1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Trade name	:	STYRENE MONOMER
Synonyms	:	Cinnamene, Vinylbenzene, Ethenylbenzene
Substance name	:	Styrene
Substance No.	:	202-851-5 (EINECS)
Chemical characterization	:	Aromatic hydrocarbons

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

Identified uses	:	Manufacture of substances; Formulation & (re)packing of substance and mixtures; Distribution of substance; Polymer production
Prohibited uses	:	Applications involving direct consumer exposure, cosmetics, toiletries, personal care products

1.3 Details of the supplier of the safety data sheet

Company	**Registration number**	**Telephone**
Lyondell Chemie Nederland, B.V. Delftseplein 27E 3013 AA Rotterdam Netherlands	01-2119457861-32-0017	31 (0) 10 275 55 00

E-mail address : product.safety@lyb.com
Responsible/issuing person

1.4 Emergency telephone

Lyondell Chemie Nederland, B.V. +32 3 575 1235

Poison Center:
Department for Poisons Information
NO: +47 22 59 13 00
24 hours all days

2. Hazards identification

2.1 Classification of the substance or mixture

Classification (REGULATION (EC) No 1272/2008)

Flammable liquids Category 3: H226

Acute toxicity	Category 4: H332
Skin irritation	Category 2: H315
Eye irritation	Category 2: H319
Aspiration hazard	Category 1: H304
Specific target organ systemic toxicity - single exposure	Category 3: H335
Reproductive toxicity	Category 2: H361d
Specific target organ systemic toxicity - repeated exposure; Inhalation Auditory system	Category 1: H372
Chronic aquatic toxicity	Category 3: H412

2.2 Label elements

Labeling (REGULATION (EC) No 1272/2008)

Hazard pictograms :

Signal Word : Danger

Hazard Statements		
:	H226	Flammable liquid and vapor.
	H332	Harmful if inhaled.
	H319	Causes serious eye irritation.
	H335	May cause respiratory irritation.
	H315	Causes skin irritation.
	H361d	Suspected of damaging the unborn child.
	H372	Causes damage to organs (Auditory system) through prolonged or repeated exposure if inhaled.
	H304	May be fatal if swallowed and enters airways.
	H412	Harmful to aquatic life with long lasting effects.

Precautionary Statements		
:	**Prevention:**	
	P201	Obtain special instructions before use.
	P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
	P233	Keep container tightly closed.
	P243	Take precautionary measures against static discharge.
	P260	Do not breathe dust/ fume/ gas/ mist/ vapors/ spray.
	P273	Avoid release to the environment.
	P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.

Response:

P301	IF SWALLOWED:
P310	Immediately call a POISON CENTER/doctor.
P331	Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.

Storage:

P403 + P235	Store in a well-ventilated place. Keep cool.

2.3 Other hazards

Static-accumulating flammable liquid can become electrostatically charged even in bonded and grounded equipment. Sparks may ignite liquid and vapor and may cause flash fire or explosion
This substance is not considered to be persistent, bioaccumulating and toxic (PBT).
This substance is not considered to be very persistent and very bioaccumulating (vPvB).

3. Composition/information on ingredients

3.1 Substances

Ingredients

Chemical name	CAS-No. EINECS-No. / ELINCS No./EC-No.	Weight %	Component Type
Styrene	100-42-5 202-851-5	> 99.8 %	A
P-Tertiary Butyl Catechol	98-29-3 202-653-9	0.0 - 0.005 %	B

Key:
(A) Substance
(B) Stabilizer

4. First aid measures

4.1 Description of first-aid measures

General advice : Always observe self-protection methods

Wear appropriate personal protective equipment, avoid direct contact.
Move out of dangerous area.
Remove contaminated shoes and clothing.
Get medical attention immediately.
Show this material safety data sheet to the doctor in attendance.

If inhaled : Remove victim to fresh air and keep at rest in a position comfortable for breathing.
Do not leave the victim unattended.
Keep patient warm and at rest.
Get immediate medical advice/ attention.
If breathing is difficult, give oxygen.
If unconscious place in recovery position and seek medical advice.
In the event of unconsciousness, apnea or cardiac arrest (no pulse), apply cardiopulmonary resuscitation.

In case of skin contact : Take off contaminated clothing and shoes immediately.
In case of contact, immediately flush skin with soap and plenty of water.
Call a physician if irritation persists.
Wash contaminated clothing before reuse.

In case of eye contact : In case of eye contact, remove contact lens and rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
Get medical attention immediately.

If swallowed : Clean mouth with water and drink afterwards plenty of water.
DO NOT induce vomiting. If vomiting does occur, have victim lean forward to reduce risk of aspiration. Get medical attention immediately.
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

Symptoms : If inhalation occurs signs and symptoms may include coughing, choking, wheezing, difficulty in breathing, chest congestion, shortness of breath and/or fever.

Hazards : Aspiration may cause pulmonary edema and pneumonitis.
Potential danger from aspiration must be weighed against possible oral toxicity when deciding to induce vomiting.

Harmful if inhaled.
Causes eye and skin irritation.
May cause hearing loss.

4.3 Indication of any immediate medical attention and special treatment needed

Treatment	:	Treat symptomatically. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient. Do NOT induce vomiting. Gastrointestinal decontamination in accidental petroleum distillate ingestions is not recommended, because of the severe aspiration hazard. Gastric lavage is indicated in those patients who require decontamination. Be sure that an endotracheal tube is in place prior to lavage; use cuffed tubes in patients over 7 years of age. Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias (irregular beating) in persons exposed to this material. All contaminated clothing should be removed, and contaminated skin areas washed with lipophilic soap, or green soap, and water. If ingested, cardiac and respiratory status must be continuously monitored. Be prepared to give oxygen and, if necessary, intubate. A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.

5. Fire-fighting measures

5.1 Extinguishing media

Suitable extinguishing media	:	SMALL FIRE: Use dry chemical, CO2, water spray or regular foam. LARGE FIRE: Use water spray, water fog or regular foam. Do not use straight streams.
Unsuitable extinguishing media	:	Do not use solid water stream - may spread fire.

5.2 Special hazards arising from the substance or mixture

Specific hazards during fire fighting	:	Eliminate all sources of ignition. Releases flammable vapors below normal ambient temperatures. May autopolymerize if uninhibited, heated or involved in a fire. Autopolymerization will be accompanied by evolution of heat, which may cause release of styrene vapors forming flammable mixtures with air. Liquid normally inhibited but not vapors. Vapors may condense as solids, plugging pressure relief devices, causing overpressure/rupture of storage containers during runaway polymerization.

Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
Move containers from fire area if it can be done without risk.
Cool containers with flooding quantities of water until well after fire is out.
Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
Always stay away from tanks engulfed in fire.
For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.
Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.

5.3 Advice for firefighters

Special protective equipment for fire-fighters : Wear positive pressure self-contained breathing apparatus (SCBA).
Structural firefighter's protective clothing will only provide limited protection.

6. Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Personal precautions : Use personal protective equipment.
Ensure adequate ventilation.
Eliminate all sources of ignition.
Evacuate personnel to safe areas.
Beware of vapors accumulating to form explosive concentrations. Vapors can accumulate in low areas.
Enter area only if strictly necessary. A combustible gas detector can be used to check for flammable gas or vapors.

6.2 Environmental precautions

Environmental precautions : Prevent entry into waterways, sewers, basements or confined areas.
Prevent further leakage or spillage if safe to do so.
If the product contaminates rivers and lakes or drains inform respective authorities.
If necessary, all contaminated waste water must be treated in a municipal or industrial wastewater treatment plant before release to surface water.

Chemical removal by air and water pollution control devices must meet the minimum efficiency requirements needed to reduce exposures to an acceptable level.
The discharge of treatment plant effluent to rivers and oceans

must achieve the dilution ratio needed to reduce exposures to an acceptable level.
The size and capacity of wastewater treatment plants must meet the minimum requirements needed to reduce exposures to an acceptable level.
Waste management practices such as incineration, recycling, reuse must be enforced as needed to reduce exposures to an acceptable level.

External treatment and disposal of waste should comply with applicable local and/or national regulations.
The maximum allowable site tonnage and the days of use should be below the number needed to maintain exposures at an acceptable level.

6.3 Methods and materials for containment and cleaning up

Methods for containment / Methods for cleaning up : Flammable liquid.
Eliminate all sources of ignition.
All equipment used when handling this product must be grounded.
Do not touch or walk through spilled material.
Stop leak if you can do it without risk.
Prevent entry into waterways, sewers, basements or confined areas.
A vapor suppressing foam may be used to reduce vapors.
Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
Use clean non-sparking tools to collect absorbed material.

7. Handling and storage

7.1 Precautions for safe handling

Advice on safe handling : May autopolymerize if uninhibited, heated or involved in a fire.
Autopolymerization will be accompanied by evolution of heat, which may cause release of styrene vapors forming flammable mixtures with air.
Do not handle near heat, sparks, or flame. Avoid contact with incompatible agents. Use only with adequate ventilation/personal protection. Avoid contact with eyes, skin and clothing. Do not enter storage area unless adequately ventilated. Metal containers involved in the transfer of this material should be grounded and bonded.
Containers that have held styrene monomer must be thoroughly cleaned, drained and dried to prevent fire hazard from residue.

Keep container tightly closed when not in use.
Take necessary action to avoid static electricity discharge (which might cause ignition of organic vapors).
Use only non-sparking tools.
After handling, always wash hands thoroughly with soap and water.

Fire-fighting class : Flammable liquid.

7.2 Conditions for safe storage, including any incompatibilities

Requirements for storage areas and containers : Monitor inhibitor to maintain appropriate concentration.
Keep containers tightly closed when not in use and store in a well-ventilated area. Isolate incompatible materials such as oxidizers. Containers should be clearly labeled. Metal containers used to store this material should be grounded.
Store below 104°F (40°C).
Empty containers may contain flammable product residues.
Do not weld, solder, drill, cut or perform similar operations on or near containers.
Ensure that all relevant regulations regarding explosive atmosphere, and handling and storage facilities of flammable products are followed.

7.3 Specific end use(s)

: (Refer to exposure scenario section for specific information).

8. Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Occupational Exposure Limits

Ingredients	CAS-No.	Type	Limit Value	Basis Revision Date	Additional Information
Styrene	100-42-5	STEL	40 ppm	US (ACGIH) 2012	
Styrene	100-42-5	TWA	20 ppm	US (ACGIH) 2012	
Styrene	100-42-5	TWA	25 ppm 105 mg/m3	OEL (NO) October 2010	

Styrene	100-42-5	STEL	25 ppm 105 mg/m3	OEL (NO) December 22, 2014	

Consult local authorities for acceptable exposure limits.

Biological Exposure Indices

Ingredients	CAS-No.	Control parameters	Biological specimen	Sampling time	Concentration	Basis
Styrene	100-42-5	Mandelic acid plus phenylglyoxylic acid	urine	end of shift	400 mg/g creatinine	ACGIH_BEIS
		Remarks: nonspecific.				
Styrene	100-42-5	Styrene	urine	end of shift	40 mg/m3	ACGIH_BEIS

DN(M)EL : End Use: Workers
Routes of exposure: Inhalation
Potential health effects: Acute effects
Value: 289 mg/m3
Systemic effects

DN(M)EL : End Use: Workers
Routes of exposure: Inhalation
Potential health effects: Acute effects
Value: 306 mg/m3
Local effects

DN(M)EL : End Use: Workers
Routes of exposure: Skin contact
Potential health effects: Long term
Systemic effects

DN(M)EL : End Use: Workers
Routes of exposure: Inhalation
Potential health effects: Long term
Value: 85 mg/m3
Systemic effects

DN(M)EL : End Use: Workers
Routes of exposure: Skin contact
Potential health effects: Long term
Value: 406 mg/kg bw/day
Systemic effects

DN(M)EL : End Use: General Population
Routes of exposure: Inhalation
Potential health effects: Acute effects
Value: 174.25 mg/m3
Systemic effects

DN(M)EL : End Use: General Population

		Routes of exposure: Inhalation Potential health effects: Acute effects Value: 182.75 mg/m3 Local effects
DN(M)EL	:	End Use: General Population Routes of exposure: Skin contact Potential health effects: Long term Value: 343 mg/kg bw/day Systemic effects
DN(M)EL	:	End Use: General Population Routes of exposure: Inhalation Potential health effects: Long term Value: 10.2 mg/m3 Systemic effects
DN(M)EL	:	End Use: General Population Routes of exposure: Ingestion Potential health effects: Long term Value: 2.1 mg/kg bw/day Systemic effects
PNEC	:	Fresh water Value: 0.028 mg/l Assessment factor -10
PNEC	:	Sea water Value: 0.014 mg/l Assessment factor - 20
PNEC	:	Water Value: 0.04 mg/l Intermittent Releases, Assessment factor -100
PNEC	:	Fresh water sediment Value: 0.614 mg/kg dw
PNEC	:	Sea sediment Value: 0.307 mg/kg dw
PNEC	:	Sewage Treatment Plant Value: 5 mg/l Assessment factor -100
PNEC	:	Soil Value: 0.2 mg/kg dw

8.2 Exposure controls

Engineering measures

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits.

Personal protective equipment

Respiratory protection	:	When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.
	:	Wear a respirator conforming to EN 140 with type A filter or better.
Hand protection	:	Use chemical resistant gloves appropriate to conditions of use. Wear chemical resistant gloves such as: Glove material fluoroelastomer; material thickness 0.4 mm; break through time ≥ 480 min. Gloves must be replaced after 8 hours of wear. The selected protective gloves have to satisfy the standard EN 374 derived from it. Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough.
Eye and face protection	:	Eye protection such as chemical splash goggles and/or face shield must be worn when possibility exists for eye contact due to splashing or spraying liquid, airborne particles, or vapor. Safety glasses are the minimum requirements. The selected goggles or glasses must satisfy the European norm standard EN 166.
Skin and body protection	:	When skin contact is possible, protective clothing including gloves, apron, sleeves, boots, head and face protection should be worn. The selected protective clothing has to satisfy the standard EN 13034, which describes clothing offering limited 8 hour protection against splashes. Choose body protection according to the amount and concentration of the dangerous substance at the work place. Use PPE that is chemical resistant to the product and prevents skin contact.
Hygiene measures	:	Selection of appropriate personal protective equipment should be based on an evaluation of the performance characteristics of the protective equipment relative to the task(s) to be performed, conditions present, duration of use, and the hazards and/or potential hazards that may be encountered during use. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Use good personal hygiene practices. Wash hands before eating, drinking, smoking, or using toilet facilities.

Take off contaminated clothing and wash before reuse.

Environmental exposure controls

General advice : See section 6.

9. Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance	:	liquid
Color	:	Colorless to yellow.
Odor	:	Aromatic, sweet odor.
Odor Threshold	:	0.017 ppm
Flash point	:	31 °C
Lower explosion limit	:	0.9 vol%
Upper explosion limit	:	6.8 vol%
Flammability (solid, gas)	:	Not applicable
Oxidizing properties	:	The substance or mixture is not classified as oxidizing.
Autoignition temperature	:	490 °C at 1,013 hPa
Molecular weight	:	104.14 g/mol
Decomposition temperature	:	not determined
Melting point/freezing point	:	-31 °C
Boiling point/boiling range	:	145 °C at 1,013 hPa
Vapor pressure	:	6.67 hPa at 20 °C
Relative density	:	0.9 - 0.91
Water solubility	:	0.32 g/l at 25 °C

Partition coefficient: n-octanol/water	:	log Pow: 2.96 at 25 °C
Viscosity, dynamic	:	0.696 mPa.s at 25 °C
Viscosity, kinematic	:	0.77 mm2/s at 25 °C
Relative vapor density	:	3.6 (Air = 1.0)
Surface tension	:	Surface activity is not expected or predicted based on structural considerations.
Evaporation rate	:	no data available
Explosive properties	:	Not explosive

9.2 Other information

Other information	:	Additional properties may be listed in Sections 2 and 5.

10. Stability and reactivity

10.1 Reactivity

This product is stable with an appropriate level of TBC inhibitor (minimum 10 ppm), but reactive (unstable) without.
Contact a company sales representative for information regarding adequate inhibitor levels and methods of making inhibitor level determinations.

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

Hazardous reactions	:	May occur.

10.4 Conditions to avoid

Conditions to avoid	:	May autopolymerize if uninhibited, heated or involved in a fire. Autopolymerization will be accompanied by evolution of heat, which may cause release of styrene vapors forming flammable mixtures with air. Depleted inhibitor levels. High temperatures and severe oxidizing conditions. Avoid static discharge or other sources of ignition.

10.5 Incompatible materials

Materials to avoid : Strong oxidizing agents
Peroxides
Contaminants and catalysts for vinyl polymers.
Alkali metal-graphite compounds.
Aluminum chloride.
Strong acids.
Strong alkalies.
Copper
Copper alloys
Rubber.
Brass.

10.6 Hazardous decomposition products

Hazardous decomposition products : On decomposition, emits acrid fumes.

Thermal decomposition : Note: Thermal decomposition may produce oxides of carbon and other toxic gases and liberate heat and pressure.

: Note: On decomposition, emits acrid fumes.

11. Toxicological information

11.1 Information on toxicological effects

Product Summary : The below given information is based on the assessment of the product including impurities.

Acute toxicity

Acute oral toxicity :

Based on acute toxicity values, not classified.

: LD50: 5,000 mg/kg
Species: Rat

Acute inhalation toxicity : Harmful if inhaled.

: LC50: 11.8 mg/l
Exposure time: 4 HOURS
Species: Rat

Acute dermal toxicity : Based on acute toxicity values, not classified.

: LD50: > 2,000 mg/kg
Species: Rat

Skin corrosion/irritation : Classified
Causes skin irritation.

Serious eye damage/eye irritation : Classified
Causes serious eye irritation.

Respiratory or skin sensitization : Respiratory sensitization
Not classified
No study available.

: Skin sensitization
Not classified
No adverse effect observed.

Chronic toxicity

Carcinogenicity : Not classified
Chronic inhalation resulted in hyperplasia and fibrosis and an increased incidence of late onset lung tumors in mice, which are believe to have arisen through a non-genotoxic mechanism. Tumor incidence in rats was unaffected after chronic inhalation exposure. There is no convincing evidence that styrene possesses significant carcinogenic potential in humans.

Germ cell mutagenicity : Not classified
No adverse effect observed.

Reproductive toxicity

Effects on fertility / Effects on or via lactation : Not classified
No adverse effect observed.
There is suggestive evidence from human studies that exposure to styrene may increase levels of serum prolactin. The clinical relevance of this effect is uncertain.

Effects on Development : Classified
Suspected of damaging the unborn child.

Target Organ Systemic Toxicant - Single exposure

: Classified, May cause respiratory irritation.

: Routes of exposure: Inhalation

Target Organ Systemic Toxicant - Repeated exposure

: Classified, Causes damage to organs through prolonged or repeated exposure.

: Routes of exposure: Inhalation
Target Organs: Auditory system

Aspiration hazard : May be fatal if swallowed and enters airways.

12. Ecological information

12.1 Toxicity

Toxicity to fish :

Toxic to fish.

: LC50: 4.02 mg/l
Exposure time: 96 HOUR

Species: Pimephales promelas (fathead minnow)

Toxicity to daphnia and other aquatic invertebrates : Toxic to aquatic invertebrates.

: EC50: 4.7 mg/l
Exposure time: 48 HOUR
Species: Daphnia magna.

Toxicity to algae : Toxic to algae.

: EC50: 4.9 mg/l
Exposure time: 72 HOUR
Species: Pseudokirchneriella subcapitata (green algae)

Toxicity to bacteria : Low toxicity to sewage treatment plant microbes expected.

: EC50: 500 mg/l

Exposure time: 30 min

Toxicity to fish (Chronic toxicity) : no data available

Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity) : Harmful to aquatic invertebrates (chronic exposure)

NOEC: 1.01 mg/l
Exposure time: 21 d
Species: Daphnia magna (Water flea)

Ecotoxicology Assessment

Ecotoxicology Assessment

Acute aquatic toxicity : Toxic to aquatic life.

Chronic aquatic toxicity : Harmful to aquatic life with long lasting effects.

Styrene :

Styrene :

12.2 Persistence and degradability

Biodegradability : 70.9 %
Rapidly degradable.
(After 28 days in a ready biodegradability test)

12.3 Bioaccumulative potential

Bioaccumulation : Bioconcentration factor (BCF): 74
Method: (QSAR calculated value)
This material is not expected to bioaccumulate.

12.4 Mobility in soil

Surface tension : Surface activity is not expected or predicted based on structural considerations.

Distribution among environmental compartments : Stability in water
Not expected to hydrolyze readily.

: Stability in soil
Expected to be biodegradable

: Adsorption/Soil
May have potential for adsorption.

(based on QSAR calculation of Koc)

Additional advice : No additional information available.

Environmental fate and pathways

12.5 Results of PBT and vPvB assessment

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

12.6 Other adverse effects

Additional ecological information : no data available

13. Disposal considerations

13.1 Waste treatment methods

Product : Contaminated product, soil, water, container residues and spill cleanup materials may be hazardous wastes.
Comply with applicable local, state or international regulations concerning solid or hazardous waste disposal and/or container disposal.
Contaminated product, soil or water should be considered dangerous due to potential evolution of flammable vapor.
Proper grounding procedures to avoid static electricity should be followed.
The product should not be allowed to enter drains, water courses or the soil.

14. Transport information

ADR

UN number	:	2055
UN proper shipping name	:	STYRENE MONOMER, STABILIZED
Transport hazard class(es)	:	3
Packing group	:	III
Classification Code	:	F1
Hazard Identification Number	:	39
Labels	:	3
Tunnel restriction code	:	D/E
Environmentally hazardous	:	no

IMDG

UN number	:	2055
Description of the goods	:	STYRENE MONOMER, STABILIZED
Class	:	3
Packing group	:	III
Labels	:	3
EmS Number 1	:	F-E
EmS Number 2	:	S-D
Marine pollutant	:	no

RID

UN number	:	2055
Description of the goods	:	STYRENE MONOMER, STABILIZED
Transport hazard class(es)	:	3
Packing group	:	III
Classification Code	:	F1
Hazard Identification Number	:	39
Labels	:	3
Environmentally hazardous	:	no

IATA

: Not Supported
: If transportation information is required, please contact Logistics Compliance at: dangerousgoods@lyb.com

15. Regulatory information

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

Water contaminating class (Germany)	:	WGK 2 water endangering
US (ACGIH)	:	Not classifiable as a human carcinogen.
International Agency for Research on Cancer	:	Possibly Carcinogenic to Humans Monograph 82 [2002], Monograph 60 [1994]

REACh status

If the product has been purchased from any company of the LyondellBasell group of companies registered in the European Union, we confirm that the chemical substance in this product has been pre-registered or, where required under REACh, registered, and that we have the intention to proceed with any required registration in accordance with the deadlines set forth in REACh. (Regulation (EU) No. 1907/2006)

Other international regulations

Global Inventory Status
The ingredients of this product are compliant with the following chemical inventory requirements or exemptions.

*Additional Explanatory Status Statements follow the table, as necessary.

Country/Region	Inventory	Status Description
Australia	AICS	Compliant
Canada	DSL	Compliant
China	IECSC	Compliant
Europe	REACH	See REACH Compliance Statement
Japan	ENCS	Compliant
Korea	KECI	Compliant
New Zealand	NZIoC	Compliant
Philippines	PICCS	Compliant
United States of America	TSCA	Compliant
Taiwan	TCSCA	Compliant

Contact product.safety@lyb.com for additional global inventory information.

15.2 Chemical safety assessment

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

16. Other information

Material safety datasheet sections which have been updated:
Revision Date April 29 2016 Revised Section(s): 1 Annex

Full text of H-Statements referred to under sections 2 and 3.

H226	Flammable liquid and vapor.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H335	May cause respiratory irritation.
H361d	Suspected of damaging the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure if inhaled.
H412	Harmful to aquatic life with long lasting effects.

Further information

Disclaimer

Multiple legal entities and registration numbers may be displayed in Section 1. The Recipient shall refer to the shipping documents to identify the legal entity that supplied this product.

