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

1.1. Product identifier

- Trade name: **DICYCLOPENTADIENE**
- Chemical name: dicyclopentadiene; 3a,4,7,7a-tetrahydro-1H-4,7-methanoindene; 4,7-Methano-1H-indene, 3a,4,7,7a-tetrahydro-;
- Registration number REACH: 01-2119463601-44-0046
- UFI code: irrelevant for substances
- Index number: 601-044-00-9
- CAS number: 77-73-6
- EC number: 201-052-9

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

1.2.1 Identified uses
Intermediate use of the substance
Polymer and Resin Production
Polymer and Resin Processing
Laboratory reagents. Research and development.

1.2.2 Non-recommended uses
Not defined. Use the product only for the intended use, that specified in point 1.2.1 or subsection 7.3.

1.3. Details of the supplier of the safety data sheet

producer: ORLEN Unipetrol RPA s.r.o. Záluží 1, 436 70 Litvínov, Czech Republic

ID No.: 27597075
☎: +420 476 161 111
fax: +420 476 709 553
unipetrolrpa@orlenunipetrol.cz
www.orlenunipetrolrpa.cz

- Director of the Monomers and Chemicals Unit: ☎: +48 242 566 615; e-mail: Dorota.Smolarek@orlen.pl
- Key Account Manager: ☎: +420 226 841 474; e-mail: Beata.Zajicova@orlenunipetrol.cz
- Head of Customer Service Department: ☎: +420 476 162 006; e-mail: Lucie.Markova@orlenunipetrol.cz
- Person professionally qualified to compile a SDS: email: reach.unirpa@orlenunipetrol.cz

1.4. Emergency telephone number

- ORLEN Unipetrol RPA s.r.o. ☎:+420 476 163 111 (NON STOP)
- Toxicological Information Center (TIS) ☎:+420 224 919 293 (NON STOP)
  Na bojišti 1, 120 00 Prague 2, Czech Republic ☎:+420 224 915 402 (NON STOP)
  e-mail: tis@vfn.cz
- Transport Information & Accident System (TRINS) ☎:+420 476 163 111 (NON STOP)

Note: Emergency telephone numbers for EU countries are listed in section 16.

SECTION 2: HAZARDS IDENTIFICATION

2.1. Classification of the substance or mixture

The product is classified as hazardous pursuant to CLP Regulation (EC) No. 1272/2008 CLP:

FLAMMABLE LIQUID, CATEGORY 2	**Flam. Liq. 2, H 225**
ACUTE TOXICITY, CATEGORY 4 (ORAL)	**Acute Tox. 4, H 302**
ASPIRATION HAZARD	**Asp. Tox. 1, H 304**
ACUTE TOXICITY, CATEGORY 2 (INHAL)	**Acute Tox. 2, H 330**

SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPLOSURE), CATEGORY 2 (AFFECTED ORGANS: NOT SPECIFIED), (ORAL)	**STOT RE 2, H 373**
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPLOSURE), CATEGORY 3 (AFFECTED ORGANS: RESPIRATORY SYSTEM, LUNGS)	**STOT SE 3, H 335**
REPRODUCTIVE TOXICITY	**Repr. 2, H 361**
SERIOUS EYE DAMAGE / EYE IRRITATION, CATEGORY 2	**Eye Irrit. 2, H 319**
SKIN CORROSION/IRRITATION, CATEGORY 2	**Skin Irrit. 2, H 315**
HAZARDS TO THE AQUATIC ENVIRONMENT (ACUTE/SHORT-TERM) CATEGORY ACUTE 1	**Aquatic Acute 1, H 400**
HAZARDS TO THE AQUATIC ENVIRONMENT (CHRONIC/LONG-TERM) CATEGORY CHRONIC 2	**Aquatic Chronic 2, H 411**

Note: The full text of the H-sentence and / or EUH-sentences is stated in Section 16.

2.2. Label elements

Product identifiers		**DICYCLOPENTADIENE** CAS number.: 77-73-6
Warning hazard symbol		
Signal word		**DANGER**
H-phrases (standard hazard phrases)	H225	Highly flammable liquid and vapour.
	H302	Harmful if swallowed.
	H304	May be fatal if swallowed and enters airways.
	H315	Causes skin irritation.
	H319	Causes serious eye irritation.
	H330	Fatal if inhaled.
	H335	May cause respiratory irritation.
	H361	Suspected of damaging fertility or the unborn child.
	H373	May cause damage to organs through prolonged or repeated exposure < state route of exposure: oral>.
	H410	Very toxic to aquatic life with long lasting effects.
P-statements (precautionary statements)	P202	Do not handle until all safety precautions have been read and understood.
	P210	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
	P233	Keep container tightly closed.
	P260	Do not breathe fume/vapours/spray.
	P273	Avoid release to the environment.
	P301+P310+P331	IF SWALLOWED: Immediately call a POISON CENTER or doctor. Do NOT induce vomiting.
	P304+P340+P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. : Immediately call a POISON CENTER or doctor.
	P303+P361+P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower.
	P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
	P308+P313	IF exposed or concerned: Get medical advice/attention.

	P391 P403+P235 P501	Collect spillage. Store in a well-ventilated place. Keep cool. Dispose of contents/container to in accordance with local/ regional/national/international regulation (as hazardous waste).
Additional information		Only for professional users.
		ORLEN Unipetrol RPA s.r.o. Záluží 1, 436 70 Litvínov, Czech Republic ☎: +420 476 161 111

2.3. Other hazards

The substance is sensitive to oxygen (peroxides are formed). Handling under nitrogen is important.
Vapours with oxygen create explosive mixtures that are heavier than air, and so they amass and spread near the ground. In case of a inication may initiate a fire or explosion. Explosive limits of vapour: in air 0.8 -6.3 Vol%.
The product is classified as hazardous if inhaled. This means that in case of consumption and subsequent vomiting, there is a risk of aspiration (entering the lungs) and a risk of chemical pneumonia (lung swelling), which may lead to death.
Product assessments for PBT / vPvB criteria see Subsection 12.5. ("Results of PBT and vPvB assessment").
The substance is not included in the candidate list pursuant to Article 59 (Paragraph 1) of the REACH Directive (SVHC substances).

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1. Substances

Name of the substance:	Dicyclopentadiene
Type and origin:	mono-constituent substance (organic)
Concentration [% hm.] *:	80-95
Index number (index):	601-044-00-9
CAS number:	77-73-6
EC number:	201-052-9

	NAME :	IDENTIFIER :
the product contains one of listed stabilizing additives/peroxide formation inhibitors in concentrations that do not exceed 0,02% (m/m). Without affecting the classification.	2,6-di-tert-butyl-p-cresol / Butylhydroxytoluen (BHT)	CAS 128-37-0 M-Factor chronic:1 (Aquatic Chronic 1).
	4-tert-butylcatechol (TBC)	CAS: 98-29-3 M-Factor Acute:1 (Aquatic Acute 1).
this substance contains the following components-impurities: • in a concentration of ≥ 10% or • influencing the classification of this substance:	1-Methyldicyclopentadiene*	CAS: - EC: 955-799-7

Note: The substance does not contain a nanoform.
Note: Specific concentration limits (SCL), M-factor (M-) and Acute toxicity estimate (ATE) were not determined for this substance (harmonized classification).

** Note: The stated composition serves to classify the dangerous properties of the product. Further information about components are contained in the business specification.*

3.2. Mixtures

Not applicable, the product is a substance.

SECTION 4: FIRST AID MEASURES

4.1. Description of first aid measures

4.1.1. General instructions

If exposed or concerned: Call a Poison center /doctor.

Call a Poison center/doctor, if you feel unwell.

When providing first aid pay attention to self-protection.

Call emergency medical services (☎112 EU) and follow their instructions until their arrival. Show the safety data sheet or label if possible.

First aid must be always administered with the objective to preserve the basic bodily functions - should the victim become unconscious or should he/she stop breathing, start resuscitation immediately (chest compression and mouth-to-mouth resuscitation with the 30:2 ratio). When the victim is unconscious but is breathing NORMALLY, put him/her in the recovery position. The condition of the patient can change very quickly, so you need to watch him/her constantly and continuously monitor his/her consciousness status and breathing.

4.1.2. Inhalation

Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, give artificial respiration (do not use mouth to mouth). Get medical advice/attention if you feel unwell.

4.1.3. Skin contact

Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower immediately at (least 15 minutes). If skin irritation or rash occurs: Get medical advice/attention.

4.1.4. Eye contact

Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Protect unharmed eye. If eye irritation persists: Get medical advice/attention.

4.1.5. Ingestion

Get medical advice/attention immediately. Clean mouth with water and drink afterwards plenty of water. Do not give milk or alcoholic beverages. Never give anything by mouth to an unconscious person.

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

Causes eye irritation. This irritation can result in redness and swelling of the eyes.

Causes irritation to the skin. This irritation can result in redness and swelling of the skin. Repeat contact with the skin may cause it to become dry and cracked.

May cause respiratory irritation. If inhalation occurs, signs and symptoms may include sore throat, headache, nausea, coughing, choking, wheezing, difficulty in breathing, chest congestion, shortness of breath and may cause transient central nervous system (CNS) depression.

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

Advice to Physician:

In case of ingestion, Ipecac-induced emesis is not recommended.

Consider use of charcoal as a slurry (240mL water/30 g charcoal). Usual dose: 25 to 100 g in adults.

If determined necessary (and under qualified medical supervision), the stomach should be emptied by gastric lavage with the airway protected by endotracheal intubation.

SECTION 5: FIREFIGHTING MEASURES

5.1. Extinguishing media

Suitable extinguishing media:
LARGE FIRE: Use water spray, water fog or foam. DO NOT use direct water jet.
SMALL FIRE: Dry powder or carbon dioxide (CO_2) extinguisher, dry sand or fire fighting foam.
Unsuitable extinguishing media: Do NOT use water jet.
Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.

5.2. Special hazards arising from the substance or mixture

Combustion Products: Carbon monoxide, carbon dioxide and unburned hydrocarbons (smoke).

5.3. Advice for firefighters

Specific hazards during fire fighting: Vapour is denser than air – flashback may be possible over considerable distances. Containers may explode under fire conditions - use water spray to cool unopened containers.
Do not allow run-off from fire fighting to enter drains or water courses – may cause explosion hazard in drains and may reignite on surface water.
Special protective equipment for fire-fighters :
Wear an approved positive pressure self-contained breathing apparatus in addition to standard fire fighting gear.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

Use extra personal protective equipment (self-contained breathing apparatus). Avoid breathing vapours or mist. Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Ensure adequate ventilation, especially in confined areas, and absence of sources of ignition. Fire-extinguishing devices should be prepared in case of a fire. Ensure all equipment is non sparking or electrically bonded.
Spillages of liquid product will create a fire hazard and form an explosive atmosphere. Beware of accumulation of vapours in low areas or contained areas, where explosive concentrations may occur. Avoid direct contact with released material. Keep people away from and upwind of spill/leak. Stay upwind.

6.2. Environmental precautions

Land spillage: Prevent further leakage or spillage if safe to do so. Prevent spillage from entering drains, sewer, basement or confined areas.

Water spillage: Prevent further leakage or spillage if safe to do so. If the spillage contaminates rivers, lakes or drains inform respective authorities.

6.3. Methods and material for containment and cleaning up

Land spillage: Contain spillage. Small spillages can be taken up by collection with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and placed in suitebla, closed container for disposal according to valid local / national regulations.
Water spillage: For large leaks into water use floating barrage and collect the substance from surface using surface skimmers (separators) or cover the leaked substance with sorbent and remove saturated sorbent from the surface by scraping or draining. Seek the advice of a specialist before using dispersants.

6.4. Reference to other

For recommended personal protective aids – see Subsection 8.2 (“Exposure controls”).
For recommended manner of removing waste – see Section 13 (“Disposal considerations”).

SECTION 7: HANDLING AND STORAGE

7.1. Precautions for safe handling

Avoid contact with skin, eyes and clothing. Do not ingest. If swallowed then seek immediate medical assistance.
Use only in well ventilated areas. Avoid all sources of ignition. Use proper bonding and/or grounding procedures. This material is a static accumulator: Take precautionary measures against static discharges. Avoid contact with heat and ignition sources and oxidizing agents.
Containers should be opened only under exhaust ventilation hood. Do not allow splash filling of bulk volumes. Do not use compressed air for filling, discharging or handling.
Use only outdoors or in a well-ventilated area. In case of inadequate ventilation wear respiratory protection - – see Subsection 8.2 (“Exposure controls”).
Ground and bond container and receiving equipment.
Avoid splashes and spills.
Avoidance of contact with contaminated tools and objects.

Clean up contamination/spills as soon as they occur.
Regular cleaning of equipment and work area.
Cleaning, inspection and maintenance of the internal structure of storage tanks must be done only by properly equipped and qualified personnel as defined by national, local or company regulations.
Handle empty containers with care; vapour residue may be flammable. Do not pressurise, cut, weld, braze, solder, drill, or grind on containers. Dispose of rinse water in accordance with local and national regulations.
The vapour is heavier than air, beware of accumulation in pits and confined spaces. The product will float on water and can be reignited on surface water.
Ensure that all relevant regulations regarding explosive atmospheres, and handling and storage facilities of flammable products are followed.
Please keep the rules of personal hygiene. Take off contaminated pieces of clothing. Wash before using again. Do not eat, drink or smoke during work! Wash your hands and exposed parts of body thoroughly with soap and water after work and before meal and possibly treat with suitable reparation lotion. Do not wear contaminated clothing, shoes or protective equipment in the catering area.
Ensure suitable management/supervision is in place to check that the RMMs in place are being used correctly and OCs followed.
Train staff on good practice to prevent / minimise exposures and to report any eye / skin problems that may develop.

7.2. Conditions for safe storage, including any incompatibilities

Storage must adhere to the fire safety requirements on buildings and electric equipment must adhere to valid regulations. Store in cool, well-ventilated places with efficient suction from all heat and combustion sources
Store in the original, tightly closed, container. Keep container tightly closed and properly labelled. Fixed storage containers, transfer containers and associated equipment should be earthed and bonded to prevent accumulation of static charge. Fixed storage containers, transfer containers and associated equipment should be earthed and bonded to prevent accumulation of static charge.
Store in either mild steel or stainless steel containers or vessels. Do not store near incompatible materials, such as oxidizers (oxygen, air etc.) or other flammable materials. Containers which are opened must be carefully resealed and kept upright to prevent leakage.
Vapour space above stored liquid may be flammable/explosive unless blanketed with inert gas.
Storage installations should be designed with adequate bunds so as to prevent ground and water pollution in case of leaks or spills.

7.3. Specific end use(s)

Relevant identified uses of the substance are mentioned in section 1.2. The substance is intended for industrial consumption as an intermediate product (Exposure scenario 2), for the production and processing of polymer (Exposure scenarios 3; 4 and 5). All mentioned exposure scenarios are part of the appendix of this safety data sheet.
For professional users only.
Product is usable for further production of polymeric materials, resins or chemical specialties, which are used in the production of adhesives, dyes/inks, automotive and marine components, optical fibres, special lenses, medical components, packaging materials or sanitary products for kitchens and bathrooms and the like.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

8.1.1. Occupational exposure limit values

The following Permissible Exposure Limits (PELs) and Maximum Allowable Concentrations (NPK-P) of Chemicals in the Atmosphere of Workplaces within the Czech Republic are set by the Government Regulation No. 361/2007 Coll., determining conditions of occupational health protection, as amended:

Name	CAS number	PEL [mg.m^{-3}]	NPK-P [mg.m^{-3}]	Note
Dicyclopentadiene	77-73-6	3	6	-

Decomposition products:	*NAME / CAS NUMBER:*	*PEL [mg.m^{-3}]*	*NPK-P [mg.m^{-3}]*	

	Carbon monoxide / 630-08-0	*23*	*117*	-
	Carbon dioxide / 124-38-9	*9 000*	*45 000*	-

Note 1: An explanation of the meaning of the PEL and NPK-P abbreviations is in section 16.
Note 2: Occupational exposure limit values for EU countries are listed in section 16.

8.1.2. DNEL/DMEL values

Exposure of workers / employees:

Route	**Type of effect**	**Risk characterisation type**	**Hazard conclusion**
Inhalation	Systemic effects - Long-term	Quantitative	DNEL = 1.058 mg/m³
	Systemic effects - Acute	-	no hazard identified
	Local effects - Long-term	Quantitative	DNEL = 2.31 mg/m³
	Local effects - Acute	Quantitative	DNEL = 160.23 mg/m³
Dermal	Systemic effects - Long-term	Quantitative	DNEL = 0.3 mg/kg bw/den
	Systemic effects - Acute	-	no hazard identified
	Local effects - Long-term	-	no hazard identified
	Local effects - Acute	-	no hazard identified
Eyes	Local effects	Qualitative	low hazard (no threshold derived

Note : An explanation of the meaning of the DNEL/DMEL abbreviations is in section 16.

8.1.3. PNEC values

Type of risk characterisation required for environmental

Compartment	**Risk characterisation type**	**Hazard conclusion**
Freshwater	Quantitative	PNEC aqua (freshwater) = 98 µg/L
Sediments (freshwater)	Quantitative	PNEC sediment (freshwater) = 15.2 mg/kg sediment dw
Marine water	Quantitative	PNEC aqua (marine water) = 9.8 µg/L
Sediments (marine water)	Quantitative	PNEC sediment (marine water) = 1.52 mg/kg sediment dw
Sewage treatment plant	Quantitative	PNEC STP = 2.2 mg/L
Air	Not needed	No hazard identified
Agricultural soil	Quantitative	PNEC soil = 2.98 mg/kg soil dw
Predator's prey (freshwater)	Not needed	no potential for bioaccumulation
Predator's prey (marine water)	Not needed	no potential for bioaccumulation
Top predator's prey (marine water)	Not needed	no potential for bioaccumulation
Predator's prey (terrestrial)	Not needed	no potential for bioaccumulation

Note : An explanation of the meaning of the PNEC abbreviations is in section 16.

8.2. Exposure control

8.2.1. Appropriate engineering controls

Exposure control of unwanted exposure of humans and the environment must be ensured by strictly keeping the substance under control by using process and control technologies, which reduce emissions and subsequent exposure with the goal of preventing the substance from entering the air and water systems as well as the soil, and of preventing possible human exposure. The areas where the substance is stored and manipulated must be equipped with impermeable floors and retaining tanks in case of emergency leaks. It is necessary to ensure global as well as local ventilation and efficient suction.

8.2.2. Individual protective measures, such as personal protective equipment

If an accident or extraordinary event causes increased exposure, employees must have access to personal protective measures (PPM) for the protection of airways, eyes, hands and skin, depending on the nature of the performed activities. Suitable protection for airways must also be available where it is not technically possible to ensure the adherence of exposition limits identified for the work environment or ensure that exposure via airways will not affect the health of people. During non-stop use of these measures during permanent work, it is necessary to include safety breaks if the nature of the PPM requires them. All PPM need to be kept in usable condition and damaged or contaminated ones need to be immediately replaced**.**

RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT (PPE):

(the specific type of protective equipment must be chosen according to the type of activity being carried out and the quantity and concentration of the dangerous substance / mixture at the workplace)

Respiratory protection: In case of brief exposure or low pollution use respiratory filter device effective against the action of organic vapors to satisfy the specifications of the standard EN 140. In case of intensive or longer exposure use self-contained respirátory protective device to remove the consequences of an emergency/accident. Follow local and national regulations.

