SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product form	:	Substance
Substance name	:	STYRENE
EC-No.	:	202-851-5
CAS-No.	:	100-42-5
REACH registration No	:	Total Petrochemicals & Refining (01-2119457861-32-0028) - TOTAL RAFFINAGE FRANCE (01-2119457861-32-0027)
Synonyms	:	100-42-5
Product group	:	-

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

1.2.1. Relevant identified uses

Main use category	:	Professional use
Use of the substance/mixture	:	Manufacture of substances Formulation & (re)packing of substances and mixtures Rubber production and processing Polymer production Polymer preparations and compounds For the detailed uses of the product see annex of the safety data sheet

1.2.2. Uses advised against

Restrictions on use	:	Fillers and putty

1.3. Details of the supplier of the safety data sheet

REFINING & CHEMICALS BRANCH
TOTAL PETROCHEMICALS & REFINING SA/NV
Rue de l'Industrie 52 Nijverheidsstraat - B-1040 BRUSSELS - BELGIUM
T +32 (0)2.288.91.11
rc.fer-sds@total.com - www.total.com

1.4. Emergency telephone number

Emergency number : Emergency call Carechem 24 International :
• for English speaking countries: +44 (0) 1235 239 670
• for Europe (in local languages): + 33 1 49 00 00 49
• for Africa and Middle East: + 44 (0) 1235 239 671• for China:
+ 86 10 5100 3039
• for Asia Pacific (Hong-Kong, Singapore, Taiwan, Philippines, India, Vietnam, Sri Lanka, Japan, Korea, Malaysia, Indonesia, Thailand) :
+ 65 3158 1074

Country	Organisation/Company	Address	Emergency number	Comment
	National Poisons Emergency number		08 45 46 47	
Ireland	National Poisons Information Centre Beaumont Hospital	PO Box 1297 Beaumont Road 9 Dublin	+353 1 809 2566 (Healthcare professionals-24/7) +353 1 809 2166 (public, 8am - 10pm, 7/7)	

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Flammable liquids, Category 3	H226
Acute toxicity (inhalation:vapour) Category 4	H332
Skin corrosion/irritation, Category 2	H315
Serious eye damage/eye irritation, Category 2	H319
Reproductive toxicity, Category 2	H361d
Specific target organ toxicity — Single exposure, Category 3, Respiratory tract irritation	H335
Specific target organ toxicity — Repeated exposure, Category 1	H372
Aspiration hazard, Category 1	H304
Hazardous to the aquatic environment — Chronic Hazard, Category 3	H412

Full text of H statements : see section 16

Adverse physicochemical, human health and environmental effects

Flammable liquid and vapour. May be fatal if swallowed and enters airways. Harmful if inhaled. Causes skin irritation. Causes serious eye irritation. May cause respiratory irritation. Suspected of damaging the unborn child. Harmful to aquatic life with long lasting effects.

2.2. Label elements

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

Hazard pictograms (CLP) :

GHS02 GHS08 GHS07

Signal word (CLP) : Danger

Hazard statements (CLP) : 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 organs through prolonged or repeated exposure.
H412 - Harmful to aquatic life with long lasting effects.

Precautionary statements (CLP) : P201 - Obtain special instructions before use.
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P243 - Take precautionary measures against static discharge.
P262 - Do not get in eyes, on skin, or on clothing.
P273 - Avoid release to the environment.
P281 - Use personal protective equipment as required.
P301+P330+P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
P303+P361+P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304+P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P309+P311 - IF exposed or if you feel unwell: Call a POISON CENTER or doctor/physician.
P403+P235 - Store in a well-ventilated place. Keep cool.

2.3. Other hazards

Other hazards not contributing to the classification : In use, may form flammable/explosive vapour-air mixture. Handling this product may result in electrostatic accumulation. Use proper grounding procedures.

SECTION 3: Composition/information on ingredients

3.1. Substances

Name : STYRENE

CAS-No. : 100-42-5

EC-No. : 202-851-5

Name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP]
Styrene	(CAS-No.) 100-42-5 (EC-No.) 202-851-5 (EC Index-No.) 601-026-00-0 (REACH-no) 01-2119457861-32	> 99	Flam. Liq. 3, H226 Acute Tox. 4 (Inhalation), H332 Skin Irrit. 2, H315 Eye Irrit. 2, H319 Repr. 2, H361d STOT SE 3, H335 STOT RE 1, H372 Asp. Tox. 1, H304 Aquatic Chronic 3, H412
Additive (Stabilizer)		0.0015	Not classified

Full text of H-statements: see section 16

3.2. Mixtures

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : Get medical advice/attention if you feel unwell.

First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. Call a physician immediately. If breathing is difficult, give oxygen. If breathing stops, give artificial respiration. Place under medical observation.

First-aid measures after skin contact : Take off immediately all contaminated clothing. Wash with plenty of water/…. Get medical advice if skin irritation persists.

First-aid measures after eye contact : Immediately rinse with water for a prolonged period while holding the eyelids wide open. Consult an eye specialist.

First-aid measures after ingestion : Do not give anything to drink. Do not induce vomiting. If swallowed, rinse mouth with water (only if the person is conscious). Take immediately victim to hospital.

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

Symptoms/effects : Refer to § 11 for more details on effects.

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

Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Carbon dioxide. Dry powder. Foam.

Unsuitable extinguishing media : Do not use a solid water stream as it may scatter and spread fire.

5.2. Special hazards arising from the substance or mixture

Explosion hazard : Heavier than air, vapours may travel long distances along ground, ignite and flash back to source. Heat may build pressure, rupturing closed containers, spreading fire and increasing risk of burns and injuries.

Hazardous decomposition products in case of fire : Toxic fumes. Carbon oxides (CO, CO2). Aldehydes. Polycyclic-aromatic hydrocarbons (PAH). Carbon (C). Ketones.

5.3. Advice for firefighters

Protection during firefighting : Complete protective clothing. Do not enter fire area without proper protective equipment, including respiratory protection.

Other information : Notify fire brigade and environmental authorities. Evacuate unnecessary personnel. Use water spray or fog for cooling exposed containers.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : No flames, no sparks. Eliminate all sources of ignition. Do not smoke. Use special care to avoid static electric charges. Prevent any contact with hot surfaces.

6.1.1. For non-emergency personnel

Protective equipment : Do not attempt to take action without suitable protective equipment. Gloves. Safety glasses.

Emergency procedures for non-emergency personnel : Avoid contact with skin and eyes.

6.1.2. For emergency responders

Protective equipment : Do not attempt to take action without suitable protective equipment. Breathing apparatus.

Emergency procedures for emergency responders : Evacuate unnecessary personnel. Eliminate all ignition sources if safe to do so.

6.2. Environmental precautions

Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

For containment : If spilled, may cause the floor to be slippery. Sweep up or vacuum up the product. Dike for recovery or absorb with appropriate material. Take up liquid spill into absorbent material, e.g.: sand, saw dust. On water, recover/skim from surface and pour out in disposal container.

Other information : Dispose of contaminated material at an authorized site. Notify authorities if product enters sewers or public waters.

6.4. Reference to other sections

For further information refer to section 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Ensure good ventilation of the work station. In use, may form flammable/explosive vapour-air mixture. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Take precautionary measures against static discharge during blending and transfer operations. Explosion-free electrical equipment and lighting with earth.

Hygiene measures : Do not eat, drink or smoke when using this product. Keep away from food and drink. Always wash hands after handling the product. Take off contaminated clothing.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures : Proper grounding procedures to avoid static electricity should be followed.

Storage conditions : Store in a well-ventilated place. Keep container tightly closed. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Containers (tanks) should be grounded and provided with adequate pressure relief valve. Explosive vapour/air mixtures may be formed.

Storage area : Store away from heat. Earth the equipment. Store in a well-ventilated place.

Packaging materials : Stainless steel.

7.3. Specific end use(s)

Recommended to professional users.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Styrene (100-42-5)		
Ireland	OEL (8 hours ref) (mg/m³)	85 mg/m³
Ireland	OEL (8 hours ref) (ppm)	20 ppm
Ireland	OEL (15 min ref) (mg/m3)	170 mg/m³
Ireland	OEL (15 min ref) (ppm)	40 ppm
United Kingdom	WEL TWA (mg/m³)	430 mg/m³
United Kingdom	WEL TWA (ppm)	100 ppm
United Kingdom	WEL STEL (mg/m³)	1080 mg/m³
United Kingdom	WEL STEL (ppm)	250 ppm
USA - ACGIH	ACGIH TWA (ppm)	20 ppm
USA - ACGIH	ACGIH STEL (ppm)	40 ppm
USA - ACGIH	Biological Exposure Indices (BEI)	400 mg/g Kreatinin (Medium: urine - Time: end of shift - Parameter: Mandelic acid plus phenylglyoxylic acid (nonspecific)) 0.2 mg/l (Medium: venous blood - Time: end of shift - Parameter: Styrene (semi-quantitative))

STYRENE (100-42-5)	
DNEL/DMEL (Workers)	
Acute - systemic effects, inhalation	289 mg/m³
Acute - local effects, inhalation	306 mg/m³
Long-term - systemic effects, dermal	406 mg/kg bodyweight/day
Long-term - systemic effects, inhalation	85 mg/m³
DNEL/DMEL (General population)	
Acute - systemic effects, inhalation	174.2 mg/m³
Acute - local effects, inhalation	182.7 mg/m³
Long-term - systemic effects,oral	2.1 mg/kg bodyweight/day
Long-term - systemic effects, inhalation	10.2 mg/m³
Long-term - systemic effects, dermal	343 mg/kg bodyweight/day
PNEC (Water)	
PNEC aqua (freshwater)	0.028 mg/l
PNEC aqua (marine water)	0.014 mg/l
PNEC aqua (intermittent, freshwater)	0.04 mg/l
PNEC aqua (intermittent, marine water)	0.04 mg/l
PNEC (Sediment)	
PNEC sediment (freshwater)	0.614 mg/kg dwt
PNEC sediment (marine water)	0.307 mg/kg dwt
PNEC (Soil)	
PNEC soil	0.2 mg/kg dwt

STYRENE (100-42-5)	
PNEC (STP)	
PNEC sewage treatment plant	5 mg/l

8.2. Exposure controls

Appropriate engineering controls:

The substance is flammable and therefore the following conditions must be met to ensure safe use: “Risks are controlled by storage and use under conditions which avoid all ignition sources.”
. Ensure adequate ventilation. Safety shower. Eye fountain.