This document is generated for the purpose of distributing health, safety, and environmental

Disclaimer

data.
Information is correct to the best of our knowledge at the date of the SDS publication.
It is not a specification sheet nor should any displayed data be construed as a specification.
Before using a product sold by a company of the LyondellBasell family of companies, users should make their own independent determination that the product is suitable for the intended use and can be used safely and legally.
SELLER MAKES NO WARRANTY; EXPRESS OR IMPLIED (INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY WARRANTY) OTHER THAN AS SEPARATELY AGREED TO BY THE PARTIES IN A CONTRACT.
Users should review the applicable Safety Data Sheet before handling the product.
This product(s) may not be used in the manufacture of any of the following, without prior written approval by Seller for each specific product and application:
(i) U.S. FDA Class I or II Medical Devices; Health Canada Class I, II or III Medical Devices; European Union Class I or II Medical Devices;
(ii) film, overwrap and/or product packaging that is considered a part or component of one of the aforementioned medical devices;
(iii) packaging in direct contact with a pharmaceutical active ingredient and/or dosage form that is intended for inhalation, injection, intravenous, nasal, ophthalmic (eye), digestive, or topical (skin) administration;
(iv) tobacco related products and applications, electronic cigarettes and similar devices.

The product(s) may not be used in:
(i) U.S. FDA Class III Medical Devices; Health Canada Class IV Medical Devices; European Class III Medical Devices;
(ii) applications involving permanent implantation into the body;
(iii) life-sustaining medical applications.

All references to U.S. FDA, Health Canada, and European Union regulations include another country's equivalent regulatory classification.
In addition to the above, LyondellBasell may further prohibit or restrict the use of its products in certain applications. For further information, please contact a LyondellBasell representative.

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The presentation of numerical data, such as that used for physical and chemical properties and toxicological values, is expressed using a comma (,) to separate digits into groups of three and a period (.) as the decimal marker. For example, 1,234.56 mg/kg = 1 234,56 mg/kg.

Annex

Free short title	Manufacturing of styrene (ES1)
Systematic title based on use descriptor	ERC 1; PROC 1, 2, 8A, 8B, 15
Name of contributing environmental scenario and corresponding ERC	ERC 1 Production of chemicals
Name(s) of contributing worker scenarios and corresponding PROCs	PROC 1 - Use in closed process, no likelihood of exposure PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 15 - Use of laboratory reagents in small scale laboratories

1.1 Contributing Scenario (1) controlling environmental exposure for ERC 1

Operational conditions	
Annual site tonnage	4.50E6 to/year
Daily amount used at site	3.43E6 kg/day
Release times per year	350 days/year *(justification: Survey from Styrene manufacturers)*
Local freshwater dilution factor	41
Local marine water dilution factor	100
Release fraction to air from process	0.01%
Release fraction to wastewater from process	0.00%
Release fraction to soil from process	0%
Fraction tonnage to region	100%
Fraction used at main source	100 % *(justification: Worst case estimation of local tonnage)*
STP	yes
River flow rate	400000 m^3/day *(justification: Emission Scenario Document IC-2 Chemical industry:chemical used in synthesis (TGD Part IV, ECB, 2003))*
Municipal sewage treatment plant discharge	10000000 L/day *(justification: Emission Scenario Document IC-2 Chemical industry:chemical used in synthesis (TGD Part IV, ECB, 2003))*
Risk management measures	
Reduction of sludge to soil	100 % *(justification: Do not apply industrial sludge to natural soils)*
Other modified EUSES values	
Fraction released to waste water (Femis.water)	0.0048 % *(justification: Mean value of measured release fractions reported in the EU Risk Assessment Report on Styrene (European Communities, 2002))*
Fraction released to air (Femis.air)	0.013 % *(justification: Worst case measured release fraction reported in the EU Risk Assessment Report on Styrene (European Communities, 2002))*
Fraction used at main source	100 % *(justification: Value used to reflect worst case estimation of local tonnage (largest manufacturing plant))*
Fraction of emission directed to water by local STP (Fstp.water)	0.044 - *(justification: Efficiency STP 95.6% calculated from on-site monitoring data at production/processing sites)*

1.2 Contributing Scenario (2) controlling industrial worker exposure for PROC 1

Name of contributing scenario	1 - Use in closed process, no likelihood of exposure
Scenario subtitle	Material transfers [CS3]. Transfer from distillator to storage tanks via pipelines.
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employee training to prevent/minimize

	exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

1.3 Contributing Scenario (3) controlling industrial worker exposure for PROC 2

Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Scenario subtitle	Use in contained systems [CS38]. De-hydrogenation Reactor
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employee training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	

Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

1.4 Contributing Scenario (4) controlling industrial worker exposure for PROC 2

Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Scenario subtitle	Use in contained systems [CS38]. Condensation of crude styrene - water separation
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employee training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

1.5 Contributing Scenario (5) controlling industrial worker exposure for PROC 2

Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Scenario subtitle	Use in contained systems [CS38]. Vacuum Distillation
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employee training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

1.6 Contributing Scenario (6) controlling industrial worker exposure for PROC 2

Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Scenario subtitle	Material transfers [CS3]. Waste management : recovery using condensation or adsorption/ desorption processes
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employee training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	

Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

1.7 Contributing Scenario (7) controlling industrial worker exposure for PROC 8A

Name of contributing scenario	8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
Scenario subtitle	Process sampling [CS2]. Sampling from reactors/condensors/distillators
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employee training to prevent/minimize exposures Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial

Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no
Use a sampling system designed to control exposure	inhalation: 80 % *(justification: Use a sampling system designed to control exposure)*

1.8 Contributing Scenario (8) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Additivation and stabilisation [CS69]. Addition of inhibitors or retardants in distillators
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employee training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no
Local exhaust ventilation	dermal: 90 % *(justification: Use local exhaust ventilation with adequate effectiveness for dermal route of exposure)*

Local exhaust ventilation	inhalation: 97 % *(justification: Use local exhaust ventilation with adequate effectiveness)*

1.9 Contributing Scenario (9) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Additivation and stabilisation [CS69]. Stabiliser addition for storage and transport
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employee training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no
Local exhaust ventilation	dermal: 90 % *(justification: Use local exhaust ventilation with adequate effectiveness for dermal route of exposure)*
Local exhaust ventilation	inhalation: 97 % *(justification: Use local exhaust ventilation with adequate effectiveness)*

1.10 Contributing Scenario (10) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Material transfers [CS3]. Unloading storage tanks for road, rail or boat transport

Qualitative Risk Assessment	
General	Clear transfer lines prior to de-coupling Ensure good work practices are implemented Provide basic employee training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	outdoors (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

1.11 Contributing Scenario (11) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Equipment maintenance [CS5]. Manufacturing equipment maintenance: opening and cleaning manufacturing equipment for maintenance purposes
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employee training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid

Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

1.12 Contributing Scenario (12) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Material transfers [CS3]. Waste management : transfer of process wastes to storage containers: off-line in workplace
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employee training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors

Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

1.13 Contributing Scenario (13) controlling industrial worker exposure for PROC 15

Name of contributing scenario	15 - Use of laboratory reagents in small scale laboratories
Scenario subtitle	Laboratory activities [CS36]. Laboratory - Quality Control
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employee training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

Free short title	Continuous mass polymerisation of Polystyrene (HIPS and GPPS) (ES2)
Systematic title based on use descriptor	ERC 6C; PROC 2, 8A, 8B, 9, 14, 15

Name of contributing environmental scenario and corresponding ERC	ERC 6c Production of plastics
Name(s) of contributing worker scenarios and corresponding PROCs	PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 9 - Transfer of chemicals into small containers (dedicated filling line) PROC 14 - Production of preparations or articles by tabletting, compression, extrusion, pelletisation PROC 15 - Use of laboratory reagents in small scale laboratories

2.1 Contributing Scenario (1) controlling environmental exposure for ERC 6C

Operational conditions	
Annual tonnage	2.42E6 to/year
Daily amount used at site	4.83E5 kg/day
Release times per year	300 days/year *(justification: 300)*
Local freshwater dilution factor	10
Local marine water dilution factor	100
Release fraction to air from process	0.10%
Release fraction to wastewater from process	0.00%
Release fraction to soil from process	0%
Fraction tonnage to region	10%
Fraction used at main source	60%
STP	yes
River flow rate	18000 m^3/day
Municipal sewage treatment plant discharge	2000000 L/day
Other modified EUSES values	
Fraction released to waste water (Femis.water)	0.000012 % *(justification: Release for production by continuous masss process (EU Risk Assessment report))*
Fraction released to air (Femis.air)	0.102 % *(justification: Worst case estimation from European polymerisation sites(EU Risk Assessment Report on Styrene,European Communities, 2002))*
Fraction used at main source	60 % *(justification: Value adopted to account for worst-case European manufacturing site)*
Fraction of emission directed to water by local STP (Fstp.water)	0.081 - *(justification: Efficiency STP 91.9%)*

2.2 Contributing Scenario (2) controlling industrial worker exposure for PROC 2

Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Scenario subtitle	Continuous process [CS54]. Styrene Storage in tanks
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium

Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

2.3 Contributing Scenario (3) controlling industrial worker exposure for PROC 2

Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Scenario subtitle	Continuous process [CS54]. Charging reactor via pipeline
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no

Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

2.4 Contributing Scenario (4) controlling industrial worker exposure for PROC 2

Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Scenario subtitle	Material transfers [CS3]. Heat exchange and agitator in reactor
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

2.5 Contributing Scenario (5) controlling industrial worker exposure for PROC 2

Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Scenario subtitle	Continuous process [CS54]. Devolatilisation tower
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures

	In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

2.6 Contributing Scenario (6) controlling industrial worker exposure for PROC 2

Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Scenario subtitle	Continuous process [CS54]. Recycling styrene from tower to rector via pipeline
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)

Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

2.7 Contributing Scenario (7) controlling industrial worker exposure for PROC 2

Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Scenario subtitle	Material transfers [CS3]. Waste management : recovery using condensation or adsorption/ desorption processes
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

2.8 Contributing Scenario (8) controlling industrial worker exposure for PROC 8A

Name of contributing scenario	8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
Scenario subtitle	Process sampling [CS2]. Sampling from reactors/devolatilisation tower
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no
Use a sampling system designed to control exposure	inhalation: 80 % *(justification: Use a sampling system designed to control exposure)*

2.9 Contributing Scenario (9) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Material transfers [CS3]. Loading tank storage from road, rail or boat transport
Qualitative Risk Assessment	
General	Clear transfer lines prior to de-coupling Ensure good work practices are implemented

	Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

2.10 Contributing Scenario (10) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Equipment maintenance [CS5]. Manufacturing equipment maintenance: opening and cleaning manufacturing equipment for maintenance purposes
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	

Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

2.11 Contributing Scenario (11) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Bulk transfers [CS14]. Finished product Loading of road tanker, railcar, container
Product characteristics	
Physical state	liquid
Concentration in substance	1-5%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

2.12 Contributing Scenario (12) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities

Scenario subtitle	Material transfers [CS3]. Waste management : transfer of process wastes to storage containers: off-line in workplace
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

2.13 Contributing Scenario (13) controlling industrial worker exposure for PROC 9

Name of contributing scenario	9 - Transfer of chemicals into small containers (dedicated filling line)
Scenario subtitle	Small package filling [CS7]. Small package filling - Packaging of product
Product characteristics	
Physical state	liquid
Concentration in substance	1-5%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2

Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

2.14 Contributing Scenario (14) controlling industrial worker exposure for PROC 14

Name of contributing scenario	14 - Production of preparations or articles by tabletting, compression, extrusion, pelletisation
Scenario subtitle	Extrusion and masterbatching [CS88]. Extruder - Pelletizing
Product characteristics	
Physical state	liquid
Concentration in substance	1-5%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

2.15 Contributing Scenario (15) controlling industrial worker exposure for PROC 15

Name of contributing scenario	15 - Use of laboratory reagents in small scale laboratories
Scenario subtitle	Laboratory activities [CS36]. Laboratory - Quality Control
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.

Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

Free short title	Batch suspension polymerisation of Polystyrene (HIPS and GPPS) (ES3)
Systematic title based on use descriptor	ERC 6C; PROC 8B, 2, 3, 8A, 9, 15, 14
Name of contributing environmental scenario and corresponding ERC	ERC 6c Production of plastics
Name(s) of contributing worker scenarios and corresponding PROCs	PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 3 - Use in closed batch process (synthesis or formulation) PROC 3 - Use in closed batch process (synthesis or formulation) PROC 3 - Use in closed batch process (synthesis or formulation)

	PROC 8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 9 - Transfer of chemicals into small containers (dedicated filling line) PROC 15 - Use of laboratory reagents in small scale laboratories PROC 14 - Production of preparations or articles by tabletting, compression, extrusion, pelletisation

3.1 Contributing Scenario (1) controlling environmental exposure for ERC 6C

Operational conditions	
Annual tonnage	2.42E6 to/year
Daily amount used at site	4.83E5 kg/day
Release times per year	300 days/year *(justification: Continuous production)*
Local freshwater dilution factor	10
Local marine water dilution factor	100
Release fraction to air from process	0.10%
Release fraction to wastewater from process	0.00%
Release fraction to soil from process	0%
Fraction tonnage to region	10%
Fraction used at main source	60%
STP	yes
River flow rate	18000 m^3/day
Municipal sewage treatment plant discharge	2000000 L/day
Other modified EUSES values	
Fraction released to waste water (Femis.water)	0.000012 % *(justification: EU Risk Assessment Report, 2002)*
Fraction released to air (Femis.air)	0.102 % *(justification: EU Risk Assessment Report, 2002)*
Fraction used at main source	60 % *(justification: Value adopted to account for worst-case European manufacturing site)*

Fraction of emission directed to water by local STP (Fstp.water)	0.081 - *(justification: Efficiency STP 91.9%)*

3.2 Contributing Scenario (2) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Material transfers [CS3]. Loading tank storage from road, rail or boat transport
Qualitative Risk Assessment	
General	Clear transfer lines prior to de-coupling Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

3.3 Contributing Scenario (3) controlling industrial worker exposure for PROC 2

Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Scenario subtitle	Material transfers [CS3]. Styrene Storage in tanks
Qualitative Risk Assessment	
General	Ensure good work practices are implemented

	Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

3.4 Contributing Scenario (4) controlling industrial worker exposure for PROC 2

Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Scenario subtitle	Material transfers [CS3]. Waste management : recovery using condensation or adsorption/ desorption processes
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)

Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

3.5 Contributing Scenario (5) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Material transfers [CS3]. Charging reactors via pipeline
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

3.6 Contributing Scenario (6) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Batch process [CS55]. Dispersing and heat in reactor
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

3.7 Contributing Scenario (7) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Batch process [CS55]. Washed and dried tanks
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection.

	Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

3.8 Contributing Scenario (8) controlling industrial worker exposure for PROC 8A

Name of contributing scenario	8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
Scenario subtitle	Process sampling [CS2]. Sampling from reactors/tanks
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2

Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no
Use a sampling system designed to control exposure	inhalation: 80 % *(justification: Use a sampling system designed to control exposure)*

3.9 Contributing Scenario (9) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Equipment maintenance [CS5]. Manufacturing equipment maintenance: opening and cleaning manufacturing equipment for maintenance purposes
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

3.10 Contributing Scenario (10) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Bulk transfers [CS14]. Finished product Loading of road tanker, railcar, container
Product characteristics	
Physical state	liquid
Concentration in substance	1-5%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

3.11 Contributing Scenario (11) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Material transfers [CS3]. Waste management : transfer of process wastes to storage containers: off-line in workplace
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	

Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

3.12 Contributing Scenario (12) controlling industrial worker exposure for PROC 9

Name of contributing scenario	9 - Transfer of chemicals into small containers (dedicated filling line)
Scenario subtitle	Small package filling [CS7]. Small package filling - Packaging of product
Product characteristics	
Physical state	liquid
Concentration in substance	1-5%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

3.13 Contributing Scenario (13) controlling industrial worker exposure for PROC 15

Name of contributing scenario	15 - Use of laboratory reagents in small scale laboratories

Scenario subtitle	Laboratory activities [CS36]. Laboratory - Quality Control
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

3.14 Contributing Scenario (14) controlling industrial worker exposure for PROC 14

Name of contributing scenario	14 - Production of preparations or articles by tabletting, compression, extrusion, pelletisation
Scenario subtitle	Operation of solids filtering equipment [CS117]. Pelletizing
Product characteristics	
Physical state	liquid
Concentration in substance	1-5%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	

Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

Free short title	Production of Expandable Polystyrene (ES4)
Systematic title based on use descriptor	ERC 6C; PROC 2, 3, 8A, 8B, 9, 14, 15
Name of contributing environmental scenario and corresponding ERC	ERC 6c Production of plastics
Name(s) of contributing worker scenarios and corresponding PROCs	PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 3 - Use in closed batch process (synthesis or formulation) PROC 3 - Use in closed batch process (synthesis or formulation) PROC 3 - Use in closed batch process (synthesis or formulation) PROC 8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities

	PROC 9 - Transfer of chemicals into small containers (dedicated filling line) PROC 14 - Production of preparations or articles by tabletting, compression, extrusion, pelletisation PROC 15 - Use of laboratory reagents in small scale laboratories

4.1 Contributing Scenario (1) controlling environmental exposure for ERC 6C

Operational conditions	
Annual tonnage	2.42E6 to/year
Daily amount used at site	4.83E5 kg/day
Release times per year	300 days/year *(justification: Continuous production)*
Local freshwater dilution factor	10
Local marine water dilution factor	100
Release fraction to air from process	0.10%
Release fraction to wastewater from process	0.00%
Release fraction to soil from process	0%
Fraction tonnage to region	10%
Fraction used at main source	60%
STP	yes
River flow rate	18000 m^3/day
Municipal sewage treatment plant discharge	2000000 L/day
Other modified EUSES values	
Fraction released to waste water (Femis.water)	0.000012 % *(justification: EU Risk Assessment Report, 2002)*
Fraction released to air (Femis.air)	0.102 % *(justification: EU Risk Assessment Report, 2002)*
Fraction used at main source	60 % *(justification: Value adopted to account for worst-case European manufacturing site)*
Fraction of emission directed to water by local STP (Fstp.water)	0.081 - *(justification: Efficiency STP 91.9%)*

4.2 Contributing Scenario (2) controlling industrial worker exposure for PROC 2

Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Scenario subtitle	Material transfers [CS3]. Waste management : recovery using condensation or adsorption/ desorption processes
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures

	In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

4.3 Contributing Scenario (3) controlling industrial worker exposure for PROC 2

Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Scenario subtitle	Material transfers [CS3]. Styrene Storage in tanks
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week

Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

4.4 Contributing Scenario (4) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Material transfers [CS3]. Charging reactors via pipeline
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

4.5 Contributing Scenario (5) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Batch process [CS55]. Dispersing and heat in reactor
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

4.6 Contributing Scenario (6) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Batch process [CS55]. Washed and dried tanks
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.

Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

4.7 Contributing Scenario (7) controlling industrial worker exposure for PROC 8A

Name of contributing scenario	8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
Scenario subtitle	Process sampling [CS2]. Sampling from reactors/tanks
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	

Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no
Use a sampling system designed to control exposure	inhalation: 80 % *(justification: Use a sampling system designed to control exposure)*

4.8 Contributing Scenario (8) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Material transfers [CS3]. Loading tank storage from road, rail or boat transport
Qualitative Risk Assessment	
General	Clear transfer lines prior to de-coupling Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

4.9 Contributing Scenario (9) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Equipment maintenance [CS5]. Manufacturing equipment maintenance: opening and cleaning manufacturing equipment for maintenance purposes
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

4.10 Contributing Scenario (10) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Bulk transfers [CS14]. Finished product Loading of road tanker, railcar, container
Product characteristics	
Physical state	liquid
Concentration in substance	1-5%
Fugacity / Dustiness	medium
Frequency and duration of use	

Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

4.11 Contributing Scenario (11) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Material transfers [CS3]. Waste management : transfer of process wastes to storage containers: off-line in workplace
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No

Respiratory protection	no

4.12 Contributing Scenario (12) controlling industrial worker exposure for PROC 9

Name of contributing scenario	9 - Transfer of chemicals into small containers (dedicated filling line)
Scenario subtitle	Small package filling [CS7]. Small package filling - Packaging of product
Product characteristics	
Physical state	liquid
Concentration in substance	1-5%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

4.13 Contributing Scenario (13) controlling industrial worker exposure for PROC 14

Name of contributing scenario	14 - Production of preparations or articles by tabletting, compression, extrusion, pelletisation
Scenario subtitle	Operation of solids filtering equipment [CS117]. Pelletizing
Product characteristics	
Physical state	liquid
Concentration in substance	1-5%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	

Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

4.14 Contributing Scenario (14) controlling industrial worker exposure for PROC 15

Name of contributing scenario	15 - Use of laboratory reagents in small scale laboratories
Scenario subtitle	Laboratory activities [CS36]. Laboratory - Quality Control
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

Free short title	Production of Styrenic Copolymers (ES5)
Systematic title based on use descriptor	ERC 6C; PROC 8B, 2, 3, 8A, 9, 15

Name of contributing environmental scenario and corresponding ERC	ERC 6c Production of plastics
Name(s) of contributing worker scenarios and corresponding PROCs	PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 3 - Use in closed batch process (synthesis or formulation) PROC 3 - Use in closed batch process (synthesis or formulation) PROC 3 - Use in closed batch process (synthesis or formulation) PROC 3 - Use in closed batch process (synthesis or formulation) PROC 8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 9 - Transfer of chemicals into small containers (dedicated filling line) PROC 15 - Use of laboratory reagents in small scale laboratories

5.1 Contributing Scenario (1) controlling environmental exposure for ERC 6C

Operational conditions

Annual tonnage	2.42E6 to/year
Daily amount used at site	4.83E5 kg/day
Release times per year	300 days/year *(justification: Continuous production)*
Local freshwater dilution factor	10
Local marine water dilution factor	100
Release fraction to air from process	0.10%
Release fraction to wastewater from process	0.00%
Release fraction to soil from process	0%
Fraction tonnage to region	10%
Fraction used at main source	60%
STP	yes
River flow rate	18000 m^3/day
Municipal sewage treatment plant discharge	2000000 L/day
Other modified EUSES values	
Fraction released to waste water (Femis.water)	0.000012 % *(justification: EU Risk Assessment Report, 2002)*
Fraction released to air (Femis.air)	0.102 % *(justification: EU Risk Assessment Report, 2002)*
Fraction used at main source	60 % *(justification: Value adopted to account for worst-case European manufacturing site)*
Fraction of emission directed to water by local STP (Fstp.water)	0.081 - *(justification: Efficiency STP 91.9%)*

5.2 Contributing Scenario (2) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Material transfers [CS3]. Loading tank storage from road, rail or boat transport
Qualitative Risk Assessment	
General	Clear transfer lines prior to de-coupling Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week

Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

5.3 Contributing Scenario (3) controlling industrial worker exposure for PROC 2

Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Scenario subtitle	Material transfers [CS3]. Styrene Storage in tanks
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

5.4 Contributing Scenario (4) controlling industrial worker exposure for PROC 2

Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Scenario subtitle	Material transfers [CS3]. Waste management : recovery using condensation or adsorption/ desorption processes
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

5.5 Contributing Scenario (5) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Material transfers [CS3]. Charging reactors via pipeline
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid

Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

5.6 Contributing Scenario (6) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Batch process [CS55]. Dissolving and polymerisation reactor
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)

Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

5.7 Contributing Scenario (7) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Batch process [CS55]. Suspension reactor
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

5.8 Contributing Scenario (8) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Batch process [CS55]. Washed and dried tanks
Qualitative Risk Assessment	
General	Ensure good work practices are implemented

	Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

5.9 Contributing Scenario (9) controlling industrial worker exposure for PROC 8A

Name of contributing scenario	8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
Scenario subtitle	Process sampling [CS2]. Sampling from reactors/tanks
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)

Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no
Use a sampling system designed to control exposure	inhalation: 80 % *(justification: Use a sampling system designed to control exposure)*

5.10 Contributing Scenario (10) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Equipment maintenance [CS5]. Manufacturing equipment maintenance: opening and cleaning manufacturing equipment for maintenance purposes
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no

Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

5.11 Contributing Scenario (11) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Bulk transfers [CS14]. Finished product Loading of road tanker, railcar, container
Product characteristics	
Physical state	liquid
Concentration in substance	1-5%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

5.12 Contributing Scenario (12) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Material transfers [CS3]. Waste management : transfer of process wastes to storage containers: off-line in workplace
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.

Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

5.13 Contributing Scenario (13) controlling industrial worker exposure for PROC 9

Name of contributing scenario	9 - Transfer of chemicals into small containers (dedicated filling line)
Scenario subtitle	Small package filling [CS7]. Small package filling - Packaging of product
Product characteristics	
Physical state	liquid
Concentration in substance	1-5%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

5.14 Contributing Scenario (14) controlling industrial worker exposure for PROC 15

Name of contributing scenario	15 - Use of laboratory reagents in small scale laboratories
Scenario subtitle	Laboratory activities [CS36]. Laboratory - Quality Control
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

Free short title	Manufacturing of UP/VE resins and formulated resins (Gelcoat, Colour Paste, Putty, Bonding paste / Adhesive, etc.) (ES6)
Systematic title based on use descriptor	ERC 2; PROC 1, 3, 4, 5, 8A, 8B, 9, 15
Name of contributing environmental scenario and corresponding ERC	ERC 2 Formulation of preparations
Name(s) of contributing worker scenarios and corresponding PROCs	PROC 1 - Use in closed process, no likelihood of exposure PROC 3 - Use in closed batch process (synthesis or formulation)

	PROC 3 - Use in closed batch process (synthesis or formulation)
	PROC 3 - Use in closed batch process (synthesis or formulation)
	PROC 4 - Use in batch and other process (synthesis) where opportunity for exposure arises
	PROC 4 - Use in batch and other process (synthesis) where opportunity for exposure arises
	PROC 5 - Mixing or blending in batch processes (multistage and/or significant contact)
	PROC 8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
	PROC 8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
	PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
	PROC 9 - Transfer of chemicals into small containers (dedicated filling line)
	PROC 15 - Use of laboratory reagents in small scale laboratories

6.1 Contributing Scenario (1) controlling environmental exposure for ERC 2

Operational conditions	
Annual tonnage	2.28E5 to/year
Daily amount used at site	4.57E4 kg/day
Release times per year	300 days/year *(justification: Continuous production)*
Local freshwater dilution factor	41
Local marine water dilution factor	100
Release fraction to air from process	0.20%
Release fraction to wastewater from process	0.00%
Release fraction to soil from process	0%
Fraction tonnage to region	10%
Fraction used at main source	60%
STP	yes

River flow rate	400000 m^3/day *(justification: Site specific information)*
Municipal sewage treatment plant discharge	10000000 L/day *(justification: Site specific information)*
Risk management measures	
Reduction of sludge to soil	100 % *(justification: Do not apply industrial sludge to natural soils)*
Other modified EUSES values	
Fraction released to waste water (Femis.water)	0.0049 % *(justification: Worst-case estimate from measured concentrations at manufacturing sites (EU Risk Assessment Report on Styrene,European Communities, 2002))*
Fraction released to air (Femis.air)	0.200 % *(justification: EU Risk Assessment Report on Styrene,European Communities, 2002)*
Fraction used at main source	60 % *(justification: Value adopted to account for largest European manufacturing site (EU Risk Assessment Report on Styrene,European Communities, 2002))*
Fraction of emission directed to water by local STP (Fstp.water)	0.081 - *(justification: Efficiency STP 91.9%)*

6.2 Contributing Scenario (2) controlling industrial worker exposure for PROC 1

Name of contributing scenario	1 - Use in closed process, no likelihood of exposure
Scenario subtitle	General exposures [CS1]. Use in contained batch processes [CS37].
Qualitative Risk Assessment	
General	Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented

	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance. Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration has been considered linearly *(justification: Limit the substance content in the product to 50%.)*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 5 80 %
Respiratory protection	no
Good standard of general ventilation; natural or controlled	inhalation: 30 % *(justification: Provide a good standard of general ventilation. Natural ventilation is from doors, windows etc. Controlled ventilation means air is supplied or removed by a powered fan.)*

6.3 Contributing Scenario (3) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Bulk transfers [CS14]. Receipt and storage of raw materials in bulk or as packed goods, indoor and outdoor; Raw material assembly and charging; dispensing of liquids and solids via pipeline;
Qualitative Risk Assessment	
General	Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling

	Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance. Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration has been considered linearly *(justification: Limit the substance content in the product to 50%.* *)*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	outdoors (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 5 80 %
Respiratory protection	no

6.4 Contributing Scenario (4) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	General exposures (closed systems) [CS15]. Dissolving linear UP/VE polymer into styrene in blending vessel (or dissolver)
Qualitative Risk Assessment	
General	Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance. Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration has been considered linearly *(justification: Limit the substance content in the product to 50%.)*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week

Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 5 80 %
Respiratory protection	no

6.5 Contributing Scenario (5) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Equipment cleaning and maintenance [CS39]. Cleaning and maintenance of blending vessel, roadtankers etc.
Qualitative Risk Assessment	
General	Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed.

	Consider the need for risk based health surveillance. Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration has been considered linearly *(justification: Limit the substance content in the product to 50%.)*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	1 - 4 hours
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 5 80 %
Respiratory protection	95%
Apply vessel entry procedure including use of forced supplied air	inhalation: 30 % *(justification: Drain down and flush system prior to equipment break-in or maintenance)*

6.6 Contributing Scenario (6) controlling industrial worker exposure for PROC 4

Name of contributing scenario	4 - Use in batch and other process (synthesis) where opportunity for exposure arises
Scenario subtitle	Material transfers [CS3]. All internal transport Raw material assembly and charging / raw material dispensing of liquids and solids manually from bulk storage or packed goods into blending tank
Qualitative Risk Assessment	
General	Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure:

	Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance. Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration has been considered linearly *(justification: Limit the substance content in the product to 50%.)*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 5 80 %
Respiratory protection	no

6.7 Contributing Scenario (7) controlling industrial worker exposure for PROC 4

Name of contributing scenario	4 - Use in batch and other process (synthesis) where opportunity for exposure arises
Scenario subtitle	Process sampling [CS2]. Sampling from blender
Qualitative Risk Assessment	
General	Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance. Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration has been considered linearly *(justification: Limit the substance content in the product to 50%.)*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2

Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 5 80 %
Respiratory protection	no

6.8 Contributing Scenario (8) controlling industrial worker exposure for PROC 5

Name of contributing scenario	5 - Mixing or blending in batch processes (multistage and/or significant contact)
Scenario subtitle	Drum/batch transfers [CS8]; Pouring from small containers [CS9]; Transfer from/pouring from containers [CS22]; Mixing operations (open systems) [CS30]. Mixing liquid and solid components / into final formulated resin in blending vessel; Examples are gelcoat blending and compounding
Qualitative Risk Assessment	
General	Use drum pumps. Carefully pour from container. Put lids on containers immediately after use. Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner.

	Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance. Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration has been considered linearly *(justification: Limit the substance content in the product to 50%.)*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 90 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 5 80 %
Respiratory protection	no

6.9 Contributing Scenario (9) controlling industrial worker exposure for PROC 8A

Name of contributing scenario	8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
Scenario subtitle	Equipment cleaning and maintenance [CS39]. Cleaning and maintenance of pipes, pumps, filters, etc.
Qualitative Risk Assessment	
General	Carefully pour from container. Use drum pumps. Put lids on containers immediately after use. Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling

	Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance. Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	1 - 4 hours
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 90 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 5 80 %
Respiratory protection	95%
Forced air circulation	inhalation: 70 % *(justification: Drain or remove substance from equipment prior to break-in or maintenance)*

6.10 Contributing Scenario (10) controlling industrial worker exposure for PROC 8A

Name of contributing scenario	8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
Scenario subtitle	Disposal of wastes [CS28]. Waste management / handling and storage of waste for removal for off-site treatment or for on-site treatment like incineration and/or biological waste water treatment
Qualitative Risk Assessment	
General	Carefully pour from container. Use drum pumps. Put lids on containers immediately after use. Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance. Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	100%

Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 5 80 %
Respiratory protection	no
Provide a good standard of general ventilation; natural or controlled	inhalation: 30 % *(justification: Provide a good standard of general ventilation. Natural ventilation is from doors, windows etc. Controlled ventilation means air is supplied or removed by a powered fan.)*

6.11 Contributing Scenario (11) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Bulk transfers [CS14]. All activities related to transport finished product to customer Dispensing final UP/VE resin (linear UP/VE polymer + styrene + additives) into roadtanker . Tier2 assessment has been done to prove safe use of styrene
Qualitative Risk Assessment	
General	Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin.

	Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance. Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	outdoors (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 5 80 %
Respiratory protection	no
Use of external/measured value inhalation	Exposure assessment using the Bayesian model of ART Version 1.5. The predicted 90th percentile full-shift exposure is 18 mg/m^3. The confidence interval is 8,1 mg/m^3 to 44 mg/m^3. PROC 8b Emission sources: Far-field exposure Vapour pressure: 1300 Pa (Elevated temperature) Liquid mole fraction: 0,5 Activity coefficient: 1 Process temperature: Room temperature Substance product type: Liquids

	Activity class: Falling of liquids Transfer technique: Transfer liquid products flow > 1000 L/min Situation: Open process, splash loading Localised controls: None No segregation, no personal enclosure Effective housekeeping practices in place? Yes Work area: Outdoors, close to buildings, worker located >4 m from far field source Duration (mins): 480 min

6.12 Contributing Scenario (12) controlling industrial worker exposure for PROC 9

Name of contributing scenario	9 - Transfer of chemicals into small containers (dedicated filling line)
Scenario subtitle	Bulk transfers [CS14]. All activities related to transport finished product to customer Dispensing final UP/VE resin (linear UP/VE polymer + styrene + additives) / into storage tank, IBC, drum or pail
Qualitative Risk Assessment	
General	Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance.

	Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration has been considered linearly *(justification: Limit the substance content in the product to 50%.)*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 5 80 %
Respiratory protection	no
LEV	inhalation: 90 % *(justification: Fill containers/cans at dedicated fill points supplied with local extract ventilation)*

6.13 Contributing Scenario (13) controlling industrial worker exposure for PROC 15

Name of contributing scenario	15 - Use of laboratory reagents in small scale laboratories
Scenario subtitle	Laboratory activities [CS36]. All laboratory activities Quality control work of samples from reactor and blending vessel; R&D work including handling of samples from 1 kg to 1 drum
Qualitative Risk Assessment	
General	Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure:

	Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance. Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration has been considered linearly *(justification: Limit the substance content in the product to 50%.)*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 90 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 5 80 %
Respiratory protection	no
Carry out in a vented booth or extracted enclosure	inhalation: 90 % *(justification: Carry out in a vented booth or extracted enclosure)*

Free short title	FRP manufacturing in an industrial setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.) (ES7)
Systematic title based on use descriptor	ERC 6D; PROC 3, 5, 7, 8A, 10, 13, 14, 15
Name of contributing environmental scenario and corresponding ERC	ERC 6d Production of resins/rubbers
Name(s) of contributing worker scenarios and corresponding PROCs	PROC 3 - Use in closed batch process (synthesis or formulation) PROC 3 - Use in closed batch process (synthesis or formulation) PROC 5 - Mixing or blending in batch processes (multistage and/or significant contact) PROC 5 - Mixing or blending in batch processes (multistage and/or significant contact) PROC 5 - Mixing or blending in batch processes (multistage and/or significant contact) PROC 7 - Industrial spraying PROC 7 - Industrial spraying PROC 8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities PROC 8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities PROC 10 - Roller application or brushing PROC 10 - Roller application or brushing PROC 13 - Treatment of articles by dipping and pouring PROC 14 - Production of preparations or articles by tabletting, compression, extrusion, pelletisation PROC 15 - Use of laboratory reagents in small scale laboratories

7.1 Contributing Scenario (1) controlling environmental exposure for ERC 6D

Operational conditions	
Annual tonnage	8.06E5 to/year
Daily amount used at site	1.61E5 kg/day
Release times per year	300 days/year *(justification: Continuous release)*
Local freshwater dilution factor	10
Local marine water dilution factor	100
Release fraction to air from process	0.10%
Release fraction to wastewater from process	0.00%
Release fraction to soil from process	0%
Fraction tonnage to region	10%
Fraction used at main source	60%
STP	yes
River flow rate	18000 m^3/day
Municipal sewage treatment plant discharge	2000000 L/day
Other modified EUSES values	
Fraction released to waste water (Femis.water)	0.00063 % *(justification: EU Risk Assessment Report, 2002)*
Fraction released to air (Femis.air)	0.102 % *(justification: EU Risk Assessment Report, 2002)*
Fraction used at main source	60 % *(justification: Value adopted to account for Worst-case European manufacturing site)*
Fraction of emission directed to water by local STP (Fstp.water)	0.081 - *(justification: Efficiency STP 91.9%)*

7.2 Contributing Scenario (2) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Material transfers [CS3]; Automated process with (semi) closed systems [CS93]; Use in contained batch processes [CS37]. Resin injection and transfer processes, such as vacuüm infusion, RTM, impregnation of sewer relining sleeves
Qualitative Risk Assessment	
General	Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed.

	Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance. Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration has been considered linearly *(justification: Limit the substance content in the product to 50%.)*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 5 80 %
Respiratory protection	no

7.3 Contributing Scenario (3) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Material transfers [CS3]. Product delivery/storage - delivery of bulk and packaged products - outdoor / indoor

Qualitative Risk Assessment	
General	Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance. Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration has been considered linearly *(justification: Limit the substance content in the product to 50%.)*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)

Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 5 80 %
Respiratory protection	no

7.4 Contributing Scenario (4) controlling industrial worker exposure for PROC 5

Name of contributing scenario	5 - Mixing or blending in batch processes (multistage and/or significant contact)
Scenario subtitle	Casting operations [CS32]; Mixing operations (open systems) [CS30]. Casting and mixing operations in (semi-) open containers. Examples are centrifugal casting, casting of polymer concrete and artificial marble and the manufacturing of SMC / BMC/ TMC, etc
Qualitative Risk Assessment	
General	Use drum pumps. Carefully pour from container. Put lids on containers immediately after use. Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance.

	Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	5-25%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 90 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 5 80 %
Respiratory protection	no

7.5 Contributing Scenario (5) controlling industrial worker exposure for PROC 5

Name of contributing scenario	5 - Mixing or blending in batch processes (multistage and/or significant contact)
Scenario subtitle	General exposures (closed systems) [CS15]. Mixing liquid and solid components / into final formulated resin in blending vessel; Examples are gelcoat blending and compounding, formulation of repair putties, bonding pastes, chemical anchoring, etc
Qualitative Risk Assessment	
General	Use drum pumps. Carefully pour from container. Put lids on containers immediately after use. Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons.

	Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance. Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration has been considered linearly *(justification: Limit the substance content in the product to 50%.)*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	enhanced (70%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 5 80 %
Respiratory protection	no

7.6 Contributing Scenario (6) controlling industrial worker exposure for PROC 5

Name of contributing scenario	5 - Mixing or blending in batch processes (multistage and/or significant contact)
Scenario subtitle	Drum/batch transfers [CS8]; Pouring from small containers [CS9]; Transfer from/pouring from containers [CS22]; Mixing operations (open systems) [CS30]. Loading of mixing equipment; Preparation of material for application; (liquid products) - batch, indoor
Qualitative Risk Assessment	
General	Carefully pour from container. Use drum pumps. Put lids on containers immediately after use. Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance. Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration has been considered linearly *(justification: Limit the substance content in the product to 50%.)*

Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 90 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 5 80 %
Respiratory protection	no

7.7 Contributing Scenario (7) controlling industrial worker exposure for PROC 7

Name of contributing scenario	7 - Industrial spraying
Scenario subtitle	Spraying [CS10]; Spraying (automatic/robotic) [CS97] All open mould applications where resins is applied by automated spraying or by robot in a spray cabin without direct worker involvement. Examples are spray lamination, gelcoat spraying and “chop-hoop” filament winding
Qualitative Risk Assessment	
General	Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately

	Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance. Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration has been considered linearly *(justification: Limit the substance content in the product to 50%.* *)*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	1,500 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 5 80 %
Respiratory protection	95%
Carry out in a vented booth or extracted enclosure	inhalation: 95 % *(justification: Ventilation effectiveness)*

7.8 Contributing Scenario (8) controlling industrial worker exposure for PROC 7

Name of contributing scenario	7 - Industrial spraying
Scenario subtitle	Spraying [CS10]; Spraying (manually) [CS97] All open mould applications where resins is applied by manual spraying in an open work environment. Examples are spray lamination, gelcoat spraying and “chop-hoop” filament winding
Qualitative Risk Assessment	
General	Where appropriate, replacement of task by automated and/or closed processes.

	Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance. Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration has been considered linearly *(justification: Limit the substance content in the product to 50%.* *)*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	1,500 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	enhanced (70%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	

Local exhaust ventilation	yes (inhalation 95 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 20 95 %
Respiratory protection	97.5 % *(justification: Use a powered respirator with masks (BS EN 12942), Filter Type A1 (Organic Vapours, BP>65°C), P3 filter (aerosols EN143), with an effectiveness of 97.5% (APF 40). For activities >1h, a constant flow airline breathing apparatus with hoods/helmets (BS EN 14594) is recommended (APF 200).)*

7.9 Contributing Scenario (9) controlling industrial worker exposure for PROC 8A

Name of contributing scenario	8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
Scenario subtitle	Equipment maintenance [CS5]; Maintenance of small items [CS18]. Equipment cleaning and maintenance, open indoor
Qualitative Risk Assessment	
General	Carefully pour from container. Use drum pumps. Put lids on containers immediately after use. Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance.

	Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration has been considered linearly *(justification: Limit the substance content in the product to 50%.)*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	1 - 4 hours
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 5 80 %
Respiratory protection	95%
Local exhaust ventilation	inhalation: 70 % *(justification: Use local exhaust ventilation with adequate effectiveness)*

7.10 Contributing Scenario (10) controlling industrial worker exposure for PROC 8A

Name of contributing scenario	8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
Scenario subtitle	Disposal of wastes [CS28]. Handling of non cured waste; Waste management / handling and storage of waste for removal for off-site treatment or for on-site treatment like incineration and/or biological waste water treatment
Qualitative Risk Assessment	
General	Carefully pour from container. Use drum pumps. Put lids on containers immediately after use. Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling

	Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance. Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration has been considered linearly *(justification: Limit the substance content in the product to 50%.)*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 90 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 5 80 %
Respiratory protection	95%

7.11 Contributing Scenario (11) controlling industrial worker exposure for PROC 10

Name of contributing scenario	10 - Roller application or brushing
Scenario subtitle	Rolling, Brushing [CS51]; Roller, spreader, flow application [CS98] All open mould applications where resins is applied by brushing, rolling and other low energy spreading operations; Examples are handlamination, gelcoatbrushing, filament winding
Qualitative Risk Assessment	
General	Use long handled tools where possible Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance. Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration has been considered linearly *(justification: Limit the substance content in the product to 50%.)*
Fugacity / Dustiness	medium
Frequency and duration of use	

Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	enhanced (70%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 5 80 %
Respiratory protection	95%

7.12 Contributing Scenario (12) controlling industrial worker exposure for PROC 10

Name of contributing scenario	10 - Roller application or brushing
Scenario subtitle	Dipping, immersion and pouring [CS4]; Rolling, Brushing [CS51]; Roller, spreader, flow application [CS98] Application of repair putties; Application of bonding pastes / adhesives.
Qualitative Risk Assessment	
General	Use long handled tools where possible Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented

	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance. Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	5-25%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 90 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 20 95 %
Respiratory protection	95%

7.13 Contributing Scenario (13) controlling industrial worker exposure for PROC 13

Name of contributing scenario	13 - Treatment of articles by dipping and pouring
Scenario subtitle	Dipping, immersion and pouring [CS4]; Continuous process [CS54]. Continuous processes with open impregnation steps, such as pultrusion with open impregnation baths and (semi-) continuous production of flat laminates
Qualitative Risk Assessment	
General	Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection.

	Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance. Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration has been considered linearly *(justification: Limit the substance content in the product to 50%.)*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 90 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 20 95 %
Respiratory protection	95%

7.14 Contributing Scenario (14) controlling industrial worker exposure for PROC 14

Name of contributing scenario	14 - Production of preparations or articles by tabletting, compression, extrusion, pelletisation

Scenario subtitle	Material transfers [CS3]; Production or preparation or articles by tabletting, compression, extrusion or pelletisation [CS100]; Treatment by heating [CS129]; Batch processes at elevated temperatures [CS136]. Processes where curing of UP / VE resins takes place at high temperature. Examples are pultrusion with injection dies and processing of SMC / BMC / TMC, etc
Qualitative Risk Assessment	
General	Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance. Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	5-25%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	

Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	enhanced (70%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 5 80 %
Respiratory protection	no

7.15 Contributing Scenario (15) controlling industrial worker exposure for PROC 15

Name of contributing scenario	15 - Use of laboratory reagents in small scale laboratories
Scenario subtitle	Laboratory activities [CS36]. Quality control work of samples from blending vessel; R&D work including handling of samples from 1 kg to 1 drum
Qualitative Risk Assessment	
General	Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed.

	Consider the need for risk based health surveillance. Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration has been considered linearly *(justification: Limit the substance content in the product to 50%.)*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 5 80 %
Respiratory protection	no

Free short title	FRP manufacturing in a professional setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.) (ES8)
Systematic title based on use descriptor	ERC 8E; PROC 3, 4, 5, 8A, 10, 11
Name of contributing environmental scenario and corresponding ERC	ERC 8e Wide dispersive outdoor use of reactive substances in open systems
Name(s) of contributing worker scenarios and corresponding PROCs	PROC 3 - Use in closed batch process (synthesis or formulation) PROC 4 - Use in batch and other process (synthesis) where opportunity for exposure arises PROC 5 - Mixing or blending in batch processes (multistage and/or significant contact) PROC 8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities

	PROC 8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities PROC 10 - Roller application or brushing PROC 10 - Roller application or brushing PROC 10 - Roller application or brushing PROC 11 - Non industrial spraying

8.1 Contributing Scenario (1) controlling environmental exposure for ERC 8E

Operational conditions	
Annual tonnage	2.42E6 to/year
Daily amount used at site	4.83E5 kg/day
Release times per year	300 days/year *(justification: Continuous production)*
Local freshwater dilution factor	10
Local marine water dilution factor	100
Release fraction to air from process	0.10%
Release fraction to wastewater from process	0.00%
Release fraction to soil from process	0%
Fraction tonnage to region	10%
Fraction used at main source	60%
STP	yes
River flow rate	18000 m^3/day
Municipal sewage treatment plant discharge	2000000 L/day
Other modified EUSES values	
Fraction released to waste water (Femis.water)	0.000012 % *(justification: EU Risk Assessment Report, 2002)*
Fraction released to air (Femis.air)	0.102 % *(justification: EU Risk Assessment Report, 2002)*
Fraction used at main source	60 % *(justification: Value adopted to account for worst-case European manufacturing site)*
Fraction of emission directed to water by local STP (Fstp.water)	0.081 - *(justification: Efficiency STP 91.9%)*

8.2 Contributing Scenario (2) controlling professional worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Use in contained batch processes [CS37]. Application of chemical anchoring

Qualitative Risk Assessment	
General	Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance. Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	5-25%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	outdoors (30%)
Domain	professional
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no

Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 10 90 %
Respiratory protection	no

8.3 Contributing Scenario (3) controlling professional worker exposure for PROC 4

Name of contributing scenario	4 - Use in batch and other process (synthesis) where opportunity for exposure arises
Scenario subtitle	Use in contained batch processes [CS37]. Sewer relining operation
Qualitative Risk Assessment	
General	Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance. Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration has been considered linearly *(justification: Limit the substance content in the product to 50%.* *)*

Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	1 - 4 hours
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	outdoors (30%)
Domain	professional
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 10 90 %
Respiratory protection	95%

8.4 Contributing Scenario (4) controlling professional worker exposure for PROC 5

Name of contributing scenario	5 - Mixing or blending in batch processes (multistage and/or significant contact)
Scenario subtitle	Material transfers [CS3]; Pouring from small containers [CS9]. Preparation of material for application (liquids) - transfer of material from one container to another; Formulating / blending resins, gelcoats, bonding pastes, putties etc. in blending vessels
Qualitative Risk Assessment	
General	Use drum pumps. Carefully pour from container. Put lids on containers immediately after use. Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin.

	Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance. Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	professional
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 80 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 10 90 %
Respiratory protection	95 % *(justification: Use a full face mask respirator - gas/vapour filter (BS EN 136 mask and BS EN 14387 filter), Filter Type A1 (Organic Vapours, BP>65°C), with an effectiveness of 95% (APF 20).)*

8.5 Contributing Scenario (5) controlling professional worker exposure for PROC 8A

Name of contributing scenario	8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
Scenario subtitle	Equipment maintenance [CS5]; Maintenance of small items [CS18]. Equipment cleaning and maintenance, open indoor
Qualitative Risk Assessment	
General	Use drum pumps. Carefully pour from container.