Protection of hands:

Protective gloves. Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation. The selected protective gloves have to satisfy the specifications of the standard EN 374. The following materials are suitable:

	Glove material	*Material thickness*	*Penetration time*
Regular work activities (staining risk)	nitrile	0.4 mm	30 minutes
Leak / accident liquidation	Viton	0.7 mm	480 minutes

Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves.

Eye protection: Tightly sealed goggles to satisfy the specifications of the standard EN 166. Where activities may lead to aerosol release e.g. spraying, then additional skin and eye protection measures such as impervious suits and face shields may be required.

Skin and body protection: Clothing protecting against chemicals, antistatic. Protective boots, antistatic. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

General protective and hygienic measures:

Comply with work hygiene standards.
Keep away from foodstuffs, beverages and feed.
Immediately remove all soiled and contaminated clothing
Wash hands before breaks and at the end of work.
Avoid contact with the eyes and skin.

8.2.3. Environmental exposure controls

Avoid product leakage to the environment with all available means. Do not let product enter drains. See section 6.2.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

The information is taken from the substance`s registration dossier (CSR) unless otherwise stated.

CHARACTERISTIC	UNIT	VALUE	NOTE/SOURCE
Physical state		liquid	at 20°C, 101,3 kPa
Colour		Colorless or yellowish	
Odour		Characteristic, pungent	

CHARACTERISTIC	UNIT	VALUE	NOTE/SOURCE
Odour threshold	[ppm]	threshold limit valueTLV = 5 ppm v/v the volatility at 25ºC was 3600 ppm v/v	odour safety class A CSR
Melting point/freezing point	[°C]	<20°C	<0°C at <85% purity, rising to 10°C at >90% purity CSR
Boiling point or Initial boiling point / boiling range	[°C]	171,5-172,9 80-190	own test (ASTM D 2887) CSR (according purity)
Flammability (solid, gas, liquid)		Flammable substance	
Upper flammability / explosive limits	[%]	6,3	
Lower flammability / explosive limits	[%]	0,8	
Flash point	[°C]	51 – 53 > 23 (42-47)	own test (ASTM D 92, ČSN EN ISO 2592) CSR
Auto-ignition temperature	[°C]	503	při 1013 hPa, CSR
Decomposition temperature	[°C]	170-172 (160)	CSR
pH		No data available	
Kinematic viscosity	[mm^2/s]	4,384 2,811	at 20°C, CSR (94% purity) at 40°C, CSR (94% purity)
Solubility in water	[$mg.l^{-1}$]	20 slightly soluble	at 25°C, CSR
Partition coefficient: n-octanol/water	[log Pow]	2,78	at 20°C, CSR
Vapour pressure	[kPa]	0,186	at 20°C, CSR
Relative density	Water=1	0,98	at 20°C, CSR
Density	[g/cm^3]	0,975 – 0,989	at 20°C, CSR
Relative vapour density	Air=1	No data available	
Particle characteristics		Irrelevant	Not applicable - this is a liquid.

9.2. Other information

9.2.1. Information with regard to physical hazard classes

CHARACTERISTIC	UNIT	VALUE	NOTE/SOURCE
Flammable liquids and vapers		yes	CSR (viz section 9.2.)
Explosive properties of liquid		Irrelevant; no chemical groups associated with explosive properties present in this molecule	CSR
Explosive properties of vapour		Explosive limits :Vol% in air 0.8 -6.3	CSR
Oxidising properties		Irrelevant; the organic substance does not contain oxygen or halogen atoms	CSR
Pyrophoric properties		none	CSR

9.2.2. Other safety characteristics

CHARACTERISTIC	UNIT	VALUE	NOTE/SOURCE
Dissociation constant		Irrelevant; The substance has no ionic structure.	CSR
Viscosity		Irrelevant;	CSR
Potential reactivity with water		does not indicate	CSR

SECTION 10: STABILITY AND REACTIVITY

10.1. Reactivity

From a chemical point of view, dicyclopentadiene is a very reactive substance. For example, it reacts slowly with atmospheric oxygen to form hydroperoxides. Therefore, handling under nitrogen is important. Peroxide radicals can initiate the formation of polymer resins. The substance contains a stabilizer/inhibitor of peroxide formation.

10.2. Chemical stability

The product is chemically stable when handled and stored under the conditions listed in Section 7.
At higher temperatures (decomposition temperature), the substance decomposes back into two molecules of cyclopentadiene - monomerizes.
Sensitive to oxygen (peroxides are formed). The substance contains a stabilizer/inhibitor of peroxide formation.
Stability in organic solvents and identity of relevant degradation products: the stability in organic solvents study does not need to be conducted as the stability of the substance is not considered to be critical.
Soluble in ethanol, ethyl ether, acetone, dichloromethane, toluene, n-hexane, ethyl acetate (non-polar solvents).

10.3. Possibility of hazardous reactions

No special reactivity has been reported.

Vapours of DCPD with air create explosive mixtures which in case of a inication may initiate a fire or explosion.

DCPD reacts slowly with atmospheric oxygen to form hydroperoxides.

10.4. Conditions to avoid

Sources of ignition (including static electricity), high temperature, flames and sparks.

10.5. Incompatible materials

Oxidizers.

10.6. Hazardous decomposition products

Heat decomposition at high temperatures, e.g. during fires, may cause the creation of carbon monoxide, carbon dioxide and unburned hydrocarbons (smoke).

SECTION 11: TOXIKOLOGICAL INFORMATION

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

11.1.1. Toxicological effects of the substance

HAZARD CLASS	DATA FROM REGISTRATION DOCUMENTATION		EVALUATION
	DESCRIPTION	RESULT	
Acute toxicity	Oral (rat, OECD 401): Inhalation 4h: vapour, whole body (rat, OECD 403): Dermal (rat, OECD 402):	LD_{50}: 590 mg/kg bw (male/female) LC50:1 972 mg/m^3 air (male/female) LD50: >2000 mg/kg bw (male/female)	Based on available data, meets the classification criteria (H302; H330). Harmful if swallowed or if inhaled.

HAZARD CLASS	DATA FROM REGISTRATION DOCUMENTATION		EVALUATION
	DESCRIPTION	RESULT	
	Dicyclopentadiene is of slight - moderate acute toxicity by the oral and inhalation routes (oral LD50 590 mg/kg, inhalation 4 hour LC50 1972 mg/m3) and is practically non-toxic by the dermal route (dermal LD50 > 2000 mg/kg). The NOAEC for irregular breathing, stereotypic behaviour in rats and mice has been reported to be 248.74 mg/m3 (Bushy Run, 1981).		
Skin corrosion/irritation	Tests of the product (OECD 404, 4h)	Product irritates skin - moderately irritating (rabbit) / moderately irritating	Meets the classification criteria Causes skin irritation. (H315)
Serious eye damage/irritation	Tests of the product (OECD 405)	slightly irritating to eyes	Based on available data, meets the classification criteria. Causes serious eye irritation. (H319)
Sensitisation	Tests of the product (OECD 406)	Dicyclopentadiene is considered not to be a skin sensitiser.	Based on available data, the classification criteria are not met.
Germ cell mutagenicity	Tests of the product: - OECD 471 - OECD 476 - OECD 471 - OECD 480 - OECD 474	The available data indicate that dicyclopentadiene has no significant genotoxicity. Dicyclopentadiene has been shown to be non-genotoxic both in vitro and in vivo.	Based on available data, the classification criteria are not met.
Carcinogenicity	It is concluded that there are sufficient data to indicate that dicyclopentadiene does not pose a risk of genotoxic carcinogenicity. There are also data available to understand that the cellular changes arising from repeated administration of dicyclopentadiene to animals are limited and to conclude that dicyclopentadiene is unlikely to be carcinogenic.		Based on available data, the classification criteria are not met.
Reproductive toxicity	Tests of the product: Fertility: Oral: feed (rat, OECD 416): Oral: gavage (rat, OECD 422): Developmental toxicity / Vývojová toxicita: Oral: (rat):	*Overall reproductive toxicity::* yes NOAEL - 750 ppm (nominal) yes NOAEL – 100 mg/kg bw/day (NOAEL): 60mg/kg bw/day (subacute) However, several of the developmental and reproductive toxicity studies with DCPD suggest that it produced foetotoxic effects at doses at or below those that produced clear signs of maternal toxicity.	Based on available data, meets the classification criteria. (H361)

HAZARD CLASS	DATA FROM REGISTRATION DOCUMENTATION		EVALUATION
	DESCRIPTION	RESULT	
STOT-repeated exposure	Oral - systemic effects (rat, OECD 422): Inhalation - systemic effects (mouse, OECD 413): Inhalation - local effects (mouse, OECD 413):	NOAEL: 4mg/kg bw/day; subacute, NOAEC: 27.6mg/m³; subchronic, NOAEC: 27.6mg/m³; subchronic	Based on available data, the classification criteria are not met.
	Oral (rat OECD 408):	tremors and convulsions seen at 100 mg/kg/day dose level in males and females	Based on available data, meets the classification criteria. (H373)
STOT-single exposure		Affected organs: respiratory tract Route of exposure: inhalation May cause respiratory irritation.	Based on available data, meets the classification criteria. (H 335)
Aspiration hazard		A substance with a kinematic viscosity ≤ 20,5 $mm^2.s^{-1}$ at 40°C	Based on available data, meets the classification criteria. (H304)

11.2. Information on other hazards

The substance is not included in the candidate list pursuant to Article 59 (Paragraph 1) of the REACH Directive (due to the characteristics that can compromise endocrine activities or due to any other reason).

SECTION 12: ECOLOGICAL INFORMATION

12.1. Toxicity

12.1.1. Aquatic toxicity:

Water environment	Fish	Short-term toxicity: LC_{50} (96 h) = 15,7 mg/l Long-term toxicity: NOELR (21d) = 1,286 mg/l NOEC (30d) = 0,767 mg/l
	Aquatic Invertebrates	Short-term toxicity: EC_{50} (48 h) = 0,823 mg/l LL_{50} (48 h) = 12,556 mg/l Long-term toxicity: NOELR (21d) = 2,405 mg/l NOEC (21d) = 0,574 mg/l Effect concentration NOEC: 3.2 mg/l
	Freshwater algae and aquatic plants	EC_{50} (72 h) = 27 mg/l EC_{10}/LC_{10} or NOEC = 18 mg/l
	Sediment organisms	EC_{50} / LC_{50} (28d) = 100,47 mg/kg sediment dw EC10, LC10 or NOEC = 19,247 mg/kg sediment dw

As the acute key value for aquatic invertebrates is 0.823 mg/L, the substance meets the criteria for acute classification category 1 under CLP with the hazard phrase H400: 'very toxic to aquatic life'. As the substance is not readily biodegradable, the lowest chronic key value indicates that DCPD meets the criteria for classification as Chronic Category 2 under CLP, with the hazard phrase H411: 'toxic to aquatic life with long lasting effects'.

12.1.2. Toxicity fot terrestrial organisms:

Soil macro-organisms	OECD Guideline 222 (Earthworm Reproduction Test)	NOEC (56d) = 125 mg DCPD/kg SDW EC_{50} (56d) = 250 mg DCPD/kg SDW
	soil macroorganisms except arthropods: long-term	LL50 (28d): 98.649 mg/kg soil dw test mat. (nominal) based on: mortality NOELR (56d): 18.898 mg/kg soil dw test mat. (nominal) based on: reproduction
	Short-term EC50 or LC50 for soil macro-organisms: 250mg/kg soil dw Long-term EC10/LC10 or NOEC for soil macro-organisms: 125mg/kg soil dw	
	Soil dwelling arthropods - Folsomia candida	LL_{50} = 55,475 mg/kg soil dw NOELR = 10,627 mg/kg soil dw
Terrestrial plants	Short-term EC50 or LC50 for terrestrial plants = 163,717mg/kg soil dw Long-term EC10/LC10 or NOEC for terrestrial plants = 31,363mg/kg soil dw	
Soil micro-organisms	Short-term EC50 or LC50 for soil micro-organisms: 1000 mg/kg soil dw	

12.1.3. Microbiological activity in sewage treatment systems:

EC_{50}/LC_{50} (72h) for aquatic micro-organisms = 102,533mg/l

EC_{10}/LC_{10} or NOEC for aquatic micro-organisms = 2,2mg/l

12.2. Persistence and degradability

Based on the screening criteria DCPD is probably P but not vP (Biowin prediction).

Dicyclopentadiene is not considered to be readily biodegradable. The study, which follows OECD guideline 301F, showed 0% biodegradation in 28 days.

Structural analysis of the substance molecule indicates that it is not expected to undergo hydrolysis in the environment due to the lack of hydrolysable functional groups.

The calculated overall OH rate constant for dicyclopentadiene is 119E-12 cm3molecule-1s-1, which represents a half-life in the atmosphere of 1.1 hours.

12.3. Bioaccumulative potential

Dicyclopentadiene is rapidly absorbed, metabolised and eliminated. no bioaccumulation potential.

Bioaccumulation factor (dimensionless): 53 (studies on fish).

12.4. Mobility in soil

This substance is expected to have low potential for bioaccumulation and adsorption to soil and sediment based on its log Kow of 2.78. The log Koc values of 3.18 (MCI method) and 2.74 (kow method) would also not indicate a potential for adsorption to soil.

12.5. Results of PBT and vPvB assessment

P: Based on the screening criteria DCPD is probably P but not vP.

B: Substance would not meet the criteria for Bioaccumulative in the PBT assessment.

T: It is concluded that DCPD does not have any serious effects which could be considered to be give an equivalent level of concern to C or M properties and the information gathered indicates that DCPD is of low toxicity to environmental organisms.

Overall conclusion: Based on the screening assessment of the available data (CSR) the submission substance is not a PBT / vPvB substance, does not fulfil the PBT and vPvB criteria.

12.6. Endocrine disrupting properties

The substance is not included in the candidate list pursuant to Article 59 (Paragraph 1) of the REACH Directive due to the characteristics that can compromise endocrine activities.

12.7. Other adverse effects

DCPD is not expected to contribute to ozone depletion, ozone formation, global warming or acidification.

Pursuant to Appendix 1 of Act No. 254/2001Coll. (the Water Act), the product is considered a hazardous harmful substance.

Do not allow product to reach ground water, water course or sewage system.

Danger to drinking water if even small quantities leak into the ground.

Also poisonous for fish and plankton in water bodies.
Toxic for aquatic organisms.
WGK: 3

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

If the remainder of the product is to be disposed (eg unused or leaked product), the valid European Union and national legislature as well as locally valid regulations have to be complied with. Deliver the waste for disposal to a professionally qualified person /to facility with the appropriate authorization to manage waste.
Recommended waste classification pursuant to COMMISSION DECISION of 18 December 2014, amending Decision 2000/532/EC on the list of waste pursuant to Directive 2008/98/EC of the European Parliament and of the Council:

13.1.1. Catalogue number

Catalogue number for products that have become waste:

07 01 04* Other organic solvents, washing liquids and mother liquors.
16 03 05* Organic waste containing dangerous substances.

Catalogue number for leaked product absorbed into an absorption agent (e.g. vapex):

15 02 02* Absorbents, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated by dangerous substances.

Catalogue number for soil contaminated by leaked product:

17 05 03* Soil and stones containing dangerous substances.

13.1.2. Recommended waste removal method

Deliver the unusable remainder of the product for disposal to a professionally qualified person with the appropriate authorization.
Recommended removal method: Energy utilization (burning)

13.1.3. Measures for limiting exposure when handling waste

Do not flush leaked product during an emergency event or accident into sewage. Proceed in accordance with instructions provided in Section 6 („Accidental release measures“) and in Subsection 8.2 („Limiting exposure“) and adhere to all valid legal regulations for the protection of people, air and water.

WARNING: *The stated information is of a recommendation character. It is related to the delivered, still unused material. Pursuant to the Waste Act, all responsibilities for managing the waste, including its assignment based on its type and category, are responsibilities of the waste originator.*

SECTION 14: TRANSPORT INFORMATION

The listed information applies to road transport (ADR) and rail (RID) transport of dangerous goods:

14.1. UN number or ID number	2048
14.2. UN proper shipping name	2048 DICYCLOPENTADIENE
14.3. Transport hazard class(es)	3
14.4. Packing group	III
14.5. Environmental hazards	based on the criteria of the UN sample regulations, the product is harmful to the environment
14.6. Special precautions for user	none
14.7. Maritime transport in bulk according to IMO instruments	the product is not designated for bulk transport pursuant to the International Maritime Organization (IMO) documents

14.8. Other information

Hazard identification number: 30
Classification code: F1
Labels: 3 + label for substances endangering the environment (symbol: fish and tree)

14.9. ADR - Excepted quantities

Limited quantities (LQ) 5L
Excepted quantities (EQ) Code: E1
Maximum net quantity per inner packaging: 30 ml
Maximum net quantity per outer packaging: 1000 ml
Transport category 3
Tunnel restriction code D/E

SECTION 15: REGULATORY INFORMATION

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

15.1.1. European Union

Regulation of the European Parliament and Council (EC) No. 1907/2006 (REACH), as amended

REGISTRATION (TITLE II OF THE REACH REGULATION)

the product was fully registered as a substance

AUTORISATION (TITLE VII OF THE REACH REGULATION)

the product is not listed in the list of substances in Annex XIV of EC Regulation No 1907/2006 REACH, and so no licensing obligation applies

RESTRICTION (TITLE VIII OF THE REACH REGULATION)

the product shall not be used in aerosol dispensers for amusement and decorative purposes intended for sale to the public(annex XVII, point 40);

the product shall not be used as part of decorative or entertainment items and games, as specified in more detail in point 3 of Annex XVII to the REACH Regulation;

Regulation of the European Parliament and Council (EC) No. 1272/2008 (CLP), as amended

the product has been classified in compliance with the stated regulation, packaging and labeling obligations of dangerous chemicals only apply to the product if it is marketed in packaging subject to its labelling according to CLP regulation

Regulation of the European Parliament and Council (EC) No. 649/2012 on the export and import of dangerous chemicals, as amended

the product is not subject to special import or export restrictions

Regulation (EU) 2019/1148 of the European Parliament and of the Council of 20 June 2019 on the marketing and use of explosives precursors, amending Regulation (EC) No 1907/2006 and repealing Regulation (EU) No 98/2013, as amended

does not apply - the product is not a precursor to explosives

Commission Decision of 18 December 2014, amending Decision 2000/532/EC on the list of waste pursuant to Directive 2008/98/EC of the European Parliament and of the Council

15.1.2. Czech Republic

Act No. 350/2011 Coll. on Chemical Substances and Chemical Mixtures, as amended

the product is not subject to the obligation of notification to the information system PCN (Poison centres notification)

Act No. 258/2000 Coll. on the Protection of Public Health, as amended
Act No. 254/2001 Coll., on Water, as amended
Act No. 201/2012 Coll., on Air Protection, as amended
Act No. 541/2020 Coll., on Waste, as amended
Decree of Ministry of Environment no. 8/2021 Coll. laying down Waste Catalogue, as amended
Governmental decree no. 361/2007 Coll., laying down occupational health and safety conditions

product has exposure limits;

Act no. 224/2015 Coll., on prevention of serious accidents caused by selected dangerous chemical substances or mixtures

15.2. Chemical safety assessment

The appropriate chemical safety assessment (CSR) was conducted when substance was registered. The substance fulfills the criteria for being classified as a hazardous substance pursuant to Directive (EC) No. 1272/2008 CLP. Exposure assessment and the consequent risk characterization procedure were executed. Exposure scenarios according to Article 31 of Regulation (EC) No. 1907/2006 of the European Parliament and of the Council (REACH) are attached to the safety data sheet.