Personal protective equipment:

Gas mask with filter type A.

Hand protection:

hydrocarbons resistant gloves. In case of repeated or prolonged contact wear gloves. recommended material: fluorinated polymer. polyvinyl alcohol. Layer thickness : all thicknesses. Breakthrough time : > 480 min. EN 374-3. In the event of contact with the liquid: Nitrile rubber gloves. Layer thickness : > 0,30 mm. Breakthrough time : > 60 min. EN 374-3. Gloves may degrade in contact with this chemical.

• Carefully check the glove for cracks or damage before reusing it, dispose of gloves where the penetration time is exceeded. • The penetration time depends on temperature, glove material, thickness and construction.
Penetration time is measured against EN 374 in laboratory conditions corresponding to permanent static contact and is not necessarily representative of the risk in the workplace. Contact the gloves' supplier for further information on the selection and resistance of gloves.

Eye protection:

Safety glasses. Do not wear contact lenses

Skin and body protection:

Wear suitable protective clothing. Safety foot-wear

Respiratory protection:

Where exposure through inhalation may occur from use, respiratory protection equipment is recommended

Environmental exposure controls:

Avoid release to the environment. Assure that emissions are compliant with all applicable air pollution control regulations.

Other information:

Handle in accordance with good industrial hygiene and safety procedures. Do not eat, drink or smoke during use.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	:	Liquid
Molecular mass	:	104 g/mol
Colour	:	Colourless.
Odour	:	Aromatic.
Odour threshold	:	No data available
pH	:	No data available
Relative evaporation rate (butylacetate=1)	:	No data available
Melting point	:	-31 °C
Freezing point	:	No data available
Boiling point	:	145 °C
Flash point	:	31 °C
Auto-ignition temperature	:	490 °C
Decomposition temperature	:	No data available
Flammability (solid, gas)	:	No data available
Vapour pressure	:	6 - 7 hPa (20°C)
Relative vapour density at 20 °C	:	3.6
Relative density	:	No data available

Density	:	906 kg/m³
Solubility	:	insoluble. Water: 320 mg/l
Log Pow	:	No data available
Viscosity, kinematic	:	0.8 mm²/s (20°C)
Viscosity, dynamic	:	No data available
Explosive properties	:	No data available
Oxidising properties	:	No data available
Explosive limits	:	1.1 - 6.1 vol %

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

Flammable liquid and vapour.

10.2. Chemical stability

Stable at ambient temperature and under normal conditions of use.

10.3. Possibility of hazardous reactions

Not established.

10.4. Conditions to avoid

No flames, no sparks. Eliminate all sources of ignition. High temperature. Heat.

10.5. Incompatible materials

No additional information available

10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity	:	Inhalation:vapour: Harmful if inhaled.
Additional information	:	Inhalation may affect the nervous system causing headache, possibly dizziness, nausea, weakness, loss of coordination and unconsciousness

Styrene (100-42-5)	
LD50 oral rat	2650 mg/kg
LC50 inhalation rat	11.8 mg/l/4h
LC50 inhalation rat (ppm)	2770 ppmv/4h

Skin corrosion/irritation	:	Causes skin irritation.
Serious eye damage/irritation	:	Causes serious eye irritation.
Respiratory or skin sensitisation	:	Not classified
Additional information	:	Based on available data, the classification criteria are not met
Germ cell mutagenicity	:	Not classified Based on available data, the classification criteria are not met
Carcinogenicity - Description	:	Not classified
Additional information	:	Based on available data, the classification criteria are not met
Reproductive toxicity	:	Suspected of damaging the unborn child.
STOT-single exposure	:	May cause respiratory irritation.
STOT-repeated exposure	:	Causes damage to organs through prolonged or repeated exposure.
Aspiration hazard	:	May be fatal if swallowed and enters airways.
Additional information	:	In case of accidental swallowing, due to its low viscosity, the product may be aspired into the lung and induce a chemical pneumonitis developing over a few hours

STYRENE (100-42-5)	
Viscosity, kinematic	0.8 mm²/s (20°C)

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general	:	Harmful to aquatic life with long lasting effects. Do not allow product to spread into the environment.

Ecology - air : Product evaporates when in contact with the air.

Ecology - water : the product spreads out on the surface of the water, a small fraction of the constituents may be dissolved.

Styrene (100-42-5)	
LC50 fish 1	< 3.24 - 4.99 mg/l (Pimephales promelas)
LC50 fish 2	19.03 - 33.53 mg/l (Lepomis macrochirus)
EC50 Daphnia 1	3.3 - 7.4 mg/l (Daphnia magna)
EC50 other aquatic organisms 1	1.4 mg/l (Pseudokirchneriella subcapitata)
EC50 other aquatic organisms 2	0.72 mg/l (Pseudokirchneriella subcapitata)
NOEC chronic algae	0.28 mg/l (96h)

12.2. Persistence and degradability

STYRENE (100-42-5)	
Persistence and degradability	Inherently biodegradable.

12.3. Bioaccumulative potential

Styrene (100-42-5)	
BCF fish 1	13.5
Log Pow	2.95

12.4. Mobility in soil

STYRENE (100-42-5)	
Ecology - soil	Avoid sub-soil penetration. it may pass through the soil and is likely to contaminate ground water.

12.5. Results of PBT and vPvB assessment

No additional information available

12.6. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste treatment methods : Hazardous waste. Dispose of in accordance with relevant local regulations. Use only registered transporters. Do not discharge the product into the environment. Empty containers should be taken for recycling, recovery or waste in accordance with local regulation.

Additional information : Handle empty containers with care because residual vapours are flammable.

SECTION 14: Transport information

In accordance with ADR / RID / IMDG / IATA / ADN

ADR	IMDG	IATA	ADN	RID
14.1. UN Number				
2055	2055	2055	2055	2055
14.2. UN proper shipping name				
STYRENE MONOMER, STABILIZED	STYRENE MONOMER, STABILIZED	Styrene monomer, stabilized	STYRENE MONOMER, STABILIZED	STYRENE MONOMER, STABILIZED
Transport document description				
UN 2055 STYRENE MONOMER, STABILIZED, 3, III, (D/E)	UN 2055 STYRENE MONOMER, STABILIZED, 3, III (32°C c.c.)	UN 2055 Styrene monomer, stabilized, 3, III	UN 2055 STYRENE MONOMER, STABILIZED, 3, III	UN 2055 STYRENE MONOMER, STABILIZED, 3, III
14.3. Transport hazard class(es)				
3	3	3	3	3
				
14.4. Packing Group				
III	III	III	III	III
14.5. Environmental hazards				
Dangerous for the environment : No	Dangerous for the environment : No Marine Pollutant : No	Dangerous for the environment : No	Dangerous for the environment : No	Dangerous for the environment : No
No supplementary information available				

14.6. Special precautions for user

- Overland transport

Classification code (ADR)	:	F1
Limited quantities (ADR)	:	5l
Excepted quantities (ADR)	:	E1
Packing instructions (ADR)	:	P001, IBC03, LP01, R001
Mixed packing provisions (ADR)	:	MP19
Portable tank and bulk container instructions (ADR)	:	T2
Portable tank and bulk container special provisions (ADR)	:	TP1
Tank code (ADR)	:	LGBF
Vehicle for tank carriage	:	FL
Transport category (ADR)	:	3
Special provisions for carriage - Packages (ADR)	:	V12
Special provisions for carriage - Operation (ADR)	:	S2
Hazard identification number (Kemler No.)	:	39
Orange plates	:	
Tunnel restriction code (ADR)	:	D/E
EAC code	:	3Y

- Transport by sea (IMDG)

Limited quantities (IMDG)	:	5 L
Excepted quantities (IMDG)	:	E1
Packing instructions (IMDG)	:	P001
IBC packing instructions (IMDG)	:	IBC03
Tank instructions (IMDG)	:	T2
Tank special provisions (IMDG)	:	TP1
EmS-No. (Fire)	:	F-E
EmS-No. (Spillage)	:	S-D
Stowage category (IMDG)	:	A
Flash point (IMDG)	:	32°C c.c.

