according to Regulation (EC) No. 1907/2006

STYRENE MONOMER

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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

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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. 01-2119457861-32-0017 31 (0) 10 275 55 00

Delftseplein 27E 3013 AA Rotterdam

Netherlands

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

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Acute toxicity

Skin irritation

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

Reproductive toxicity

Specific target organ systemic toxicity - repeated

Category 2: H361d

Category 1: H372

exposure; Inhalation Auditory system

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.

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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	> 99.8 %	А
	202-851-5		
P-Tertiary Butyl	98-29-3	0.0 - 0.005 %	В
Catechol	202-653-9		

Key:

- (A) Substance
- (B) Stabilizer

4. First aid measures

4.1 Description of first-aid measures

General advice : Always observe self-protection methods

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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.

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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

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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.

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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.

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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

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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

arounded.

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.

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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.	Туре	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	

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Consult local authorities for acceptable exposure limits.

Biological Exposure Indices

Ingredients	CAS-No.	Control	Biological	Sampling	Concentration	Basis
		parameters	specimen	time		
Styrene	100-42-5	Mandelic acid plus phenylglyox ylic acid	urine	end of shift	400 mg/g creatinine	ACGIH_BEIS
		Remarks: no	onspecific.			
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
End Use: Workers

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 : End Use: Workers

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

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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.

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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.

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Take off contaminated clothing and wash before reuse.

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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

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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.

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10.5 Incompatible materials

Materials to avoid : Strong oxidizing agents

Peroxides

Contaminants and catalysts for vinyl polymers.

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Alkali metal-graphite compounds.

Aluminum chloride. Strong acids. Strong alkalies.

Copper Copper alloys Rubber. Brass.

10.6 Hazardous decomposition products

Hazardous decomposition

Thermal decomposition

products

: On decomposition, emits acrid fumes.

: 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

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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 / : Not classified

Effects on or via lactation 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

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: Classified, May cause respiratory irritation.

: Routes of exposure: Inhalation

Target Organ Systemic Toxicant - Repeated exposure

: Classified, Causes damage to organs through prolonged or

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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

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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)

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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.

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(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

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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

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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 : Possibly Carcinogenic to Humans

Research on Cancer 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.

according to Regulation (EC) No. 1907/2006

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*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

H226

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.

Flammable liquid and vapor.

	riaminable liquid and vapori
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

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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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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 of contributing environmental scenario	
	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

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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 m³/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	0.044 - (justification: Efficiency STP 95.6% calculated from on-site monitoring data at production/processing sites)

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	
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Version 2.1 Revision Date 04/29/2016 Print Date 04/29/2016 SDS No.: BE645 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 >4 hours (default) Duration of activity Frequency of use 5 days / week Human factors not influenced by risk management 240 cm^2 Exposed skin surface Other given operational conditions affecting workers exposure Location indoors industrial Domain Technical conditions and measures to control dispersion and exposure Local exhaust ventilation 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 2 - Use in closed, continuous process with occasional Name of contributing scenario controlled exposure Scenario subtitle Use in contained systems [CS38]. De-hydrogenation Reactor **Qualitative Risk Assessment** Ensure good work practices are implemented Provide basic employee training to prevent/minimize exposures General 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) 5 days / week Frequency of use Human factors not influenced by risk management 24 / 294

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480 cm^2
ng workers exposure
indoors
industrial
trol dispersion and exposure
no
nal protection, hygiene and health evaluation
No
no
industrial worker exposure for PROC 2
2 - Use in closed, continuous process with occasional controlled exposure
Use in contained systems [CS38]. Condensation of crude styrene - water separation
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.
ese suitable enemically resistant groves.
liquid
100%
medium
>4 hours (default)
5 days / week
nagement
480 cm ²
ng workers exposure
indoors
industrial
trol dispersion and exposure
no
nal protection, hygiene and health evaluation
No
no
industrial worker exposure for PROC 2
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Version 2.1 Revision Date 04/29/2016 Print Date 04/29/2016 SDS No.: BE645 2 - Use in closed, continuous process with occasional Name of contributing scenario controlled exposure Scenario subtitle Use in contained systems [CS38]. Vacuum Distillation **Oualitative Risk Assessment** Ensure good work practices are implemented Provide basic employee training to prevent/minimize exposures General In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves. **Product characteristics** liquid Physical state 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 480 cm^2 Exposed skin surface 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 2 - Use in closed, continuous process with occasional Name of contributing scenario controlled exposure Material transfers [CS3]. Waste management: recovery using Scenario subtitle condensation or adsorption/ desorption processes **Qualitative Risk Assessment** Ensure good work practices are implemented Provide basic employee training to prevent/minimize exposures General In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves. **Product characteristics** 26 / 294

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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)	

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	·
	Ensure good work practices are implemented
	Provide basic employee training to prevent/minimize exposures
General	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 n	nanagement
Exposed skin surface	960 cm ²
Other given operational conditions affe	cting workers exposure
Location	indoors
Domain	industrial
Technical conditions and measures to c	ontrol dispersion and exposure
Local exhaust ventilation	no
Conditions and measures related to per	rsonal 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)
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Local exhaust ventilation	inhalation: 97 % (justification: Use local exhaust ventilation
Local exhaust ventuation	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

	Ensure good work practices are implemented
	Provide basic employee training to prevent/minimize
Ganaral	exposures
	In case of potential exposure:
	Use suitable eye protection.

Product characteristics

Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium

Use suitable chemically resistant gloves.

Frequency and duration of use

1 0	
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

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Qualitative Risk Assessment	
Quantative Risk Assessment	
	Clear transfer lines prior to de-coupling
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 m	nanagement
Exposed skin surface	960 cm ²
Other given operational conditions affect	cting workers exposure
Location	outdoors (30%)
Domain	industrial
Technical conditions and measures to co	ontrol dispersion and exposure
Local exhaust ventilation	no
Conditions and measures related to per	sonal protection, hygiene and health evaluation
Protective gloves	No
Respiratory protection	no
1.11 Contributing Scenario (11) control	ling 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	
	Ensure good work practices are implemented
	Provide basic employee training to prevent/minimize
General	exposures
	In case of potential exposure:
	Use suitable eye protection.
	Use suitable chemically resistant gloves.
Product characteristics	Tay or
Physical state	liquid
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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	k management	
Exposed skin surface	960 cm ²	
Other given operational conditions a	ffecting workers exposure	
Location	indoors	
Domain	industrial	
Technical conditions and measures to	o control dispersion and exposure	
Local exhaust ventilation	no	
Conditions and measures related to p	personal protection, hygiene and health evaluation	
Protective gloves	No	
Respiratory protection	no	<u> </u>

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	
	Ensure good work practices are implemented
	Provide basic employee training to prevent/minimize exposures
General	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 manageme	ent
Exposed skin surface	960 cm ²
Other given operational conditions affecting workers exposure	
Location	indoors
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<i>p</i> .	1 conservation
Domain	industrial
Technical conditions and measures to	
Local exhaust ventilation	no
	personal protection, hygiene and health evaluation
Protective gloves	No
Respiratory protection	no
1.13 Contributing Scenario (13) cont	rolling 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	
	Ensure good work practices are implemented
	Provide basic employee training to prevent/minimize
General	exposures
General	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 risl	k management
Exposed skin surface	240 cm^2
Other given operational conditions a	ffecting workers exposure
Location	indoors
Domain	industrial
Technical conditions and measures to	o control dispersion and exposure
Local exhaust ventilation	no
Conditions and measures related to p	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

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Name of contributing environmental scenario and corresponding ERC	ERC 6c Production of plastics
	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
Name(s) of contributing worker scenarios and	PROC 8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
corresponding PROCs	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

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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 indus	trial worker exposure for PROC 2
Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure

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		
	Ensure good work practices are implemented	
	Provide basic employe training to prevent/minimize exposures	
General	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	
	·	

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Frequency and d	luration of use		
Duration of activi	ity	>4 hours (default)	
Frequency of use		5 days / week	
	ot influenced by risk manageme	ent	
Exposed skin surf	face	480 cm ²	
Other given open	rational conditions affecting wor	kers exposure	
Location		indoors	
Domain		industrial	
Technical condit	ions and measures to control dis	persion and exposure	
Local exhaust ver	ntilation	no	
Conditions and r	neasures related to personal pro	tection, hygiene and health evaluation	
Protective gloves		No	
Respiratory prote	ction	no	
	, 20011111111111111111111111111111111111		ith occasional
2.3 Contributing Name of contributing	uting scenario	2 - Use in closed, continuous process we controlled exposure	in occusionar
Name of contribu	uting scenario	controlled exposure	
Name of contribution			
Name of contribu		controlled exposure	eactor via pipeline
Name of contribution		Continuous process [CS54]. Charging re Ensure good work practices are implementation of the provide basic employe training to prevent	eactor via pipeline
Name of contribution Scenario subtitle Qualitative Risk		Controlled exposure Continuous process [CS54]. Charging re Ensure good work practices are implement provide basic employe training to prevent exposures	eactor via pipeline
Name of contribution		Controlled exposure Continuous process [CS54]. Charging re Ensure good work practices are implement provide basic employe training to prevent exposures In case of potential exposure:	eactor via pipeline
Name of contribution Scenario subtitle Qualitative Risk		Controlled exposure Continuous process [CS54]. Charging re Ensure good work practices are implement provide basic employe training to prevent exposures In case of potential exposure: Use suitable eye protection.	eactor via pipeline ented nt/minimize
Name of contribution Scenario subtitle Qualitative Risk General	Assessment	Controlled exposure Continuous process [CS54]. Charging re Ensure good work practices are implement provide basic employe training to prevent exposures In case of potential exposure:	eactor via pipeline ented nt/minimize
Name of contribution Scenario subtitle Qualitative Risk General Product character	Assessment	Continuous process [CS54]. Charging re Ensure good work practices are implemented provide basic employe training to prevent exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.	eactor via pipeline ented nt/minimize
Name of contribution Scenario subtitle Qualitative Risk General Product character Physical state	Assessment	Controlled exposure Continuous process [CS54]. Charging re Ensure good work practices are implement provide basic employe training to prevent exposures In case of potential exposure: Use suitable eye protection.	eactor via pipeline ented nt/minimize
Name of contribution Scenario subtitle Qualitative Risk General Product character Physical state Concentration in second	Assessment eristics substance	Continuous process [CS54]. Charging recontinuous process [CS54]. Charging recontinuous process [CS54]. Charging recontinuous process [CS54]. Charging recontinuous process are implemented provide basic employe training to prevent exposures. In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.	eactor via pipeline ented nt/minimize
Name of contribution Scenario subtitle Qualitative Risk General Product character Physical state Concentration in Sugacity / Dustine	Assessment eristics substance ess	Continuous process [CS54]. Charging re Ensure good work practices are implemented provide basic employe training to prevent exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.	eactor via pipeline ented nt/minimize
Name of contribution Scenario subtitle Qualitative Risk General Product character Physical state Concentration in state Fugacity / Dustine Frequency and descriptions	Assessment eristics substance ess luration of use	Continuous process [CS54]. Charging re Ensure good work practices are implement Provide basic employe training to prevent exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves. liquid medium	eactor via pipeline ented nt/minimize
Name of contribution Scenario subtitle Qualitative Risk General Product character Physical state Concentration in a Fugacity / Dustine Frequency and department of activities.	Assessment eristics substance ess luration of use	controlled exposure Continuous process [CS54]. Charging reserved to the continuous process [CS54]. Charging reserved to t	eactor via pipeline ented nt/minimize
Name of contribution Scenario subtitle Qualitative Risk General Product character Physical state Concentration in state Fugacity / Dustine Frequency and department of activity Frequency of use	Assessment eristics substance ess luration of use ty	Controlled exposure Continuous process [CS54]. Charging reserved to the continuous process [CS54]. Charging reserved to the continuous process [CS54]. Charging reserved to the continuous process are implement to prevent exposures. In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves. liquid medium >4 hours (default) 5 days / week	eactor via pipeline ented nt/minimize
Name of contributions Scenario subtitle Qualitative Risk General Product character Physical state Concentration in a Fugacity / Dustine Frequency and of Duration of activity Frequency of use Human factors in	Assessment eristics substance ess luration of use ty not influenced by risk management	Controlled exposure Continuous process [CS54]. Charging re Ensure good work practices are implement of the provide basic employe training to prevent exposures. In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves. liquid medium >4 hours (default) 5 days / week	eactor via pipeline ented nt/minimize
Name of contribute Scenario subtitle Qualitative Risk General Product character Physical state Concentration in state Frequency and department of activity Frequency of use Human factors in Exposed skin surface	Assessment eristics substance ess luration of use ty not influenced by risk managemerace	Controlled exposure Continuous process [CS54]. Charging reserved to the continuous process are implemented to prevente the continuous process. In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves. Iiquid medium >4 hours (default) 5 days / week ent 480 cm²	eactor via pipeline ented nt/minimize
Name of contribution Scenario subtitle Qualitative Risk General Product character Physical state Concentration in a Fugacity / Dusting Frequency and de Duration of activity Frequency of use Human factors in Exposed skin surf Other given open	Assessment eristics substance ess luration of use ty not influenced by risk management	Controlled exposure Continuous process [CS54]. Charging reserved the continuous proce	eactor via pipeline ented nt/minimize
Scenario subtitle Qualitative Risk General Product characte Physical state Concentration in services Frequency and description Duration of activity Frequency of use Human factors in Exposed skin surfe Other given oper Location	Assessment eristics substance ess luration of use ty not influenced by risk managemerace	Controlled exposure Continuous process [CS54]. Charging reserved to the continuous process [CS54]. Charging reserved to provide the continuous process [CS54]	eactor via pipeline ented nt/minimize
Name of contribution Scenario subtitle Qualitative Risk General Product character Physical state Concentration in strugacity / Dusting Frequency and department of activities Frequency of use Human factors in Exposed skin surful Other given oper Location Domain	Assessment eristics substance ess luration of use ty not influenced by risk managemerational conditions affecting wor	Controlled exposure Continuous process [CS54]. Charging re Ensure good work practices are implemed Provide basic employe training to prevent exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves. liquid medium >4 hours (default) 5 days / week ent 480 cm² kers exposure indoors industrial	eactor via pipeline ented nt/minimize
Name of contribution Scenario subtitle Qualitative Risk General Product character Physical state Concentration in strugacity / Dusting Frequency and department of activities Frequency of use Human factors in Exposed skin surful Other given oper Location Domain	Assessment eristics substance ess luration of use ty not influenced by risk managemerace rational conditions affecting wor	Controlled exposure Continuous process [CS54]. Charging re Ensure good work practices are implemed Provide basic employe training to prevent exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves. liquid medium >4 hours (default) 5 days / week ent 480 cm² kers exposure indoors industrial	eactor via pipeline ented nt/minimize

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Conditions and measures related	to personal protection, hygiene and health evaluation
Protective gloves	No
Respiratory protection	no
1 71	
2.4 Contributing Scenario (4) con	trolling 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 condition	s affecting workers exposure
Location	indoors
Domain	industrial
Technical conditions and measure	es 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) con	trolling 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

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		In case of potential exposure:	
		Use suitable eye protection.	
		Use suitable chemically resistant gloves.	
Product characte	ristics		
Physical state		liquid	
Concentration in s	ubstance		100%
Fugacity / Dustine	SS	medium	
Frequency and du	uration of use		
Duration of activit	у	>4 hours (default)	
Frequency of use		5 days / week	
Human factors no	ot influenced by risk manageme	ent	
Exposed skin surfa	ace	480 cm ²	
Other given opera	ational conditions affecting wor	kers exposure	
Location		indoors	
Domain		industrial	
Technical conditi	ons and measures to control dis	persion and exposure	
Local exhaust vent	tilation	no	
Conditions and m	neasures related to personal pro	tection, hygiene and health evaluation	
Protective gloves		No	
Respiratory protec	4:	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		
	Ensure good work practices are implemented	
	Provide basic employe training to prevent/minimize exposures	
General	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)	
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Frequency of use		5 days / week
1 ,	influenced by risk manageme	
Exposed skin surface		480 cm ²
	onal conditions affecting wor	
Location	onar conditions affecting wor	indoors
Domain		industrial
	s and measures to control dis	I
Local exhaust ventila		no
		tection, hygiene and health evaluation
Protective gloves	r	No
Respiratory protectio	n	no
2.7 Contributing Sco	enario (7) controlling industr	rial worker exposure for PROC 2
Name of contributing	ng 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 Ass	sessment	
General		Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection.
Product characteris	tios	Use suitable chemically resistant gloves.
Physical state	ues	liquid
Concentration in subs	stance	100%
Fugacity / Dustiness	stance	medium
Frequency and dura	ation of use	nedium
Duration of activity	ition of use	>4 hours (default)
Frequency of use		5 days / week
	influenced by risk manageme	
Exposed skin surface		480 cm ²
	onal conditions affecting wor	
Location	onar conditions affecting wor	indoors
Domain		industrial
	s and measures to control dis	
Local exhaust ventila		no
		otection, hygiene and health evaluation
Protective gloves	production of personal pro	No
Respiratory protectio	n	no