SECTION 16: OTHER INFORMATION

Changes adopted as a part of the revision process

22/08/2022: Revision (2): Editing information in the sections 1. and 15. - registration of a substance under REACH;

10/02/2023: Revision (3): Editing information in the sections: 2.; 3.; 4.; 8.1.2.; 9.1.; 11.1 and Annex - Exposure scenarios – additing informations from registration dossier/CSR according REACH regulatory, add new hazard classification STOT RE2;

Acronyms and abbreviations used in the text

ADR	Agreement concerning the International Carriage of Dangerous Goods by Road
CAS	Registration number assigned to the substance by the Chemical Abstracts Service of the American Chemical Society
CLP	EU Directive No. 1272/2008 on Classification, Labeling and Packaging of chemical substances and mixtures, which is implemented into the European legislature by the means of GHS (United Nations´ Globally harmonized System) for classifying and labeling chemical substances
CMR	Carcinogenic, mutagenic or toxic for reproduction
ČSN EN (ISO)	European standard incorporated into the Czech technical standards
CSR	Chemical Safety Report
DMEL	Derived minimal effect level - an exposure level that corresponds to a low and possibly theoretical risk, which should be considered as an acceptable risk (for threshholdless effects, i.e. there is no exposure level without effect))
DNEL	Derived no-effect level - level of exposure derived from toxicological data that does not produce any adverse effects on human health
DW	Data waiving
EC_{50}	Effective concentration EC_{50} is the concentration of substance that causes immobilization of 50% of individuals
ErC_{50}	Effective concentration EC_{50} is the concentration of substance that causes 50 % decrease of Algea growth
ECHA	European Chemicals Agency
ES	Official number of the chemical substance in the European Union: EINECS from the European Inventory of Existing Commercial Substances, or ELINCS from the European List of Notified Chemical Substances, or NLP from the No Longer Polymer list
HSDB	Hazardous Substances Data Bank
IATA	International Air Transport Association
IBC	Intermediate Bulk Container
IC_{50}	Inhibition concentration IC_{50} that causes inhibition of 50% of individuals
ICAO	International Civil Aviation Organization
ICE	"Intervention in Chemical Transport Emergencies" system providing both professional and practical assistance in dealing with emergency situations related to the transport and storage of hazardous chemicals
IMDG	International Maritime Dangerous Goods
IMO	International Maritime Organisation
ISO	International Organization for Standardization

LC_{50}/LD_{50}	Lethal concentration/level is the concentration/level of substance that causes mortality of 50 % individuals
LOEC/LOEL	Lowest Observed Effect Concentration/Level
log Kow	Logarithm of distribution coefficient n-octanol/water
MARPOL	International convention on preventing boat pollution, as amended by the 1978 protocol
nf	Not feasible
NOAEC/NOAEL	No Observed Adverse Effect Concentration/No Observed Adverse Effect Level
NOEC/NOEL	No Observed Effect Concentration/No Observed Effect Level
NPK-P	The highest permitted concentration of the chemical substance in the air (the concentration of the substance that a worker may be exposed to for a maximum of 15 minutes but which must never be exceeded)
OECD	Organization for Economic Co-operation and Development
OOP	Recommended personal protective aids
OSN	United Nations
(Q)SAR	Quantitative Structure-Activity Relationship
PBT, vPvB	Persistent, bioaccumulative and toxic; high persistent and high bioaccumulative
PCN	Poison Centres Notification – international system for the notification of dangerous mixtures
PEL	Permitted exposure limit of the chemical substance in the air (the exposure value that an employee may be exposed to during the entire working shift (8 hours), without endangering his health during lifetime occupational exposure)
PNEC	Predicted No Effect Concentration
REACH	EU Directive No. 1907/2006 on Registration, Evaluation and Authorization of Chemicals
RID	Regulations concerning the International Carriage of Dangerous Goods by Rail
SDS	Safety Data Sheet
STOT	Specific Target Organ Toxicity
STP	Sewage treatment plant
su	Scientifically Unjustified
TRINS	Transport Information and Accident System of the Czech Republic, providing professional and practical assistance in dealing with emergency situations related to transport and storage of hazardous chemical substances, included in ICE
UACRON	Chemical database (The University of Akron).
UFI code	Unique identifier of the composition of the product containing the dangerous mixture (s).
UN	The four-digit identification number of the substance or object identifying hazardous material in international transport
UVCB	Substances of Unknown or Variable composition, Complex reaction products or Biological materials

Data sources used for preparing the material safety sheet

Annexes I, IV, VI and VII to Regulation (EC) No. 1272/2008 CLP, as amended.
Principles for providing first aid upon being exposed to chemical substances.
Research data sources (PubChem; CLP notification, ECHA, Gestis sanitary limits).
Substance registration documentation pursuant to Regulation (EC) No. 1907/2006 REACH
Decision of ECHA on registration in accordance with EC Regulation No 1907/2006 REACH

Full text of H-/ EUH-sentences and abbreviations of hazard classes stated in Section 2 and/or 3

H 225	Highly flammable liquid and vapour.
H 302	Harmful if swallowed.
H 304	May be fatal if swallowed and enters airways.
H 315	Causes skin irritation.
H 319	Causes serious eye irritation.
H 330	Fatal if inhaled.
H 332	Harmful if inhaled.
H 335	May cause respiratory irritation.
H 361	Suspected of damaging fertility or the unborn child.
H 373	May cause damage to organs through prolonged or repeated exposure < state route of exposure: oral>.

H 400	Very toxic to aquatic life with long lasting effects.
H 411	Toxic to aquatic life with long lasting effects.
Aquatic Acute	Hazards to the aquatic environment, category Acute toxicity
Aquatic Chronic	Hazards to the aquatic environment, category Chronic toxicity
Acute Tox.	Aspiration hazard
Asp. Tox.	Aspiration hazard
Eye Irrit.	Eye irritation
Flam. Liq.	Flammable liquid
Repr.	Reproductive toxicity
Skin Irrit.	Skin irritation
STOT SE	Specific target organ toxicity (single explosure)
STOT RE	Specific target organ toxicity (repeated explosure)

Training instructions

Persons handling the product must be advised of the risks involved in handling the product and the health and environmental protection requirements (see applicable provisions of the Labor Code).

Access to information

Pursuant to Article 35 of Directive (EC) No. 1907/2006 REACH, every employer is obliged to allow access to the information stated on the given material safety sheet to all workers who use this product or are exposed to its impacts while working, and also to representatives of these workers.

Occupational exposure limit values for countries (see point 8.1.1)

Name	Country	8-hour limit [mg.m^{-3}]	Short-term limit [mg.m^{-3}]
Dicyclopentadiene CAS: 77-73-6	European Union (Regulation No. 2000/39/EC as amended)	Limit values for the substance itself have not been determine *it is recommended to adhere to the limits determined for the components contained in the substance:*	
	European Union	*not specified*	*not specified*
	France	*30*	*not specified*
	Italy	*not specified*	*not specified*
	Germany (AGS)	*2,7*	*2,7*
	Poland	*10*	*not specified*
	Austria	*3*	*6*
	Slovenia	*not specified*	*not specified*
	Netherlands	*not specified*	*not specified*
	United Kingdom	*27*	*not specified*
	USA - NIOSH	*30*	*not specified*
	People's Republic of China	*25*	*not specified*

8-hour limit: *Measured or calculated in relation to the 8-hour reference period as a timely weighted average*
Short-term limit: *Exposure limit value, which shall not be exceeded and which corresponds to a 15-minute period*

Emergency telephone number for countries (see subsection 1.4)

Nationale centers (PCCS)		TELEPHON	LANGUAGE	web
Great Britain		☎ 8448920111	English	☎+44/123 5836002; 5753363
Belgium		☎+32/70245245	French	http://www.centreantipoisons.be
		☎+32/70245245	Dutch	http://www.antigifcentrum.be
		☎+32/70245245	German	http://www.poisoncentre.be
Bulgaria		☎+359/29154411	Bulgarian	https://pirogov.eu/bg
Croatia		☎+385/12348342	Croatian	https://www.imi.hr/en/jedinica/poison-control-centre
Czech Republic		☎+420/224-919293; 915402	Czech	http://www.tis-cz.cz
Denmark		☎+45/82121212	Danish	https://www.bispebjerghospital.dk/giftlinien

Estonia		☎+372/7943794	Estonian	https://www.16662.ee
Finland		☎+358/9471977	Finnish	http://www.hus.fi/sairaanhoito/sairaanhoitopalvelut/myrkytystietokeskus/Sivut/default.aspx
France - Angers		☎+33/241482121	French	http://www.centres-antipoison.net/angers/index.html
France - Bordeaux		☎+33/556964080	French	http://www.centres-antipoison.net/bordeaux/index.html
France - Lille		☎+33/0800595959	French	http://www.centres-antipoison.net/lille/index.html
France - Lyon		☎+33/472116911	French	http://www.centres-antipoison.net/lyon/index.html
France - Marseille		☎+33/491752525	French	http://www.centres-antipoison.net/marseille/index.html
France - Nancy		☎+33/383225050	French	http://www.centres-antipoison.net/nancy/index.html
France - Paris		☎+33/140054848	French	http://www.centres-antipoison.net/paris/index.html
France - Strasbourg		☎+33/388373737	French	http://www.centres-antipoison.net/strasbourg/index.html
France - Toulouse		☎+33/561777447	French	http://www.centres-antipoison.net/toulouse/index.html
Ireland		☎+353/18092166	English	http://www.poisons.ie/Public
Italy - Bergamo		☎+39/800883300	Italian	http://www.asst-pg23.it/section/259/Tossicologia_-_Centro_antiveleni
Italy - Firenze		☎+39/557947819	Italian	http://www.antiveleni.altervista.org
Italy - Milano		☎+39/266101029	Italian	http://www.centroantiveleni.org
Italy - Pavia		☎+39/38224444	Italian	http://www-3.unipv.it/reumatologia-tossicologia/cav
Italy - Napoli		☎+39/817472870	Italian	
Italy - Foggia		☎+39/881732326	Italian	
Italy - Roma		☎+39/668593726, 39/649978000, 39/63054343	Italian	http://www.corso-primo-soccorso-roma.it/centriantiveleno-lazio.html
Cyprus		☎+357/22405611	Greek	http://www.mlsi.gov.cy/
Lithuania		☎+370/52362052	Lithuanian	http://www.apsinuodijau.lt
Latvia		☎+371/67000610	Latvian	https://www.aslimnica.lv/lv
Luxembourg		☎+49/80025500	German	http://www.poisoncentre.be
		☎+352/80025500	French	http://www.centreantipoisons.be
Hungary		☎+36/680201199, 36/0614766464	Hungarian	http://www.okbi.hu/page.php?trid=1&dz=103
Malta		☎+356/23952000	English	https://mccaa.org.mt/
Germany - Berlin		☎+49/3019240	German	https://giftnotruf.charite.de
Germany - Bonn		☎+49/22819240	German	http://www.gizbonn.de/index.php?id=272
Germany - Erfurt		☎+49/361730730	German	https://www.ggiz-erfurt.de/home.html
Germany - Freiburg		☎+49/76119240	German	https://www.uniklinik-freiburg.de/giftberatung.html
Germany - Göttingen		☎+49/55119240	German	https://www.giz-nord.de/cms/index.php
Germany – Homburg/Saar		☎+49/684119240	German	http://www.uniklinikum-saarland.de/de/einrichtungen/kliniken_institute/kinder_und_jugendmedizin/informations_und_behandlungszentrum_fuer_vergiftungen_des_saarlandes
Germany – Mainz		☎+49/613119240	German	http://www.giftinfo.uni-mainz.de/index.php?id=24807
Germany - München		☎+49/8919240	German	http://www.toxinfo.med.tum.de
Netherlands		☎+31/31887558561	Dutch	http://www.productnotification.nl/
Poland - Kraków		☎+48/124119999	Polish	http://www.oit.cm.uj.edu.pl
Poland – Gdansk		☎+48/586820404	Polish	http://www.pctox.pl/news.php

Poland – Poznaň		☎+48/618476946	Polish	http://www.raszeja.poznan.pl/oddzialy/oddzialtoksykologiczny
Poland - Warszawa		☎+48/607218174	Polish	okzit@burdpi.pol.pl
Portugal		☎+351/808250143	Portuguese	http://www.inem.pt
Austria		☎+43/14064343	German	http://www.goeg.at/de/VIZ
Greece		☎+30/2132009000	Greek	http://www.aglaiakyriakou.gr/; http://0317.syzefxis.gov.gr
Romania		☎+40/213183606, 215992300, 265212111	Romanian	spital@urgentafloreasca.ro secretariat@spitjudms.ro infotox@insp.gov.ro
Slovakia		☎+421/254774166	Slovak	http://www.ntic.sk
Slovenia		☎+386/15221293	Slovenian	www.kclj.si
Spain		☎+34/915620420	Spanish	https://www.administraciondejusticia.gob.es/paj/publico/ciudadano/informacion_institucional/organismos/instituto_nacional_de_toxicologia_y_ciencias_forenses/servicios/info_toxicologica/que_es_sit/!ut/p/c5/04_SB8K8xLLM9MSSzPy8xBz9CP0os3g_A1cjCyd-DRwMDUwNLA08nwzAvM0czA_8gM6B8pFm8maerqWdQsImJcaiLiYGncViYa4CHr4GBiQExug1wAEd-CusNBrsWpwsLUACKPy3WuRvjlg83wy5sQ0G8CtR-P__w88nNT9QtyQyMMMj0zA9IVFQHY18l4/dl3/d3/L2dJQSEvUUt3QS9ZQnZ3LzZfTjBFMjhCMUEwMDUwOTBJQjFWSjZBNjBPTjA!/?itemId=45381
Sweden		☎+46/104566700	Swedish	https://giftinformation.se

Statement: *The material safety sheet has been prepared in compliance with Directive (EC) No. 1907/2006 REACH. It includes data that are necessary for securing occupational health and safety and the protection of the environment. These data have been provided in good faith, correspond to the current state of knowledge and experience and are in accordance with our valid legal regulations The data provided does not replace the quality specification and can not be considered as a guarantee of the suitability and usability of this product for a specific application. It is the responsibility of the product user to assess the accuracy of the information in a particular application where the product's properties can influence different factors. The consumer is responsible for compliance with the appropriate, regionally valid legal regulations.*

ANNEX OF MATERIAL SAFETY DATA SHEET

EXPOSURE SCENARIOS ACCORDING TO ARTICLE 31 OF REGULATION (EC) NO 1907/2006 (REACH) OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

The Annex contains **exposure scenarios contained in Chapter 9 of the chemical safety report** dated **07/12/2022** (**numbering from it is maintained here below**) for identified uses of the substance processed by Chesar v3.7.

Exposure scenario	**Title**	**pages**
ES2 (IS)	Intermediate use of the substance	24 - 36
ES3 (IS)	Polymer Production	37 - 50
ES4 (IS)	Polymer Processing	51 - 63
ES5 (PW)	Polymer Processing	64 - 73
IS – Industrial end use at site; PW – Professional workers		

General section for environmental contributing scenarios ENV CS (for ES 2-5)

9.0.3. Introduction to the assessment for the environment

9.0.3.1. Tonnage

Table 9.2. Tonnage for assessment

Exposure scenario	**Title**	
ES2 (IS)	Intermediate use of the substance (ERC 6a)	8.5E4
ES3 (IS)	Polymer Production (ERC 6c)	4.1E4
ES4 (IS)	Polymer Processing (ERC 4)	2E3
ES5 (PW)	Polymer Processing (ERC 8d)	1E3

9.0.3.2. Scope and type of assessment for the environment

The scope of exposure assessment and type of risk characterisation required for the environment are described in the following table based on the hazard conclusions presented in section 7 (of CSR).

Table 9.2. Type of risk characterisation required for the environment

Protection target	**Risk characterisation type**	**Hazard conclusion (see section 7)**
Fresh water	Quantitative	PNEC aqua (freshwater) = 98 µg/L
Sediment (freshwater)	Quantitative	PNEC sediment (freshwater) = 15.2 mg/kg sediment dw
Marine water	Quantitative	PNEC aqua (marine water) = 9.8 µg/L
Sediment (marine water)	Quantitative	PNEC sediment (marine water) = 1.52 mg/kg sediment dw
Sewage Treatment Plant	Quantitative	PNEC STP = 2.2 mg/L
Air	Not needed	No hazard identified
Agricultural soil	Quantitative	PNEC soil = 2.98 mg/kg soil dw
Predator's prey (freshwater)	Not needed	No potential for bioaccumulation
Predator's prey (marine water)	Not needed	No potential for bioaccumulation
Top predator's prey (marine water)	Not needed	No potential for bioaccumulation
Predator's prey (terrestrial)	Not needed	No potential for bioaccumulation

General section for worker contributing scenarios Worker CS (for ES 2-5)

9.0.4. Introduction to the assessment for workers

9.0.4.1. Scope and type of assessment for workers

The scope of exposure assessment and type of risk characterisation required for workers are described in the following table based on the hazard conclusions presented in CSR section 5.11.

Table 9.5. Type of risk characterisation required for workers

Route	Type of effect	Risk characterisation type	Hazard conclusion (CSR section 5.11)
Inhalation	Systemic effects - long term	Quantitative	DNEL (Derived No Effect Level) = 1.058 mg/m³
	Systemic effects - acute	Not needed	No hazard identified
	Local effects – long term	Quantitative	DNEL (Derived No Effect Level) = 2.31 mg/m³
	Local effects - acute	Quantitative	DNEL (Derived No Effect Level) = 160.2 mg/m³
Dermal	Systemic effects - long term	Quantitative	DNEL (Derived No Effect Level) = 0.3 mg/kg bw/day
	Systemic effects - acute	Not needed	No hazard identified
	Local effects – long term	Not needed	No hazard identified
	Local effects - acute	Not needed	No hazard identified
Eye	Local effects	Qualitative	Low hazard (no threshold derived)

9.0.4.2. Comments on assessment approach for workers

Concentration limits for uses in mixture

The following concentration limits are set for use in mixture. If the substance is in a mixture below those concentrations, qualitative risks are assumed to be controlled for the respective routes and types of effect:

- Eye effect: 10%

General information on risk management related to toxicological hazard:

For qualitative endpoints such as Skin Irritation (H315) and Eye Irritation (H319) risk management measures (RMMs) were implemented to ensure that risk is minimised. For Aspiration Hazard (H304) the advice is for the worker as follows: Do not ingest. If swallowed then seek immediate medical assistance.

