals(including petroleum products)  SU 9: Manufacture of fine chemicals  SU 24: Scientific research and development
Use of formulated monomeric 2-EHA up to 21% in paints and adhesives	PROC 10: Roller application or brushing  PROC 11: Non industrial spraying	PC 1: Adhesives, sealants  PC 9a: Coatings	ERC 8c: Wide dispersive indoor use resulting in	SU 10: Formulation[mixing] of preparations

Identified Uses	Process Category (PROC)	Product Category (PC)	Environmental release category (ERC)	Sector of Use (SU)
	<p>PROC 19: Hand-mixing with intimate contact and only PPE available.</p> <p>PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)</p> <p>PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)</p>	<p>and paints, thinners, paint removes</p> <p>PC 32: Polymer preparations and compounds</p>	<p>inclusion into or onto a matrix</p> <p>ERC 8f: Wide dispersible outdoor use resulting in inclusion into or onto a matrix</p>	<p>and/or re-packaging (excluding alloys)</p> <p>SU 12: Manufacture of plastics products, including compounding and conversion</p> <p>SU 19: Building and construction work</p>

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#### COMPANY INFORMATION

Company name: LG chem.  
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Contact Telephone: +82 61 680 6920  
Fax:  
Email Address:  
Emergency Telephone:

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#### SECTION 2: HAZARDS IDENTIFICATION

Classification:

Physical / Chemical Hazards:  
**Annex I of Directive 67/548/EEC:**  
N/A

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**EU CLP 2008 :**

N/A

Health Hazards:

**Annex I of Directive 67/548/EEC:**

Xi; R37/38, R43

**EU CLP 2008 :**

Skin Irrit. 2

Skin Sens. 1

STOT Single Exp. 3

Environmental Hazards :

**Annex I of Directive 67/548/EEC:**

N/A

**EU CLP 2008 :**

N/A



**Labelling**

**Signal word :** Warning

**Hazard statement:**

H315: Causes skin irritation.

H335: May cause respiratory irritation.

H317: May cause an allergic skin reaction.

**Additional precautionary statements:**

P264 Wash thoroughly after handling.

P280 Wear protective gloves/protective clothing/eye protection/face protection.

P261 Avoid breathing dust/fume/gas/mist/vapours/spray.

P272 Contaminated work clothing should not be allowed out of the workplace.

P271 Use only outdoors or in a well-ventilated area.

P302+P352 IF ON SKIN: Wash with plenty of soap and water.

P321 Specific treatment.

P332+P313 If skin irritation occurs get medical advice/attention.

P362 Take off contaminated clothing and wash before reuse.

P333+P313 If skin irritation or a rash occurs get medical advice/attention.

P363 Wash contaminated clothing before reuse.

P304+P340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

P312 Call a POISON CENTER or doctor/physician if you feel unwell.

P403+P233 Store in a well ventilated place. Keep container tightly closed.

P405 Store locked up.

P501 Dispose of contents/container to ...

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**SECTION 3: COMPOSITION / INFORMATION ON INGREDIENTS**

Component	Conc <sup>n</sup> / %	CAS / EC #	Classification
2-ethylhexyl acrylate	>= 99.5	103-11-7/203-080-7	See section.2

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**SECTION 4: FIRST AID MEASURES**

After skin contact:	-Wash skin immediately with large amounts of water. -Wash and dry carefully contaminated clothing and shoes before reuse. -In case of contact with chemicals, get immediate medical advice/attention.
After eye contact:	-Wash eyes immediately with large amounts of water. -Remove contact lenses if present and easy to do. -Get immediate medical advice/attention if irritating, pain, swelling, tear, dazzling eyes occur.
After ingestion:	-If swallowed, immediately call a POISON CENTER or doctor/physician. -Do NOT induce vomiting.
After inhalation:	-Move victims immediately to place with fresh air and not contaminated area. -If not breathing, give artificial respiration and have a trained individual administer oxygen. -Get medical attention immediately if inhaled.
Acute and delayed symptoms/effects:	-Inhalation: short-term exposure: May cause irritation of respiratory and pulmonary organs. -Skin contact: short-term exposure: May cause severe skin irritation. -Eye contact: short-term exposure: May cause slightly eye irritation.
Indication of immediate medical attention and notes for physician:	-Move victim to fresh air. -Call 911 or emergency medical service. -Give artificial respiration if victim is not breathing. -Administer oxygen if breathing is difficult. -Remove and isolate contaminated clothing and shoes. -In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes. -Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

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**SECTION 5: FIREFIGHTING MEASURES**

## Extinguishing media:

- o suitable extinguishing media:
  - Small fire: Dry chemical, CO<sub>2</sub>, water spray or regular foam.
  - Large fire: Water spray, fog or regular foam.
- o unsuitable extinguishing media: Do not use straight streams
- o In case of major fire and large quantities:
  - Dike fire-control water for later disposal.
  - Move containers from fire area if you can do it without risk.
- o tank/trailer/train truck fire:
  - Cool containers with flooding quantities of water until well after fire is out.
  - Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
  - ALWAYS stay away from tanks engulfed in fire.
  - If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

## Specific hazards arising from the chemical

- o Thermal decomposition products : irritating, corrosive and/or toxic gases, Carbon oxides
  - o Fires and an explosion
    - Some may burn but none ignite readily.
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- Some may be transported hot.
  - Containers may explode when heated.

Special protective equipment and precautions for fire-fighters

- Wear positive pressure self-contained breathing apparatus (SCBA).
  - Structural firefighters' protective clothing will only provide limited protection.
  - Runoff from fire control may cause pollution.
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## **SECTION 6: ACCIDENTAL RELEASE MEASURES**

Personal precautions, protective equipment and emergency procedures

- CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
- As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.
- Keep unauthorized personnel away.
- Stay upwind.
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

Environmental precautions and protective procedures

- Provide local exhaust ventilation system.
- Make an embankment for further processing.
- Prevent entry into waterways, sewers, basements or confined areas.

The methods of purification and removal

- o Small spill
    - With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.
    - Take up with sand or other non-combustible absorbent material and place into containers for later disposal.
  - o Large spill
    - Dike far ahead of liquid spill for later disposal.
    - Cover powder spill with plastic sheet or tarp to minimize spreading.
    - Prevent entry into waterways, sewers, basements or confined areas.
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## **SECTION 7: HANDLING AND STORAGE**

Handling:

- Wash contaminated clothing and Contaminated work clothing should not be allowed out of the workplace.
- Do not breathe gas/fumes/vapours/spray.
- Wash thoroughly after handling.
- Use certificated protective equipment.
- DO NOT eat, drink or smoke in product area.
- Avoid contact with skin, eyes and cloths.

Storage:

- Store locked up.
  - Keep in well-ventilated place.
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## **SECTION 8: EXPOSURE CONTROL / PERSONAL PROTECTION**

**Exposure limits / standards:**

- o Regulation in Korea: Not available
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- US (NIOSH/OSHA AGGIH):
  - NIOSH- Not available
  - ACGIH- Not available
- Biological Exposure Index: Not available

**Occupational exposure controls:**

- **DNEL and PNEC**
  - **DNEL : 37.5 mg/m<sup>3</sup>, PNEC : 0.00272 mg/L (freshwater)**

**Engineering Controls:**

- Provide local exhaust ventilation system or other engineering controls to keep the airborne concentrations of vapours below their respective threshold limit value.
- Check legal suitability of exposure level.

**Personal Protection:**

Respiratory protection

- Respiratory protection: Wear NIOSH/MESA approved full or half face piece (with goggles) respiratory protective equipment.

Eye protection

- Wear facepiece with goggles to protect from scattering dust or toxic liquid.
- Further eye protection such as chemical goggles and/or protecting glasses must be worn when the possibility exists for eye contact due to splashing or spraying liquid or airborne particle.

Hand protection

- Wear appropriate chemical-resistant gloves that protect chemicals directly.

Body protection

- Wear appropriate protective chemical-resistant clothing.

Specific Hygiene Measures

- Not required

**Environmental exposure controls:**

Not required

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**SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES**

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Appearance:	Liquid, colourless
Odour:	Not available
Odour threshold	Not applicable
pH:	Not available
Molecular weight	184.2753
Freezing point:	Not available
Melting point:	-90 °C
Boiling point / range:	215 °C at 1013 hPa
Autoignition temperature	252 °C

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**SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES**

Flash point	86 °C
Flammability:	Combustible liquid. The substance has no pyrophoric properties and does not liberate flammable gases on contact with water.
Explosive properties:	non explosive
Oxidising properties:	no oxidising properties
Vapour pressure:	0.24 hPa 25 °C
Relative density:	0.88 at 20 °C
Solubility:	Not available
Water solubility:	9.6 mg/L at 25 °C
Log partition coefficient (n-octanol/water):	ca. 4 at 25 °C
Viscosity:	1.75 mPa s at 20 °C
Vapour density:	Not available
Evaporation rate (n-butyl acetate = 1):	Not available
Other information:	None
Surface tension:	The surface tension of 2-ethylhexyl Acrylate (90% saturation) was measured at 68,2 mN/m at 20°C.
Granulometry:	not applicable
Stability in organic solvents and identity of relevant degradation products:	not applicable
Dissociation constant:	not applicable

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**SECTION 10: STABILITY AND REACTIVITY**

## Chemical stability

-Avoid contact with heat and light. And Do monitor the contents of the inhibitor.

## Possibility of hazardous reactions

-It may polymerize by heat, light, peroxide.

## Conditions to avoid

- Containers may explode when heated.
- Avoid heat, sparks, open flames, or other sources of ignition.
- Put away from water supply and sewage.

