TENNANTS DISTRIBUTION LIMITED
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PRODUCT SPECIFICATION

Product Name	Styrene Monomer
Specification Reference	STMO/5 (17/02/0047108)

SALES SPECIFICATION

Property	**Unit**	**Method**	**Specification**
Appearance		Visual	Clear colourless liquid
Purity	wt. %	ASTM D 5135	Min 99.80
Benzene	mg/kg	ASTM D 6229	Max 1
Ethyl Benzene	mg/kg	ASTM D 5135	Max 500
787878787878787878789997	wt. %	ASTM D 2119	Max 0.0100
Peroxides as H_2O_2	mg/kg	ASTM D 2340	Max 50
Polymer	mg/kg	ASTM D 2121 Test Method A	Max 10
Inhibitor	ppm wt	ASTM D 4590	10 – 15
Colour or	Pt-Co scale	ASTM D 1209	Max 10
Colour	Pt-Co scale	ASTM D 5386	Max 15

NOTES

Exclusion of Liability

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Health and Safety

A Material Safety Data Sheet has been issued describing the health, safety and environmental properties of this product, identifying the potential hazards and giving advice on the handling precautions and emergency procedures. This must be consulted fully before handling, storage and use.

SAFETY DATA SHEET

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY

1.1 Product Identifier

Chemical Name (EINECS)	Styrene
CAS Number	100-42-5
EINECS Number	202-851-5
Index Number	601-026-00-0
REACH Registration Number	01-2119457861-32-XXXX

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

Identified use(s):
Polymerisation
Manufacture and formulation of resins
Use of resins and mixture of resins

Uses advised against
No data available.

Reference to relevant exposure scenarios
For an overview of the exact titles of the relevant exposure scenarios please refer to section 16 of this SDS.

1.3 Details of the supplier of the safety data sheet

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1.4 Emergency telephone number
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2. HAZARDS IDENTIFICATION

Classification of the substance or mixture

Classification in accordance with Regulation (EC) No 1272/2008
Acute Tox. 4; H332
Aquatic Chronic 3; H412
Asp. Tox. 1; H304
Eye Irrit. 2; H319
Flam. Liq. 3; H226
Repr. 2; H361d
Skin Irrit. 2; H315
STOT RE 1; H372
STOT SE 3; H335

Classification information
This product is assessed and classified using the methods and criteria below referred to in Article 9 of Regulation (EC) n° 1272/2008: Physical hazards: determined through assessment data based on the methods or standards referred to in part 2 of Annex I to CLP. Health hazards and environmental hazards: determined through toxicological and ecotoxicological assessment data based on the methods or standards referred to in Part 3 and 4 of Annex I to CLP.

Label Elements

Labelling according to Regulation (EC) No 1272/2008 (CLP Regulation)

Product identifier
100-42-5 (styrene)

Hazard Pictograms

GHS02 GHS07 GHS08

Single Word: Danger

Hazard statements

H226 Flammable liquid and vapour.
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 ears through prolonged or repeated exposure by inhalation.
H412 Harmful to aquatic life with long lasting effects.

Precautionary statements

P210 Keep away from heat/sparks/open flames/hot surfaces. – No smoking
P260 Do not breathe dust/fume/gas/mist/vapours/spray.
P301+ P310 IF SWALLOWED. Immediately call a POISON CENTER or doctor/physician.
P331 Do NOT induce vomiting.
P370+P378 In case of fire: Use water spray, extinguishing powder, foam or CO_2 to extinguish.
P403+P233 Store in a well-ventilated place. Keep container tightly closed.

2.3 Other hazards

PBT assessment: The product is not considered to be a PBT.
vPvB assessment: The product is not considered to be a vPvB.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substances

Styrene characterisation

Styrene, stabilizer: 4-tert-butylpyrocatechol (CAS 98-29-3)
Formula: C_8H_8
Molecular weight: 104.15

Identification numbers

CAS Number: 100-42-5
EC Number: 202-851-5
Index Number: 601-026-00-0

4. FIRST AID MEASURES

4.1 Description of first aid measures

General information

In case of persisting adverse effects, consult a physician. Remove contaminated clothing and shoes immediately, and launder thoroughly before reusing. If the patient is likely to become unconscious, place and transport in stable sideways position.

Inhalation

When inhaled remove to fresh air and seek medical aid.

Skin contact

In case of contact with skin wash off immediately with soap and water.

Eye contact

Remove contact lenses. Rinse eye thoroughly under running water keeping eyelids wide open and protecting the unaffected eye (at least 10 to 15 minutes).

Ingestion

Seek medical attention. Do not induce vomiting. Rinse mouth thoroughly with water. Never give anything by mouth to an unconscious person.

4.2 Most import symptoms and effects, both acute and delayed

Effects

In the case of swallowing with subsequent vomiting, aspiration of the lungs can occur which can lead to chemical pneumonia or asphyxiation.

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIRE FIGHTING MEASURES

5.1 Extinguishing Media

Suitable extinguishing media: Carbon dioxide; water spray jet; Alcohol-resistant foam; extinguishing powder.
Unsuitable extinguishing media: High power water jet

5.2 Special hazards arising from the substance or mixture

In the event of fire, the following can be released: Carbon dioxide (CO_2); Carbon monoxide (CO)

5.3 Advice for fire-fighters

Cool endangered containers with water spray jet. Use self-contained breathing apparatus. Wear protective clothing.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel

Ensure adequate ventilation. Remove persons to safety. Keep away sources of ignition.

For emergency responders

No data available. Personal protective equipment (PPE) – see Section 8.

6.2 Environmental precautions

Do not allow to enter drains or waterways. Do not discharge into subsoil/soil.

6.3 Methods and material for containment and cleaning up

Pick up with absorbent material (e.g. kieselguhr). When picked up, treat material as prescribed under heading "Disposal considerations".

6.4 Reference to other sections

Information regarding Waste Disposal see Section 13

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Product inherent handling risks must be minimised taking the appropriate measures for protection and preventive actions. The working process should be designed to rule out the release of hazardous substances or skin contact as far it is possible by the state of the art. Avoid eye, skin and clothing contact. Avoid formation of aerosols.

General protective and hygiene measures

Wash hands and skin before breaks and after work. Remove soiled or soaked clothing immediately. Keep away from food, drink and animal feeding stuffs. Avoid contact with eyes and skin. Provide eye wash fountain in work area. Do not inhale vapours. Do not eat or drink during work - no smoking.

Advice on protection against fire and explosion

Vapours can form an explosive mixture with air. Keep away from sources of ignition - refrain from smoking. Take precautionary measures against static charges.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures and storage conditions

Keep container tightly closed in a cool, well-ventilated place, open and handle carefully. Stabiliser may lose effectiveness by long-term storage of product. Protect from light.

Recommended storage temperature.

Value < 40ºC

Requirements for storage rooms and vessels

Keep container tightly closed. Containers which are opened must be carefully closed and kept upright to prevent leakage.

Appropriate material: steel; stainless steel; glass; aluminium

Inappropriate material: brass, copper, copper alloys

Advice on storage assembly

Do not store together with: Oxidizing agents; Acids; Peroxides; explosive substances; spontaneously combusting substances; ammonium nitrate

7.3 Specific end use(s)

No data available

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Exposure limit values

Styrene
CAS No:100-42-5
EC No: 202-851-5

List of approved workplace exposure limits (WELs) / EH40

Styrene		
TWA	430 mg/m^3	100ml/m^3
STEL	1080 mg/m^3	250ml/m^3

DNEL and PNEC values

DNEL value (worker)

STYRENE
CAS no:100-42-5
EC no: 202-851-5

Routes of exposure	**Exposure time**	**Effect**	**Value**
Dermal	Long term (chronic)	systemic	406 mg/kg/day
Inhalation	Short term (acute)	local	306mg/m^3
Inhalation	Short term (acute)	systemic	289 mg/m^3

Inhalation	Long term (chronic)	systemic	85 mg/m^3

DNEL value (consumer)
STYRENE
CAS no:100-42-5
EC no: 202-851-5

Routes of exposure	Exposure time	Effect	Value
Oral	Long term (chronic)	systemic	2.1 mg/kg/day
Dermal	Long term (chronic)	systemic	343 mg/kg/day
Inhalation	Short term (acute)	systemic	174.25 mg/m^3
Inhalation	Short term (acute)	local	182.75 mg/m^3
Inhalation	Long term (chronic)	systemic	10.2 mg/m^3

PNEC Values
STYRENE
CAS no:100-42-5
EC no: 202-851-5

Ecological compartment	Type	Value
Water	Fresh water	0.028 mg/l
Water	Marine water	0.014 mg/l
Water	Fresh water sediment	0.614 mg/kg dry weight
Water	Marine water sediment	0.307 mg/kg dry weight
Water	Aqua intermittent	0.04 mg/l
Soil	-	0.2 mg/kg dry weight
Sewage treatment plant	-	5 mg/l

8.2 Exposure controls

Appropriate Engineering controls
No data available

Personal protective equipment

Respiratory protection
Respiratory protection is required under exceptional conditions such as unintentional release of chemicals, exceeding of threshold values for air. In case of aerosol and mist formation, take appropriate measures for breathing protection in the event workplace threshold values are not specified.
Respirator: Type A

Hand protection
Protective gloves (EN 374); Before use, the protective gloves should be tested in any case for its specific work-station suitability (i.e. mechanical resistance, product compatibility and antistatic properties). Adhere to the manufacturer's instructions and information relating to the use, storage, care and replacement of protective gloves. Protective gloves shall be replaced immediately when physically damaged or worn. Design operations thus to avoid permanent use of protective gloves.
Appropriate Material: Fluorocarbon rubber (Viton)
Material thickness: 0.4 mm
Breakthrough time: >480 min.