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Process sampling [CS2]. Sampling from reactors/devolatilisation tower	Name of contributing scenario	8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities	
General Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection. Use suitable coveralls to prevent exposure to the skin. Product characteristics Physical state Concentration in substance 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 cm² Other given operational conditions affecting workers exposure Location 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 unbalation: 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	Scenario subtitle		
General 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	Qualitative Risk Assessment	<u>.</u>	
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 cm² 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 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 Material transfers [CS3]. Loading tank storage from road, rail	General	Provide basic employe training to prevent/minimize exposures Use suitable eye protection. Use suitable chemically resistant gloves.	
Concentration in substance 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 cm² Other given operational conditions affecting workers exposure Location 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 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 Material transfers [CS3]. Loading tank storage from road, rail	Product characteristics	·	
Frequency and duration of use Duration of activity	Physical state	liquid	
Duration of activity >4 hours (default)	Concentration in substance	100%	
Duration of activity >4 hours (default) Frequency of use 5 days / week Human factors not influenced by risk management Exposed skin surface 960 cm² 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 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 Material transfers [CS3]. Loading tank storage from road, rail	Fugacity / Dustiness	medium	
Frequency of use 5 days / week Human factors not influenced by risk management Exposed skin surface 960 cm² 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 inhalation: 80 % (justification: Use a sampling system exposure) 2.9 Contributing Scenario (9) controlling industrial worker exposure for PROC 8B Name of contributing scenario Material transfers [CS3]. Loading tank storage from road, rail	Frequency and duration of use		
Human factors not influenced by risk management Exposed skin surface 960 cm² 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 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 Material transfers [CS3]. Loading tank storage from road, rail	Duration of activity	>4 hours (default)	
Exposed skin surface 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 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 Material transfers [CS3]. Loading tank storage from road, rail	Frequency of use	5 days / week	
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 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 Material transfers [CS3]. Loading tank storage from road, rail	Human factors not influenced by risk manage	ement	
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 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 Material transfers [CS3]. Loading tank storage from road, rail	Exposed skin surface	960 cm ²	
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 Material transfers [CS3]. Loading tank storage from road, rail	Other given operational conditions affecting	workers exposure	
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 inhalation: 80 % (justification: Use a sampling system 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 Material transfers [CS3]. Loading tank storage from road, rail	Location	indoors	
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	Domain	industrial	
Conditions and measures related to personal protection, hygiene and health evaluation Protective gloves No Respiratory protection no Use a sampling system designed to control 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	Technical conditions and measures to control	dispersion and exposure	
Protective gloves Respiratory protection 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 Material transfers [CS3]. Loading tank storage from road, rail	Local exhaust ventilation	no	
Respiratory protection no Use a sampling system designed to control 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	Conditions and measures related to personal	protection, hygiene and health evaluation	
Use a sampling system designed to control 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	Protective gloves	No	
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	Respiratory protection	no	
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			
Name of contributing scenario dedicated facilities Scenario subtitle Material transfers [CS3]. Loading tank storage from road, rail	2.9 Contributing Scenario (9) controlling inde	ustrial worker exposure for PROC 8B	
Scenario suprine	Name of contributing scenario		
	Scenario subtitle		

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
General	Ensure good work practices are implemented
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Version 2.1 Revision Date 04/29/2016 Print Date 04/29/2016 SDS No.: BE645 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 5 days / week Frequency of use Human factors not influenced by risk management 960 cm^2 Exposed skin surface Other given operational conditions affecting workers exposure Location indoors Domain industrial Technical conditions and measures to control dispersion and exposure Local exhaust ventilation 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 8b - Transfer of chemicals from/to vessels/ large containers at Name of contributing scenario dedicated facilities Equipment maintenance [CS5]. Manufacturing equipment Scenario subtitle maintenance: opening and cleaning manufacturing equipment for maintenance purposes **Qualitative Risk Assessment** Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures General 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 40 / 294

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Duration of activi	ty	15 mins to 1 hour
Duration of activity Frequency of use		5 days / week
1 ,	ot influenced by risk manageme	
		960 cm ²
Exposed skin surf		
	rational conditions affecting wor	
Location		indoors
Domain		industrial
	ions and measures to control dis	persion and exposure
Local exhaust ven		no
	neasures related to personal pro	tection, hygiene and health evaluation
Protective gloves		No
Respiratory protect	ction	no
2.11 Contributin	g Scenario (11) controlling indus	strial worker exposure for PROC 8B
Name of contribu	uting 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
Dec les 4 els esse 4		tanker, rancar, container
Product characte	eristics	11 1.1
Physical state	1.7	liquid
Concentration in s		1-5%
Fugacity / Dustine		medium
Frequency and d		41 (10 1)
Duration of activi	ty	>4 hours (default)
Frequency of use		5 days / week
	ot influenced by risk manageme	
Exposed skin surf	ace	960 cm ²
Other given oper	ational conditions affecting wor	kers exposure
Location		indoors
Domain		industrial
Technical condit	ions and measures to control dis	spersion and exposure
Local exhaust ven	ntilation	no
Conditions and n	neasures related to personal pro	tection, hygiene and health evaluation
Protective gloves		No
Respiratory protect	ction	no
2.12 Contributin	g Scenario (12) controlling indu	strial worker exposure for PROC 8B
		Oh Transfer of chamicals from to vessels there contained at

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

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S 1/1/d	Material transfers [CS3]. Waste management: transfer of
Scenario subtitle	process wastes to storage containers: off-line in workplace
Qualitative Risk Assessment	
	Ensure good work practices are implemented
	Provide basic employe training to prevent/minimize
General	exposures
	In case of potential exposure:
	Use suitable eye protection. Use suitable chemically resistant gloves.
Due du et als que et avietics	Use suitable chemically resistant gloves.
Product characteristics Physical state	1::d
Physical state Concentration in substance	liquid
	100%
Fugacity / Dustiness	medium
Frequency and duration of use	145 1 1 1
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk m	<u> </u>
Exposed skin surface	960 cm ²
Other given operational conditions affect	
Location	indoors
Domain	industrial
Technical conditions and measures to co	ontrol dispersion and exposure
Local exhaust ventilation	no
Conditions and measures related to pers	sonal protection, hygiene and health evaluation
Protective gloves	No
Respiratory protection	no
2.13 Contributing Scenario (13) controll	ling 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 m	anagement
Exposed skin surface	480 cm ²
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Other given operational conditions affecting was Location Domain	
	indoors
Domain	industrial
Technical conditions and measures to control	L
Local exhaust ventilation	no
Conditions and measures related to personal p	
Protective gloves	No
Respiratory protection	no
2.14 Contributing Scenario (14) controlling in	
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 manage	ement
Exposed skin surface	480 cm ²
Other given operational conditions affecting w	vorkers exposure
Location	indoors
Domain	industrial
Technical conditions and measures to control	dispersion and exposure
Local exhaust ventilation	no
Conditions and measures related to personal J	protection, hygiene and health evaluation
Protective gloves	No
Respiratory protection	no
2.15 Contributing Scenario (15) controlling in	dustrial 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.

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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 managem	ent		
Exposed skin surface	240 cm^2		
Other given operational conditions affecting wo	rkers 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	
	PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities	
	PROC 2 - Use in closed, continuous process with occasional controlled exposure	
Name(s) of contributing worker scenarios and	PROC 2 - Use in closed, continuous process with occasional controlled exposure	
corresponding PROCs	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)	

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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)

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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		
	Clear transfer lines prior to de-coupling	
	Ensure good work practices are implemented	

General exposures
In case of potential exposure:
Use suitable eye protection.

Use suitable chemically resistant gloves.

Provide basic employe training to prevent/minimize

Product characteristics Physical state

Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium

Frequency and duration of use

1 0	
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 cm²

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
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according to Regulation (EC) No. 1907/2006 Gen. Variant: SDS NO STYRENE MONOMER Version 2.1 Revision Date 04/29/2016 Print Date 04/29/2016 SDS No.: BE645 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) 5 days / week Frequency of use Human factors not influenced by risk management 480 cm^{2} Exposed skin surface Other given operational conditions affecting workers exposure Location indoors Domain industrial Technical conditions and measures to control dispersion and exposure Local exhaust ventilation 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 2 - Use in closed, continuous process with occasional Name of contributing scenario controlled exposure Material transfers [CS3]. Waste management: recovery using Scenario subtitle condensation or adsorption/ desorption processes **Qualitative Risk Assessment** Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures General 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)

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gloves.
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3.6 Contributing	Scenario (6) controlling	industrial works	er exposure for PROC 3
3.0 Conditioning	occiiai io (u	, comu omme	muusu iai wui no	I CAPUSUIC IUI I NOC 3

3.6 Contributing Scenario (6) controlling	g 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	
	Ensure good work practices are implemented
	Provide basic employe training to prevent/minimize
General	exposures
	In case of potential exposure:
	Use suitable eye protection.
Duo du et el eue et enietica	Use suitable chemically resistant gloves.
Product characteristics	1111
Physical state	liquid
Concentration in substance	1009
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 m	
Exposed skin surface	240 cm^2
Other given operational conditions affect	eting workers exposure
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to co	ontrol dispersion and exposure
Local exhaust ventilation	no
Conditions and measures related to pers	sonal protection, hygiene and health evaluation
Protective gloves	No
Respiratory protection	no
3.7 Contributing Scenario (7) controlling	g 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	
	Ensure good work practices are implemented
General	Provide basic employe training to prevent/minimize
	exposures
	In case of potential exposure:
	Use suitable eye protection.
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	Use suitable chemically resistant gloves.
Product characteristics	Ose suitable eliciliteariy resistant groves.
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	incutain
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk	, · · ·
Exposed skin surface	240 cm ²
Other given operational conditions aff Location	
	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to	
Local exhaust ventilation	no
	ersonal protection, hygiene and health evaluation
Protective gloves	No
Respiratory protection	no
	ing industrial worker exposure for PROC 8A 8a - Transfer of chemicals from/to vessels/ large containers at
Name of contributing scenario	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)
•	5 days / week
riequency of use	, · · ·
Frequency of use Human factors not influenced by risk	
Human factors not influenced by risk	
	960 cm ²

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Other given operational conditions affecting	workers exposure		
Location	indoors		
Domain	industrial		
Technical conditions and measures to contro	l 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 ind	ustrial 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	ese summer one memory resistant groves.		
Physical state	liquid		
Concentration in substance	100%		
Fugacity / Dustiness	medium		
Frequency and duration of use	1		
Duration of activity	15 mins to 1 hour		
Frequency of use	5 days / week		
Human factors not influenced by risk manag			
Exposed skin surface	960 cm ²		
Other given operational conditions affecting	workers exposure		
Location	indoors		
Domain	industrial		
Technical conditions and measures to contro	l dispersion and exposure		
Local exhaust ventilation	no		
Conditions and measures related to personal	protection, hygiene and health evaluation		
Protective gloves	No		
Respiratory protection	no		
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3.10 Contributing Scenario (10) controllin	g 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 m	anagement
Exposed skin surface	960 cm ²
Other given operational conditions affec	ting workers exposure
Location	indoors
Domain	industrial
Technical conditions and measures to co	ontrol dispersion and exposure
Local exhaust ventilation	no
Local Canaust ventuation	110
	sonal protection, hygiene and health evaluation
	L -
Conditions and measures related to pers	sonal protection, hygiene and health evaluation
Conditions and measures related to personate Protective gloves Respiratory protection	onal protection, hygiene and health evaluation No
Conditions and measures related to pers Protective gloves Respiratory protection 3.11 Contributing Scenario (11) controll	ing industrial worker exposure for PROC 8B 8b - Transfer of chemicals from/to vessels/ large containers at
Conditions and measures related to personal Protective gloves Respiratory protection 3.11 Contributing Scenario (11) controll Name of contributing scenario	sonal protection, hygiene and health evaluation No no ing industrial worker exposure for PROC 8B 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities Material transfers [CS3]. Waste management : transfer of
Conditions and measures related to pers Protective gloves Respiratory protection 3.11 Contributing Scenario (11) controll Name of contributing scenario Scenario subtitle	sonal protection, hygiene and health evaluation No no ing industrial worker exposure for PROC 8B 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities Material transfers [CS3]. Waste management : transfer of
Conditions and measures related to pers Protective gloves Respiratory protection 3.11 Contributing Scenario (11) controll Name of contributing scenario Scenario subtitle Qualitative Risk Assessment	ing industrial worker exposure for PROC 8B 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities Material transfers [CS3]. Waste management: transfer of process wastes to storage containers: off-line in workplace Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection.
Conditions and measures related to pers Protective gloves Respiratory protection 3.11 Contributing Scenario (11) controll Name of contributing scenario Scenario subtitle Qualitative Risk Assessment General	ing industrial worker exposure for PROC 8B 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities Material transfers [CS3]. Waste management: transfer of process wastes to storage containers: off-line in workplace Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection.
Conditions and measures related to pers Protective gloves Respiratory protection 3.11 Contributing Scenario (11) controll Name of contributing scenario Scenario subtitle Qualitative Risk Assessment General	sonal protection, hygiene and health evaluation No no ing industrial worker exposure for PROC 8B 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities Material transfers [CS3]. Waste management : transfer of process wastes to storage containers: off-line in workplace 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.
Conditions and measures related to pers Protective gloves Respiratory protection 3.11 Contributing Scenario (11) controll Name of contributing scenario Scenario subtitle Qualitative Risk Assessment General Product characteristics Physical state	ing industrial worker exposure for PROC 8B 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities Material transfers [CS3]. Waste management: transfer of process wastes to storage containers: off-line in workplace 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.

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Duration of activity	15 mins to 1 hour	
Frequency of use	5 days / week	
Human factors not influenced by r	sk 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	

${\bf 3.12}\ Contributing\ Scenario\ (12)\ controlling\ industrial\ worker\ exposure\ for\ PROC\ 9$

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 ma	nagement		
Exposed skin surface	480 cm^2		
Other given operational conditions affect	ing workers exposure		
Location	indoors		
Domain	industrial		
Technical conditions and measures to cor	ntrol dispersion and exposure		
Local exhaust ventilation	no		
Conditions and measures related to person	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

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Scenario subtitle	Laboratory activities [CS36]. Laboratory	- Ouality Control
Qualitative Risk Assessment		Carrie y a carrie
	Ensure good work practices are implement	nted
	Provide basic employe training to preven	t/minimize
General	exposures	
General	In case of potential exposure:	
	Use suitable eye protection.	
D. J.	Use suitable chemically resistant gloves.	
Product characteristics	T	
Physical state	liquid	1000
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 managen		
Exposed skin surface	240 cm ²	
Other given operational conditions affecting wo	orkers exposure	
Location	indoors	
Domain	industrial	
Technical conditions and measures to control d	ispersion and exposure	
Local exhaust ventilation	no	
Conditions and measures related to personal pr	otection, hygiene and health evaluation	
Protective gloves	No	
Respiratory protection	no	
3.14 Contributing Scenario (14) controlling ind	ustrial worker exposure for PROC 14	
Name of contributing scenario	14 - Production of preparations or articles	s by tabletting,
	compression, extrusion, pelletisation	
Scenario subtitle	Operation of solids filtering equipment [C	CS117]. Pelletizing
Product characteristics	Tai aa	
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 managen		
Exposed skin surface	480 cm ²	
Other given operational conditions affecting wo	orkers exposure	
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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
	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)
Name(s) of contributing worker scenarios and	PROC 3 - Use in closed batch process (synthesis or formulation)
corresponding PROCs	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

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laboratories

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

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	$18000 \text{ m}^3/\text{day}$	
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
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		In case of potential exposure:	
		Use suitable eye protection.	
		Use suitable chemically resistant gloves.	
Product character	ristics		
Physical state		liquid	
Concentration in su	ibstance		100%
Fugacity / Dustines	SS	medium	
Frequency and du	ration of use		
Duration of activity	у	>4 hours (default)	
Frequency of use		5 days / week	
Human factors no	t influenced by risk manageme	ent	
Exposed skin surfa	ce	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 vent	ilation	no	
Conditions and measures related to personal protection, hygiene and health evaluation			
Protective gloves		No	
Respiratory protect	rion	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	
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Human factors not influenced by ri	
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) contr	olling 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	ese surante enemicariy resistant groves.
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 ri	sk management
Exposed skin surface	240 cm ²
Other given operational conditions	
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures	
Local exhaust ventilation	no
	personal protection, hygiene and health evaluation
Protective gloves	No
Respiratory protection	no
- • •	•
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4.5 Contributing Scenario (5)) controlling industrial	worker exposure for PROC 3
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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	
	Ensure good work practices are implemented
General	Provide basic employe training to prevent/minimize
	exposures
General	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	x management
Exposed skin surface	240 cm^2
Other given operational conditions at	ffecting 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 p	personal protection, hygiene and health evaluation
Protective gloves	No
Respiratory protection	no

$\textbf{4.6 Contributing Scenario (6) controlling industrial worker exposure for PROC\,3}$

3 - Use in closed batch process (synthesis or formulation)	
Batch process [CS55]. Washed and dried tanks	
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.	