	Put lids on containers immediately after use. Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance. Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	professional
Technical conditions and measures to control dispersion and exposure	

Local exhaust ventilation	yes (inhalation 80 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 10 90 %
Respiratory protection	95%

8.6 Contributing Scenario (6) controlling professional worker exposure for PROC 8A

Name of contributing scenario	8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
Scenario subtitle	Disposal of wastes [CS28]. Handling of non cured waste; Waste management / handling and storage of waste for removal for off-site treatment or for on-site treatment like incineration and/or biological waste water treatment
Qualitative Risk Assessment	
General	Use drum pumps. Carefully pour from container. Put lids on containers immediately after use. Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance. Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation

Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	professional
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 80 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 10 90 %
Respiratory protection	95%

8.7 Contributing Scenario (7) controlling professional worker exposure for PROC 10

Name of contributing scenario	10 - Roller application or brushing
Scenario subtitle	Rolling, Brushing [CS51]; Roller, spreader, flow application [CS98] All open mould applications where resins is applied by brushing, rolling and other low energy spreading operations; Examples are handlamination, gelcoatbrushing, semi-continuous production of flat panels and laminates
Qualitative Risk Assessment	
General	Use long handled tools where possible Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures.

	Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance. Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration has been considered linearly *(justification: Limit the substance content in the product to 50%.)*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	professional
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 80 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 10 90 %
Respiratory protection	97.5 % *(justification: Use a powered respirator with hood/helmets (BS EN 12941), Filter Type A1 (Organic Vapours, BP>65°C), with an effectiveness of 97.5% (APF 40).)*

8.8 Contributing Scenario (8) controlling professional worker exposure for PROC 10

Name of contributing scenario	10 - Roller application or brushing
Scenario subtitle	Dipping, immersion and pouring [CS4]; Rolling, Brushing [CS51]; Roller, spreader, flow application [CS98] Application of repair putties; Application of bonding pastes / adhesives.

Qualitative Risk Assessment	
General	Use long handled tools where possible Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance. Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration has been considered linearly *(justification: Limit the substance content in the product to 50%.)*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors

Ventilation	good (30%)
Domain	professional
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 80 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 10 90 %
Respiratory protection	97.5 % *(justification: Use a powered respirator with hood/helmets (BS EN 12941), Filter Type A1 (Organic Vapours, BP>65°C), with an effectiveness of 97.5% (APF 40).)*

8.9 Contributing Scenario (9) controlling professional worker exposure for PROC 10

Name of contributing scenario	10 - Roller application or brushing
Scenario subtitle	Dipping, immersion and pouring [CS4]; Rolling, Brushing [CS51]; Roller, spreader, flow application [CS98] Application of floorings, mastics, coatings, castings
Qualitative Risk Assessment	
General	Use long handled tools where possible Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance. Avoid inhalation of the product.

	In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration has been considered linearly *(justification: Limit the substance content in the product to 50%.)*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	professional
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 80 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 10 90 %
Respiratory protection	97.5 % *(justification: Use a powered respirator with hood/helmets (BS EN 12941), Filter Type A1 (Organic Vapours, BP>65°C), with an effectiveness of 97.5% (APF 40).)*

8.10 Contributing Scenario (10) controlling professional worker exposure for PROC 11

Name of contributing scenario	11 - Non industrial spraying
Scenario subtitle	Spraying [CS10]; Spraying (manually) [CS97] All open mould applications where resins is applied by manual spraying in an open work environment. Examples are spray lamination, gelcoat spraying and “chop-hoop” filament winding
Qualitative Risk Assessment	
General	Where appropriate, replacement of task by automated and/or closed processes. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure:

	Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable chemically resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable coveralls to prevent exposure to the skin. Wear a suitable respiratory protection with adequate effectiveness . Clear spills immediately Disposal - This material and its container must be disposed of in a safe manner. Ensure good work practices are implemented Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Consider the need for risk based health surveillance. Avoid inhalation of the product. In case of vapours: Handle in a fume cupboard or under extract ventilation
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration has been considered linearly *(justification: Limit the substance content in the product to 50%.* *)*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	1,500 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	professional
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 80 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 10 90 %

Respiratory protection	97.5 % *(justification: Use a powered respirator with masks (BS EN 12942), Filter Type A1 (Organic Vapours, BP>65°C), P3 filter (aerosols EN143), with an effectiveness of 97.5% (APF 40). For activities >1h, a constant flow airline breathing apparatus with hoods/helmets (BS EN 14594) is recommended (APF 200).)*

Free short title	Production of Styrene Butadiene Rubber (SBR) (ES9)
Systematic title based on use descriptor	ERC 6C; PROC 2, 3, 8A, 8B, 9, 15
Name of contributing environmental scenario and corresponding ERC	ERC 6c Production of plastics
Name(s) of contributing worker scenarios and corresponding PROCs	PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 3 - Use in closed batch process (synthesis or formulation) PROC 3 - Use in closed batch process (synthesis or formulation) PROC 3 - Use in closed batch process (synthesis or formulation) PROC 3 - Use in closed batch process (synthesis or formulation) PROC 3 - Use in closed batch process (synthesis or formulation) PROC 3 - Use in closed batch process (synthesis or formulation) PROC 8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities

	PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 9 - Transfer of chemicals into small containers (dedicated filling line) PROC 15 - Use of laboratory reagents in small scale laboratories

9.1 Contributing Scenario (1) controlling environmental exposure for ERC 6C

Operational conditions	
Annual tonnage	2.42E6 to/year
Daily amount used at site	4.83E5 kg/day
Release times per year	300 days/year *(justification: Continuous production)*
Local freshwater dilution factor	10
Local marine water dilution factor	100
Release fraction to air from process	0.10%
Release fraction to wastewater from process	0.00%
Release fraction to soil from process	0%
Fraction tonnage to region	10%
Fraction used at main source	60%
STP	yes
River flow rate	18000 m^3/day
Municipal sewage treatment plant discharge	2000000 L/day
Other modified EUSES values	
Fraction released to waste water (Femis.water)	0.000012 % *(justification: EU Risk Assessment Report, 2002)*
Fraction released to air (Femis.air)	0.102 % *(justification: EU Risk Assessment Report, 2002)*
Fraction used at main source	60 % *(justification: Value adopted to account for worst-case European manufacturing site)*
Fraction of emission directed to water by local STP (Fstp.water)	0.081 - *(justification: Efficiency STP 91.9%)*

9.2 Contributing Scenario (2) controlling industrial worker exposure for PROC 2

Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Scenario subtitle	Material transfers [CS3]. Styrene Storage in tanks

Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

9.3 Contributing Scenario (3) controlling industrial worker exposure for PROC 2

Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Scenario subtitle	Material transfers [CS3]. Waste management : recovery using condensation or adsorption/ desorption processes
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid

Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

9.4 Contributing Scenario (4) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Material transfers [CS3]. Charging reactors via pipeline
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	

Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

9.5 Contributing Scenario (5) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Batch process [CS55]. Polymerisation reactor
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

9.6 Contributing Scenario (6) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Batch process [CS55]. Vacuum steam distillation
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures

	In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

9.7 Contributing Scenario (7) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Batch process [CS55]. Coagulation reactor
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	

Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

9.8 Contributing Scenario (8) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Batch process [CS55]. Drying tank
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

9.9 Contributing Scenario (9) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Material transfers [CS3]. Recycling styrene from distillator to reactor via pipeline
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

9.10 Contributing Scenario (10) controlling industrial worker exposure for PROC 8A

Name of contributing scenario	8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
Scenario subtitle	Process sampling [CS2]. Sampling from reactors
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection. Use suitable chemically resistant gloves.

	Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no
Use a sampling system designed to control exposure	inhalation: 80 % *(justification: Use a sampling system designed to control exposure)*

9.11 Contributing Scenario (11) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Material transfers [CS3]. Loading tank storage from road, rail or boat transport
Qualitative Risk Assessment	
General	Clear transfer lines prior to de-coupling Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week

Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

9.12 Contributing Scenario (12) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Equipment maintenance [CS5]. Manufacturing equipment maintenance: opening and cleaning manufacturing equipment for maintenance purposes
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

9.13 Contributing Scenario (13) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Bulk transfers [CS14]. Finished product Loading of road tanker, railcar, container
Product characteristics	
Physical state	liquid
Concentration in substance	1-5%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

9.14 Contributing Scenario (14) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Material transfers [CS3]. Waste management : transfer of process wastes to storage containers: off-line in workplace
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	

Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

9.15 Contributing Scenario (15) controlling industrial worker exposure for PROC 9

Name of contributing scenario	9 - Transfer of chemicals into small containers (dedicated filling line)
Scenario subtitle	Small package filling [CS7]. Small package filling - Packaging of product
Product characteristics	
Physical state	liquid
Concentration in substance	1-5%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

9.16 Contributing Scenario (16) controlling industrial worker exposure for PROC 15

Name of contributing scenario	15 - Use of laboratory reagents in small scale laboratories

Scenario subtitle	Laboratory activities [CS36]. Laboratory - Quality Control
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

Free short title	Production of Styrene Butadiene Latex (SBL) (ES10)
Systematic title based on use descriptor	ERC 6C; PROC 2, 3, 8A, 8B, 9, 15
Name of contributing environmental scenario and corresponding ERC	ERC 6c Production of plastics
Name(s) of contributing worker scenarios and corresponding PROCs	PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 3 - Use in closed batch process (synthesis or formulation)

	PROC 3 - Use in closed batch process (synthesis or formulation)
	PROC 3 - Use in closed batch process (synthesis or formulation)
	PROC 3 - Use in closed batch process (synthesis or formulation)
	PROC 8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
	PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
	PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
	PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
	PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
	PROC 9 - Transfer of chemicals into small containers (dedicated filling line)
	PROC 15 - Use of laboratory reagents in small scale laboratories

10.1 Contributing Scenario (1) controlling environmental exposure for ERC 6C

Operational conditions	
Annual tonnage	2.42E6 to/year
Daily amount used at site	4.83E5 kg/day
Release times per year	300 days/year *(justification: Continuous production)*
Local freshwater dilution factor	10
Local marine water dilution factor	100
Release fraction to air from process	0.10%
Release fraction to wastewater from process	0.00%
Release fraction to soil from process	0%
Fraction tonnage to region	10%
Fraction used at main source	60%
STP	yes

River flow rate	18000 m^3/day
Municipal sewage treatment plant discharge	2000000 L/day
Other modified EUSES values	
Fraction released to waste water (Femis.water)	0.000012 % *(justification: EU Risk Assessment Report, 2002)*
Fraction released to air (Femis.air)	0.102 % *(justification: EU Risk Assessment Report, 2002)*
Fraction used at main source	60 % *(justification: Value adopted to account for worst-case European manufacturing site)*
Fraction of emission directed to water by local STP (Fstp.water)	0.081 - *(justification: Efficiency STP 91.9%)*

10.2 Contributing Scenario (2) controlling industrial worker exposure for PROC 2

Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Scenario subtitle	Material transfers [CS3]. Styrene Storage in tanks
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

10.3 Contributing Scenario (3) controlling industrial worker exposure for PROC 2

Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Scenario subtitle	Material transfers [CS3]. Waste management : recovery using condensation or adsorption/ desorption processes
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

10.4 Contributing Scenario (4) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Material transfers [CS3]. Charging reactors via pipeline
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	

Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

10.5 Contributing Scenario (5) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Batch process [CS55]. Polymerisation reactor
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)

Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

10.6 Contributing Scenario (6) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Batch process [CS55]. Vacuum steam distillation
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

10.7 Contributing Scenario (7) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Material transfers [CS3]. Recycling styrene from distillator to reactor via pipeline
Qualitative Risk Assessment	

General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

10.8 Contributing Scenario (8) controlling industrial worker exposure for PROC 8A

Name of contributing scenario	8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
Scenario subtitle	Process sampling [CS2]. Sampling from reactors
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	

Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no
Use a sampling system designed to control exposure .	inhalation: 80 % *(justification: Use a sampling system designed to control exposure)*

10.9 Contributing Scenario (9) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Material transfers [CS3]. Loading tank storage from road, rail or boat transport
Qualitative Risk Assessment	
General	Clear transfer lines prior to de-coupling Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	

Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

10.10 Contributing Scenario (10) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Equipment maintenance [CS5]. Manufacturing equipment maintenance: opening and cleaning manufacturing equipment for maintenance purposes
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

10.11 Contributing Scenario (11) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Bulk transfers [CS14]. Finished product Loading of road tanker, railcar, container

Product characteristics	
Physical state	liquid
Concentration in substance	1-5%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

10.12 Contributing Scenario (12) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Material transfers [CS3]. Waste management : transfer of process wastes to storage containers: off-line in workplace
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2

Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

10.13 Contributing Scenario (13) controlling industrial worker exposure for PROC 9

Name of contributing scenario	9 - Transfer of chemicals into small containers (dedicated filling line)
Scenario subtitle	Small package filling [CS7]. Small package filling - Packaging of product
Product characteristics	
Physical state	liquid
Concentration in substance	1-5%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

10.14 Contributing Scenario (14) controlling industrial worker exposure for PROC 15

Name of contributing scenario	15 - Use of laboratory reagents in small scale laboratories
Scenario subtitle	Laboratory activities [CS36]. Laboratory - Quality Control
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection.

	Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

Free short title	Production of Styrene Isoprene Copolymers (ES11)
Systematic title based on use descriptor	ERC 6C; PROC 2, 3, 8A, 8B, 9, 15
Name of contributing environmental scenario and corresponding ERC	ERC 6c Production of plastics
Name(s) of contributing worker scenarios and corresponding PROCs	PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 3 - Use in closed batch process (synthesis or formulation) PROC 3 - Use in closed batch process (synthesis or formulation) PROC 3 - Use in closed batch process (synthesis or formulation) PROC 3 - Use in closed batch process (synthesis or formulation)

	PROC 8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 9 - Transfer of chemicals into small containers (dedicated filling line) PROC 15 - Use of laboratory reagents in small scale laboratories

11.1 Contributing Scenario (1) controlling environmental exposure for ERC 6C

Operational conditions	
Annual tonnage	2.42E6 to/year
Daily amount used at site	4.83E5 kg/day
Release times per year	300 days/year *(justification: Continuous production)*
Local freshwater dilution factor	10
Local marine water dilution factor	100
Release fraction to air from process	0.10%
Release fraction to wastewater from process	0.00%
Release fraction to soil from process	0%
Fraction tonnage to region	10%
Fraction used at main source	60%
STP	yes
River flow rate	18000 m^3/day
Municipal sewage treatment plant discharge	2000000 L/day
Other modified EUSES values	
Fraction released to waste water (Femis.water)	0.000012 % *(justification: EU Risk Assessment Report, 2002)*
Fraction released to air (Femis.air)	0.102 % *(justification: EU Risk Assessment Report, 2002)*

Fraction used at main source	60 % *(justification: Value adopted to account for worst-case European manufacturing site)*
Fraction of emission directed to water by local STP (Fstp.water)	0.081 - *(justification: Efficiency STP 91.9%)*

11.2 Contributing Scenario (2) controlling industrial worker exposure for PROC 2

Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Scenario subtitle	Material transfers [CS3]. Styrene Storage in tanks
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

11.3 Contributing Scenario (3) controlling industrial worker exposure for PROC 2

Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Scenario subtitle	Material transfers [CS3]. Waste management : recovery using condensation or adsorption/ desorption processes
Qualitative Risk Assessment	
General	Ensure good work practices are implemented

	Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

11.4 Contributing Scenario (4) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Material transfers [CS3]. Charging reactors via pipeline
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)

Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

11.5 Contributing Scenario (5) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Batch process [CS55]. Dissolving and polymerisation reactor
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No

Respiratory protection	no

11.6 Contributing Scenario (6) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Batch process [CS55]. Suspension reactor
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

11.7 Contributing Scenario (7) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Batch process [CS55]. Washed and dried tanks
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.

Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

11.8 Contributing Scenario (8) controlling industrial worker exposure for PROC 8A

Name of contributing scenario	8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
Scenario subtitle	Process sampling [CS2]. Sampling from reactors/tanks
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	

Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no
Use a sampling system designed to control exposure	inhalation: 80 % *(justification: Use a sampling system designed to control exposure)*

11.9 Contributing Scenario (9) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Equipment maintenance [CS5]. Manufacturing equipment maintenance: opening and cleaning manufacturing equipment for maintenance purposes
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

11.10 Contributing Scenario (10) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Bulk transfers [CS14]. Finished product Loading of road tanker, railcar, container
Product characteristics	
Physical state	liquid
Concentration in substance	1-5%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

11.11 Contributing Scenario (11) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Material transfers [CS3]. Loading tank storage from road, rail or boat transport
Qualitative Risk Assessment	
General	Clear transfer lines prior to de-coupling Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	

Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

11.12 Contributing Scenario (12) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Material transfers [CS3]. Waste management : transfer of process wastes to storage containers: off-line in workplace
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No

Respiratory protection	no

11.13 Contributing Scenario (13) controlling industrial worker exposure for PROC 9

Name of contributing scenario	9 - Transfer of chemicals into small containers (dedicated filling line)
Scenario subtitle	Small package filling [CS7]. Small package filling - Packaging of product
Product characteristics	
Physical state	liquid
Concentration in substance	1-5%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

11.14 Contributing Scenario (14) controlling industrial worker exposure for PROC 15

Name of contributing scenario	15 - Use of laboratory reagents in small scale laboratories
Scenario subtitle	Laboratory activities [CS36]. Laboratory - Quality Control
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium

Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

Free short title	Production of other Styrene based polymeric dispersions (ES12)
Systematic title based on use descriptor	ERC 6C; PROC 2, 3, 8A, 8B, 9, 15
Name of contributing environmental scenario and corresponding ERC	ERC 6c Production of plastics
Name(s) of contributing worker scenarios and corresponding PROCs	PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 3 - Use in closed batch process (synthesis or formulation) PROC 3 - Use in closed batch process (synthesis or formulation) PROC 3 - Use in closed batch process (synthesis or formulation) PROC 3 - Use in closed batch process (synthesis or formulation) PROC 8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities

	PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 9 - Transfer of chemicals into small containers (dedicated filling line) PROC 15 - Use of laboratory reagents in small scale laboratories

12.1 Contributing Scenario (1) controlling environmental exposure for ERC 6C

Operational conditions	
Annual tonnage	2.42E6 to/year
Daily amount used at site	4.83E5 kg/day
Release times per year	300 days/year *(justification: Continuous production)*
Local freshwater dilution factor	10
Local marine water dilution factor	100
Release fraction to air from process	0.10%
Release fraction to wastewater from process	0.00%
Release fraction to soil from process	0%
Fraction tonnage to region	10%
Fraction used at main source	60%
STP	yes
River flow rate	18000 m^3/day
Municipal sewage treatment plant discharge	2000000 L/day
Other modified EUSES values	
Fraction released to waste water (Femis.water)	0.000012 % *(justification: EU Risk Assessment Repoert, 2002)*
Fraction released to air (Femis.air)	0.102 % *(justification: EU Risk Assessment Repoert, 2002)*
Fraction used at main source	60 % *(justification: Value adopted to account for worst-case European manufacturing site)*
Fraction of emission directed to water by local STP (Fstp.water)	0.081 - *(justification: Efficiency STP 91.9%)*

12.2 Contributing Scenario (2) controlling industrial worker exposure for PROC 2

Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Scenario subtitle	Material transfers [CS3]. Styrene Storage in tanks
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

12.3 Contributing Scenario (3) controlling industrial worker exposure for PROC 2

Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Scenario subtitle	Material transfers [CS3]. Waste management : recovery using condensation or adsorption/ desorption processes
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection.

	Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

12.4 Contributing Scenario (4) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Material transfers [CS3]. Charging reactors via pipeline
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors

Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

12.5 Contributing Scenario (5) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Batch process [CS55]. Dissolving and polymerisation reactor
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

12.6 Contributing Scenario (6) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Batch process [CS55]. Suspension reactor
Qualitative Risk Assessment	

General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

12.7 Contributing Scenario (7) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Batch process [CS55]. Washed and dried tanks
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)

Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

12.8 Contributing Scenario (8) controlling industrial worker exposure for PROC 8A

Name of contributing scenario	8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
Scenario subtitle	Process sampling [CS2]. Sampling from reactors/tanks
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No

Respiratory protection	no
Use a sampling system designed to control exposure	inhalation: 80 % *(justification: Use a sampling system designed to control exposure)*

12.9 Contributing Scenario (9) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Material transfers [CS3]. Loading tank storage from road, rail or boat transport
Qualitative Risk Assessment	
General	Clear transfer lines prior to de-coupling Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

12.10 Contributing Scenario (10) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Equipment maintenance [CS5]. Manufacturing equipment maintenance: opening and cleaning manufacturing equipment for maintenance purposes

Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

12.11 Contributing Scenario (11) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Bulk transfers [CS14]. Finished product Loading of road tanker, railcar, container
Product characteristics	
Physical state	liquid
Concentration in substance	1-5%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors

Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

12.12 Contributing Scenario (12) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Material transfers [CS3]. Waste management : transfer of process wastes to storage containers: off-line in workplace
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

12.13 Contributing Scenario (13) controlling industrial worker exposure for PROC 9

Name of contributing scenario	9 - Transfer of chemicals into small containers (dedicated filling line)
Scenario subtitle	Small package filling [CS7]. Small package filling - Packaging of product
Product characteristics	
Physical state	liquid
Concentration in substance	1-5%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

12.14 Contributing Scenario (14) controlling industrial worker exposure for PROC 15

Name of contributing scenario	15 - Use of laboratory reagents in small scale laboratories
Scenario subtitle	Laboratory activities [CS36]. Laboratory - Quality Control
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2

Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

Free short title	Production of filled Polyols (ES13)
Systematic title based on use descriptor	ERC 6C; PROC 2, 3, 8A, 8B, 9, 15
Name of contributing environmental scenario and corresponding ERC	ERC 6c Production of plastics
Name(s) of contributing worker scenarios and corresponding PROCs	PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 3 - Use in closed batch process (synthesis or formulation) PROC 3 - Use in closed batch process (synthesis or formulation) PROC 3 - Use in closed batch process (synthesis or formulation) PROC 3 - Use in closed batch process (synthesis or formulation) PROC 8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities

	PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 9 - Transfer of chemicals into small containers (dedicated filling line) PROC 15 - Use of laboratory reagents in small scale laboratories

13.1 Contributing Scenario (1) controlling environmental exposure for ERC 6C

Operational conditions	
Annual tonnage	2.42E6 to/year
Daily amount used at site	4.83E5 kg/day
Release times per year	300 days/year *(justification: Continuous production)*
Local freshwater dilution factor	10
Local marine water dilution factor	100
Release fraction to air from process	0.10%
Release fraction to wastewater from process	0.00%
Release fraction to soil from process	0%
Fraction tonnage to region	10%
Fraction used at main source	60%
STP	yes
River flow rate	18000 m^3/day
Municipal sewage treatment plant discharge	2000000 L/day
Other modified EUSES values	
Fraction released to waste water (Femis.water)	0.000012 % *(justification: EU Risk Assessment Report, 2002)*
Fraction released to air (Femis.air)	0.102 % *(justification: EU Risk Assessment Report, 2002)*
Fraction used at main source	60 % *(justification: Value adopted to account for worst-case European manufacturing site)*
Fraction of emission directed to water by local STP (Fstp.water)	0.081 - *(justification: Efficiency STP 91.9%)*

13.2 Contributing Scenario (2) controlling industrial worker exposure for PROC 2

Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Scenario subtitle	Material transfers [CS3]. Waste management : recovery using condensation or adsorption/ desorption processes

Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

13.3 Contributing Scenario (3) controlling industrial worker exposure for PROC 2

Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Scenario subtitle	Material transfers [CS3]. Styrene Storage in tanks
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	

Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

13.4 Contributing Scenario (4) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Material transfers [CS3]. Charging reactors via pipeline
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	

Protective gloves	No
Respiratory protection	no

13.5 Contributing Scenario (5) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Batch process [CS55]. Dissolving and polymerisation reactor
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

13.6 Contributing Scenario (6) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Batch process [CS55]. Suspension reactor
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection.

	Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

13.7 Contributing Scenario (7) controlling industrial worker exposure for PROC 3

Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	Batch process [CS55]. Washed and dried tanks
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	

Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

13.8 Contributing Scenario (8) controlling industrial worker exposure for PROC 8A

Name of contributing scenario	8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
Scenario subtitle	Process sampling [CS2]. Sampling from reactors/tanks
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no
Use a sampling system designed to control exposure	inhalation: 80 % *(justification: Use a sampling system designed to control exposure)*

13.9 Contributing Scenario (9) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Material transfers [CS3]. Loading tank storage from road, rail or boat transport
Qualitative Risk Assessment	
General	Clear transfer lines prior to de-coupling Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

13.10 Contributing Scenario (10) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Equipment maintenance [CS5]. Manufacturing equipment maintenance: opening and cleaning manufacturing equipment for maintenance purposes
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection.

	Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

13.11 Contributing Scenario (11) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Bulk transfers [CS14]. Finished product Loading of road tanker, railcar, container
Product characteristics	
Physical state	liquid
Concentration in substance	1-5%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No

Respiratory protection	no

13.12 Contributing Scenario (12) controlling industrial worker exposure for PROC 8B

Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Scenario subtitle	Material transfers [CS3]. Waste management : transfer of process wastes to storage containers: off-line in workplace
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

13.13 Contributing Scenario (13) controlling industrial worker exposure for PROC 9

Name of contributing scenario	9 - Transfer of chemicals into small containers (dedicated filling line)
Scenario subtitle	Small package filling [CS7]. Small package filling - Packaging of product
Product characteristics	
Physical state	liquid

Concentration in substance	1-5%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

13.14 Contributing Scenario (14) controlling industrial worker exposure for PROC 15

Name of contributing scenario	15 - Use of laboratory reagents in small scale laboratories
Scenario subtitle	Laboratory activities [CS36]. Laboratory - Quality Control
Qualitative Risk Assessment	
General	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no

Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	No
Respiratory protection	no

RISK CHARACTERISATION

The scenarios described above result in an exposure of environment, workers and consumers. In order to determine if this specific exposure is safe for a specific scenario, the exposure is put into relation to the corresponding indicative reference value (e.g. DNEL, PNEC). The resulting risk characterisation ratio (RCR) indicates if the specific scenario is safe or not. In addition to individual exposure estimates also exposure from combined routes and compartments are displayed, as well as combined exposure from different scenarios.

1 Scenario 1: Manufacturing of styrene (ES1)

The following RCR calculations refer to the contributing scenarios described in Annex

1.1 Contributing Scenario (1) controlling environmental exposure for ERC1
Manufacturing of styrene

The quantitative risk characterisation for this environmental exposure has been calculated using EasyTRA.

The environmental exposure calculation per compartment is based on the algorithms of the EU TGD 2003 Risk Assessment Spreadsheet Model 1.24a.

1.1.1 Aquatic compartment (including sediment)

Table 1. Environmental risk aquatic of ES 1.1

Compartments	**PEC**	**PNEC**	**RCR = PEC/PNEC**	**MSafe kg/d**
Freshwater	0.01786 mg/L	0.028 mg/L	0.637865	2.02E+07
Freshwater sediment	0.692977 mg/kg_{dwt}	1.086 mg/kg_{dwt}	0.637865	2.02E+07
Marine water	0.007258 mg/L	0.014 mg/L	0.51846	2.48E+07
Marine water sediment	0.281628 mg/kg_{dwt}	0.5432 mg/kg_{dwt}	0.51846	2.48E+07

1.1.2 Terrestrial compartment

Table 2. Environmental risk terrestrial of ES 1.1

Compartments	**PEC**	**PNEC**	**RCR = PEC/PNEC**	**MSafe kg/d**

Agricultural soil	0.012296 mg/kg_{dwt}	0.200 mg/kg_{dwt}	0.061479	2.09E+08

1.1.3 Microbiological activity in sewage treatment systems

Table 3. Environmental risk STP of ES 1.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
STP	0.724416 mg/L	5 mg/L	0.144883	8.87E+07

1.1.4 Man via environment

Secondary poisoning considers indirect exposure of man via foods, air and drinking water. The following table shows the calculated exposure to the substance from exemplary food sources at different trophic levels together with the total exposure over all routes and food sources.

Table 4. Environmental risk man via environment of ES 1.1

Food source	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL	MSafe kg/d
Fish	0.000022 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	0.00001	-
Root crop	5.82E-7 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	2.77E-07	-
Leaf crop	1.20E-6 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	5.73E-07	-
Milk	2.99E-9 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	1.43E-09	-
Meat	4.64E-9 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	2.21E-09	-
Drinking water	2.87E-6 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	1.37E-06	-
inhalation	0.000086 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	0.000041	-
Total	0.000112 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	0.000054	2.40E+11

1.2 Contributing Scenario (2) controlling industrial worker exposure for PROC 1

Manufacturing of styrene Material transfers [CS3]. Transfer from distillator to storage tanks via pipelines.

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 5. Worker risk of ES 1.2

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	0.034286 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.000084
inhalation, long-term systemic	0.043395 mg/m^3	85 mg/m^3	0.000511
Combined routes	0.040485 $mg/kg_{bw}/day$	-	0.000595

1.3 Contributing Scenario (3) controlling industrial worker exposure for PROC 2
Manufacturing of styrene Use in contained systems [CS38]. De-hydrogenation Reactor

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 6. Worker risk of ES 1.3

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	1.371 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.003378
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	4.471 $mg/kg_{bw}/day$	-	0.258645

1.4 Contributing Scenario (4) controlling industrial worker exposure for PROC 2

Manufacturing of styrene Use in contained systems [CS38]. Condensation of crude styrene - water separation

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 7. Worker risk of ES 1.4

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	1.371 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.003378
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	4.471 $mg/kg_{bw}/day$	-	0.258645

1.5 Contributing Scenario (5) controlling industrial worker exposure for PROC 2
Manufacturing of styrene Use in contained systems [CS38]. Vacuum Distillation

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 8. Worker risk of ES 1.5

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	1.371 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.003378
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	4.471 $mg/kg_{bw}/day$	-	0.258645

1.6 Contributing Scenario (6) controlling industrial worker exposure for PROC 2
Manufacturing of styrene Material transfers [CS3]. Waste management : recovery using condensation

or adsorption/ desorption processes

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 9. Worker risk of ES 1.6

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	1.371 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.003378
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	4.471 $mg/kg_{bw}/day$	-	0.258645

1.7 Contributing Scenario (7) controlling industrial worker exposure for PROC 8A
Manufacturing of styrene Process sampling [CS2]. Sampling from reactors/condensors/distillators

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 10. Worker risk of ES 1.7

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	13.714 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.033779
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535
Combined routes	19.914 $mg/kg_{bw}/day$	-	0.544314

1.8 Contributing Scenario (8) controlling industrial worker exposure for PROC 8B
Manufacturing of styrene Additivation and stabilisation [CS69]. Addition of inhibitors or retardants in

distillators

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 11. Worker risk of ES 1.8

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	1.371 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.003378
inhalation, long-term systemic	3.255 mg/m^3	85 mg/m^3	0.03829
Combined routes	1.836 mg/kg$_{bw}$/day	-	0.041668

1.9 Contributing Scenario (9) controlling industrial worker exposure for PROC 8B
Manufacturing of styrene Additivation and stabilisation [CS69]. Stabiliser addition for storage and transport

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 12. Worker risk of ES 1.9

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	1.371 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.003378
inhalation, long-term systemic	3.255 mg/m^3	85 mg/m^3	0.03829
Combined routes	1.836 mg/kg$_{bw}$/day	-	0.041668

1.10 Contributing Scenario (10) controlling industrial worker exposure for PROC 8B

Manufacturing of styrene Material transfers [CS3]. Unloading storage tanks for road, rail or boat transport

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 13. Worker risk of ES 1.10

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	2.743 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.006756
inhalation, long-term systemic	15.188 mg/m^3	85 mg/m^3	0.178687
Combined routes	4.913 $mg/kg_{bw}/day$	-	0.185443

1.11 Contributing Scenario (11) controlling industrial worker exposure for PROC 8B
Manufacturing of styrene Equipment maintenance [CS5]. Manufacturing equipment maintenance: opening and cleaning manufacturing equipment for maintenance purposes

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 14. Worker risk of ES 1.11

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	2.743 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 $mg/kg_{bw}/day$	-	0.262023

1.12 Contributing Scenario (12) controlling industrial worker exposure for PROC 8B

Manufacturing of styrene Material transfers [CS3]. Waste management : transfer of process wastes to storage containers: off-line in workplace

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 15. Worker risk of ES 1.12

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	2.743 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 $mg/kg_{bw}/day$	-	0.262023

1.13 Contributing Scenario (13) controlling industrial worker exposure for PROC 15
Manufacturing of styrene Laboratory activities [CS36]. Laboratory - Quality Control

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 16. Worker risk of ES 1.13

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	0.342857 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.000844
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535
Combined routes	6.542 $mg/kg_{bw}/day$	-	0.511379

2 Scenario 2: Continuous mass polymerisation of Polystyrene (HIPS and GPPS) (ES2)

The following RCR calculations refer to the contributing scenarios described in chapter 9.2

2.1 Contributing Scenario (1) controlling environmental exposure for ERC6C
Continuous mass polymerisation of Polystyrene (HIPS and GPPS)

The quantitative risk characterisation for this environmental exposure has been calculated using EasyTRA.

The environmental exposure calculation per compartment is based on the algorithms of the EU TGD 2003 Risk Assessment Spreadsheet Model 1.24a.

2.1.1 Aquatic compartment (including sediment)

Table 17. Environmental risk aquatic of ES 2.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
Freshwater	0.000435 mg/L	0.028 mg/L	0.015553	3.11E+07
Freshwater sediment	0.016896 mg/kg_{dwt}	1.086 mg/kg_{dwt}	0.015553	3.11E+07
Marine water	0.000042 mg/L	0.014 mg/L	0.002969	1.63E+08
Marine water sediment	0.001613 mg/kg_{dwt}	0.5432 mg/kg_{dwt}	0.002969	1.63E+08

2.1.2 Terrestrial compartment

Table 18. Environmental risk terrestrial of ES 2.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
Agricultural soil	0.01318 mg/kg_{dwt}	0.200 mg/kg_{dwt}	0.065901	7.34E+06

2.1.3 Microbiological activity in sewage treatment systems

Table 19. Environmental risk STP of ES 2.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
STP	0.002347 mg/L	5 mg/L	0.000469	1.03E+09

2.1.4 Man via environment

Secondary poisoning considers indirect exposure of man via foods, air and drinking water. The following table shows the calculated exposure to the substance from exemplary food sources at different trophic levels together with the total exposure over all routes and food sources.

Table 20. Environmental risk man via environment of ES 2.1

Food source	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**	**MSafe kg/d**
Fish	0.000022 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	0.00001	-
Root crop	5.82E-7 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	2.77E-07	-
Leaf crop	1.20E-6 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	5.73E-07	-
Milk	2.99E-9 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	1.43E-09	-
Meat	4.64E-9 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	2.21E-09	-
Drinking water	2.87E-6 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	1.37E-06	-
inhalation	0.000086 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	0.000041	-
Total	0.000112 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	0.000054	9.04E+09

2.2 Contributing Scenario (2) controlling industrial worker exposure for PROC 2
Continuous mass polymerisation of Polystyrene (HIPS and GPPS) Continuous process [CS54]. Styrene Storage in tanks

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 21. Worker risk of ES 2.2

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**

dermal, long-term systemic	1.371 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.003378
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	4.471 mg/kg$_{bw}$/day	-	0.258645

2.3 Contributing Scenario (3) controlling industrial worker exposure for PROC 2
Continuous mass polymerisation of Polystyrene (HIPS and GPPS) Continuous process [CS54]. Charging reactor via pipeline

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 22. Worker risk of ES 2.3

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	1.371 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.003378
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	4.471 mg/kg$_{bw}$/day	-	0.258645

2.4 Contributing Scenario (4) controlling industrial worker exposure for PROC 2
Continuous mass polymerisation of Polystyrene (HIPS and GPPS) Material transfers [CS3]. Heat exchange and agitator in reactor

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 23. Worker risk of ES 2.4

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**

dermal, long-term systemic	1.371 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.003378
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	4.471 mg/kg$_{bw}$/day	-	0.258645

2.5 Contributing Scenario (5) controlling industrial worker exposure for PROC 2
Continuous mass polymerisation of Polystyrene (HIPS and GPPS) Continuous process [CS54].
Devolatilisation tower

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 24. Worker risk of ES 2.5

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	1.371 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.003378
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	4.471 mg/kg$_{bw}$/day	-	0.258645

2.6 Contributing Scenario (6) controlling industrial worker exposure for PROC 2
Continuous mass polymerisation of Polystyrene (HIPS and GPPS) Continuous process [CS54].
Recycling styrene from tower to rector via pipeline

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 25. Worker risk of ES 2.6

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	1.371 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.003378
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	4.471 mg/kg$_{bw}$/day	-	0.258645

2.7 Contributing Scenario (7) controlling industrial worker exposure for PROC 2
Continuous mass polymerisation of Polystyrene (HIPS and GPPS) Material transfers [CS3]. Waste management : recovery using condensation or adsorption/ desorption processes

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 26. Worker risk of ES 2.7

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	1.371 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.003378
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	4.471 mg/kg$_{bw}$/day	-	0.258645

2.8 Contributing Scenario (8) controlling industrial worker exposure for PROC 8A
Continuous mass polymerisation of Polystyrene (HIPS and GPPS) Process sampling [CS2]. Sampling from reactors/devolatilisation tower

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 27. Worker risk of ES 2.8

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	13.714 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.033779
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535
Combined routes	19.914 mg/kg$_{bw}$/day	-	0.544314

2.9 Contributing Scenario (9) controlling industrial worker exposure for PROC 8B
Continuous mass polymerisation of Polystyrene (HIPS and GPPS) Material transfers [CS3]. Loading tank storage from road, rail or boat transport

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 28. Worker risk of ES 2.9

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	2.743 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 mg/kg$_{bw}$/day	-	0.262023

2.10 Contributing Scenario (10) controlling industrial worker exposure for PROC 8B
Continuous mass polymerisation of Polystyrene (HIPS and GPPS) Equipment maintenance [CS5]. Manufacturing equipment maintenance: opening and cleaning manufacturing equipment for maintenance purposes

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 29. Worker risk of ES 2.10

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	2.743 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 mg/kg$_{bw}$/day	-	0.262023

2.11 Contributing Scenario (11) controlling industrial worker exposure for PROC 8B Continuous mass polymerisation of Polystyrene (HIPS and GPPS) Bulk transfers [CS14]. Finished product Loading of road tanker, railcar, container

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 30. Worker risk of ES 2.11

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	2.743 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 mg/kg$_{bw}$/day	-	0.262023

2.12 Contributing Scenario (12) controlling industrial worker exposure for PROC 8B Continuous mass polymerisation of Polystyrene (HIPS and GPPS) Material transfers [CS3]. Waste management : transfer of process wastes to storage containers: off-line in workplace

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 31. Worker risk of ES 2.12

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	2.743 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 $mg/kg_{bw}/day$	-	0.262023

2.13 Contributing Scenario (13) controlling industrial worker exposure for PROC 9
Continuous mass polymerisation of Polystyrene (HIPS and GPPS) Small package filling [CS7]. Small package filling - Packaging of product

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 32. Worker risk of ES 2.13

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	1.371 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.003378
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535
Combined routes	7.571 $mg/kg_{bw}/day$	-	0.513913

2.14 Contributing Scenario (14) controlling industrial worker exposure for PROC 14
Continuous mass polymerisation of Polystyrene (HIPS and GPPS) Extrusion and masterbatching [CS88]. Extruder - Pelletizing

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 33. Worker risk of ES 2.14

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.685714 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.001689
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535
Combined routes	6.885 $mg/kg_{bw}/day$	-	0.512224

2.15 Contributing Scenario (15) controlling industrial worker exposure for PROC 15
Continuous mass polymerisation of Polystyrene (HIPS and GPPS) Laboratory activities [CS36].
Laboratory - Quality Control

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 34. Worker risk of ES 2.15

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.342857 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.000844
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535
Combined routes	6.542 $mg/kg_{bw}/day$	-	0.511379

3 Scenario 3: Batch suspension polymerisation of Polystyrene (HIPS and GPPS) (ES3)

The following RCR calculations refer to the contributing scenarios described in chapter 9.3

3.1 Contributing Scenario (1) controlling environmental exposure for ERC6C
Batch suspension polymerisation of Polystyrene (HIPS and GPPS)

The quantitative risk characterisation for this environmental exposure has been calculated using EasyTRA.

The environmental exposure calculation per compartment is based on the algorithms of the EU TGD 2003 Risk Assessment Spreadsheet Model 1.24a.

3.1.1 Aquatic compartment (including sediment)

Table 35. Environmental risk aquatic of ES 3.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
Freshwater	0.000435 mg/L	0.028 mg/L	0.015553	3.11E+07
Freshwater sediment	0.016896 mg/kg_{dwt}	1.086 mg/kg_{dwt}	0.015553	3.11E+07
Marine water	0.000042 mg/L	0.014 mg/L	0.002969	1.63E+08
Marine water sediment	0.001613 mg/kg_{dwt}	0.5432 mg/kg_{dwt}	0.002969	1.63E+08

3.1.2 Terrestrial compartment

Table 36. Environmental risk terrestrial of ES 3.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
Agricultural soil	0.01318 mg/kg_{dwt}	0.200 mg/kg_{dwt}	0.065901	7.34E+06

3.1.3 Microbiological activity in sewage treatment systems

Table 37. Environmental risk STP of ES 3.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
STP	0.002347 mg/L	5 mg/L	0.000469	1.03E+09

3.1.4 Man via environment

Secondary poisoning considers indirect exposure of man via foods, air and drinking water. The following table shows the calculated exposure to the substance from exemplary food sources at different trophic levels together with the total exposure over all routes and food sources.

Table 38. Environmental risk man via environment of ES 3.1

Food source	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL	MSafe kg/d
Fish	0.000022 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	0.00001	-
Root crop	5.82E-7 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	2.77E-07	-
Leaf crop	1.20E-6 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	5.73E-07	-
Milk	2.99E-9 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	1.43E-09	-
Meat	4.64E-9 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	2.21E-09	-
Drinking water	2.87E-6 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	1.37E-06	-
inhalation	0.000086 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	0.000041	-
Total	0.000112 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	0.000054	9.04E+09

3.2 Contributing Scenario (2) controlling industrial worker exposure for PROC 8B
Batch suspension polymerisation of Polystyrene (HIPS and GPPS) Material transfers [CS3]. Loading tank storage from road, rail or boat transport

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 39. Worker risk of ES 3.2

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	2.743 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 $mg/kg_{bw}/day$	-	0.262023

3.3 Contributing Scenario (3) controlling industrial worker exposure for PROC 2
Batch suspension polymerisation of Polystyrene (HIPS and GPPS) Material transfers [CS3]. Styrene Storage in tanks

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 40. Worker risk of ES 3.3

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	1.371 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.003378
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	4.471 $mg/kg_{bw}/day$	-	0.258645

3.4 Contributing Scenario (4) controlling industrial worker exposure for PROC 2
Batch suspension polymerisation of Polystyrene (HIPS and GPPS) Material transfers [CS3]. Waste management : recovery using condensation or adsorption/ desorption processes

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 41. Worker risk of ES 3.4

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	1.371 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.003378
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	4.471 $mg/kg_{bw}/day$	-	0.258645

3.5 Contributing Scenario (5) controlling industrial worker exposure for PROC 3
Batch suspension polymerisation of Polystyrene (HIPS and GPPS) Material transfers [CS3]. Charging reactors via pipeline

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 42. Worker risk of ES 3.5

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.685714 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	5.025 mg/kg$_{bw}$/day	-	0.359063

3.6 Contributing Scenario (6) controlling industrial worker exposure for PROC 3
Batch suspension polymerisation of Polystyrene (HIPS and GPPS) Batch process [CS55]. Dispersing and heat in reactor

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 43. Worker risk of ES 3.6

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.685714 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	5.025 mg/kg$_{bw}$/day	-	0.359063

3.7 Contributing Scenario (7) controlling industrial worker exposure for PROC 3
Batch suspension polymerisation of Polystyrene (HIPS and GPPS) Batch process [CS55]. Washed and dried tanks

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 44. Worker risk of ES 3.7

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.685714 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	5.025 $mg/kg_{bw}/day$	-	0.359063

3.8 Contributing Scenario (8) controlling industrial worker exposure for PROC 8A
Batch suspension polymerisation of Polystyrene (HIPS and GPPS) Process sampling [CS2]. Sampling from reactors/tanks

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 45. Worker risk of ES 3.8

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	13.714 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.033779
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535
Combined routes	19.914 $mg/kg_{bw}/day$	-	0.544314

3.9 Contributing Scenario (9) controlling industrial worker exposure for PROC 8B
Batch suspension polymerisation of Polystyrene (HIPS and GPPS) Equipment maintenance [CS5]. Manufacturing equipment maintenance: opening and cleaning manufacturing equipment for maintenance purposes

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 46. Worker risk of ES 3.9

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	2.743 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 $mg/kg_{bw}/day$	-	0.262023

3.10 Contributing Scenario (10) controlling industrial worker exposure for PROC 8B
Batch suspension polymerisation of Polystyrene (HIPS and GPPS) Bulk transfers [CS14]. Finished product Loading of road tanker, railcar, container

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 47. Worker risk of ES 3.10

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	2.743 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267

Combined routes	5.843 mg/kg$_{bw}$/day	-	0.262023

3.11 Contributing Scenario (11) controlling industrial worker exposure for PROC 8B
Batch suspension polymerisation of Polystyrene (HIPS and GPPS) Material transfers [CS3]. Waste management : transfer of process wastes to storage containers: off-line in workplace

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 48. Worker risk of ES 3.11

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	2.743 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 mg/kg$_{bw}$/day	-	0.262023

3.12 Contributing Scenario (12) controlling industrial worker exposure for PROC 9
Batch suspension polymerisation of Polystyrene (HIPS and GPPS) Small package filling [CS7]. Small package filling - Packaging of product

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 49. Worker risk of ES 3.12

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	1.371 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.003378
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535

Combined routes	7.571 mg/kg$_{bw}$/day	-	0.513913

3.13 Contributing Scenario (13) controlling industrial worker exposure for PROC 15
Batch suspension polymerisation of Polystyrene (HIPS and GPPS) Laboratory activities [CS36]. Laboratory - Quality Control

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 50. Worker risk of ES 3.13

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	0.342857 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.000844
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535
Combined routes	6.542 mg/kg$_{bw}$/day	-	0.511379

3.14 Contributing Scenario (14) controlling industrial worker exposure for PROC 14
Batch suspension polymerisation of Polystyrene (HIPS and GPPS) Operation of solids filtering equipment [CS117]. Pelletizing

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 51. Worker risk of ES 3.14

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	0.685714 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.001689
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535

Combined routes	6.885 $mg/kg_{bw}/day$	-	0.512224

4 Scenario 4: Production of Expandable Polystyrene (ES4)

The following RCR calculations refer to the contributing scenarios described in chapter 9.4

4.1 Contributing Scenario (1) controlling environmental exposure for ERC6C
Production of Expandable Polystyrene

The quantitative risk characterisation for this environmental exposure has been calculated using EasyTRA.

The environmental exposure calculation per compartment is based on the algorithms of the EU TGD 2003 Risk Assessment Spreadsheet Model 1.24a.

4.1.1 Aquatic compartment (including sediment)

Table 52. Environmental risk aquatic of ES 4.1

Compartments	**PEC**	**PNEC**	**RCR = PEC/PNEC**	**MSafe kg/d**
Freshwater	0.000435 mg/L	0.028 mg/L	0.015553	3.11E+07
Freshwater sediment	0.016896 mg/kg_{dwt}	1.086 mg/kg_{dwt}	0.015553	3.11E+07
Marine water	0.000042 mg/L	0.014 mg/L	0.002969	1.63E+08
Marine water sediment	0.001613 mg/kg_{dwt}	0.5432 mg/kg_{dwt}	0.002969	1.63E+08

4.1.2 Terrestrial compartment

Table 53. Environmental risk terrestrial of ES 4.1

Compartments	**PEC**	**PNEC**	**RCR = PEC/PNEC**	**MSafe kg/d**
Agricultural soil	0.01318 mg/kg_{dwt}	0.200 mg/kg_{dwt}	0.065901	7.34E+06

4.1.3 Microbiological activity in sewage treatment systems

Table 54. Environmental risk STP of ES 4.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
STP	0.002347 mg/L	5 mg/L	0.000469	1.03E+09

4.1.4 Man via environment

Secondary poisoning considers indirect exposure of man via foods, air and drinking water. The following table shows the calculated exposure to the substance from exemplary food sources at different trophic levels together with the total exposure over all routes and food sources.