Eye protection
Tightly fitting safety glasses (EN 166).

Other
Normal chemical work clothing

Environmental exposure controls
No data available.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties	
Form	Liquid
Colour	Colourless to yellowish
Odour	Characteristic
Odour threshold	No data available
pH value	No data available
Melting point	-31ºC
Boiling point	145ºC at 101.3 kPa
Decomposition point	No data available
Flashpoint	31ºC
Auto- ignition temperature	No data available
Oxidising properties	Not oxidising

Explosive properties	Product does not present an explosion hazard
Flammability (solid, gas)	No data available
Lower flammability or explosive limits	1.1% vol
Upper flammability or explosive limits	6.1% vol
Vapour pressure at 20ºC	6.67 hPa
Vapour density	No data available
Evaporation rate	No data available
Relative density	0.9 at 20ºC
Density at 20 ºC	0.9-0.91 g/cm^3
Solubility in water at 25ºC	320 mg/l
Solubilities	No data available
Partition coefficient (log Pow)(octanol/water)at 25ºC	2.96
Viscosity, dynamic	0.696 mPa*s at 25ºC
9.2 Other information	No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage and handling conditions (See section 7).

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Formations of peroxides possible. Risk of polymerisation; Heat, naked flames and other ignition sources. light

10.5 Incompatible materials
Oxidizing agents; Acids

10.6 Hazardous decomposition products
None, if handled according to intended use.

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

Acute oral toxicity	
LD50	5000 mg/kg
Species	Rat
Source	ECHA
Acute dermal toxicity	
LD50	>2000 mg/kg
Species	Rat
Source	ECHA
Acute inhalation toxicity	
LC50	11.8 mg/l
Duration of exposure	4 hours
Species	Rat
Source	ECHA
Irritant/ corrosive effects	
Irritant effects on skin	
Species	Rabbit
Evaluation	Irritant
Source	ECHA
Irritant effects on eyes	
Species	Rabbit
Evaluation	Irritant
Source	ECHA
Sensitisation	
Species	Guinea Pig
Evaluation	Non-sensitizing

Source	ECHA

Germ cell mutagenicity

Value	Based on available data, the classification criteria are not met.
Source	ECHA

Reproduction toxicity

Source	ECHA
Remarks	Based on available data, the classification criteria are not met.

Carcinogenicity

Source	ECHA
Remarks	Based on available data, the classification criteria are not met.

STOT-single exposure

No data available

STOT-repeated exposure

No data available

Aspiration hazard

In case of swallowing with subsequent vomiting, aspiration of the lungs can occur which can lead to chemical pneumonia or asphyxiation

Delayed and immediate effects as well as chronic effects from short and long-term exposure.

Irritates respiratory tract.

12. ECOLOGICAL INFORMATION

12.1 Other adverse effects

Ecotoxicity

Fish toxicity

LC50	4.02 mg/l
Species	Pimephale promelas
Duration of exposure	96 hours
Source	ECHA

Daphnia toxicity (acute)

EC50	4.7 mg/l
Species	Daphnia magna
Method	OECD 202
Duration of exposure	48 hours
Source	ECHA

Daphnia toxicity (chronic)

EC50	1.01 mg/l
Species	Daphnia magna
Method	OECD 211
Duration of exposure	21 days
Source	ECHA

Algae toxicity (acute)

EC50	>4.9 mg/l
Species	Selenastrum capricornutum
Method	EPA OTS 797.1050
Duration of exposure	72 hours
Source	ECHA

Algae toxicity (chronic)

EC50	0.28 mg/l
Species	Selenastrum capricornutum
Method	EPA OTS 797.1050
Duration of exposure	96 days
Source	ECHA

Bacteria toxicity

EC50	Appr. 500mg/l
Species	Activated sludge
Method	OECD 209
Duration of exposure	30 min
Source	ECHA

12.2 Persistence and degradability

Biodegradability

Value	70.9% ThOD
Duration of exposure	28 days

Method	ISO DIS 9408
Source	ECHA
Evaluation	Readily biodegradable
Abiotic degradation	
Type	Photolysis
Half-life	7.4 h
Source	ECHA
12.3 Bioaccumulative potential	
Bioaccumulative potential	
Partition coefficient: n-octanol/water	
Log Pow	2.96
Reference temperature	25ºC
Source	ECHA
12.4 Mobility in soil	
Log Koc	2.55
Reference temperature	20ºC
Method	QSAR
Source	ECHA
12.5 Results of PBT and vPvB assessment	
PBT assessment	The product is not considered to be a PBT.
vPvB assessment	The product is not considered to be a vPvB.

12.6 Other adverse effects
No data available

12.7 Other information
Product is not allowed to discharge into aquatic environment, drains or sewage treatment plants**.**

13. DISPOSAL CONSIDERATIONS

13.1 Product
Allocation of a waste code number, according to the European Waste catalogue, should be carried out in agreement with the regional waste disposal company.

13.2 Packaging
Residuals must be removed from packaging and when emptied completely disposed of in accordance with the regulations for waste removal. Incompletely emptied packaging must be disposed of in the form of disposal specified by the regional disposer.

14. TRANSPORT INFORMATION

Transport ADR/RID/ADN	
Class	3
Classification code	F1
Packaging group	III
Hazard identification number	39
UN number	2055
Technical name	Styrene monomer , stabilized
Tunnel restriction code	D/E
Label	3
Transport IMDG	
Class	3
Packaging group	III
UN number	2055
Proper shipping name	Styrene monomer, stabilized
EmS	F-E+S-D
Label	3
Transport ICAO/IATA	
Class	3
Packaging group	III
UN number	2055
Proper shipping name	Styrene monomer, stabilized
Label	3
Other information	No further data
Environmental hazards	Information on environmental hazards, if relevant, see

above

Transport in bulk according to Annex II of Marpol and the IBC Code
Product name: Styrene monomer
Pollution category: Y
Ship type: 3

15. REGULATORY INFORMATION

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture
EU Regulations
Regulation (EC) No 1907/2006 (REACH) Annex XIV (List of substances subject to authorisation)
In accordance with the Reach regulation (EC) 1907/2006, the product does not contain any substances that are considered as subject to listing in annex XIV, inventory of substances requiring authorisation.
REACH candidate list of substances of very high concern (SVHC) for authorisation
In accordance with article 57 and article 59 of the Reach regulation (EC) 1907/2006, this substance is not considered as subject to listing in annex XIV, inventory of substances requiring authorisation ("Authorisation list").
Regulation (EC) No 1907/2006 (REACH) Annex XVII: RESTRICTIONS ON THE MANUFACTURE, PLACING ON THE MARKET AND USE OF CERTAIN DANGEROUS SUBSTANCES, PREPARATIONS AND ARTICLES
The substance is not subject to the provisions of annex XVII (restriction entries) of the Reach regulation (EC) 1907/2006.
Directive 2012/18/EU on the control of major-accident hazards involving dangerous substances
This product is subject to Part I of Annex I, risk category: P5c
Other regulations
Adhere to the national sanitary and occupational safety regulations when using this product.
National Regulations
National chemical inventories

EINECS/ELINCS (European Community)	listed
TSCA (USA)	listed
DSL/NDSL (Canada)	DSL listed
MITI/ENCS (Japan)	listed
ECL (Korea)	listed
AICS (Australia)	listed
IECSC / NEPA (China)	listed
PICCS (Philippines)	listed
NZIoC (New Zealand)	listed
CSNN (Taiwan)	listed

15.2 Chemical safety assessment
A Chemical Safety Assessment has been carried out

16. OTHER INFORMATION

Further information
ES5 has been removed because "Use of resin/blended resins - consumer use" is no longer supported
Sources of key data used to compile the data sheet:
Regulation (EC) No 1907/2006 (REACH), 1272/2008 (CLP) as amended in each case. EC Directives 2000/39/EC, 2006/15/EC, 2009/161/EU
National Threshold Limit Values of the corresponding countries as amended in each case. Transport regulations according to ADR, RID, IMDG, IATA as amended in each case. The data sources used to determine physical, toxic and ecotoxic data, are indicated directly in the corresponding chapter.
List of existing exposition scenarios

ES001	Polymerisation - industrial use
ES002	Manufacturing/Formulation of resins - industrial use
ES003	Use of resins/blended resins - industrial use
ES004	Use of resins/blended resins - professional use

Source of key data used to compile the data sheet
Supplier information
Modifications from last revision
The Specification has been reviewed and updated. The Safety Data Sheet has been revised throughout in accordance with current requirements
Date: 06/02/17

Trade name: Styrene Monomer

SECTION 1: Title and scope of exposure scenario (ES)

1.1 Title exposure scenario (ES)

ES1 Polymerisation - industrial use

1.2 Scope of exposure scenario (ES)

ES Type	Worker Exposure Scenario for substance/mixture
Life cycle stage	Industrial end use

Product identifier

Trade name	Styrene Monomer
Substance name	styrene
REACH registration no.	01-2119457861-32
CAS no.	100-42-5
EC no.	202-851-5

Use descriptors

Sector of use (SU)		
Category	Code	Use description
Main user group	SU3	Industrial uses
Sector of end-use	SU12	Manufacture of plastics products, including compounding and conversion

Environmental release category (ERC)		
Category	Code	Use description
Environmental release category (ERC)	ERC6c	Industrial use of monomers for manufacture of thermoplastics

Process category (PROC)		
Category	Code	Use description
Process category (PROC)	PROC2	Use in closed, continuous process with occasional controlled exposure
	PROC3	Use in closed batch process (synthesis or formulation)
	PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities
	PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
	PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
	PROC14	Production of preparations or articles by tabletting, compression, extrusion, pelettisation
	PROC15	Use as laboratory reagent

SECTION 2: Operational conditions (OC) and risk management measures (RMM) controlling exposure towards environment and men

2.1 Product characteristics

State of aggregation		
liquid		
Reference temperature	25	°C

Dustiness
Not applicable

Vapour pressure		
Value	6.67	hPa
Reference temperature	20	°C
Source	ECHA	

Other information
The efficiency of a risk management measure is a theoretical value. The efficiency describes to which extend (in percent) the calculated exposure can be diminished by applying a certain measure. If the described operational conditions and risk management measures are fulfilled by a downstream user, the efficiency as highlighted in the ES can be applied. A downstream user might check whether the efficiency of the LEV or general ventilation corresponds to his site.