## Incompatible materials

-acid, base, oxidants, peroxides

## Hazardous decomposition product

-Thermal decomposition product : irritating, corrosive and/or toxic gases, Carbon oxides

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**SECTION 11: TOXICOLOGICAL INFORMATION**

	<b>Conclusion / Remarks</b>
<b>(a) acute toxicity;</b>	
By oral route	LD50 = ca. 4435 mg/kg bw (male/female) (rat) (OECD Guideline 401) no classification required
By inhalation	LC50 (8 h) > 1.19 mg/L air (nominal) (male/female) (rat) (OECD Guideline 403)
By dermal route	LD50 = ca. 7522 mg/kg bw (rabbit)

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	no classification required
<b>(b) skin corrosion/irritation;</b>	Test was conducted with 20-hour exposure under occlusion and direct comparison of 4 acrylates. Moderate-severe erythema and slight edema were observed with mean scores over 24 -48 -72 h of 2.2 for erythema and 0.8 for edema. At the end of the observation time (8 d) desquamation was again reported. (OECD Guideline 404).
<b>(c) serious eye damage/irritation;</b>	In test (BASF test) on rabbit eye irritation, eye irritation was not observed. (OECD guideline 405)
<b>(d) respiratory or skin sensitization;</b>	In the skin sensitization tests with mouse, the application of the test substance at concentrations of 0.5, 1, 2.5, 5 and 10 % w/v in acetone: olive oil (4:1) resulted in an increase in isotope incorporation which was greater than 3-fold at the 10 % w/v concentration. Consequently, the test substance was shown to be a potential skin sensitiser.
<b>(e) germ cell mutagenicity;</b>	2-EHA was negative in bacterial mutation tests. Data from mammalian cells give no relevant evidence for clastogenicity; however, a fully reliable study is lacking. 2-EHA seems to have a low potential for induction of gene mutations in mammalian cells. Since this effect is limited to doses with strong cytotoxicity, it is highly unlikely that this potential will be expressed <i>in vivo</i> . The data from mammalian cell indicator tests did not add relevant information. In a study conducted in compliance with GLP and OECD TG 486, 2-ethylhexyl acrylate was negative in the <i>in vivo</i> UDS assay using rat hepatocytes. This <i>in vivo</i> test provides a method for investigating genotoxic effects of chemicals in the liver. The end-point measured is indicative of DNA damage and subsequent repair in liver cells. The liver is usually the major site of metabolism of absorbed compounds. It is thus an appropriate site to measure DNA damage <i>in vivo</i> . The lack of specific information on mutagenic activity provided by the UDS test is compensated for by the potential sensitivity of this endpoint because it is measured in the whole genome. Thus, taking the negative test result <i>in vivo</i> for 2-EHA into consideration, it can be assumed that 2-EHA will not cause any DNA damage, i. e. genotoxicity <i>in vivo</i> .
<b>(f) carcinogenicity;</b>	There are no data available to the carcinogenic effects with respect to oral or inhalative exposure routes.
<b>(g) reproductive toxicity;</b>	In reproductive toxicity the no-observed-adverse-effect concentration (NOAEC) for parental systemic toxicity was determined to be 5 ppm (= ca. 0.018 mg/L) and was based on histologic changes in the nasal tissues seen at higher concentrations. The NOAEC for developmental toxicity was 25 ppm (= ca. 0.089 mg/L), based on decreases in pup body weight at 75 ppm which were secondary to parental toxicity. The NOAEC for reproductive toxicity was 75 ppm (= ca. 0.268 mg/L), the highest concentration tested. In Developmental toxicity, no embryotoxic, teratogenic or fetotoxic properties of 2-EHA had been revealed from this study for concentrations of up to and including 100 ppm. Due to technical limitations exposure to higher concentrations could not be tested. Based on slightly reduced food intake and lower maternal weight gain at the higher exposure level a NOAEC for maternal toxicity of 75 ppm (approximately 0.56 mg/L) was derived from this study. No embryo-/fetotoxic effects were revealed even at the highest tested concentration at which some signs of maternal toxicity had been observed. Therefore, a NOAEC

	for developmental toxicity of 100 ppm (approximately 0.75 mg/L) was derived from this study.
<b>(h) STOT-single exposure;</b>	Nasal and ocular irritation noted in a test on acute inhalation toxicity with rats, severe local irritation potential detected on the skin and slight irritation potential detected on the conjunctivae of rabbits; serious lesions as seen after repeated inhalation of 2-EHA may well be initiated i. a. by primary respiratory irritation.
<b>(i) STOT-repeated exposure;</b>	In a valid 90-day inhalation study (BASF, 1989) Wistar rats were administered in a whole-body exposition on 6 hours per day, 5 days per week, to 2-EHA vapour at concentrations of 0 ppm, 10 ppm, 30 ppm or 100 ppm (approximately 0.075 mg/l, 0.226 mg/l or 0.753 mg/l for the treatment groups) (2-EHA purity 99.7 %). Repeated exposure to 10 ppm was tolerated without signs by male and female Wistar rats. At 30 ppm and 100 ppm the clinical signs (eyelid closure, lethargy) were not very pronounced and possibly point to the irritant effect of the 2-EHA vapors. The only effect of the test substance found on gross pathological assessment of the male animals in the 100 ppm group was a dark coloration of the liver parenchyma associated with indistinct lobular marking. The inhalation of 2-EHA in rats was associated with degeneration of the olfactory mucosa in the dorsal and dorsolateral areas of the anterior parts of the nasal cavity. Slight to moderate hepatic fatty change in males and minimal to slight hepatic fatty change in females was a common finding in rats of all dose groups.
<b>(j) aspiration hazard.</b>	Not relevant.

## SECTION 12: ECOLOGICAL INFORMATION

	<b>Conclusion / Remarks</b>
<b>12.1 Toxicity</b>	
<b>Acute toxicity</b>	Fish: 96hr-LC50= 1.81 mg/L ( <i>Oncorhynchus mykiss</i> ) (OECD TG 203)
	Invertebrates: 48hr-EC=1.3 mg/L ( <i>Daphnia magna</i> ) (OECD TG 202)
	Algae: 72hr-EC50= 1.71 mg/L ( <i>Desmodesmus subspicatus</i> ) (OECD TG 201)
<b>Chronic toxicity</b>	Invertebrates: 48d-NOEC (reproduction) = 0.136 mg/L ( <i>Daphnia magna</i> ) (OECD TG 211)
	Algae:72hr-NOEC= 0.45 mg/l( <i>Scenedesmus subspicatus</i> )
<b>12.2 Persistence and degradability</b>	Readily biodegradable Based on a log Kow 4 2-EHA is not expected to persistence.
<b>12.3 Bioaccumulative potential</b>	Based on an experimental log Pow 4 and subsequently calculated BCF 270~282.4, a potential for bioaccumulation has not to be expected.

<b>12.4 Mobility in soil</b>	Based on a Koc 429, 2-EHA is placed into a low to very low mobility.
<b>12.5 Results of PBT and vPvB assessment</b>	Regarding all available data on biotic and abiotic degradation, bioaccumulation and toxicity it can be stated that the substance does not fulfill the PBT criteria (not PBT) and not the vPvB criteria (not vPvB).
<b>12.6 Other adverse effects</b>	None identified

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#### SECTION 13: DISPOSAL CONSIDERATIONS

##### Disposal method

-Waste must be disposed of in accordance with federal, state and local environmental control regulations.

##### Disposal precaution

-Consider the require attentions in accordance with waste treatment management regulation.

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#### SECTION 14: TRANSPORT INFORMATION

UN #: 3082  
 Class: class 9  
 Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S  
 Packing group: III  
 Marine pollutant Not applicable  
 Other information:

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#### SECTION 15: REGULATORY INFORMATION

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**Chemical Safety Assessment has been performed for 2-ethylhexyl acrylate.**

#### **Dangerous as defined by the EU CLP 2008:**

- for physical-chemical properties  
 Skin Irrit. 2, Skin Sens. 1, STOT Single Exp. 3



#### **Labelling**

**Signal word** : Warning

#### **Hazard statement:**

H315: Causes skin irritation.  
 H335: May cause respiratory irritation.  
 H317: May cause an allergic skin reaction.

#### **Additional precautionary statements:**

P264 Wash thoroughly after handling.  
 P280 Wear protective gloves/protective clothing/eye protection/face protection.  
 P261 Avoid breathing dust/fume/gas/mist/vapours/spray.

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P272 Contaminated work clothing should not be allowed out of the workplace.  
P271 Use only outdoors or in a well-ventilated area.  
P302+P352 IF ON SKIN: Wash with plenty of soap and water.  
P321 Specific treatment.  
P332+P313 If skin irritation occurs get medical advice/attention.  
P362 Take off contaminated clothing and wash before reuse.  
P333+P313 If skin irritation or a rash occurs get medical advice/attention.  
P363 Wash contaminated clothing before reuse.  
P304+P340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.  
P312 Call a POISON CENTER or doctor/physician if you feel unwell.  
P403+P233 Store in a well ventilated place. Keep container tightly closed.  
P405 Store locked up.  
P501 Dispose of contents/container to ...

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## **SECTION 16: OTHER INFORMATION**

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Product safety data sheet for 2-ethylhexyl acrylate prepared in accordance with Annex II of the REACH Regulation EG 1907/2006, Regulation (EG) 1272/2008.

Version: 1.0/EN  
Revision date: 18 November 2010

This safety data sheet (SDS) is based on the legal provisions of the REACH Regulation (EC 1907/2006; article 31 and Annex II), as amended. Its contents are intended as a guide to the appropriate precautionary handling of the material. It is the responsibility of recipients of this SDS to ensure that the information contained therein is properly read and understood by all people who may use, handle, dispose or in any way come in contact with the product. Information and instructions provided in this SDS are based on the current state of scientific and technical knowledge at the date of issue indicated. It should not be construed as any guarantee of technical performance, suitability for particular applications, and does not establish a legally valid contractual relationship. This version of the SDS supersedes all previous versions.

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## **ANNEX TO THE SDS**

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# **EXPOSURE ASSESSMENT**

### **Introduction and uses**

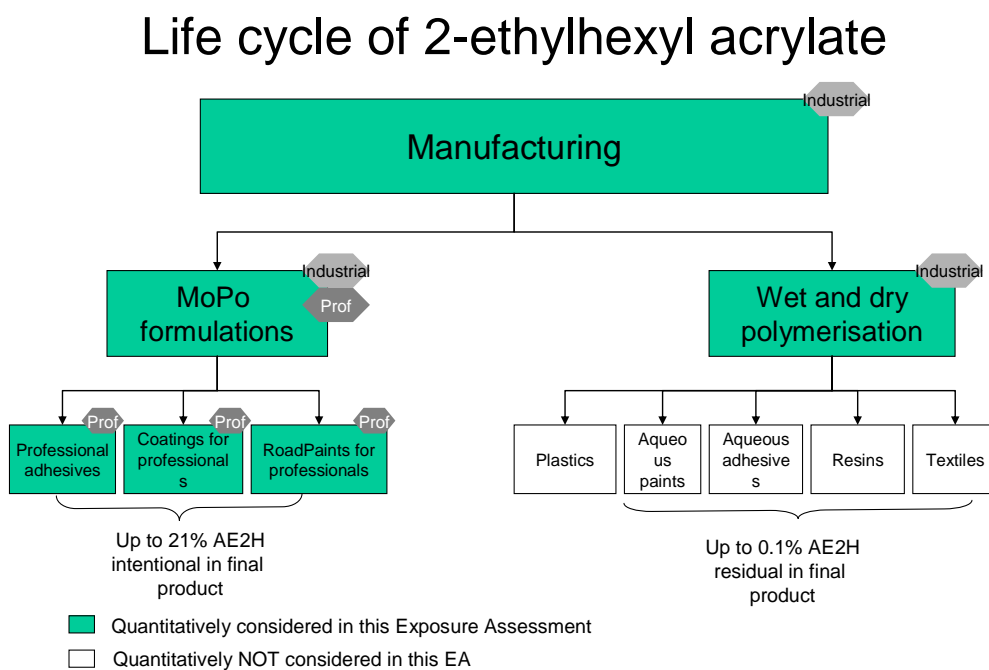
2-Ethylhexyl acrylate is produced from alcohol and acrylic acid by catalytic dehydration in a continuous closed process. Aqueous waste generated from production is treated in waste water treatment plants. According to the market analysis published by Tecnon OrbiChem, November 2009 QIV, in 2009, the total European annual production volume was estimated at 145,000 tonnes involving 3 production companies.