General information on risk management related to physicochemical hazard:

The substance is classified as H225 (flammability hazard). The following RMMs and operational conditions would ensure minimal risk. FLAMMABILITY HAZARD - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

Operational conditions and Risk Management measures (conditions of use) common for all contribution scenarios CS

Operational conditions and Risk Management measures (conditions of use) common for all contribution scenarios CS	**Method**
Product (Article) characteristics	
• Percentage (w/w) of substance in mixture/article: <= 100.0 % (unless otherwise specified by exception for EC 4 or 5)	TRA Workers 3.0
• Physical form of the used product: Liquid, including paste/slurry/suspension	TRA Workers 3.0
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: *see specific ´Conditions of use´ for a particular CS*	TRA Workers 3.0
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced **or** • Occupational Health and Safety Management System: Basic (for ES 5)	TRA Workers 3.0
• General (room) ventilation: *see specific ´Conditions of use´ for a particular CS*	TRA Workers 3.0
• Local exhaust ventilation: *see specific ´Conditions of use´ for a particular CS*	TRA Workers 3.0
Conditions and measures related to personal protection, hygiene and health evaluation	
• Respiratory protection: *see specific ´Conditions of use´ for a particular CS*	TRA Workers 3.0
• Dermal protection: see specific ´Conditions of use´ for a particular CS	TRA Workers 3.0
• Face/eye protection: Eye protection	
Other conditions affecting workers exposure	
• Operating temperature: for a specific CS it is mostly <= 32°C (then <= 40°C or 20°C)	TRA Workers 3.0
• Place of use: *see specific ´Conditions of use´ for a particular CS*	TRA Workers 3.0
General measures (eye irritants) [G44] Use suitable eye protection [PPE26] Avoid direct eye contact with product, also via contamination on hands [E73] Assumes a good basic standard of occupational hygiene is implemented [G1] General measures (skin irritants) [G19]: Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if direct hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin effects that may develop [E3].	

Remarks on exposure dataset obtained with ECETOC TRA

The vapour pressure at operating temperature (20°C) used for the calculation is 186 Pa.
The vapour pressure at operating temperature (32°C) used for the calculation is 418.2 Pa.
The vapour pressure at operating temperature (40°C) used for the calculation is 689.5 Pa.

Risk characterisation

Qualitative risk characterisation (Eye, local): RMMs listed in the QRA (section 9.0.4 above) such as eye and dermal protection are included for each activity.

INSTRUCTIONS FOR COMPLIANCE CHECK WITH THE EXPOSURE SCENARIO

Exposure estimates were conducted using the ECETOC TRA assessment method. If complying with the recommended risk management measures under the listed operating conditions, it is not expected that exposure could exceed the established DNEL/DMEL values.
Manufacturing processes do not present an unacceptable risk to the health of industrial workers if the exposures are controlled by appropriate operating conditions (eg task duration, use of ventilation) and risk management measures (eg personal protective equipment) of such a type, that the exposures do not exceed the established DNELs / DMELs.Where risk management measures / operational conditions have been modified, users must make sure that risks are controlled at least at equivalent levels.

Exposure assessment

9.2. Exposure scenario 2: Use at industrial sites - Intermediate use of the substance

Environment contributing scenario(s):	
CS 1 Intermediate use of the substance	ERC 6a
Worker contributing scenario(s):	
CS 2 General exposures (closed systems) [CS15] (Indoor)	PROC 1
CS 3 General exposures (closed systems) [CS15] (Outdoor)	PROC 1
CS 4 General exposures (closed systems) [CS15] (LEV, Indoor, continuous process)	PROC 2
CS 5 General exposures (closed systems) [CS15] (LEV, Indoor, batch process)	PROC 3
CS 6 General exposures (closed systems) [CS15] (LEV, Indoor)	PROC 4
CS 7 General exposures (closed systems) [CS15] (RPE, Indoor)	PROC 4
CS 8 General exposures (closed systems) [CS15] (RPE, Indoor)	PROC 4
CS 9 Process sampling [CS2] (LEV, Indoor)	PROC 9
CS 10 Process sampling [CS2] (RPE, Indoor)	PROC 9
CS 11 Process sampling [CS2] (RPE, Outdoor)	PROC 9
CS 12 Bulk transfers [CS14] . (closed systems) [CS107] (LEV, Indoor)	PROC 8b
CS 13 Bulk transfers [CS14] (LEV, Indoor)	PROC 8b
CS 14 Bulk transfers [CS14] (RPE, Outdoor)	PROC 8b
CS 15 Bulk transfers [CS14] . (closed systems) [CS107] (LEV, Indoor)	PROC 8b
CS 16 Equipment cleaning and maintenance [CS39] (LEV, Indoor)	PROC 8a, PROC 28
CS 17 Storage [CS67] (Indoor)	PROC 1
CS 18 Storage [CS67] (Indoor)	PROC 2

CS *Contribution scenario*
RPE *Respiratory Protect. Equipment*
LEV *Local exhaust ventilation*

Further description of the use:
This exposure scenario is for the use of the substance as an intermediate (not related to Strictly Controlled Conditions). It includes recycling/ recovery, material transfers, storage, sampling, associated laboratory activities, maintenance and loading (including marine vessel/barge, road/rail car and bulk container).

9.2.1. Environmental contributing scenario ENV CS 1: Intermediate use of the substance (ERC 6a)

9.2.1.1. Conditions of use

Amount used, frequency and duration of use (or from service life)
• Annual use amount at site: <= 2E3 tonnes/year
• Daily use amount at site: <= 50 tonnes/day *The substance maximum use rate (MSPERC) is assumed to be 50 tonnes/day.* *Maximum site tonnage, based on sector knowledge (Maximum amount of substance that is delivered to a site in one day based on typical site capacity (e.g., two trucks, each with a volume of 25 tonnes)). May be overwritten with own use rate.* *300 emission days/year were assumed (Default 'Manufacture' – Tonnage > 10000 tonnes/year. Consider overwriting for own tonnage < 10000).*
Technical and organisational conditions and measures
• On-site treatment of off-air: Typical measures to maintain workplace concentrations or airborne VOCs and particulates below respective OELS *e.g. thermal wet scrubber - gas removal and/or air filtration - particle removal and/or thermal oxidation and/or vapour recovery - adsorption*
• Process efficiency: Process optimized for highly efficient use of raw materials (very minimal environmental release)
• On-site treatment of off-air: Upgrade of the system in place or additional air treatment measures [Effectiveness Air: 50%] *Upgrade of the system in place or additional air treatment measures, such as wet scrubber and/or air filtration and/or thermal oxidation and/or vapour recovery systems, in order to achieve a reduction of the air emissions. 50% is the arbitrary default of this determinant value to be overwritten by the assessor according to the required removal efficiency (assessment outcome)* Air explanation: *Arbitrary values, overwritten according to the assessment outcome*
• Indoor/outdoor use: Indoor Use
• On-site treament of wastewater: Acclimated biological treatment [Effectiveness Water: 70%] *For readily and inherently biodegradable substances, the removal efficiency for acclimated biological treatment may be significantly higher than SimpleTreat estimates; thus, SimpleTreat estimates can serve as a conservative lower bound. Substance-specific efficiencies can be considered and can be used to overwrite the arbitrary default of this determinant value, which is set to 70%* Water explanation: *For readily and inherently biodegradable substances, the removal efficiency for acclimated biological treatment may be significantly higher than SimpleTreat estimates; thus, SimpleTreat estimates can serve as a conservative lower bound.* *Substance-specific efficiencies can be considered and can be used to overwrite the arbitrary default of this determinant value, which is set to 70 %.*
• Equipment cleaning: No release to wastewater from process as such, wastewater emissions limited to release generated from final equipment cleaning step using water
Conditions and measures related to biological sewage treatment plant
• Application of the STP sludge on agricultural soil: No
• Biological STP: Site specific [Effectiveness Water: 91.56%]
• Discharge rate of STP: >= 2E3 m3/day
Conditions and measures related to external treatment of waste (including article waste)
• Particular considerations on the waste treatment operations: No (low risk) *ERC based assessment demonstrating control of risk with default conditions. Low risk assumed for waste life stage. Waste disposal according to national/local legislation is sufficient.*
Other conditions affecting environmental exposure: • Dilution factor to freshwater: <= 40

Fate (release percentage) in the biological sewage treatment plant

The biological STP is site specific and the releases to the various compartments have been set by the assessor. They are distributed in the following way:

Release to water	8.435%
Release to air	79.87%
Release to sludge	11.68%
Release degraded	0%

Explanation: Default EUSES settings

9.2.1.2. Releases

The local releases to the environment are reported in the following table. Note that the releases reported do not account for the removal in the modelled biological STP.

Table 9.25. Local releases to the environment

Release	Release estimation method	Explanations
Water	Estimated release factor (Maximum Allowable Emission)	**Release factor before on site RMM:** 0.06% **Release factor after on site RMM:** 0.018% **Local release rate:** 9 kg/day
Air	Estimated release factor (Maximum Allowable Emission)	**Release factor before on site RMM:** 1% **Release factor after on site RMM:** 0.5% **Local release rate:** 250 kg/day
Non agricultural soil	ERC	**Release factor after on site RMM:** 0.1%

9.2.1.3. Exposure and risks for the environment and man via the environment

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table. The exposure estimates have been obtained with EUSES 2.1.2 unless stated otherwise.

Table 9.26. Exposure concentrations and risks for the environment and man via the environment

Protection target	Exposure concentration	Risk quantification
Fresh water	**Local PEC:** 9.75E-3 mg/L	RCR = 0.099
Sediment (freshwater)	**Local PEC:** 1.511 mg/kg dw	RCR = 0.099
Marine water	**Local PEC:** 3.81E-3 mg/L	RCR = 0.389
Sediment (marine water)	**Local PEC:** 0.591 mg/kg dw	RCR = 0.389
Sewage Treatment Plant	**Local PEC:** 0.38 mg/L	RCR = 0.173
Agricultural soil	**Local PEC:** 0.075 mg/kg dw	RCR = 0.025
Man via environment - Inhalation (systemic effects)	**Concentration in air:** 7.62E-3 mg/m³	RCR = 0.029
Man via environment - Inhalation (local effects)	**Concentration in air:** 7.62E-3 mg/m³	RCR = 0.012
Man via environment - Oral	**Exposure via food consumption:** 2.87E-4 mg/kg bw/day	RCR < 0.01
Man via environment - combined routes		RCR = 0.031

9.2.2. Worker CS 2: General exposures (closed systems) [CS15]; Indoor (PROC 1)

9.2.2.1. Conditions of use – specific to CS

	Method
• Duration of activity: <= 8 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: No	TRA Workers 3.0
• Closed process without likelihood of exposure	TRA Workers 3.0
• Dermal protection: Yes (effectiveness >= 80%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.2.2.2. Exposure and risks for workers

Table 9.27. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.055 mg/m³ (TRA Workers)	RCR = 0.052
Inhalation, local, long term	0.055 mg/m³ (TRA Workers)	RCR = 0.024
Inhalation, local, acute	0.22 mg/m³ (TRA Workers)	RCR < 0.01
Dermal, systemic, long term	6.8E-3 mg/m³ (TRA Workers)	RCR = 0.023
Combined routes, systemic, long-term		RCR = 0.075

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.2.3. Worker CS 3: General exposures (closed systems) [CS15]; Outdoor (PROC 1)

9.2.3.1. Conditions of use – specific to CS

	Method
• Duration of activity: <= 8 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: No	TRA Workers 3.0
• Closed process without likelihood of exposure	TRA Workers 3.0
• Dermal protection: Yes (effectiveness >= 80%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Outdoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.2.3.2. Exposure and risks for workers

Table 9.28. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.039 mg/m³ (TRA Workers)	RCR = 0.036
Inhalation, local, long term	0.039 mg/m³ (TRA Workers)	RCR = 0.017
Inhalation, local, acute	0.154 mg/m³ (TRA Workers)	RCR < 0.01

Route of exposure and type of effects	Exposure concentration	Risk quantification
Dermal, systemic, long term	6.8E-3 mg/m³ (TRA Workers)	RCR = 0.023
Combined routes, systemic, long-term		RCR = 0.059

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.2.4. Worker CS 4: General exposures (closed systems) [CS15]. LEV, Indoor (PROC 2)

9.2.4.1. Conditions of use – specific to CS

	Method
• Duration of activity: <= 8 h/day	TRA Workers 3.0
• Room ventilation: Good (3 to 5 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, specifically designed fixed capturing hood, on tool extraction or enclosing hoods (assumed effectiveness >= 90-95%) *Handle substance within a predominantly closed system provided with extract ventilation [E49].* Local exhaust ventilation effectiveness used by TRA: inhalation 90 %; dermal 90 %	TRA Workers 3.0
• Closed continuous process with occasional controlled exposure	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with specific employee training. (effectiveness >= 95%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.2.4.2. Exposure and risks for workers

Table 9.29. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.386 mg/m³ (TRA Workers)	RCR = 0.364
Inhalation, local, long term	0.386 mg/m³ (TRA Workers)	RCR = 0.167
Inhalation, local, acute	1.542 mg/m³ (TRA Workers)	RCR < 0.01
Dermal, systemic, long term	6.85E-3 mg/kg bw/day (TRA Workers)	RCR = 0.023
Combined routes, systemic, long-term		RCR = 0.387

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.2.5. Worker CS 5: General exposures (closed systems) [CS15]; LEV, Indoor (PROC 3)

9.2.5.1. Conditions of use – specific to CS

	Method
• Duration of activity: <=8 h/day	TRA Workers 3.0
• Room ventilation: Enhanced (5 to 10 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, specifically designed fixed capturing hood, on tool extraction or enclosing hoods (assumed effectiveness >= 90-95%) *Handle substance within a predominantly closed system provided with extract ventilation [E49].* Local exhaust ventilation effectiveness used by TRA: inhalation 90 %; dermal 90 %	TRA Workers 3.0
• Closed batch process with occasional controlled exposure	TRA Workers 3.0

	Method
• Dermal protection: Chemical resistant dermal protection with specific employee training. (effectiveness >= 95%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.2.5.2. Exposure and risks for workers

Table 9.30. Exposure concentrations and risks for workers

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**
Inhalation, systemic, long term	0.496 mg/m³ (TRA Workers)	RCR = 0.469
Inhalation, local, long term	0.496 mg/m³ (TRA Workers)	RCR = 0.215
Inhalation, local, acute	1.983 mg/m³ (TRA Workers)	RCR = 0.012
Dermal, systemic, long term	3.45E-3 mg/kg bw/day (TRA Workers)	RCR = 0.011
Combined routes, systemic, long-term		RCR = 0.48

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.2.6. Worker CS 6: General exposures (closed systems) [CS15]. LEV, Indoor (PROC 4)

9.2.6.1. Conditions of use – specific to CS

	Method
• Duration of activity: <= 8 h/day	TRA Workers 3.0
• Room ventilation: Enhanced (5 to 10 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, specifically designed fixed capturing hood, on tool extraction or enclosing hoods (assumed effectiveness >= 90-95%) *Provide extract ventilation to points where emissions occur [E54].* Local exhaust ventilation effectiveness used by TRA: inhalation 90 %; dermal 90 %	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with specific employee training. (effectiveness >= 95%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.2.6.2. Exposure and risks for workers

Table 9.31. Exposure concentrations and risks for workers

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**
Inhalation, systemic, long term	0.826 mg/m³ (TRA Workers)	RCR = 0.781
Inhalation, local, long term	0.826 mg/m³ (TRA Workers)	RCR = 0.358
Inhalation, local, acute	3.305 mg/m³ (TRA Workers)	RCR = 0.021
Dermal, systemic, long term	0. 034 mg/kg bw/day (TRA Workers)	RCR = 0.114
Combined routes, systemic, long-term		RCR = 0.895

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.2.7. Worker CS 7: General exposures (open systems) [CS16]. Indoor (PROC 4)

9.2.7.1. Conditions of use – specific to CS

	Method
• Percentage (w/w) of substance in mixture/article: <= 25 %	TRA Workers 3.0
• Duration of activity: <=4 h/day	TRA Workers 3.0
• Room ventilation: Enhanced (5 to 10 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: No	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with specific employee training. (effectiveness >= 95%)	TRA Workers 3.0
• Respiratory protection: Yes (APF >= 10)	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.2.7.2. Exposure and risks for workers

Table 9.32. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.297 mg/m³ (TRA Workers)	RCR = 0.281
Inhalation, local, long term	0.297 mg/m³ (TRA Workers)	RCR = 0.129
Inhalation, local, acute	1.983 mg/m³ (TRA Workers)	RCR = 0.012
Dermal, systemic, long term	0.206 mg/kg bw/day (TRA Workers)	RCR = 0.686
Combined routes, systemic, long-term		RCR = 0.967

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.2.8. Worker CS 8: General exposures (closed systems) [CS15]. Outdoor (PROC 4)

9.2.8.1. Conditions of use – specific to CS

	Method
• Percentage (w/w) of substance in mixture/article: <= 25 %	TRA Workers 3.0
• Duration of activity: <=1 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: No	TRA Workers 3.0
• Respiratory protection: Yes (APF >= 10)	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with specific employee training. (effectiveness >= 95%)	TRA Workers 3.0
• Place of use: Outdoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.2.8.2. Exposure and risks for workers

Table 9.33. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.231 mg/m³ (TRA Workers)	RCR = 0.219
Inhalation, local, long term	0.231 mg/m³ (TRA Workers)	RCR = 0.1

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, local, acute	4.627 mg/m³ (TRA Workers)	RCR = 0.029
Dermal, systemic, long term	0.206 mg/kg bw/day (TRA Workers)	RCR = 0.686
Combined routes, systemic, long-term		RCR = 0.905

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.2.9. Worker CS 9: Process sampling [CS2]; Indoor (PROC 9)

9.2.9.1. Conditions of use – specific to CS

	Method
• Duration of activity: <= 4 h/day	TRA Workers 3.0
• Room ventilation: Enhanced (5 to 10 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, specifically designed fixed capturing hood, on tool extraction or enclosing hoods (assumed effectiveness >= 90-95%) *Ensure samples are under containment or extract ventilation [E76] or sample via a closed loop or other system to avoid exposure [E8]* Local exhaust ventilation effectiveness used by TRA: inhalation 90 %; dermal 90 %	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with specific employee training. (effectiveness >= 95%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.2.9.2. Exposure and risks for workers

Table 9.34. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.496 mg/m³ (TRA Workers)	RCR = 0.469
Inhalation, local, long term	0.496 mg/m³ (TRA Workers)	RCR = 0.215
Inhalation, local, acute	3.305 mg/m³ (TRA Workers)	RCR = 0.021
Dermal, systemic, long term	0.034 mg/kg bw/day (TRA Workers)	RCR = 0.114
Combined routes, systemic, long-term		RCR = 0.583

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.2.10. Worker CS 10: Process sampling [CS2]; Indoor (PROC 9)

9.2.10.1. Conditions of use – specific to CS

	Method
• Percentage (w/w) of substance in mixture/article: <= 25 %	TRA Workers 3.0
• Duration of activity: <= 1 h/day	TRA Workers 3.0
• Room ventilation: Enhanced (5 to 10 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: No	TRA Workers 3.0
• Respiratory protection: Yes (APF >= 10)	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with specific employee training. (effectiveness >= 95%)	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0

	Method
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.2.10.2. Exposure and risks for workers

Table 9.35. Exposure concentrations and risks for workers

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**
Inhalation, systemic, long term	0.099 mg/m³ (TRA Workers)	RCR = 0.094
Inhalation, local, long term	0.099 mg/m³ (TRA Workers)	RCR = 0.043
Inhalation, local, acute	1.983 mg/m³ (TRA Workers)	RCR = 0.012
Dermal, systemic, long term	0.206 mg/kg bw/day (TRA Workers)	RCR = 0.686
Combined routes, systemic, long-term		RCR = 0.78

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.2.11. Worker CS 11: Process sampling [CS2] Outdoor (PROC 9)

9.2.11.1. Conditions of use – specific to CS

	Method
• Percentage (w/w) of substance in mixture/article: <= 25 %	TRA Workers 3.0
• Duration of activity: <= 1 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: No	TRA Workers 3.0
• Respiratory protection: Yes (APF >= 10)	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with specific employee training. (effectiveness >= 95%)	
• Place of use: Outdoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 21.