2.2 Contributing scenario controlling environmental exposure

Affected environmental release category (ERC)		
Category	Code	Use description
Environmental release category (ERC)	ERC6c	Industrial use of monomers for manufacture of thermoplastics

Operational conditions controlling environmental exposure

Maximum allowable site tonnage covered by this ES (MSafe)			
	ERC6c		
MSafe	7340 t/d		

daily quantity used on site			
	ERC6c		
Value	483 t/d		

Emission conditions			
	ERC6c		
Type of emission	Continuous release		
Duration of emission	≤ 300 days/year		

Risk management measures (RMM) controlling environmental exposure

Technical measures and efficiency of the risk managment measures (in exposure calculation model)
No special measures are required.

Organisational measures
No special measures are required.

Measures related to wastewater treatment and efficiency of the risk managment measures (in exposure calculation model)		
ERC6c	Measures	Ensure all waste water is collected and treated via a WWTP.
	Efficiency (%)	91.9

Measures related to waste treatment
For further instructions related to waste management please refer to section 13 of the Safety Data Sheet.

2.3 Contributing scenario controlling worker exposure

Affected process category (PROC)		
Category	Code	Use description
Process category (PROC)	PROC2	Use in closed, continuous process with occasional controlled exposure
	PROC3	Use in closed batch process (synthesis or formulation)
	PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities
	PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
	PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
	PROC14	Production of preparations or articles by tabletting, compression, extrusion, pelettisation
	PROC15	Use as laboratory reagent

Operational conditions controlling worker exposure

Concentration of substance							
	PROC2, PROC15		PROC3		PROC8a		
Value	≤ 100	%	≤ 100	%	≤ 100	%	
	PROC8b		PROC9, PROC14				
Value	≤ 100	%	≤ 5	%			

Use conditions							
	PROC2, PROC15		PROC3		PROC8a		
Location of use	Indoor use		Indoor use		Indoor use		
Duration of use	≤ 8	hours/day	≤ 8	hours/day	≤ 8	hours/day	
Frequency of use	≤ 220	days/year	≤ 220	days/year	≤ 220	days/year	
	PROC8b		PROC9, PROC14				
Location of use	Indoor use		Indoor use				
Duration of use	≤ 1	hours/day	≤ 8	hours/day			
Frequency of use	≤ 220	days/year	≤ 220	days/year			

Further operational conditions	
PROC2, PROC15	Assumes a good basic standard of occupational hygiene is implemented.
PROC3	Assumes a good basic standard of occupational hygiene is implemented.
PROC8a	Assumes a good basic standard of occupational hygiene is implemented.
PROC8b	Assumes a good basic standard of occupational hygiene is implemented.
PROC9, PROC14	Assumes a good basic standard of occupational hygiene is implemented.

Risk management measures (RMM) controlling worker exposure

Technical measures and efficiency of the risk managment measures (in exposure calculation model)		
PROC2, PROC15	Measures	No special measures are required.
PROC3	Measures	Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour, corresponds to outdoor use).
	Efficiency (%)	30
PROC8a	Measures	No special measures are required.
PROC8b	Measures	No special measures are required.
PROC9, PROC14	Measures	No special measures are required.

Organisational measures	
PROC2, PROC15	No special measures are required.
PROC3	No special measures are required.
PROC8a	Use a sampling system designed to control exposure.
PROC8b	Drain down and flush system prior to equipment break-in or maintenance.
PROC9, PROC14	No special measures are required.

Personal protective equipment and efficiency of the risk managment measures (in exposure calculation model)

Advice	
PROC2, PROC15	For further instructions related to "Personal protective equipment" please refer to section 8 of the Safety Data Sheet.
PROC3	For further instructions related to "Personal protective equipment" please refer to section 8 of the Safety Data Sheet.
PROC8a	For further instructions related to "Personal protective equipment" please refer to section 8 of the Safety Data Sheet.
PROC8b	For further instructions related to "Personal protective equipment" please refer to section 8 of the Safety Data Sheet.
PROC9, PROC14	For further instructions related to "Personal protective equipment" please refer to section 8 of the Safety Data Sheet.

Eye / face protection		
PROC2, PROC15	Measures	Wear eye/face protection.
PROC3	Measures	Wear eye/face protection.
PROC8a	Measures	Wear eye/face protection.
PROC8b	Measures	Wear eye/face protection.
PROC9, PROC14	Measures	Wear eye/face protection.

Hand protection		
PROC2, PROC15	Measures	Wear suitable gloves tested to EN374.
PROC3	Measures	Wear suitable gloves tested to EN374.
PROC8a	Measures	Wear suitable gloves tested to EN374.
PROC8b	Measures	Wear suitable gloves tested to EN374.
PROC9, PROC14	Measures	Wear suitable gloves tested to EN374.

Other		
PROC2, PROC15	Measures	Wear standard work clothes.
PROC3	Measures	Wear standard work clothes.
PROC8a	Measures	Wear standard work clothes.
PROC8b	Measures	Wear standard work clothes.
PROC9, PROC14	Measures	Wear standard work clothes.

SECTION 3: Exposure estimation and reference to sources

3.1 Advice

The Risk Characterization Ratio (RCR) is the quotient of predicted human/environmental exposure and the related DNEL/PNEC. Exposure is calculated based on exposure models as stated below. If RCR ≤ 1 a use is considered as safe under operational conditions and risk management measures as specified in the exposure szenario.

For DNEL/PNEC values please refer to section 8 of the safety data sheet.

3.2 Exposure estimation - Environment

Affected environmental release category (ERC)		
Category	Code	Use description
Environmental release category (ERC)	ERC6c	Industrial use of monomers for manufacture of thermoplastics

Used exposure estimation model for calculation of environmental exposure	
Used exposure estimation model	EasyTRA Version 4.1
Link to exposure estimation tool	EASY TRA: http://www.easytra.de EU TGD spreadsheet: http://cem-nl.eu/eutgd.html
Other information	EU TGD 2003 Risk Assessment Spreadsheet Model 1.24a

Risk characterisation ratio (RCR)			
	ERC6c		
Microbiological activity in sewage treatment plants (STP)	0.000		
Freshwater	0.015		
Freshwater sediment	0.015		
Seawater	0.003		
Marine sediment	0.003		
Soil	0.066		
Indirect exposure for man via the environment	0.000		
Risc determining compartment	Soil		

3.3 Exposure estimation - Worker

Affected process category (PROC)		
Category	Code	Use description
Process category (PROC)	PROC2	Use in closed, continuous process with occasional controlled exposure
	PROC3	Use in closed batch process (synthesis or formulation)
	PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities
	PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
	PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
	PROC14	Production of preparations or articles by tabletting, compression, extrusion, pelettisation
	PROC15	Use as laboratory reagent

Used exposure estimation model for calculation of worker exposure	
Used exposure estimation model	EasyTRA Version 4.1
Link to exposure estimation tool	EASY TRA: http://www.easytra.de

Risk characterisation ratio (RCR)				
	Exposure estimation	**inhalative**	**dermal**	**total**
PROC2	Long-term systemic	0.255	0.003	0.258
PROC3	Long-term systemic	0.357	0.002	0.359
PROC8a	Long-term systemic	0.510	0.034	0.544
PROC8b	Long-term systemic	0.255	0.007	0.262
PROC9	Long-term systemic	0.510	0.003	0.513
PROC14	Long-term systemic	0.510	0.002	0.512
PROC15	Long-term systemic	0.510	0.001	0.511

SECTION 4: Guidance to DU to evaluate whether he works inside the boundaries set by the ES

4.1 Recommendations and advice

Recommendations and general advice

- For additional instructions relating to adaptation of conditions of use in view of a scaling, pls. see the VCI practice guide, part I, section 7.7. https://www.vci.de/Themen/Chemikaliensicherheit/REACH/Seiten/REACH-Praxisfuehrer.aspx

If a downstream user uses the substance/preparation differently than stated in the ES (different operational conditions and/or risk management measures), he has the possibility to vary certain parameters of the exposure assessment. With the help of easy calculations he can check whether he still operates under safe circumstances. This process is called Scaling.

Scaling advice

Type of ventilation

If the type of ventilation at the use site of a downstream user (DU) differs from the instructions in the ES, a linear correlation between the RCR (Inhalation) and the type of ventilation exists. Following scaling factors (f) apply: General ventilation (< 3 air changes per hour) =1; good general ventilation (3 to 5 air changes per hour, corresponds to outdoor use) = 0,7; enhanced general ventilation (> 5 air changes per hour) = 0,3.
RCR (DU) = f(DU) * RCR (as stated in ES) / f (type of ventilation stated in ES)
In the same manner a scaling for the efficiency of the local extract ventilation (LEV) can by applied.
Duration of use:
If the duration of the use by a worker at a downstream user (DU) site differs from the instructions in the ES, a linear correlation between the RCR (Inhalation) and the duration of use exist. Following scaling factors (f) apply: duration > 4 hours/day = 1; duration: 1-4 hours/day = 0,6; duration: 15 min/day – 1 hour/day = 0,2; duration < 15 min/day = 0,1.
RCR (DU) = f(DU) * RCR (as stated in ES) / f (duration in ES)
Concentration of the substance in the product:
If the downstream user (DU) uses the substance in a different concentration than the one stated in the ES, a linear correlation between the RCR (Inhalation)and the RCR (dermal) and the concentration exists. Following scaling factors (f) apply: Concentration >25% =1; concentration >= 5% = 0,6; concentration >= 1% = 0,2; concentration < 1% = 0,1.
RCR (DU) = f(DU) * RCR (as stated in ES) / f (concentration in ES).