Its major use is as monomer in the chemical industry for the production of polymers and copolymers, which are mainly processed further to aqueous polymer dispersions. The polymers and

polymer dispersions are used in adhesives and as binders for paints. Other applications of these polymers include coatings raw materials and uses in the plastics and textiles industries. For all these applications, levels of 2-ethylhexyl acrylate in the polymers and polymer dispersions are residual and below 0,1% ; according to art.14 of regulation 1907/2006 REACH, a quantitative chemical safety assessment need not to be performed. The European Risk Assessment Report in 2005 concluded that no risk was expected from these final applications.

In addition, 2-ethylhexyl acrylate is used as a monomer in so called MonomerPolymer (MoPo) formulations used as construction-industry chemicals (eg floor coatings, road marking substances) and coatings in concentrations up to 21%.

**Life cycle of 2-ethylhexyl acrylate :**



As a result, the following uses have been considered in this CSR:

- IU1 : Polymerisation and formulation
- IU2 : Use of formulated monomeric 2-EHA up to 21% in paints and adhesives
- IU3 : use as laboratory reagent

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## General remarks

### Human health – Worker and consumer

2-Ethylhexyl acrylate is a chemical monomer manufactured, formulated and polymerised within industrial settings. When formulated in coatings, road paints and professional adhesives, it is used by professionals. There are no uses involving consumer exposure.

The primary routes of industrial and professional exposure to 2-ethylhexyl acrylate are skin contact and inhalation; ingestion is not an anticipated route of exposure.

In addition to a long term inhalation DNEL set at 37.5 mg/m<sup>3</sup> (see chapter 5.11.2), an induction-specific DNEL was derived for skin sensitization.

As 2-ethylhexyl acrylate may cause sensitisation by skin contact, gloves are recommended for all Exposure Scenarios. For the purpose of the dermal exposure assessment, the following effectiveness values are assumed:

- Use of suitable gloves: 80%;
- Use of suitable gloves in combination with basic employee training: 90%;
- Use of suitable gloves in combination with specific activity training: 95%;
- Use of suitable gloves in combination with intensive management supervision controls: 98%

Worker exposure in industrial and professional settings was assessed with the ECETOC TRA modelling tool. Description of ECETOC TRA details can be found in the Technical Report 93 (2004) or at <https://www.ecetoc-tra.org/>. (version used: ECETOC TRA 2.0)

### Environment

Releases of 2-ethylhexyl acrylate into the environment are to be expected during production and processing (polymerization, formulation) mainly via wastewater and lesser amounts via exhaust gases.

As reported in the EU Risk Assessment, the assessment of environmental exposure was carried out by means of EUSES v2.1. Documentation concerning EUSES 2.1 can be found at <http://ecb.jrc.ec.europa.eu/euses/> .

For the purpose of modelling, a total European annual production volume of 145 ktonnes was considered, involving 3 production sites, one production site producing 65% of the total volume, the second 30% and the third 5% (source Tecnon OrbiChem, November 2009 QIV,). These sites are also involved in processing of 2-EHA. Polymerisation includes wet processes and dry processes ; for the purpose of modelling wet polymerisation was considered only, hence representing a worst case.

In order to refine the parameterization of EUSES to better reflect operations in the production and polymerisation facilities, water emission samples were analyzed in February, 2010, and April, 2010, for a total of at least six samples per site taken on different work days. Values in the following table represent averages of the influent

to and effluent from the wastewater treatment plant at each site.

<b>ETHYLHEXYL ACRYLATE</b>		
	<b>Influent (in ug/l)</b>	<b>Effluent (in ug/l)</b>
Manufacture and Distribution of Substance	<b>19</b>	<b>&lt;1</b>
Polymerization at Production Site	<b>&lt; 10</b>	<b>&lt;1</b>
Polymerization at Downstream User Sites		
Manufacture of Intermediates at Production and Downstream User Sites		
Use as Laboratory Reagent	<b>38</b>	<b>&lt;1</b>
Use of Preparations Containing Up to 21% Monomer		
Other Uses of Substance as Intermediate		

The three sites represent major producers and downstream users in Europe (relevant for Exposure Scenario 1 and 2). Based on these results available at each European production site, the plant effluent concentration was set at 10 µg/L in exposure scenarios 1 and 2 (as a worst case scenario).

As reported in the European Risk Assessment Report 2005, a second “external” processing site performing wet polymerisation of 2-EHA with a volume of 20700 tonnes was considered to represent a realistic worst case (see table below).



Formulation of aqueous polymer dispersions and processing/use of water based adhesives and paints containing less than 0,1% residual monomeric 2-EHA are not considered quantitatively in this environmental assessment according to art.14 of regulation 1907/2006 REACH. The European Risk Assessment Report in 2005 concluded that no environmental risk was expected from these final applications.

As reported in the European Risk Assessment Report 2005, use of formulation of aqueous polymer dispersions based adhesives and paints containing up to 21% monomeric 2-EHA was considered with an increased volume.

#### Volumes considered for environmental risk assessment in the EU RAR and in this CSR

	<b>EU Risk Assessment</b> (in tonnes)	<b>CSR 2010</b> (in tonnes)
<b>Production</b>	70 000	145 000 <sup>(a)</sup>
<b>Internal polymerisation</b>	32 000	66 300 <sup>(b)</sup>
<b>Use in polymerisation on downstream user sites</b>	10 000	20 700 <sup>(b)</sup>
<b>Use of adhesives and paints containing up to 21% 2-EHA</b>	35,7	74 <sup>(b)</sup>

(a): source Tecnon OrbiChem, November 2009 QIV

(b): volume considered in the EU RAR increased to account for the increase of production. This is a working hypothesis for the purpose of this risk assessment as no public data could be identified on real use volumes.

The following information has been used for the exposure assessments:

<b>Substance</b>	2-Ethylhexyl acrylate
<b>CAS no</b>	103-11-7
<b>Substance Volatility (hPa at 25 ° C)</b>	0.24
<b>TRA Volatility Range</b>	Low
<b>Biodegradability</b>	Readily

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	biodegradable
<b>Molecular Weight (g/mol)</b>	184.27
<b>Melting Point (° C)</b>	-90
<b>Boiling Point (° C)</b>	215
<b>Solubility (g/l at 20 ° C)</b>	9.6E-03
<b>Kow</b>	4
<b>Chemical class for Koc-QSAR</b>	Esters
<b>Koc L/kg</b>	429

## Short description of all exposure scenarios

The following Exposure Scenarios were identified and are listed in Table 1.1.

**Table 1.1. Short description of all exposure scenarios with their use descriptors and life cycle stage**

Number (ES)	Short description of exposure scenario	Product Category (PC)	Life cycle stage covered by ES						Sector of use (SU)	Process category (PROC)	Article Category (AC)	Environmental release category (ERC)
			Manufacture	Formulation	End use			Service Life				
					Industrial	Professional	Consumer					
ES1	<i>Manufacture and distribution</i>	19	X	X	X		-	-	8, 9	1, 2, 3, 8a, 8b, 9	-	ERC1
ES2	<i>Polymerisation and formulation at production sites facilities</i>	19, 32		X	X				8, 9, 12	1, 2, 3, 4, 5, 8a, 8b, 9		ERC6c, ERCd
ES3	<i>Polymerisation and formulation at downstream user sites</i>	19, 32	-	X	X	-	-	-	8, 9, 12	1, 2, 3, 4, 5, 8a, 8b, 9	-	ERC6c, ERC6d
ES4	<i>Use of formulated monomeric 2-EHA up to 21% in paints and adhesives</i>	1, 9a, 32	-	-	X	X	-	-	10, 12, 19	5, 7, 9, 10, 11, 19	-	ERC6c, ERC6d, ERC8c, ERC8f
ES5	<i>Use as laboratory reagent</i>	19, 21	-	-	-	-	-	-	8, 9, 24	15	-	Included in ERC1

Based on the physico-chemical properties of the substance and the overall release into the environment described in the exposure scenarios, regional PECs for the various environmental compartments were calculated by means of EUSES v2.1.

**Regional PECs:**

**Table 1.2. PECs Regional**

Compartment	PEC	Unit
Surface water	1.23E-04	mg L-1
Seawater	8.6E-06	mg L-1
Air	8.43E-06	mg m-3
Agricultural soil	1.62E-04	mg kgwwt-1

Pore water of agricultural soil	2.1E-05	mg L-1
Natural soil	5.32E-07	mg kgwwt-1
Industrial soil	1.9E-03	mg kgwwt-1
Sediment	1.22E-03	mg kgwwt-1
Seawater sediment	7.24E-05	mg kgwwt-1

Total daily intake (regional) for humans was estimated to be 1.18E-04 mg/kg bw/d.

## 1.1. Exposure Scenario 1 : Manufacture and distribution of the substance

Table 1.3. Description of ES1

1.1.1. Exposure Scenario 1	
1.1.1.1 Title : Manufacture and distribution of the substance	
<b>Reference number</b>	1
<b>Free short title</b>	Manufacture and distribution of the substance
<b>Systematic title based on use descriptor</b>	SU 8 and 9; PROC 1, 2, 3, 8a, 8b, 9 ; PC 19 ; ERC1
<b>Processes, tasks, activities covered</b>	<p>PROC1: Use in closed process, no likelihood of exposure; Industrial setting.</p> <p>PROC2: Use in closed, continuous process with occasional controlled exposure (e.g. sampling); Industrial setting.</p> <p>PROC3: Use in closed batch process (synthesis or formulation); Industrial setting.</p> <p>PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities</p> <p>PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities</p> <p>PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)</p>

<b>Environment characteristic covered</b>	ERC1: Production of a chemical substance	
<b>1.1.1.2. Operational conditions and risk management measures</b>		
Industrial dedicated processes Manufacture of the substance is limited to 3 production sites in Europe.		
<b>1.1.1.2.1 Control of workers exposure for PROC 1</b>		
<b>Title information related to contributing scenario</b>		
<b>Workers related free short title</b>	Use in closed process, no likelihood of exposure.	
<b>Use descriptor covered</b>	PROC 1	
<b>Processes, tasks, activities covered</b>	Use of the substance in high integrity contained system where little potential exists for exposures, e.g. any sampling via closed loop systems.	
<b>Assessment Method</b>	ECETOC TRA 2.0	
<b>Product characteristic</b>		
Physical state	liquid	
Concentration of substance	100%	
<b>Amounts used</b>		
This information is not needed for assessment of worker's exposure.		
<b>Other given operational conditions affecting workers exposure</b>		
Location	Inside	<i>Outdoor location is covered by this worst case inside location.</i>
Domain	Industrial	
<b>Frequency and duration of use/exposure</b>		
Duration of exposure	> 4 hours/day	<i>Lower durations of exposure are covered by this worst case duration</i>
Frequency of exposure	≤ 240 days/year	
<b>Human factors not influenced by risk management</b>		
Exposed skin surface	Palm of one hand (240 cm <sup>2</sup> )	
<b>Technical conditions and measures to control dispersion from source towards the worker</b>		
Not applicable – closed system		
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>		
Training of operators, supervision, risk management systems		
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>		