9.2.11.2. Exposure and risks for workers

Table 9.36. Exposure concentrations and risks for workers

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**
Inhalation, systemic, long term	0.231 mg/m³ (TRA Workers)	RCR = 0.219
Inhalation, local, long term	0.231 mg/m³ (TRA Workers)	RCR = 0.1
Inhalation, local, acute	4.627 mg/m³ (TRA Workers)	RCR = 0.029
Dermal, systemic, long term	0.206 mg/kg bw/day (TRA Workers)	RCR = 0.686
Combined routes, systemic, long-term		RCR = 0.905

9.2.12. Worker CS 12: Bulk transfers [CS14]. (closed systems) [CS107] Indoor (PROC 8b)

9.2.12.1. Conditions of use – specific to CS

	Method
• Duration of activity: <= 4 h/day	TRA Workers 3.0
• Room ventilation: Good (3 to 5 air changes per hour)	TRA Workers 3.0

	Method
• Local exhaust ventilation: Yes, enclosing hood with very high effectiveness such as fume cupboard (assumed effectiveness >= 95%) *Ensure material transfers are under containment or extract ventilation [E66].* Local exhaust ventilation effectiveness used by TRA: inhalation 95 %; dermal 95 %	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with specific employee training. (effectiveness >= 95%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.2.12.2. Exposure and risks for workers

Table 9.37. Exposure concentrations and risks for workers

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**
Inhalation, systemic, long term	0.578 mg/m³ (TRA Workers)	RCR = 0.547
Inhalation, local, long term	0.578 mg/m³ (TRA Workers)	RCR = 0.25
Inhalation, local, acute	3.856 mg/m³ (TRA Workers)	RCR = 0.024
Dermal, systemic, long term	0.034 mg/kg bw/day (TRA Workers)	RCR = 0.114
Combined routes, systemic, long-term		RCR = 0.661

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.2.13. Worker CS 13: Bulk transfers [CS14]. LEV, Indoor (PROC 8b)

9.2.13.1. Conditions of use – specific to CS

	Method
• Duration of activity: <= 8 h/day	TRA Workers 3.0
• Room ventilation: Enhanced (5 to 10 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, enclosing hood with very high effectiveness such as fume cupboard (assumed effectiveness >= 95%) Local exhaust ventilation effectiveness used by TRA: inhalation 95 %; dermal 95 %	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with specific employee training. (effectiveness >= 95%)	
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.2.13.2. Exposure and risks for workers

Table 9.38. Exposure concentrations and risks for workers

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**
Inhalation, systemic, long term	0.413 mg/m³ (TRA Workers)	RCR = 0.39
Inhalation, local, long term	0.413 mg/m³ (TRA Workers)	RCR = 0.179
Inhalation, local, acute	1.653 mg/m³ (TRA Workers)	RCR = 0.01
Dermal, systemic, long term	0.034 mg/kg bw/day (TRA Workers)	RCR = 0.114

Route of exposure and type of effects	Exposure concentration	Risk quantification
Combined routes, systemic, long-term		RCR = 0.505

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.2.14. Worker CS 14: Bulk transfers [CS14] Outdoor (PROC 8b)

9.2.14.1. Conditions of use – specific to CS

	Method
• Percentage (w/w) of substance in mixture/article: <= 5 %	TRA Workers 3.0
• Duration of activity: <= 1 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: No	TRA Workers 3.0
• Respiratory protection: Yes (APF >= 10)	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with specific employee training. (effectiveness >= 95%)	
• Place of use: Outdoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.2.14.2. Exposure and risks for workers

Table 9.39. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.077 mg/m³ (TRA Workers)	RCR = 0.073
Inhalation, local, long term	0.077 mg/m³ (TRA Workers)	RCR = 0.033
Inhalation, local, acute	1.542 mg/m³ (TRA Workers)	RCR < 0.01
Dermal, systemic, long term	0.137 mg/kg bw/day (TRA Workers)	RCR = 0.457
Combined routes, systemic, long-term		RCR = 0.53

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.2.15. Worker CS 15: Bulk transfers [CS14] (closed systems) [CS107] Indoor (PROC 8b)

9.2.15.1. Conditions of use – specific to CS

	Method
• Duration of activity: <= 4 h/day	TRA Workers 3.0
• Room ventilation: Good (3 to 5 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, enclosing hood with very high effectiveness such as fume cupboard (assumed effectiveness >= 95%) *Ensure material transfers are under containment or extract ventilation [E66].* Local exhaust ventilation effectiveness used by TRA: inhalation 95 %; dermal 95 %	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with specific employee training. (effectiveness >= 95%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.2.15.2. Exposure and risks for workers

Table 9.40. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.578 mg/m³ (TRA Workers)	RCR = 0.547
Inhalation, local, long term	0.578 mg/m³ (TRA Workers)	RCR = 0.25
Inhalation, local, acute	3.856 mg/m³ (TRA Workers)	RCR = 0.024
Dermal, systemic, long term	0.034 mg/kg bw/day (TRA Workers)	RCR = 0.114
Combined routes, systemic, long-term		RCR = 0.661

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.2.16. Worker CS 16: Equipment cleaning and maintenance [CS39]. Indoor (PROC 8a, PROC 28)

9.2.16.1. Conditions of use – specific to CS

	Method
• Percentage (w/w) of substance in mixture/article: <= 1 %	TRA Workers 3.0
• Duration of activity: <= 1 h/day	TRA Workers 3.0
• Room ventilation: Enhanced (5 to 10 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, specifically designed fixed capturing hood, on tool extraction or enclosing hoods (assumed effectiveness >= 90-95%) *LEV has been added to equate to the SOP. Drain down and flush system prior to equipment break-in or maintenance [E55]* Local exhaust ventilation effectiveness used by TRA: inhalation 90 %; dermal 90 %	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with specific employee training. (effectiveness >= 95%)	
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.2.16.2. Exposure and risks for workers

Table 9.41. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.033 mg/m³ (TRA Workers)	RCR = 0.031
Inhalation, local, long term	0.033 mg/m³ (TRA Workers)	RCR = 0.014
Inhalation, local, acute	0.661 mg/m³ (TRA Workers)	RCR < 0.01
Dermal, systemic, long term	6.86E-3 mg/kg bw/day (TRA Workers)	RCR = 0.023
Combined routes, systemic, long-term		RCR = 0.054

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.2.17. Worker CS 17: Storage [CS67] Outdoor (PROC 1)

9.2.17.1. Conditions of use – specific to CS

	Method
• Duration of activity: <= 8 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0

	Method
• Local exhaust ventilation: No	TRA Workers 3.0
• Closed process without likelihood of exposure *Store substance within a closed system [E84].*	TRA Workers 3.0
• Dermal protection: Yes (effectiveness >= 80%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Outdoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.2.17.2. Exposure and risks for workers

Table 9.42. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.039 mg/m³ (TRA Workers)	RCR = 0.036
Inhalation, local, long term	0.039 mg/m³ (TRA Workers)	RCR = 0.017
Inhalation, local, acute	0.154 mg/m³ (TRA Workers)	RCR < 0.01
Dermal, systemic, long term	6.8E-3 mg/kg bw/day (TRA Workers)	RCR = 0.023
Combined routes, systemic, long-term		RCR = 0.059

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.2.18. Worker CS 18: Storage [CS67] Indoor (PROC 2)

9.2.18.1. Conditions of use – specific to CS

	Method
• Duration of activity: <= 1 h/day	TRA Workers 3.0
• Room ventilation: Enhanced (5 to 10 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: No	TRA Workers 3.0
• Closed continuous process with occasional controlled exposure *Store substance within a closed system [E84].*	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.2.18.2. Exposure and risks for workers

Table 9.43. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.331 mg/m³ (TRA Workers)	RCR = 0.312
Inhalation, local, long term	0.331 mg/m³ (TRA Workers)	RCR = 0.143
Inhalation, local, acute	6.61 mg/m³ (TRA Workers)	RCR = 0.041
Dermal, systemic, long term	0.137 mg/kg bw/day (TRA Workers)	RCR = 0.457
Combined routes, systemic, long-term		RCR = 0.769

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.3. Exposure scenario 3: Use at industrial sites - Polymer Production

Environment contributing scenario(s):		
CS 1	Polymer Production	ERC 6c
Worker contributing scenario(s):		
CS 2	General exposures (closed systems) [CS15]. Continuous process [CS54]. No sampling [CS57] (Indoor)	PROC 1
CS 3	General exposures (closed systems) [CS15]. Continuous process [CS54]. No sampling [CS57] (Outdoor)	PROC 1
CS 4	Bulk transfers [CS14]. Transport [CS58]. With sample collection [CS56] (LEV, Indoor)	PROC 8b
CS 5	Polymerisation (bulk and batch) [CS65]. Continuous process [CS54]. With sample collection [CS56] (LEV, Indoor)	PROC 2
CS 6	Polymerisation (bulk and batch) [CS65]. Batch process[CS55]. With sample collection [CS56] (LEV, Indoor)	PROC 3
CS 7	Polymerisation (bulk and batch) [CS65]. Batch process [CS55]. With sample collection [CS56] (Outdoor)	PROC 3
CS 8	Finishing operations [CS102]. Batch process [CS55]. With sample collection [CS56] (LEV, Indoor)	PROC 3
CS 9	Intermediate polymer storage [CS66] (LEV, Indoor)	PROC 4
CS 10	Additivation and stabilisation [CS69] (LEV, Indoor)	PROC 3
CS 11	Mixing in containers [CS23]. Batch process [CS55] (LEV, Indoor)	PROC 5
CS 12	Pelletizing [CS53]. Extrusion and masterbatching [CS88] (LEV, Indoor)	PROC 6
CS 13	Pelletizing [CS53] (LEV, Indoor)	PROC 14
CS 14	Pelletisation and pellet screening [CS68]. (closed systems) [CS107]. Rework of articles [CS86] (LEV, Indoor)	**PROC 8b**, PROC 21
CS 15	Bulk transfers [CS14]. With sample collection [CS56] (LEV, Indoor)	PROC 3
CS 16	Transport [CS58]. With sample collection [CS56] (LEV, Indoor)	PROC 8b
CS 17	Equipment maintenance [CS5] (LEV, Indoor)	**PROC 8a**, PROC 28
CS 18	Storage [CS67] (Outdoor)	PROC 1
CS 19	Storage [CS67]. With occasional controlled exposure [CS137] (LEV, Indoor)	PROC 2

CS *Contribution scenario*
LEV *Local exhaust ventilation*

Further description of the use:

The use of monomers for the manufacture of polymers has been assessed using the appropriate PROC codes and Chesar tool as per ECHA technical guidance. The resulting polymers produced from these monomers are exempted from the provisions on registration of Title II of REACH (Article 2(9)) which includes the production of a chemical safety assessment (Article 14). Additionally, the producer or importer of an article containing a polymeric substance is not required to register the polymer. However, in order to ensure safe use in the event of potential exposure to residual monomer, the manufacture of polymers and their subsequent general handling in use has been assessed and included in the exposure assessment using ECETOC TRA. Calculation of the risk characterization ratio for these scenarios, for the monomers in these registrations, has demonstrated that a residual monomer level of 1% (related to the amount of monomer used) or below is safe. If the residual monomer levels are higher than this then we recommend that the downstream user assesses the product as a mixture containing monomer and applies the appropriate risk management measures for the monomer according to the description of the use (PROC/SU code).

9.3.1. Environmental contributing scenario ENV CS 1: Polymer Production (ERC 6c)

9.3.1.1. Conditions of use

Amount used, frequency and duration of use (or from service life)
• Daily use amount at site: <= 50 tonnes/day Daily use amount default approach of the REACH guidance (R16.3.2): 0.2 % of regional tonnage based on default for wide dispersive use. Conservative assumption for number of emission days: 300 days/year (default wide dispersive use, ECHA R16.3.2)
• Annual use amount at site: <= 4.1E3 tonnes/year
• Percentage of EU tonnage used at regional scale: = 10 %
Technical and organisational conditions and measures
• Equipment cleaning: No release to wastewater from process as such, wastewater emissions limited to release generated from final equipment cleaning step using water
• Indoor/outdoor use: Indoor Use
• On-site treatment of off-air: Typical measures to maintain workplace concentrations or airborne VOCs and particulates below respective OELS
• Process efficiency: Process optimized for efficient use of raw materials
Conditions and measures related to biological sewage treatment plant
• Application of the STP sludge on agricultural soil: No
• Biological STP: Site specific [Effectiveness Water: 91.56%]
• Discharge rate of STP: >= 2E3 m3/day
Conditions and measures related to external treatment of waste (including article waste)
• Particular considerations on the waste treatment operations: No (low risk) *ERC based assessment demonstrating control of risk with default conditions. Low risk assumed for waste life stage. Waste disposal according to national/local legislation is sufficient.*

Fate (release percentage) in the biological sewage treatment plant

The biological STP is site specific and the releases to the various compartments have been set by the assessor. They are distributed in the following way:

Release to water	8.435%
Release to air	79.87%
Release to sludge	11.68%
Release degraded	0%

Explanation: Default EUSES settings

9.3.1.2. Releases

The local releases to the environment are reported in the following table. Note that the releases reported do not account for the removal in the modelled biological STP.

Table 9.25. Local releases to the environment

Release	Release estimation method	Explanations
Water	Estimated release factor (Maximum Allowable Emission)	**Release factor before on site RMM:** 0.015% **Release factor after on site RMM:** 0.015% **Local release rate:** 7.5 kg/day
Air	Estimated release factor (Maximum	**Release factor before on site RMM:** 0.2%

Release	Release estimation method	Explanations
	Allowable Emission)	**Release factor after on site RMM:** 0.2% **Local release rate:** 100 kg/day
Non agricultural soil	ERC	**Release factor after on site RMM:** 0%

Releases to waste

Release factor to external waste: 0 %

9.3.1.3. Exposure and risks for the environment and man via the environment

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table. The exposure estimates have been obtained with EUSES 2.1.2 unless stated otherwise.

Table 9.26. Exposure concentrations and risks for the environment and man via the environment

Protection target	Exposure concentration	Risk quantification
Fresh water	**Local PEC:** 0.032 mg/L	RCR = 0.325
Sediment (freshwater)	**Local PEC:** 4.935 mg/kg dw	RCR = 0.325
Marine water	**Local PEC:** 3.18E-3 mg/L	RCR = 0.324
Sediment (marine water)	**Local PEC:** 0.493 mg/kg dw	RCR = 0.324
Sewage Treatment Plant	**Local PEC:** 0.316 mg/L	RCR = 0.144
Agricultural soil	**Local PEC:** 0.063 mg/kg dw	RCR = 0.021
Man via environment - Inhalation (systemic effects)	**Concentration in air:** 6.25E-3 mg/m³	RCR < 0.01
Man via environment - Inhalation (local effects)	**Concentration in air:** 6.25E-3 mg/m³	RCR < 0.01
Man via environment - Oral	**Exposure via food consumption:** 8.32E-4 mg/kg bw/day	RCR < 0.01
Man via environment - combined routes		RCR = 0.03

9.3.2. Worker CS 2: General exposures (closed systems) [CS15]. Continuous process [CS54]. No sampling [CS57]. Indoor (PROC 1)

9.3.2.1. Conditions of use – specific to CS

• Duration of activity: <= 8 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: No	TRA Workers 3.0
• Closed process without likelihood of exposure	TRA Workers 3.0
• Dermal protection: Yes (effectiveness >= 80%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32°C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.3.2.2. Exposure and risks for workers

Table 9.46. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.055 mg/m³ (TRA Workers)	RCR = 0.052
Inhalation, local, long term	0.055 mg/m³ (TRA Workers)	RCR = 0.024
Inhalation, local, acute	0.22 mg/m³ (TRA Workers)	RCR < 0.01
Dermal, systemic, long term	6.8E-3 mg/kg bw/day (TRA Workers)	RCR = 0.023
Combined routes, systemic, long-term		RCR = 0.075

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.3.3. Worker CS 3: General exposures (closed systems) [CS15]. Continuous process [CS54]. No sampling [CS57]. Outdoor (PROC 1)

9.3.3.1. Conditions of use – specific to CS

	Method
• Duration of activity: <= 8 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: No	TRA Workers 3.0
• Closed process without likelihood of exposure	TRA Workers 3.0
• Dermal protection: Yes (effectiveness >= 80%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Outdoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.3.3.2. Exposure and risks for workers

Table 9.47. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.039 mg/m³ (TRA Workers)	RCR = 0.036
Inhalation, local, long term	0.039 mg/m³ (TRA Workers)	RCR = 0.017

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, local, acute	0.154 mg/m³ (TRA Workers)	RCR < 0.01
Dermal, systemic, long term	6.8E-3 mg/kg bw/day (TRA Workers)	RCR = 0.023
Combined routes, systemic, long-term		RCR = 0.059

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.3.4. Worker CS 4: Bulk transfers [CS14]. Transport [CS58]. With sample collection [CS56]. LEV, Indoor (PROC 8b)

9.3.4.1. Conditions of use – specific to CS

	Method
• Percentage (w/w) of substance in mixture/article: <= 1 %	TRA Workers 3.0
• Duration of activity: <= 4 h/day	TRA Workers 3.0
• Room ventilation: Good (3 to 5 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, enclosing hood with very high effectiveness such as fume cupboard (assumed effectiveness >= 95%) Local exhaust ventilation effectiveness used by TRA: inhalation 95 %; dermal 95 %	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with specific employee training. (effectiveness >= 95%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.3.4.2. Exposure and risks for workers

Table 9.48. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.058 mg/m³ (TRA Workers)	RCR = 0.055
Inhalation, local, long term	0.058 mg/m³ (TRA Workers)	RCR = 0.025
Inhalation, local, acute	0.386 mg/m³ (TRA Workers)	RCR < 0.01
Dermal, systemic, long term	3.43E-3 mg/kg bw/day (TRA Workers)	RCR = 0.011
Combined routes, systemic, long-term		RCR = 0.066

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.3.5. Worker CS 5: Polymerisation (bulk and batch) [CS65]. Continuous process [CS54]. With sample collection [CS56]. LEV, Indoor (PROC 2)

9.3.5.1. Conditions of use

	Method
• Duration of activity: <=4 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, specifically designed fixed capturing hood, on tool extraction or enclosing hoods (assumed effectiveness >= 90-95%) Local exhaust ventilation effectiveness used by TRA: inhalation 90 % ; dermal 90 %	TRA Workers 3.0
• Closed continuous process with occasional controlled exposure	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with specific employee training. (effectiveness >= 95%)	TRA Workers 3.0

	Method
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.3.5.2. Exposure and risks for workers