- Air transport (IATA)

PCA Excepted quantities (IATA)	:	E1
PCA Limited quantities (IATA)	:	Y344
PCA limited quantity max net quantity (IATA)	:	10L
PCA packing instructions (IATA)	:	355
PCA max net quantity (IATA)	:	60L
CAO packing instructions (IATA)	:	366
CAO max net quantity (IATA)	:	220L
ERG code (IATA)	:	3L

- Inland waterway transport

Classification code (ADN)	:	F1
Limited quantities (ADN)	:	5 L
Excepted quantities (ADN)	:	E1
Carriage permitted (ADN)	:	T
Equipment required (ADN)	:	PP, EX, A
Ventilation (ADN)	:	VE01
Number of blue cones/lights (ADN)	:	0

- Rail transport

Classification code (RID)	:	F1

Limited quantities (RID)	:	5L
Excepted quantities (RID)	:	E1
Packing instructions (RID)	:	P001, IBC03, LP01, R001
Mixed packing provisions (RID)	:	MP19
Portable tank and bulk container instructions (RID)	:	T2
Portable tank and bulk container special provisions (RID)	:	TP1
Tank codes for RID tanks (RID)	:	LGBF
Transport category (RID)	:	3
Special provisions for carriage – Packages (RID)	:	W12
Colis express (express parcels) (RID)	:	CE4
Hazard identification number (RID)	:	39

14.7. Transport in bulk according to Annex II of Marpol and the IBC Code

Ship type	:	Type 3
Pollution category	:	Y

SECTION 15: Regulatory information

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

15.1.1. EU-Regulations

The following restrictions are applicable according to Annex XVII of the REACH Regulation (EC) No 1907/2006:

3. Liquid substances or mixtures which are regarded as dangerous in accordance with Directive 1999/45/EC or are fulfilling the criteria for any of the following hazard classes or categories set out in Annex I to Regulation (EC) No 1272/2008	Styrene
3(a) Substances or mixtures fulfilling the criteria for any of the following hazard classes or categories set out in Annex I to Regulation (EC) No 1272/2008: Hazard classes 2.1 to 2.4, 2.6 and 2.7, 2.8 types A and B, 2.9, 2.10, 2.12, 2.13 categories 1 and 2, 2.14 categories 1 and 2, 2.15 types A to F	STYRENE - Styrene
3(b) Substances or mixtures fulfilling the criteria for any of the following hazard classes or categories set out in Annex I to Regulation (EC) No 1272/2008: Hazard classes 3.1 to 3.6, 3.7 adverse effects on sexual function and fertility or on development, 3.8 effects other than narcotic effects, 3.9 and 3.10	STYRENE - Styrene
3(c) Substances or mixtures fulfilling the criteria for any of the following hazard classes or categories set out in Annex I to Regulation (EC) No 1272/2008: Hazard class 4.1	STYRENE - Styrene
40. Substances classified as flammable gases category 1 or 2, flammable liquids categories 1, 2 or 3, flammable solids category 1 or 2, substances and mixtures which, in contact with water, emit flammable gases, category 1, 2 or 3, pyrophoric liquids category 1 or pyrophoric solids category 1, regardless of whether they appear in Part 3 of Annex VI to Regulation (EC) No 1272/2008 or not.	Styrene

STYRENE is not on the REACH Candidate List

STYRENE is not on the REACH Annex XIV List

15.1.2. National regulations

Listed on ELINCS (European List of Notified Chemical Substances)
Listed on the Korean ECL (Existing Chemicals List)
Complies the United States TSCA (Toxic Substances Control Act) inventory
Listed on the Canadian DSL (Domestic Substances List)
Listed on the AICS (Australian Inventory of Chemical Substances)
Listed on the Philippines Inventory of Chemicals and Chemical Substances (PICCS)
Listed on the China Inventory of Existing Chemical Substances (IECSC)
Listed on the Japanese ENCS (Existing & New Chemical Substances) inventory
Listed on NZIoC (New Zealand Inventory of Chemicals)

15.2. Chemical safety assessment

A chemical safety assessment has been carried out

SECTION 16: Other information

Training advice	:	Training staff on good practice. Manipulations are to be done only by qualified and authorised persons.
Other information	:	Use good personal hygiene practices.

Full text of H- and EUH-statements:

Acute Tox. 4 (Inhalation)	Acute toxicity (inhal.), Category 4
Acute Tox. 4 (Inhalation:vapour)	Acute toxicity (inhalation:vapour) Category 4
Aquatic Chronic 3	Hazardous to the aquatic environment — Chronic Hazard, Category 3
Asp. Tox. 1	Aspiration hazard, Category 1
Eye Irrit. 2	Serious eye damage/eye irritation, Category 2
Flam. Liq. 3	Flammable liquids, Category 3
Repr. 2	Reproductive toxicity, Category 2
Skin Irrit. 2	Skin corrosion/irritation, Category 2
STOT RE 1	Specific target organ toxicity — Repeated exposure, Category 1
STOT SE 3	Specific target organ toxicity — Single exposure, Category 3, Respiratory tract irritation
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 organs through prolonged or repeated exposure.
H412	Harmful to aquatic life with long lasting effects.

SDS EU (REACH Annex II)

This information applies to the PRODUCT AS SUCH and conforming to specifications of TOTAL.
In case of formulations or mixtures, it is necessary to ascertain that a new danger will not appear.
The information contained is based on our knowledge of the product, at the date of publishing and it is given quite sincerely. However the revision of some data is in progress.
Users are advised of possible additional hazards when the product is used in applications for which it was not intended. This sheet shall only be used and reproduced for prevention and security purposes.
The references to legislative, regulatory and codes of practice documents cannot be considered as exhaustive.
It is the responsibility of the person receiving the product to refer to the totality of the official documents concerning the use, the possession and the handling of the product.
It is also the responsibility of the handlers of the product to pass on to any subsequent persons who will come into contact with the product. (usage, storage, cleaning of containers, other processes) the totality of the information contained within this safety data sheet and necessary for safety at work, the protection of health and the protection of environment.

Annex to the safety data sheet

Product exposure scenario(s)

ES Type	ES title
Worker	Manufacture of substances
Worker	Continuous mass polymerisation of Polystyrene (HIPS and GPPS)
Worker	Batch suspension polymerisation of Polystyrene (HIPS and GPPS)
Worker	Production of expandable polystyrene
Worker	Production of styrenic copolymers
Worker	Manufacturing of UP/VE resins and formulated resins (Gelcoat, Colour Paste, Putty, Bonding paste / Adhesive, etc.)
Worker	FRP manufacturing in an industrial setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.)
Worker	FRP manufacturing in an professional setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.)
Worker	Production of Styrene Butadiene Rubber (SBR)
Worker	Production of Styrene Butadiene Latex (SBL)
Worker	Production of Styrene Isoprene Copolymers
Worker	Production of other Styrene based polymeric dispersions
Worker	Production of filled Polyols

1. Exposure scenario ES1-Sty

Manufacture of substances

ES Ref.: ES1-Sty ES Type: Worker Version: 1.0	Company ES code: Total Date of issue: 15/04/2016

Use descriptors	SU3 PROC1, PROC2, PROC8a, PROC8b, PROC15 ERC1
Processes, tasks, activities covered	Industrial use

2. Operational conditions and risk management measures

2.1.1 Contributing scenario controlling worker exposure (PROC8b)

Additivation and stabilisation. Stabiliser addition for storage and transport	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Local exhaust ventilation - efficiency of at least [%]:	90 in contact with skin
	Local exhaust ventilation - efficiency of at least [%]:	97 Inhalation
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.2 Contributing scenario controlling worker exposure (PROC1)

Material transfers. Transfer from distillator to storage tanks via pipelines.	
PROC1	Use in closed process, no likelihood of exposure

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.3 Contributing scenario controlling worker exposure (PROC2)

Use in contained systems. Transfer from distillator to storage tanks via pipelines.

PROC2	Use in closed, continuous process with occasional controlled exposure

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	100 %
Volatility	medium

Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.4 Contributing scenario controlling worker exposure (PROC2)

Use in contained systems. Condensation of crude styrene - water separation	
PROC2	Use in closed, continuous process with occasional controlled exposure

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	100 %
Volatility	medium

Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.5 Contributing scenario controlling worker exposure (PROC2)

Use in contained systems. Vacuum distillation	
PROC2	Use in closed, continuous process with occasional controlled exposure

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	100 %
Volatility	medium

Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection	

	and gloves	

2.1.6 Contributing scenario controlling worker exposure (PROC2)

Material transfers. Waste management : recovery using condensation or adsorption/ desorption processes	
PROC2	Use in closed, continuous process with occasional controlled exposure

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.7 Contributing scenario controlling worker exposure (PROC8a)

Process sampling. Sampling from reactors/condensors/distillators	
PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear suitable coveralls to prevent exposure to the skin. Use suitable eye protection and gloves	
	wear a respirator providing a minimum efficiency of (%):	80

2.1.8 Contributing scenario controlling worker exposure (PROC8b)

Additivation and stabilisation. Addition of inhibitors or retardants in distillators	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level	Local exhaust ventilation - efficiency of at least [%]:	90

(source) to prevent release		in contact with skin
	Local exhaust ventilation - efficiency of at least [%]:	97 Inhalation
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.9 Contributing scenario controlling worker exposure (PROC8b)

Material transfers. Unloading storage tanks for road, rail or boat transport	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	100 %
Volatility	medium

Operational conditions

Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Outdoor	30 %

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Clear transfer lines prior to de-coupling	
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.10 Contributing scenario controlling worker exposure (PROC8b)

Equipment maintenance. Manufacturing equipment maintenance: opening and cleaning manufacturing equipment for maintenance purposes	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	100 %
Volatility	medium

Operational conditions

Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Clear transfer lines prior to de-coupling	
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.11 Contributing scenario controlling worker exposure (PROC8b)

Material transfers. Waste management : transfer of process wastes to storage containers: off-line in workplace	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	100 %

Volatility	medium	
Operational conditions		
Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Clear transfer lines prior to de-coupling	
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.12 Contributing scenario controlling worker exposure (PROC15)

Material transfers. Laboratory - Quality Control	
PROC15	Use as laboratory reagent

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Clear transfer lines prior to de-coupling	
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.2 Contributing scenario controlling environmental exposure (ERC1)