4.2 Exposure estimation - Environment

Used exposure estimation model for calculation of environmental exposure	
Used exposure estimation model	EasyTRA Version 4.1
Link to exposure estimation tool	EASY TRA: http://www.easytra.de EU TGD spreadsheet: http://cem-nl.eu/eutgd.html
Other information	EU TGD 2003 Risk Assessment Spreadsheet Model 1.24a

Further input parameters used for environmental exposure estimation				
	ERC6c			
Effluent discharge volume of STP	≥	2000 m³/d		
River flow rate	≥	18000 m³/d		
Freshwater dilution factor		10		
Marine water dilution factor		100		
Emission factor air		0.001		
Emission factor water		0.000		
Emission factor soil		0.000		

4.3 Exposure estimation - Worker

Used exposure estimation model for calculation of worker exposure	
Used exposure estimation model	EasyTRA Version 4.1
Link to exposure estimation tool	EASY TRA: http://www.easytra.de

ES3 Use of resins/blended resins - industrial use

Trade name: Styrene Monomer

SECTION 1: Title and scope of exposure scenario (ES)

1.1 Title exposure scenario (ES)

ES3 Use of resins/blended resins - industrial use

1.2 Scope of exposure scenario (ES)

ES Type	Worker Exposure Scenario for substance/mixture
Life cycle stage	Industrial end use

Product identifier

Trade name	Styrene Monomer
Substance name	styrene
REACH registration no.	01-2119457861-32
CAS no.	100-42-5
EC no.	202-851-5

Use descriptors

Sector of use (SU)		
Category	Code	Use description
Main user group	SU3	Industrial uses
Sector of end-use	SU12	Manufacture of plastics products, including compounding and conversion

Environmental release category (ERC)		
Category	Code	Use description
Environmental release category (ERC)	ERC6d	Industrial use of process regulators for polymerisation processes in production of resins, rubbers, polymers

Process category (PROC)		
Category	Code	Use description
Process category (PROC)	PROC3	Use in closed batch process (synthesis or formulation)
	PROC5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)
	PROC7	Industrial spraying
	PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities
	PROC10	Roller application or brushing
	PROC13	Treatment of articles by dipping and pouring
	PROC14	Production of preparations or articles by tabletting, compression, extrusion, pelettisation
	PROC15	Use as laboratory reagent

Product category (PC)		
Category	Code	Use description
Product category (PC)	PC32	Polymer preparations and compounds

Other information

This use includes the manufacture of fiber reinforced polymers (FRP) using unsaturated polyester (UP)/ epoxy vinyl ester resins (VE) and/ or formulated resins

SECTION 2: Operational conditions (OC) and risk management measures (RMM) controlling exposure towards environment and men

2.1 Product characteristics

State of aggregation	
liquid	
Reference temperature	25 °C

Dustiness
Not applicable

Vapour pressure		
Value	6.67	hPa
Reference temperature	20	°C
Source	ECHA	

Other information
The efficiency of a risk management measure is a theoretical value. The efficiency describes to which extend (in percent) the calculated exposure can be diminished by applying a certain measure. If the described operational conditions and risk management measures are fulfilled by a downstream user, the efficiency as highlighted in the ES can be applied. A downstream user might check whether the efficiency of the LEV or general ventilation corresponds to his site.

2.2 Contributing scenario controlling environmental exposure

Affected environmental release category (ERC)		
Category	Code	Use description
Environmental release category (ERC)	ERC6d	Industrial use of process regulators for polymerisation processes in production of resins, rubbers, polymers

Operational conditions controlling environmental exposure

Maximum allowable site tonnage covered by this ES (MSafe)			
	ERC6d		
MSafe	737 t/d		

daily quantity used on site			
	ERC6d		
Value	161 t/d		

Emission conditions			
	ERC6d		
Type of emission	Continuous release		
Duration of emission	≤ 300 days/year		

Risk management measures (RMM) controlling environmental exposure

Technical measures and efficiency of the risk managment measures (in exposure calculation model)
No special measures are required.

Organisational measures
No special measures are required.

Measures related to wastewater treatment and efficiency of the risk managment measures (in exposure calculation model)		
ERC6d	Measures	Ensure all waste water is collected and treated via a WWTP.
	Efficiency (%)	91.9

Measures related to waste treatment
For further instructions related to waste management please refer to section 13 of the Safety Data Sheet.

2.3 Contributing scenario controlling worker exposure

Affected process category (PROC)		
Category	Code	Use description
Process category (PROC)	PROC3	Use in closed batch process (synthesis or formulation)
	PROC5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)
	PROC7	Industrial spraying
	PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities
	PROC10	Roller application or brushing
	PROC13	Treatment of articles by dipping and pouring
	PROC14	Production of preparations or articles by tabletting, compression, extrusion, pelettisation
	PROC15	Use as laboratory reagent

Operational conditions controlling worker exposure

Concentration of substance							
	PROC3		PROC5		PROC7		
Value	≤ 100	%	≤ 25	%	≤ 100	%	
	PROC8a		PROC10		PROC13		
Value	≤ 100	%	≤ 100	%	≤ 100	%	
	PROC14		PROC15				
Value	≤ 25	%	≤ 100	%			

Use conditions							
	PROC3		PROC5		PROC7		
Location of use	Indoor use		Indoor use		Indoor use		
Duration of use	≤ 8	hours/day	≤ 8	hours/day	≤ 8	hours/day	
Frequency of use	≤ 220	days/year	≤ 220	days/year	≤ 220	days/year	
	PROC8a		PROC10		PROC13		
Location of use	Indoor use		Indoor use		Indoor use		
Duration of use	≤ 8	hours/day	≤ 8	hours/day	≤ 8	hours/day	
Frequency of use	≤ 220	days/year	≤ 220	days/year	≤ 220	days/year	
	PROC14		PROC15				
Location of use	Indoor use		Indoor use				
Duration of use	≤ 8	hours/day	≤ 8	hours/day			
Frequency of use	≤ 220	days/year	≤ 220	days/year			

Further operational conditions	
PROC3	Assumes use at not more than 20°C above ambient temperature, unless stated differently.
	Assumes a good basic standard of occupational hygiene is implemented.
PROC5	Assumes use at not more than 20°C above ambient temperature, unless stated differently.
	Assumes a good basic standard of occupational hygiene is implemented.
PROC7	Assumes use at not more than 20°C above ambient temperature, unless stated differently.
	Assumes a good basic standard of occupational hygiene is implemented.
PROC8a	Assumes use at not more than 20°C above ambient temperature, unless stated differently.
	Assumes a good basic standard of occupational hygiene is implemented.
PROC10	Assumes use at not more than 20°C above ambient temperature, unless stated differently.
	Assumes a good basic standard of occupational hygiene is implemented.
PROC13	Assumes use at not more than 20°C above ambient temperature, unless stated differently.
	Assumes a good basic standard of occupational hygiene is implemented.
PROC14	Assumes use at not more than 20°C above ambient temperature, unless stated differently.
	Assumes a good basic standard of occupational hygiene is implemented.
PROC15	Assumes use at not more than 20°C above ambient temperature, unless stated differently.
	Assumes a good basic standard of occupational hygiene is implemented.

Risk management measures (RMM) controlling worker exposure

Technical measures and efficiency of the risk managment measures (in exposure calculation model)		
PROC3	Measures	Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour, corresponds to outdoor use).
	Efficiency (%)	30
PROC5	Measures	Provide extract ventilation to points where emissions occur.
	Efficiency (%)	90
PROC7	Measures	Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour, corresponds to outdoor use).
	Efficiency (%)	30
	Measures	Ensure that a spray booth is used.
PROC8a	Measures	Provide extract ventilation to points where emissions occur.
	Efficiency (%)	90
PROC10	Measures	Provide a good standard of controlled ventilation (10 to 15 air changes per hour).
	Efficiency (%)	70
PROC13	Measures	Provide extract ventilation to points where emissions occur.
	Efficiency (%)	90
PROC14	Measures	Provide a good standard of controlled ventilation (10 to 15 air changes per hour).
	Efficiency (%)	70
PROC15	Measures	No special measures are required.

Organisational measures	
PROC3	Put lids on containers immediately after use.
PROC5	Put lids on containers immediately after use.
PROC7	Use long handled tools where possible.
	Carefully pour from containers.
PROC8a	Put lids on containers immediately after use.
PROC10	Use long handled brushes and rollers where possible.
	Ensure the ventilation system is regularly maintained and tested.
	Dispose of empty containers and wastes safely.
PROC13	No special measures are required.
PROC14	No special measures are required.
PROC15	No special measures are required.