Table 9.49. Exposure concentrations and risks for workers

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**
Inhalation, systemic, long term	0.331 mg/m³ (TRA Workers)	RCR = 0.312
Inhalation, local, long term	0.331 mg/m³ (TRA Workers)	RCR = 0.143
Inhalation, local, acute	2.203 mg/m³ (TRA Workers)	RCR = 0.014
Dermal, systemic, long term	6.85E-3 mg/kg bw/day (TRA Workers)	RCR = 0.023
Combined routes, systemic, long-term		RCR = 0.335

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.3.6. Worker CS 6: Polymerisation (bulk and batch) [CS65]. Batch process[CS55]. With sample collection [CS56]. LEV, Indoor (PROC 3)

9.3.6.1. Conditions of use

	Method
• Duration of activity: <=8 h/day	TRA Workers 3.0
• Room ventilation: Enhanced (5 to 10 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, specifically designed fixed capturing hood, on tool extraction or enclosing hoods (assumed effectiveness >= 90-95%) Local exhaust ventilation effectiveness used by TRA: inhalation 90 %; dermal 90 %	TRA Workers 3.0
• Closed batch process with occasional controlled exposure	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.3.6.2. Exposure and risks for workers

Table 9.50. Exposure concentrations and risks for workers

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**
Inhalation, systemic, long term	0.496 mg/m³ (TRA Workers)	RCR = 0.469
Inhalation, local, long term	0.496 mg/m³ (TRA Workers)	RCR = 0.215
Inhalation, local, acute	1.983 mg/m³ (TRA Workers)	RCR = 0.012
Dermal, systemic, long term	6.9E-3 mg/kg bw/day (TRA Workers)	RCR = 0.023
Combined routes, systemic, long-term		RCR = 0.492

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.3.7. Worker CS 7: Polymerisation (bulk and batch) [CS65]. Batch process [CS55]. With sample collection [CS56]. Outdoor (PROC 3)

9.3.7.1. Conditions of use

	Method
• Percentage (w/w) of substance in mixture/article: <= 25 %	TRA Workers 3.0
• Duration of activity: <=8 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: No	TRA Workers 3.0
• Closed batch process with occasional controlled exposure	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	TRA Workers 3.0
• Respiratory protection: Yes (APF >= 10)	TRA Workers 3.0
• Place of use: Outdoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.3.7.2. Exposure and risks for workers

Table 9.51. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.694 mg/m³ (TRA Workers)	RCR = 0.656
Inhalation, local, long term	0.694 mg/m³ (TRA Workers)	RCR = 0.3
Inhalation, local, acute	2.776 mg/m³ (TRA Workers)	RCR = 0.017
Dermal, systemic, long term	0.041 mg/kg bw/day (TRA Workers)	RCR = 0.138
Combined routes, systemic, long-term		RCR = 0.794

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.3.8. Worker CS 8: Finishing operations [CS102]. Batch process [CS55]. With sample collection [CS56]. LEV, Indoor (PROC 3)

9.3.8.1. Conditions of use

	Method
• Duration of activity: <=8 h/day	TRA Workers 3.0
• Room ventilation: Enhanced (5 to 10 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, specifically designed fixed capturing hood, on tool extraction or enclosing hoods (assumed effectiveness >= 90-95%) Local exhaust ventilation effectiveness used by TRA: inhalation 90 %; dermal 90 %	TRA Workers 3.0
• Closed batch process with occasional controlled exposure	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.3.8.2. Exposure and risks for workers

Table 9.52. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.496 mg/m³ (TRA Workers)	RCR = 0.469
Inhalation, local, long term	0.496 mg/m³ (TRA Workers)	RCR = 0.215
Inhalation, local, acute	1.983 mg/m³ (TRA Workers)	RCR = 0.012
Dermal, systemic, long term	6.9E-3 mg/kg bw/day (TRA Workers)	RCR = 0.023
Combined routes, systemic, long-term		RCR = 0.492

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.3.9. Worker CS 9: Intermediate polymer storage [CS66] LEV, Indoor (PROC 4)

9.3.9.1. Conditions of use

	Method
• Percentage (w/w) of substance in mixture/article: <= 5 %	TRA Workers 3.0
• Duration of activity: <=4 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, specifically designed fixed capturing hood, on tool extraction or enclosing hoods (assumed effectiveness >= 90-95%) Local exhaust ventilation effectiveness used by TRA: inhalation 90 % ; dermal 90 %	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for Ecs 2-5) from page 22.

9.3.9.2. Exposure and risks for workers

Table 9.53. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.331 mg/m³ (TRA Workers)	RCR = 0.312
Inhalation, local, long term	0.331 mg/m³ (TRA Workers)	RCR = 0.143
Inhalation, local, acute	2.203 mg/m³ (TRA Workers)	RCR = 0.014
Dermal, systemic, long term	0.014 mg/kg bw/day (TRA Workers)	RCR = 0.046
Combined routes, systemic, long-term		RCR = 0.358

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.3.10. Worker CS 10: Additivation and stabilisation [CS69] LEV, Indoor (PROC 3)

9.3.10.1. Conditions of use

	Method
• Duration of activity: <=8 h/day	TRA Workers 3.0
• Room ventilation: Enhanced (5 to 10 air changes per hour)	TRA Workers 3.0

	Method
• Local exhaust ventilation: Yes, specifically designed fixed capturing hood, on tool extraction or enclosing hoods (assumed effectiveness >= 90-95%) Local exhaust ventilation effectiveness used by TRA: inhalation 90 %; dermal 90 %	TRA Workers 3.0
• Closed batch process with occasional controlled exposure	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Dermal protection: Yes (effectiveness >= 80%)	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.3.10.2. Exposure and risks for workers

Table 9.54. Exposure concentrations and risks for workers

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**
Inhalation, systemic, long term	0.496 mg/m³ (TRA Workers)	RCR = 0.469
Inhalation, local, long term	0.496 mg/m³ (TRA Workers)	RCR = 0.215
Inhalation, local, acute	1.983 mg/m³ (TRA Workers)	RCR = 0.012
Dermal, systemic, long term	6.9E-3 mg/kg bw/day (TRA Workers)	RCR = 0.023
Combined routes, systemic, long-term		RCR = 0.492

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.3.11. Worker CS 11: Mixing in containers [CS23]. Batch process [CS55]. LEV, Indoor (PROC 5)

9.3.11.1. Conditions of use

	Method
• Percentage (w/w) of substance in mixture/article: <= 5 %	TRA Workers 3.0
• Duration of activity: <=8 h/day	TRA Workers 3.0
• Room ventilation: Good (3 to 5 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, specifically designed fixed capturing hood, on tool extraction or enclosing hoods (assumed effectiveness >= 90-95%) Local exhaust ventilation effectiveness used by TRA: inhalation 90 %; dermal 90 %	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Dermal protection: Yes (effectiveness >= 80%)	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.3.11.2. Exposure and risks for workers

Table 9.55. Exposure concentrations and risks for workers

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**
Inhalation, systemic, long term	0.386 mg/m³ (TRA Workers)	RCR = 0.364
Inhalation, local, long term	0.386 mg/m³ (TRA Workers)	RCR = 0.167
Inhalation, local, acute	1.542 mg/m³ (TRA Workers)	RCR < 0.01

Route of exposure and type of effects	Exposure concentration	Risk quantification
Dermal, systemic, long term	0.055 mg/kg bw/day (TRA Workers)	RCR = 0.183
Combined routes, systemic, long-term		RCR = 0.547

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.3.12. Worker CS 12: Pelletizing [CS53].Extrusion and masterbatching [CS88] LEV, Indoor (PROC 6)

9.3.12.1. Conditions of use

	Method
• Percentage (w/w) of substance in mixture/article: <= 1 %	TRA Workers 3.0
• Duration of activity: <=4 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, specifically designed fixed capturing hood, on tool extraction or enclosing hoods (assumed effectiveness >= 90-95%) Local exhaust ventilation effectiveness used by TRA: inhalation 90 % ; dermal 90 %	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with specific employee training. (effectiveness >= 95%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.3.12.2. Exposure and risks for workers

Table 9.56. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.165 mg/m³ (TRA Workers)	RCR = 0.156
Inhalation, local, long term	0.165 mg/m³ (TRA Workers)	RCR = 0.072
Inhalation, local, acute	1.102 mg/m³ (TRA Workers)	RCR < 0.01
Dermal, systemic, long term	0.014 mg/kg bw/day (TRA Workers)	RCR = 0.046
Combined routes, systemic, long-term		RCR = 0.202

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.3.13. Worker CS 13: Pelletizing [CS53]. LEV, Indoor (PROC 14)

9.3.13.1. Conditions of use

	Method
• Percentage (w/w) of substance in mixture/article: <= 5 %	TRA Workers 3.0
• Duration of activity: <=4 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, specifically designed fixed capturing hood, on tool extraction or enclosing hoods (assumed effectiveness >= 90-95%) Local exhaust ventilation effectiveness used by TRA: inhalation 90 % ; dermal 90 %	TRA Workers 3.0
• Dermal protection: Yes (effectiveness >= 80%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0

	Method
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.3.13.2. Exposure and risks for workers

Table 9.57. Exposure concentrations and risks for workers

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**
Inhalation, systemic, long term	0.331 mg/m³ (TRA Workers)	RCR = 0.312
Inhalation, local, long term	0.331 mg/m³ (TRA Workers)	RCR = 0.143
Inhalation, local, acute	2.203 mg/m³ (TRA Workers)	RCR = 0.014
Dermal, systemic, long term	0.014 mg/kg bw/day (TRA Workers)	RCR = 0.046
Combined routes, systemic, long-term		RCR = 0.358

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.3.14. Worker CS 14: Pelletisation and pellet screening [CS68]. (closed systems) [CS107]. Rework of articles [CS86] Indoor (PROC 8b, PROC 21)

9.3.14.1. Conditions of use

	Method
• Percentage (w/w) of substance in mixture/article: <= 5 %	TRA Workers 3.0
• Duration of activity: <=8 h/day	TRA Workers 3.0
• Room ventilation: Good (3 to 5 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, enclosing hood with very high effectiveness such as fume cupboard (assumed effectiveness >= 95%) Local exhaust ventilation effectiveness used by TRA: inhalation 95 %; dermal 95 %	TRA Workers 3.0
• Dermal protection: Yes (effectiveness >= 80%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.3.14.2. Exposure and risks for workers

Table 9.58. Exposure concentrations and risks for workers

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**
Inhalation, systemic, long term	0.193 mg/m³ (TRA Workers)	RCR = 0.182
Inhalation, local, long term	0.193 mg/m³ (TRA Workers)	RCR = 0.083
Inhalation, local, acute	0.771 mg/m³ (TRA Workers)	RCR < 0.01
Dermal, systemic, long term	0.027 mg/kg bw/day (TRA Workers)	RCR = 0.091
Combined routes, systemic, long-term		RCR = 0.274

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.3.15. Worker CS 15: Bulk transfers [CS14]. With sample collection [CS56]. LEV, Indoor (PROC 3)

9.3.15.1. Conditions of use

	Method
• Closed batch process with occasional controlled exposure	

	Method
• Duration of activity: <= 4 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, specifically designed fixed capturing hood, on tool extraction or enclosing hoods (assumed effectiveness >= 90-95%) Local exhaust ventilation effectiveness used by TRA: inhalation 90 %; dermal 90 %	TRA Workers 3.0
• Dermal protection: Yes (effectiveness >= 80%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for Ecs 2-5) from page 22.

9.3.15.2. Exposure and risks for workers

Table 9.59. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.992 mg/m³ (TRA Workers)	RCR = 0.937
Inhalation, local, long term	0.992 mg/m³ (TRA Workers)	RCR = 0.429
Inhalation, local, acute	6.61 mg/m³ (TRA Workers)	RCR = 0.041
Dermal, systemic, long term	0.014 mg/kg bw/day (TRA Workers)	RCR = 0.046
Combined routes, systemic, long-term		RCR = 0.983

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.3.16. Worker CS 16: Transport [CS58]. With sample collection [CS56]. LEV, Indoor (PROC 8b)

9.3.16.1. Conditions of use

	Method
• Percentage (w/w) of substance in mixture/article: <= 1 %	TRA Workers 3.0
• Duration of activity: <= 4 h/day	TRA Workers 3.0
• Room ventilation: Good (3-5 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, enclosing hood with very high effectiveness such as fume cupboard (assumed effectiveness >= 95%) Local exhaust ventilation effectiveness used by TRA: inhalation 95 %; dermal 95 %	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with specific employee training. (effectiveness >= 95%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.3.16.2. Exposure and risks for workers

Table 9.60. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.058 mg/m³ (TRA Workers)	RCR = 0.055
Inhalation, local, long term	0.058 mg/m³ (TRA Workers)	RCR = 0.025

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, local, acute	0.386 mg/m³ (TRA Workers)	RCR < 0.01
Dermal, systemic, long term	3.43E-3 mg/kg bw/day (TRA Workers)	RCR = 0.011
Combined routes, systemic, long-term		RCR = 0.066

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.3.17. Worker CS 17: Equipment maintenance [CS5] LEV, Indoor (PROC 8a,PROC 28)

9.3.17.1. Conditions of use – specific to CS

	Method
• Percentage (w/w) of substance in mixture/article: <= 1 %	TRA Workers 3.0
• Duration of activity: <= 1 h/day	TRA Workers 3.0
• Room ventilation: Enhanced (5 to 10 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, specifically designed fixed capturing hood, on tool extraction or enclosing hoods (assumed effectiveness >= 90-95%) *LEV has been added to equate to the SOP. Drain down and flush system prior to equipment break-in or maintenance [E55]* Local exhaust ventilation effectiveness used by TRA: inhalation 90 %; dermal 90 %	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with specific employee training. (effectiveness >= 95%)	
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.3.17.2. Exposure and risks for workers

Table 9.61. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.033 mg/m³ (TRA Workers)	RCR = 0.031
Inhalation, local, long term	0.033 mg/m³ (TRA Workers)	RCR = 0.014
Inhalation, local, acute	0.661 mg/m³ (TRA Workers)	RCR < 0.01
Dermal, systemic, long term	6.86E-3 mg/kg bw/day (TRA Workers)	RCR = 0.023
Combined routes, systemic, long-term		RCR = 0.054

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.3.18. Worker CS 18: Storage [CS67]. Indoor (PROC 1)

9.3.18.1. Conditions of use – specific to CS

	Method
• Percentage (w/w) of substance in mixture/article: <= 5 %	TRA Workers 3.0
• Duration of activity: <= 8 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: No	TRA Workers 3.0
• Closed continuous process with occasional controlled exposure *Store substance within a closed system [E84].*	TRA Workers 3.0
• Dermal protection: Yes (effectiveness >= 80%)	TRA Workers 3.0

	Method
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Outdoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.3.18.2. Exposure and risks for workers

Table 9.62. Exposure concentrations and risks for workers

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**
Inhalation, systemic, long term	7.71E-3 mg/m³ (TRA Workers)	RCR < 0.01
Inhalation, local, long term	7.71E-3 mg/m³ (TRA Workers)	RCR < 0.01
Inhalation, local, acute	0.031 mg/m³ (TRA Workers)	RCR < 0.01
Dermal, systemic, long term	1.36E-3 mg/kg bw/day (TRA Workers)	RCR < 0.01
Combined routes, systemic, long-term		RCR = 0.012

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.3.19. Worker CS 19: Storage [CS67]. With occasional controlled exposure [CS137] Indoor (PROC 2)

9.3.18.1. Conditions of use – specific to CS

	Method
• Duration of activity: <= 8 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, specifically designed fixed capturing hood, on tool extraction or enclosing hoods (assumed effectiveness >= 90-95%) Local exhaust ventilation effectiveness used by TRA: inhalation 90 % ; dermal 90 %	TRA Workers 3.0
• Closed continuous process with occasional controlled exposure *Store substance within a closed system [E84].*	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.3.19.2. Exposure and risks for workers

Table 9.63. Exposure concentrations and risks for workers

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**
Inhalation, systemic, long term	0.551 mg/m³ (TRA Workers)	RCR = 0.521
Inhalation, local, long term	0.551 mg/m³ (TRA Workers)	RCR = 0.238
Inhalation, local, acute	2.203 mg/m³ (TRA Workers)	RCR = 0.014
Dermal, systemic, long term	0.014 mg/kg bw/day (TRA Workers)	RCR = 0.046
Combined routes, systemic, long-term		RCR = 0.566

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.4. Exposure scenario 4: Use at industrial sites - Polymer Processing

Market sector: ESIG / ESVOC GES Use Map

Environment contributing scenario(s):			**SPERC**
CS 1	Polymer Processing	ERC 4	ESVOC 4.21a.v1
Worker contributing scenario(s):			**SWED**
CS 2	Bulk transfers [CS14]. (closed systems) [CS107] (Indoor)	PROC 1	
CS 3	Bulk transfers [CS14]. (closed systems) [CS107] (Outdoor)	PROC 1	
CS 4	Bulk transfers [CS14]. (closed systems) [CS107] (LEV, Indoor)	PROC 2	
CS 5	Bulk transfers [CS14]. Dedicated facility [CS81] (LEV, Indoor)	PROC 8b	
CS 6	Bulk weighing [CS91]. (closed systems) [CS107] (Indoor)	PROC 1	
CS 7	Bulk weighing [CS91]. (closed systems) [CS107] (LEV, Indoor)	PROC 2	
CS 8	Small scale weighing [CS90] (LEV, Indoor)	PROC 9	
CS 9	Additive premixing [CS92] (closed batch process, LEV, Indoor)	PROC 3	
CS 10	Additive premixing [CS92] (LEV, Indoor)	PROC 4	
CS 11	Additive premixing [CS92] (LEV, Indoor)	PROC 5	
CS 12	Calendering [CS64] elevated temperature [CS111] (LEV, Indoor)	PROC 6	
CS 13	Production of articles by dipping and pouring [CS113] (LEV, Indoor)	PROC 13	
CS 14	Extrusion and masterbatching [CS88] (LEV, Indoor)	PROC 14	
CS 15	Injection moulding of articles [CS89] (LEV, Indoor)	**PROC 14**, PROC 21	
CS 16	Equipment maintenance [CS5] (LEV, Indoor)	**PROC 8a**, PROC 28	
CS 17	Storage [CS67] (Indoor)	PROC 1	
CS 18	Storage [CS67] (Indoor)	PROC 2	

CS *Contribution scenario*
LEV *Local exhaust ventilation*

9.4.1. Env CS 1: Polymer Processing (ERC 4)

9.4.1.1. Conditions of use

Basis for daily use amount at site: MSPERC

Amount used, frequency and duration of use (or from service life)
• Daily use amount at site: <= 50 tonnes/day *By default the substance maximum use rate (MSPERC) is assumed to be 50000 kg/d Maximum site tonnage, based on sector knowledge (Maximum amount of substance that is delivered to a site in one day based on typical site capacity (e.g., two trucks, each with a volume of 25 tonnes)).* *300 emission days/year are assumed (Default for an 'Industrial end use' with Tonnage > 5000 tonnes/year)*
• Annual use amount at site: <= 1E3 tonnes/year
Technical and organisational conditions and measures
• Equipment cleaning: No release to wastewater form process as such
• Indoor/Outdoor use: Indoor use
• On-site treatment of off-air: Typical measures to maintain workplace concentrations or airborne VOCs and particulates below respective OELS
• Process efficiency: Process optimized for highly efficient use of raw materials (very minimal environmental release)
Conditions and measures related to biological sewage treatment plant
• Application of the STP sludge on agricultural soil: Yes
• Discharge rate of STP: >= 2E3 m3/day
• Biological STP: Standard [Effectiveness Water: 91.57%]
Conditions and measures related to external treatment of waste (including article waste)
• Particular considerations on the waste treatment operations

9.4.1.2. Releases

The releases have been estimated on the basis of SPERC ESVOC 4.21a.v1: Polymer Processing (industrial): solvent-borne
Modification date: 05/02/2013

Description of activities/processes covered by the SPERC

Industrial use of solvent-borne polymer processing materials encompasses a wide range of activities such as material transfers, additives handling, moulding, curing, etc. Substance losses are reduced through use of general and site-specific risk management measures to maintain workplace concentrations of airborne VOCs and particulates below respective OELs.