ERC1	Manufacture of substances

Product characteristics

No additional information

Operational conditions		
Amounts used	Daily amount per site	3430000 kg/day
	Fraction of EU tonnage used in region:	100 %
	Fraction of Regional tonnage used locally:	100 %
	Annual site tonnage (tonnes/year):	4500000 t/yr
Frequency and duration of use	Emission Days (days/year):	350
Environmental factors not influenced by risk management	Local freshwater dilution factor:	41
	Local marine water dilution factor:	100
	Receiving surface water flow (m³/day):	400000
Other given operational conditions affecting environmental exposure	Release fraction to air from process	0.013 %
	Release fraction to wastewater	0.0048 %
	Release fraction to soil from process	0 %
Risk Management Measures		
Conditions and measures related to sewage treatment plant	Assumed domestic sewage treatment plant flow (m³/d):	10000 m³/d
	Efficiency	95.6 %
Conditions and measures related to external recovery	No application of sludge to soil	

of waste		

3. Exposure estimation and reference to its source

3.1. Health

Information for contributing exposure scenario	
2.1.1	Qualitative approach used to conclude safe use
2.1.2	Qualitative approach used to conclude safe use
2.1.3	Qualitative approach used to conclude safe use
2.1.4	Qualitative approach used to conclude safe use
2.1.5	Qualitative approach used to conclude safe use
2.1.6	Qualitative approach used to conclude safe use
2.1.7	Qualitative approach used to conclude safe use
2.1.8	Qualitative approach used to conclude safe use
2.1.9	Qualitative approach used to conclude safe use
2.1.10	Qualitative approach used to conclude safe use
2.1.11	Qualitative approach used to conclude safe use
2.1.12	Qualitative approach used to conclude safe use

3.2. Environment

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

4.1. Health

Guidance - Health	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures

4.2. Environment

Guidance - Environment	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures

1. Exposure scenario ES2-Sty

Continuous mass polymerisation of Polystyrene (HIPS and GPPS)

ES Ref.: ES2-Sty ES Type: Worker Version: 1.0	Company ES code: Total Date of issue: 15/04/2016

Use descriptors	SU3 PROC2, PROC8a, PROC8b, PROC9, PROC14, PROC15 ERC6c
Processes, tasks, activities covered	Industrial use

2. Operational conditions and risk management measures

2.1.1 Contributing scenario controlling worker exposure (PROC2)

Continuous process. Styrene Storage in tanks	
PROC2	Use in closed, continuous process with occasional controlled exposure

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	100 %
Volatility	medium

Operational conditions

Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures

Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.2 Contributing scenario controlling worker exposure (PROC2)

Continuous process. Charging reactor via pipeline	
PROC2	Use in closed, continuous process with occasional controlled exposure

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	100 %
Volatility	medium

Operational conditions

Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures

Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.3 Contributing scenario controlling worker exposure (PROC2)

Material transfers. Heat exchange and agitator in reactor	
PROC2	Use in closed, continuous process with occasional controlled exposure

Product characteristics

Physical form of product	Liquid

Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.4 Contributing scenario controlling worker exposure (PROC2)

Continuous process. Devolatilisation tower	
PROC2	Use in closed, continuous process with occasional controlled exposure

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.5 Contributing scenario controlling worker exposure (PROC2)

Continuous process. Recycling styrene from tower to reactor via pipeline	
PROC2	Use in closed, continuous process with occasional controlled exposure

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.6 Contributing scenario controlling worker exposure (PROC2)

Material transfers. Waste management : recovery using condensation or adsorption/ desorption processes

PROC2	Use in closed, continuous process with occasional controlled exposure

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	100 %
Volatility	medium

Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.7 Contributing scenario controlling worker exposure (PROC8a)

Process sampling. Sampling from reactors/devolatilisation tower	
PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	100 %
Volatility	medium

Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear suitable coveralls to prevent exposure to the skin. Use suitable eye protection and gloves	
	wear a respirator providing a minimum efficiency of (%):	80

2.1.8 Contributing scenario controlling worker exposure (PROC8b)

Material transfers. Loading tank storage from road, rail or boat transport	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	100 %
Volatility	medium

Operational conditions		
Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Clear transfer lines prior to de-coupling	
Organisational measures to prevent /limit releases,	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are	

dispersion and exposure	trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.9 Contributing scenario controlling worker exposure (PROC8b)

Equipment maintenance. Cleaning manufacturing equipment for maintenance purposes	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics

Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	

Operational conditions

Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures

Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.10 Contributing scenario controlling worker exposure (PROC8b)

Bulk transfers. road tanker/rail car loading	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics

Physical form of product	Liquid	
Concentration of substance in product	1-5%	
Volatility	medium	

Operational conditions

Frequency and duration of use	Exposure duration	> 4 h
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures

Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.11 Contributing scenario controlling worker exposure (PROC8b)

Material transfers. Transfer of process wastes to storage containers	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics

Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	

Operational conditions

Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.12 Contributing scenario controlling worker exposure (PROC9)

Small package filling	
PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	1-5%
Volatility	medium

Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.13 Contributing scenario controlling worker exposure (PROC14)

Extrusion and masterbatching	
PROC14	Production of preparations or articles by tabletting, compression, extrusion, pelletisation

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	1-5%
Volatility	medium

Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.14 Contributing scenario controlling worker exposure (PROC15)

Laboratory activities	
PROC15	Use as laboratory reagent

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	100 %
Volatility	medium

Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face	

	side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.2 Contributing scenario controlling environmental exposure (ERC6c)

ERC6c	Industrial use of monomers for manufacture of thermo-plastics

Product characteristics

No additional information

Operational conditions

Amounts used	Daily amount per site	483000 kg/day
	Fraction of EU tonnage used in region:	10 %
	Fraction of Regional tonnage used locally:	60 %
	Annual site tonnage (tonnes/year):	2420000 t/yr
Frequency and duration of use	Emission Days (days/year):	300
Environmental factors not influenced by risk management	Local freshwater dilution factor:	10
	Local marine water dilution factor:	100
	Receiving surface water flow (m³/day):	18000
Other given operational conditions affecting environmental exposure	Release fraction to air from process	0.102 %
	Release fraction to wastewater	0.000012 %
	Release fraction to soil from process	0 %
Risk Management Measures		
Conditions and measures related to sewage treatment plant	Assumed domestic sewage treatment plant flow (m³/d):	2000 m³/d
	Efficiency	91.9 %
Conditions and measures related to external recovery of waste	No application of sludge to soil	

3. Exposure estimation and reference to its source

3.1. Health

Information for contributing exposure scenario	
2.1.1	Qualitative approach used to conclude safe use
2.1.2	Qualitative approach used to conclude safe use
2.1.3	Qualitative approach used to conclude safe use
2.1.4	Qualitative approach used to conclude safe use
2.1.5	Qualitative approach used to conclude safe use
2.1.6	Qualitative approach used to conclude safe use
2.1.7	Qualitative approach used to conclude safe use
2.1.8	Qualitative approach used to conclude safe use
2.1.9	Qualitative approach used to conclude safe use
2.1.10	Qualitative approach used to conclude safe use
2.1.11	Qualitative approach used to conclude safe use
2.1.12	Qualitative approach used to conclude safe use
2.1.13	Qualitative approach used to conclude safe use
2.1.14	Qualitative approach used to conclude safe use

3.2. Environment

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

4.1. Health

Guidance - Health	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures

4.2. Environment

Guidance - Environment	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus,

	scaling may be necessary to define appropriate site-specific risk management measures

1. Exposure scenario ES3-Sty

Batch suspension polymerisation of Polystyrene (HIPS and GPPS)

ES Ref.: ES3-Sty ES Type: Worker Version: 1.0	Company ES code: Total Date of issue: 15/04/2016

Use descriptors	SU3 PROC2, PROC3, PROC8a, PROC8b, PROC9, PROC14, PROC15 ERC6c
Processes, tasks, activities covered	Industrial use

2. Operational conditions and risk management measures

2.1.1 Contributing scenario controlling worker exposure (PROC3)

Batch process. Washed and dried tanks	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.2 Contributing scenario controlling worker exposure (PROC8b)

Material transfers. Loading tank storage from road, rail or boat transport	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Clear transfer lines prior to de-coupling	
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.3 Contributing scenario controlling worker exposure (PROC2)

Material transfers. Styrene Storage in tanks	
PROC2	Use in closed, continuous process with occasional controlled exposure

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.4 Contributing scenario controlling worker exposure (PROC2)

Material transfers. Waste management : recovery using condensation or adsorption/ desorption processes	
PROC2	Use in closed, continuous process with occasional controlled exposure

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.5 Contributing scenario controlling worker exposure (PROC3)

Material transfers. Charging reactor via pipeline	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %

Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.6 Contributing scenario controlling worker exposure (PROC3)

Batch process. Dispersing and heat in reactor	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics

Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	

Operational conditions

Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.7 Contributing scenario controlling worker exposure (PROC8a)

Process sampling	
PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities

Product characteristics

Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	

Operational conditions

Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures

Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear suitable coveralls to prevent exposure to the skin. Use suitable eye protection and gloves	
	wear a respirator providing a minimum efficiency of (%):	80

2.1.8 Contributing scenario controlling worker exposure (PROC8b)

Equipment maintenance. Cleaning manufacturing equipment for maintenance purposes	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics

Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	

Operational conditions

Frequency and duration of use	Avoid carrying out activities involving exposure for	

	more than 1 hour	
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.9 Contributing scenario controlling worker exposure (PROC8b)

Bulk transfers. road tanker/rail car loading	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	1-5%	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.10 Contributing scenario controlling worker exposure (PROC8b)

Material transfers. Waste management : transfer of process wastes to storage containers: off-line in workplace	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.11 Contributing scenario controlling worker exposure (PROC9)

Small package filling	
PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	1-5%

Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.12 Contributing scenario controlling worker exposure (PROC15)

Laboratory activities	
PROC15	Use as laboratory reagent

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.13 Contributing scenario controlling worker exposure (PROC14)

Operation of solids filtering equipment	
PROC14	Production of preparations or articles by tabletting, compression, extrusion, pelletisation

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	1-5%	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.2 Contributing scenario controlling environmental exposure (ERC6c)

ERC6c	Industrial use of monomers for manufacture of thermo-plastics
Product characteristics	