Personal protective equipment and efficiency of the risk managment measures (in exposure calculation model)

Advice	
PROC3	For further instructions related to "Personal protective equipment" please refer to section 8 of the Safety Data Sheet.
PROC5	For further instructions related to "Personal protective equipment" please refer to section 8 of the Safety Data Sheet.
PROC7	If operation is carried out in a vented booth or extracted enclosure, no respirator is necessary.
	For further instructions related to "Personal protective equipment" please refer to section 8 of the Safety Data Sheet.
PROC8a	For further instructions related to "Personal protective equipment" please refer to section 8 of the Safety Data Sheet.
PROC10	For further instructions related to "Personal protective equipment" please refer to section 8 of the Safety Data Sheet.
PROC13	For further instructions related to "Personal protective equipment" please refer to section 8 of the Safety Data Sheet.
PROC14	For further instructions related to "Personal protective equipment" please refer to section 8 of the Safety Data Sheet.
PROC15	For further instructions related to "Personal protective equipment" please refer to section 8 of the Safety Data Sheet.

Respiratory protection		
PROC3	Measures	No special measures necessary.
PROC5	Measures	No special measures necessary.
PROC7	Measures	Wear a respirator conforming to EN140 with Type A filter or better.
	Efficiency (%)	90
PROC8a	Measures	No special measures necessary.
PROC13	Measures	No special measures necessary.
PROC14	Measures	No special measures necessary.
PROC15	Measures	No special measures necessary.

Eye / face protection		
PROC3	Measures	Wear eye/face protection.
PROC5	Measures	Wear eye/face protection.
PROC7	Measures	Wear eye/face protection.
PROC8a	Measures	Wear eye/face protection.
PROC10	Measures	Wear eye/face protection.
PROC13	Measures	Wear eye/face protection.
PROC14	Measures	Wear eye/face protection.
PROC15	Measures	Wear eye/face protection.

Hand protection		
PROC3	Measures	Wear suitable gloves tested to EN374.
	Efficiency (%)	80
PROC5	Measures	Wear suitable gloves tested to EN374.
	Efficiency (%)	80
PROC7	Measures	Wear suitable gloves tested to EN374.
	Efficiency (%)	80
PROC8a	Measures	Wear suitable gloves tested to EN374.
	Efficiency (%)	80
PROC10	Measures	Wear suitable gloves tested to EN374.
	Efficiency (%)	80
PROC13	Measures	No special measures are required.
PROC14	Measures	Wear suitable gloves tested to EN374.
	Efficiency (%)	80
PROC15	Measures	Wear suitable gloves tested to EN374.

Other		
PROC3	Measures	No special measures necessary.
PROC5	Measures	No special measures necessary.
PROC7	Measures	Wear suitable coveralls to prevent exposure to the skin.
PROC8a	Measures	No special measures necessary.
PROC10	Measures	Wear suitable coveralls to prevent exposure to the skin.
PROC13	Measures	No special measures necessary.
PROC14	Measures	No special measures necessary.
PROC15	Measures	No special measures necessary.

SECTION 3: Exposure estimation and reference to sources

3.1 Advice

The Risk Characterization Ratio (RCR) is the quotient of predicted human/environmental exposure and the related DNEL/PNEC. Exposure is calculated based on exposure models as stated below. If RCR ≤ 1 a use is considered as safe under operational conditions and risk management measures as specified in the exposure szenario.

For DNEL/PNEC values please refer to section 8 of the safety data sheet.

3.2 Exposure estimation - Environment

Affected environmental release category (ERC)		
Category	Code	Use description
Environmental release category (ERC)	ERC6d	Industrial use of process regulators for polymerisation processes in production of resins, rubbers, polymers

Used exposure estimation model for calculation of environmental exposure	
Used exposure estimation model	EasyTRA Version 4.1
Link to exposure estimation tool	EASY TRA: http://www.easytra.de EU TGD spreadsheet: http://cem-nl.eu/eutgd.html
Other information	EU TGD 2003 Risk Assessment Spreadsheet Model 1.24a

Risk characterisation ratio (RCR)			
	ERC6d		
Microbiological activity in sewage treatment plants (STP)	0.008		
Freshwater	0.154		
Freshwater sediment	0.154		
Seawater	0.031		
Marine sediment	0.031		
Soil	0.219		
Indirect exposure for man via the environment	0.000		
Risc determining compartment	Soil		

3.3 Exposure estimation - Worker

Affected process category (PROC)		
Category	Code	Use description
Process category (PROC)	PROC3	Use in closed batch process (synthesis or formulation)
	PROC5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)
	PROC7	Industrial spraying
	PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities
	PROC10	Roller application or brushing
	PROC13	Treatment of articles by dipping and pouring
	PROC14	Production of preparations or articles by tabletting, compression, extrusion, pelettisation
	PROC15	Use as laboratory reagent

Used exposure estimation model for calculation of worker exposure	
Used exposure estimation model	EasyTRA Version 4.1
Link to exposure estimation tool	EASY TRA: http://www.easytra.de

Risk characterisation ratio (RCR)				
	Exposure estimation	**inhalative**	**dermal**	**total**
PROC3	Long-term systemic	0.357	0.000	0.357
PROC5	Long-term systemic	0.153	0.004	0.157
PROC7	Long-term systemic	0.638	0.021	0.659
PROC8a	Long-term systemic	0.765	0.007	0.772
PROC10	Long-term systemic	0.765	0.013	0.778
PROC13	Long-term systemic	0.255	0.034	0.289
PROC14	Long-term systemic	0.459	0.001	0.460
PROC15	Long-term systemic	0.510	0.000	0.510

SECTION 4: Guidance to DU to evaluate whether he works inside the boundaries set by the ES

4.1 Recommendations and advice

Recommendations and general advice

- For additional instructions relating to adaptation of conditions of use in view of a scaling, pls. see the VCI practice guide, part I, section 7.7. https://www.vci.de/Themen/Chemikaliensicherheit/REACH/Seiten/REACH-Praxisfuehrer.aspx

If a downstream user uses the substance/preparation differently than stated in the ES (different operational conditions and/or risk management measures), he has the possibility to vary certain parameters of the exposure assessment. With the help of easy calculations he can check whether he still operates under safe circumstances. This process is called Scaling.

Scaling advice

Type of ventilation

If the type of ventilation at the use site of a downstream user (DU) differs from the instructions in the ES, a linear correlation between the RCR (Inhalation) and the type of ventilation exists. Following scaling factors (f) apply: General ventilation (< 3 air changes per hour) =1; good general ventilation (3 to 5 air changes per hour, corresponds to outdoor use) = 0,7; enhanced general ventilation (> 5 air changes per hour) = 0,3.
RCR (DU) = f(DU) * RCR (as stated in ES) / f (type of ventilation stated in ES)
In the same manner a scaling for the efficiency of the local extract ventilation (LEV) can by applied.
Duration of use:
If the duration of the use by a worker at a downstream user (DU) site differs from the instructions in the ES, a linear correlation between the RCR (Inhalation) and the duration of use exist. Following scaling factors (f) apply: duration > 4 hours/day = 1; duration: 1-4 hours/day = 0,6; duration: 15 min/day – 1 hour/day = 0,2; duration < 15 min/day = 0,1.
RCR (DU) = f(DU) * RCR (as stated in ES) / f (duration in ES)
Concentration of the substance in the product:
If the downstream user (DU) uses the substance in a different concentration than the one stated in the ES, a linear correlation between the RCR (Inhalation)and the RCR (dermal) and the concentration exists. Following scaling factors (f) apply: Concentration >25% =1; concentration >= 5% = 0,6; concentration >= 1% = 0,2; concentration < 1% = 0,1.
RCR (DU) = f(DU) * RCR (as stated in ES) / f (concentration in ES).

4.2 Exposure estimation - Environment

Used exposure estimation model for calculation of environmental exposure	
Used exposure estimation model	EasyTRA Version 4.1
Link to exposure estimation tool	EASY TRA: http://www.easytra.de EU TGD spreadsheet: http://cem-nl.eu/eutgd.html
Other information	EU TGD 2003 Risk Assessment Spreadsheet Model 1.24a

Further input parameters used for environmental exposure estimation				
	ERC6d			
Effluent discharge volume of STP	≥	2000	m^3/d	
River flow rate	≥	18000	m^3/d	
Freshwater dilution factor		10		
Marine water dilution factor		100		
Emission factor air		0.001		
Emission factor water		0.000		
Emission factor soil		0.0025		

4.3 Exposure estimation - Worker

Used exposure estimation model for calculation of worker exposure	
Used exposure estimation model	EasyTRA Version 4.1
Link to exposure estimation tool	EASY TRA: http://www.easytra.de

Other information	
PROC7	occupational exposure can be further reduced by implementation of the following measure:
	Carry out in a vented booth or extracted enclosure.
	Reduction of the exposure compared to the conditions stated in the exposure scenario by 30%

ES3 Use of resins/blended resins - industrial use

Trade name: Styrene Monomer

SECTION 1: Title and scope of exposure scenario (ES)

1.1 Title exposure scenario (ES)

ES3 Use of resins/blended resins - industrial use

1.2 Scope of exposure scenario (ES)

ES Type	Worker Exposure Scenario for substance/mixture
Life cycle stage	Industrial end use

Product identifier

Trade name	Styrene Monomer
Substance name	styrene
REACH registration no.	01-2119457861-32
CAS no.	100-42-5
EC no.	202-851-5

Use descriptors

Sector of use (SU)		
Category	Code	Use description
Main user group	SU3	Industrial uses
Sector of end-use	SU12	Manufacture of plastics products, including compounding and conversion

Environmental release category (ERC)		
Category	Code	Use description
Environmental release category (ERC)	ERC6d	Industrial use of process regulators for polymerisation processes in production of resins, rubbers, polymers

Process category (PROC)		
Category	Code	Use description
Process category (PROC)	PROC3	Use in closed batch process (synthesis or formulation)
	PROC5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)
	PROC7	Industrial spraying
	PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities
	PROC10	Roller application or brushing
	PROC13	Treatment of articles by dipping and pouring
	PROC14	Production of preparations or articles by tabletting, compression, extrusion, pelettisation
	PROC15	Use as laboratory reagent

Product category (PC)		
Category	Code	Use description
Product category (PC)	PC32	Polymer preparations and compounds

Other information

This use includes the manufacture of fiber reinforced polymers (FRP) using unsaturated polyester (UP)/ epoxy vinyl ester resins (VE) and/ or formulated resins

SECTION 2: Operational conditions (OC) and risk management measures (RMM) controlling exposure towards environment and men

2.1 Product characteristics

State of aggregation	
liquid	
Reference temperature	25 °C

Dustiness
Not applicable

Vapour pressure		
Value	6.67	hPa
Reference temperature	20	°C
Source	ECHA	

Other information
The efficiency of a risk management measure is a theoretical value. The efficiency describes to which extend (in percent) the calculated exposure can be diminished by applying a certain measure. If the described operational conditions and risk management measures are fulfilled by a downstream user, the efficiency as highlighted in the ES can be applied. A downstream user might check whether the efficiency of the LEV or general ventilation corresponds to his site.