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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 ma	nagement
Exposed skin surface	240 cm^2
Other given operational conditions affect	ing workers exposure
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to con	ntrol dispersion and exposure
Local exhaust ventilation	no
Conditions and measures related to perso	onal protection, hygiene and health evaluation
Protective gloves	No
Respiratory protection	no
4.7 Contributing Scenario (7) controlling Name of contributing scenario	industrial worker exposure for PROC 8A 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 ma	nagement
Exposed skin surface	960 cm ²
Other given operational conditions affect	
Other given operational conditions affect	

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Gen. Variant: SDS NO STYRENE MONOMER Version 2.1 Revision Date 04/29/2016 Print Date 04/29/2016 SDS No.: BE645 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 Use a sampling system designed to control inhalation: 80 % (justification: Use a sampling system exposure designed to control exposure) 4.8 Contributing Scenario (8) controlling industrial worker exposure for PROC 8B 8b - Transfer of chemicals from/to vessels/ large containers at Name of contributing scenario dedicated facilities Material transfers [CS3]. Loading tank storage from road, rail Scenario subtitle or boat transport **Qualitative Risk Assessment** Clear transfer lines prior to de-coupling Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures General 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 5 days / week Frequency of use 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 61 / 294

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4.9 Contributing Scenario (9) controlling	g 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	•
	Ensure good work practices are implemented
	Provide basic employe training to prevent/minimize
General	exposures
General	In case of potential exposure:
	Use suitable eye protection.
	Use suitable chemically resistant gloves.
Product characteristics	T.,
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 m	
Exposed skin surface	960 cm^2
Other given operational conditions affect	cting workers exposure
Location	indoors
Domain	industrial
Technical conditions and measures to co	ontrol dispersion and exposure
Local exhaust ventilation	no
Conditions and measures related to pers	sonal protection, hygiene and health evaluation
Protective gloves	No
Respiratory protection	no
4.10 Contributing Scenario (10) controll	ling 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	<u> </u>
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Respiratory protection no

4.12 Contributing Scenario (12) controlli	ng 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 ma	nagement	
Exposed skin surface	480 cm ²	
Other given operational conditions affect	ting workers exposure	
Location	indoors	
Domain	industrial	
Technical conditions and measures to control dispersion and exposure		
Local exhaust ventilation	no	
Conditions and measures related to person	onal protection, hygiene and health evaluation	
Protective gloves	No	
Respiratory protection	no	
4.13 Contributing Scenario (13) controlli	ng 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 ma	nnagement	
Exposed skin surface	480 cm^2	
Other given operational conditions affect	ting workers exposure	

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Location	indoors
Domain	industrial
Technical conditions and measures to	control dispersion and exposure
Local exhaust ventilation	no
Conditions and measures related to pe	ersonal protection, hygiene and health evaluation
Protective gloves	No
Respiratory protection	no
4.14 Contributing Scenario (14) contr	olling 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	
	Ensure good work practices are implemented
	Provide basic employe training to prevent/minimize
General	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	
Exposed skin surface	240 cm^2
Other given operational conditions af	fecting workers exposure
Location	indoors
Domain	industrial
Technical conditions and measures to	control dispersion and exposure
Local exhaust ventilation	no
Conditions and measures related to po	ersonal protection, hygiene and health evaluation
Protective gloves	No

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

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Name of contributing environmental scenario and corresponding ERC	ERC 6c Production of plastics
	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)
Name(s) of contributing worker scenarios and corresponding PROCs	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 con	nditions
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Version 2.1	Revision Date 04/29/2016	Print Date 04/29/2016	SDS No.: BE645
Annual tonnage		2.42E6 to/year	
Daily amount use	d at site	4.83E5 kg/day	
Release times per		300 days/year (justification: Continuous production)	
Local freshwater			10
Local marine wat			100
	o air from process		0.10%
	o wastewater from process		0.00%
	o soil from process		0%
Fraction tonnage	•		10%
Fraction used at n			60%
STP		yes	
River flow rate		$18000 \text{ m}^3/\text{day}$	
	e treatment plant discharge	2000000 L/day	
Other modified l		2000000 L/day	
	to waste water (Femis.water)	0.000012 % (justification: EU Risk A	ssassment Penert 2002)
Fraction released		0.102 % (justification: EU Risk Asses	
Traction released	to all (Fellis.all)		
Fraction used at n	nain source	60 % (justification: Value adopted to European manufacturing site)	account for worst-case
Fraction of emission directed to water by local STP (Fstp.water)		0.081 - (justification: Efficiency STP 91.9%)	
5.2 Contributing	Scenario (2) controlling industr	ial worker exposure for PROC 8B	
Name of contrib	uting scenario	8b - Transfer of chemicals from/to ve dedicated facilities	essels/ large containers at
Scenario subtitle		Material transfers [CS3]. Loading tan	k storage from road, rail
Scenario subtitle		or boat transport	-
Qualitative Risk	Assessment		
		Clear transfer lines prior to de-coupli	ng
		Ensure good work practices are imple	
		Provide basic employe training to pre-	event/minimize
General		exposures	
		In case of potential exposure:	
		Use suitable eye protection.	
		Use suitable chemically resistant glov	ves.
Product characte	eristics	Fac. 1.	
Physical state		liquid	
Concentration in			100%
Fugacity / Dustiness		medium	
Frequency and d		F.2	
Duration of activity		15 mins to 1 hour	
Frequency of use		5 days / week	

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Other given operational conditions affecting work Location Domain Technical conditions and measures to control displayed and measures related to personal protective gloves Respiratory protection 5.3 Contributing Scenario (3) controlling industri Name of contributing scenario Scenario subtitle Qualitative Risk Assessment General Product characteristics Physical state Concentration in substance	indoors industrial persion and exposure no ection, hygiene and health evaluation No no
Location Domain Technical conditions and measures to control displaced exhaust ventilation Conditions and measures related to personal protective gloves Respiratory protection 5.3 Contributing Scenario (3) controlling industri Name of contributing scenario Scenario subtitle Qualitative Risk Assessment General Product characteristics Physical state Concentration in substance Fugacity / Dustiness	industrial persion and exposure no ection, hygiene and health evaluation No no al worker exposure for PROC 2 2 - Use in closed, continuous process with occasional controlled exposure Material transfers [CS3]. Styrene Storage in tanks Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure:
Technical conditions and measures to control displaced exhaust ventilation Conditions and measures related to personal proterotive gloves Respiratory protection 5.3 Contributing Scenario (3) controlling industrication Name of contributing scenario Scenario subtitle Qualitative Risk Assessment General Product characteristics Physical state Concentration in substance Fugacity / Dustiness	industrial persion and exposure no ection, hygiene and health evaluation No no al worker exposure for PROC 2 2 - Use in closed, continuous process with occasional controlled exposure Material transfers [CS3]. Styrene Storage in tanks Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure:
Technical conditions and measures to control displaced exhaust ventilation Conditions and measures related to personal proterior gloves Respiratory protection 5.3 Contributing Scenario (3) controlling industrication subtitle Qualitative Risk Assessment General Product characteristics Physical state Concentration in substance Fugacity / Dustiness	persion and exposure no ection, hygiene and health evaluation No no al worker exposure for PROC 2 2 - Use in closed, continuous process with occasional controlled exposure Material transfers [CS3]. Styrene Storage in tanks Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure:
Local exhaust ventilation Conditions and measures related to personal proterion Protective gloves Respiratory protection 5.3 Contributing Scenario (3) controlling industrication Name of contributing scenario Scenario subtitle Qualitative Risk Assessment General Product characteristics Physical state Concentration in substance Fugacity / Dustiness	no ection, hygiene and health evaluation No no al worker exposure for PROC 2 2 - Use in closed, continuous process with occasional controlled exposure Material transfers [CS3]. Styrene Storage in tanks Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure:
Conditions and measures related to personal prot Protective gloves Respiratory protection 5.3 Contributing Scenario (3) controlling industri Name of contributing scenario Scenario subtitle Qualitative Risk Assessment General Product characteristics Physical state Concentration in substance Fugacity / Dustiness	no al worker exposure for PROC 2 2 - Use in closed, continuous process with occasional controlled exposure Material transfers [CS3]. Styrene Storage in tanks Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure:
Protective gloves Respiratory protection 5.3 Contributing Scenario (3) controlling industri Name of contributing scenario Scenario subtitle Qualitative Risk Assessment General Product characteristics Physical state Concentration in substance Fugacity / Dustiness	No no al worker exposure for PROC 2 2 - Use in closed, continuous process with occasional controlled exposure Material transfers [CS3]. Styrene Storage in tanks Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure:
Scenario (3) controlling industri Name of contributing scenario Scenario subtitle Qualitative Risk Assessment General Product characteristics Physical state Concentration in substance Fugacity / Dustiness	al worker exposure for PROC 2 2 - Use in closed, continuous process with occasional controlled exposure Material transfers [CS3]. Styrene Storage in tanks Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure:
5.3 Contributing Scenario (3) controlling industri Name of contributing scenario Scenario subtitle Qualitative Risk Assessment General Product characteristics Physical state Concentration in substance Fugacity / Dustiness	al worker exposure for PROC 2 2 - Use in closed, continuous process with occasional controlled exposure Material transfers [CS3]. Styrene Storage in tanks Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure:
Name of contributing scenario Scenario subtitle Qualitative Risk Assessment General Product characteristics Physical state Concentration in substance Fugacity / Dustiness	2 - Use in closed, continuous process with occasional controlled exposure Material transfers [CS3]. Styrene Storage in tanks Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure:
Scenario subtitle Qualitative Risk Assessment General Product characteristics Physical state Concentration in substance Fugacity / Dustiness	Controlled exposure Material transfers [CS3]. Styrene Storage in tanks Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure:
Qualitative Risk Assessment General Product characteristics Physical state Concentration in substance Fugacity / Dustiness	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure:
General Product characteristics Physical state Concentration in substance Fugacity / Dustiness	Provide basic employe training to prevent/minimize exposures In case of potential exposure:
Product characteristics Physical state Concentration in substance Fugacity / Dustiness	Provide basic employe training to prevent/minimize exposures In case of potential exposure:
Product characteristics Physical state Concentration in substance Fugacity / Dustiness	Use suitable chemically resistant gloves.
Physical state Concentration in substance Fugacity / Dustiness	Coo summer characteristics (continued to continue to c
Concentration in substance Fugacity / Dustiness	liquid
Fugacity / Dustiness	100%
	medium
riequency and duration of use	
	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk managemen	nt
Exposed skin surface	480 cm^2
Other given operational conditions affecting work	xers exposure
	indoors
Domain	industrial
Technical conditions and measures to control disp	persion and exposure
Local exhaust ventilation	no
Conditions and measures related to personal prot	ection, hygiene and health evaluation
Protective gloves	No
Respiratory protection	no

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Gen. Variant: SDS NO STYRENE MONOMER Version 2.1 Revision Date 04/29/2016 Print Date 04/29/2016 SDS No.: BE645 2 - Use in closed, continuous process with occasional Name of contributing scenario controlled exposure Material transfers [CS3]. Waste management: recovery using Scenario subtitle condensation or adsorption/ desorption processes **Qualitative Risk Assessment** Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures General In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves. **Product characteristics** Physical state liquid 100% Concentration in substance 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 480 cm^2 Exposed skin surface 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** Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures General In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves. **Product characteristics** Physical state liquid 69 / 294

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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	x management	
Exposed skin surface	240 cm^2	
Other given operational conditions at	ffecting 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 p	ersonal 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	2 Use in closed botch process (synthesis or formulation)				
C	3 - Use in closed batch process (synthesis or formulation)				
Scenario subtitle	Batch process [CS55]. Dissolving and polymerisation reactor				
Qualitative Risk Assessment					
	Ensure good work practices are implemented				
	Provide basic employe training to prevent/minimize				
C 1	exposures				
General	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%)				
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Domain		industrial	
Technical conditi	ons and measures to control dis		
Local exhaust ven		no	
		otection, hygiene and health evaluation	
Protective gloves	.	No	
Respiratory protec	etion	no	
T J I		-	
		rial worker exposure for PROC 3	
Name of contribu	ting scenario	3 - Use in closed batch process (synthesis	
Scenario subtitle		Batch process [CS55]. Suspension reactor	
Qualitative Risk	Assessment		
		Ensure good work practices are implement	
		Provide basic employe training to prevent	/minimize
General		exposures	
		In case of potential exposure:	
		Use suitable eye protection.	
		Use suitable chemically resistant gloves.	
Product characte	ristics	[
Physical state		liquid	1000/
Concentration in s			100%
Fugacity / Dustine		medium	
Frequency and de			
Duration of activit	У	>4 hours (default)	
Frequency of use		5 days / week	
Human factors no	ot influenced by risk manageme	-	
Exposed skin surfa	ace	240 cm ²	
Other given oper	ational conditions affecting wor	kers exposure	
Location		indoors	
Ventilation		good (30%)	
Domain		industrial	
Technical conditi	ons and measures to control dis	spersion and exposure	
Local exhaust ven	tilation	no	
Conditions and m	neasures related to personal pro	tection, hygiene and health evaluation	
Protective gloves		No	
Respiratory protec	tion	no	
5.8 Contributing	Scenario (8) controlling industr	rial worker exposure for PROC 3	
Name of contribu	iting scenario	3 - Use in closed batch process (synthesis	or formulation)
Scenario subtitle	-	Batch process [CS55]. Washed and dried	
Qualitative Risk	Assessment		
General		Ensure good work practices are implement	ited
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Version 2.1 Revision Date 04/29/2016 Print Date 04/29/2016 SDS No.: BE645 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) 5 days / week Frequency of use Human factors not influenced by risk management 240 cm^2 Exposed skin surface 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 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 8a - Transfer of chemicals from/to vessels/ large containers at Name of contributing scenario non dedicated facilities Scenario subtitle Process sampling [CS2]. Sampling from reactors/tanks **Qualitative Risk Assessment** Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures General 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) 72 / 294

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Frequency of use	5 days / week
Human factors not influenced by risk manager	nent
Exposed skin surface	960 cm ²
Other given operational conditions affecting w	
Location	indoors
Domain	industrial
Technical conditions and measures to control of	lispersion and exposure
Local exhaust ventilation	no
Conditions and measures related to personal p	rotection, 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 ind	lustrial 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	ese suiture enemicary resistant groves.
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 manager	
Exposed skin surface	960 cm ²
Other given operational conditions affecting w	
Location	indoors
Domain	industrial
Technical conditions and measures to control of	
Local exhaust ventilation	no
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Conditions and measures related to perso	onal protection, hygiene and health evaluation	 n
Protective gloves	No	
Respiratory protection	no	
	•	
5.11 Contributing Scenario (11) controlli	ng industrial worker exposure for PROC 8B	
Name of contributing scenario	8b - Transfer of chemicals from/to ves dedicated facilities	ssels/ large containers at
Scenario subtitle	Bulk transfers [CS14]. Finished produtanker, railcar, container	ct Loading of road
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 ma	nagement	
Exposed skin surface	960 cm ²	
Other given operational conditions affect	ing workers exposure	
Location	indoors	
Domain	industrial	
Technical conditions and measures to con	ntrol dispersion and exposure	
Local exhaust ventilation	no	
Conditions and measures related to perso	onal protection, hygiene and health evaluation	n
Protective gloves	No	
Respiratory protection	no	
5.12 Contributing Scenario (12) controlli	ng industrial worker exposure for PROC 8B	
Name of contributing scenario	8b - Transfer of chemicals from/to ves dedicated facilities	
Scenario subtitle	Material transfers [CS3]. Waste mana process wastes to storage containers:	
Qualitative Risk Assessment		
General	Ensure good work practices are imple Provide basic employe training to prevexposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant glove	vent/minimize
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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 ma	
Exposed skin surface	960 cm ²
Other given operational conditions affect	ting workers exposure
Location	indoors
Domain	industrial
Technical conditions and measures to con	ntrol dispersion and exposure
Local exhaust ventilation	no
Conditions and measures related to pers	onal protection, hygiene and health evaluation
Protective gloves	No
Respiratory protection	no
5.13 Contributing Scenario (13) controlli 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 ma	L Company of the comp
Exposed skin surface	480 cm^2
Other given operational conditions affect	ting workers exposure
Location	indoors
Domain	industrial
Technical conditions and measures to con	ntrol dispersion and exposure
Local exhaust ventilation	no
Conditions and measures related to person	onal protection, nygiene and nealth evaluation
Conditions and measures related to personate Protective gloves	No

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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	·
	Ensure good work practices are implemented
	Provide basic employe training to prevent/minimize exposures
General	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 m	anagement
Exposed skin surface	240 cm^2
Other given operational conditions affect	eting workers exposure
Location	indoors
Domain	industrial
Technical conditions and measures to co	ontrol dispersion and exposure
Local exhaust ventilation	no
Conditions and measures related to pers	sonal 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)

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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

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TOTOICH ET	550 No.: 520 10
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 indust	rial 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	
	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.
General	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
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		Supervision in place to check that the being used correctly and OCs follows	
		Consider the need for risk based healt	th surveillance.
		Avoid inhalation of the product.	
		In case of vapours:	
		Handle in a fume cupboard or under e	extract ventilation
Product characte	eristics		
Physical state		liquid	
Concentration in s	substance	50 %, concentration has been conside (justification: Limit the substance con 50%.)	•
Fugacity / Dustine	ess	medium	
Frequency and d	luration of use		
Duration of activi	ty	>4 hours (default)	
Frequency of use		5 days / week	
Human factors n	ot influenced by risk manageme	nt	
Exposed skin surf	ace	240 cm^2	
Other given oper	rational conditions affecting wor	kers exposure	
Location		indoors	
Domain		industrial	
Technical condit	ions and measures to control dis	persion and exposure	
Local exhaust ver	ntilation	no	
Conditions and r	neasures related to personal pro	tection, hygiene and health evaluatio	n
Protective gloves		Gloves APF 5 80 %	
Respiratory protection	ction	no	
Good standard of controlled	general ventilation; natural or	inhalation: 30 % (justification: Provide general ventilation. Natural ventilation windows etc. Controlled ventilation in removed by a powered fan.)	on is from doors,
6.3 Contributing	Scenario (3) controlling industr	ial worker exposure for PROC 3	
Name of contribu	uting scenario	3 - Use in closed batch process (synthesis)	nesis or formulation)
Scenario subtitle		Bulk transfers [CS14]. Receipt and st bulk or as packed goods, indoor and c assembly and charging; dispensing of pipeline;	outdoor; Raw material
Qualitative Risk	Assessment		
		Where appropriate, replacement of ta closed processes.	sk by automated and/or
G 1		Minimise exposure by partial enclosu	re of the operation or
General		equipment and provide extract ventila Clear transfer lines prior to de-coupli	ation at openings.