Table 55. Environmental risk man via environment of ES 4.1

Food source	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL	MSafe kg/d
Fish	0.000022 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	0.00001	-
Root crop	5.82E-7 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	2.77E-07	-
Leaf crop	1.20E-6 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	5.73E-07	-
Milk	2.99E-9 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	1.43E-09	-
Meat	4.64E-9 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	2.21E-09	-
Drinking water	2.87E-6 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	1.37E-06	-
inhalation	0.000086 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	0.000041	-
Total	0.000112 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	0.000054	9.04E+09

4.2 Contributing Scenario (2) controlling industrial worker exposure for PROC 2
Production of Expandable Polystyrene Material transfers [CS3]. Waste management : recovery using condensation or adsorption/ desorption processes

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 56. Worker risk of ES 4.2

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	1.371 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.003378
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	4.471 mg/kg$_{bw}$/day	-	0.258645

4.3 Contributing Scenario (3) controlling industrial worker exposure for PROC 2
Production of Expandable Polystyrene Material transfers [CS3]. Styrene Storage in tanks

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 57. Worker risk of ES 4.3

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	1.371 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.003378
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	4.471 mg/kg$_{bw}$/day	-	0.258645

4.4 Contributing Scenario (4) controlling industrial worker exposure for PROC 3
Production of Expandable Polystyrene Material transfers [CS3]. Charging reactors via pipeline

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 58. Worker risk of ES 4.4

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.685714 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	5.025 $mg/kg_{bw}/day$	-	0.359063

4.5 Contributing Scenario (5) controlling industrial worker exposure for PROC 3
Production of Expandable Polystyrene Batch process [CS55]. Dispersing and heat in reactor

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 59. Worker risk of ES 4.5

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.685714 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	5.025 $mg/kg_{bw}/day$	-	0.359063

4.6 Contributing Scenario (6) controlling industrial worker exposure for PROC 3
Production of Expandable Polystyrene Batch process [CS55]. Washed and dried tanks

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 60. Worker risk of ES 4.6

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.685714 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	5.025 mg/kg$_{bw}$/day	-	0.359063

4.7 Contributing Scenario (7) controlling industrial worker exposure for PROC 8A
Production of Expandable Polystyrene Process sampling [CS2]. Sampling from reactors/tanks

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 61. Worker risk of ES 4.7

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	13.714 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.033779
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535
Combined routes	19.914 mg/kg$_{bw}$/day	-	0.544314

4.8 Contributing Scenario (8) controlling industrial worker exposure for PROC 8B
Production of Expandable Polystyrene Material transfers [CS3]. Loading tank storage from road, rail or boat transport

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 62. Worker risk of ES 4.8

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	2.743 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 $mg/kg_{bw}/day$	-	0.262023

4.9 Contributing Scenario (9) controlling industrial worker exposure for PROC 8B
Production of Expandable Polystyrene Equipment maintenance [CS5]. Manufacturing equipment maintenance: opening and cleaning manufacturing equipment for maintenance purposes

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 63. Worker risk of ES 4.9

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	2.743 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 $mg/kg_{bw}/day$	-	0.262023

4.10 Contributing Scenario (10) controlling industrial worker exposure for PROC 8B
Production of Expandable Polystyrene Bulk transfers [CS14]. Finished product Loading of road tanker, railcar, container

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 64. Worker risk of ES 4.10

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	2.743 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 mg/kg$_{bw}$/day	-	0.262023

4.11 Contributing Scenario (11) controlling industrial worker exposure for PROC 8B
Production of Expandable Polystyrene Material transfers [CS3]. Waste management : transfer of process wastes to storage containers: off-line in workplace

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 65. Worker risk of ES 4.11

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	2.743 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 mg/kg$_{bw}$/day	-	0.262023

4.12 Contributing Scenario (12) controlling industrial worker exposure for PROC 9
Production of Expandable Polystyrene Small package filling [CS7]. Small package filling - Packaging of product

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 66. Worker risk of ES 4.12

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	1.371 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.003378
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535
Combined routes	7.571 mg/kg$_{bw}$/day	-	0.513913

4.13 Contributing Scenario (13) controlling industrial worker exposure for PROC 14
Production of Expandable Polystyrene Operation of solids filtering equipment [CS117]. Pelletizing

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 67. Worker risk of ES 4.13

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.685714 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.001689
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535
Combined routes	6.885 mg/kg$_{bw}$/day	-	0.512224

4.14 Contributing Scenario (14) controlling industrial worker exposure for PROC 15
Production of Expandable Polystyrene Laboratory activities [CS36]. Laboratory - Quality Control

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 68. Worker risk of ES 4.14

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.342857 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.000844
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535
Combined routes	6.542 $mg/kg_{bw}/day$	-	0.511379

5 Scenario 5: Production of Styrenic Copolymers (ES5)

The following RCR calculations refer to the contributing scenarios described in chapter 9.5

5.1 Contributing Scenario (1) controlling environmental exposure for ERC6C
Production of Styrenic Copolymers

The quantitative risk characterisation for this environmental exposure has been calculated using EasyTRA.

The environmental exposure calculation per compartment is based on the algorithms of the EU TGD 2003 Risk Assessment Spreadsheet Model 1.24a.

5.1.1 Aquatic compartment (including sediment)

Table 69. Environmental risk aquatic of ES 5.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
Freshwater	0.000435 mg/L	0.028 mg/L	0.015553	3.11E+07
Freshwater sediment	0.016896 mg/kg_{dwt}	1.086 mg/kg_{dwt}	0.015553	3.11E+07
Marine water	0.000042 mg/L	0.014 mg/L	0.002969	1.63E+08
Marine water sediment	0.001613 mg/kg_{dwt}	0.5432 mg/kg_{dwt}	0.002969	1.63E+08

5.1.2 Terrestrial compartment

Table 70. Environmental risk terrestrial of ES 5.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
Agricultural soil	0.01318 mg/kg_{dwt}	0.200 mg/kg_{dwt}	0.065901	7.34E+06

5.1.3 Microbiological activity in sewage treatment systems

Table 71. Environmental risk STP of ES 5.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
STP	0.002347 mg/L	5 mg/L	0.000469	1.03E+09

5.1.4 Man via environment

Secondary poisoning considers indirect exposure of man via foods, air and drinking water. The following table shows the calculated exposure to the substance from exemplary food sources at different trophic levels together with the total exposure over all routes and food sources.

Table 72. Environmental risk man via environment of ES 5.1

Food source	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL	MSafe kg/d
Fish	0.000022 mg/kg_{bw}/day	2.1 mg/kg_{bw}/day	0.00001	-
Root crop	5.82E-7 mg/kg_{bw}/day	2.1 mg/kg_{bw}/day	2.77E-07	-
Leaf crop	1.20E-6 mg/kg_{bw}/day	2.1 mg/kg_{bw}/day	5.73E-07	-
Milk	2.99E-9 mg/kg_{bw}/day	2.1 mg/kg_{bw}/day	1.43E-09	-
Meat	4.64E-9 mg/kg_{bw}/day	2.1 mg/kg_{bw}/day	2.21E-09	-
Drinking water	2.87E-6 mg/kg_{bw}/day	2.1 mg/kg_{bw}/day	1.37E-06	-
inhalation	0.000086 mg/kg_{bw}/day	2.1 mg/kg_{bw}/day	0.000041	-
Total	0.000112 mg/kg_{bw}/day	2.1 mg/kg_{bw}/day	0.000054	9.04E+09

5.2 Contributing Scenario (2) controlling industrial worker exposure for PROC 8B
Production of Styrenic Copolymers Material transfers [CS3]. Loading tank storage from road, rail or boat transport

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 73. Worker risk of ES 5.2

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	2.743 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 $mg/kg_{bw}/day$	-	0.262023

5.3 Contributing Scenario (3) controlling industrial worker exposure for PROC 2
Production of Styrenic Copolymers Material transfers [CS3]. Styrene Storage in tanks

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 74. Worker risk of ES 5.3

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	1.371 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.003378
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	4.471 $mg/kg_{bw}/day$	-	0.258645

5.4 Contributing Scenario (4) controlling industrial worker exposure for PROC 2
Production of Styrenic Copolymers Material transfers [CS3]. Waste management : recovery using condensation or adsorption/ desorption processes

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 75. Worker risk of ES 5.4

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	1.371 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.003378
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	4.471 $mg/kg_{bw}/day$	-	0.258645

5.5 Contributing Scenario (5) controlling industrial worker exposure for PROC 3
Production of Styrenic Copolymers Material transfers [CS3]. Charging reactors via pipeline

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 76. Worker risk of ES 5.5

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	0.685714 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	5.025 $mg/kg_{bw}/day$	-	0.359063

5.6 Contributing Scenario (6) controlling industrial worker exposure for PROC 3
Production of Styrenic Copolymers Batch process [CS55]. Dissolving and polymerisation reactor

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 77. Worker risk of ES 5.6

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	0.685714 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	5.025 mg/kg$_{bw}$/day	-	0.359063

5.7 Contributing Scenario (7) controlling industrial worker exposure for PROC 3
Production of Styrenic Copolymers Batch process [CS55]. Suspension reactor

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 78. Worker risk of ES 5.7

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	0.685714 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	5.025 mg/kg$_{bw}$/day	-	0.359063

5.8 Contributing Scenario (8) controlling industrial worker exposure for PROC 3
Production of Styrenic Copolymers Batch process [CS55]. Washed and dried tanks

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 79. Worker risk of ES 5.8

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.685714 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	5.025 mg/kg$_{bw}$/day	-	0.359063

5.9 Contributing Scenario (9) controlling industrial worker exposure for PROC 8A
Production of Styrenic Copolymers Process sampling [CS2]. Sampling from reactors/tanks

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 80. Worker risk of ES 5.9

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	13.714 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.033779
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535
Combined routes	19.914 mg/kg$_{bw}$/day	-	0.544314

5.10 Contributing Scenario (10) controlling industrial worker exposure for PROC 8B
Production of Styrenic Copolymers Equipment maintenance [CS5]. Manufacturing equipment

maintenance: opening and cleaning manufacturing equipment for maintenance purposes

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 81. Worker risk of ES 5.10

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	2.743 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 mg/kg$_{bw}$/day	-	0.262023

5.11 Contributing Scenario (11) controlling industrial worker exposure for PROC 8B
Production of Styrenic Copolymers Bulk transfers [CS14]. Finished product Loading of road tanker, railcar, container

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 82. Worker risk of ES 5.11

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	2.743 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 mg/kg$_{bw}$/day	-	0.262023

5.12 Contributing Scenario (12) controlling industrial worker exposure for PROC 8B

Production of Styrenic Copolymers Material transfers [CS3]. Waste management : transfer of process wastes to storage containers: off-line in workplace

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 83. Worker risk of ES 5.12

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	2.743 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 $mg/kg_{bw}/day$	-	0.262023

5.13 Contributing Scenario (13) controlling industrial worker exposure for PROC 9
Production of Styrenic Copolymers Small package filling [CS7]. Small package filling - Packaging of product

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 84. Worker risk of ES 5.13

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	1.371 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.003378
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535
Combined routes	7.571 $mg/kg_{bw}/day$	-	0.513913

5.14 Contributing Scenario (14) controlling industrial worker exposure for PROC 15

Production of Styrenic Copolymers Laboratory activities [CS36]. Laboratory - Quality Control

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 85. Worker risk of ES 5.14

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.342857 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.000844
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535
Combined routes	6.542 mg/kg$_{bw}$/day	-	0.511379

6 Scenario 6: Manufacturing of UP/VE resins and formulated resins (Gelcoat, Colour Paste, Putty, Bonding paste / Adhesive, etc.) (ES6)

The following RCR calculations refer to the contributing scenarios described in chapter 9.6

6.1 Contributing Scenario (1) controlling environmental exposure for ERC2
Manufacturing of UP/VE resins and formulated resins (Gelcoat, Colour Paste, Putty, Bonding paste / Adhesive, etc.)

The quantitative risk characterisation for this environmental exposure has been calculated using EasyTRA.

The environmental exposure calculation per compartment is based on the algorithms of the EU TGD 2003 Risk Assessment Spreadsheet Model 1.24a.

6.1.1 Aquatic compartment (including sediment)

Table 86. Environmental risk aquatic of ES 6.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
Freshwater	0.000643 mg/L	0.028 mg/L	0.022965	1.99E+06
Freshwater sediment	0.024949 mg/kg$_{dwt}$	1.086 mg/kg$_{dwt}$	0.022965	1.99E+06
Marine water	0.000199 mg/L	0.014 mg/L	0.014243	3.21E+06

Marine water sediment	0.007737 mg/kg_{dwt}	0.5432 mg/kg_{dwt}	0.014243	3.21E+06

6.1.2 Terrestrial compartment

Table 87. Environmental risk terrestrial of ES 6.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
Agricultural soil	0.002059 mg/kg_{dwt}	0.200 mg/kg_{dwt}	0.010296	4.43E+06

6.1.3 Microbiological activity in sewage treatment systems

Table 88. Environmental risk STP of ES 6.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
STP	0.018138 mg/L	5 mg/L	0.003628	1.26E+07

6.1.4 Man via environment

Secondary poisoning considers indirect exposure of man via foods, air and drinking water. The following table shows the calculated exposure to the substance from exemplary food sources at different trophic levels together with the total exposure over all routes and food sources.

Table 89. Environmental risk man via environment of ES 6.1

Food source	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL	MSafe kg/d
Fish	0.000022 mg/kg_{bw}/day	2.1 mg/kg_{bw}/day	0.00001	-
Root crop	5.82E-7 mg/kg_{bw}/day	2.1 mg/kg_{bw}/day	2.77E-07	-
Leaf crop	1.20E-6 mg/kg_{bw}/day	2.1 mg/kg_{bw}/day	5.73E-07	-
Milk	2.99E-9 mg/kg_{bw}/day	2.1 mg/kg_{bw}/day	1.43E-09	-
Meat	4.64E-9 mg/kg_{bw}/day	2.1 mg/kg_{bw}/day	2.21E-09	-

Drinking water	2.87E-6 mg/kg$_{bw}$/day	2.1 mg/kg$_{bw}$/day	1.37E-06	-
inhalation	0.000086 mg/kg$_{bw}$/day	2.1 mg/kg$_{bw}$/day	0.000041	-
Total	0.000112 mg/kg$_{bw}$/day	2.1 mg/kg$_{bw}$/day	0.000054	8.53E+08

6.2 Contributing Scenario (2) controlling industrial worker exposure for PROC 1
Manufacturing of UP/VE resins and formulated resins (Gelcoat, Colour Paste, Putty, Bonding paste / Adhesive, etc.) General exposures [CS1]. Use in contained batch processes [CS37].

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 90. Worker risk of ES 6.2

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	0.003429 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	8.44E-06
inhalation, long-term systemic	0.015188 mg/m^3	85 mg/m^3	0.000179
Combined routes	0.005598 mg/kg$_{bw}$/day	-	0.000187

6.3 Contributing Scenario (3) controlling industrial worker exposure for PROC 3
Manufacturing of UP/VE resins and formulated resins (Gelcoat, Colour Paste, Putty, Bonding paste / Adhesive, etc.) Bulk transfers [CS14]. Receipt and storage of raw materials in bulk or as packed goods, indoor and outdoor; Raw material assembly and charging; dispensing of liquids and solids via pipeline;

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 91. Worker risk of ES 6.3

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.068571 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.000169
inhalation, long-term systemic	15.188 mg/m^3	85 mg/m^3	0.178687
Combined routes	2.238 mg/kg$_{bw}$/day	-	0.178856

6.4 Contributing Scenario (4) controlling industrial worker exposure for PROC 3
Manufacturing of UP/VE resins and formulated resins (Gelcoat, Colour Paste, Putty, Bonding paste / Adhesive, etc.) General exposures (closed systems) [CS15]. Dissolving linear UP/VE polymer into styrene in blending vessel (or dissolver)

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 92. Worker risk of ES 6.4

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.068571 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.000169
inhalation, long-term systemic	15.188 mg/m^3	85 mg/m^3	0.178687
Combined routes	2.238 mg/kg$_{bw}$/day	-	0.178856

6.5 Contributing Scenario (5) controlling industrial worker exposure for PROC 3
Manufacturing of UP/VE resins and formulated resins (Gelcoat, Colour Paste, Putty, Bonding paste / Adhesive, etc.) Equipment cleaning and maintenance [CS39]. Cleaning and maintenance of blending vessel, roadtankers etc.

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with

the total exposure of workers over all routes if applicable.

Table 93. Worker risk of ES 6.5

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.041143 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.000101
inhalation, long-term systemic	0.455652 mg/m^3	85 mg/m^3	0.005361
Combined routes	0.106236 mg/kg$_{bw}$/day	-	0.005462

6.6 Contributing Scenario (6) controlling industrial worker exposure for PROC 4
Manufacturing of UP/VE resins and formulated resins (Gelcoat, Colour Paste, Putty, Bonding paste / Adhesive, etc.) Material transfers [CS3]. All internal transport Raw material assembly and charging / raw material dispensing of liquids and solids manually from bulk storage or packed goods into blending tank

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 94. Worker risk of ES 6.6

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.685714 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	5.025 mg/kg$_{bw}$/day	-	0.359063

6.7 Contributing Scenario (7) controlling industrial worker exposure for PROC 4
Manufacturing of UP/VE resins and formulated resins (Gelcoat, Colour Paste, Putty, Bonding paste / Adhesive, etc.) Process sampling [CS2]. Sampling from blender

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 95. Worker risk of ES 6.7

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.137143 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.000338
inhalation, long-term systemic	6.075 mg/m^3	85 mg/m^3	0.071475
Combined routes	1.005 mg/kg$_{bw}$/day	-	0.071813

6.8 Contributing Scenario (8) controlling industrial worker exposure for PROC 5
Manufacturing of UP/VE resins and formulated resins (Gelcoat, Colour Paste, Putty, Bonding paste / Adhesive, etc.) Drum/batch transfers [CS8]; Pouring from small containers [CS9]; Transfer from/pouring from containers [CS22]; Mixing operations (open systems) [CS30]. Mixing liquid and solid components / into final formulated resin in blending vessel; Examples are gelcoat blending and compounding

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 96. Worker risk of ES 6.8

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	1.371 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.003378
inhalation, long-term systemic	10.849 mg/m^3	85 mg/m^3	0.127634
Combined routes	2.921 mg/kg$_{bw}$/day	-	0.131012

6.9 Contributing Scenario (9) controlling industrial worker exposure for PROC 8A
Manufacturing of UP/VE resins and formulated resins (Gelcoat, Colour Paste, Putty, Bonding paste / Adhesive, etc.) Equipment cleaning and maintenance [CS39]. Cleaning and maintenance of pipes, pumps, filters, etc.

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 97. Worker risk of ES 6.9

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	1.646 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.004053
inhalation, long-term systemic	0.19528 mg/m^3	85 mg/m^3	0.002297
Combined routes	1.674 $mg/kg_{bw}/day$	-	0.006351

6.10 Contributing Scenario (10) controlling industrial worker exposure for PROC 8A Manufacturing of UP/VE resins and formulated resins (Gelcoat, Colour Paste, Putty, Bonding paste / Adhesive, etc.) Disposal of wastes [CS28]. Waste management / handling and storage of waste for removal for off-site treatment or for on-site treatment like incineration and/or biological waste water treatment

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 98. Worker risk of ES 6.10

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.548571 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.001351
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	4.888 $mg/kg_{bw}/day$	-	0.358726

6.11 Contributing Scenario (11) controlling industrial worker exposure for PROC 8B

Manufacturing of UP/VE resins and formulated resins (Gelcoat, Colour Paste, Putty, Bonding paste / Adhesive, etc.) Bulk transfers [CS14]. All activities related to transport finished product to customer Dispensing final UP/VE resin (linear UP/VE polymer + styrene + additives) into roadtanker . Tier2 assessment has been done to prove safe use of styrene

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 99. Worker risk of ES 6.11

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	2.743 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.006756
inhalation, long-term systemic (measured / external: Exposure assessment using the Bayesian model of ART Version 1.5. The predicted 90th percentile full-shift exposure is 18 mg/m^3. The confidence interval is 8,1 mg/m^3 to 44 mg/m^3. PROC 8b Emission sources: Far-field exposure Vapour pressure: 1300 Pa (Elevated temperature) Liquid mole fraction: 0,5 Activity coefficient: 1 Process temperature: Room temperature Substance product type: Liquids Activity class: Falling of liquids Transfer technique: Transfer liquid products flow > 1000 L/min Situation: Open process, splash loading Localised controls: None	18 mg/m^3	85 mg/m^3	0.211765

No segregation, no personal enclosure Effective housekeeping practices in place? Yes Work area: Outdoors, close to buildings, worker located >4 m from far field source Duration (mins): 480 min			
Combined routes	5.314 $mg/kg_{bw}/day$	-	0.218521

6.12 Contributing Scenario (12) controlling industrial worker exposure for PROC 9
Manufacturing of UP/VE resins and formulated resins (Gelcoat, Colour Paste, Putty, Bonding paste / Adhesive, etc.) Bulk transfers [CS14]. All activities related to transport finished product to customer Dispensing final UP/VE resin (linear UP/VE polymer + styrene + additives) / into storage tank, IBC, drum or pail

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 100. Worker risk of ES 6.12

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	0.685714 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.001689
inhalation, long-term systemic	10.849 mg/m^3	85 mg/m^3	0.127634
Combined routes	2.236 $mg/kg_{bw}/day$	-	0.129323

6.13 Contributing Scenario (13) controlling industrial worker exposure for PROC 15
Manufacturing of UP/VE resins and formulated resins (Gelcoat, Colour Paste, Putty, Bonding paste / Adhesive, etc.) Laboratory activities [CS36]. All laboratory activities Quality control work of samples from reactor and blending vessel; R&D work including handling of samples from 1 kg to 1 drum

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 101. Worker risk of ES 6.13

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.034286 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.000084
inhalation, long-term systemic	0.216977 mg/m^3	85 mg/m^3	0.002553
Combined routes	0.065282 mg/kg$_{bw}$/day	-	0.002637

7 Scenario 7: FRP manufacturing in an industrial setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.) (ES7)

The following RCR calculations refer to the contributing scenarios described in chapter 9.7

7.1 Contributing Scenario (1) controlling environmental exposure for ERC6D
FRP manufacturing in an industrial setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.)

The quantitative risk characterisation for this environmental exposure has been calculated using EasyTRA.

The environmental exposure calculation per compartment is based on the algorithms of the EU TGD 2003 Risk Assessment Spreadsheet Model 1.24a.

7.1.1 Aquatic compartment (including sediment)

Table 102. Environmental risk aquatic of ES 7.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
Freshwater	0.004307 mg/L	0.028 mg/L	0.153807	1.05E+06
Freshwater sediment	0.167096 mg/kg$_{dwt}$	1.086 mg/kg$_{dwt}$	0.153807	1.05E+06
Marine water	0.000429 mg/L	0.014 mg/L	0.03062	5.26E+06
Marine water sediment	0.016633 mg/kg$_{dwt}$	0.5432 mg/kg$_{dwt}$	0.03062	5.26E+06

7.1.2 Terrestrial compartment

Table 103. Environmental risk terrestrial of ES 7.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
Agricultural soil	0.043737 mg/kg_{dwt}	0.200 mg/kg_{dwt}	0.218684	7.37E+05

7.1.3 Microbiological activity in sewage treatment systems

Table 104. Environmental risk STP of ES 7.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
STP	0.041079 mg/L	5 mg/L	0.008216	1.96E+07

7.1.4 Man via environment

Secondary poisoning considers indirect exposure of man via foods, air and drinking water. The following table shows the calculated exposure to the substance from exemplary food sources at different trophic levels together with the total exposure over all routes and food sources.