2.2 Contributing scenario controlling environmental exposure

Affected environmental release category (ERC)		
Category	Code	Use description
Environmental release category (ERC)	ERC6d	Industrial use of process regulators for polymerisation processes in production of resins, rubbers, polymers

Operational conditions controlling environmental exposure

Maximum allowable site tonnage covered by this ES (MSafe)			
	ERC6d		
MSafe	737 t/d		

daily quantity used on site			
	ERC6d		
Value	161 t/d		

Emission conditions			
	ERC6d		
Type of emission	Continuous release		
Duration of emission	≤ 300 days/year		

Risk management measures (RMM) controlling environmental exposure

Technical measures and efficiency of the risk managment measures (in exposure calculation model)
No special measures are required.

Organisational measures
No special measures are required.

Measures related to wastewater treatment and efficiency of the risk managment measures (in exposure calculation model)		
ERC6d	Measures	Ensure all waste water is collected and treated via a WWTP.
	Efficiency (%)	91.9

Measures related to waste treatment
For further instructions related to waste management please refer to section 13 of the Safety Data Sheet.

2.3 Contributing scenario controlling worker exposure

Affected process category (PROC)		
Category	Code	Use description
Process category (PROC)	PROC3	Use in closed batch process (synthesis or formulation)
	PROC5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)
	PROC7	Industrial spraying
	PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities
	PROC10	Roller application or brushing
	PROC13	Treatment of articles by dipping and pouring
	PROC14	Production of preparations or articles by tabletting, compression, extrusion, pelettisation
	PROC15	Use as laboratory reagent

Operational conditions controlling worker exposure

Concentration of substance							
	PROC3		PROC5		PROC7		
Value	≤ 100	%	≤ 25	%	≤ 100	%	
	PROC8a		PROC10		PROC13		
Value	≤ 100	%	≤ 100	%	≤ 100	%	
	PROC14		PROC15				
Value	≤ 25	%	≤ 100	%			

Use conditions							
	PROC3		PROC5		PROC7		
Location of use	Indoor use		Indoor use		Indoor use		
Duration of use	≤ 8	hours/day	≤ 8	hours/day	≤ 8	hours/day	
Frequency of use	≤ 220	days/year	≤ 220	days/year	≤ 220	days/year	
	PROC8a		PROC10		PROC13		
Location of use	Indoor use		Indoor use		Indoor use		
Duration of use	≤ 8	hours/day	≤ 8	hours/day	≤ 8	hours/day	
Frequency of use	≤ 220	days/year	≤ 220	days/year	≤ 220	days/year	
	PROC14		PROC15				
Location of use	Indoor use		Indoor use				
Duration of use	≤ 8	hours/day	≤ 8	hours/day			
Frequency of use	≤ 220	days/year	≤ 220	days/year			

Further operational conditions	
PROC3	Assumes use at not more than 20°C above ambient temperature, unless stated differently.
	Assumes a good basic standard of occupational hygiene is implemented.
PROC5	Assumes use at not more than 20°C above ambient temperature, unless stated differently.
	Assumes a good basic standard of occupational hygiene is implemented.
PROC7	Assumes use at not more than 20°C above ambient temperature, unless stated differently.
	Assumes a good basic standard of occupational hygiene is implemented.
PROC8a	Assumes use at not more than 20°C above ambient temperature, unless stated differently.
	Assumes a good basic standard of occupational hygiene is implemented.
PROC10	Assumes use at not more than 20°C above ambient temperature, unless stated differently.
	Assumes a good basic standard of occupational hygiene is implemented.
PROC13	Assumes use at not more than 20°C above ambient temperature, unless stated differently.
	Assumes a good basic standard of occupational hygiene is implemented.
PROC14	Assumes use at not more than 20°C above ambient temperature, unless stated differently.
	Assumes a good basic standard of occupational hygiene is implemented.
PROC15	Assumes use at not more than 20°C above ambient temperature, unless stated differently.
	Assumes a good basic standard of occupational hygiene is implemented.

Risk management measures (RMM) controlling worker exposure

Technical measures and efficiency of the risk managment measures (in exposure calculation model)		
PROC3	Measures	Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour, corresponds to outdoor use).
	Efficiency (%)	30
PROC5	Measures	Provide extract ventilation to points where emissions occur.
	Efficiency (%)	90
PROC7	Measures	Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour, corresponds to outdoor use).
	Efficiency (%)	30
	Measures	Ensure that a spray booth is used.
PROC8a	Measures	Provide extract ventilation to points where emissions occur.
	Efficiency (%)	90
PROC10	Measures	Provide a good standard of controlled ventilation (10 to 15 air changes per hour).
	Efficiency (%)	70
PROC13	Measures	Provide extract ventilation to points where emissions occur.
	Efficiency (%)	90
PROC14	Measures	Provide a good standard of controlled ventilation (10 to 15 air changes per hour).
	Efficiency (%)	70
PROC15	Measures	No special measures are required.

Organisational measures	
PROC3	Put lids on containers immediately after use.
PROC5	Put lids on containers immediately after use.
PROC7	Use long handled tools where possible.
	Carefully pour from containers.
PROC8a	Put lids on containers immediately after use.
PROC10	Use long handled brushes and rollers where possible.
	Ensure the ventilation system is regularly maintained and tested.
	Dispose of empty containers and wastes safely.
PROC13	No special measures are required.
PROC14	No special measures are required.
PROC15	No special measures are required.

Personal protective equipment and efficiency of the risk managment measures (in exposure calculation model)

Advice	
PROC3	For further instructions related to "Personal protective equipment" please refer to section 8 of the Safety Data Sheet.
PROC5	For further instructions related to "Personal protective equipment" please refer to section 8 of the Safety Data Sheet.
PROC7	If operation is carried out in a vented booth or extracted enclosure, no respirator is necessary.
	For further instructions related to "Personal protective equipment" please refer to section 8 of the Safety Data Sheet.
PROC8a	For further instructions related to "Personal protective equipment" please refer to section 8 of the Safety Data Sheet.
PROC10	For further instructions related to "Personal protective equipment" please refer to section 8 of the Safety Data Sheet.
PROC13	For further instructions related to "Personal protective equipment" please refer to section 8 of the Safety Data Sheet.
PROC14	For further instructions related to "Personal protective equipment" please refer to section 8 of the Safety Data Sheet.
PROC15	For further instructions related to "Personal protective equipment" please refer to section 8 of the Safety Data Sheet.

Respiratory protection		
PROC3	Measures	No special measures necessary.
PROC5	Measures	No special measures necessary.
PROC7	Measures	Wear a respirator conforming to EN140 with Type A filter or better.
	Efficiency (%)	90
PROC8a	Measures	No special measures necessary.
PROC13	Measures	No special measures necessary.
PROC14	Measures	No special measures necessary.
PROC15	Measures	No special measures necessary.

Eye / face protection		
PROC3	Measures	Wear eye/face protection.
PROC5	Measures	Wear eye/face protection.
PROC7	Measures	Wear eye/face protection.
PROC8a	Measures	Wear eye/face protection.
PROC10	Measures	Wear eye/face protection.
PROC13	Measures	Wear eye/face protection.
PROC14	Measures	Wear eye/face protection.
PROC15	Measures	Wear eye/face protection.

Hand protection		
PROC3	Measures	Wear suitable gloves tested to EN374.
	Efficiency (%)	80
PROC5	Measures	Wear suitable gloves tested to EN374.
	Efficiency (%)	80
PROC7	Measures	Wear suitable gloves tested to EN374.
	Efficiency (%)	80
PROC8a	Measures	Wear suitable gloves tested to EN374.
	Efficiency (%)	80
PROC10	Measures	Wear suitable gloves tested to EN374.
	Efficiency (%)	80
PROC13	Measures	No special measures are required.
PROC14	Measures	Wear suitable gloves tested to EN374.
	Efficiency (%)	80
PROC15	Measures	Wear suitable gloves tested to EN374.

Other		
PROC3	Measures	No special measures necessary.
PROC5	Measures	No special measures necessary.
PROC7	Measures	Wear suitable coveralls to prevent exposure to the skin.
PROC8a	Measures	No special measures necessary.
PROC10	Measures	Wear suitable coveralls to prevent exposure to the skin.
PROC13	Measures	No special measures necessary.
PROC14	Measures	No special measures necessary.
PROC15	Measures	No special measures necessary.

SECTION 3: Exposure estimation and reference to sources

3.1 Advice

The Risk Characterization Ratio (RCR) is the quotient of predicted human/environmental exposure and the related DNEL/PNEC. Exposure is calculated based on exposure models as stated below. If RCR ≤ 1 a use is considered as safe under operational conditions and risk management measures as specified in the exposure szenario.

For DNEL/PNEC values please refer to section 8 of the safety data sheet.