Gloves (90% effectiveness)	yes <sup>1</sup>
<b>1.1.1.2.2 Control of workers exposure for PROC 2</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	Use in closed, continuous process with occasional controlled exposure (e.g. sampling).
<b>Use descriptor covered</b>	PROC 2
<b>Processes, tasks, activities covered</b>	Continuous process but where the design philosophy is not specifically aimed at minimizing emissions. It is not high integrity and occasional exposure will arise e.g. through maintenance, sampling and equipment brakings.
<b>Assessment Method</b>	ECETOC TRA 2.0
<b>Product characteristic</b>	
Physical state	liquid
Concentration of substance	100%
<b>Amounts used</b>	
This information is not needed for assessment of worker's exposure.	
<b>Other given operational conditions affecting workers exposure</b>	
Location	Indoor <i>Outside locations are covered by this worst case Indoor location.</i>
Domain	Industrial
<b>Frequency and duration of use/exposure</b>	
Duration of exposure	> 4 hours/day <i>Lower duration of exposure are covered by this worst case duration</i>
Frequency of exposure	≤ 240 days/year
<b>Human factors not influenced by risk management</b>	
Exposed skin surface	Palm of both hands (480 cm <sup>2</sup> )
<b>Technical conditions and measures to control dispersion from source towards the worker</b>	
Local exhaust ventilation	No
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>	
Training of operators, supervision, risk management systems	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Gloves (90% effectiveness)	yes

<sup>1</sup> The following effectiveness values are assumed: Use of suitable gloves: 80%; Use of suitable gloves in combination with basic employee training: 90%; Use of suitable gloves in combination with specific activity training: 95%; Use of suitable gloves in combination with intensive management supervision controls: 98%

1.1.1.2.3 Control of workers exposure for PROC 3		
<b>Title information related to contributing scenario</b>		
<b>Workers related free short title</b>	Use in closed batch process (synthesis or formulation); Industrial setting.	
<b>Use descriptor covered</b>	PROC 3	
<b>Processes, tasks, activities covered</b>	Batch manufacture of a chemical or formulation where the predominant handling is in a contained manner, but where some opportunity for contact with chemicals occurs (e.g. through sampling).	
<b>Assessment Method</b>	ECETOC TRA 2.0	
<b>Product characteristic</b>		
Physical state	liquid	
Concentration of substance	100%	
<b>Amounts used</b>		
This information is not needed for assessment of worker's exposure.		
<b>Other given operational conditions affecting workers exposure</b>		
Location	Inside	<i>Outdoor locations are covered by this worst case inside location.</i>
Domain	Industrial	
<b>Frequency and duration of use/exposure</b>		
Duration of exposure	> 4 hours/day	<i>Lower durations of exposure are covered by this worst case duration</i>
Frequency of exposure	≤ 240 days/year	
<b>Human factors not influenced by risk management</b>		
Exposed skin surface	Palm of one hand (240 cm <sup>2</sup> )	
<b>Technical conditions and measures to control dispersion from source towards the worker</b>		
Local exhaust ventilation	No	
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>		
Training of operators, supervision, risk management systems		
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>		
Gloves (90% effectiveness)	yes	
1.1.1.2.4 Control of workers exposure for PROC 8a		
<b>Title information related to contributing scenario</b>		
<b>Workers related free short title</b>	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities	

<b>Use descriptor covered</b>	PROC 8a			
<b>Processes, tasks, activities covered</b>	Sampling, loading, filling, transfer, dumping, bagging in non dedicated facilities. Exposure related to dust, vapour, aerosols or spillage and cleaning of equipment to be expected			
<b>Assessment Method</b>	ECETOC TRA 2.0			
<b>Product characteristic</b>				
Physical state	liquid			
Concentration of substance	100%			
<b>Amounts used</b>				
This information is not needed for assessment of worker's exposure.				
<b>Human factors not influenced by risk management</b>				
Exposed skin surface	Palm of both hands (480 cm <sup>2</sup> )			
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>				
Training of operators, supervision, risk management systems				
<b>Operational conditions affecting workers exposure</b>				
Domain	Industrial			
Scenarios	A	B	C	D
Location	Outdoor	Indoor	Indoor	Indoor
<b>Frequency and duration of use/exposure</b>				
Duration of exposure (hours/day)	< 4	> 4	> 4	< 1
Frequency of exposure	≤ 240 days/year			
<b>Technical conditions and measures to control dispersion from source towards the worker</b>				
Local exhaust ventilation	n.a.	No	Yes	No
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>				
Suitable respiratory protection (90% effectiveness)	No	Yes	No	No
Gloves (90% effectiveness)	Yes			
<b>1.1.1.2.5 Control of workers exposure for PROC 8b</b>				
<b>Title information related to contributing scenario</b>				
<b>Workers related free short title</b>	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities			
<b>Use descriptor covered</b>	PROC 8b			
<b>Processes, tasks, activities covered</b>	Sampling, loading, filling, transfer, dumping, bagging in dedicated facilities. Exposure related to dust, vapour,			



	aerosols or spillage and cleaning of equipment to be expected			
<b>Assessment Method</b>	ECETOC TRA 2.0			
<b>Product characteristic</b>				
Physical state	Liquid			
Concentration of substance	100%			
<b>Amounts used</b>				
This information is not needed for assessment of worker's exposure.				
<b>Human factors not influenced by risk management</b>				
Exposed skin surface	Palm of both hands (480 cm <sup>2</sup> )			
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>				
Training of operators, supervision, risk management systems				
<b>Operational conditions affecting workers exposure</b>				
Domain	Industrial			
Scenarios	A	B	C	D
Location	Outdoor	Indoor	Indoor	Indoor
<b>Frequency and duration of use/exposure</b>				
Duration of exposure (hours/day)	> 4	> 4	> 4	< 4
Frequency of exposure	≤ 240 days/year			
<b>Technical conditions and measures to control dispersion from source towards the worker</b>				
Local exhaust ventilation	n.a.	No	Yes	No
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>				
Suitable respiratory protection (90% effectiveness)	No	Yes	No	No
Gloves (90% effectiveness)	Yes			
<b>1.1.1.2.6 Control of workers exposure for PROC 9</b>				
<b>Title information related to contributing scenario</b>				
<b>Workers related free short title</b>	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)			
<b>Use descriptor covered</b>	PROC 9			
<b>Processes, tasks, activities covered</b>	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)			
<b>Assessment Method</b>	ECETOC TRA 2.0			
<b>Product characteristic</b>				

Physical state	Liquid		
Concentration of substance	100%		
<b>Amounts used</b>			
This information is not needed for assessment of worker's exposure.			
<b>Other given operational conditions affecting workers exposure</b>			
Location	Indoor	<i>Outdoor locations are covered by this worst case indoor location.</i>	
Domain	Industrial		
<b>Human factors not influenced by risk management</b>			
Exposed skin surface	Palm of two hands (480 cm <sup>2</sup> )		
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>			
Training of operators, supervision, risk management systems			
<b>Frequency and duration of use/exposure</b>			
Frequency of exposure	≤ 240 days/year		
Duration of exposure	> 4 hours/day		
<b>Technical conditions and measures to control dispersion from source towards the worker</b>			
Local exhaust ventilation	No		
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>			
Gloves	Yes		
<b>1.1.1.2.7 Control of environmental exposure for ERC1</b>			
<b>Free short title</b>	Production 2-EHA at production sites		
<b>Use descriptor covered</b>	ERC 1		
<b>Description</b>	Production of organic and inorganic substances in chemical, petrochemical, primary metals and minerals industry including intermediates, monomers using continuous processes or batch processes applying dedicated or multi-purpose equipment, either technically controlled or operated by manual interventions.		
<b>Assessment Method</b>	EUSES v2.1		
<b>Product characteristics</b>			
Physical state	Liquid		
Concentration of substance	100%		
<b>Amounts used</b>			
	Site X	Site Y	Site Z
<b>Maximum daily use at a site</b>	≤ 314	145	24,2

(tons/day production)			
<b>Maximum annual use at a site</b> (tons/day production)	≤ 94 200	43 500	7 250
<b>Fraction of the main local source</b>	1	1	1
<b>Frequency and duration of use</b>	300 days (no. of emission days/year)		
<b>Pattern of release to the environment</b>	Continuous		
<b>Environment factors not influenced by risk management</b>			
<b>Receiving surface water flow rate</b>	≥ 1.8E+04 m3/d (default)		
<b>Other given operational conditions affecting environmental exposure</b>			
Industry category	3: Chemical industry: chemicals used in synthesis		
Use category	33: Intermediates		
Main category production	Ib: Intermed. stored on-site/continuous prod.		
Main category industrial use	Ib: Continuous production process		
Extra details on use category	Wet process		
Emission tables	Production: A1.2, B1.6; Industrial use: A3.3, B3.2		
Release fraction to air from process (production / industrial use)	1E-05 (default)	0 (default)	
Release fraction to wastewater from process (production / industrial use)	3E-03 (default)	5E-04 (default)	
Release fraction to soil from process (production / industrial use)	1E-05 (default)	1E-04 (default)	
<b>Technical conditions and measures at process level (source) to prevent release</b>			
Not relevant.			
<b>Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil</b>			
Not relevant.			
<b>Organizational measures to prevent/limit release from site</b>			
Not relevant.			
<b>Conditions and measures related to municipal sewage treatment plant</b>			
<b>Municipal Sewage Treatment Plant (STP)</b>	Yes (freshwater and marine assessment)		
<b>Discharge rate of the Municipal STP</b>	≥ 2000 m3/d (default)		
<b>Incineration of the sludge of the Municipal STP</b>	No (default)		

	Site X	Site Y	Site Z
<b>Concentration of chemical in untreated wastewater</b>	550 mg/l (default)	254 mg/l (default)	42.3 mg/l (default)
<b>Concentration of chemical (total) in the STP effluent*</b>	10 µg/L	10 µg/L	10 µg/L
<b>Conditions and measures related to external treatment of waste for disposal</b>			
Not relevant.			
<b>Conditions and measures related to external recovery of waste</b>			
Not relevant.			
* Analytical monitoring of the plant effluent and STP effluent at all 3 production sites of 2-EHA in Europe were performed, revealing no concentrations above the limit of quantification of 1 µg/l. Based on those results, an overestimating value of 0.01 mg.L-1 (10 µg/l) was input into EUSES as the STP effluent concentration for the production sites. This assumption of 10 µg/l is considered conservative since measured values were all below the LOD of 1 µg/l.			