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Version 2.1 Revision Date 04/29/2016 Print Date 04/29/2016 SDS No.: BE645 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 50 %, concentration has been considered linearly (justification: Limit the substance content in the product to Concentration in substance 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 240 cm^2 Exposed skin surface Other given operational conditions affecting workers exposure outdoors (30%) Location 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 80 / 294

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Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle	General exposures (closed systems) [CS15]. Dissolving linea UP/VE polymer into styrene in blending vessel (or dissolver)
Qualitative Risk Assessment	
	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.
General	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

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Version 2.1 Revision Date 0	4/29/2016 Print Date 04/29/2016	SDS No.: BE64
Human factors not influenced by risk	management	
Exposed skin surface	240 cm ²	
Other given operational conditions af	fecting 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 pe	ersonal protection, hygiene and health evaluation	n
Protective gloves	Gloves APF 5 80 %	
Respiratory protection	no	
6.5 Contributing Scenario (5) controll Name of contributing scenario	ing industrial worker exposure for PROC 3	
Scenario subtitle	3 - Use in closed batch process (synth	esis or formulation)
Scenario subutte	3 - Use in closed batch process (synth Equipment cleaning and maintenance maintenance of blending vessel, road	[CS39]. Cleaning and
Qualitative Risk Assessment	Equipment cleaning and maintenance	[CS39]. Cleaning and
	Equipment cleaning and maintenance	[CS39]. Cleaning and tankers etc.
	Equipment cleaning and maintenance maintenance of blending vessel, road: Where appropriate, replacement of ta	[CS39]. Cleaning and tankers etc. sk by automated and/or re of the operation or
	Equipment cleaning and maintenance maintenance of blending vessel, road Where appropriate, replacement of ta closed processes. Minimise exposure by partial enclosure	[CS39]. Cleaning and tankers etc. sk by automated and/or are of the operation or ation at openings.
	Equipment cleaning and maintenance maintenance of blending vessel, road: Where appropriate, replacement of ta closed processes. Minimise exposure by partial enclosure equipment and provide extract ventilations.	[CS39]. Cleaning and tankers etc. sk by automated and/or re of the operation or ation at openings.
	Equipment cleaning and maintenance maintenance of blending vessel, road: Where appropriate, replacement of ta closed processes. Minimise exposure by partial enclosus equipment and provide extract ventila Clear transfer lines prior to de-coupli. Drain down and flush system prior to	[CS39]. Cleaning and tankers etc. sk by automated and/or re of the operation or ation at openings.
	Equipment cleaning and maintenance maintenance of blending vessel, road: Where appropriate, replacement of ta closed processes. Minimise exposure by partial enclosu equipment and provide extract ventila Clear transfer lines prior to de-coupli. Drain down and flush system prior to maintenance.	[CS39]. Cleaning and tankers etc. sk by automated and/or re of the operation or ation at openings.

General

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

Minimise number of staff exposed.

Use suitable eye protection.

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.



according to Regulation (EC) No. 1907/2006 Gen. Variant: SDS NO STYRENE MONOMER Version 2.1 Revision Date 04/29/2016 Print Date 04/29/2016 SDS No.: BE645 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 50 %, concentration has been considered linearly Concentration in substance (justification: Limit the substance content in the product to 50%.) medium Fugacity / Dustiness Frequency and duration of use 1 - 4 hours Duration of activity 5 days / week Frequency of use 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 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 inhalation: 30 % (justification: Drain down and flush system forced supplied air prior to equipment break-in or maintenance) 6.6 Contributing Scenario (6) controlling industrial worker exposure for PROC 4 4 - Use in batch and other process (synthesis) where Name of contributing scenario opportunity for exposure arises Material transfers [CS3]. All internal transport Raw material assembly and charging / raw material dispensing of liquids Scenario subtitle and solids manually from bulk storage or packed goods into blending tank **Qualitative Risk Assessment** 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. General Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure:

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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 cm²

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

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

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Version 2.1 Revision Date 04/29/2016 Print Date 04/29/2016 SDS No.: BE645 4 - Use in batch and other process (synthesis) where Name of contributing scenario opportunity for exposure arises Scenario subtitle Process sampling [CS2]. Sampling from blender **Qualitative Risk Assessment** 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 General 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** liquid

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	

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nal conditions affecting wor	kers exposure
	indoors
	good (30%)
	industrial
and measures to control dis	spersion and exposure
on	no
ures related to personal pro	tection, hygiene and health evaluation
	Gloves APF 5 80 %
	no
nario (8) controlling industr	rial worker exposure for PROC 5
scenario	5 - Mixing or blending in batch processes (multistage and/or significant contact)
	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
ssment	
	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.
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	and measures to control dison ures related to personal pro nario (8) controlling industr

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Version 2.1 Revision Date 04/29/2016 Print Date 04/29/2016 SDS No.: BE645 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 50 %, concentration has been considered linearly Concentration in substance (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 480 cm^2 Exposed skin surface Other given operational conditions affecting workers exposure Location indoors Domain industrial Technical conditions and measures to control dispersion and exposure Local exhaust ventilation ves (inhalation 90 %) Conditions and measures related to personal protection, hygiene and health evaluation Gloves APF 5 80 % Protective gloves Respiratory protection 6.9 Contributing Scenario (9) controlling industrial worker exposure for PROC 8A 8a - Transfer of chemicals from/to vessels/ large containers at Name of contributing scenario non dedicated facilities Equipment cleaning and maintenance [CS39]. Cleaning and Scenario subtitle maintenance of pipes, pumps, filters, etc. **Qualitative Risk Assessment** Carefully pour from container. Use drum pumps. Put lids on containers immediately after use. Where appropriate, replacement of task by automated and/or General 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 87 / 294

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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
liquid
100%
medium
1 - 4 hours
5 days / week
nent
960 cm ²
orkers exposure
indoors
industrial
ispersion and exposure
yes (inhalation 90 %)
rotection, hygiene and health evaluation
Gloves APF 5 80 %
95%
inhalation: 70 % (justification: Drain or remove substance from equipment prior to break-in or maintenance)

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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 onsite treatment like incineration and/or biological waste water treatment
Qualitative Risk Assessment	
	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.
Canaral	Use suitable chemically resistant gloves.
General	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%

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yondelbasell Gen. Variant: SDS_NO

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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 managem	nent
Exposed skin surface	960 cm ²
Other given operational conditions affecting wo	orkers exposure
Location	indoors
Domain	industrial
Technical conditions and measures to control di	ispersion and exposure
Local exhaust ventilation	no
Conditions and measures related to personal pr	otection, 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 indu	ustrial worker exposure for PROC 8B 8b - Transfer of chemicals from/to vessels/ large containers at
Name of contributing scenario	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	
	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.
General	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.
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yondellbasell Gen. Variant: SDS NO

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Version 2.1 Revision Date 04/29/2016 Print Date 04/29/2016 SDS No.: BE645 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 960 cm^2 Exposed skin surface Other given operational conditions affecting workers exposure Location outdoors (30%) Domain industrial Technical conditions and measures to control dispersion and exposure Local exhaust ventilation Conditions and measures related to personal protection, hygiene and health evaluation Gloves APF 5 80 % Protective gloves Respiratory protection Exposure assessment using the Bayesian model of ART Version 1.5. The predicted 90th percentile full-shift exposure is 18 mg/m³. The confidence interval is 8,1 mg/m³ to 44 mg/m³. PROC 8b Use of external/measured value inhalation 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 91 / 294

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lvondellbasell Gen. Variant: SDS NO

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Version 2.1 Revision Date 04/29/2016 Print Date 04/29/2016 SDS No.: BE645 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		
	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:	

General

exposures. Wear suitable coveralls to prevent exposure to the skin.

Provide specific employee training to prevent/minimize

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

Restrict access to authorised persons. Minimise number of staff exposed.

Use suitable chemically resistant gloves.

Use suitable eye protection.

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.

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		Avoid inhalation of the product.	
		In case of vapours:	
		Handle in a fume cupboard or under extra	act ventilation
Product character	istics		
Physical state		liquid	
Concentration in su	bstance	50 %, concentration has been considered (justification: Limit the substance content 50%.)	
Fugacity / Dustines	S	medium	
Frequency and du	ration of use		
Duration of activity		>4 hours (default)	
Frequency of use		5 days / week	
Human factors not	Human factors not influenced by risk management		
Exposed skin surface	ce	480 cm ²	
Other given opera	Other given operational conditions affecting workers exposure		
Location		indoors	
Domain		industrial	
Technical conditio	ns and measures to control dis	persion and exposure	
Local exhaust venti	lation	no	
Conditions and me	easures related to personal pro	tection, hygiene and health evaluation	
Protective gloves		Gloves APF 5 80 %	
Respiratory protecti	on	no	
LEV		inhalation: 90 % (justification: Fill conta dedicated fill points supplied with local e	

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	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:		
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	1	Restrict access to authorised persons.			
		Minimise number of staff exposed.			
		Use suitable eye protection.			
		Use suitable chemically resistant gloves			
		Provide specific employee training to prexposures.	revent/minimize		
		Wear suitable coveralls to prevent expo	sure to the skin.		
		Wear a suitable respiratory protection we effectiveness.	rith adequate		
		Clear spills immediately			
		Disposal - This material and its contained in a safe manner.	er must be disposed of		
		Ensure good work practices are implem	ented		
		Supervision in place to check that the R 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 ext	ract ventilation		
Product characteristics					
Physical state		liquid			
Concentration in substance		50 %, concentration has been considered (justification: Limit the substance contents 50%.)	•		
Fugacity / Dustiness		medium			
Frequency and duration of us	se				
Duration of activity		>4 hours (default)			
Frequency of use		5 days / week			
Human factors not influenced	l by risk manageme	nt			
Exposed skin surface		240 cm ²			
Other given operational cond	itions affecting worl				
Location		indoors			
Domain		industrial			
Technical conditions and mea	sures to control dis	persion and exposure			
Local exhaust ventilation		yes (inhalation 90 %)			
Conditions and measures rela	nted to personal prot	tection, hygiene and health evaluation			
Protective gloves	- -	Gloves APF 5 80 %			
Respiratory protection	1	no			
Carry out in a vented booth or e	extracted enclosure	inhalation: 90 % (justification: Carry of extracted enclosure)	ut in a vented booth or		

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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		
	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		
Name(s) of contributing worker scenarios and corresponding PROCs	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		

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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

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		
	closed systems [CS93]; Use in contained batch processes		
Qualitative Risk Assessment			
	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.		
Communi	Clear transfer lines prior to de-coupling		
General	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.		

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lvondellbasell Gen. Variant: SDS NO

Version 2.1 Revision Date 04/29/2016 Print Date 04/29/2016 SDS No.: BE645 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 50 %, concentration has been considered linearly Concentration in substance (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 240 cm^2 Exposed skin surface 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 Conditions and measures related to personal protection, hygiene and health evaluation Gloves APF 5 80 % Protective gloves 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) Material transfers [CS3]. Product delivery/storage - delivery Scenario subtitle of bulk and packaged products - outdoor / indoor 97 / 294

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Qualitative Risk Assessment			
	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.		
General	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			
Exposed skin surface	240 cm^2		
Other given operational conditions aff	ecting workers exposure		
Location	indoors		
Ventilation	good (30%)		
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Domain		industrial		
	s and measures to control dis			
Local exhaust ventila		no		
		otection, hygiene and health evaluation		
Protective gloves	isures related to personal pro	Gloves APF 5 80 %		
Respiratory protection	un .	no		
Respiratory protection	VII	110		
7.4 Contributing Sc	enario (4) controlling industr	rial worker exposure for PROC 5		
Name of contributing	ng 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 As	sessment			
		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.		
General		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.		
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Gen. Variant: SDS NO STYRENE MONOMER Version 2.1 Revision Date 04/29/2016 Print Date 04/29/2016 SDS No.: BE645 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 7.5 Contributing Scenario (5) controlling industrial worker exposure for PROC 5 5 - Mixing or blending in batch processes (multistage and/or Name of contributing scenario significant contact) General exposures (closed systems) [CS15]. Mixing liquid and solid components / into final formulated resin in blending Scenario subtitle vessel; Examples are gelcoat blending and compounding, formulation of repair putties, bonding pastes, chemical anchoring, etc **Qualitative Risk Assessment** 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 General 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.

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of staff exposed.		
rotection.		
ically resistant gloves.		
mployee training to prevent/minimize		
r J.		
eralls to prevent exposure to the skin.		
spiratory protection with adequate		
liately		
terial and its container must be disposed of		
practices are implemented		
ce to check that the RMMs in place are ly and OCs followed.		
for risk based health surveillance.		
Avoid inhalation of the product.		
In case of vapours:		
supboard or under extract ventilation		
n has been considered linearly it the substance content in the product to		
ıre		
11 1/1 1 /*		
d health evaluation		
d health evaluation %		

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

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ICS9]: Transfer from/pouring from containers ICS22]: Mixing operations (open systems) [CS30]. Loading of mix equipment; Preparation of material for application; (liquid products) - batch, indoor Qualitative Risk Assessment	Version 2.1	Revision Date 04/29/2016	Print Date 04/29/2016	SDS No.: BE64		
Significant contact) Significant contact)						
ICS9]: Transfer from/pouring from containers ICS22]: Mixing operations (open systems) [CS30]. Loading of mix equipment; Preparation of material for application; (liquid products) - batch, indoor Qualitative Risk Assessment	Name of contribu	iting scenario		s (multistage and/or		
General Carefully pour from container. Use drum pumps. Put lids on containers immediately after use. Where appropriate, replacement of task by automated and/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-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 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 Iiquid 50 %, concentration has been considered linearly	Scenario subtitle		Mixing operations (open systems) [CS30]. Loading of mixing equipment; Preparation of material for application; (liquid			
Use drum pumps. Put lids on containers immediately after use. Where appropriate, replacement of task by automated and/closed processes. Minimise exposure by partial enclosure of the operation of equipment and provide extract ventilation at openings. Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in a maintenance. In case of potential exposure: Restrict access to authorised persons. Minimise number of staff exposed. Use suitable eye protection. Use suitable eye protection. Vera suitable coveralls resistant gloves. Provide specific employee training to prevent/minimize exposures. Wear suitable respiratory protection with adequate effectiveness. Clear spills immediately Disposal - This material and its container must be disposed 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 Iiquid 50 %, concentration has been considered linearly	Qualitative Risk	Assessment				
Physical state liquid 50 %, concentration has been considered linearly	General		Use drum pumps. Put lids on containers immediately after to Where appropriate, replacement of task be closed processes. Minimise exposure by partial enclosure of equipment and provide extract ventilation. Clear transfer lines prior to de-coupling. Drain down and flush system prior to equipment and provide extract ventilation. 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 pre exposures. Wear suitable coveralls to prevent exposures. Wear a suitable respiratory protection wire effectiveness. Clear spills immediately Disposal - This material and its container in a safe manner. Ensure good work practices are impleme Supervision in place to check that the RN being used correctly and OCs followed. Consider the need for risk based health so Avoid inhalation of the product. In case of vapours:	event/minimize are to the skin. th adequate must be disposed of onted MMs in place are are urveillance.		
50 %, concentration has been considered linearly		ristics				
· · · · · · · · · · · · · · · · · · ·	Physical state		-			
Concentration in substance (justification: Limit the substance content in the product to 50%.)	Concentration in s	ubstance	(justification: Limit the substance conten	•		

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	1
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 ma	
Exposed skin surface	480 cm^2
Other given operational conditions affect	ting workers exposure
Location	indoors
Domain	industrial
Technical conditions and measures to co	ontrol dispersion and exposure
Local exhaust ventilation	yes (inhalation 90 %)
Conditions and measures related to pers	sonal protection, hygiene and health evaluation
Protective gloves	Gloves APF 5 80 %
Respiratory protection	no
7.7 Contributing Scenario (7) controlling	g 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
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according to Regulation (EC) No. 1907/2006 Gen. Variant: SDS NO STYRENE MONOMER Version 2.1 Revision Date 04/29/2016 Print Date 04/29/2016 SDS No.: BE645 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 50 %, concentration has been considered linearly (justification: Limit the substance content in the product to Concentration in substance 50%. Fugacity / Dustiness medium Frequency and duration of use Duration of activity >4 hours (default) 5 days / week Frequency of use Human factors not influenced by risk management $1.500 \, \text{cm}^2$ Exposed skin surface Other given operational conditions affecting workers exposure Location indoors industrial Domain Technical conditions and measures to control dispersion and exposure Local exhaust ventilation Conditions and measures related to personal protection, hygiene and health evaluation Gloves APF 5 80 % Protective gloves 95% Respiratory protection 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 Spraying [CS10]; Spraying (manually) [CS97] All open mould applications where resins is applied by manual spraying in an open work environment. Examples are spray Scenario subtitle lamination, gelcoat spraying and "chop-hoop" filament winding **Qualitative Risk Assessment** Where appropriate, replacement of task by automated and/or General closed processes.

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		Minimise exposure by partial enclosure equipment and provide extract ventilation	
		Clear transfer lines prior to de-coupling	
		Drain down and flush system prior to equaintenance.	juipment break-in or
		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 prexposures.	event/minimize
		Wear suitable coveralls to prevent expos	sure to the skin.
		Wear a suitable respiratory protection w effectiveness.	ith adequate
		Clear spills immediately	
		Disposal - This material and its containe in a safe manner.	er must be disposed of
		Ensure good work practices are implement	ented
		Supervision in place to check that the R 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 ext	ract ventilation
Product charact	eristics		
Physical state		liquid	
Concentration in	substance	50 %, concentration has been considered (justification: Limit the substance contents).	
)	
Fugacity / Dustin	ness	medium	
Frequency and o	duration of use		
Duration of activ	ity	>4 hours (default)	
Frequency of use	:	5 days / week	
Human factors i	not influenced by risk manageme	ent	
Exposed skin sur	face	$1,500 \text{ cm}^2$	
Other given ope	rational conditions affecting wor	kers exposure	
Location		indoors	
Ventilation		enhanced (70%)	
Domain		industrial	
Technical condit	tions and measures to control dis	persion and exposure	
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Local exhaust ventilation	yes (inhalation 95 %)
	al 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 in	ndustrial 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	
	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.
General	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.
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	ı	Avoid inhalation of the product.	
		In case of vapours:	
		Handle in a fume cupboard or under e	avtract vantilation
Product charact	taristics	Trandre in a rume cupobard of under c	extract ventuation
Physical state	Cristics	liquid	
1 Hysical state		*	4 11
Concentration in substance		50%, concentration has been considered linearly (justification: Limit the substance content in the product to 50%.)	
Fugacity / Dustiness		medium	
Frequency and o	duration of use		
Duration of activ	ity	1 - 4 hours	
Frequency of use	:	5 days / week	
Human factors i	not influenced by risk manageme	nt	
Exposed skin sur	face	960 cm ²	
Other given ope	rational conditions affecting wor	kers exposure	
Location		indoors	
Domain		industrial	
Technical condit	tions and measures to control dis	persion and exposure	
Local exhaust ver	ntilation	no	
Conditions and	measures related to personal pro	tection, hygiene and health evaluation	on
Protective gloves	3	Gloves APF 5 80 %	
Respiratory prote	ection		95%
Local exhaust ver	ntilation	inhalation: 70 % (justification: Use lowith adequate effectiveness)	ocal exhaust ventilation
7.10 Contributin	ng Scenario (10) controlling indus	strial worker exposure for PROC 8A	
Name of contrib	outing scenario	8a - Transfer of chemicals from/to ve non dedicated facilities	ssels/ large containers at
Scenario subtitle		Disposal of wastes [CS28]. Handling Waste management / handling and storemoval for off-site treatment or for concineration and/or biological waste varieties.	orage of waste for on-site treatment like
Qualitative Risk	Assessment		
		Carefully pour from container.	
		Use drum pumps.	
		Put lids on containers immediately af	ter use.
General		Where appropriate, replacement of ta closed processes.	sk by automated and/or
		Minimise exposure by partial enclosure equipment and provide extract ventila	
		Clear transfer lines prior to de-coupli	ng
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	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%			

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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	•
	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.
General	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	

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Frequency of use

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Duration of activity >4 hours (default)

5 days / week

Human factors not influenced by risk management

Exposed skin surface 960 cm²

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	Local exhaust ventilation	n
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Conditions and measures related to personal protection, hygiene and health evaluation

conditions and measures related to personal protection, my greate and neutrin 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.

closed processes.