Product/substance domain:

Processing of formulated polymers including material transfers, additives handling (e.g. pigments, stabilisers, fillers, plasticisers, etc.), moulding, curing and forming activities, material re-works, storage and associated maintenance.
Substance Domain: Applicable to petroleum substances (e.g., aliphatic and aromatic hydrocarbons) and petrochemicals (e.g., ketones, alcohols, acetates, glycols, glycol ethers, and glycol ether acetates).
Size of installation: substance use rate assumed to be maximum of 50000 kg/d
Processing conditions: Dry process

Sub-SPERC: ESVOC 4.21a.c.v1: VP 100 - 1000 Pa;Vapour pressure 100 - 1000 Pa
The local releases to the environment are reported in the following table.

Table 9.63. Local releases to the environment

Release	Explanations
Water	**Release factor:** 0% **Local release rate:** 0 kg/day **Explanation:** EUTGD (2003) Appendix 1 (European Commission Technical Guidance Document on Risk Assessment (EUTGD) Part 2 – 2nd Edition (2003). Appendix 1 Polymers Industry, Table 3.11 for polymer processing (for solvents).)
Air	**Release factor:** 25% **Local release rate:** 1.25E4 kg/day **Explanation:** EUTGD (2003) Appendix 1 (European Commission Technical Guidance Document on Risk Assessment (EUTGD) Part 2 – 2nd Edition (2003). Appendix 1 Polymers Industry, Table 3.11 for polymer processing (for solvents).)
Non agricultural soil	**Release factor:** 1E-3% **Local release rate:** - kg/day **Explanation:** EUTGD (2003) Appendix 1 (European Commission Technical Guidance Document on Risk Assessment (EUTGD) Part 2 – 2nd Edition (2003). Appendix 1 Polymers Industry, Table 3.11 for polymer processing (for solvents).)

Releases to waste

Release factor to external waste: 0 %
This will be addressed at a later stage

9.4.1.3. Exposure and risks for the environment and man via the environment

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table. The exposure estimates have been obtained with EUSES 2.1.2 unless stated otherwise.

Table 9.65. Exposure concentrations and risks for the environment and man via the environment

Protection target	Exposure concentration	Risk quantification
Fresh water	**Local PEC:** 2.78E-4 mg/L	RCR < 0.01
Sediment (freshwater)	**Local PEC:** 0.043 mg/kg dw	RCR < 0.01
Marine water	**Local PEC:** 2.28E-5 mg/L	RCR < 0.01
Sediment (marine water)	**Local PEC:** 3.54E-3 mg/kg dw	RCR < 0.01
Sewage Treatment Plant	**Local PEC:** 0 mg/L	RCR < 0.01
Agricultural soil	**Local PEC:** 1.824 mg/kg dw	RCR = 0.612
Man via environment - Inhalation (systemic effects)	**Concentration in air:** 0.19 mg/m³	RCR = 0.732
Man via environment - Inhalation (local effects)	**Concentration in air:** 0.19 mg/m³	RCR = 0.292
Man via environment - Oral	**Exposure via food consumption:** 4.22E-3 mg/kg bw/day	RCR = 0.028
Man via environment - combined routes		RCR = 0.761

9.4.2. Worker CS 2: Bulk transfers [CS14]. (closed systems) [CS107] Indoor (PROC 1)

9.4.2.1. Conditions of use – specific to CS

• Duration of activity: <= 8 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: No	TRA Workers 3.0
• Closed process without likelihood of exposure	TRA Workers 3.0
• Dermal protection: Yes (effectiveness >= 80%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.4.2.2. Exposure and risks for workers

Table 9.66. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.055 mg/m³ (TRA Workers)	RCR = 0.052
Inhalation, local, long term	0.055 mg/m³ (TRA Workers)	RCR = 0.024
Inhalation, local, acute	0.22 mg/m³ (TRA Workers)	RCR < 0.01
Dermal, systemic, long term	6.8E-3 mg/kg bw/day (TRA Workers)	RCR = 0.023
Combined routes, systemic, long-term		RCR = 0.075

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.4.3. Worker CS 3: Bulk transfers [CS14]. (closed systems) [CS107] Outdoor (PROC 1)

9.4.3.1. Conditions of use – specific to CS

	Method
• Duration of activity: <= 8 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: No	TRA Workers 3.0
• Closed process without likelihood of exposure	TRA Workers 3.0
• Dermal protection: Yes (effectiveness >= 80%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Outdoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.4.3.2. Exposure and risks for workers

Table 9.67. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.039 mg/m³ (TRA Workers)	RCR = 0.036
Inhalation, local, long term	0.039 mg/m³ (TRA Workers)	RCR = 0.017
Inhalation, local, acute	0.154 mg/m³ (TRA Workers)	RCR < 0.01
Dermal, systemic, long term	6.8E-3 mg/kg bw/day (TRA Workers)	RCR = 0.023

Route of exposure and type of effects	Exposure concentration	Risk quantification
Combined routes, systemic, long-term		RCR = 0.059

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.4.4. Worker CS 4: Bulk transfers [CS14]. (closed systems) [CS107]. LEV, Indoor (PROC 2)

9.4.4.1. Conditions of use – specific to CS

	Method
• Percentage (w/w) of substance in mixture/article: <= 1 %	
• Duration of activity: <= 8 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, specifically designed fixed capturing hood, on tool extraction or enclosing hoods (assumed effectiveness >= 90-95%) Local exhaust ventilation effectiveness used by TRA: inhalation 90%; dermal 90 %	TRA Workers 3.0
• Closed continuous process with occasional controlled exposure	TRA Workers 3.0
• Dermal protection: Yes (effectiveness >= 80%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.4.4.2. Exposure and risks for workers

Table 9.68. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.055 mg/m³ (TRA Workers)	RCR = 0.052
Inhalation, local, long term	0.055 mg/m³ (TRA Workers)	RCR = 0.024
Inhalation, local, acute	0.22 mg/m³ (TRA Workers)	RCR < 0.01
Dermal, systemic, long term	2.74E-3 mg/kg bw/day (TRA Workers)	RCR < 0.01
Combined routes, systemic, long-term		RCR = 0.061

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.4.5. Worker CS 5: Bulk transfers [CS14]. Dedicated facility [CS81]. LEV, Indoor (PROC 8b)

9.4.5.1. Conditions of use – specific to CS

	Method
• Percentage (w/w) of substance in mixture/article: <= 1 %	
• Duration of activity: <= 8 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, enclosing hood with very high effectiveness such as fume cupboard (assumed effectiveness >= 95%) Local exhaust ventilation effectiveness used by TRA: inhalation 95%; dermal 95 %	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Dermal protection: Yes (effectiveness >= 80%)	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0

	Method
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.4.5.2. Exposure and risks for workers

Table 9.69. Exposure concentrations and risks for workers

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**
Inhalation, systemic, long term	0.138 mg/m³ (TRA Workers)	RCR = 0.13
Inhalation, local, long term	0.138 mg/m³ (TRA Workers)	RCR = 0.06
Inhalation, local, acute	0.551 mg/m³ (TRA Workers)	RCR < 0.01
Dermal, systemic, long term	0.014 mg/kg bw/day (TRA Workers)	RCR = 0.046
Combined routes, systemic, long-term		RCR = 0.176

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.4.6. Worker CS 6: Bulk weighing [CS91]. (closed systems) [CS107]. Indoor (PROC 1)

9.4.6.1. Conditions of use

	Method
• Duration of activity: <=8 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: No	TRA Workers 3.0
• Closed process without likelihood of exposure	TRA Workers 3.0
• Dermal protection: : Yes (effectiveness >= 80%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.4.6.2. Exposure and risks for workers

Table 9.70. Exposure concentrations and risks for workers

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**
Inhalation, systemic, long term	0.055 mg/m³ (TRA Workers)	RCR = 0.052
Inhalation, local, long term	0.055 mg/m³ (TRA Workers)	RCR = 0.024
Inhalation, local, acute	0.22 mg/m³ (TRA Workers)	RCR < 0.01
Dermal, systemic, long term	6.8E-3 mg/kg bw/day (TRA Workers)	RCR = 0.023
Combined routes, systemic, long-term		RCR = 0.075

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.4.7. Worker CS 7: Bulk weighing [CS91]. (closed systems) [CS107]. LEV, Indoor (PROC 2)

9.4.7.1. Conditions of use

	Method
• Percentage (w/w) of substance in mixture/article: <= 1 %	
• Duration of activity: <= 8 h/day	TRA Workers 3.0

	Method
• Room ventilation: Good (3-5 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, specifically designed fixed capturing hood, on tool extraction or enclosing hoods (assumed effectiveness >= 90-95%) Local exhaust ventilation effectiveness used by TRA: inhalation 90 %; dermal 90 %	TRA Workers 3.0
• Closed continuous process with occasional controlled exposure	TRA Workers 3.0
• Dermal protection: Yes (effectiveness >= 80%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.4.7.2. Exposure and risks for workers

Table 9.71. Exposure concentrations and risks for workers

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**
Inhalation, systemic, long term	0.039 mg/m³ (TRA Workers)	RCR = 0.036
Inhalation, local, long term	0.039 mg/m³ (TRA Workers)	RCR = 0.017
Inhalation, local, acute	0.154 mg/m³ (TRA Workers)	RCR < 0.01
Dermal, systemic, long term	2.74E-3 mg/kg bw/day (TRA Workers)	RCR < 0.01
Combined routes, systemic, long-term		RCR = 0.046

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.4.8. Worker CS 8: Small scale weighing [CS90] Indoor (PROC 9)

9.3.8.1. Conditions of use

	Method
• Percentage (w/w) of substance in mixture/article: <= 1 %	
• Duration of activity: <= 8 h/day	TRA Workers 3.0
• Room ventilation: Good (3 to 5 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, specifically designed fixed capturing hood, on tool extraction or enclosing hoods (assumed effectiveness >= 90-95%) Local exhaust ventilation effectiveness used by TRA: inhalation 90 % ; dermal 90 %	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.4.8.2. Exposure and risks for workers

Table 9.72. Exposure concentrations and risks for workers

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**
Inhalation, systemic, long term	0.193 mg/m³ (TRA Workers)	RCR = 0.182
Inhalation, local, long term	0.193 mg/m³ (TRA Workers)	RCR = 0.083
Inhalation, local, acute	0.771 mg/m³ (TRA Workers)	RCR < 0.01

Route of exposure and type of effects	Exposure concentration	Risk quantification
Dermal, systemic, long term	6.86E-3 mg/kg bw/day (TRA Workers)	RCR = 0.023
Combined routes, systemic, long-term		RCR = 0.205

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.4.9. Worker CS 9: Additive premixing [CS92]. LEV, Indoor (PROC 3)

9.4.9.1. Conditions of use

	Method
• Duration of activity: <=8 h/day	TRA Workers 3.0
• Room ventilation: Enhanced (5 to 10 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, specifically designed fixed capturing hood, on tool extraction or enclosing hoods (assumed effectiveness >= 90-95%) Local exhaust ventilation effectiveness used by TRA: inhalation 90 %; dermal 90 %	TRA Workers 3.0
• Closed batch process with occasional controlled exposure	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.4.9.2. Exposure and risks for workers

Table 9.73. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.496 mg/m³ (TRA Workers)	RCR = 0.469
Inhalation, local, long term	0.496 mg/m³ (TRA Workers)	RCR = 0.215
Inhalation, local, acute	1.983 mg/m³ (TRA Workers)	RCR = 0.012
Dermal, systemic, long term	6.9E-3 mg/kg bw/day (TRA Workers)	RCR = 0.023
Combined routes, systemic, long-term		RCR = 0.492

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.4.10. Worker CS 10: Additive premixing [CS92]. LEV, Indoor (PROC 4)

9.4.10.1. Conditions of use

	Method
• Percentage (w/w) of substance in mixture/article: <= 1 %	
• Duration of activity: <=8 h/day	TRA Workers 3.0
• Room ventilation: Good (3-5 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, specifically designed fixed capturing hood, on tool extraction or enclosing hoods (assumed effectiveness >= 90-95%) Local exhaust ventilation effectiveness used by TRA: inhalation 90 %; dermal 90 %	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Dermal protection: Yes (effectiveness >= 80%)	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0

	Method
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.4.10.2. Exposure and risks for workers

Table 9.74. Exposure concentrations and risks for workers

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**
Inhalation, systemic, long term	0.193 mg/m³ (TRA Workers)	RCR = 0.182
Inhalation, local, long term	0.193 mg/m³ (TRA Workers)	RCR = 0.083
Inhalation, local, acute	0.771 mg/m³ (TRA Workers)	RCR < 0.01
Dermal, systemic, long term	0.014 mg/kg bw/day (TRA Workers)	RCR = 0.046
Combined routes, systemic, long-term		RCR = 0.228

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.4.11. Worker CS 11: Additive premixing [CS92]. LEV, Indoor (PROC 5)

9.4.11.1. Conditions of use

	Method
• Percentage (w/w) of substance in mixture/article: <= 1 %	TRA Workers 3.0
• Duration of activity: <=8 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, specifically designed fixed capturing hood, on tool extraction or enclosing hoods (assumed effectiveness >= 90-95%) Local exhaust ventilation effectiveness used by TRA: inhalation 90 %; dermal 90 %	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.4.11.2. Exposure and risks for workers

Table 9.75. Exposure concentrations and risks for workers

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**
Inhalation, systemic, long term	0.275 mg/m³ (TRA Workers)	RCR = 0.26
Inhalation, local, long term	0.275 mg/m³ (TRA Workers)	RCR = 0.119
Inhalation, local, acute	1.102 mg/m³ (TRA Workers)	RCR < 0.01
Dermal, systemic, long term	0.014 mg/kg bw/day (TRA Workers)	RCR = 0.046
Combined routes, systemic, long-term		RCR = 0.306

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.4.12. Worker CS 12: Calendering [CS64] elevated temperature [CS111] LEV, Indoor (PROC 6)

9.4.12.1. Conditions of use

	Method
• Percentage (w/w) of substance in mixture/article: <= 1 %	TRA Workers 3.0
• Duration of activity: <=8 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, specifically designed fixed capturing hood, on tool extraction or enclosing hoods (assumed effectiveness >= 90-95%) *Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings [E60].* Local exhaust ventilation effectiveness used by TRA: inhalation 90 %; dermal 90 %	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 60 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.4.12.2. Exposure and risks for workers

Table 9.76. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.275 mg/m³ (TRA Workers)	RCR = 0.26
Inhalation, local, long term	0.275 mg/m³ (TRA Workers)	RCR = 0.119
Inhalation, local, acute	1.102 mg/m³ (TRA Workers)	RCR < 0.01
Dermal, systemic, long term	0.027 mg/kg bw/day (TRA Workers)	RCR = 0.091
Combined routes, systemic, long-term		RCR = 0.352

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.4.13. Worker CS 13: Production of articles by dipping and pouring [CS113]. Indoor (PROC 13)

9.4.13.1. Conditions of use

	Method
• Percentage (w/w) of substance in mixture/article: <= 1 %	TRA Workers 3.0
• Duration of activity: <=4 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, specifically designed fixed capturing hood, on tool extraction or enclosing hoods (assumed effectiveness >= 90-95%) Local exhaust ventilation effectiveness used by TRA: inhalation 90 % ; dermal 90 %	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with specific employee training. (effectiveness >= 95%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.4.13.2. Exposure and risks for workers

Table 9.77. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.331 mg/m³ (TRA Workers)	RCR = 0.312
Inhalation, local, long term	0.331 mg/m³ (TRA Workers)	RCR = 0.143
Inhalation, local, acute	2.203 mg/m³ (TRA Workers)	RCR = 0.014
Dermal, systemic, long term	6.86E-3 mg/kg bw/day (TRA Workers)	RCR = 0.023
Combined routes, systemic, long-term		RCR = 0.335

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.4.14. Worker CS 14: Extrusion and masterbatching [CS88] LEV, Indoor (PROC 14)

9.4.14.1. Conditions of use

	Method
• Percentage (w/w) of substance in mixture/article: <= 1 %	TRA Workers 3.0
• Duration of activity: <=8 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3Enhanced (5 to 10 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, specifically designed fixed capturing hood, on tool extraction or enclosing hoods (assumed effectiveness >= 90-95%) Local exhaust ventilation effectiveness used by TRA: inhalation 90 % ; dermal 90 %	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 21.