### 1.1.2 Exposure estimation

**Table 1.4. Estimated exposure for workers/PROC 1**

Route of exposure	Concentrations		Justification
	level	units	
Long-term exposure, local, dermal	10.0	µg/cm <sup>2</sup>	ECETOC TRA V.2
Long-term exposure, local, inhalative	0.077	mg/m <sup>3</sup>	ECETOC TRA V.2
Short-term exposure, local, dermal	10.0	µg/cm <sup>2</sup>	ECETOC TRA V.2

**Table 1.5. Estimated exposure for workers/PROC 2**

Route of exposure	Concentrations		Justification
	level	units	
Long-term exposure, local, dermal	20.0	µg/cm <sup>2</sup>	ECETOC TRA V.2
Long-term exposure, local, inhalative	7.679	mg/m <sup>3</sup>	ECETOC TRA V.2

Short-term exposure, local, dermal	20.0	µg/cm <sup>2</sup>	ECETOC TRA V.2
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**Table 1.6. Estimated exposure for workers/PROC 3**

Route of exposure	Concentrations		Justification
	level	units	
Long-term exposure, local, dermal	10.0	µg/cm <sup>2</sup>	ECETOC TRA V.2
Long-term exposure, local, inhalative	23.038	mg/m <sup>3</sup>	ECETOC TRA V.2
Short-term exposure, local, dermal	10.0	µg/cm <sup>2</sup>	ECETOC TRA V.2

**Table 1.7. Estimated exposure for workers/PROC 8a**

Estimated exposure for workers/PROC 8b					
Scenario	A	B	C	D	units
Long-term exposure, local, dermal	100.0	100	100	100	µg/cm <sup>2</sup>
Long-term exposure, local, inhalative	35.25	7.68	7.68	15.36	mg/m <sup>3</sup>
Short-term exposure, local, dermal	100.0	100	100	100	µg/cm <sup>2</sup>

**Table 1.8. Estimated exposure for workers/PROC 8b**

Estimated exposure for workers/PROC 8b					
Scenario	A	B	C	D	units
Long-term exposure, local, dermal	100.0	100	100	100	µg/cm <sup>2</sup>
Long-term exposure, local, inhalative	26.88	3.83	1.15	23.03	mg/m <sup>3</sup>

Short-term exposure, local, dermal	100.0	100	100	100	µg/cm <sup>2</sup>
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**Table 1.9. Estimated exposure for workers/PROC 9**

Estimated exposure for workers/PROC 9			
Route of exposure	Concentrations		Justification
	level	units	
Long-term exposure, local, dermal	60.0	µg/cm <sup>2</sup>	ECETOC TRA V.2
Long-term exposure, local, inhalative	23.038	mg/m <sup>3</sup>	ECETOC TRA V.2
Short-term exposure, local, dermal	60.0	µg/cm <sup>2</sup>	ECETOC TRA V.2

**Table 1.10. Estimated exposure for environment/ERC1**

Site	X	Y	Z	units
Compartment	PEC	PEC	PEC	
STP	1E-02	1E-02	1E-02	mg/L
Freshwater	9.45E-04	9.45E-04	9.45E-04	mg/L
Freshwater sediment	0.0113	0.0113	0.0113	mg/kg wwt
Soil (agricultural)	8.3E-03	4.15E-03	1.22E-04	mg/kg wwt
Marine water	9.07E-05	9.07E-05	9.07E-05	mg/l
Marine water sediment	1.1E-03	1.1E-03	1.1E-03	mg/kg wwt
Total daily intake man via environment	0.0245	0.0117	0.0026	mg/kg bw/d
Air	0.0763	0.0352	0.0058	mg/m <sup>-3</sup>

## 1.2. Exposure Scenario 2 : Polymerisation and formulation at production sites facilities

### 1.2.1 Exposure Scenario

**Table 1.11. Description of ES2**

<b>1.2.1. Exposure Scenario 2</b>	
<b>1.2.1.1 Title : Polymerisation and formulation at production sites facilities</b>	
<b>Reference number</b>	2
<b>Free short title</b>	Polymerisation and formulation at production site facilities
<b>Systematic title based on use descriptor</b>	SU 8, 9, 12 ; PROC 1, 2, 3, 4, 5, 8a, 8b, 9 ; ERC6c, 6d,
<b>Processes, tasks, activities covered</b>	<p>PROC1: Use in closed process, no likelihood of exposure; Industrial setting.</p> <p>PROC2: Use in closed, continuous process with occasional controlled exposure (e.g. sampling); Industrial setting.</p> <p>PROC3: Use in closed batch process (synthesis or formulation); Industrial setting.</p> <p>PROC4: Batch process where significant opportunity for exposure arises</p> <p>PROC5: Mixing or blending in batch process for formulation of preparations containing up to 21% 2-EHA (multistage and/or significant contact)</p> <p>PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities</p> <p>PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities</p> <p>PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)PROC4: Use in batch and other process where opportunity for exposure arises.</p>
<b>Environment characteristic covered</b>	<p>ERC6c: Industrial use of monomers in the production of plastics (thermoplastics), polymerisation processes.</p> <p>ERC6d: Industrial use of chemicals in the production of thermosets and rubbers, polymer processing</p>
<b>1.2.1.2. Operational conditions and risk management measures</b>	
<p>Industrial dedicated processes</p> <p>3 production sites in Europe</p>	
<b>1.2.1.2.1 Control of workers exposure for PROC 1</b>	
<b>Title information related to contributing scenario</b>	

<b>Workers related free short title</b>	Use in closed process, no likelihood of exposure; Industrial setting
<b>Use descriptor covered</b>	PROC 1
<b>Processes, tasks, activities covered</b>	Use of the substance in high integrity contained system where little potential exists for exposure
<b>Assessment Method</b>	ECETOC TRA 2.0

For further information see table 1.3

#### 1.2.1.2.2 Control of workers exposure for PROC 2

##### Title information related to contributing scenario

<b>Workers related free short title</b>	Use in closed, continuous process with occasional controlled exposure (e.g. sampling); Industrial setting.
<b>Use descriptor covered</b>	PROC 2
<b>Processes, tasks, activities covered</b>	Continuous process but where the design philosophy is not specifically aimed at minimising emissions. It is not high integrity and occasional exposure will arise eg. Through maintenance, sampling and equipment breakages
<b>Assessment Method</b>	ECETOC TRA 2.0

For further information see table 1.3

#### 1.2.1.2.3 Control of workers exposure for PROC 3

##### Title information related to contributing scenario

<b>Workers related free short title</b>	Use in closed batch process (synthesis or formulation); Industrial setting
<b>Use descriptor covered</b>	PROC 3
<b>Processes, tasks, activities covered</b>	Batch manufacture of a chemical or formulation where the predominant handling is in a contained manner but where some opportunity for contact with the chemical occurs.
<b>Assessment Method</b>	ECETOC TRA 2.0

For further information see table 1.3

#### 1.2.1.2.4 Control of workers exposure for PROC 4

##### Title information related to contributing scenario

<b>Workers related free short title</b>	Use in batch and other process where opportunity for exposure arises.
<b>Use descriptor covered</b>	PROC 4
<b>Processes, tasks, activities covered</b>	Batch use of a chemical where significant opportunity for exposure arises, e.g. during charging, sampling or discharge of material, and when the nature of the design is likely to



	result in exposure			
<b>Assessment Method</b>	ECETOC TRA 2.0			
<b>Product characteristic</b>				
Physical state	Liquid			
Concentration of substance	100%			
<b>Amounts used</b>				
This information is not needed for assessment of worker's exposure.				
<b>Human factors not influenced by risk management</b>				
Exposed skin surface	Palm of both hands (480 cm <sup>2</sup> )			
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>				
Training of operators, supervision, risk management systems				
<b>Operational conditions affecting workers exposure</b>				
Domain	Industrial			
Scenarios	A	B	C	D
Location	Outdoor	Indoor	Indoor	Indoor
<b>Frequency and duration of use/exposure</b>				
Duration of exposure (hours/day)	> 4	> 4	> 4	< 4
Frequency of exposure	≤ 240 days/year			
<b>Technical conditions and measures to control dispersion from source towards the worker</b>				
Local exhaust ventilation	n.a.	No	Yes	No
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>				
Suitable respiratory protection (90% effectiveness)	No	Yes	No	No
Gloves (90% effectiveness)	Yes			
<b>1.2.1.2.5 Control of workers exposure for PROC 5</b>				
<b>Title information related to contributing scenario</b>				
<b>Workers related free short title</b>	Mixing or blending in batch process for formulation or preparations containing up to 21% 2-EHA (multistage and/or significant contact)			
<b>Use descriptor covered</b>	PROC 5			
<b>Processes, tasks, activities covered</b>	Manufacture or formulation of chemical products or articles using technologies related to mixing and blending of solid or liquid materials, and where the process is in stages and provides opportunity for significant contact at any stage			
<b>Assessment Method</b>	ECETOC TRA 2.0			

<b>Product characteristic</b>	
Physical state	liquid
Concentration of substance	<25%
<b>Amounts used</b>	
This information is not needed for assessment of worker's exposure.	
<b>Human factors not influenced by risk management</b>	
Exposed skin surface	Palm of both hands (480 cm <sup>2</sup> )
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>	
Training of operators, supervision, risk management systems	
<b>Operational conditions affecting workers exposure</b>	
Domain	Industrial
Location	Indoor <i>Outdoor locations are covered by this worst case inside location</i>
<b>Frequency and duration of use/exposure</b>	
Duration of exposure (hours/day)	> 4
Frequency of exposure	≤ 240 days/year
<b>Technical conditions and measures to control dispersion from source towards the worker</b>	
Local exhaust ventilation	n.a.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Gloves (90% effectiveness)	Yes
<b>1.2.1.2.6 Control of workers exposure for PROC 8a</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	Indoor transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities
<b>Use descriptor covered</b>	PROC 8a
<b>Processes, tasks, activities covered</b>	Indoor sampling, loading, filling, transfer, dumping, bagging in non dedicated facilities. Exposure related to dust, vapour, aerosols or spillage and cleaning of equipment to be expected
<b>Assessment Method</b>	ECETOC TRA 2.0
For further information see table 1.3	
<b>1.2.1.2.7 Control of workers exposure for PROC 8b</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	Indoor transfer of substance or preparation

	(charging/discharging) from/to vessels/large containers at dedicated facilities
<b>Use descriptor covered</b>	PROC 8b
<b>Processes, tasks, activities covered</b>	Indoor sampling, loading, filling, transfer, dumping, bagging in dedicated facilities. Exposure related to dust, vapour, aerosols or spillage and cleaning of equipment to be expected
<b>Assessment Method</b>	ECETOC TRA 2.0
For further information see table 1.3	
<b>1.2.1.2.8 Control of workers exposure for PROC 9</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
<b>Use descriptor covered</b>	PROC 9
<b>Processes, tasks, activities covered</b>	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
<b>Assessment Method</b>	ECETOC TRA 2.0
For further information see table 1.3	
<b>1.2.1.2.9 Control of environmental exposure for ERC6c and/or ERC6d</b>	
<b>Free short title</b>	Industrial use of process regulators/monomers for polymerisation
<b>Use descriptor covered</b>	ERC6c, ERC6d
<b>Description</b>	ERC6c: Industrial use of monomers in the production of plastics (thermoplastics), polymerisation processes. ERC6d: Industrial use of chemicals in the production of thermosets and rubbers, polymer processing.
<b>Assessment Method</b>	EUSES v2.1
<b>Product characteristics</b>	
Physical state	liquid
Concentration of substance	100%
<b>Amounts used</b>	
<b>Maximum daily use at a site</b> (tons/day production)	221
<b>Maximum annual use at a site</b> (tons/day production)	66 300
<b>Fraction of the main local source</b>	1

<b>Frequency and duration of use</b>	300 days (no. of emission days/year)	
<b>Pattern of release to the environment</b>	Continuous	
<b>Environment factors not influenced by risk management</b>		
<b>Receiving surface water flow rate</b>	≥ 1.8E+04 m <sup>3</sup> /d (default)	
<b>Other given operational conditions affecting environmental exposure</b>		
Industry category	11: Polymers industry	
Use category	43 : Process regulators	
Main category industrial use	Polymerisation processes	
Extra details on use category	Wet : monomers	
Emission tables	A3.10, B3.9	
Release fraction to air from process (production / industrial use)	1E-03 (default)	
Release fraction to wastewater from process (production / industrial use)	1E-05 (default)	
<b>Technical conditions and measures at process level (source) to prevent release</b>		
Not relevant.		
<b>Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil</b>		
Not relevant.		
<b>Organizational measures to prevent/limit release from site</b>		
Not relevant.		
<b>Conditions and measures related to municipal sewage treatment plant</b>		
<b>Municipal Sewage Treatment Plant (STP)</b>	Yes (freshwater and marine assessment)	
<b>Discharge rate of the Municipal STP</b>	≥ 2000 m <sup>3</sup> /d (default)	
<b>Incineration of the sludge of the Municipal STP</b>	No (default)	
<b>Concentration of chemical in untreated wastewater</b>	365 µg/l (default)	
<b>Concentration of chemical (total) in the STP effluent *</b>	10 µg/L	
<b>Conditions and measures related to external treatment of waste for disposal</b>		
Not relevant.		
<b>Conditions and measures related to external recovery of waste</b>		

Not relevant.