Qualitative Risk Assessment

General

Use long handled tools where possible
Where appropriate, replacement of task by automated and/or

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



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		Supervision in place to chec being used correctly and OO	ck that the RMMs in place are Cs followed.
		Consider the need for risk b	
		Avoid inhalation of the prod	duct.
		In case of vapours:	
Handle in a fume cupboard or under extract ve		or under extract ventilation	
Product characte	ristics		
Physical state		liquid	
Concentration in s	ubstance	5-25%	
Fugacity / Dustine	ss	medium	
Frequency and du	uration of use		
Duration of activit	у	>4 hours (default)	
Frequency of use		5 days / week	
Human factors no	ot influenced by risk manageme	ent	
Exposed skin surfa	ace	960 cm ²	
Other given opera	ational conditions affecting wor	kers exposure	
Location		indoors	
Domain		industrial	
Technical conditi	ons and measures to control dis	persion and exposure	
Local exhaust vent	tilation	yes (inhalation 90 %)	
Conditions and m	neasures related to personal pro	tection, hygiene and health	evaluation
Protective gloves		Gloves APF 20 95 %	
Respiratory protec	tion	95%	
7.13 Contributing	g Scenario (13) controlling indus	strial worker exposure for l	PROC 13
Name of contribu	ting scenario	13 - Treatment of articles by	y 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		
		Where appropriate, replaced closed processes.	ment of task by automated and/or
		Minimise exposure by parti equipment and provide extra	al enclosure of the operation or act ventilation at openings.
		Clear transfer lines prior to	de-coupling
General		Drain down and flush systemaintenance.	m prior to equipment break-in or
		In case of potential exposur	e:
		Restrict access to authorised	-
		Minimise number of staff ex	•
		Use suitable eye protection.	

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Version 2.1 Revision Date 04/29/2016 Print Date 04/29/2016 SDS No.: BE645 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 50 %, concentration has been considered linearly Concentration in substance (justification: Limit the substance content in the product to medium Fugacity / Dustiness Frequency and duration of use Duration of activity >4 hours (default) Frequency of use 5 days / week Human factors not influenced by risk management 480 cm^{2} Exposed skin surface Other given operational conditions affecting workers exposure Location indoors Domain industrial Technical conditions and measures to control dispersion and exposure Local exhaust ventilation ves (inhalation 90 %) Conditions and measures related to personal protection, hygiene and health evaluation Gloves APF 20 95 % Protective gloves Respiratory protection 95% 7.14 Contributing Scenario (14) controlling industrial worker exposure for PROC 14 14 - Production of preparations or articles by tabletting, Name of contributing scenario compression, extrusion, pelletisation

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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	
	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.
General	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	I 10 - 11
Physical state	liquid
Concentration in substance	5-25%
Fuguency and duration of use	medium
Frequency and duration of use Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk manageme	
Transar factors not influenced by risk management	LIII

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Exposed skin surface	480 cm^2	
Other given operational conditions affecting wor	rkers 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	·
	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.
General	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.

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		Consider the need for risk based health	surveillance.
		Avoid inhalation of the product.	
		In case of vapours:	
		Handle in a fume cupboard or under ext	tract ventilation
Product characterist	ics		
Physical state		liquid	
Concentration in subs	tance	50 %, concentration has been considered lin the substance content in the product to 50%	
Fugacity / Dustiness		medium	
Frequency and dura	tion of use		
Duration of activity		>4 hours (default)	
Frequency of use		5 days / week	
Human factors not in	nfluenced by risk management		
Exposed skin surface		240 cm ²	
Other given operation	onal conditions affecting workers	exposure	
Location		indoors	
Domain		industrial	
Technical conditions	and measures to control dispersion	on and exposure	
Local exhaust ventilat	tion	no	
Conditions and meas	sures related to personal protectio	n, hygiene and health evaluation	
Protective gloves		Gloves APF 5 80 %	
Respiratory protection	1	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
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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

8 (7	
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
	_

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Qualitative Risk Assessment	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.
General	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 man	
Exposed skin surface	240 cm^2
Other given operational conditions affecting	ng workers exposure
Location	outdoors (30%)
Domain	professional
Technical conditions and measures to cont	rol dispersion and exposure
Local exhaust ventilation	no

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Conditions and made	asures related to norsonal pro	otection, hygiene and health evaluation	
Protective gloves	asures related to personal pro	Gloves APF 10 90 %	
Respiratory protection	าท	no	
respiratory protection	511	no .	
8.3 Contributing So	cenario (3) controlling profess	sional worker exposure for PROC 4	
Name of contributi	ng scenario	4 - Use in batch and other process (syntheopportunity for exposure arises	esis) where
Scenario subtitle		Use in contained batch processes [CS37] operation	. Sewer relining
Qualitative Risk As	ssessment	1 *	
		Where appropriate, replacement of task b closed processes.	y automated and/or
		Minimise exposure by partial enclosure of equipment and provide extract ventilation	
		Clear transfer lines prior to de-coupling	
		Drain down and flush system prior to equipmaintenance.	nipment break-in or
		In case of potential exposure:	
		Restrict access to authorised persons.	
		Minimise number of staff exposed.	
		Use suitable eye protection.	
		Use suitable chemically resistant gloves.	
General		Provide specific employee training to pre exposures.	event/minimize
		Wear suitable coveralls to prevent exposu	are to the skin.
		Wear a suitable respiratory protection wire effectiveness.	th adequate
		Clear spills immediately	
		Disposal - This material and its container in a safe manner.	must be disposed of
		Ensure good work practices are implement	nted
		Supervision in place to check that the RN being used correctly and OCs followed.	Ms in place are
		Consider the need for risk based health su	urveillance.
		Avoid inhalation of the product.	
		In case of vapours:	
		Handle in a fume cupboard or under extra	act ventilation
Product characteris	stics		
Physical state		liquid	
Concentration in sub	ostance	50 %, concentration has been considered (justification: Limit the substance conten 50%.	•
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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 r	nanagement
Exposed skin surface	480 cm ²
Other given operational conditions affe	ecting workers exposure
Location	outdoors (30%)
Domain	professional
Technical conditions and measures to o	control dispersion and exposure
Local exhaust ventilation	no
Conditions and measures related to per	rsonal protection, hygiene and health evaluation
Protective gloves	Gloves APF 10 90 %
Respiratory protection	95%
8.4 Contributing Scenario (4) controlling	ng 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	•
	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
General	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.
	He witchle showing the majetant plane
	Use suitable chemically resistant gloves.
	Provide specific employee training to prevent/minimize
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Version 2.1 Revision Date 04/29/2016 Print Date 04/29/2016 SDS No.: BE645 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 5 days / week Frequency of use Human factors not influenced by risk management 480 cm^{2} Exposed skin surface 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 ves (inhalation 80 %) Conditions and measures related to personal protection, hygiene and health evaluation Protective gloves Gloves APF 10 90 % 95 % (justification: Use a full face mask respirator gas/vapour filter (BS EN 136 mask and BS EN 14387 filter), Respiratory protection 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 8a - Transfer of chemicals from/to vessels/ large containers at Name of contributing scenario non dedicated facilities Equipment maintenance [CS5]; Maintenance of small items Scenario subtitle [CS18]. Equipment cleaning and maintenance, open indoor **Qualitative Risk Assessment** Use drum pumps. General Carefully pour from container. 120 / 294

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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

	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 ri	sk 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

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Local exhaust ventilation	yes (inhalation 80 %)
Conditions and measures related to personal pro-	
Protective gloves	Gloves APF 10 90 %
Respiratory protection	95%
8.6 Contributing Scenario (6) controlling profes	sional 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	
	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.
General	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
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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 managem	•
Exposed skin surface	960 cm ²
Other given operational conditions affecting wo	arkers exposure
Location Variation operations are compared to the control of the control operation operation operation of the control operation operatio	indoors
Ventilation	good (30%)
Domain	professional
Technical conditions and measures to control d	1.
Local exhaust ventilation	yes (inhalation 80 %)
Conditions and measures related to personal pr	
Protective gloves	Gloves APF 10 90 %
Respiratory protection	959
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	
	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
General	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.
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	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 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 aff	fecting 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 pe	ersonal 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).)
	ing professional worker exposure for PROC 10
Name of contributing geometric	10 Pollar application or brushing

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.

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Qualitative Risk Assessment	The Lorentz Health of the Market
	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.
General	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 o 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 aff	ecting workers exposure
Location	indoors

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Gen. Variant: SDS NO STYRENE MONOMER Version 2.1 Revision Date 04/29/2016 Print Date 04/29/2016 SDS No.: BE645 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 Gloves APF 10 90 % Protective gloves 97.5 % (justification: Use a powered respirator with hood/helmets (BS EN 12941), Filter Type A1 (Organic Respiratory protection Vapours, BP>65°C), with an effectiveness of 97.5% (APF 8.9 Contributing Scenario (9) controlling professional worker exposure for PROC 10 Name of contributing scenario 10 - Roller application or brushing Dipping, immersion and pouring [CS4]; Rolling, Brushing Scenario subtitle [CS51]; Roller, spreader, flow application [CS98] Application of floorings, mastics, coatings, castings **Qualitative Risk Assessment** 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. General 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.

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Avoid inhalation of the product.

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Gen. Variant: SDS NO STYRENE MONOMER Version 2.1 Revision Date 04/29/2016 Print Date 04/29/2016 SDS No.: BE645 In case of vapours: Handle in a fume cupboard or under extract ventilation **Product characteristics** Physical state liquid 50 %, concentration has been considered linearly Concentration in substance (justification: Limit the substance content in the product to 50%.) Fugacity / Dustiness medium Frequency and duration of use Duration of activity >4 hours (default) 5 days / week Frequency of use Human factors not influenced by risk management 960 cm^2 Exposed skin surface 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 Gloves APF 10 90 % Protective gloves 97.5 % (justification: Use a powered respirator with hood/helmets (BS EN 12941), Filter Type A1 (Organic Respiratory protection *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 Spraying [CS10]; Spraying (manually) [CS97] All open mould applications where resins is applied by manual Scenario subtitle spraying in an open work environment. Examples are spray lamination, gelcoat spraying and "chop-hoop" filament winding **Qualitative Risk Assessment** 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. General Clear transfer lines prior to de-coupling Drain down and flush system prior to equipment break-in or maintenance. In case of potential exposure: 127 / 294

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Protective gloves

Version 2.1 Revision Date 04/29/2016 Print Date 04/29/2016 SDS No.: BE645 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 50 %, concentration has been considered linearly (justification: Limit the substance content in the product to Concentration in substance 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 $1,500 \text{ cm}^2$ 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 %)

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Gloves APF 10 90 %

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

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	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).)
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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
	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)
Name(s) of contributing worker scenarios and	PROC 3 - Use in closed batch process (synthesis or formulation)
corresponding PROCs	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

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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	$18000 \text{ m}^3/\text{day}$
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

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

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Qualitative Risk Assessment		
	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures	
General	In case of potential exposure:	
	Use suitable eye protection.	
	Use suitable chemically resistant gloves.	
Product characteristics		
Physical state	liquid	
Concentration in substance	1	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	x management	
Exposed skin surface	480 cm^2	
Other given operational conditions at	ffecting workers exposure	
Location	indoors	
Domain	industrial	
Technical conditions and measures to	control dispersion and exposure	
Local exhaust ventilation	no	
Conditions and measures related to p	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	•	
	Ensure good work practices are implemented	
	Provide basic employe training to prevent/minimize exposures	
General	In case of potential exposure:	
	Use suitable eye protection.	
	Use suitable chemically resistant gloves.	
Product characteristics	•	
Physical state	liquid	
	•	
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Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	medium
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk	
•	480 cm ²
Exposed skin surface	
Other given operational conditions aff	
Location	indoors
Domain	industrial
Technical conditions and measures to	control dispersion and exposure
Local exhaust ventilation	no
	ersonal protection, hygiene and health evaluation
Protective gloves	No
Respiratory protection	no
9.4 Contributing Scenario (4) controll	ing 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 aff	
Location Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to	l
remital conditions and measures w	Control dispersion and exposure
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Local exhaust ventil	ation	no	
		tection, hygiene and health evaluation	
Protective gloves		No	
Respiratory protection	on	no	
71			
9.5 Contributing S	cenario (5) controlling industr	ial worker exposure for PROC 3	
Name of contributi	ng scenario	3 - Use in closed batch process (synthesis	or formulation)
Scenario subtitle		Batch process [CS55]. Polymerisation rea	ctor
Qualitative Risk A	ssessment		
		Ensure good work practices are implement	ited
		Provide basic employe training to prevent	/minimize
General		exposures	
General		In case of potential exposure:	
		Use suitable eye protection.	
		Use suitable chemically resistant gloves.	
Product characteri	stics		
Physical state		liquid	
Concentration in sub			100%
Fugacity / Dustiness		medium	
Frequency and dur	ration of use		
Duration of activity		>4 hours (default)	
Frequency of use		5 days / week	
Human factors not	influenced by risk manageme		
Exposed skin surfac	e	240 cm^2	
Other given operat	ional conditions affecting wor	kers exposure	
Location		indoors	
Ventilation		good (30%)	
Domain		industrial	
Technical condition	ns and measures to control dis	persion and exposure	
Local exhaust ventil	ation	no	
Conditions and me	asures related to personal pro	tection, hygiene and health evaluation	
Protective gloves		No	
Respiratory protection	on	no	
9.6 Contributing S	cenario (6) controlling industr	ial worker exposure for PROC 3	
Name of contributi	ng scenario	3 - Use in closed batch process (synthesis	or formulation)
Scenario subtitle		Batch process [CS55]. Vacuum steam dis	tillation
Qualitative Risk A	ssessment		
		Ensure good work practices are implement	ited
General		Provide basic employe training to prevent exposures	
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Version 2.1 Revision Date 04/29/2016 Print Date 04/29/2016 SDS No.: BE645 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 >4 hours (default) Duration of activity 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 3 - Use in closed batch process (synthesis or formulation) Name of contributing scenario Scenario subtitle Batch process [CS55]. Coagulation reactor **Qualitative Risk Assessment** Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures General 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 134 / 294