3.2 Exposure estimation - Environment

Affected environmental release category (ERC)		
Category	Code	Use description
Environmental release category (ERC)	ERC6d	Industrial use of process regulators for polymerisation processes in production of resins, rubbers, polymers

Used exposure estimation model for calculation of environmental exposure	
Used exposure estimation model	EasyTRA Version 4.1
Link to exposure estimation tool	EASY TRA: http://www.easytra.de EU TGD spreadsheet: http://cem-nl.eu/eutgd.html
Other information	EU TGD 2003 Risk Assessment Spreadsheet Model 1.24a

Risk characterisation ratio (RCR)			
	ERC6d		
Microbiological activity in sewage treatment plants (STP)	0.008		
Freshwater	0.154		
Freshwater sediment	0.154		
Seawater	0.031		
Marine sediment	0.031		
Soil	0.219		
Indirect exposure for man via the environment	0.000		
Risc determining compartment	Soil		

3.3 Exposure estimation - Worker

Affected process category (PROC)		
Category	Code	Use description
Process category (PROC)	PROC3	Use in closed batch process (synthesis or formulation)
	PROC5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)
	PROC7	Industrial spraying
	PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities
	PROC10	Roller application or brushing
	PROC13	Treatment of articles by dipping and pouring
	PROC14	Production of preparations or articles by tabletting, compression, extrusion, pelettisation
	PROC15	Use as laboratory reagent

Used exposure estimation model for calculation of worker exposure	
Used exposure estimation model	EasyTRA Version 4.1
Link to exposure estimation tool	EASY TRA: http://www.easytra.de

Risk characterisation ratio (RCR)				
	Exposure estimation	**inhalative**	**dermal**	**total**
PROC3	Long-term systemic	0.357	0.000	0.357
PROC5	Long-term systemic	0.153	0.004	0.157
PROC7	Long-term systemic	0.638	0.021	0.659
PROC8a	Long-term systemic	0.765	0.007	0.772
PROC10	Long-term systemic	0.765	0.013	0.778
PROC13	Long-term systemic	0.255	0.034	0.289
PROC14	Long-term systemic	0.459	0.001	0.460
PROC15	Long-term systemic	0.510	0.000	0.510

SECTION 4: Guidance to DU to evaluate whether he works inside the boundaries set by the ES

4.1 Recommendations and advice

Recommendations and general advice

- For additional instructions relating to adaptation of conditions of use in view of a scaling, pls. see the VCI practice guide, part I, section 7.7. https://www.vci.de/Themen/Chemikaliensicherheit/REACH/Seiten/REACH-Praxisfuehrer.aspx

If a downstream user uses the substance/preparation differently than stated in the ES (different operational conditions and/or risk management measures), he has the possibility to vary certain parameters of the exposure assessment. With the help of easy calculations he can check whether he still operates under safe circumstances. This process is called Scaling.

Scaling advice

Type of ventilation

If the type of ventilation at the use site of a downstream user (DU) differs from the instructions in the ES, a linear correlation between the RCR (Inhalation) and the type of ventilation exists. Following scaling factors (f) apply: General ventilation (< 3 air changes per hour) =1; good general ventilation (3 to 5 air changes per hour, corresponds to outdoor use) = 0,7; enhanced general ventilation (> 5 air changes per hour) = 0,3.
RCR (DU) = f(DU) * RCR (as stated in ES) / f (type of ventilation stated in ES)
In the same manner a scaling for the efficiency of the local extract ventilation (LEV) can by applied.
Duration of use:
If the duration of the use by a worker at a downstream user (DU) site differs from the instructions in the ES, a linear correlation between the RCR (Inhalation) and the duration of use exist. Following scaling factors (f) apply: duration > 4 hours/day = 1; duration: 1-4 hours/day = 0,6; duration: 15 min/day – 1 hour/day = 0,2; duration < 15 min/day = 0,1.
RCR (DU) = f(DU) * RCR (as stated in ES) / f (duration in ES)
Concentration of the substance in the product:
If the downstream user (DU) uses the substance in a different concentration than the one stated in the ES, a linear correlation between the RCR (Inhalation)and the RCR (dermal) and the concentration exists. Following scaling factors (f) apply: Concentration >25% =1; concentration >= 5% = 0,6; concentration >= 1% = 0,2; concentration < 1% = 0,1.
RCR (DU) = f(DU) * RCR (as stated in ES) / f (concentration in ES).

4.2 Exposure estimation - Environment

Used exposure estimation model for calculation of environmental exposure	
Used exposure estimation model	EasyTRA Version 4.1
Link to exposure estimation tool	EASY TRA: http://www.easytra.de EU TGD spreadsheet: http://cem-nl.eu/eutgd.html
Other information	EU TGD 2003 Risk Assessment Spreadsheet Model 1.24a

Further input parameters used for environmental exposure estimation				
	ERC6d			
Effluent discharge volume of STP	≥	2000	m^3/d	
River flow rate	≥	18000	m^3/d	
Freshwater dilution factor		10		
Marine water dilution factor		100		
Emission factor air		0.001		
Emission factor water		0.000		
Emission factor soil		0.0025		

4.3 Exposure estimation - Worker

Used exposure estimation model for calculation of worker exposure	
Used exposure estimation model	EasyTRA Version 4.1
Link to exposure estimation tool	EASY TRA: http://www.easytra.de

Other information	
PROC7	occupational exposure can be further reduced by implementation of the following measure:
	Carry out in a vented booth or extracted enclosure.
	Reduction of the exposure compared to the conditions stated in the exposure scenario by 30%

Trade name: Styrene Monomer

SECTION 1: Title and scope of exposure scenario (ES)

1.1 Title exposure scenario (ES)

ES4 Use of resins/blended resins - professional use

1.2 Scope of exposure scenario (ES)

ES Type	Worker Exposure Scenario for substance/mixture
Life cycle stage	Professional end use

Product identifier

Trade name	Styrene Monomer
Substance name	styrene
REACH registration no.	01-2119457861-32
CAS no.	100-42-5
EC no.	202-851-5

Use descriptors

Sector of use (SU)		
Category	Code	Use description
Main user group	SU22	Professional uses
Sector of end-use	SU12	Manufacture of plastics products, including compounding and conversion

Environmental release category (ERC)		
Category	Code	Use description
Environmental release category (ERC)	ERC8e	Wide dispersive outdoor use of reactive substances in open systems

Process category (PROC)		
Category	Code	Use description
Process category (PROC)	PROC3	Use in closed batch process (synthesis or formulation)
	PROC4	Use in batch and other process (synthesis) where opportunity for exposure arises
	PROC5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)
	PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities
	PROC10	Roller application or brushing
	PROC11	Non industrial spraying

Other information

This use includes the manufacture of fiber reinforced polymers (FRP) using unsaturated polyester (UP)/ epoxy vinyl ester resins (VE) and/ or formulated resins

SECTION 2: Operational conditions (OC) and risk management measures (RMM) controlling exposure towards environment and men

2.1 Product characteristics

State of aggregation		
liquid		
Reference temperature	25	°C

Dustiness
Not applicable

Vapour pressure		
Value	6.67	hPa
Reference temperature	20	°C
Source	ECHA	

Other information
The efficiency of a risk management measure is a theoretical value. The efficiency describes to which extend (in percent) the calculated exposure can be diminished by applying a certain measure. If the described operational conditions and risk management measures are fulfilled by a downstream user, the efficiency as highlighted in the ES can be applied. A downstream user might check whether the efficiency of the LEV or general ventilation corresponds to his site.

2.2 Contributing scenario controlling environmental exposure

Affected environmental release category (ERC)		
Category	Code	Use description
Environmental release category (ERC)	ERC8e	Wide dispersive outdoor use of reactive substances in open systems

Operational conditions controlling environmental exposure

Maximum allowable site tonnage covered by this ES (MSafe)			
	ERC8e		
MSafe	31100 t/d		

daily quantity used on site			
	ERC8e		
Value	483 t/d		

Emission conditions			
	ERC8e		
Type of emission	Continuous release		
Duration of emission	≤ 300 days/year		

Risk management measures (RMM) controlling environmental exposure

Technical measures and efficiency of the risk managment measures (in exposure calculation model)
No special measures are required.

Organisational measures
No special measures are required.

Measures related to wastewater treatment and efficiency of the risk managment measures (in exposure calculation model)		
ERC8e	Measures	Ensure all waste water is collected and treated via a WWTP.
	Efficiency (%)	91.9

Measures related to waste treatment
For further instructions related to waste management please refer to section 13 of the Safety Data Sheet.

2.3 Contributing scenario controlling worker exposure

Affected process category (PROC)		
Category	Code	Use description
Process category (PROC)	PROC3	Use in closed batch process (synthesis or formulation)
	PROC4	Use in batch and other process (synthesis) where opportunity for exposure arises
	PROC5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)
	PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities
	PROC10	Roller application or brushing
	PROC11	Non industrial spraying

Operational conditions controlling worker exposure

Concentration of substance						
	PROC3		PROC4		PROC5	
Value	≤ 100	%	≤ 100	%	≤ 100	%
	PROC8a		PROC10		PROC11	
Value	≤ 100	%	≤ 100	%	≤ 100	%

Use conditions						
	PROC3		PROC4		PROC5	
Location of use	Indoor use		Indoor use		Indoor use	
Duration of use	≤ 8	hours/day	≤ 8	hours/day	≤ 8	hours/day
Frequency of use	≤ 220	days/year	≤ 220	days/year	≤ 220	days/year
	PROC8a		PROC10		PROC11	
Location of use	Indoor use		Indoor use		Indoor use	
Duration of use	≤ 1	hours/day	≤ 8	hours/day	≤ 4	hours/day
Frequency of use	≤ 220	days/year	≤ 220	days/year	≤ 220	days/year

Further operational conditions	
PROC3	Assumes use at not more than 20°C above ambient temperature, unless stated differently.
	Assumes a good basic standard of occupational hygiene is implemented.
PROC4	Assumes use at not more than 20°C above ambient temperature, unless stated differently.
	Assumes a good basic standard of occupational hygiene is implemented.
PROC5	Assumes use at not more than 20°C above ambient temperature, unless stated differently.
	Assumes a good basic standard of occupational hygiene is implemented.
PROC8a	Assumes use at not more than 20°C above ambient temperature, unless stated differently.
	Assumes a good basic standard of occupational hygiene is implemented.
PROC10	Assumes use at not more than 20°C above ambient temperature, unless stated differently.
	Assumes a good basic standard of occupational hygiene is implemented.
PROC11	Assumes use at not more than 20°C above ambient temperature, unless stated differently.
	Assumes a good basic standard of occupational hygiene is implemented.