Table 105. Environmental risk man via environment of ES 7.1

Food source	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL	MSafe kg/d
Fish	0.000022 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	0.00001	-
Root crop	5.82E-7 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	2.77E-07	-
Leaf crop	1.20E-6 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	5.73E-07	-
Milk	2.99E-9 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	1.43E-09	-
Meat	4.64E-9 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	2.21E-09	-
Drinking water	2.87E-6 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	1.37E-06	-

inhalation	0.000086 mg/kg$_{bw}$/day	2.1 mg/kg$_{bw}$/day	0.000041	-
Total	0.000112 mg/kg$_{bw}$/day	2.1 mg/kg$_{bw}$/day	0.000054	3.01E+09

7.2 Contributing Scenario (2) controlling industrial worker exposure for PROC 3
FRP manufacturing in an industrial setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.) Material transfers [CS3]; Automated process with (semi) closed systems [CS93]; Use in contained batch processes [CS37]. Resin injection and transfer processes, such as vacuüm infusion, RTM, impregnation of sewer relining sleeves

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 106. Worker risk of ES 7.2

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	0.068571 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.000169
inhalation, long-term systemic	15.188 mg/m^3	85 mg/m^3	0.178687
Combined routes	2.238 mg/kg$_{bw}$/day	-	0.178856

7.3 Contributing Scenario (3) controlling industrial worker exposure for PROC 3
FRP manufacturing in an industrial setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.) Material transfers [CS3]. Product delivery/storage - delivery of bulk and packaged products - outdoor / indoor

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 107. Worker risk of ES 7.3

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.068571 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.000169
inhalation, long-term systemic	15.188 mg/m^3	85 mg/m^3	0.178687
Combined routes	2.238 mg/kg$_{bw}$/day	-	0.178856

7.4 Contributing Scenario (4) controlling industrial worker exposure for PROC 5
FRP manufacturing in an industrial setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.) Casting operations [CS32]; Mixing operations (open systems) [CS30]. Casting and mixing operations in (semi-) open containers. Examples are centrifugal casting, casting of polymer concrete and artificial marble and the manufacturing of SMC / BMC/ TMC, etc

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 108. Worker risk of ES 7.4

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	1.646 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.004053
inhalation, long-term systemic	13.019 mg/m^3	85 mg/m^3	0.15316
Combined routes	3.506 mg/kg$_{bw}$/day	-	0.157214

7.5 Contributing Scenario (5) controlling industrial worker exposure for PROC 5
FRP manufacturing in an industrial setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.) General exposures (closed systems) [CS15]. Mixing liquid and solid components / into final formulated resin in blending vessel; Examples are gelcoat blending and compounding, formulation of repair putties, bonding pastes, chemical anchoring, etc

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 109. Worker risk of ES 7.5

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	1.371 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.003378
inhalation, long-term systemic	32.547 mg/m^3	85 mg/m^3	0.382901
Combined routes	6.021 mg/kg$_{bw}$/day	-	0.386279

7.6 Contributing Scenario (6) controlling industrial worker exposure for PROC 5
FRP manufacturing in an industrial setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.) Drum/batch transfers [CS8]; Pouring from small containers [CS9]; Transfer from/pouring from containers [CS22]; Mixing operations (open systems) [CS30]. Loading of mixing equipment; Preparation of material for application; (liquid products) - batch, indoor

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 110. Worker risk of ES 7.6

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	1.371 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.003378
inhalation, long-term systemic	10.849 mg/m^3	85 mg/m^3	0.127634
Combined routes	2.921 mg/kg$_{bw}$/day	-	0.131012

7.7 Contributing Scenario (7) controlling industrial worker exposure for PROC 7
FRP manufacturing in an industrial setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.) Spraying [CS10]; Spraying (automatic/robotic) [CS97] All open mould applications where resins is applied by automated spraying or by robot in a spray cabin without direct

worker involvement. Examples are spray lamination, gelcoat spraying and “chop-hoop” filament winding

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 111. Worker risk of ES 7.7

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	4.286 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.010556
inhalation, long-term systemic	1.356 mg/m^3	85 mg/m^3	0.015954
Combined routes	4.479 mg/kg$_{bw}$/day	-	0.02651

7.8 Contributing Scenario (8) controlling industrial worker exposure for PROC 7
FRP manufacturing in an industrial setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.) Spraying [CS10]; Spraying (manually) [CS97] All open mould applications where resins is applied by manual spraying in an open work environment. Examples are spray lamination, gelcoat spraying and “chop-hoop” filament winding

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 112. Worker risk of ES 7.8

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	1.071 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.002639
inhalation, long-term systemic	0.203416 mg/m^3	85 mg/m^3	0.002393
Combined routes	1.1 mg/kg$_{bw}$/day	-	0.005032

7.9 Contributing Scenario (9) controlling industrial worker exposure for PROC 8A
FRP manufacturing in an industrial setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.) Equipment maintenance [CS5]; Maintenance of small items [CS18]. Equipment cleaning and maintenance, open indoor

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 113. Worker risk of ES 7.9

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.822857 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.002027
inhalation, long-term systemic	0.976398 mg/m^3	85 mg/m^3	0.011487
Combined routes	0.962343 $mg/kg_{bw}/day$	-	0.013514

7.10 Contributing Scenario (10) controlling industrial worker exposure for PROC 8A
FRP manufacturing in an industrial setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.) Disposal of wastes [CS28]. Handling of non cured waste; Waste management / handling and storage of waste for removal for off-site treatment or for on-site treatment like incineration and/or biological waste water treatment

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 114. Worker risk of ES 7.10

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	1.371 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.003378
inhalation, long-term systemic	0.542443 mg/m^3	85 mg/m^3	0.006382

Combined routes	1.449 mg/kg$_{bw}$/day	-	0.00976

7.11 Contributing Scenario (11) controlling industrial worker exposure for PROC 10
FRP manufacturing in an industrial setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.) Rolling, Brushing [CS51]; Roller, spreader, flow application [CS98] All open mould applications where resins is applied by brushing, rolling and other low energy spreading operations; Examples are handlamination, gelcoatbrushing, filament winding

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 115. Worker risk of ES 7.11

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	2.743 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.006756
inhalation, long-term systemic	1.627 mg/m^3	85 mg/m^3	0.019145
Combined routes	2.975 mg/kg$_{bw}$/day	-	0.025901

7.12 Contributing Scenario (12) controlling industrial worker exposure for PROC 10
FRP manufacturing in an industrial setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.) Dipping, immersion and pouring [CS4]; Rolling, Brushing [CS51]; Roller, spreader, flow application [CS98] Application of repair putties; Application of bonding pastes / adhesives.

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 116. Worker risk of ES 7.12

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.822857 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.002027
inhalation, long-term systemic	0.650932 mg/m^3	85 mg/m^3	0.007658
Combined routes	0.915847 mg/kg$_{bw}$/day	-	0.009685

7.13 Contributing Scenario (13) controlling industrial worker exposure for PROC 13
FRP manufacturing in an industrial setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.) Dipping, immersion and pouring [CS4]; Continuous process [CS54]. Continuous processes with open impregnation steps, such as pultrusion with open impregnation baths and (semi-) continuous production of flat laminates

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 117. Worker risk of ES 7.13

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.342857 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.000844
inhalation, long-term systemic	0.542443 mg/m^3	85 mg/m^3	0.006382
Combined routes	0.420349 mg/kg$_{bw}$/day	-	0.007226

7.14 Contributing Scenario (14) controlling industrial worker exposure for PROC 14
FRP manufacturing in an industrial setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.) Material transfers [CS3]; Production or preparation or articles by tabletting, compression, extrusion or pelletisation [CS100]; Treatment by heating [CS129]; Batch processes at elevated temperatures [CS136]. Processes where curing of UP / VE resins takes place at high temperature. Examples are pultrusion with injection dies and processing of SMC / BMC / TMC, etc

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 118. Worker risk of ES 7.14

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.411429 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.001013
inhalation, long-term systemic	39.056 mg/m^3	85 mg/m^3	0.459481
Combined routes	5.991 $mg/kg_{bw}/day$	-	0.460495

7.15 Contributing Scenario (15) controlling industrial worker exposure for PROC 15
FRP manufacturing in an industrial setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.) Laboratory activities [CS36]. Quality control work of samples from blending vessel; R&D work including handling of samples from 1 kg to 1 drum

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 119. Worker risk of ES 7.15

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.034286 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.000084
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	3.134 $mg/kg_{bw}/day$	-	0.255352

8 Scenario 8: FRP manufacturing in a professional setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.) (ES8)

The following RCR calculations refer to the contributing scenarios described in chapter 9.8

8.1 Contributing Scenario (1) controlling environmental exposure for ERC8E
FRP manufacturing in a professional setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.)

The quantitative risk characterisation for this environmental exposure has been calculated using EasyTRA.

The environmental exposure calculation per compartment is based on the algorithms of the EU TGD 2003 Risk Assessment Spreadsheet Model 1.24a.

8.1.1 Aquatic compartment (including sediment)

Table 120. Environmental risk aquatic of ES 8.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
Freshwater	0.000435 mg/L	0.028 mg/L	0.015553	3.11E+07
Freshwater sediment	0.016896 mg/kg_{dwt}	1.086 mg/kg_{dwt}	0.015553	3.11E+07
Marine water	0.000042 mg/L	0.014 mg/L	0.002969	1.63E+08
Marine water sediment	0.001613 mg/kg_{dwt}	0.5432 mg/kg_{dwt}	0.002969	1.63E+08

8.1.2 Terrestrial compartment

Table 121. Environmental risk terrestrial of ES 8.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
Agricultural soil	0.002327 mg/kg_{dwt}	0.200 mg/kg_{dwt}	0.011634	4.16E+07

8.1.3 Microbiological activity in sewage treatment systems

Table 122. Environmental risk STP of ES 8.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
STP	0.002347 mg/L	5 mg/L	0.000469	1.03E+09

8.1.4 Man via environment

Secondary poisoning considers indirect exposure of man via foods, air and drinking water. The following table shows the calculated exposure to the substance from exemplary food sources at different trophic levels together with the total exposure over all routes and food sources.

Table 123. Environmental risk man via environment of ES 8.1

Food source	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**	**MSafe kg/d**
Fish	0.000022 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	0.00001	-
Root crop	5.82E-7 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	2.77E-07	-
Leaf crop	1.20E-6 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	5.73E-07	-
Milk	2.99E-9 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	1.43E-09	-
Meat	4.64E-9 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	2.21E-09	-
Drinking water	2.87E-6 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	1.37E-06	-
inhalation	0.000086 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	0.000041	-
Total	0.000112 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	0.000054	9.04E+09

8.2 Contributing Scenario (2) controlling professional worker exposure for PROC 3
FRP manufacturing in a professional setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.) Use in contained batch processes [CS37]. Application of chemical anchoring

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 124. Worker risk of ES 8.2

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.041143 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.000101
inhalation, long-term systemic	45.565 mg/m^3	85 mg/m^3	0.536062
Combined routes	6.55 mg/kg$_{bw}$/day	-	0.536163

8.3 Contributing Scenario (3) controlling professional worker exposure for PROC 4
FRP manufacturing in a professional setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.) Use in contained batch processes [CS37]. Sewer relining operation

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 125. Worker risk of ES 8.3

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.205714 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.000507
inhalation, long-term systemic	2.278 mg/m^3	85 mg/m^3	0.026803
Combined routes	0.53118 mg/kg$_{bw}$/day	-	0.02731

8.4 Contributing Scenario (4) controlling professional worker exposure for PROC 5
FRP manufacturing in a professional setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.) Material transfers [CS3]; Pouring from small containers [CS9]. Preparation of material for application (liquids) - transfer of material from one container to another; Formulating / blending resins, gelcoats, bonding pastes, putties etc. in blending vessels

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with

the total exposure of workers over all routes if applicable.

Table 126. Worker risk of ES 8.4

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.274286 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.000676
inhalation, long-term systemic	0.607536 mg/m^3	85 mg/m^3	0.007147
Combined routes	0.361077 mg/kg$_{bw}$/day	-	0.007823

8.5 Contributing Scenario (5) controlling professional worker exposure for PROC 8A
FRP manufacturing in a professional setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.) Equipment maintenance [CS5]; Maintenance of small items [CS18]. Equipment cleaning and maintenance, open indoor

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 127. Worker risk of ES 8.5

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.274286 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.000676
inhalation, long-term systemic	0.607536 mg/m^3	85 mg/m^3	0.007147
Combined routes	0.361077 mg/kg$_{bw}$/day	-	0.007823

8.6 Contributing Scenario (6) controlling professional worker exposure for PROC 8A
FRP manufacturing in a professional setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.) Disposal of wastes [CS28]. Handling of non cured waste; Waste management / handling and storage of waste for removal for off-site treatment or for on-site treatment like

incineration and/or biological waste water treatment

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 128. Worker risk of ES 8.6

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.274286 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.000676
inhalation, long-term systemic	0.607536 mg/m^3	85 mg/m^3	0.007147
Combined routes	0.361077 mg/kg$_{bw}$/day	-	0.007823

8.7 Contributing Scenario (7) controlling professional worker exposure for PROC 10
FRP manufacturing in a professional setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.) Rolling, Brushing [CS51]; Roller, spreader, flow application [CS98] All open mould applications where resins is applied by brushing, rolling and other low energy spreading operations; Examples are handlamination, gelcoatbrushing, semi-continuous production of flat panels and laminates

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 129. Worker risk of ES 8.7

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	1.371 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.003378
inhalation, long-term systemic	0.759421 mg/m^3	85 mg/m^3	0.008934
Combined routes	1.48 mg/kg$_{bw}$/day	-	0.012312

8.8 Contributing Scenario (8) controlling professional worker exposure for PROC 10
FRP manufacturing in a professional setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.) Dipping, immersion and pouring [CS4]; Rolling, Brushing [CS51]; Roller, spreader, flow application [CS98] Application of repair putties; Application of bonding pastes / adhesives.

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 130. Worker risk of ES 8.8

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	1.371 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.003378
inhalation, long-term systemic	0.759421 mg/m^3	85 mg/m^3	0.008934
Combined routes	1.48 mg/kg$_{bw}$/day	-	0.012312

8.9 Contributing Scenario (9) controlling professional worker exposure for PROC 10
FRP manufacturing in a professional setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.) Dipping, immersion and pouring [CS4]; Rolling, Brushing [CS51]; Roller, spreader, flow application [CS98] Application of floorings, mastics, coatings, castings

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 131. Worker risk of ES 8.9

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	1.371 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.003378

inhalation, long-term systemic	0.759421 mg/m^3	85 mg/m^3	0.008934
Combined routes	1.48 mg/kg$_{bw}$/day	-	0.012312

8.10 Contributing Scenario (10) controlling professional worker exposure for PROC 11
FRP manufacturing in a professional setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.) Spraying [CS10]; Spraying (manually) [CS97] All open mould applications where resins is applied by manual spraying in an open work environment. Examples are spray lamination, gelcoat spraying and “chop-hoop” filament winding

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 132. Worker risk of ES 8.10

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	5.357 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.013195
inhalation, long-term systemic	3.797 mg/m^3	85 mg/m^3	0.044672
Combined routes	5.9 mg/kg$_{bw}$/day	-	0.057867

9 Scenario 9: Production of Styrene Butadiene Rubber (SBR) (ES9)

The following RCR calculations refer to the contributing scenarios described in chapter 9.9

9.1 Contributing Scenario (1) controlling environmental exposure for ERC6C
Production of Styrene Butadiene Rubber (SBR)

The quantitative risk characterisation for this environmental exposure has been calculated using EasyTRA.

The environmental exposure calculation per compartment is based on the algorithms of the EU TGD 2003 Risk Assessment Spreadsheet Model 1.24a.

9.1.1 Aquatic compartment (including sediment)

Table 133. Environmental risk aquatic of ES 9.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
Freshwater	0.000435 mg/L	0.028 mg/L	0.015553	3.11E+07
Freshwater sediment	0.016896 mg/kg_{dwt}	1.086 mg/kg_{dwt}	0.015553	3.11E+07
Marine water	0.000042 mg/L	0.014 mg/L	0.002969	1.63E+08
Marine water sediment	0.001613 mg/kg_{dwt}	0.5432 mg/kg_{dwt}	0.002969	1.63E+08

9.1.2 Terrestrial compartment

Table 134. Environmental risk terrestrial of ES 9.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
Agricultural soil	0.01318 mg/kg_{dwt}	0.200 mg/kg_{dwt}	0.065901	7.34E+06

9.1.3 Microbiological activity in sewage treatment systems

Table 135. Environmental risk STP of ES 9.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
STP	0.002347 mg/L	5 mg/L	0.000469	1.03E+09

9.1.4 Man via environment

Secondary poisoning considers indirect exposure of man via foods, air and drinking water. The following table shows the calculated exposure to the substance from exemplary food sources at different trophic levels together with the total exposure over all routes and food sources.

Table 136. Environmental risk man via environment of ES 9.1

Food source	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL	MSafe kg/d
Fish	0.000022 mg/kg_{bw}/day	2.1 mg/kg_{bw}/day	0.00001	-

Root crop	5.82E-7 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	2.77E-07	-
Leaf crop	1.20E-6 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	5.73E-07	-
Milk	2.99E-9 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	1.43E-09	-
Meat	4.64E-9 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	2.21E-09	-
Drinking water	2.87E-6 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	1.37E-06	-
inhalation	0.000086 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	0.000041	-
Total	0.000112 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	0.000054	9.04E+09

9.2 Contributing Scenario (2) controlling industrial worker exposure for PROC 2
Production of Styrene Butadiene Rubber (SBR) Material transfers [CS3]. Styrene Storage in tanks

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 137. Worker risk of ES 9.2

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	1.371 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.003378
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	4.471 $mg/kg_{bw}/day$	-	0.258645

9.3 Contributing Scenario (3) controlling industrial worker exposure for PROC 2
Production of Styrene Butadiene Rubber (SBR) Material transfers [CS3]. Waste management : recovery using condensation or adsorption/ desorption processes

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 138. Worker risk of ES 9.3

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	1.371 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.003378
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	4.471 mg/kg$_{bw}$/day	-	0.258645

9.4 Contributing Scenario (4) controlling industrial worker exposure for PROC 3
Production of Styrene Butadiene Rubber (SBR) Material transfers [CS3]. Charging reactors via pipeline

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 139. Worker risk of ES 9.4

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.685714 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	5.025 mg/kg$_{bw}$/day	-	0.359063

9.5 Contributing Scenario (5) controlling industrial worker exposure for PROC 3
Production of Styrene Butadiene Rubber (SBR) Batch process [CS55]. Polymerisation reactor

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 140. Worker risk of ES 9.5

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.685714 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	5.025 mg/kg$_{bw}$/day	-	0.359063

9.6 Contributing Scenario (6) controlling industrial worker exposure for PROC 3
Production of Styrene Butadiene Rubber (SBR) Batch process [CS55]. Vacuum steam distillation

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 141. Worker risk of ES 9.6

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.685714 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	5.025 mg/kg$_{bw}$/day	-	0.359063

9.7 Contributing Scenario (7) controlling industrial worker exposure for PROC 3
Production of Styrene Butadiene Rubber (SBR) Batch process [CS55]. Coagulation reactor

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with

the total exposure of workers over all routes if applicable.

Table 142. Worker risk of ES 9.7

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.685714 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	5.025 mg/kg$_{bw}$/day	-	0.359063

9.8 Contributing Scenario (8) controlling industrial worker exposure for PROC 3
Production of Styrene Butadiene Rubber (SBR) Batch process [CS55]. Drying tank

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 143. Worker risk of ES 9.8

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.685714 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	5.025 mg/kg$_{bw}$/day	-	0.359063

9.9 Contributing Scenario (9) controlling industrial worker exposure for PROC 3
Production of Styrene Butadiene Rubber (SBR) Material transfers [CS3]. Recycling styrene from distillator to reactor via pipeline

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 144. Worker risk of ES 9.9

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.685714 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	5.025 mg/kg$_{bw}$/day	-	0.359063

9.10 Contributing Scenario (10) controlling industrial worker exposure for PROC 8A
Production of Styrene Butadiene Rubber (SBR) Process sampling [CS2]. Sampling from reactors

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 145. Worker risk of ES 9.10

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	13.714 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.033779
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535
Combined routes	19.914 mg/kg$_{bw}$/day	-	0.544314

9.11 Contributing Scenario (11) controlling industrial worker exposure for PROC 8B
Production of Styrene Butadiene Rubber (SBR) Material transfers [CS3]. Loading tank storage from road, rail or boat transport

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 146. Worker risk of ES 9.11

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	2.743 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 mg/kg$_{bw}$/day	-	0.262023

9.12 Contributing Scenario (12) controlling industrial worker exposure for PROC 8B
Production of Styrene Butadiene Rubber (SBR) Equipment maintenance [CS5]. Manufacturing equipment maintenance: opening and cleaning manufacturing equipment for maintenance purposes

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 147. Worker risk of ES 9.12

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	2.743 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 mg/kg$_{bw}$/day	-	0.262023

9.13 Contributing Scenario (13) controlling industrial worker exposure for PROC 8B
Production of Styrene Butadiene Rubber (SBR) Bulk transfers [CS14]. Finished product Loading of road tanker, railcar, container

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 148. Worker risk of ES 9.13

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	2.743 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 $mg/kg_{bw}/day$	-	0.262023

9.14 Contributing Scenario (14) controlling industrial worker exposure for PROC 8B
Production of Styrene Butadiene Rubber (SBR) Material transfers [CS3]. Waste management : transfer of process wastes to storage containers: off-line in workplace

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 149. Worker risk of ES 9.14

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	2.743 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 $mg/kg_{bw}/day$	-	0.262023

9.15 Contributing Scenario (15) controlling industrial worker exposure for PROC 9
Production of Styrene Butadiene Rubber (SBR) Small package filling [CS7]. Small package filling - Packaging of product

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 150. Worker risk of ES 9.15

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	1.371 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.003378
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535
Combined routes	7.571 mg/kg$_{bw}$/day	-	0.513913

9.16 Contributing Scenario (16) controlling industrial worker exposure for PROC 15
Production of Styrene Butadiene Rubber (SBR) Laboratory activities [CS36]. Laboratory - Quality Control

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 151. Worker risk of ES 9.16

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.342857 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.000844
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535
Combined routes	6.542 mg/kg$_{bw}$/day	-	0.511379

10 Scenario 10: Production of Styrene Butadiene Latex (SBL) (ES10)

The following RCR calculations refer to the contributing scenarios described in chapter 9.10

10.1 Contributing Scenario (1) controlling environmental exposure for ERC6C
Production of Styrene Butadiene Latex (SBL)

The quantitative risk characterisation for this environmental exposure has been calculated using EasyTRA.

The environmental exposure calculation per compartment is based on the algorithms of the EU TGD 2003 Risk Assessment Spreadsheet Model 1.24a.

10.1.1 Aquatic compartment (including sediment)

Table 152. Environmental risk aquatic of ES 10.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
Freshwater	0.000435 mg/L	0.028 mg/L	0.015553	3.11E+07
Freshwater sediment	0.016896 mg/kg_{dwt}	1.086 mg/kg_{dwt}	0.015553	3.11E+07
Marine water	0.000042 mg/L	0.014 mg/L	0.002969	1.63E+08
Marine water sediment	0.001613 mg/kg_{dwt}	0.5432 mg/kg_{dwt}	0.002969	1.63E+08

10.1.2 Terrestrial compartment

Table 153. Environmental risk terrestrial of ES 10.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
Agricultural soil	0.01318 mg/kg_{dwt}	0.200 mg/kg_{dwt}	0.065901	7.34E+06

10.1.3 Microbiological activity in sewage treatment systems

Table 154. Environmental risk STP of ES 10.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
STP	0.002347 mg/L	5 mg/L	0.000469	1.03E+09

10.1.4 Man via environment

Secondary poisoning considers indirect exposure of man via foods, air and drinking water. The following table shows the calculated exposure to the substance from exemplary food sources at different trophic levels together with the total exposure over all routes and food sources.