No additional information

Operational conditions		
Amounts used	Daily amount per site	483000 kg/day
	Fraction of EU tonnage used in region:	10 %
	Fraction of Regional tonnage used locally:	60 %
	Annual site tonnage (tonnes/year):	2420000 t/yr
Frequency and duration of use	Emission Days (days/year):	300
Environmental factors not influenced by risk management	Local freshwater dilution factor:	10
	Local marine water dilution factor:	100
	Receiving surface water flow (m³/day):	18000
Other given operational conditions affecting environmental exposure	Release fraction to air from process	0.102 %
	Release fraction to wastewater	0.000012 %
	Release fraction to soil from process	0 %
Risk Management Measures		
Conditions and measures related to sewage treatment plant	Assumed domestic sewage treatment plant flow (m³/d):	2000 m³/d
	Efficiency	91.9 %
Conditions and measures related to external recovery of waste	No application of sludge to soil	

3. Exposure estimation and reference to its source

3.1. Health

Information for contributing exposure scenario	
2.1.1	Qualitative approach used to conclude safe use
2.1.2	Qualitative approach used to conclude safe use
2.1.3	Qualitative approach used to conclude safe use
2.1.4	Qualitative approach used to conclude safe use
2.1.5	Qualitative approach used to conclude safe use
2.1.6	Qualitative approach used to conclude safe use
2.1.7	Qualitative approach used to conclude safe use
2.1.8	Qualitative approach used to conclude safe use
2.1.9	Qualitative approach used to conclude safe use
2.1.10	Qualitative approach used to conclude safe use
2.1.11	Qualitative approach used to conclude safe use
2.1.12	Qualitative approach used to conclude safe use
2.1.13	Qualitative approach used to conclude safe use

3.2. Environment

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

4.1. Health

Guidance - Health	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures

4.2. Environment

Guidance - Environment	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures

1. Exposure scenario ES4-Sty

Production of expandable polystyrene

ES Ref.: ES4-Sty ES Type: Worker Version: 1.0	Company ES code: Total Date of issue: 15/04/2016

Use descriptors	SU3 PROC2, PROC3, PROC8a, PROC8b, PROC9, PROC14, PROC15 ERC6c
Processes, tasks, activities covered	Industrial use

2. Operational conditions and risk management measures

2.1.1 Contributing scenario controlling worker exposure (PROC8b)

Equipment maintenance. Cleaning manufacturing equipment for maintenance purposes	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.2 Contributing scenario controlling worker exposure (PROC2)

Material transfers. Styrene Storage in tanks	
PROC2	Use in closed, continuous process with occasional controlled exposure

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.3 Contributing scenario controlling worker exposure (PROC3)

Material transfers. Charging reactor via pipeline	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics	
Physical form of product	Liquid

Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.4 Contributing scenario controlling worker exposure (PROC3)

Batch process. Dispersing and heat in reactor	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.5 Contributing scenario controlling worker exposure (PROC3)

Batch process. Washed and dried tanks	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are	

	trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.6 Contributing scenario controlling worker exposure (PROC8a)

Process sampling	
PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear suitable coveralls to prevent exposure to the skin. Use suitable eye protection and gloves	
	wear a respirator providing a minimum efficiency of (%):	80

2.1.7 Contributing scenario controlling worker exposure (PROC8b)

Material transfers. Loading tank storage from road, rail or boat transport	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Clear transfer lines prior to de-coupling	
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.8 Contributing scenario controlling worker exposure (PROC8b)

Bulk transfers. road tanker/rail car loading	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	1-5%	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h
	Use frequency	5 days/week

Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.9 Contributing scenario controlling worker exposure (PROC8b)

Material transfers. Waste management : transfer of process wastes to storage containers: off-line in workplace	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.10 Contributing scenario controlling worker exposure (PROC9)

Small package filling	
PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	1-5%	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.11 Contributing scenario controlling worker exposure (PROC14)

Operation of solids filtering equipment	
PROC14	Production of preparations or articles by tabletting, compression, extrusion, pelletisation

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	1-5%	
Volatility	medium	
Operational conditions		

Frequency and duration of use	Exposure duration	> 4 h
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.12 Contributing scenario controlling worker exposure (PROC15)

Laboratory activities	
PROC15	Use as laboratory reagent

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.2 Contributing scenario controlling environmental exposure (ERC6c)

ERC6c	Industrial use of monomers for manufacture of thermo-plastics

Product characteristics

No additional information

Operational conditions		
Amounts used	Daily amount per site	483000 kg/day
	Fraction of EU tonnage used in region:	10 %
	Fraction of Regional tonnage used locally:	60 %
	Annual site tonnage (tonnes/year):	2420000 t/yr
Frequency and duration of use	Emission Days (days/year):	300
Environmental factors not influenced by risk management	Local freshwater dilution factor:	10
	Local marine water dilution factor:	100
	Receiving surface water flow (m³/day):	18000
Other given operational conditions affecting environmental exposure	Release fraction to air from process	0.102 %
	Release fraction to wastewater	0.000012 %
	Release fraction to soil from process	0 %
Risk Management Measures		
Conditions and measures related to sewage treatment plant	Assumed domestic sewage treatment plant flow (m³/d):	2000 m³/d
	Efficiency	91.9 %
Conditions and measures related to external recovery of waste	No application of sludge to soil	

3. Exposure estimation and reference to its source

3.1. Health

Information for contributing exposure scenario	
2.1.1	Qualitative approach used to conclude safe use

2.1.2	Qualitative approach used to conclude safe use
2.1.3	Qualitative approach used to conclude safe use
2.1.4	Qualitative approach used to conclude safe use
2.1.5	Qualitative approach used to conclude safe use
2.1.6	Qualitative approach used to conclude safe use
2.1.7	Qualitative approach used to conclude safe use
2.1.8	Qualitative approach used to conclude safe use
2.1.9	Qualitative approach used to conclude safe use
2.1.10	Qualitative approach used to conclude safe use
2.1.11	Qualitative approach used to conclude safe use
2.1.12	Qualitative approach used to conclude safe use

3.2. Environment

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

4.1. Health

Guidance - Health	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures

4.2. Environment

Guidance - Environment	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures

1. Exposure scenario ES5-Sty

Production of styrenic copolymers

ES Ref.: ES5-Sty ES Type: Worker Version: 1.0	Company ES code: Total Date of issue: 15/04/2016

Use descriptors	SU3 PROC2, PROC3, PROC8a, PROC8b, PROC9, PROC15 ERC6c
Processes, tasks, activities covered	Industrial use

2. Operational conditions and risk management measures

2.1.1 Contributing scenario controlling worker exposure (PROC8a)

Process sampling	
PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	100 %
Volatility	medium

Operational conditions

Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures

Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear suitable coveralls to prevent exposure to the skin. Use suitable eye protection and gloves	
	wear a respirator providing a minimum efficiency of (%):	80

2.1.2 Contributing scenario controlling worker exposure (PROC8b)

Bulk transfers. road tanker/rail car loading	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	1-5%
Volatility	medium

Operational conditions

Frequency and duration of use	Exposure duration	> 4 h
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures

Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.3 Contributing scenario controlling worker exposure (PROC2)

Material transfers. Styrene Storage in tanks	
PROC2	Use in closed, continuous process with occasional controlled exposure

Product characteristics

Physical form of product	Liquid

Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.4 Contributing scenario controlling worker exposure (PROC2)

Material transfers. Waste management : recovery using condensation or adsorption/ desorption processes	
PROC2	Use in closed, continuous process with occasional controlled exposure

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.5 Contributing scenario controlling worker exposure (PROC3)

Material transfers. Charging reactor via pipeline	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.6 Contributing scenario controlling worker exposure (PROC3)

Batch process. Dissolving and polymerisation reactor	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.7 Contributing scenario controlling worker exposure (PROC3)

Batch process. Suspension reactor	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.8 Contributing scenario controlling worker exposure (PROC3)

Batch process. Washed and dried tanks	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers	Indoors	

exposure		
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.9 Contributing scenario controlling worker exposure (PROC8b)

Equipment maintenance. Cleaning manufacturing equipment for maintenance purposes	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.10 Contributing scenario controlling worker exposure (PROC8b)

Material transfers. Waste management : transfer of process wastes to storage containers: off-line in workplace	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.11 Contributing scenario controlling worker exposure (PROC9)

Small package filling	
PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	1-5%	
Volatility	medium	
Operational conditions		

Frequency and duration of use	Exposure duration	> 4 h
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.12 Contributing scenario controlling worker exposure (PROC15)

Laboratory activities	
PROC15	Use as laboratory reagent

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.2 Contributing scenario controlling environmental exposure (ERC1)

ERC1	Manufacture of substances

Product characteristics

No additional information

Operational conditions		
Amounts used	Daily amount per site	483000 kg/day
	Fraction of EU tonnage used in region:	10 %
	Fraction of Regional tonnage used locally:	60 %
	Annual site tonnage (tonnes/year):	2420000 t/yr
Frequency and duration of use	Emission Days (days/year):	300
Environmental factors not influenced by risk management	Local freshwater dilution factor:	10
	Local marine water dilution factor:	100
	Receiving surface water flow (m³/day):	18000
Other given operational conditions affecting environmental exposure	Release fraction to air from process	0.102 %
	Release fraction to wastewater	0.000012 %
	Release fraction to soil from process	0 %
Risk Management Measures		
Conditions and measures related to sewage treatment plant	Assumed domestic sewage treatment plant flow (m³/d):	2000 m³/d
	Efficiency	91.9 %
Conditions and measures related to external recovery of waste	No application of sludge to soil	

3. Exposure estimation and reference to its source

3.1. Health

Information for contributing exposure scenario	
2.1.1	Qualitative approach used to conclude safe use

2.1.2	Qualitative approach used to conclude safe use
2.1.3	Qualitative approach used to conclude safe use
2.1.4	Qualitative approach used to conclude safe use
2.1.5	Qualitative approach used to conclude safe use
2.1.6	Qualitative approach used to conclude safe use
2.1.7	Qualitative approach used to conclude safe use
2.1.8	Qualitative approach used to conclude safe use
2.1.9	Qualitative approach used to conclude safe use
2.1.10	Qualitative approach used to conclude safe use
2.1.11	Qualitative approach used to conclude safe use
2.1.12	Qualitative approach used to conclude safe use

3.2. Environment

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

4.1. Health

Guidance - Health	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures

4.2. Environment

Guidance - Environment	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures

1. Exposure scenario ES6-Sty

Manufacturing of UP/VE resins and formulated resins (Gelcoat, Colour Paste, Putty, Bonding paste / Adhesive, etc.)