Trade name: Styrene Monomer

Risk management measures (RMM) controlling worker exposure

Technical measures and efficiency of the risk managment measures (in exposure calculation model)		
PROC3	Measures	Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour, corresponds to outdoor use).
	Efficiency (%)	30
PROC4	Measures	Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour, corresponds to outdoor use).
	Efficiency (%)	30
PROC5	Measures	Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour, corresponds to outdoor use).
	Efficiency (%)	30
	Measures	Use drum pumps or carefully pour from container.
PROC8a	Measures	Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour, corresponds to outdoor use).
	Efficiency (%)	30
PROC10	Measures	Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour, corresponds to outdoor use).
	Efficiency (%)	30
PROC11	Measures	Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour, corresponds to outdoor use).
	Efficiency (%)	30

Organisational measures	
PROC3	No special measures are required.
PROC4	No special measures are required.
PROC5	Put lids on containers immediately after use.
PROC8a	Dispose of empty containers and wastes safely.
PROC10	Use long handled brushes and rollers where possible.
PROC11	Keep people not involved in the activity, away from the operation.

Personal protective equipment and efficiency of the risk managment measures (in exposure calculation model)

Advice	
PROC3	For further instructions related to "Personal protective equipment" please refer to section 8 of the Safety Data Sheet.
PROC4	For further instructions related to "Personal protective equipment" please refer to section 8 of the Safety Data Sheet.
PROC5	For further instructions related to "Personal protective equipment" please refer to section 8 of the Safety Data Sheet.
PROC8a	For further instructions related to "Personal protective equipment" please refer to section 8 of the Safety Data Sheet.
PROC10	For further instructions related to "Personal protective equipment" please refer to section 8 of the Safety Data Sheet.
PROC11	For further instructions related to "Personal protective equipment" please refer to section 8 of the Safety Data Sheet.

Respiratory protection		
PROC3	Measures	No special measures necessary.
PROC4	Measures	Wear a respirator conforming to EN140 with Type A filter or better.
	Efficiency (%)	90
PROC5	Measures	Wear a respirator conforming to EN140 with Type A filter or better.
	Efficiency (%)	90
PROC8a	Measures	No special measures necessary.
PROC10	Measures	Wear a respirator conforming to EN140 with Type A filter or better.
	Efficiency (%)	90
PROC11	Measures	Wear a respirator conforming to EN140 with Type A filter or better.
	Efficiency (%)	95

Eye / face protection		
PROC3	Measures	Wear eye/face protection.
PROC4	Measures	Wear eye/face protection.
PROC5	Measures	Wear eye/face protection.
PROC8a	Measures	Wear eye/face protection.
PROC10	Measures	Wear eye/face protection.
PROC11	Measures	Wear eye/face protection.

Hand protection		
PROC3	Measures	Wear suitable gloves tested to EN374.
	Efficiency (%)	80
PROC4	Measures	Wear suitable gloves tested to EN374.
	Efficiency (%)	80
PROC5	Measures	Wear suitable gloves tested to EN374.
	Efficiency (%)	80
PROC8a	Measures	Wear suitable gloves tested to EN374.
	Efficiency (%)	80
PROC10	Measures	Wear suitable gloves tested to EN374.
	Efficiency (%)	80
PROC11	Measures	Wear suitable gloves tested to EN374.
	Efficiency (%)	80

SECTION 3: Exposure estimation and reference to sources

3.1 Advice

The Risk Characterization Ratio (RCR) is the quotient of predicted human/environmental exposure and the related DNEL/PNEC. Exposure is calculated based on exposure models as stated below. If RCR ≤ 1 a use is considered as safe under operational conditions and risk management measures as specified in the exposure szenario.

For DNEL/PNEC values please refer to section 8 of the safety data sheet.

3.2 Exposure estimation - Environment

Affected environmental release category (ERC)		
Category	Code	Use description
Environmental release category (ERC)	ERC8e	Wide dispersive outdoor use of reactive substances in open systems

Used exposure estimation model for calculation of environmental exposure	
Used exposure estimation model	EasyTRA Version 4.1
Link to exposure estimation tool	EASY TRA: http://www.easytra.de EU TGD spreadsheet: http://cem-nl.eu/eutgd.html
Other information	EU TGD 2003 Risk Assessment Spreadsheet Model 1.24a

Risk characterisation ratio (RCR)			
	ERC8e		
Microbiological activity in sewage treatment plants (STP)	0.000		
Freshwater	0.016		
Freshwater sediment	0.016		
Seawater	0.003		
Marine sediment	0.003		
Soil	0.012		
Indirect exposure for man via the environment	0.000		
Risc determining compartment	Fresh water		

3.3 Exposure estimation - Worker

Affected process category (PROC)		
Category	Code	Use description
Process category (PROC)	PROC3	Use in closed batch process (synthesis or formulation)
	PROC4	Use in batch and other process (synthesis) where opportunity for exposure arises
	PROC5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)
	PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities
	PROC10	Roller application or brushing
	PROC11	Non industrial spraying

Used exposure estimation model for calculation of worker exposure	
Used exposure estimation model	EasyTRA Version 4.1
Link to exposure estimation tool	EASY TRA: http://www.easytra.de

Risk characterisation ratio (RCR)				
	Exposure estimation	**inhalative**	**dermal**	**total**
PROC3	Long-term systemic	0.536	0.000	0.536
PROC4	Long-term systemic	0.179	0.003	0.182
PROC5	Long-term systemic	0.357	0.007	0.364
PROC8a	Long-term systemic	0.715	0.001	0.716
PROC10	Long-term systemic	0.357	0.013	0.370
PROC11	Long-term systemic	0.536	0.031	0.567

SECTION 4: Guidance to DU to evaluate whether he works inside the boundaries set by the ES

4.1 Recommendations and advice

Recommendations and general advice

- For additional instructions relating to adaptation of conditions of use in view of a scaling, pls. see the VCI practice guide, part I, section 7.7. https://www.vci.de/Themen/Chemikaliensicherheit/REACH/Seiten/REACH-Praxisfuehrer.aspx

If a downstream user uses the substance/preparation differently than stated in the ES (different operational conditions and/or risk management measures), he has the possibility to vary certain parameters of the exposure assessment. With the help of easy calculations he can check whether he still operates under safe circumstances. This process is called Scaling.

Scaling advice

Type of ventilation

If the type of ventilation at the use site of a downstream user (DU) differs from the instructions in the ES, a linear correlation between the RCR (Inhalation) and the type of ventilation exists. Following scaling factors (f) apply: General ventilation (< 3 air changes per hour) =1; good general ventilation (3 to 5 air changes per hour, corresponds to outdoor use) = 0,7; enhanced general ventilation (> 5 air changes per hour) = 0,3.
RCR (DU) = f(DU) * RCR (as stated in ES) / f (type of ventilation stated in ES)
In the same manner a scaling for the efficiency of the local extract ventilation (LEV) can by applied.
Duration of use:
If the duration of the use by a worker at a downstream user (DU) site differs from the instructions in the ES, a linear correlation between the RCR (Inhalation) and the duration of use exist. Following scaling factors (f) apply: duration > 4 hours/day = 1; duration: 1-4 hours/day = 0,6; duration: 15 min/day – 1 hour/day = 0,2; duration < 15 min/day = 0,1.
RCR (DU) = f(DU) * RCR (as stated in ES) / f (duration in ES)
Concentration of the substance in the product:
If the downstream user (DU) uses the substance in a different concentration than the one stated in the ES, a linear correlation between the RCR (Inhalation)and the RCR (dermal) and the concentration exists. Following scaling factors (f) apply: Concentration >25% =1; concentration >= 5% = 0,6; concentration >= 1% = 0,2; concentration < 1% = 0,1.
RCR (DU) = f(DU) * RCR (as stated in ES) / f (concentration in ES).

4.2 Exposure estimation - Environment

Used exposure estimation model for calculation of environmental exposure	
Used exposure estimation model	EasyTRA Version 4.1
Link to exposure estimation tool	EASY TRA: http://www.easytra.de EU TGD spreadsheet: http://cem-nl.eu/eutgd.html
Other information	EU TGD 2003 Risk Assessment Spreadsheet Model 1.24a

Further input parameters used for environmental exposure estimation				
	ERC8e			
Effluent discharge volume of STP	≥	2000	m^3/d	
River flow rate	≥	18000	m^3/d	
Freshwater dilution factor		10		
Marine water dilution factor		100		
Emission factor air		0.001		
Emission factor water		0.000		
Emission factor soil		0.000		

4.3 Exposure estimation - Worker

Used exposure estimation model for calculation of worker exposure	
Used exposure estimation model	EasyTRA Version 4.1
Link to exposure estimation tool	EASY TRA: http://www.easytra.de