Table 155. Environmental risk man via environment of ES 10.1

Food source	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL	MSafe kg/d
Fish	0.000022 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	0.00001	-
Root crop	5.82E-7 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	2.77E-07	-
Leaf crop	1.20E-6 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	5.73E-07	-
Milk	2.99E-9 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	1.43E-09	-
Meat	4.64E-9 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	2.21E-09	-
Drinking water	2.87E-6 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	1.37E-06	-
inhalation	0.000086 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	0.000041	-
Total	0.000112 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	0.000054	9.04E+09

10.2 Contributing Scenario (2) controlling industrial worker exposure for PROC 2
Production of Styrene Butadiene Latex (SBL) Material transfers [CS3]. Styrene Storage in tanks

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 156. Worker risk of ES 10.2

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	1.371 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.003378
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	4.471 $mg/kg_{bw}/day$	-	0.258645

10.3 Contributing Scenario (3) controlling industrial worker exposure for PROC 2
Production of Styrene Butadiene Latex (SBL) Material transfers [CS3]. Waste management : recovery using condensation or adsorption/ desorption processes

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 157. Worker risk of ES 10.3

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	1.371 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.003378
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	4.471 $mg/kg_{bw}/day$	-	0.258645

10.4 Contributing Scenario (4) controlling industrial worker exposure for PROC 3
Production of Styrene Butadiene Latex (SBL) Material transfers [CS3]. Charging reactors via pipeline

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 158. Worker risk of ES 10.4

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	0.685714 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	5.025 $mg/kg_{bw}/day$	-	0.359063

10.5 Contributing Scenario (5) controlling industrial worker exposure for PROC 3

Production of Styrene Butadiene Latex (SBL) Batch process [CS55]. Polymerisation reactor

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 159. Worker risk of ES 10.5

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.685714 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	5.025 mg/kg$_{bw}$/day	-	0.359063

10.6 Contributing Scenario (6) controlling industrial worker exposure for PROC 3
Production of Styrene Butadiene Latex (SBL) Batch process [CS55]. Vacuum steam distillation

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 160. Worker risk of ES 10.6

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.685714 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	5.025 mg/kg$_{bw}$/day	-	0.359063

10.7 Contributing Scenario (7) controlling industrial worker exposure for PROC 3
Production of Styrene Butadiene Latex (SBL) Material transfers [CS3]. Recycling styrene from distillator to reactor via pipeline

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 161. Worker risk of ES 10.7

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.685714 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	5.025 $mg/kg_{bw}/day$	-	0.359063

10.8 Contributing Scenario (8) controlling industrial worker exposure for PROC 8A
Production of Styrene Butadiene Latex (SBL) Process sampling [CS2]. Sampling from reactors

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 162. Worker risk of ES 10.8

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	13.714 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.033779
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535
Combined routes	19.914 $mg/kg_{bw}/day$	-	0.544314

10.9 Contributing Scenario (9) controlling industrial worker exposure for PROC 8B
Production of Styrene Butadiene Latex (SBL) Material transfers [CS3]. Loading tank storage from road, rail or boat transport

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 163. Worker risk of ES 10.9

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	2.743 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 $mg/kg_{bw}/day$	-	0.262023

10.10 Contributing Scenario (10) controlling industrial worker exposure for PROC 8B
Production of Styrene Butadiene Latex (SBL) Equipment maintenance [CS5]. Manufacturing equipment maintenance: opening and cleaning manufacturing equipment for maintenance purposes

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 164. Worker risk of ES 10.10

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	2.743 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 $mg/kg_{bw}/day$	-	0.262023

10.11 Contributing Scenario (11) controlling industrial worker exposure for PROC 8B
Production of Styrene Butadiene Latex (SBL) Bulk transfers [CS14]. Finished product Loading of road tanker, railcar, container

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 165. Worker risk of ES 10.11

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	2.743 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 $mg/kg_{bw}/day$	-	0.262023

10.12 Contributing Scenario (12) controlling industrial worker exposure for PROC 8B
Production of Styrene Butadiene Latex (SBL) Material transfers [CS3]. Waste management : transfer of process wastes to storage containers: off-line in workplace

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 166. Worker risk of ES 10.12

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	2.743 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 $mg/kg_{bw}/day$	-	0.262023

10.13 Contributing Scenario (13) controlling industrial worker exposure for PROC 9
Production of Styrene Butadiene Latex (SBL) Small package filling [CS7]. Small package filling - Packaging of product

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 167. Worker risk of ES 10.13

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	1.371 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.003378
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535
Combined routes	7.571 mg/kg$_{bw}$/day	-	0.513913

10.14 Contributing Scenario (14) controlling industrial worker exposure for PROC 15
Production of Styrene Butadiene Latex (SBL) Laboratory activities [CS36]. Laboratory - Quality Control

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 168. Worker risk of ES 10.14

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.342857 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.000844
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535
Combined routes	6.542 mg/kg$_{bw}$/day	-	0.511379

11 Scenario 11: Production of Styrene Isoprene Copolymers (ES11)

The following RCR calculations refer to the contributing scenarios described in chapter 9.11

11.1 Contributing Scenario (1) controlling environmental exposure for ERC6C
Production of Styrene Isoprene Copolymers

The quantitative risk characterisation for this environmental exposure has been calculated using EasyTRA.

The environmental exposure calculation per compartment is based on the algorithms of the EU TGD 2003 Risk Assessment Spreadsheet Model 1.24a.

11.1.1 Aquatic compartment (including sediment)

Table 169. Environmental risk aquatic of ES 11.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
Freshwater	0.000435 mg/L	0.028 mg/L	0.015553	3.11E+07
Freshwater sediment	0.016896 mg/kg_{dwt}	1.086 mg/kg_{dwt}	0.015553	3.11E+07
Marine water	0.000042 mg/L	0.014 mg/L	0.002969	1.63E+08
Marine water sediment	0.001613 mg/kg_{dwt}	0.5432 mg/kg_{dwt}	0.002969	1.63E+08

11.1.2 Terrestrial compartment

Table 170. Environmental risk terrestrial of ES 11.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
Agricultural soil	0.01318 mg/kg_{dwt}	0.200 mg/kg_{dwt}	0.065901	7.34E+06

11.1.3 Microbiological activity in sewage treatment systems

Table 171. Environmental risk STP of ES 11.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
STP	0.002347 mg/L	5 mg/L	0.000469	1.03E+09

11.1.4 Man via environment

Secondary poisoning considers indirect exposure of man via foods, air and drinking water. The following table shows the calculated exposure to the substance from exemplary food sources at different trophic levels together with the total exposure over all routes and food sources.

Table 172. Environmental risk man via environment of ES 11.1

Food source	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL	MSafe kg/d
Fish	0.000022 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	0.00001	-
Root crop	5.82E-7 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	2.77E-07	-
Leaf crop	1.20E-6 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	5.73E-07	-
Milk	2.99E-9 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	1.43E-09	-
Meat	4.64E-9 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	2.21E-09	-
Drinking water	2.87E-6 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	1.37E-06	-
inhalation	0.000086 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	0.000041	-
Total	0.000112 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	0.000054	9.04E+09

11.2 Contributing Scenario (2) controlling industrial worker exposure for PROC 2
Production of Styrene Isoprene Copolymers Material transfers [CS3]. Styrene Storage in tanks

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 173. Worker risk of ES 11.2

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	1.371 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.003378
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267

Combined routes	4.471 $mg/kg_{bw}/day$	-	0.258645

11.3 Contributing Scenario (3) controlling industrial worker exposure for PROC 2
Production of Styrene Isoprene Copolymers Material transfers [CS3]. Waste management : recovery using condensation or adsorption/ desorption processes

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 174. Worker risk of ES 11.3

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	1.371 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.003378
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	4.471 $mg/kg_{bw}/day$	-	0.258645

11.4 Contributing Scenario (4) controlling industrial worker exposure for PROC 3
Production of Styrene Isoprene Copolymers Material transfers [CS3]. Charging reactors via pipeline

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 175. Worker risk of ES 11.4

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	0.685714 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374

Combined routes	5.025 mg/kg$_{bw}$/day	-	0.359063

11.5 Contributing Scenario (5) controlling industrial worker exposure for PROC 3
Production of Styrene Isoprene Copolymers Batch process [CS55]. Dissolving and polymerisation reactor

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 176. Worker risk of ES 11.5

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	0.685714 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	5.025 mg/kg$_{bw}$/day	-	0.359063

11.6 Contributing Scenario (6) controlling industrial worker exposure for PROC 3
Production of Styrene Isoprene Copolymers Batch process [CS55]. Suspension reactor

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 177. Worker risk of ES 11.6

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	0.685714 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374

Combined routes	5.025 $mg/kg_{bw}/day$	-	0.359063

11.7 Contributing Scenario (7) controlling industrial worker exposure for PROC 3
Production of Styrene Isoprene Copolymers Batch process [CS55]. Washed and dried tanks

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 178. Worker risk of ES 11.7

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	0.685714 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	5.025 $mg/kg_{bw}/day$	-	0.359063

11.8 Contributing Scenario (8) controlling industrial worker exposure for PROC 8A
Production of Styrene Isoprene Copolymers Process sampling [CS2]. Sampling from reactors/tanks

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 179. Worker risk of ES 11.8

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	13.714 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.033779
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535
Combined routes	19.914 $mg/kg_{bw}/day$	-	0.544314

11.9 Contributing Scenario (9) controlling industrial worker exposure for PROC 8B
Production of Styrene Isoprene Copolymers Equipment maintenance [CS5]. Manufacturing equipment maintenance: opening and cleaning manufacturing equipment for maintenance purposes

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 180. Worker risk of ES 11.9

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	2.743 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 $mg/kg_{bw}/day$	-	0.262023

11.10 Contributing Scenario (10) controlling industrial worker exposure for PROC 8B
Production of Styrene Isoprene Copolymers Bulk transfers [CS14]. Finished product Loading of road tanker, railcar, container

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 181. Worker risk of ES 11.10

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	2.743 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267

Combined routes	5.843 $mg/kg_{bw}/day$	-	0.262023

11.11 Contributing Scenario (11) controlling industrial worker exposure for PROC 8B
Production of Styrene Isoprene Copolymers Material transfers [CS3]. Loading tank storage from road, rail or boat transport

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 182. Worker risk of ES 11.11

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	2.743 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 $mg/kg_{bw}/day$	-	0.262023

11.12 Contributing Scenario (12) controlling industrial worker exposure for PROC 8B
Production of Styrene Isoprene Copolymers Material transfers [CS3]. Waste management : transfer of process wastes to storage containers: off-line in workplace

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 183. Worker risk of ES 11.12

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	2.743 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.006756

inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 mg/kg_{bw}/day	-	0.262023

11.13 Contributing Scenario (13) controlling industrial worker exposure for PROC 9
Production of Styrene Isoprene Copolymers Small package filling [CS7]. Small package filling - Packaging of product

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 184. Worker risk of ES 11.13

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	1.371 mg/kg_{bw}/day	406 mg/kg_{bw}/day	0.003378
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535
Combined routes	7.571 mg/kg_{bw}/day	-	0.513913

11.14 Contributing Scenario (14) controlling industrial worker exposure for PROC 15
Production of Styrene Isoprene Copolymers Laboratory activities [CS36]. Laboratory - Quality Control

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 185. Worker risk of ES 11.14

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	0.342857 mg/kg_{bw}/day	406 mg/kg_{bw}/day	0.000844
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535

Combined routes	6.542 $mg/kg_{bw}/day$	-	0.511379

12 Scenario 12: Production of other Styrene based polymeric dispersions (ES12)

The following RCR calculations refer to the contributing scenarios described in chapter 9.12

12.1 Contributing Scenario (1) controlling environmental exposure for ERC6C
Production of other Styrene based polymeric dispersions

The quantitative risk characterisation for this environmental exposure has been calculated using EasyTRA.

The environmental exposure calculation per compartment is based on the algorithms of the EU TGD 2003 Risk Assessment Spreadsheet Model 1.24a.

12.1.1 Aquatic compartment (including sediment)

Table 186. Environmental risk aquatic of ES 12.1

Compartments	**PEC**	**PNEC**	**RCR = PEC/PNEC**	**MSafe kg/d**
Freshwater	0.000435 mg/L	0.028 mg/L	0.015553	3.11E+07
Freshwater sediment	0.016896 mg/kg_{dwt}	1.086 mg/kg_{dwt}	0.015553	3.11E+07
Marine water	0.000042 mg/L	0.014 mg/L	0.002969	1.63E+08
Marine water sediment	0.001613 mg/kg_{dwt}	0.5432 mg/kg_{dwt}	0.002969	1.63E+08

12.1.2 Terrestrial compartment

Table 187. Environmental risk terrestrial of ES 12.1

Compartments	**PEC**	**PNEC**	**RCR = PEC/PNEC**	**MSafe kg/d**
Agricultural soil	0.01318 mg/kg_{dwt}	0.200 mg/kg_{dwt}	0.065901	7.34E+06

12.1.3 Microbiological activity in sewage treatment systems

Table 188. Environmental risk STP of ES 12.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
STP	0.002347 mg/L	5 mg/L	0.000469	1.03E+09

12.1.4 Man via environment

Secondary poisoning considers indirect exposure of man via foods, air and drinking water. The following table shows the calculated exposure to the substance from exemplary food sources at different trophic levels together with the total exposure over all routes and food sources.

Table 189. Environmental risk man via environment of ES 12.1

Food source	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL	MSafe kg/d
Fish	0.000022 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	0.00001	-
Root crop	5.82E-7 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	2.77E-07	-
Leaf crop	1.20E-6 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	5.73E-07	-
Milk	2.99E-9 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	1.43E-09	-
Meat	4.64E-9 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	2.21E-09	-
Drinking water	2.87E-6 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	1.37E-06	-
inhalation	0.000086 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	0.000041	-
Total	0.000112 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	0.000054	9.04E+09

12.2 Contributing Scenario (2) controlling industrial worker exposure for PROC 2
Production of other Styrene based polymeric dispersions Material transfers [CS3]. Styrene Storage in tanks

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with

the total exposure of workers over all routes if applicable.

Table 190. Worker risk of ES 12.2

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	1.371 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.003378
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	4.471 mg/kg$_{bw}$/day	-	0.258645

12.3 Contributing Scenario (3) controlling industrial worker exposure for PROC 2
Production of other Styrene based polymeric dispersions Material transfers [CS3]. Waste management : recovery using condensation or adsorption/ desorption processes

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 191. Worker risk of ES 12.3

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	1.371 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.003378
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	4.471 mg/kg$_{bw}$/day	-	0.258645

12.4 Contributing Scenario (4) controlling industrial worker exposure for PROC 3
Production of other Styrene based polymeric dispersions Material transfers [CS3]. Charging reactors via pipeline

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 192. Worker risk of ES 12.4

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.685714 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	5.025 mg/kg$_{bw}$/day	-	0.359063

12.5 Contributing Scenario (5) controlling industrial worker exposure for PROC 3
Production of other Styrene based polymeric dispersions Batch process [CS55]. Dissolving and polymerisation reactor

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 193. Worker risk of ES 12.5

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.685714 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	5.025 mg/kg$_{bw}$/day	-	0.359063

12.6 Contributing Scenario (6) controlling industrial worker exposure for PROC 3
Production of other Styrene based polymeric dispersions Batch process [CS55]. Suspension reactor

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with

the total exposure of workers over all routes if applicable.

Table 194. Worker risk of ES 12.6

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.685714 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	5.025 mg/kg$_{bw}$/day	-	0.359063

12.7 Contributing Scenario (7) controlling industrial worker exposure for PROC 3
Production of other Styrene based polymeric dispersions Batch process [CS55]. Washed and dried tanks

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 195. Worker risk of ES 12.7

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.685714 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	5.025 mg/kg$_{bw}$/day	-	0.359063

12.8 Contributing Scenario (8) controlling industrial worker exposure for PROC 8A
Production of other Styrene based polymeric dispersions Process sampling [CS2]. Sampling from reactors/tanks

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with

the total exposure of workers over all routes if applicable.

Table 196. Worker risk of ES 12.8

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	13.714 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.033779
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535
Combined routes	19.914 mg/kg$_{bw}$/day	-	0.544314

12.9 Contributing Scenario (9) controlling industrial worker exposure for PROC 8B
Production of other Styrene based polymeric dispersions Material transfers [CS3]. Loading tank storage from road, rail or boat transport

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 197. Worker risk of ES 12.9

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	2.743 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 mg/kg$_{bw}$/day	-	0.262023

12.10 Contributing Scenario (10) controlling industrial worker exposure for PROC 8B
Production of other Styrene based polymeric dispersions Equipment maintenance [CS5]. Manufacturing equipment maintenance: opening and cleaning manufacturing equipment for maintenance purposes

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 198. Worker risk of ES 12.10

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	2.743 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 $mg/kg_{bw}/day$	-	0.262023

12.11 Contributing Scenario (11) controlling industrial worker exposure for PROC 8B
Production of other Styrene based polymeric dispersions Bulk transfers [CS14]. Finished product Loading of road tanker, railcar, container

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 199. Worker risk of ES 12.11

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	2.743 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 $mg/kg_{bw}/day$	-	0.262023

12.12 Contributing Scenario (12) controlling industrial worker exposure for PROC 8B
Production of other Styrene based polymeric dispersions Material transfers [CS3]. Waste management : transfer of process wastes to storage containers: off-line in workplace

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 200. Worker risk of ES 12.12

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	2.743 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 $mg/kg_{bw}/day$	-	0.262023

12.13 Contributing Scenario (13) controlling industrial worker exposure for PROC 9
Production of other Styrene based polymeric dispersions Small package filling [CS7]. Small package filling - Packaging of product

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 201. Worker risk of ES 12.13

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	1.371 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.003378
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535
Combined routes	7.571 $mg/kg_{bw}/day$	-	0.513913

12.14 Contributing Scenario (14) controlling industrial worker exposure for PROC 15
Production of other Styrene based polymeric dispersions Laboratory activities [CS36]. Laboratory - Quality Control

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 202. Worker risk of ES 12.14

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.342857 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.000844
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535
Combined routes	6.542 $mg/kg_{bw}/day$	-	0.511379

13 Scenario 13: Production of filled Polyols (ES13)

The following RCR calculations refer to the contributing scenarios described in chapter 9.13

13.1 Contributing Scenario (1) controlling environmental exposure for ERC6C
Production of filled Polyols

The quantitative risk characterisation for this environmental exposure has been calculated using EasyTRA.

The environmental exposure calculation per compartment is based on the algorithms of the EU TGD 2003 Risk Assessment Spreadsheet Model 1.24a.

13.1.1 Aquatic compartment (including sediment)

Table 203. Environmental risk aquatic of ES 13.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
Freshwater	0.000435 mg/L	0.028 mg/L	0.015553	3.11E+07
Freshwater sediment	0.016896 mg/kg_{dwt}	1.086 mg/kg_{dwt}	0.015553	3.11E+07
Marine water	0.000042 mg/L	0.014 mg/L	0.002969	1.63E+08
Marine water sediment	0.001613 mg/kg_{dwt}	0.5432 mg/kg_{dwt}	0.002969	1.63E+08

13.1.2 Terrestrial compartment

Table 204. Environmental risk terrestrial of ES 13.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
Agricultural soil	0.01318 mg/kg_{dwt}	0.200 mg/kg_{dwt}	0.065901	7.34E+06

13.1.3 Microbiological activity in sewage treatment systems

Table 205. Environmental risk STP of ES 13.1

Compartments	PEC	PNEC	RCR = PEC/PNEC	MSafe kg/d
STP	0.002347 mg/L	5 mg/L	0.000469	1.03E+09

13.1.4 Man via environment

Secondary poisoning considers indirect exposure of man via foods, air and drinking water. The following table shows the calculated exposure to the substance from exemplary food sources at different trophic levels together with the total exposure over all routes and food sources.

Table 206. Environmental risk man via environment of ES 13.1

Food source	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL	MSafe kg/d
Fish	0.000022 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	0.00001	-
Root crop	5.82E-7 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	2.77E-07	-
Leaf crop	1.20E-6 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	5.73E-07	-
Milk	2.99E-9 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	1.43E-09	-
Meat	4.64E-9 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	2.21E-09	-
Drinking water	2.87E-6 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	1.37E-06	-
inhalation	0.000086 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	0.000041	-

Total	0.000112 $mg/kg_{bw}/day$	2.1 $mg/kg_{bw}/day$	0.000054	9.04E+09

13.2 Contributing Scenario (2) controlling industrial worker exposure for PROC 2
Production of filled Polyols Material transfers [CS3]. Waste management : recovery using condensation or adsorption/ desorption processes

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 207. Worker risk of ES 13.2

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	1.371 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.003378
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	4.471 $mg/kg_{bw}/day$	-	0.258645

13.3 Contributing Scenario (3) controlling industrial worker exposure for PROC 2
Production of filled Polyols Material transfers [CS3]. Styrene Storage in tanks

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 208. Worker risk of ES 13.3

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	1.371 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.003378
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267

Combined routes	4.471 mg/kg$_{bw}$/day	-	0.258645

13.4 Contributing Scenario (4) controlling industrial worker exposure for PROC 3
Production of filled Polyols Material transfers [CS3]. Charging reactors via pipeline

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 209. Worker risk of ES 13.4

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	0.685714 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	5.025 mg/kg$_{bw}$/day	-	0.359063

13.5 Contributing Scenario (5) controlling industrial worker exposure for PROC 3
Production of filled Polyols Batch process [CS55]. Dissolving and polymerisation reactor

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 210. Worker risk of ES 13.5

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	0.685714 mg/kg$_{bw}$/day	406 mg/kg$_{bw}$/day	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	5.025 mg/kg$_{bw}$/day	-	0.359063

13.6 Contributing Scenario (6) controlling industrial worker exposure for PROC 3
Production of filled Polyols Batch process [CS55]. Suspension reactor

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 211. Worker risk of ES 13.6

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	0.685714 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	5.025 $mg/kg_{bw}/day$	-	0.359063

13.7 Contributing Scenario (7) controlling industrial worker exposure for PROC 3
Production of filled Polyols Batch process [CS55]. Washed and dried tanks

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 212. Worker risk of ES 13.7

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	0.685714 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.001689
inhalation, long-term systemic	30.377 mg/m^3	85 mg/m^3	0.357374
Combined routes	5.025 $mg/kg_{bw}/day$	-	0.359063

13.8 Contributing Scenario (8) controlling industrial worker exposure for PROC 8A
Production of filled Polyols Process sampling [CS2]. Sampling from reactors/tanks

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 213. Worker risk of ES 13.8

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	13.714 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.033779
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535
Combined routes	19.914 $mg/kg_{bw}/day$	-	0.544314

13.9 Contributing Scenario (9) controlling industrial worker exposure for PROC 8B
Production of filled Polyols Material transfers [CS3]. Loading tank storage from road, rail or boat transport

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 214. Worker risk of ES 13.9

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	2.743 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 $mg/kg_{bw}/day$	-	0.262023

13.10 Contributing Scenario (10) controlling industrial worker exposure for PROC 8B
Production of filled Polyols Equipment maintenance [CS5]. Manufacturing equipment maintenance: opening and cleaning manufacturing equipment for maintenance purposes

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 215. Worker risk of ES 13.10

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	2.743 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 $mg/kg_{bw}/day$	-	0.262023

13.11 Contributing Scenario (11) controlling industrial worker exposure for PROC 8B
Production of filled Polyols Bulk transfers [CS14]. Finished product Loading of road tanker, railcar, container

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 216. Worker risk of ES 13.11

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	2.743 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 $mg/kg_{bw}/day$	-	0.262023

13.12 Contributing Scenario (12) controlling industrial worker exposure for PROC 8B
Production of filled Polyols Material transfers [CS3]. Waste management : transfer of process wastes to storage containers: off-line in workplace

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 217. Worker risk of ES 13.12

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	2.743 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.006756
inhalation, long-term systemic	21.698 mg/m^3	85 mg/m^3	0.255267
Combined routes	5.843 $mg/kg_{bw}/day$	-	0.262023

13.13 Contributing Scenario (13) controlling industrial worker exposure for PROC 9
Production of filled Polyols Small package filling [CS7]. Small package filling - Packaging of product

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 218. Worker risk of ES 13.13

Route	**Exposure concentration (EC)**	**DNEL**	**Risk characterisation ratio = EC/DNEL**
dermal, long-term systemic	1.371 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.003378
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535
Combined routes	7.571 $mg/kg_{bw}/day$	-	0.513913

13.14 Contributing Scenario (14) controlling industrial worker exposure for PROC 15
Production of filled Polyols Laboratory activities [CS36]. Laboratory - Quality Control

The quantitative risk characterisation for this worker exposure has been calculated by EasyTRA.

The following table shows the exposure estimations via the dermal and inhalatory route together with the total exposure of workers over all routes if applicable.

Table 219. Worker risk of ES 13.14

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal, long-term systemic	0.342857 $mg/kg_{bw}/day$	406 $mg/kg_{bw}/day$	0.000844
inhalation, long-term systemic	43.395 mg/m^3	85 mg/m^3	0.510535
Combined routes	6.542 $mg/kg_{bw}/day$	-	0.511379

14 Overall exposure (combined for all relevant emission/release sources)

14.1 Local release of all wide dispersive uses (including regional exposure)

The regional exposure represents the steady-state concentration of a given substance in the environmental compartments after all partitioning and degradation processes have been taken into account. In addition the aggregated emissions from all wide dispersive uses at a local STP are considered as well. From the calculated predicted environmental concentrations (PECs) and the corresponding predicted no-effect concentrations (PNECs) risk characterization ratios (RCRs) for the standard region are derived the same way as for the local scale. The calculations of the regional PECs were performed utilizing the SimpleBox Model as proposed by the TGD, local emissions at the STP were calculated using the formulae given in the TGD.

14.1.1 Aquatic compartment (including sediment)

Table 220. Aquatic compartment (including sediment)

Compartments	PEC	PNEC	RCR = PEC/PNEC
Freshwater	0.000435 mg/L	0.028 mg/L	0.015553
Freshwater sediment	0.006792 mg/kg_{dwt}	1.086 mg/kg_{dwt}	0.006252
Marine water	0.000042	0.014 mg/L	0.002969

	mg/L		
Marine water sediment	0.000644 mg/kg_{dwt}	0.5432 mg/kg_{dwt}	0.001186

14.1.2 Terrestrial compartment

Table 221. Terrestrial compartment

Compartments	**PEC**	**PNEC**	**RCR = PEC/PNEC**
Agricultural soil	0.002322 mg/kg_{dwt}	0.200 mg/kg_{dwt}	0.011612
Grassland	0.000197 mg/kg_{dwt}	0.200 mg/kg_{dwt}	0.000983

14.1.3 Microbiological activity in sewage treatment systems

Table 222. Microbiological activity in sewage treatment systems

Compartments	**PEC**	**PNEC**	**RCR = PEC/PNEC**
STP	0.002347 mg/L	5 mg/L	0.000469

14.3.1 Total releases

Table 223. Total releases

Release route	**Total releases per year**
water	235.165 to/year
air	2.41E4 to/year
soil	0 to/year