\* Analytical monitoring of the plant effluent and STP effluent at all 3 production sites of 2-EHA in Europe were performed, revealing no concentrations above the limit of quantification of 1 µg/l. Based on those results, an overestimating value of 0.01 mg.L-1 (10 µg/l) was input into EUSES as the STP effluent concentration for the production sites. This assumption of 10 µg/l is considered conservative since measured values were all below the LOD of 1 µg/l.

### 1.2.2 Exposure estimation

For the estimated exposure for workers/PROC1, see table 1.4

For the estimated exposure for workers/PROC2, see table 1.5

For the estimated exposure for workers/PROC3, see table 1.6

**Table 1.12. Estimated exposure for workers/PROC 4**

Scenario	A	B	C	D	units
Route of exposure					
Long-term exposure, local, dermal	100.0	100	100	100	µg/cm <sup>2</sup>
Long-term exposure, local, inhalative	26.88	3.83	3.83	23.03	mg/m <sup>3</sup>
Short-term exposure, local, dermal	100.0	100	100	100	µg/cm <sup>2</sup>

**Table 1.13. Estimated exposure for workers/PROC5**

Route of exposure	Concentrations		Justification
	level	units	
Long-term exposure, local, dermal	120.0	µg/cm <sup>2</sup>	ECETOC TRA V.2
Long-term exposure, local, inhalative	23.04	mg/m <sup>3</sup>	ECETOC TRA V.2
Short-term exposure, local, dermal	120.0	µg/cm <sup>2</sup>	ECETOC TRA V.2

For the estimated exposure for workers/PROC8a, see table 1.7

For the estimated exposure for workers/PROC8b, see table 1.8

For the estimated exposure for workers/PROC9, see table 1.9

**Table 1.14. Estimated exposure for environment/ERC6c and ERC6d at production sites facilities**

<b>Compartment</b>	<b>PEC</b>	<b>Units</b>
STP	1E-02	mg/L
Freshwater	9.45E-04	mg/L
Freshwater sediment	0.0113	mg/kg wwt
Soil (agricultural)	1.8E-03	mg/kg wwt
Marine water	9.07E-05	mg/l
Marine water sediment	1.1E-03	mg/kg wwt
Total daily intake man via environment	5.97E-03	mg/kg bw/d
Air	0.0167	mg/m <sup>-3</sup>

### **1.3. Exposure Scenario 3 : Polymerisation and formulation at downstream users facilities**

#### **1.3.1 Exposure Scenario**

**Table 1.15. Description of ES3**

<b>1.3.1.1 Title : Polymerisation and formulation at downstream users facilities</b>	
<b>Reference number</b>	3
<b>Free short title</b>	Polymerisation and formulation at downstream users facilities
<b>Systematic title based on use descriptor</b>	SU 8, 9, 12 ; PROC 1, 2, 3, 4, 5, 8a, 8b, 9 ; ERC6c, 6d
<b>Processes, tasks, activities covered</b>	PROC1: Use in closed process, no likelihood of exposure; Industrial setting. PROC2: Use in closed, continuous process with occasional controlled exposure (e.g. sampling); Industrial setting. PROC3: Use in closed batch process (synthesis or formulation); Industrial setting.

	<p>PROC4: Batch process where significant opportunity for exposure arises</p> <p>PROC5: Mixing or blending in batch process for formulation of preparations containing up to 21% 2-EHA (multistage and/or significant contact)</p> <p>PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities</p> <p>PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities</p> <p>PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)PROC4: Use in batch and other process where opportunity for exposure arises.</p>
<b>Environment characteristic covered</b>	<p>ERC6c: Industrial use of monomers in the production of plastics (thermoplastics), polymerisation processes.</p> <p>ERC6d: Industrial use of chemicals in the production of thermosets and rubbers, polymer processing</p>
<b>1.3.1.2. Operational conditions and risk management measures</b>	
Industrial dedicated processes	
<b>1.3.1.2.1 Control of workers exposure for PROC 1</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	Use in closed process, no likelihood of exposure; Industrial setting
<b>Use descriptor covered</b>	PROC 1
<b>Processes, tasks, activities covered</b>	Use of the substance in high integrity contained system where little potential exists for exposure
<b>Assessment Method</b>	ECETOC TRA 2.0
For further information see table 1.3	
<b>1.3.1.2.2 Control of workers exposure for PROC 2</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	Use in closed, continuous process with occasional controlled exposure (e.g. sampling); Industrial setting.
<b>Use descriptor covered</b>	PROC 2
<b>Processes, tasks, activities covered</b>	Continuous process but where the design philosophy is not specifically aimed at minimising emissions. It is not high integrity and occasional exposure will arise eg.

	Through maintenance, sampling and equipment breakages
<b>Assessment Method</b>	ECETOC TRA 2.0
For further information see table 1.3	
<b>1.3.1.2.3 Control of workers exposure for PROC 3</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	Use in closed batch process (synthesis or formulation); Industrial setting
<b>Use descriptor covered</b>	PROC 3
<b>Processes, tasks, activities covered</b>	Batch manufacture of a chemical or formulation where the predominant handling is in a contained manner but where some opportunity for contact with the chemical occurs.
<b>Assessment Method</b>	ECETOC TRA 2.0
For further information see table 1.3	
<b>1.3.1.2.4 Control of workers exposure for PROC 4</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	Use in batch and other process where opportunity for exposure arises.
<b>Use descriptor covered</b>	PROC 4
<b>Processes, tasks, activities covered</b>	Batch use of a chemical where significant opportunity for exposure arises, e.g. during charging, sampling or discharge of material, and when the nature of the design is likely to result in exposure
<b>Assessment Method</b>	ECETOC TRA 2.0
For further information see table 1.11	
<b>1.3.1.2.5 Control of workers exposure for PROC 5</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	Mixing or blending in batch process for formulation or preparations containing up to 21% 2-EHA (multistage and/or significant contact)
<b>Use descriptor covered</b>	PROC 5
<b>Processes, tasks, activities covered</b>	Manufacture or formulation of chemical products or articles using technologies related to mixing and blending of solid or liquid materials, and where the process is in stages and provides opportunity for significant contact at any stage
<b>Assessment Method</b>	ECETOC TRA 2.0
For further information see table 1.11	



**1.3.1.2.6 Control of workers exposure for PROC 8a****Title information related to contributing scenario**

<b>Workers related free short title</b>	Indoor transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities
<b>Use descriptor covered</b>	PROC 8a
<b>Processes, tasks, activities covered</b>	Indoor sampling, loading, filling, transfer, dumping, bagging in non dedicated facilities. Exposure related to dust, vapour, aerosols or spillage and cleaning of equipment to be expected
<b>Assessment Method</b>	ECETOC TRA 2.0

For further information see table 1.3

**1.3.1.2.7 Control of workers exposure for PROC 8b****Title information related to contributing scenario**

<b>Workers related free short title</b>	Indoor transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
<b>Use descriptor covered</b>	PROC 8b
<b>Processes, tasks, activities covered</b>	Indoor sampling, loading, filling, transfer, dumping, bagging in dedicated facilities. Exposure related to dust, vapour, aerosols or spillage and cleaning of equipment to be expected
<b>Assessment Method</b>	ECETOC TRA 2.0

For further information see table 1.3

**1.3.1.2.8 Control of workers exposure for PROC 9****Title information related to contributing scenario**

<b>Workers related free short title</b>	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
<b>Use descriptor covered</b>	PROC 9
<b>Processes, tasks, activities covered</b>	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
<b>Assessment Method</b>	ECETOC TRA 2.0

For further information see table 1.3

**1.3.1.2.9 Control of environmental exposure for ERC6c, ERC6d**

<b>Free short title</b>	Industrial use of process regulators/monomers for polymerisation processes
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<b>Use descriptor covered</b>	ERC6c, 6d	
<b>Description</b>	ERC6c: Industrial use of monomers in the production of plastics (thermoplastics), polymerisation processes. ERC6d: Industrial use of chemicals in the production of thermosets and rubbers, polymer processing.	
<b>Assessment Method</b>	EUSES v2.1	
<b>Product characteristics</b>		
Physical state	liquid	
Concentration of substance	100%	
<b>Amounts used</b>		
<b>Maximum daily use at a site</b> (tons/day production)	69	
<b>Maximum annual use at a site</b> (tons/day production)	20 700	
<b>Fraction of the main local source</b>	0,05	
<b>Frequency and duration of use</b>	300 days (no. of emission days/year)	
<b>Pattern of release to the environment</b>	Continuous	
<b>Environment factors not influenced by risk management</b>		
<b>Receiving surface water flow rate</b>	≥ 1.8E+04 m3/d (default)	
<b>Other given operational conditions affecting environmental exposure</b>		
Industry category	11: Polymers industry	
Use category	43 : Process regulators	
Main category industrial use	Polymerisation processes	
Extra details on use category	Wet : monomers	
Emission tables	A3.10, B3.9	
Release fraction to air from process (production / industrial use)	1E-03 (default)	
Release fraction to wastewater from process (production / industrial use)	1E-05 (default)	
<b>Technical conditions and measures at process level (source) to prevent release</b>		
Not relevant.		
<b>Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil</b>		
Not relevant.		
<b>Organizational measures to prevent/limit release from site</b>		

Not relevant.	
<b>Conditions and measures related to municipal sewage treatment plant</b>	
<b>Municipal Sewage Treatment Plant (STP)</b>	Yes (freshwater and marine assessment)
<b>Discharge rate of the Municipal STP</b>	≥ 2000 m <sup>3</sup> /d (default)
<b>Incineration of the sludge of the Municipal STP</b>	No (default)
<b>Concentration of chemical in untreated wastewater</b>	17.3 µg/L (default)
<b>Concentration of chemical (total) in the STP effluent</b>	1.25 µg/L (default)
<b>Conditions and measures related to external treatment of waste for disposal</b>	
Not relevant.	
<b>Conditions and measures related to external recovery of waste</b>	
Not relevant.	