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Exposed skin surfa	ace	240 cm^2
	rational conditions affecting wor	
Location	ational conditions affecting wor	indoors
Ventilation		good (30%)
Domain		industrial
	ions and measures to control dis	<u>I</u>
Local exhaust ven		no
		tection, hygiene and health evaluation
Protective gloves	icasures related to personal pro	No
Respiratory protect	etion	no
Respiratory protect	21011	110
9.8 Contributing	Scenario (8) controlling industr	rial worker exposure for PROC 3
Name of contribu	ıting scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle		Batch process [CS55]. Drying tank
Qualitative Risk	Assessment	
		Ensure good work practices are implemented
		Provide basic employe training to prevent/minimize
General		exposures
General		In case of potential exposure:
		Use suitable eye protection.
		Use suitable chemically resistant gloves.
Product characte	eristics	
Physical state		liquid
Concentration in s		100%
Fugacity / Dustine	ess	medium
Frequency and d	uration of use	
Duration of activit	ty	>4 hours (default)
Frequency of use		5 days / week
Human factors n	ot influenced by risk manageme	ent
Exposed skin surfa	ace	240 cm^2
Other given oper	ational conditions affecting wor	kers exposure
Location		indoors
Ventilation		good (30%)
Domain		industrial
Technical conditi	ions and measures to control dis	spersion and exposure
Local exhaust ven	tilation	no
Conditions and n	neasures related to personal pro	tection, hygiene and health evaluation
Protective gloves		No
Respiratory protect	ction	no
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9.9 Contributing Scenario (9) controlling industrial worker exposure for PROC 3 Name of contributing scenario Scenario subtitle chemically resistant gloves. Scenario subtitle chemically resistant gloves.	Version 2.1	Revision Date 04/29/2016	Print Date 04/29/2016 S	DS No.: BE645
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 Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures are implemented provide basic employe training to prevent/minimize exposure: Use suitable eye protection. Use suitable chemically resistant gloves. Product characteristics Physical state liquid Concentration in substance liquid Concentration in substance 100% Frequency of use 5 days / week Human factors not influenced by risk management Exposed skin surface 240 cm² 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 an				
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 Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection: Use suitable eye protection: Use suitable eye protection: Use suitable eye protection: Use suitable chemically resistant gloves.				
Scenario subtitle Qualitative Risk Assessment Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures (Use suitable eye protection.) Use suitable eye protection. Use suitable eye protection. Use suitable of the microling industrial worker exposures (Dathaust ventilation and measures related to personal protection, hygiene and health evaluation prevent/minimize exposures) Prequency and duration of use Duration of activity	9.9 Contributing S	cenario (9) controlling industr	rial worker exposure for PROC 3	
Peactor via pipeline	Name of contributi	ing scenario	3 - Use in closed batch process (synthesis or t	formulation)
Fractor via pipeline	Scenario subtitle			rom distillator to
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 eye protection. Use suitable chemically resistant gloves. Product characteristics			reactor via pipeline	
General Provide basic employe training to prevent/minimize exposures in case of potential exposure: Use suitable eye protection. Use suitable eye protection. Product characteristics Physical state Iiquid Concentration in substance Iiquid Fugacity / Dustiness medium Frequency and duration of use Duration of activity Ahours (default) Frequency of use 5 days / week Human factors not influenced by risk management Exposed skin surface 240 cm² Other given operational conditions affecting works exposure Location industrial good (30%) Domain industrial Technical conditions and measures to control dispersion and exposure Local exhaust ventilation no no Conditions and measures to control dispersion and exposure Local exhaust ventilation no no Conditions and measures related to personal protection, hygiene and health evaluation Protective gloves No Respiratory protection no no 9.10 Contributing Scenario (10) controlling industrial worker exposure for PROC 8A Name of contributing scenario and measures and and exposure for process and exposure for	Qualitative Risk A	ssessment		
General Repeat			• • •	
General In case of potential exposure: Use suitable eye protection. Use suitable eye protection. Product characteristics Physical state Iiquid 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 cm² 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 Scenario subtitle Process sampling [CS2]. Sampling from reactors Qualitative Risk Assessment Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection.				nımıze
Product characteristics Physical state Concentration in substance Pigacity / Dustiness Requency and duration of use Duration of activity Prequency of use Buman factors not influenced by risk management Location Ventilation Dumain Pethical conditions and measures to control discrision and measures related to personal personal measures related to personal roll decidend facilities Protective gloves No Respiratory protection Ponter ibuting Scenario (10) controlling interval and inclinated second in a condicated facilities Scenario subtitle Procease Rame of contributing scenario Qualitative Risk Assessment Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Localia Consultation Responsed to protection, by generating to prevent/minimize exposure Beneral Bensure good work practices are implemented Provide basic employe training to prevent/minimize exposures exposures Location Locati	General		-	
Product characteristics Physical state liquid Concentration in substance nedium Frequency medium Frequency and duration of use Duration of activity >4 hours (default) Frequency of use 5 days / week Human factors not influenced by risk managemetration of use Exposed skin surface 240 cm² 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 Potentibuting Scenario (10) controlling industrial worker exposure for PROC 8A Name of contributing scenario Process sampling [CS2]. Sampling from reactors Qualitative Risk Assessment Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures (Use suitable eye protection.)				
Product characteristics Physical state Physical state Iiquid Concentration in substance Incomposition of substance Incomposition of activity Prequency and duration of use Frequency of use Imman factors not influenced by risk management Exposed skin surface Other given operational conditions affecting workers exposure Location Indoors Ventilation Iomain Industrial Technical conditions and measures to control dispersion and exposure Local exhaust ventilation Indoors Protective gloves No Respiratory protection No Respiratory protection Protective gloves Rame of contributing scenario Qualitative Risk Assessment Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection.				
Concentration in substance 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 cm² Other given operational conditions affecting worker 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 Qualitative Risk Assessment Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection.	Product characteri	istics	, ,	
Concentration in substance 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 cm² Other given operational conditions affecting worker 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 Qualitative Risk Assessment Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection.	Physical state		liquid	
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 cm² 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 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 Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection.	Concentration in sul	bstance		100%
Duration of activity >4 hours (default) Frequency of use 5 days / week Human factors not influenced by risk management Exposed skin surface 240 cm² 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 Qualitative Risk Assessment Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection.	Fugacity / Dustiness	S	medium	
Frequency of use 5 days / week Human factors not influenced by risk management Exposed skin surface 240 cm² 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 Scenario subtitle Process sampling [CS2]. Sampling from reactors Qualitative Risk Assessment Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection.	Frequency and dur	ration of use		
Human factors not influenced by risk management Exposed skin surface 240 cm² 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 Scenario subtitle Process sampling [CS2]. Sampling from reactors Qualitative Risk Assessment Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection.	Duration of activity		>4 hours (default)	
Exposed skin surface 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 Ono Contributing Scenario (10) controlling industrial worker exposure for PROC 8A Name of contributing scenario Scenario subtitle Process sampling [CS2]. Sampling from reactors Qualitative Risk Assessment Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection.	Frequency of use		5 days / week	
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 Scenario subtitle Process sampling [CS2]. Sampling from reactors Qualitative Risk Assessment Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection.	Human factors not	influenced by risk manageme	ent	
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 Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection.	Exposed skin surfac	e	240 cm ²	
Domain good (30%)	Other given operat	tional conditions affecting wor	kers exposure	
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 Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection.	Location		indoors	
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 Scenario subtitle Process sampling [CS2]. Sampling from reactors Qualitative Risk Assessment Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection.	Ventilation		good (30%)	
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 Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection.	Domain		industrial	
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 Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection.	Technical condition	ns and measures to control dis	spersion and exposure	
Protective gloves Respiratory protection no 9.10 Contributing Scenario (10) controlling industrial worker exposure for PROC 8A Name of contributing scenario Scenario subtitle Process sampling [CS2]. Sampling from reactors Qualitative Risk Assessment Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection.	Local exhaust ventil	lation	no	
Respiratory protection no 9.10 Contributing Scenario (10) controlling industrial worker exposure for PROC 8A Name of contributing scenario Scenario subtitle Process sampling [CS2]. Sampling from reactors Qualitative Risk Assessment Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection.	Conditions and me	asures related to personal pro	tection, hygiene and health evaluation	
9.10 Contributing Scenario (10) controlling industrial worker exposure for PROC 8A Name of contributing scenario Scenario subtitle Process sampling [CS2]. Sampling from reactors Qualitative Risk Assessment Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection.	Protective gloves		No	
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 Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection.	Respiratory protecti	on	no	
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 Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection.				
non dedicated facilities Scenario subtitle Process sampling [CS2]. Sampling from reactors Qualitative Risk Assessment Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection.	9.10 Contributing	Scenario (10) controlling indu		
Qualitative Risk Assessment Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection.	Name of contributi	ing scenario		rge containers at
Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection.	Scenario subtitle		Process sampling [CS2]. Sampling from reactions of the control of	tors
Provide basic employe training to prevent/minimize exposures Use suitable eye protection.	Qualitative Risk A	ssessment		
General exposures Use suitable eye protection.			• • •	
Use suitable eye protection.	C 1			nimize
	General		=	
Ose suitable eliciliteatity resistant gioves.				
			Ose suitable elicilically resistant gloves.	

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	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	L ''' '
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk manag	, ·
Exposed skin surface	960 cm ²
Other given operational conditions affecting	
Location	indoors
Domain	industrial
Technical conditions and measures to control	1
Local exhaust ventilation	no
Conditions and measures related to personal	1 357
Protective gloves	No
Respiratory protection	no
Use a sampling system designed to control	inhalation: 80 % (justification: Use a sampling system
exposure	designed to control exposure)
9.11 Contributing Scenario (11) controlling in Name of contributing scenario	ndustrial worker exposure for PROC 8B 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	<u> </u>
	Clear transfer lines prior to de-coupling
	Ensure good work practices are implemented
	Provide basic employe training to prevent/minimize
General	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
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Human factors not influenced by risk managem	ent		
Exposed skin surface	960 cm ²		
Other given operational conditions affecting wo			
Location Location	indoors		
Domain	industrial		
Technical conditions and measures to control di			
Local exhaust ventilation	no		
Conditions and measures related to personal pr			
Protective gloves	No		
Respiratory protection	no		
T 7 F			
9.12 Contributing Scenario (12) controlling indu	ustrial worker exposure for PROC 8B		
Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at		
Name of contributing scenario	dedicated facilities		
	Equipment maintenance [CS5]. Manufacturing equipment		
Scenario subtitle	maintenance: opening and cleaning manufacturing equipment		
O. W. d. Dill.	for maintenance purposes		
Qualitative Risk Assessment	I Francisco I and a series and a series and a series at the series at th		
	Ensure good work practices are implemented Provide basic employe training to prevent/minimize		
	exposures		
General	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 managem	nent		
Exposed skin surface	960 cm ²		
Other given operational conditions affecting wo			
Location	indoors		
Domain	industrial		
Technical conditions and measures to control di	ispersion and exposure		
Local exhaust ventilation	no		
Conditions and measures related to personal pr	otection, hygiene and health evaluation		
Protective gloves	No		
Respiratory protection	no		
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9.13 Contributing Scenario (13) controlling	industrial worker exposure for PROC 8B

illuustriai worker exposure for FROC ob		
8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities		
Bulk transfers [CS14]. Finished product Loading of road tanker, railcar, container		
<u> </u>		
liquid		
1-5%		
medium		
>4 hours (default)		
5 days / week		
gement		
960 cm ²		
workers exposure		
indoors		
industrial		
ol dispersion and exposure		
no		
l protection, hygiene and health evaluation		
No		
no		
industrial worker exposure for PROC 8B		
8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities		
Material transfers [CS3]. Waste management: transfer of process wastes to storage containers: off-line in workplace		
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.		
liquid		
100%		
medium		
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Duration of activity	15 mins to 1 hour			
Frequency of use	5 days / week			
Human factors not influenced by risk manageme	. ·			
Exposed skin surface	960 cm ²			
Other given operational conditions affecting wor				
Location	indoors			
Domain	industrial			
Technical conditions and measures to control dis				
Local exhaust ventilation	no			
Conditions and measures related to personal pro				
Protective gloves	No			
Respiratory protection	no			
9.15 Contributing Scenario (15) controlling indu	strial worker exposure for PROC 9			
	9 - Transfer of chemicals into small containers (dedicated			
Name of contributing scenario	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 manageme	ent			
Exposed skin surface	480 cm ²			
Other given operational conditions affecting wor	rkers exposure			
Location	indoors			
Domain	industrial			
Technical conditions and measures to control dis	spersion and exposure			
Local exhaust ventilation	no			
Conditions and measures related to personal pro	otection, hygiene and health evaluation			
Protective gloves	No			
Respiratory protection	no			
9.16 Contributing Scenario (16) controlling indu	strial worker exposure for PROC 15			
Name of contributing scenario	15 - Use of laboratory reagents in small scale laboratories			
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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
General	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 ri	sk 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

Production of Styrene Butadiene Latex (SBL) (ES10)	
ERC 6C; PROC 2, 3, 8A, 8B, 9, 15	
ERC 6c Production of plastics	
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)	

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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	

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River flow rate 18000 m²/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 (Fistp.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 Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures General Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection. Use suitable eye protection. Use suitable eye protection. Use suitable chemically resistant gloves. Prequency 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 cm² Other given operational conditions affecting workers exposure Location indoors Domain indoors Domain indoors Conditions and measures to control dispersion and exposure Local exhaust ventilation Protective gloves No						
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 (Estp. water) 0.081 - (justification: Efficiency STP 91.9%) 10.2 Contributing Scenario (2) controlling industrial worker exposure for PROC 2 Name of contributing scenario Scenario subtitle Material transfers [CS3]. Styrene Storage in tanks Qualitative Risk Assessment Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures General Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection. Use suitable eye protection. Use suitable chemically resistant gloves. Product characteristics Physical state liquid Concentration in substance fo days / week Human factors not influenced by risk ma	version 2.1	Revision Date 04/29/2010	Fillit Date 04/29/20	10	3D3 No BE043	
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 (Estp. water) 0.081 - (justification: Efficiency STP 91.9%) 10.2 Contributing Scenario (2) controlling industrial worker exposure for PROC 2 Name of contributing scenario Scenario subtitle Material transfers [CS3]. Styrene Storage in tanks Qualitative Risk Assessment Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures General Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection. Use suitable eye protection. Use suitable chemically resistant gloves. Product characteristics Physical state liquid Concentration in substance fo days / week Human factors not influenced by risk ma	•	-	_			
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: EU Risk Assessment Report, 2002) 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 Scenario subtitle Material transfers [CS3]. Styrene Storage in tanks Qualitative Risk Assessment Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures Use suitable eye protection. Product characteristies Physical state Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposure:	River flow rate		18000 m ³ /day			
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Fraction released to air (Femis.air) Fraction used at main source Fraction used at main source Fraction of emission directed to water by local STP (Fstp.water) 10.2 Contributing Scenario (2) controlling industrial worker exposure for PROC 2 Name of contributing scenario Scenario subtitle Oualitative Risk Assessment Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable ehemically resistant gloves. Product characteristics Physical state Concentration in substance Frequency and duration of use Duration of activity Frequency of use Justice of use of the surface of the given operational conditions affecting worker exposure Location Domain Technical conditions and measures to control dispersion and exposure Local exhaust ventilation Protective gloves No Outper given operational to personal protection, hygiene and health evaluation Protective gloves No Outper given operational to personal protection, hygiene and health evaluation Protective gloves No	Other modified	EUSES values				
Fraction used at main source Fraction of emission directed to water by local STP (Fstp. water) 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 Material transfers [CS3]. Styrene Storage in tanks	Fraction released	to waste water (Femis.water)	0.000012 % (justification: E	EU Risk Assessi	nent Report, 2002)	
Fraction used at man source Fraction of emission directed to water by local STP (Fstp.water) 10.2 Contributing Scenario (2) controlling industrial worker exposure for PROC 2 Name of contributing scenario Scenario subtitle Caulitative Risk Assessment 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 eye protection. Use suitable chemically resistant gloves. Product characteristics Physical state Concentration in substance Frequency and duration of use Duration of activity Frequency of use Frequency of use S days / week Human factors not influenced by risk management Exposed skin surface 480 cm² Other given operational conditions affecting workers exposure Local exhaust ventilation Industrial Technical conditions and measures to control dispersion and exposure Local exhaust ventilation Protective gloves No	Fraction released	to air (Femis.air)	0.102 % (justification: EU F	Risk Assessmen	t Report, 2002)	
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	Fraction used at r	main source				
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 Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure:		ion directed to water by local	0.081 - (justification: Efficie	ency STP 91.9%	6)	
Scenario subtitle Material transfers [CS3]. Styrene Storage in tanks Qualitative Risk Assessment	10.2 Contributin	ng Scenario (2) controlling indust	trial worker exposure for Pl	ROC 2		
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General Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection. Use suitable eye protection. Use suitable chemically resistant gloves. Product characteristics Physical state liquid Concentration in substance 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 cm² 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	Qualitative Risk	Assessment				
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General 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 cm² 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				ing to prevent/	minimize	
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 cm² Other given operational conditions affecting workers exposure Location 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	General		•			
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 cm² Other given operational conditions affecting workers exposure Location indoors Domain indoors 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				5.		
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 cm² Other given operational conditions affecting workers exposure Location indoors Domain indoustrial 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			1			
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Concentration in substance 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 cm² 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			liauid			
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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 cm² 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			medium			
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Frequency of use 5 days / week Human factors not influenced by risk management Exposed skin surface 480 cm² 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			>4 hours (default)			
Human factors not influenced by risk management Exposed skin surface 480 cm² 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	Frequency of use		5 days / week			
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	Human factors r	not influenced by risk manageme	ent			
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	Exposed skin surf	face	480 cm^2			
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	Other given open	rational conditions affecting wor	kers exposure			
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	Location		•			
Local exhaust ventilation no Conditions and measures related to personal protection, hygiene and health evaluation Protective gloves No	Domain					
Conditions and measures related to personal protection, hygiene and health evaluation Protective gloves No	Technical condit	tions and measures to control dis	persion and exposure			
Protective gloves No	Local exhaust ver	l exhaust ventilation no				
•	Conditions and	measures related to personal pro	tection, hygiene and health	evaluation		
Respiratory protection no	Protective gloves		No			
	Respiratory prote	ction	no			

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10.3 Contributing Scenario (3) controllin	ng 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 ma	anagement
Exposed skin surface	480 cm ²
Other given operational conditions affect	ting workers exposure
Location	indoors
Domain	industrial
Technical conditions and measures to con	ntrol dispersion and exposure
Local exhaust ventilation	no
Conditions and measures related to person	onal protection, hygiene and health evaluation
Protective gloves	No
Respiratory protection	no
10.4 Contributing Scenario (4) controllin	ng 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	
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Gen. Variant: SDS NO STYRENE MONOMER Version 2.1 Revision Date 04/29/2016 Print Date 04/29/2016 SDS No.: BE645 liquid Physical state 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 240 cm^2 Exposed skin surface 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** Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures General 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 240 cm^2 Exposed skin surface Other given operational conditions affecting workers exposure Location indoors Ventilation good (30%)