9.4.14.2. Exposure and risks for workers

Table 9.78. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.275 mg/m³ (TRA Workers)	RCR = 0.26
Inhalation, local, long term	0.275 mg/m³ (TRA Workers)	RCR = 0.119
Inhalation, local, acute	1.102 mg/m³ (TRA Workers)	RCR < 0.01
Dermal, systemic, long term	3.43E-3 mg/kg bw/day (TRA Workers)	RCR = 0.011
Combined routes, systemic, long-term		RCR = 0.272

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.4.15. Worker CS 15: Injection moulding of articles [CS89]. LEV, Indoor (PROC 14, PROC 21)

9.4.15.1. Conditions of use

	Method
• Percentage (w/w) of substance in mixture/article: <= 1 %	TRA Workers 3.0
• Duration of activity: <=8 h/day	TRA Workers 3.0

	Method
• Room ventilation: Enhanced (5 to 10 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, specifically designed fixed capturing hood, on tool extraction or enclosing hoods (assumed effectiveness >= 90-95%) Local exhaust ventilation effectiveness used by TRA: inhalation 90 % ; dermal 90 %	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.4.15.2. Exposure and risks for workers

Table 9.79. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.083 mg/m³ (TRA Workers)	RCR = 0.078
Inhalation, local, long term	0.083 mg/m³ (TRA Workers)	RCR = 0.036
Inhalation, local, acute	0.331 mg/m³ (TRA Workers)	RCR < 0.01
Dermal, systemic, long term	3.43E-3 mg/kg bw/day (TRA Workers)	RCR = 0.011
Combined routes, systemic, long-term		RCR = 0.09

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.4.16. Worker CS 16: Equipment maintenance [CS5]. LEV, Indoor (PROC 8a, PROC 28)

9.4.16.1. Conditions of use

	Method
• Percentage (w/w) of substance in mixture/article: <= 1 %	TRA Workers 3.0
• Duration of activity: <= 8 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, specifically designed fixed capturing hood, on tool extraction or enclosing hoods (assumed effectiveness >= 90-95%) *LEV has been added to equate to the SOP. Drain down and flush system prior to equipment break-in or maintenance [E55]* Local exhaust ventilation effectiveness used by TRA: inhalation 90 %; dermal 90 %	TRA Workers 3.0
• Dermal protection: : Chemical resistant dermal protection with specific employee training. (effectiveness >= 95%)	
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.4.16.2. Exposure and risks for workers

Table 9.80. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.551 mg/m³ (TRA Workers)	RCR = 0.521

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, local, long term	0.551 mg/m³ (TRA Workers)	RCR = 0.238
Inhalation, local, acute	2.203 mg/m³ (TRA Workers)	RCR = 0.014
Dermal, systemic, long term	6.86E-3 mg/kg bw/day (TRA Workers)	RCR = 0.023
Combined routes, systemic, long-term		RCR = 0.543

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.4.17. Worker CS 17: Storage [CS67]. Outdoor (PROC 1)

9.4.17.1. Conditions of use – specific to CS

	Method
• Percentage (w/w) of substance in mixture/article: <= 1 %	TRA Workers 3.0
• Duration of activity: <= 8 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: No	TRA Workers 3.0
• Closed process without likelihood of exposure *Store substance within a closed system [E84].*	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Dermal protection: Yes (effectiveness >= 80%)	TRA Workers 3.0
• Place of use: Outdoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.4.17.2. Exposure and risks for workers

Table 9.81. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	3.86E-3 mg/m³ (TRA Workers)	RCR < 0.01
Inhalation, local, long term	3.86E-3 mg/m³ (TRA Workers)	RCR < 0.01
Inhalation, local, acute	0.015 mg/m³ (TRA Workers)	RCR < 0.01
Dermal, systemic, long term	6.8E-4 mg/kg bw/day (TRA Workers)	RCR < 0.01
Combined routes, systemic, long-term		RCR < 0.01

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.4.18. Worker CS 18: Storage [CS67]. Indoor (PROC 2)

9.4.18.1. Conditions of use – specific to CS

	Method
• Percentage (w/w) of substance in mixture/article: <= 1 %	TRA Workers 3.0
• Duration of activity: <= 8 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: No	TRA Workers 3.0
• Closed continuous process with occasional controlled exposure *Store substance within a closed system [E84].*	TRA Workers 3.0
• Dermal protection: Yes (effectiveness >= 80%)	

	Method
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.4.18.2. Exposure and risks for workers

Table 9.82. Exposure concentrations and risks for workers

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**
Inhalation, systemic, long term	0.551 mg/m³ (TRA Workers)	RCR = 0.521
Inhalation, local, long term	0.551 mg/m³ (TRA Workers)	RCR = 0.238
Inhalation, local, acute	2.203 mg/m³ (TRA Workers)	RCR = 0.014
Dermal, systemic, long term	0.027 mg/kg bw/day (TRA Workers)	RCR = 0.091
Combined routes, systemic, long-term		RCR = 0.612

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.5. Exposure scenario 5: Widespread use by professional workers - Polymer Processing

Market sector: ESIG / ESVOC GES Use Map

Environment contributing scenario(s):		
CS 1	Polymer Processing	**ERC 8d**, ERC 8a
Worker contributing scenario(s):		
CS 2	Bulk transfers [CS14]. (closed systems) [CS107] (Indoor)	PROC 1
CS 3	Bulk transfers [CS14]. (closed systems) [CS107] (Outdoor)	PROC 1
CS 4	Bulk transfers [CS14]. (closed systems) [CS107] (continuous process, LEV, Indoor)	PROC 2
CS 5	Material transfers [CS3]. Dedicated facility [CS81] (LEV, Indoor)	PROC 8b
CS 6	Material transfers [CS3]. Dedicated facility [CS81] (RPE, Indoor)	PROC 8b
CS 7	Injection moulding of articles [CS89] (LEV, Indoor)	**PROC 6**, PROC 21
CS 8	Injection moulding of articles [CS89] (RPE, Outdoor)	**PROC 6**, PROC 21
CS 9	Injection moulding of articles [CS89] (LEV, Indoor)	PROC 14
CS 10	Equipment maintenance [CS5] (LEV, Indoor)	**PROC 8a**, PROC 28
CS 11	Storage [CS67] (Outdoor)	PROC 1, PROC 2
CS 12	Storage [CS67] (Indoor)	PROC 2, PROC 1

CS *Contribution scenario*
RPE *Respiratory Protect. Equipment*
LEV *Local exhaust ventilation*

9.5.1. Env CS 1: Polymer Processing (ERC 8d, ERC 8a)

9.5.1.1. Conditions of use

Amount used, frequency and duration of use (or from service life)
• Daily local widespread use amount: <= 5.5E-4 tonnes/day
Conditions and measures related to biological sewage treatment plant
• Biological STP: Standard [Effectiveness Water: 91.57%]
Conditions and measures related to external treatment of waste (including article waste)
• Particular considerations on the waste treatment operations

9.5.1.2. Releases

The local releases to the environment are reported in the following table. Note that the releases reported do not account for the removal in the modelled biological STP.

Table 9.82. Local releases to the environment

Release	Release estimation method	Explanations
Water	ERC	**Release factor before on site RMM:** 100% **Release factor after on site RMM:** 100% **Local release rate:** 0.55 kg/day
Air	ERC	**Release factor before on site RMM:** 100% **Release factor after on site RMM:** 100%
Non agricultural soil	ERC	**Release factor after on site RMM:** 20%

9.5.1.3. Exposure and risks for the environment and man via the environment

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table. The exposure estimates have been obtained with EUSES 2.1.2 unless stated otherwise.

Table 9.84. Exposure concentrations and risks for the environment and man via the environment

Protection target	Exposure concentration	Risk quantification
Fresh water	**Local PEC:** 2.59E-3 mg/L	RCR = 0.026
Sediment (freshwater)	**Local PEC:** 0.401 mg/kg dw	RCR = 0.026
Marine water	**Local PEC:** 2.54E-4 mg/L	RCR = 0.026
Sediment (marine water)	**Local PEC:** 0.039 mg/kg dw	RCR = 0.026
Sewage Treatment Plant	**Local PEC:** 0.023 mg/L	RCR = 0.011
Agricultural soil	**Local PEC:** 1.019 mg/kg dw	RCR = 0.342
Man via environment - Inhalation (systemic effects)	**Concentration in air:** 1.28E-4 mg/m³	RCR < 0.01
Man via environment - Inhalation (local effects)	**Concentration in air:** 1.28E-4 mg/m³	RCR < 0.01
Man via environment - Oral	**Exposure via food consumption:** 2.47E-3 mg/kg bw/day	RCR = 0.016
Man via environment - combined routes		RCR = 0.017

9.5.2. Worker CS 2: Bulk transfers [CS14]. (closed systems) [CS107] Indoor (PROC 1)

9.5.2.1. Conditions of use – specific to CS

• Percentage (w/w) of substance in mixture/article: <= 1 %	TRA Workers 3.0
• Duration of activity: <= 8 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: No	TRA Workers 3.0
• Closed process without likelihood of exposure	TRA Workers 3.0
• Dermal protection: Yes (effectiveness >= 80%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.5.2.2. Exposure and risks for workers

Table 9.85 Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	5.51E-3 mg/m³ (TRA Workers)	RCR < 0.01
Inhalation, local, long term	5.51E-3 mg/m³ (TRA Workers)	RCR < 0.01
Inhalation, local, acute	0.022 mg/m³ (TRA Workers)	RCR < 0.01
Dermal, systemic, long term	6.8E-4 mg/kg bw/day (TRA Workers)	RCR < 0.01
Combined routes, systemic, long-term		RCR < 0.01

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.5.3. Worker CS 3: Bulk transfers [CS14]. (closed systems) [CS107] Outdoor (PROC 1)

9.5.3.1. Conditions of use – specific to CS

	Method
• Occupational Health and Safety Management System: Basic	TRA Workers 3.0
• Percentage (w/w) of substance in mixture/article: <= 1 %	TRA Workers 3.0
• Duration of activity: <= 8 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: No	TRA Workers 3.0
• Closed process without likelihood of exposure	TRA Workers 3.0
• Dermal protection: Yes (effectiveness >= 80%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Outdoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.4.3.2. Exposure and risks for workers

Table 9.86. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	3.86E-3 mg/m³ (TRA Workers)	RCR < 0.01

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, local, long term	3.86E-3 mg/m³ (TRA Workers)	RCR < 0.01
Inhalation, local, acute	0.015 mg/m³ (TRA Workers)	RCR < 0.01
Dermal, systemic, long term	6.8E-4 mg/kg bw/day (TRA Workers)	RCR < 0.01
Combined routes, systemic, long-term		RCR < 0.01

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.5.4. Worker CS 4: Bulk transfers [CS14]. (closed systems) [CS107]. LEV, Indoor (PROC 2)

9.5.4.1. Conditions of use – specific to CS

	Method
• Percentage (w/w) of substance in mixture/article: <= 1 %	
• Duration of activity: <= 8 h/day	TRA Workers 3.0
• Room ventilation: Good (3 to 5 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, specifically designed LEV such as receiving hoods (assumed effectiveness >= 80-90%) Local exhaust ventilation effectiveness used by TRA: inhalation 80 % ; dermal 80 %	TRA Workers 3.0
• Closed continuous process with occasional controlled exposure	TRA Workers 3.0
• Dermal protection: Yes (effectiveness >= 80%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.5.4.2. Exposure and risks for workers

Table 9.87. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.386 mg/m³ (TRA Workers)	RCR = 0.364
Inhalation, local, long term	0.386 mg/m³ (TRA Workers)	RCR = 0.167
Inhalation, local, acute	1.542 mg/m³ (TRA Workers)	RCR < 0.01
Dermal, systemic, long term	5.48E-3 mg/kg bw/day (TRA Workers)	RCR = 0.018
Combined routes, systemic, long-term		RCR = 0.383

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.5.5. Worker CS 5: Material transfers [CS3]. Dedicated facility [CS81] Indoor (PROC 8b)

9.5.5.1. Conditions of use – specific to CS

	Method
• Percentage (w/w) of substance in mixture/article: <= 1 %	TRA Workers 3.0
• Duration of activity: <= 8 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, specifically designed fixed capturing hood, on tool extraction or enclosing hoods (assumed effectiveness >= 90-95%) *Ensure material transfers are under containment or extract ventilation [E66]*	TRA Workers 3.0

	Method
Local exhaust ventilation effectiveness used by TRA: inhalation 90 %; dermal 80 %	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.5.5.2. Exposure and risks for workers

Table 9.88. Exposure concentrations and risks for workers

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**
Inhalation, systemic, long term	0.551 mg/m³ (TRA Workers)	RCR = 0.521
Inhalation, local, long term	0.551 mg/m³ (TRA Workers)	RCR = 0.238
Inhalation, local, acute	2.203 mg/m³ (TRA Workers)	RCR = 0.014
Dermal, systemic, long term	0.027 mg/kg bw/day (TRA Workers)	RCR = 0.091
Combined routes, systemic, long-term		RCR = 0.612

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.5.6. Worker CS 6: Material transfers [CS3]. Dedicated facility [CS81] Indoor (PROC 8b)

9.5.6.1. Conditions of use – specific to CS

	Method
• Occupational Health and Safety Management System: Basic	TRA Workers 3.0
• Percentage (w/w) of substance in mixture/article: <= 1 %	TRA Workers 3.0
• Duration of activity: <= 4 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: No	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	TRA Workers 3.0
• Respiratory protection: Yes (APF >= 10)	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.5.6.2. Exposure and risks for workers

Table 9.89. Exposure concentrations and risks for workers

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**
Inhalation, systemic, long term	0.331 mg/m³ (TRA Workers)	RCR = 0.312
Inhalation, local, long term	0.331 mg/m³ (TRA Workers)	RCR = 0.143
Inhalation, local, acute	2.203 mg/m³ (TRA Workers)	RCR = 0.014
Dermal, systemic, long term	0.137 mg/kg bw/day (TRA Workers)	RCR = 0.457
Combined routes, systemic, long-term		RCR = 0.769

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.5.7. Worker CS 7: Injection moulding of articles [CS89]. Indoor (PROC 6, PROC 21)

9.5.7.1. Conditions of use – specific to CS

	Method
• Occupational Health and Safety Management System: Basic	TRA Workers 3.0
• Percentage (w/w) of substance in mixture/article: <= 1 %	TRA Workers 3.0
• Duration of activity: <= 8 h/day	TRA Workers 3.0
• Room ventilation: Good (3 to 5 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, specifically designed LEV such as receiving hoods (assumed effectiveness >= 80-90%) Local exhaust ventilation effectiveness used by TRA: inhalation 80 %; dermal 80 %	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.5.7.2. Exposure and risks for workers

Table 9.90. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.771 mg/m³ (TRA Workers)	RCR = 0.729
Inhalation, local, long term	0.771 mg/m³ (TRA Workers)	RCR = 0.334
Inhalation, local, acute	3.085 mg/m³ (TRA Workers)	RCR = 0.019
Dermal, systemic, long term	0.055 mg/kg bw/day (TRA Workers)	RCR = 0.183
Combined routes, systemic, long-term		RCR = 0.912

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.5.8. Worker CS 8: Injection moulding of articles [CS89]. Outdoor (PROC 6, PROC 21)

9.5.8.1. Conditions of use – specific to CS

	Method
• Occupational Health and Safety Management System: Basic	TRA Workers 3.0
• Percentage (w/w) of substance in mixture/article: <= 1 %	TRA Workers 3.0
• Duration of activity: <= 1 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: No	TRA Workers 3.0
• Respiratory protection: Yes (APF >= 10)	TRA Workers 3.0
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	TRA Workers 3.0
• Place of use: Outdoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.5.8.2. Exposure and risks for workers

Table 9.91. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.077 mg/m³ (TRA Workers)	RCR = 0.073
Inhalation, local, long term	0.077 mg/m³ (TRA Workers)	RCR = 0.033
Inhalation, local, acute	1.542 mg/m³ (TRA Workers)	RCR < 0.01
Dermal, systemic, long term	0.274 mg/kg bw/day (TRA Workers)	RCR = 0.914
Combined routes, systemic, long-term		RCR = 0.987

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.5.9. Worker CS 9: Injection moulding of articles [CS89]. LEV, Indoor (PROC 14)

9.4.9.1. Conditions of use

	Method
• Occupational Health and Safety Management System: Basic	TRA Workers 3.0
• Percentage (w/w) of substance in mixture/article: <= 1 %	TRA Workers 3.0
• Duration of activity: <=8 h/day	TRA Workers 3.0
• Room ventilation: Good (3 to 5 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: Yes, specifically designed LEV such as receiving hoods (assumed effectiveness >= 80-90%) Local exhaust ventilation effectiveness used by TRA: inhalation 80 % ; dermal 80 %	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Dermal protection: Yes (effectiveness >= 80%)	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.4.9.2. Exposure and risks for workers

Table 9.92. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.771 mg/m³ (TRA Workers)	RCR = 0.729
Inhalation, local, long term	0.771 mg/m³ (TRA Workers)	RCR = 0.334
Inhalation, local, acute	3.085 mg/m³ (TRA Workers)	RCR = 0.019
Dermal, systemic, long term	0.014 mg/kg bw/day (TRA Workers)	RCR = 0.046
Combined routes, systemic, long-term		RCR = 0.775

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.5.10. Worker CS 10: Equipment maintenance [CS5]. Indoor (PROC 8a, PROC 28)

9.5.10.1. Conditions of use

	Method
• Occupational Health and Safety Management System: Basic	TRA Workers 3.0
• Percentage (w/w) of substance in mixture/article: <= 1 %	TRA Workers 3.0
• Duration of activity: <= 1 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0

	Method
• Local exhaust ventilation: Yes, specifically designed LEV such as receiving hoods (assumed effectiveness >= 80-90%) *LEV has been added to equate to the SOP. Drain down and flush system prior to equipment break-in or maintenance [E55]* Local exhaust ventilation effectiveness used by TRA: inhalation 80 %; dermal 80 %	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Dermal protection: : Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.5.10.2. Exposure and risks for workers

Table 9.93. Exposure concentrations and risks for workers

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**
Inhalation, systemic, long term	0.551 mg/m³ (TRA Workers)	RCR = 0.521
Inhalation, local, long term	0.551 mg/m³ (TRA Workers)	RCR = 0.238
Inhalation, local, acute	11.01 mg/m³ (TRA Workers)	RCR = 0.069
Dermal, systemic, long term	0.027 mg/kg bw/day (TRA Workers)	RCR = 0.091
Combined routes, systemic, long-term		RCR = 0.612

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.5.11. Worker CS 11: Storage [CS67]. Outdoor (PROC 1)

9.5.11.1. Conditions of use – specific to CS

	Method
• Occupational Health and Safety Management System: Basic	TRA Workers 3.0
• Percentage (w/w) of substance in mixture/article: <= 100 %	TRA Workers 3.0
• Duration of activity: <= 8 h/day	TRA Workers 3.0
• Room ventilation: Basic (up to 3 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: No	TRA Workers 3.0
• Closed process without likelihood of exposure *Store substance within a closed system [E84].*	TRA Workers 3.0
• Dermal protection: Yes (effectiveness >= 80%)	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Place of use: Outdoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.5.11.2. Exposure and risks for workers

Table 9.94. Exposure concentrations and risks for workers

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**
Inhalation, systemic, long term	0.039 mg/m³ (TRA Workers)	RCR = 0.036
Inhalation, local, long term	0.039 mg/m³ (TRA Workers)	RCR = 0.017

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, local, acute	0.154 mg/m³ (TRA Workers)	RCR < 0.01
Dermal, systemic, long term	6.8E-3 mg/kg bw/day (TRA Workers)	RCR = 0.023
Combined routes, systemic, long-term		RCR = 0.059

RCR = Risk Characterization Ratio (RCR <1 safe use)

9.5.12. Worker CS 12: Storage [CS67]. Indoor (PROC 2)

9.5.12.1. Conditions of use – specific to CS

	Method
• Occupational Health and Safety Management System: Basic	TRA Workers 3.0
• Percentage (w/w) of substance in mixture/article: <= 1 %	TRA Workers 3.0
• Duration of activity: <= 8 h/day	TRA Workers 3.0
• Room ventilation: Enhanced (5 to 10 air changes per hour)	TRA Workers 3.0
• Local exhaust ventilation: No	TRA Workers 3.0
• Closed continuous process with occasional controlled exposure *Store substance within a closed system [E84].*	TRA Workers 3.0
• Respiratory protection: No	TRA Workers 3.0
• Dermal protection: Yes (effectiveness >= 80%)	TRA Workers 3.0
• Place of use: Indoor	TRA Workers 3.0
• Operating temperature: <= 32 °C	TRA Workers 3.0

Note: conditions of use common to all ECs apply at the same time, see General part… (for ECs 2-5) from page 22.

9.5.12.2. Exposure and risks for workers

Table 9.95. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.826 mg/m³ (TRA Workers)	RCR = 0.781
Inhalation, local, long term	0.826 mg/m³ (TRA Workers)	RCR = 0.358
Inhalation, local, acute	3.305 mg/m³ (TRA Workers)	RCR = 0.021
Dermal, systemic, long term	0.027 mg/kg bw/day (TRA Workers)	RCR = 0.091
Combined routes, systemic, long-term		RCR = 0.872

RCR = Risk Characterization Ratio (RCR <1 safe use)