### 1.3.2 Exposure estimation

For the estimated exposure for workers/PROC1, see table 1.4

For the estimated exposure for workers/PROC2, see table 1.5

For the estimated exposure for workers/PROC3, see table 1.6

For the estimated exposure for workers/PROC4, see table 1.12

For the estimated exposure for workers/PROC5, see table 1.13

For the estimated exposure for workers/PROC8a, see table 1.7

For the estimated exposure for workers/PROC8b, see table 1.8

For the estimated exposure for workers/PROC9, see table 1.9

**Table 1.16. Estimated exposure for environment/ERC6c, 6d at downstream users sites**

<b>Compartment</b>	<b>PEC</b>	<b>Units</b>
STP	1.25E-03	mg/L
Freshwater	2.26E-04	mg/L
Freshwater sediment	2.51E-03	mg/kg wwt
Soil (agricultural)	8.75E-05	mg/kg wwt

Marine water	1.89E-05	mg/l
Marine water sediment	2.13E-04	mg/kg wwt
Total daily intake man via environment	4.391E-04	mg/kg bw/d
Air	7.97E-04	mg/m <sup>-3</sup>

## 1.4. Exposure Scenario 4 : Use of formulated monomeric 2-EHA up to 21% in paints and adhesives

### 1.4.1 Exposure Scenario

Table 1.17. Description of ES4

1.4.1.1 Title : Use of formulated monomeric 2-EHA up to 21% in paints and adhesives	
Reference number	4
Free short title	Use of preparations containing up to 21% 2-EHA
Systematic title based on use descriptor	SU 10, 12, 19 ; PROC 5, 7, 9, 10, 11, 19 ; ERC6c, 6d, 8c, 8f
Processes, tasks, activities covered	<p>PROC5: Mixing or blending in batch process for formulation of preparations containing up to 21% 2-EHA (multistage and/or significant contact)</p> <p>PROC7: Industrial spraying</p> <p>PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)PROC4: Use in batch and other process where opportunity for exposure arises.</p> <p>PROC10: Roller application or brushing</p> <p>PROC 11: Non industrial spraying</p> <p>PROC 19: Hand mixing with intimate contact</p>
Environment characteristics covered	<p>ERC6c: Industrial use of monomers in the production of plastics (thermoplastics), polymerisation processes.</p> <p>ERC6d: Industrial use of chemicals in the production of thermosets and rubbers, polymer processing.</p> <p>ERC8c: Professional indoor use of substances which will be physically or chemically bound into or onto a matrix such as binding agent in paints and coatings or adhesives.</p> <p>ERC8f: Professional outdoor use of substances which will be physically or chemically bound into or onto a matrix such as</p>

	binding agent in paints and coatings or adhesives.		
<b>1.4.1.2. Operational conditions and risk management measures</b>			
Industrial dedicated processes			
<b>1.4.1.2.1 Control of workers exposure for PROC 5</b>			
<b>Title information related to contributing scenario</b>			
<b>Workers related free short title</b>	Mixing or blending in batch process for formulation or preparations containing up to 21% 2-EHA (multistage and/or significant contact)		
<b>Use descriptor covered</b>	PROC 5		
<b>Processes, tasks, activities covered</b>	Manufacture or formulation of chemical products or articles using technologies related to mixing and blending of solid or liquid materials, and where the process is in stages and provides opportunity for significant contact at any stage		
<b>Assessment Method</b>	ECETOC TRA 2.0		
For further information see table 1.11			
<b>1.4.1.2.2 Control of workers exposure for PROC 7</b>			
<b>Title information related to contributing scenario</b>			
<b>Workers related free short title</b>	Industrial spraying		
<b>Use descriptor covered</b>	PROC7		
<b>Processes, tasks, activities covered</b>	Air dispersive techniques, spraying for surface coatings, adhesives, polishes/cleaners.		
<b>Assessment Method</b>	ECETOC TRA 2.0		
<b>Product characteristic</b>			
Physical state	Liquid		
Concentration of substance	<25%		
<b>Amounts used</b>			
This information is not needed for assessment of worker's exposure.			
<b>Human factors not influenced by risk management</b>			
Exposed skin surface	Two hands and forearms (1500 cm <sup>2</sup> )		
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>			
Training of operators, supervision, risk management systems			
<b>Operational conditions affecting workers exposure</b>			
Domain	Industrial		
Scenarios	A	B	C
Location	Indoor	Outdoor	Outdoor

<b>Frequency and duration of use/exposure</b>			
Duration of exposure (hours/day)	> 4	> 4	< 15 min/day
Frequency of exposure	≤ 240 days/year		
<b>Technical conditions and measures to control dispersion from source towards the worker</b>			
Local exhaust ventilation	Yes	n.a.	n.a.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>			
Suitable respiratory protection (90% effectiveness)	No	Yes	No
Gloves (90% effectiveness)	Yes		
<b>1.4.1.2.3 Control of workers exposure for PROC 9</b>			
<b>Title information related to contributing scenario</b>			
<b>Workers related free short title</b>	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)		
<b>Use descriptor covered</b>	PROC 9		
<b>Processes, tasks, activities covered</b>	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)		
<b>Assessment Method</b>	ECETOC TRA 2.0		
For further information see table 1.3			
<b>1.4.1.2.4 Control of workers exposure for PROC 10 in industrial settings</b>			
<b>Title information related to contributing scenario</b>			
<b>Workers related free short title</b>	Roller application or brushing		
<b>Use descriptor covered</b>	PROC10		
<b>Processes, tasks, activities covered</b>	Roller application or brushing, low energy spreading of e.g. coatings. Substances can be inhaled as vapours, skin contact can occur through droplets, splashes, working with wipes and handling of treated surfaces		
<b>Assessment Method</b>	ECETOC TRA 2.0		
<b>Product characteristic</b>			
Physical state	Liquid		
Concentration of substance	<25%		
<b>Amounts used</b>			
This information is not needed for assessment of worker's exposure.			
<b>Human factors not influenced by risk management</b>			
Exposed skin surface	Both hands (960 cm <sup>2</sup> )		
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>			

Training of operators, supervision, risk management systems				
<b>Operational conditions affecting workers exposure</b>				
Domain	Industrial			
Scenarios	A	B	C	D
Location	Outdoor	Indoor	Indoor	Indoor
<b>Frequency and duration of use/exposure</b>				
Duration of exposure (hours/day)	> 4	> 4	> 4	< 4
Frequency of exposure	≤ 240 days/year			
<b>Technical conditions and measures to control dispersion from source towards the worker</b>				
Local exhaust ventilation	n.a.	No	Yes	No
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>				
Suitable respiratory protection (90% effectiveness)	No	Yes	No	No
Gloves (90% effectiveness)	Yes			
<b>1.4.1.2.5 Control of workers exposure for PROC 10 in professional settings</b>				
<b>Title information related to contributing scenario</b>				
<b>Workers related free short title</b>	Roller application or brushing			
<b>Use descriptor covered</b>	PROC10			
<b>Processes, tasks, activities covered</b>	Roller application or brushing, low energy spreading of e.g. coatings. Substances can be inhaled as vapours, skin contact can occur through droplets, splashes, working with wipes and handling of treated surfaces			
<b>Assessment Method</b>	ECETOC TRA 2.0			
<b>Product characteristic</b>				
Physical state	Liquid			
Concentration of substance	<25%			
<b>Amounts used</b>				
This information is not needed for assessment of worker's exposure.				
<b>Human factors not influenced by risk management</b>				
Exposed skin surface	Both hands (960 cm <sup>2</sup> )			
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>				
Training of operators, supervision, risk management systems				
<b>Operational conditions affecting workers exposure</b>				
Domain	Professional			

Scenarios	A	B	C	D	E
Location	Outdoor	Outdoor	Indoor	Indoor	Indoor
<b>Frequency and duration of use/exposure</b>					
Duration of exposure (hours/day)	< 1	> 4	> 4	< 4	< 1
Frequency of exposure	≤ 240 days/year				
<b>Technical conditions and measures to control dispersion from source towards the worker</b>					
Local exhaust ventilation	n.a.	n.a.	No	Yes	No
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>					
Suitable respiratory protection (90% effectiveness)	No	Yes	Yes	No	No
Gloves (90% effectiveness)	Yes				
<b>1.4.1.2.6 Control of workers exposure for PROC 11</b>					
<b>Title information related to contributing scenario</b>					
Workers related free short title	Non industrial spraying				
Use descriptor covered	PROC11				
Processes, tasks, activities covered	Non industrial spraying for surface coating, adhesives				
Assessment Method	ECETOC TRA 2.0				
<b>Product characteristic</b>					
Physical state	Liquid				
Concentration of substance	<25%				
<b>Amounts used</b>					
This information is not needed for assessment of worker's exposure.					
<b>Human factors not influenced by risk management</b>					
Exposed skin surface	Palm of both hands and forearms (1500 cm <sup>2</sup> )				
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>					
Training of operators, supervision, risk management systems					
<b>Operational conditions affecting workers exposure</b>					
Domain	Professional				
Scenarios	A	B	C	D	
Location	Outdoor	Outdoor	Indoor	Indoor	
<b>Frequency and duration of use/exposure</b>					
Duration of exposure (hours/day)	> 4	< 15 min	> 4	< 15 min	
Frequency of exposure	≤ 240 days/year				



<b>Technical conditions and measures to control dispersion from source towards the worker</b>				
Local exhaust ventilation	n.a.	n.a.	Yes	Yes
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>				
Suitable respiratory protection (90% effectiveness)	Yes	No	Yes	No
Gloves (95% effectiveness)	Yes			
<b>1.4.1.2.7 Control of workers exposure for PROC 19</b>				
<b>Title information related to contributing scenario</b>				
<b>Workers related free short title</b>	Hand mixing with intimate contact			
<b>Use descriptor covered</b>	PROC10			
<b>Processes, tasks, activities covered</b>	Hand mixing with intimate contact and only PPE available			
<b>Assessment Method</b>	ECETOC TRA 2.0			
<b>Product characteristic</b>				
Physical state	Liquid			
Concentration of substance	<25%			
<b>Amounts used</b>				
This information is not needed for assessment of worker's exposure.				
<b>Human factors not influenced by risk management</b>				
Exposed skin surface	1980 cm <sup>2</sup>			
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>				
Training of operators, supervision, risk management systems				
<b>Operational conditions affecting workers exposure</b>				
Domain	Professional			
Scenarios	A	B	C	D
Location	Outdoor	Outdoor	Indoor	Indoor
<b>Frequency and duration of use/exposure</b>				
Duration of exposure (hours/day)	> 4	< 1	> 4	< 1
Frequency of exposure	≤ 240 days/year			
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>				
Suitable respiratory protection (90% effectiveness)	Yes	No	Yes	No
Gloves (98% effectiveness)	Yes			
<b>1.2.1.2.8 Control of environmental exposure for ERC6c, 6d</b>				
<b>Free short title</b>	Industrial use of process regulators/monomers for			

	polymerisation processes	
<b>Use descriptor covered</b>	ERC6c, 6d	
<b>Description</b>	ERC6c: Industrial use of monomers in the production of plastics (thermoplastics), polymerisation processes. ERC6d: Industrial use of chemicals in the production of thermosets and rubbers, polymer processing.	
<b>Assessment Method</b>	EUSES v2.1	
<b>Product characteristics</b>		
Physical state	liquid	
Concentration of substance	21%	
<b>Amounts used</b>		
<b>Maximum daily use at a site</b> (tons/day production)	0,24	
<b>Maximum annual use at a site</b> (tons/day production)	74	
<b>Fraction of the main local source</b>	0,01	
<b>Frequency and duration of use</b>	300 days (no. of emission days/year)	
<b>Pattern of release to the environment</b>	Continuous	
<b>Environment factors not influenced by risk management</b>		
<b>Receiving surface water flow rate</b>	$\geq 1.8E+04 \text{ m}^3/\text{d}$ (default)	
<b>Other given operational conditions affecting environmental exposure</b>		
Industry category	14: Paint, lacquers and varnishes industry	
Use category	10 : Colouring agents	
Main category industrial use	Water based	
Extra details on use category	Wet : monomers	
Emission tables	A3.15, B3.13	
Release fraction to air from process (production / industrial use)	5E-03 (default)	
Release fraction to wastewater from process (production / industrial use)	5E-03 (default)	
<b>Technical conditions and measures at process level (source) to prevent release</b>		
Not relevant.		
<b>Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil</b>		
Not relevant.		