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Domain		industrial	
Technical condit	ions and measures to control dis	spersion and exposure	
Local exhaust ven	ntilation	no	
Conditions and n	neasures related to personal pro	tection, hygiene and health evaluation	
Protective gloves		No	
Respiratory protect	ction	no	
10.6 Contributin	g Scenario (6) controlling indust	trial worker exposure for PROC 3	
Name of contribu	uting scenario	3 - Use in closed batch process (synthesis or formulat	ion)
Scenario subtitle	-	Batch process [CS55]. Vacuum steam distillation	
Qualitative Risk	Assessment	-	
		Ensure good work practices are implemented	
		Provide basic employe training to prevent/minimize	
General		exposures	
General		In case of potential exposure:	
		Use suitable eye protection.	
		Use suitable chemically resistant gloves.	
Product characte	eristics		
Physical state		liquid	
Concentration in s	substance		100%
Fugacity / Dustine	ess	medium	
Frequency and d	luration of use		
Duration of activi	ty	>4 hours (default)	
Frequency of use		5 days / week	
Human factors not influenced by risk management			
Exposed skin surf	ace	240 cm ²	
Other given oper	rational conditions affecting wor	kers exposure	
Location		indoors	
Ventilation		good (30%)	
Domain		industrial	
Technical condit	ions and measures to control dis	spersion and exposure	
Local exhaust ven		no	
Conditions and n	neasures related to personal pro	tection, hygiene and health evaluation	
Protective gloves	-	No	
Respiratory protect	ction	no	
10.7 Contributing Scenario (7) controlling industrial worker exposure for PROC 3			
Name of contribu		3 - Use in closed batch process (synthesis or formulat	ion)
	mania pecinario	Material transfers [CS3]. Recycling styrene from dist	
Scenario subtitle		reactor via pipeline	mator to
Qualitative Risk Assessment			
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according to Regulation (EC) No. 1907/2006 Gen. Variant: SDS NO STYRENE MONOMER Version 2.1 Revision Date 04/29/2016 Print Date 04/29/2016 SDS No.: BE645 Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures General In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves. **Product characteristics** Physical state liquid 100% Concentration in substance 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 240 cm^2 Exposed skin surface 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 8a - Transfer of chemicals from/to vessels/ large containers at Name of contributing scenario non dedicated facilities Scenario subtitle Process sampling [CS2]. Sampling from reactors **Qualitative Risk Assessment** Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures General 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

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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 wo	rkers exposure	
Location	indoors	
Domain	industrial	
Technical conditions and measures to control di	spersion and exposure	
Local exhaust ventilation	no	
Conditions and measures related to personal pr	otection, 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 indus	strial 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		
	Clear transfer lines prior to de-coupling	
	Ensure good work practices are implemented	
	Provide basic employe training to prevent/minimize	
General	exposures In case of potential exposure:	
	Use suitable eye protection.	
	Use suitable chemically resistant gloves.	
Product characteristics	ese surante enemicany resistant groves.	
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		
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Local exhaust ver	ntilation	no	
Conditions and r	neasures related to personal pro	otection, hygiene and health evaluation	
Protective gloves		No	
Respiratory protection	ction	no	
10.10 Contributi	ng Scenario (10) controlling ind	ustrial worker exposure for PROC 8B	
Name of contribu	uting scenario	8b - Transfer of chemicals from/to vessels/ large contained dedicated facilities	ers at
Scenario subtitle		Equipment maintenance [CS5]. Manufacturing equipmen 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.	
D 1 4 1 4	• ,•	Use suitable chemically resistant gloves.	
Product characte	eristics	limid	
Physical state		liquid	1,000
Concentration in s		medium	100%
Fugacity / Dustine Frequency and d		medium	
Duration of activi		15 mins to 1 hour	
Frequency of use	ty	5 days / week	
	not influenced by risk manageme	· ·	
Exposed skin surf	· · · · · · · · · · · · · · · · · · ·	960 cm ²	
Location	rational conditions affecting wor	indoors	
Domain		industrial	
	ions and measures to control dis		
Local exhaust ver		no	
		otection, hygiene and health evaluation	
Protective gloves	neagares related to personal pro	No	
Respiratory protection	ction	no	
		ustrial worker exposure for PROC 8B	
Name of contribu	uting scenario	8b - Transfer of chemicals from/to vessels/ large contained dedicated facilities	rs at
Scenario subtitle		Bulk transfers [CS14]. Finished product Loading of road tanker, railcar, container	
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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		
	Ensure good work practices are implemented	
	Provide basic employe training to prevent/minimize exposures	
General	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	
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Other given operational conditions affe	ecting workers exposure	
Location	indoors	
Domain	industrial	
Technical conditions and measures to o	control dispersion and exposure	
Local exhaust ventilation	no	
Conditions and measures related to per	rsonal protection, hygiene and health evaluation	
Protective gloves	No	
Respiratory protection	no	
10.13 Contributing Scenario (13) contr	olling 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 r	nanagement	
Exposed skin surface	480 cm ²	
Other given operational conditions affe	ecting workers exposure	
Location	indoors	
Domain	industrial	
Technical conditions and measures to o	control dispersion and exposure	
Local exhaust ventilation	no	
Conditions and measures related to per	rsonal 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	1 7 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	
	Ensure good work practices are implemented	
General	Provide basic employe training to prevent/minimize	
	exposures	
	In case of potential exposure:	
	Use suitable eye protection.	
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	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 manageme	ent	
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
	PROC 2 - Use in closed, continuous process with occasional controlled exposure
Name(s) of contributing worker scenarios and corresponding PROCs	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)
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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)
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Fraction used at m	nain source	60 % (justification: Value adopted to account for worst-case European manufacturing site)	
Fraction of emissi STP (Fstp.water)	on directed to water by local	0.081 - (justification: Efficiency STP 91.9%)	
11.2 Contributing	11.2 Contributing Scenario (2) controlling industrial worker exposure for PROC 2		
Name of contribu	nting 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 characte	eristics		
Physical state		liquid	
Concentration in s	substance	100%	
Fugacity / Dustine	ess	medium	
Frequency and d			
Duration of activit		>4 hours (default)	
Frequency of use	•	5 days / week	
	Human factors not influenced by risk management		
Exposed skin surfa		480 cm^2	
-	rational conditions affecting wor	kers exnosure	
Location	unional conditions unrecking wor	indoors	
Domain		industrial	
Technical conditi	ions and measures to control dis	persion and exposure	
Local exhaust ven		no	
Conditions and n	neasures related to personal pro	tection, hygiene and health evaluation	
Protective gloves	•	No	
Respiratory protect	ction	no	
11.3 Contributing Scenario (3) controlling industrial worker exposure for PROC 2			
Name of contribu	nting 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	
		17.100	
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	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)

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		
	Ensure good work practices are implemented	
	Provide basic employe training to prevent/minimize exposures	
General	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)	
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Frequency of use		5 days / week
	t influenced by risk manageme	
Exposed skin surface	•	240 cm^2
	tional conditions affecting wor	
Location Location	tional conditions affecting wor	indoors
Ventilation		good (30%)
Domain		industrial
	ons and measures to control dis	
Local exhaust venti		no
		tection, hygiene and health evaluation
Protective gloves	and the relation to personal pro-	No
Respiratory protecti	ion	no
Trespiratory protects		
11.5 Contributing	Scenario (5) controlling indust	trial worker exposure for PROC 3
Name of contribut	ing scenario	3 - Use in closed batch process (synthesis or formulation)
Scenario subtitle		Batch process [CS55]. Dissolving and polymerisation reactor
Qualitative Risk A	ssessment	
		Ensure good work practices are implemented
		Provide basic employe training to prevent/minimize
General		exposures
General		In case of potential exposure:
		Use suitable eye protection.
	•	Use suitable chemically resistant gloves.
Product character	istics	11
Physical state	1 .	liquid
Concentration in su		100%
Fugacity / Dustines		medium
Frequency and du		. 41 (1.6.1)
Duration of activity		>4 hours (default)
Frequency of use		5 days / week
	t influenced by risk manageme	
Exposed skin surface	ie .	240 cm^2
	tional conditions affecting wor	kers exposure
Location		indoors
Ventilation		good (30%)
Domain		industrial
	ns and measures to control dis	spersion and exposure
Local exhaust venti		no
	easures related to personal pro	tection, hygiene and health evaluation
Protective gloves		No
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VEISION 2.1	Nevision Date 04/29/2010	Fillit Date 04/29/2010	3D3 No.: BL043
Respiratory prote	ection	no	
11 (C 4-21-42-42-42-42-42-42-42-42-42-42-42-42-42-	C	total annual annual annual fara DDOC 2	
	<u> </u>	trial worker exposure for PROC 3	·
Name of contrib	uting scenario	3 - Use in closed batch process (synthes	· · · · · · · · · · · · · · · · · · ·
Scenario subtitle		Batch process [CS55]. Suspension react	or
Qualitative Risk	Assessment	F	4. 1
		Ensure good work practices are implem Provide basic employe training to preve	
		exposures	in/minimze
General		In case of potential exposure:	
		Use suitable eye protection.	
		Use suitable chemically resistant gloves	
Product charact	eristics		
Physical state		liquid	
Concentration in	substance		100%
Fugacity / Dustin	ess	medium	
Frequency and o	duration of use		
Duration of activi	ity	>4 hours (default)	
Frequency of use		5 days / week	
Human factors i	not influenced by risk manageme	ent	
Exposed skin sur	face	240 cm^2	
Other given oper	rational conditions affecting wor	kers exposure	
Location		indoors	
Ventilation		good (30%)	
Domain		industrial	
Technical condit	tions and measures to control dis	spersion and exposure	
Local exhaust ver	ntilation	no	
Conditions and	measures related to personal pro	tection, hygiene and health evaluation	
Protective gloves	The second secon	No	
Respiratory prote	ection	no	
11.7 Contributin	ng Scenario (7) controlling indust	trial worker exposure for PROC 3	
Name of contrib	uting scenario	3 - Use in closed batch process (synthes	is or formulation)
Scenario subtitle		Batch process [CS55]. Washed and drie	d tanks
Qualitative Risk	Assessment		
		Ensure good work practices are implem	
		Provide basic employe training to preve	nt/minimize
General		exposures In case of potential exposure:	
		In case of potential exposure: Use suitable eye protection.	
		Use suitable chemically resistant gloves	
		ose suitable eliciliteariy resistant gloves	•
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100%
(default)
veek
sure
%)
nd exposure
•
ygiene and health evaluation
er exposure for PROC 8A sfer of chemicals from/to vessels/ large containers at
cated facilities
ampling [CS2]. Sampling from reactors/tanks
bood work practices are implemented basic employe training to prevent/minimize states ble eye protection. ble chemically resistant gloves. table coveralls to prevent exposure to the skin.
100%
(default)
veek
sure
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Gen. Variant: SDS NO STYRENE MONOMER Version 2.1 Revision Date 04/29/2016 Print Date 04/29/2016 SDS No.: BE645 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 Use a sampling system designed to control inhalation: 80 % (justification: Use a sampling system exposure designed to control exposure) 11.9 Contributing Scenario (9) controlling industrial worker exposure for PROC 8B 8b - Transfer of chemicals from/to vessels/ large containers at Name of contributing scenario dedicated facilities Equipment maintenance [CS5]. Manufacturing equipment Scenario subtitle maintenance: opening and cleaning manufacturing equipment for maintenance purposes **Qualitative Risk Assessment** Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures General 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 15 mins to 1 hour Duration of activity 5 days / week Frequency of use Human factors not influenced by risk management 960 cm^2 Exposed skin surface Other given operational conditions affecting workers exposure Location indoors Domain industrial Technical conditions and measures to control dispersion and exposure Local exhaust ventilation Conditions and measures related to personal protection, hygiene and health evaluation Protective gloves No Respiratory protection no 159 / 294

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

Name of contributing seems is	8b - Transfer of chemicals from/to vessels/ large containers a
Name of contributing scenario	dedicated facilities
Scenario subtitle	Bulk transfers [CS14]. Finished product Loading of road
	tanker, railcar, container
Product characteristics	Territoria
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 ma	
Exposed skin surface	960 cm^2
Other given operational conditions affec	ting workers exposure
Location	indoors
Domain	industrial
Technical conditions and measures to co	ontrol dispersion and exposure
Local exhaust ventilation	no
Conditions and measures related to pers	onal protection, hygiene and health evaluation
Protective gloves	No
Respiratory protection	no
11 11 Contributing Scenario (11) control	lling industrial worker exposure for PROC 8B
11.11 Contributing Section (11) Control	ining industrial worker exposure for 1 KOC ob
Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers a dedicated facilities
	8b - Transfer of chemicals from/to vessels/ large containers a
Name of contributing scenario Scenario subtitle	8b - Transfer of chemicals from/to vessels/ large containers a dedicated facilities Material transfers [CS3]. Loading tank storage from road, rail
Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers a dedicated facilities Material transfers [CS3]. Loading tank storage from road, rail
Name of contributing scenario Scenario subtitle	8b - Transfer of chemicals from/to vessels/ large containers a dedicated facilities Material transfers [CS3]. Loading tank storage from road, rai or boat transport
Name of contributing scenario Scenario subtitle	8b - Transfer of chemicals from/to vessels/ large containers a dedicated facilities Material transfers [CS3]. Loading tank storage from road, rai or boat transport Clear transfer lines prior to de-coupling Ensure good work practices are implemented Provide basic employe training to prevent/minimize
Name of contributing scenario Scenario subtitle Qualitative Risk Assessment	8b - Transfer of chemicals from/to vessels/ large containers a dedicated facilities Material transfers [CS3]. Loading tank storage from road, rai or boat transport Clear transfer lines prior to de-coupling Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures
Name of contributing scenario Scenario subtitle	8b - Transfer of chemicals from/to vessels/ large containers a dedicated facilities Material transfers [CS3]. Loading tank storage from road, rai or boat transport 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:
Name of contributing scenario Scenario subtitle Qualitative Risk Assessment	8b - Transfer of chemicals from/to vessels/ large containers a dedicated facilities Material transfers [CS3]. Loading tank storage from road, rai or boat transport 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.
Name of contributing scenario Scenario subtitle Qualitative Risk Assessment General	8b - Transfer of chemicals from/to vessels/ large containers a dedicated facilities Material transfers [CS3]. Loading tank storage from road, rai or boat transport 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:
Name of contributing scenario Scenario subtitle Qualitative Risk Assessment General Product characteristics	8b - Transfer of chemicals from/to vessels/ large containers a dedicated facilities Material transfers [CS3]. Loading tank storage from road, rai or boat transport 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.
Name of contributing scenario Scenario subtitle Qualitative Risk Assessment General Product characteristics Physical state	8b - Transfer of chemicals from/to vessels/ large containers a dedicated facilities Material transfers [CS3]. Loading tank storage from road, rai or boat transport 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.
Name of contributing scenario Scenario subtitle Qualitative Risk Assessment General Product characteristics Physical state Concentration in substance	8b - Transfer of chemicals from/to vessels/ large containers a dedicated facilities Material transfers [CS3]. Loading tank storage from road, rai or boat transport 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.
Name of contributing scenario Scenario subtitle Qualitative Risk Assessment General Product characteristics Physical state	8b - Transfer of chemicals from/to vessels/ large containers a dedicated facilities Material transfers [CS3]. Loading tank storage from road, rai or boat transport 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.

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Gen. Variant: SDS NO STYRENE MONOMER Version 2.1 Revision Date 04/29/2016 Print Date 04/29/2016 SDS No.: BE645 Duration of activity 15 mins to 1 hour Frequency of use 5 days / week Human factors not influenced by risk management 960 cm^{2} Exposed skin surface 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 8b - Transfer of chemicals from/to vessels/ large containers at Name of contributing scenario dedicated facilities Material transfers [CS3]. Waste management: transfer of Scenario subtitle process wastes to storage containers: off-line in workplace **Qualitative Risk Assessment** Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures General 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 161 / 294

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Respiratory protection no

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

8 ,	olling 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 m	nanagement
Exposed skin surface	480 cm ²
Other given operational conditions affect	cting workers exposure
Location	indoors
Domain	industrial
Technical conditions and measures to co	ontrol dispersion and exposure
Local exhaust ventilation	no
Conditions and measures related to pers	sonal protection, hygiene and health evaluation
Conditions and measures related to personate Protective gloves	sonal protection, hygiene and health evaluation No
Protective gloves Respiratory protection	No
Protective gloves Respiratory protection	No no
Protective gloves Respiratory protection 11.14 Contributing Scenario (14) contro	No no olling industrial worker exposure for PROC 15
Protective gloves Respiratory protection 11.14 Contributing Scenario (14) contro Name of contributing scenario	No no blling industrial worker exposure for PROC 15 15 - Use of laboratory reagents in small scale laboratories
Protective gloves Respiratory protection 11.14 Contributing Scenario (14) contro Name of contributing scenario Scenario subtitle	No no blling industrial worker exposure for PROC 15 15 - Use of laboratory reagents in small scale laboratories
Protective gloves Respiratory protection 11.14 Contributing Scenario (14) contro Name of contributing scenario Scenario subtitle	No no Polling industrial worker exposure for PROC 15 15 - Use of laboratory reagents in small scale laboratories Laboratory activities [CS36]. Laboratory - Quality Control Ensure good work practices are implemented Provide basic employe training to prevent/minimize
Protective gloves Respiratory protection 11.14 Contributing Scenario (14) contro Name of contributing scenario Scenario subtitle Qualitative Risk Assessment	No no lling industrial worker exposure for PROC 15 15 - Use of laboratory reagents in small scale laboratories Laboratory activities [CS36]. Laboratory - Quality Control Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures
Protective gloves Respiratory protection 11.14 Contributing Scenario (14) contro Name of contributing scenario Scenario subtitle	No no Polling industrial worker exposure for PROC 15 15 - Use of laboratory reagents in small scale laboratories Laboratory activities [CS36]. Laboratory - Quality Control Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure:
Protective gloves Respiratory protection 11.14 Contributing Scenario (14) contro Name of contributing scenario Scenario subtitle Qualitative Risk Assessment	No no Delling industrial worker exposure for PROC 15 15 - Use of laboratory reagents in small scale laboratories Laboratory activities [CS36]. Laboratory - Quality Control Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure: Use suitable eye protection.
Protective gloves Respiratory protection 11.14 Contributing Scenario (14) contro Name of contributing scenario Scenario subtitle Qualitative Risk Assessment General	No no Polling industrial worker exposure for PROC 15 15 - Use of laboratory reagents in small scale laboratories Laboratory activities [CS36]. Laboratory - Quality Control Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures In case of potential exposure:
Protective gloves Respiratory protection 11.14 Contributing Scenario (14) contro Name of contributing scenario Scenario subtitle Qualitative Risk Assessment General Product characteristics	No no lling industrial worker exposure for PROC 15 15 - Use of laboratory reagents in small scale laboratories Laboratory activities [CS36]. Laboratory - Quality Control 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.
Protective gloves Respiratory protection 11.14 Contributing Scenario (14) contro Name of contributing scenario Scenario subtitle Qualitative Risk Assessment General Product characteristics Physical state	No no lling industrial worker exposure for PROC 15 15 - Use of laboratory reagents in small scale laboratories Laboratory activities [CS36]. Laboratory - Quality Control 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.
Protective gloves Respiratory protection 11.14 Contributing Scenario (14) contro Name of contributing scenario Scenario subtitle Qualitative Risk Assessment General Product characteristics	No no lling industrial worker exposure for PROC 15 15 - Use of laboratory reagents in small scale laboratories Laboratory activities [CS36]. Laboratory - Quality Control 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.