ES Ref.: ES6-Sty ES Type: Worker Version: 1.0	Company ES code: Total Date of issue: 15/04/2016

Use descriptors	SU3 PROC1, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC15 ERC2
Processes, tasks, activities covered	Industrial use

2. Operational conditions and risk management measures

2.1.1 Contributing scenario controlling worker exposure (PROC4)

Material transfers	
PROC4	Use in batch and other process (synthesis) where opportunity for exposure arises

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	50 %
Volatility	medium

Operational conditions

Frequency and duration of use	Exposure duration	> 4 h
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	80 %

2.1.2 Contributing scenario controlling worker exposure (PROC1)

General exposures. Use in contained batch processes	
PROC1	Use in closed process, no likelihood of exposure

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	50 %
Volatility	medium

Operational conditions

Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week

Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	80 %

2.1.3 Contributing scenario controlling worker exposure (PROC3)

Bulk transfers. Receipt and storage of raw materials	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	50 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Outdoor	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	80 %

2.1.4 Contributing scenario controlling worker exposure (PROC3)

General exposures (closed systems). Dissolving linear UP/VE polymer into styrene in blending vessel (or dissolver)	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	50 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	80 %

2.1.5 Contributing scenario controlling worker exposure (PROC3)

Equipment cleaning and maintenance	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	50 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
	Good standard of general ventilation	30 %

Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	80 %
	Breathing apparatus. Efficiency	95 %

2.1.6 Contributing scenario controlling worker exposure (PROC4)

Process sampling	
PROC4	Use in batch and other process (synthesis) where opportunity for exposure arises

Product characteristics

Physical form of product	Liquid	
Concentration of substance in product	50 %	
Volatility	medium	

Operational conditions

Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm^2) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	80 %

2.1.7 Contributing scenario controlling worker exposure (PROC5)

Drum/batch transfers. Pouring from small containers. Transfer from/pouring from containers. Mixing operations (open systems)	
PROC5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)

Product characteristics

Physical form of product	Liquid	
Concentration of substance in product	50 %	
Volatility	medium	

Operational conditions

Frequency and duration of use	Exposure duration	>= 4 h
	Use frequency	5 days/week

Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
	Use drum pumps. Carefully pour from containers. Put lids on containers immediately after use	
	Local exhaust ventilation - efficiency of at least [%]:	90
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	80 %

2.1.8 Contributing scenario controlling worker exposure (PROC8a)

Equipment cleaning and maintenance	
PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	< 4 h
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
	Use drum pumps. Carefully pour from containers. Put lids on containers immediately after use	
	Local exhaust ventilation - efficiency of at least [%]:	90
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed.	

	Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	80 %
	Breathing apparatus. Efficiency	95 %

2.1.9 Contributing scenario controlling worker exposure (PROC8a)

Disposal of wastes	
PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
	Use drum pumps. Carefully pour from containers. Put lids on containers immediately after use	
	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	80 %

2.1.10 Contributing scenario controlling worker exposure (PROC8b)

Bulk transfers	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	outdoor	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	80 %

2.1.11 Contributing scenario controlling worker exposure (PROC9)

Bulk transfers	
PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	50 %
Volatility	medium

Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
	Local exhaust ventilation - efficiency of at least [%]:	90 %
	Fill containers/cans at dedicated fill points supplied with local extract ventilation	
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	80 %

2.1.12 Contributing scenario controlling worker exposure (PROC15)

Laboratory activities	
PROC15	Use as laboratory reagent

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	50 %

Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm^2) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
	Local exhaust ventilation - efficiency of at least [%]:	90 %
	Carry out in a vented booth or extracted enclosure	
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	80 %

2.2 Contributing scenario controlling environmental exposure (ERC2)

ERC2	Formulation of preparations

Product characteristics

No additional information

Operational conditions		
Amounts used	Daily amount per site	45700 kg/day
	Fraction of EU tonnage used in region:	10 %
	Fraction of Regional tonnage used locally:	60 %
	Annual site tonnage (tonnes/year):	228000 t/yr
Frequency and duration of use	Emission Days (days/year):	300
Environmental factors not influenced by risk management	Local freshwater dilution factor:	41
	Local marine water dilution factor:	100
	Receiving surface water flow (m^3/day):	400000
Other given operational conditions affecting environmental exposure	Release fraction to air from process	0.2 %
	Release fraction to wastewater	0.0049 %
	Release fraction to soil from process	0 %
Risk Management Measures		
Conditions and measures related to sewage treatment plant	Assumed domestic sewage treatment plant flow (m^3/d):	10000 m^3/d
	Efficiency	91.9 %
Conditions and measures related to external recovery of waste	No application of sludge to soil	

3. Exposure estimation and reference to its source

3.1. Health

Information for contributing exposure scenario	
2.1.1	Qualitative approach used to conclude safe use
2.1.2	Qualitative approach used to conclude safe use
2.1.3	Qualitative approach used to conclude safe use
2.1.4	Qualitative approach used to conclude safe use
2.1.5	Qualitative approach used to conclude safe use

2.1.6	Qualitative approach used to conclude safe use
2.1.7	Qualitative approach used to conclude safe use
2.1.8	Qualitative approach used to conclude safe use
2.1.9	Qualitative approach used to conclude safe use
2.1.10	Qualitative approach used to conclude safe use
2.1.11	Qualitative approach used to conclude safe use
2.1.12	Qualitative approach used to conclude safe use

3.2. Environment

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

4.1. Health

Guidance - Health	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures

4.2. Environment

Guidance - Environment	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures

1. Exposure scenario ES7-Sty

FRP manufacturing in an industrial setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.)

ES Ref.: ES7-Sty ES Type: Worker Version: 1.0	Company ES code: Total Date of issue: 16/04/2016

Use descriptors	SU3 PROC3, PROC5, PROC7, PROC8a, PROC10, PROC13, PROC14, PROC15 ERC6d
Processes, tasks, activities covered	Industrial use

2. Operational conditions and risk management measures

2.1.1 Contributing scenario controlling worker exposure (PROC3)

Material transfers. Automated process with (semi) closed systems. Use in contained batch processes	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	50 %
Volatility	medium

Operational conditions

Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	80 %

2.1.2 Contributing scenario controlling worker exposure (PROC3)

Material transfers	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	50 %
Volatility	medium

Operational conditions

Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week

Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	80 %

2.1.3 Contributing scenario controlling worker exposure (PROC5)

Casting operations. Mixing operations (open systems)	
PROC5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	25-50 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
	Local exhaust ventilation - efficiency of at least [%]:	90 %
	Use drum pumps. Carefully pour from containers. Put lids on containers immediately after use	
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic	

	medical surveillance is required	
	Protective gloves. Efficiency	80 %

2.1.4 Contributing scenario controlling worker exposure (PROC5)

General exposures (closed systems)	
PROC5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	50 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
	Provide enhanced general ventilation by mechanical means. Efficiency	70 %
	Use drum pumps. Carefully pour from containers. Put lids on containers immediately after use	
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	80 %

2.1.5 Contributing scenario controlling worker exposure (PROC5)

Drum/batch transfers. Pouring from small containers. Transfer from/pouring from containers. Mixing operations (open systems)	
PROC5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	50 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
	Local exhaust ventilation - efficiency of at least [%]:	90 %
	Use drum pumps. Carefully pour from containers. Put lids on containers immediately after use	
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	80 %

2.1.6 Contributing scenario controlling worker exposure (PROC7)

Spraying. Spraying (automatic/robotic)	
PROC7	Industrial spraying

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	50 %
Volatility	medium

Operational conditions

Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface assumed:	1500 cm²
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
	Carry out in a vented booth or extracted enclosure. Efficiency	95 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	80 %
	wear a respirator providing a minimum efficiency of (%):	95 %

2.1.7 Contributing scenario controlling worker exposure (PROC7)

Spraying. Spraying (automatic/robotic)	
PROC7	Industrial spraying

Product characteristics

Physical form of product	Liquid	
Concentration of substance in product	50 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface assumed:	1500 cm²
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
	Local exhaust ventilation - efficiency of at least [%]:	95 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	95 %
	wear a respirator providing a minimum efficiency of (%):	97.5 % AFP 40

2.1.8 Contributing scenario controlling worker exposure (PROC8a)

Equipment maintenance. Maintenance of small items	
PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	50 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	<= 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
	Carefully pour from containers. Use drum pumps. Put lids on containers immediately after use	
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	

Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	80 %
	wear a respirator providing a minimum efficiency of (%):	95 %

2.1.9 Contributing scenario controlling worker exposure (PROC8a)

Disposal of wastes.	
PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	50 %
Volatility	medium

Operational conditions

Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
	Carefully pour from containers. Use drum pumps. Put lids on containers immediately after use	
	Local exhaust ventilation - efficiency of at least [%]:	90 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	80 %
	wear a respirator providing a minimum efficiency of (%):	95 %

2.1.10 Contributing scenario controlling worker exposure (PROC10)

Roller application or brushing.	
PROC10	Roller application or brushing

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	50 %
Volatility	medium

Operational conditions

Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week

Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
	Provide enhanced general ventilation by mechanical means. Efficiency	70 %
	Use long handled tools where possible	
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	80 %
	wear a respirator providing a minimum efficiency of (%):	95 %

2.1.11 Contributing scenario controlling worker exposure (PROC10)

Dipping, immersion and pouring. Roller application or brushing	
PROC10	Roller application or brushing

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	Limit the substance content in the product to 25 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
	Local exhaust ventilation - efficiency of at least [%]:	90 %
	Use long handled tools where possible	
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed.	

	Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	95 %
	wear a respirator providing a minimum efficiency of (%):	95 %

2.1.12 Contributing scenario controlling worker exposure (PROC13)

Dipping, immersion and pouring. Continuous process	
PROC13	Treatment of articles by dipping and pouring

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	50 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
	Local exhaust ventilation - efficiency of at least [%]:	90 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	95 %
	wear a respirator providing a minimum efficiency of (%):	95 %

2.1.13 Contributing scenario controlling worker exposure (PROC14)

Material transfers. Production or preparations or articles by tabletting, compression, extrusion or pelletisation. Treatment by heating. Batch processes at elevated temperatures	
PROC14	Production of preparations or articles by tabletting, compression, extrusion, pelletisation

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	Limit the substance content in the product to 25 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level	Automate activity where possible. Minimise exposure by partial enclosure of the operation or equipment	

(source) to prevent release	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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
	Provide enhanced general ventilation by mechanical means. Efficiency	70 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	80 %

2.1.14 Contributing scenario controlling worker exposure (PROC15)

Laboratory activities	
PROC15	Use as laboratory reagent

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	50 %
Volatility	medium

Operational conditions

Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	80 %

2.2 Contributing scenario controlling environmental exposure (ERC6d)

ERC6d	Industrial use of process regulators for polymerisation processes in production of resins, rubbers, polymers

Product characteristics

No additional information

Operational conditions

Amounts used	Daily amount per site	161000 kg/day

	Fraction of EU tonnage used in region:	10 %
	Fraction of Regional tonnage used locally:	60 %
	Annual site tonnage (tonnes/year):	8000000 t/yr
Frequency and duration of use	Emission Days (days/year):	300
Environmental factors not influenced by risk management	Local freshwater dilution factor:	10
	Local marine water dilution factor:	100
	Receiving surface water flow (m³/day):	18000
Other given operational conditions affecting environmental exposure	Release fraction to air from process	0.102 %
	Release fraction to wastewater	0.00063 %
	Release fraction to soil from process	0 %

Risk Management Measures

Conditions and measures related to sewage treatment plant	Assumed domestic sewage treatment plant flow (m³/d):	2000 m³/d
	Efficiency	91.9 %

3. Exposure estimation and reference to its source

3.1. Health

Information for contributing exposure scenario	
2.1.1	Qualitative approach used to conclude safe use
2.1.2	Qualitative approach used to conclude safe use
2.1.3	Qualitative approach used to conclude safe use
2.1.4	Qualitative approach used to conclude safe use
2.1.5	Qualitative approach used to conclude safe use
2.1.6	Qualitative approach used to conclude safe use
2.1.7	Qualitative approach used to conclude safe use
2.1.8	Qualitative approach used to conclude safe use
2.1.9	Qualitative approach used to conclude safe use
2.1.10	Qualitative approach used to conclude safe use
2.1.11	Qualitative approach used to conclude safe use
2.1.12	Qualitative approach used to conclude safe use
2.1.13	Qualitative approach used to conclude safe use
2.1.14	Qualitative approach used to conclude safe use

3.2. Environment

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

4.1. Health

Guidance - Health	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures

4.2. Environment

Guidance - Environment	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures

1. Exposure scenario ES8-Sty

FRP manufacturing in an professional setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.)

ES Ref.: ES8-Sty ES Type: Worker Version: 1.0	Company ES code: Total Date of issue: 14/04/2016

Use descriptors	SU22 PROC3, PROC4, PROC5, PROC8a, PROC10, PROC11 ERC8e
Processes, tasks, activities covered	Professional use

2. Operational conditions and risk management measures

2.1.1 Contributing scenario controlling worker exposure (PROC10)

Dipping, immersion and pouring. Roller application or brushing	
PROC10	Roller application or brushing

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	50 %
Volatility	medium

Operational conditions

Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
	Use long handled tools where possible	
	Local exhaust ventilation - efficiency of at least [%]:	80 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	90 %
	wear a respirator providing a minimum efficiency of (%):	97.5 % AFP 40

2.1.2 Contributing scenario controlling worker exposure (PROC3)

Use in contained batch processes	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	Limit the substance content in the product to 25 %
Volatility	medium

Operational conditions

Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Outdoor	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	90 %

2.1.3 Contributing scenario controlling worker exposure (PROC4)

Use in contained batch processes	
PROC4	Use in batch and other process (synthesis) where opportunity for exposure arises

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	50 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	<= 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Outdoor	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	90 %

	wear a respirator providing a minimum efficiency of (%):	95 %

2.1.4 Contributing scenario controlling worker exposure (PROC5)

Material transfers. Pouring from small containers	
PROC5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
	Use drum pumps. Carefully pour from containers. Put lids on containers immediately after use	
	Local exhaust ventilation - efficiency of at least [%]:	80 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	90 %
	wear a respirator providing a minimum efficiency of (%):	95 % AFP 20

2.1.5 Contributing scenario controlling worker exposure (PROC8a)

Equipment maintenance. Maintenance of small items	
PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level	Automate activity where possible. Minimise exposure	

(source) to prevent release	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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
	Use drum pumps. Carefully pour from containers. Put lids on containers immediately after use	
	Local exhaust ventilation - efficiency of at least [%]:	80 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	90 %
	wear a respirator providing a minimum efficiency of (%):	95 %

2.1.6 Contributing scenario controlling worker exposure (PROC8a)

Disposal of wastes	
PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	100 %
Volatility	medium

Operational conditions

Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm^2) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
	Use drum pumps. Carefully pour from containers. Put lids on containers immediately after use	
	Local exhaust ventilation - efficiency of at least [%]:	80 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	90 %
	wear a respirator providing a minimum efficiency of	95 %

	(%):	

2.1.7 Contributing scenario controlling worker exposure (PROC10)

Roller application or brushing	
PROC10	Roller application or brushing

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	50 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or under extract ventilation	
	Use long handled tools where possible	
	Local exhaust ventilation - efficiency of at least [%]:	80 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	90 %
	wear a respirator providing a minimum efficiency of (%):	97.5 % AFP 40

2.1.8 Contributing scenario controlling worker exposure (PROC11)

Spraying. Spraying (automatic/robotic)	
PROC11	Non industrial spraying

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	50 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface assumed:	1500 cm²
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Automate activity where possible. 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. Clear up spills immediately and dispose of waste safely	
	If vapour is released : Handle in a fume cupboard or	

	under extract ventilation	
	Local exhaust ventilation - efficiency of at least [%]:	80 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures. Prevent unauthorised access. Minimise number of staff exposed	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves. Wear suitable coveralls to prevent exposure to the skin. Wear suitable respiratory equipment	
	Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Depending on the degree of exposure, periodic medical surveillance is required	
	Protective gloves. Efficiency	90 %
	wear a respirator providing a minimum efficiency of (%):	97.5 % AFP 40

2.2 Contributing scenario controlling environmental exposure (ERC8e)

ERC8e	Wide dispersive outdoor use of reactive substances in open systems

Product characteristics

No additional information

Operational conditions

Amounts used	Daily amount per site	483000 kg/day
	Fraction of EU tonnage used in region:	10 %
	Fraction of Regional tonnage used locally:	60 %
	Annual site tonnage (tonnes/year):	2420000 t/yr
Frequency and duration of use	Emission Days (days/year):	300
Environmental factors not influenced by risk management	Local freshwater dilution factor:	10
	Local marine water dilution factor:	100
	Receiving surface water flow (m³/day):	18000
Other given operational conditions affecting environmental exposure	Release fraction to air from process	0.102 %
	Release fraction to wastewater	0.000012 %
	Release fraction to soil from process	0 %

Risk Management Measures

Conditions and measures related to sewage treatment plant	Assumed domestic sewage treatment plant flow (m³/d):	2000 m³/d
	Efficiency	91.9 %

3. Exposure estimation and reference to its source

3.1. Health

Information for contributing exposure scenario	
2.1.1	Qualitative approach used to conclude safe use
2.1.2	Qualitative approach used to conclude safe use
2.1.3	Qualitative approach used to conclude safe use
2.1.4	Qualitative approach used to conclude safe use
2.1.5	Qualitative approach used to conclude safe use
2.1.6	Qualitative approach used to conclude safe use
2.1.7	Qualitative approach used to conclude safe use
2.1.8	Qualitative approach used to conclude safe use

3.2. Environment

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

4.1. Health

Guidance - Health	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures

4.2. Environment

Guidance - Environment	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures

1. Exposure scenario ES9-Sty

Production of Styrene Butadiene Rubber (SBR)

ES Ref.: ES9-Sty ES Type: Worker Version: 1.0	Company ES code: Total Date of issue: 15/04/2016

Use descriptors	SU3 PROC2, PROC3, PROC8a, PROC8b, PROC9, PROC15 ERC6c
Processes, tasks, activities covered	Industrial use

2. Operational conditions and risk management measures

2.1.1 Contributing scenario controlling worker exposure (PROC2)

Material transfers. Storage	
PROC2	Use in closed, continuous process with occasional controlled exposure

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	100 %
Volatility	medium

Operational conditions

Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures

Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.2 Contributing scenario controlling worker exposure (PROC2)