<b>Organizational measures to prevent/limit release from site</b>	
Not relevant.	
<b>Conditions and measures related to municipal sewage treatment plant</b>	
<b>Municipal Sewage Treatment Plant (STP)</b>	Yes (freshwater and marine assessment)
<b>Discharge rate of the Municipal STP</b>	≥ 2000 m <sup>3</sup> /d (default)
<b>Incineration of the sludge of the Municipal STP</b>	No (default)
<b>Concentration of chemical in untreated wastewater</b>	6.17 µg/L (default)
<b>Concentration of chemical (total) in the STP effluent</b>	0.44 µg/L (default)
<b>Conditions and measures related to external treatment of waste for disposal</b>	
Not relevant.	
<b>Conditions and measures related to external recovery of waste</b>	
Not relevant.	
<b>1.2.1.2.9 Control of environmental exposure for ERC8c, 8f</b>	
<b>Free short title</b>	Wide dispersive indoor and outdoor use resulting in inclusion into or onto a matrix
<b>Use descriptor covered</b>	ERC8c, ERC8f
<b>Description</b>	Professional indoor and outdoor use of substances which will be physically or chemically bound into or onto a matrix such as binding agent in paints and coatings or adhesives.
<b>Assessment Method</b>	EUSES v2.1
<b>Product characteristics</b>	
Physical state	liquid
Concentration of substance	21%
<b>Amounts used</b>	
<b>Maximum daily use at a site (tons/day production)</b>	0,24
<b>Maximum annual use at a site (tons/day production)</b>	74
<b>Fraction of the main local source</b>	0,002
<b>Frequency and duration of use</b>	150 days (no. of emission days/year)
<b>Pattern of release to the</b>	Continuous

<b>environment</b>	
<b>Environment factors not influenced by risk management</b>	
<b>Receiving surface water flow rate</b>	≥ 1.8E+04 m <sup>3</sup> /d (default)
<b>Other given operational conditions affecting environmental exposure</b>	
Industry category	14: Paint, lacquers and varnishes industry
Use category	10 : Colouring agents
Main category industrial use	Water based
Extra details on use category	Wet : monomers
Emission tables	A4.5, B4.4
Release fraction to air from process (production / industrial use)	5E-03 (default)
Release fraction to wastewater from process (production / industrial use)	5E-03 (default)
<b>Technical conditions and measures at process level (source) to prevent release</b>	
Not relevant.	
<b>Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil</b>	
Not relevant.	
<b>Organizational measures to prevent/limit release from site</b>	
Not relevant.	
<b>Conditions and measures related to municipal sewage treatment plant</b>	
<b>Municipal Sewage Treatment Plant (STP)</b>	Yes (freshwater and marine assessment)
<b>Discharge rate of the Municipal STP</b>	≥ 2000 m <sup>3</sup> /d (default)
<b>Incineration of the sludge of the Municipal STP</b>	No (default)
<b>Concentration of chemical in untreated wastewater</b>	0 µg/L (default)
<b>Concentration of chemical (total) in the STP effluent</b>	0 µg/L (default)
<b>Conditions and measures related to external treatment of waste for disposal</b>	
Not relevant.	
<b>Conditions and measures related to external recovery of waste</b>	
Not relevant.	

## 1.4.2 Exposure estimation

For the estimated exposure for workers/PROC5, see table 1.13

**Table 1.18. Estimated exposure for workers/PROC 7**

Scenario	A	B	C	units
Route of exposure				
Long-term exposure, local, dermal	120.0	120	120	µg/cm <sup>2</sup>
Long-term exposure, local, inhalative	23.04	32.25	32,25	mg/m <sup>3</sup>
Short-term exposure, local, dermal	120.0	120	120	µg/cm <sup>2</sup>

For the estimated exposure for workers/PROC9, see table 1.9

**Table 1.19. Estimated exposure for workers/PROC 10 industrial**

Scenario	A	B	C	D	units
Route of exposure					
Long-term exposure, local, dermal	120.0	120	120	120	µg/cm <sup>2</sup>
Long-term exposure, local, inhalative	32.25	4.61	4.61	27.64	mg/m <sup>3</sup>
Short-term exposure, local, dermal	120.0	120	120	120	µg/cm <sup>2</sup>

**Table 1.20. Estimated exposure for workers/PROC 10 professional**

Scenario	A	B	C	D	E	units
Route of exposure						
Long-term exposure, local, dermal	120.0	120	120	120	120	µg/cm <sup>2</sup>
Long-term exposure, local, inhalative	16.12	8.06	11.52	11.52	23.04	mg/m <sup>3</sup>
Short-term exposure, local, dermal	120.0	120	120	120	120	µg/cm <sup>2</sup>

**Table 1.21. Estimated exposure for workers/PROC 11**

Scenario	A	B	C	D	units
Route of exposure					
Long-term exposure, local, dermal	150.0	150.0	150.0	150.0	µg/cm <sup>2</sup>
Long-term exposure, local, inhalative	32.25	32.25	9.21	9.21	mg/m <sup>3</sup>
Short-term exposure, local, dermal	150.0	150.0	150.0	150.0	µg/cm <sup>2</sup>

**Table 1.22. Estimated exposure for workers/PROC 19**

Scenario	A	B	C	D	units
Route of exposure					
Long-term exposure, local, dermal	60.0	60.0	60.0	60.0	µg/cm <sup>2</sup>
Long-term exposure, local, inhalative	32.25	8.06	11.52	23.04	mg/m <sup>3</sup>
Short-term exposure, local, dermal	60.0	60.0	60.0	60.0	µg/cm <sup>2</sup>

**Table 1.23. Estimated exposure for environment/ERC6c and 6d**

Compartment	PEC	Units
STP	4.48E-08	mg/L
Freshwater	1.6E-04	mg/L
Freshwater sediment	1.7E-03	mg/kg wwt
Soil (agricultural)	6.24E-07	mg/kg wwt
Marine water	1.23E-05	mg/l
Marine water sediment	1.32E-04	mg/kg wwt

Total daily intake man via environment	1.39E-04	mg/kg bw/d
Air	9.28E-06	mg/m <sup>-3</sup>

**Table 1.24. Estimated exposure for environment/ERC8c and ERC8f**

Compartment	PEC	Units
STP	0	mg/L
Freshwater	1.23E-04	mg/L
Freshwater sediment	1.25E-03	mg/kg wwt
Soil (agricultural)	5.32E-07	mg/kg wwt
Marine water	8.59E-06	mg/l
Marine water sediment	8.69E-05	mg/kg wwt
Total daily intake man via environment	1.08E-04	mg/kg bw/d
Air	8.43E-06	mg/m <sup>-3</sup>

## 1.5. Use as laboratory reagent

### 1.5.1. Exposure Scenario

**Table 1.25. Description of ES5**

1.5.1.1. Title	
Reference number	5
Free short title	Use as laboratory reagent
Systematic title based on use descriptor	SU 8, 9 and 24; PROC 15; ERC 1
Processes, tasks, activities covered	PROC15: Use a laboratory reagent; Non-industrial setting.
Environment characteristic covered	ERC1: Production of chemicals.
1.5.1.2. Operational conditions and risk management measures	
Use as laboratory agent at the 3 production sites in Europe.	

<b>1.5.1.2.1 Control of workers exposure for PROC 15</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	Use a laboratory reagent; Non-industrial setting.
<b>Use descriptor covered</b>	PROC 15
<b>Processes, tasks, activities covered</b>	Use of substances at small scale laboratory (< 1 L or 1 kg). Larger laboratories and R+D installations should be treated as industrial processes.
<b>Assessment Method</b>	ECETOC TRA 2.0
<b>Product characteristic</b>	Industrial
Physical state	liquid
Concentration of substance	100%
<b>Amounts used</b>	
This information is not needed for assessment of worker's exposure.	
<b>Operational conditions affecting workers exposure</b>	
Location	Inside
Domain	Industrial
<b>Frequency and duration of use/exposure</b>	
Duration of exposure	> 4 hours/day
Frequency of exposure	≤ 240 days/year
<b>Human factors not influenced by risk management</b>	
Exposed skin surface	Palm of one hand (240 cm <sup>2</sup> )
<b>Technical conditions and measures at process level (source) to prevent release</b>	
Not relevant.	
<b>Technical conditions and measures to control dispersion from source towards the worker</b>	
Local exhaust ventilation (Effectiveness: 90%)	yes
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>	
Not relevant.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Suitable respiratory protection	No
Gloves (Effectiveness: 90%)	Yes
<b>1.5.1.2.2 Control of environmental exposure for ERC 1</b>	
<b>Free short title</b>	Production of chemical.
<b>Use descriptor covered</b>	ERC 1



<b>Description</b>	Production of organic and inorganic substances in chemical, petrochemical, primary metals and minerals industry including intermediates, monomers using continuous processes or batch processes applying dedicated or multi-purpose equipment, either technically controlled or operated by manual interventions.
<b>Assessment Method</b>	EUSES v2.1
For further information see Table 1.3	

### 1.5.2. Exposure Estimation

**Table 1.26. Estimated exposure for workers / PROC 15**

Route of exposure	Concentrations		Justification
	level	units	
Long-term exposure, local, dermal	10.0	µg/cm <sup>2</sup>	ECETOC TRA V.2
Long-term exposure, local, inhalative	3.83	mg/m <sup>3</sup>	ECETOC TRA V.2
Short-term exposure, local, dermal	10.0	µg/cm <sup>2</sup>	ECETOC TRA V.2

For the estimated exposure for the environment / ERC 1 see Table 1.10