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Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by ris	k management
Exposed skin surface	240 cm^2
Other given operational conditions	iffecting workers exposure
Location	indoors
Domain	industrial
Technical conditions and measures	o 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
	PROC 2 - Use in closed, continuous process with occasional controlled exposure
Name(s) of contributing worker scenarios and corresponding PROCs	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

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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

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%)

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

12.2 Contributing Scenario (2) controlling inc	dustrial 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	
	Ensure good work practices are implemented
	Provide basic employe training to prevent/minimize
Commit	exposures
General	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 manage	ement
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	
	Ensure good work practices are implemented
	Provide basic employe training to prevent/minimize
General	exposures
	In case of potential exposure:
	Use suitable eye protection.
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	Use suitable chemically resistant gloves.
Product characteristics	ese sultante enemietari, resistante groves.
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	
Exposed skin surface	480 cm^2
Other given operational conditions af	
Location	indoors
Domain	industrial
Technical conditions and measures to	
Local exhaust ventilation	no
	ersonal protection, hygiene and health evaluation
Protective gloves	No
Respiratory protection	no
T T T	
12.4 Contributing Scenario (4) contro	olling 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	
	Ensure good work practices are implemented
	Provide basic employe training to prevent/minimize
General	exposures In case of potential exposure:
	Use suitable eye protection.
	Use suitable chemically resistant gloves.
Product characteristics	ese surable eleminearly resistant groves.
Physical state	liquid
Concentration in substance	100%
Fugacity / Dustiness	medium
Frequency and duration of use	modum
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk	
Human factors not influenced by risk	
Exposed skin surface	240 cm ²
Exposed skin surface Other given operational conditions af	240 cm ² fecting workers exposure
Exposed skin surface	240 cm ²
Exposed skin surface Other given operational conditions af	240 cm ² fecting workers exposure

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Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control	dispersion and exposure
Local exhaust ventilation	no
Conditions and measures related to personal J	protection, hygiene and health evaluation
Protective gloves	No
Respiratory protection	no
12.5 Contributing Scenario (5) controlling ind	ustrial 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	
	Ensure good work practices are implemented
	Provide basic employe training to prevent/minimize
General	exposures
General	In case of potential exposure:
	Use suitable eye protection.
	Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	1009
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 manage	ment
Exposed skin surface	240 cm^2
Other given operational conditions affecting v	vorkers 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 J	protection, hygiene and health evaluation
Protective gloves	No
Respiratory protection	no
12.6 Contributing Scenario (6) controlling ind	ustrial worker exposure for PROC 3
	3 - Use in closed batch process (synthesis or formulation)
Name of contributing scenario	5 Ose in closed batch process (synthesis of formulation)
Name of contributing scenario Scenario subtitle	Batch process [CS55]. Suspension reactor

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Gen. Variant: SDS NO STYRENE MONOMER Version 2.1 Revision Date 04/29/2016 Print Date 04/29/2016 SDS No.: BE645 Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures General In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves. **Product characteristics** Physical state liquid 100% Concentration in substance 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 240 cm^2 Exposed skin surface 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** Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures General 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) 168 / 294

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Frequency of use		5 days / week	
Human factors not in	nfluenced by risk manageme	ent	
Exposed skin surface		240 cm ²	
Other given operation	onal conditions affecting wor	kers exposure	
Location		indoors	
Ventilation		good (30%)	
Domain		industrial	
Technical conditions	and measures to control dis	persion and exposure	
Local exhaust ventilat		no	-
Conditions and meas	sures related to personal pro	tection, hygiene and health evaluation	
Protective gloves	• •	No	-
Respiratory protection	1	no	
12.8 Contributing Sc	enario (8) controlling indust	rial worker exposure for PROC 8A	
Name of contributing	g scenario	8a - Transfer of chemicals from/to vessels, non dedicated facilities	large containers at
Scenario subtitle		Process sampling [CS2]. Sampling from re	eactors/tanks
Qualitative Risk Ass	essment		
		Ensure good work practices are implemen	ted
		Provide basic employe training to prevent	'minimize
General		exposures	
		Use suitable eye protection.	
		Use suitable chemically resistant gloves.	ua ta tha alsin
Product characterist	ias	Wear suitable coveralls to prevent exposur	e to the skin.
Physical state	ics	liquid	
Concentration in subs	tanca	nquia	100%
Fugacity / Dustiness	tance	medium	10070
Frequency and dura	tion of use	nedium	
Duration of activity	tion of use	>4 hours (default)	
Frequency of use		5 days / week	
1 ,	nfluenced by risk manageme	*	
Exposed skin surface	Tion manageme	960 cm ²	
	onal conditions affecting wor		
Location Location	mar conditions affecting wor	indoors	
Domain		industrial	
	and measures to control dis		
Local exhaust ventilat		no	
		tection, hygiene and health evaluation	
Protective gloves	production personal pro-	No	
		1 - 15	
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Respiratory protection



according to Regulation (EC) No. 1907/2006 Gen. Variant: SDS NO STYRENE MONOMER Revision Date 04/29/2016 SDS No.: BE645 Version 2.1 Print Date 04/29/2016 Respiratory protection inhalation: 80 % (justification: Use a sampling system Use a sampling system designed to control exposure designed to control exposure) 12.9 Contributing Scenario (9) controlling industrial worker exposure for PROC 8B 8b - Transfer of chemicals from/to vessels/ large containers at Name of contributing scenario dedicated facilities Material transfers [CS3]. Loading tank storage from road, rail Scenario subtitle or boat transport

Clear transfer lines prior to de-coupling	
Ensure good work practices are implemented	
Provide basic employe training to prevent/minimize	
exposures	
Use suitable eye protection.	
Use suitable chemically resistant gloves.	
liquid	
100	0%
medium	
15 mins to 1 hour	
5 days / week	
ent	
960 cm ²	
kers exposure	
indoors	
industrial	
spersion and exposure	
no	
tection, hygiene and health evaluation	
No	
	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. liquid 10 medium 15 mins to 1 hour 5 days / week ent 960 cm² ekers exposure indoors industrial spersion and exposure no notection, hygiene and health evaluation

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

no

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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 n	nanagement	
Exposed skin surface	960 cm ²	
Other given operational conditions affective		
Location	indoors	
Domain	industrial	
Technical conditions and measures to c	control dispersion and exposure	
Local exhaust ventilation	no	
Conditions and measures related to per	rsonal protection, hygiene and health evaluation	
Protective gloves	No	
Respiratory protection	no	
12.11 Contributing Scenario (11) contr	olling 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 r		
Exposed skin surface	960 cm^2	
Other given operational conditions affective	cung workers exposure	
Other given operational conditions affection	indoors	

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Domain	1	industrial	
	ons and measures to control dis		
Local exhaust vent		no	
		tection, hygiene and health evaluation	_
Protective gloves	icasures related to personal pro	No	
Respiratory protec	tion	no	
7			
12.12 Contributir	ng Scenario (12) controlling ind	ustrial worker exposure for PROC 8B	
Name of contribu	ting scenario	8b - Transfer of chemicals from/to vessels/dedicated facilities	/ large containers at
Scenario subtitle		Material transfers [CS3]. Waste management process wastes to storage containers: off-li	
Qualitative Risk	Assessment		
General		Ensure good work practices are implement Provide basic employe training to prevent/ exposures In case of potential exposure: Use suitable eye protection. Use suitable chemically resistant gloves.	
Product characte	rictics	Ose suitable elicilicarry resistant groves.	
Physical state	Tistics	liquid	
Concentration in s	ubstance		100%
Fugacity / Dustine		medium	
Frequency and du			
Duration of activit		15 mins to 1 hour	
Frequency of use	,	5 days / week	
	ot influenced by risk manageme	-	
Exposed skin surfa	· e	960 cm ²	
	ational conditions affecting wor		
Location	ational conditions affecting wor	indoors	
Domain		industrial	
	ons and measures to control dis		
Local exhaust vent		no	
		tection, hygiene and health evaluation	
Protective gloves	icusares related to personal pro	No	
Respiratory protec	tion	no	
		ustrial worker exposure for PROC 9	
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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 man	agement
Exposed skin surface	480 cm ²
Other given operational conditions affecting	ng workers exposure
Location	indoors
Domain	industrial
Technical conditions and measures to cont	rol dispersion and exposure
Local exhaust ventilation	no
Conditions and measures related to person	al protection, hygiene and health evaluation
Protective gloves	No
Respiratory protection	no
12.14 Contributing Scenario (14) controllin	ng 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	
	Ensure good work practices are implemented
	Provide basic employe training to prevent/minimize exposures
General	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 man	agement
Exposed skin surface	240 cm ²
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Other given operational conditions affecting wor	rkers exposure
Location	indoors
Domain	industrial
Technical conditions and measures to control dis	spersion and exposure
Local exhaust ventilation	no
Conditions and measures related to personal pro-	otection, 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
	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)
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 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

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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

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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 m	anagement	
Exposed skin surface	480 cm ²	
Other given operational conditions affect		
Location	indoors	
Domain	industrial	
Technical conditions and measures to co	ontrol dispersion and exposure	
Local exhaust ventilation	no	
Conditions and measures related to pers	sonal protection, hygiene and health evaluation	
Protective gloves	No	
Respiratory protection	no	
	ng industrial worker exposure for PROC 2 2 - Use in closed, continuous process with occasional	
Name of contributing scenario	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	1 8 8	
Physical state	liquid	
Concentration in substance	1	100%
Fugacity / Dustiness	medium	
Frequency and duration of use	<u>'</u>	

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Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by ris	k management
Exposed skin surface	480 cm^2
Other given operational conditions	ffecting workers exposure
Location	indoors
Domain	industrial
Technical conditions and measures	o 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

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		
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General

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Gen. Variant: SDS NO STYRENE MONOMER Version 2.1 Revision Date 04/29/2016 Print Date 04/29/2016 SDS No.: BE645 Protective gloves No Respiratory protection nο 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** Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures General 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 240 cm^2 Exposed skin surface 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** Ensure good work practices are implemented Provide basic employe training to prevent/minimize

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exposures

In case of potential exposure: Use suitable eye protection.

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	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 manageme	ent
Exposed skin surface	240 cm ²
Other given operational conditions affecting wor	rkers exposure
Location	indoors
Ventilation	good (30%)
Domain	industrial
Technical conditions and measures to control dis	spersion and exposure
Local exhaust ventilation	no
Conditions and measures related to personal pro-	otection, hygiene and health evaluation
Protective gloves	No
Respiratory protection	no
13.7 Contributing Scenario (7) controlling indus	
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	Γ
	Ensure good work practices are implemented Provide basic employe training to prevent/minimize exposures
General	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)
	>+ nours (default)
Frequency of use	5 days / week
·	5 days / week
Frequency of use	5 days / week
Frequency of use Human factors not influenced by risk management	5 days / week ent 240 cm ²
Frequency of use Human factors not influenced by risk management Exposed skin surface	5 days / week ent 240 cm ²

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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	
respiratory protection	IIO .	
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	1 .	
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 manage	ment	
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 I	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 ind	ustrial worker exposure for PROC 8B	

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Name of contributing scenario	8b - Transfer of chemicals from/to vessels dedicated facilities	s/ large containers at
Scenario subtitle	Material transfers [CS3]. Loading tank sto or boat transport	orage from road, rail
Qualitative Risk Assessment		
	Clear transfer lines prior to de-coupling	
	Ensure good work practices are implement	
Consent	Provide basic employe training to prevent exposures	/minimize
General	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 manageme	ent	
Exposed skin surface	960 cm ²	
Other given operational conditions affecting wor	rkers exposure	
Location	indoors	
Domain	industrial	
Technical conditions and measures to control dis	spersion and exposure	
Local exhaust ventilation	no	
Conditions and measures related to personal pro-	tection, hygiene and health evaluation	
Protective gloves	No	
Respiratory protection	no	
13.10 Contributing Scenario (10) controlling ind	ustrial worker exposure for PROC 8B	
Name of contributing scenario	8b - Transfer of chemicals from/to vessels dedicated facilities	s/ large containers at
Scenario subtitle	Equipment maintenance [CS5]. Manufact maintenance: opening and cleaning manufor maintenance purposes	
Qualitative Risk Assessment		
General	Ensure good work practices are implement Provide basic employe training to prevent exposures	
	In case of potential exposure: Use suitable eye protection.	
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	Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	1009
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 i	
Exposed skin surface	960 cm ²
Other given operational conditions affo	ecting workers exposure
Location	indoors
Domain	industrial
Technical conditions and measures to o	control dispersion and exposure
Local exhaust ventilation	no
Conditions and measures related to per	rsonal protection, hygiene and health evaluation
Protective gloves	No
Respiratory protection	no
13.11 Contributing Scenario (11) contributing scenario	rolling industrial worker exposure for PROC 8B 8b - Transfer of chemicals from/to vessels/ large containers at
Scenario subtitle	dedicated facilities Bulk transfers [CS14]. Finished product Loading of road
Scenario subtitie	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
`	
Frequency of use	
Frequency of use Human factors not influenced by risk i	management 960 cm ²
Frequency of use Human factors not influenced by risk I Exposed skin surface	management 960 cm ²
Frequency of use Human factors not influenced by risk in Exposed skin surface Other given operational conditions affective and the statement of the statement	management 960 cm ² ecting workers exposure
Frequency of use Human factors not influenced by risk to Exposed skin surface Other given operational conditions afford Location	management 960 cm ² ecting workers exposure indoors industrial
Frequency of use Human factors not influenced by risk in Exposed skin surface Other given operational conditions afford Location Domain	management 960 cm ² ecting workers exposure indoors industrial
Frequency of use Human factors not influenced by risk in Exposed skin surface Other given operational conditions afform Location Domain Technical conditions and measures to other Local exhaust ventilation	management 960 cm ² ecting workers exposure indoors industrial control dispersion and exposure
Frequency of use Human factors not influenced by risk in Exposed skin surface Other given operational conditions afformation and the Exposed skin surface Location Domain Technical conditions and measures to the Exposed skin surface	management 960 cm² ecting workers exposure indoors industrial control dispersion and exposure no
Frequency of use Human factors not influenced by risk to Exposed skin surface Other given operational conditions afform Location Domain Technical conditions and measures to one Local exhaust ventilation Conditions and measures related to perform the performance of the conditions and measures related to perform the conditions and measures related to the conditions and measures related to the co	management 960 cm² ecting workers exposure indoors industrial control dispersion and exposure no rsonal protection, hygiene and health evaluation

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Respiratory protection	no
13.12 Contributing Scenario (12) controlling ind	uctrial warker expecure for DDOC 8R

13.12 Contributing Scenario (12) controlling ind	ustrial 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 wor	kers exposure	
Location	indoors	
Domain	industrial	
Technical conditions and measures to control dis	spersion and exposure	
Local exhaust ventilation	no	
Conditions and measures related to personal pro-	otection, 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
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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 dis	spersion 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

	Ensure good work practices are implemented
General	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

ł	Exposed	skin sur	face	240 cn	n-
	-				

Other given operational conditions affecting workers exposure

Location	indoors
Domain	industrial

Technical conditions and measures to control dispersion and exposure

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

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	LPNEC	RCR = PEC/PNEC	MSafe kg/d	
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Agricultural soil	0.012296 mg/kg _{dwt}	0.200 mg/kg _{dwt}	0.061479	2.09E+08
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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

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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

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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

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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

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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	concentration 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

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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

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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

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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

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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.

Table 21. Worker risk of ES 2.2

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

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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.

Table 27. Worker risk of ES 2.8

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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.

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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.

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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.

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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.

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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

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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

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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.

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

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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.

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

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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.

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

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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.

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

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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.

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

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

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

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Combined routes	6.885 mg/kg _{bw} /day	-	0.512224
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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

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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.

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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.

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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

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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.

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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.

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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.

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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

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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

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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

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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

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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

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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

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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)		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

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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

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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

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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

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Marine water sediment	0.007737	0.5432	0.014243	3.21E+06
	mg/kg _{dwt}	mg/kg _{dwt}		

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	-

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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

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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

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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.

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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.

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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

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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

Table 99. Worker fisk of ES 0.1	-		
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/m³. The confidence interval is 8,1 mg/m³ to 44 mg/m³.	18 mg/m ³	85 mg/m ³	0.211765
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			

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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.

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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

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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	-

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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 vacuum 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

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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.

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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

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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 regins is applied by ground applications where regins is applied by ground 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

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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

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Combined routes	1.449 mg/kg _{bw} /day	-	0.00976
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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

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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

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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)

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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

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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

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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

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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

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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

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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

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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

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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	-

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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

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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

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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

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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.

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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.

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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.

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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.

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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.

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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

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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.

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

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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

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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

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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)		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

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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)		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

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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

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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)		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

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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.

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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.

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

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Combined routes	4.471 mg/kg _{bw} /day	-	0.258645
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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.

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

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Combined routes	5.025 mg/kg _{bw} /day	-	0.359063
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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.

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

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Combined routes	5.025 mg/kg _{bw} /day	-	0.359063
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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

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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.

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

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

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

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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.

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

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Combined routes	6.542 mg/kg _{bw} /day	-	0.511379
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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

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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

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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

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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

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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

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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

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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

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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**

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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

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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	1
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	-

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Total	0.000112 mg/kg _{bw} /day	2.1 mg/kg _{bw} /day	0.000054	9.04E+09
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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.

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

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Combined routes	4.471 mg/kg _{bw} /day	-	0.258645
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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

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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.

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

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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.

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

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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.

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

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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.

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

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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

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	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