Material transfers. Waste management	
PROC2	Use in closed, continuous process with occasional controlled exposure

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	100 %
Volatility	medium

Operational conditions

Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures

Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.3 Contributing scenario controlling worker exposure (PROC3)

Material transfers. Charging reactor via pipeline	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics

Physical form of product	Liquid

Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.4 Contributing scenario controlling worker exposure (PROC3)

Batch process. Polymerisation reactor	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.5 Contributing scenario controlling worker exposure (PROC3)

Batch process. Vacuum distillation	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are	

	trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.6 Contributing scenario controlling worker exposure (PROC3)

Batch process. Coagulation reactor	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.7 Contributing scenario controlling worker exposure (PROC3)

Batch process. Drying tank	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.8 Contributing scenario controlling worker exposure (PROC3)

Material transfers. Recycling styrene from tower to reactor via pipeline	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day

	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.9 Contributing scenario controlling worker exposure (PROC8a)

Process sampling	
PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Provide extract ventilation to material transfer points and other openings	80 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.10 Contributing scenario controlling worker exposure (PROC8b)

Material transfers. Loading tank storage from road, rail or boat transport	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Clear transfer lines prior to de-coupling	
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.11 Contributing scenario controlling worker exposure (PROC8b)

Equipment maintenance	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.12 Contributing scenario controlling worker exposure (PROC8b)

Bulk transfers	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	1-5%	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.13 Contributing scenario controlling worker exposure (PROC8b)

Material transfers. Waste management	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	

Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.14 Contributing scenario controlling worker exposure (PROC9)

Small package filling	
PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	1-5%
Volatility	medium

Operational conditions

Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures

Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.15 Contributing scenario controlling worker exposure (PROC15)

Laboratory activities	
PROC15	Use as laboratory reagent

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	100 %
Volatility	medium

Operational conditions

Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures

Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.2 Contributing scenario controlling environmental exposure (ERC6c)

ERC6c	Industrial use of monomers for manufacture of thermo-plastics

Product characteristics

No additional information

Operational conditions

Amounts used	Daily amount per site	483000 kg/day
	Fraction of EU tonnage used in region:	10 %
	Fraction of Regional tonnage used locally:	60 %
	Annual site tonnage (tonnes/year):	2420000 t/yr
Frequency and duration of use	Emission Days (days/year):	300
Environmental factors not influenced by risk management	Local freshwater dilution factor:	10
	Local marine water dilution factor:	100
	Receiving surface water flow (m³/day):	18000
Other given operational conditions affecting	Release fraction to air from process	0.102 %
	Release fraction to wastewater	0.000012 %

environmental exposure	Release fraction to soil from process	0 %
Risk Management Measures		
Conditions and measures related to sewage treatment plant	Assumed domestic sewage treatment plant flow (m^3/d):	2000 m^3/d
	Efficiency	91.9 %

3. Exposure estimation and reference to its source

3.1. Health

Information for contributing exposure scenario	
2.1.1	Qualitative approach used to conclude safe use
2.1.2	Qualitative approach used to conclude safe use
2.1.3	Qualitative approach used to conclude safe use
2.1.4	Qualitative approach used to conclude safe use
2.1.5	Qualitative approach used to conclude safe use
2.1.6	Qualitative approach used to conclude safe use
2.1.7	Qualitative approach used to conclude safe use
2.1.8	Qualitative approach used to conclude safe use
2.1.9	Qualitative approach used to conclude safe use
2.1.10	Qualitative approach used to conclude safe use
2.1.11	Qualitative approach used to conclude safe use
2.1.12	Qualitative approach used to conclude safe use
2.1.13	Qualitative approach used to conclude safe use
2.1.14	Qualitative approach used to conclude safe use
2.1.15	Qualitative approach used to conclude safe use

3.2. Environment

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

4.1. Health

Guidance - Health	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures

4.2. Environment

Guidance - Environment	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures

1. Exposure scenario ES10-Sty

Production of Styrene Butadiene Latex (SBL)

ES Ref.: ES10-Sty ES Type: Worker Version: 1.0	Company ES code: Total Date of issue: 15/04/2016

Use descriptors	SU3 PROC2, PROC3, PROC8a, PROC8b, PROC9, PROC15 ERC6c
Processes, tasks, activities covered	Industrial use

2. Operational conditions and risk management measures

2.1.1 Contributing scenario controlling worker exposure (PROC8a)

Process sampling	
PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	100 %
Volatility	medium

Operational conditions

Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Provide extract ventilation to material transfer points and other openings	80 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.2 Contributing scenario controlling worker exposure (PROC2)

Material transfers. Storage	
PROC2	Use in closed, continuous process with occasional controlled exposure

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	100 %
Volatility	medium

Operational conditions

Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures

Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.3 Contributing scenario controlling worker exposure (PROC2)

Material transfers. Waste management	
PROC2	Use in closed, continuous process with occasional controlled exposure

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.4 Contributing scenario controlling worker exposure (PROC3)

Material transfers. Charging reactor via pipeline	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.5 Contributing scenario controlling worker exposure (PROC3)

Batch process. Polymerisation reactor	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are	

	trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.6 Contributing scenario controlling worker exposure (PROC3)

Batch process. Vacuum distillation	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.7 Contributing scenario controlling worker exposure (PROC3)

Material transfers. Recycling styrene from tower to reactor via pipeline	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.8 Contributing scenario controlling worker exposure (PROC8b)

Material transfers. Loading tank storage from road, rail or boat transport	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	

	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Clear transfer lines prior to de-coupling	
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.9 Contributing scenario controlling worker exposure (PROC8b)

Equipment maintenance	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.10 Contributing scenario controlling worker exposure (PROC8b)

Bulk transfers	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	1-5%	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.11 Contributing scenario controlling worker exposure (PROC8b)

Material transfers. Waste management	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	

Volatility	medium	
Operational conditions		
Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.12 Contributing scenario controlling worker exposure (PROC9)

Small package filling	
PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	1-5%	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.13 Contributing scenario controlling worker exposure (PROC15)

Laboratory activities	
PROC15	Use as laboratory reagent

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.2 Contributing scenario controlling environmental exposure (ERC6c)

ERC6c	Industrial use of monomers for manufacture of thermo-plastics
Product characteristics	

No additional information

Operational conditions		
Amounts used	Daily amount per site	483000 kg/day
	Fraction of EU tonnage used in region:	10 %
	Fraction of Regional tonnage used locally:	60 %
	Annual site tonnage (tonnes/year):	2420000 t/yr
Frequency and duration of use	Emission Days (days/year):	300
Environmental factors not influenced by risk management	Local freshwater dilution factor:	10
	Local marine water dilution factor:	100
	Receiving surface water flow (m³/day):	18000
Other given operational conditions affecting environmental exposure	Release fraction to air from process	0.102 %
	Release fraction to wastewater	0.000012 %
	Release fraction to soil from process	0 %

Risk Management Measures		
Conditions and measures related to sewage treatment plant	Assumed domestic sewage treatment plant flow (m³/d):	2000 m³/d
	Efficiency	91.9 %

3. Exposure estimation and reference to its source

3.1. Health

Information for contributing exposure scenario	
2.1.1	Qualitative approach used to conclude safe use
2.1.2	Qualitative approach used to conclude safe use
2.1.3	Qualitative approach used to conclude safe use
2.1.4	Qualitative approach used to conclude safe use
2.1.5	Qualitative approach used to conclude safe use
2.1.6	Qualitative approach used to conclude safe use
2.1.7	Qualitative approach used to conclude safe use
2.1.8	Qualitative approach used to conclude safe use
2.1.9	Qualitative approach used to conclude safe use
2.1.10	Qualitative approach used to conclude safe use
2.1.11	Qualitative approach used to conclude safe use
2.1.12	Qualitative approach used to conclude safe use
2.1.13	Qualitative approach used to conclude safe use

3.2. Environment

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

4.1. Health

Guidance - Health	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures

4.2. Environment

Guidance - Environment	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures

1. Exposure scenario ES11-Sty

Production of Styrene Isoprene Copolymers

ES Ref.: ES11-Sty ES Type: Worker Version: 1.0	Company ES code: Total Date of issue: 15/04/2016

Use descriptors	SU3 PROC2, PROC3, PROC8a, PROC8b, PROC9, PROC15 ERC6c
Processes, tasks, activities covered	Industrial use

2. Operational conditions and risk management measures

2.1.1 Contributing scenario controlling worker exposure (PROC8a)

Process sampling	
PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	100 %
Volatility	medium

Operational conditions

Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Provide extract ventilation to material transfer points and other openings	80 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.2 Contributing scenario controlling worker exposure (PROC2)

Material transfers. Storage	
PROC2	Use in closed, continuous process with occasional controlled exposure

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	100 %
Volatility	medium

Operational conditions

Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures

Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.3 Contributing scenario controlling worker exposure (PROC2)

Material transfers. Waste management	
PROC2	Use in closed, continuous process with occasional controlled exposure

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.4 Contributing scenario controlling worker exposure (PROC3)

Material transfers. Charging reactor via pipeline	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.5 Contributing scenario controlling worker exposure (PROC3)

Batch process. Dissolving and polymerisation reactor	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are	

	trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.6 Contributing scenario controlling worker exposure (PROC3)

Batch process. Suspension reactor	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.7 Contributing scenario controlling worker exposure (PROC3)

Batch process. Washed and dried tanks	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.8 Contributing scenario controlling worker exposure (PROC8b)

Equipment maintenance	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	

	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.9 Contributing scenario controlling worker exposure (PROC8b)

Bulk transfers	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	1-5%	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.10 Contributing scenario controlling worker exposure (PROC8b)

Material transfers. Loading tank storage from road, rail or boat transport	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Clear transfer lines prior to de-coupling	
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.11 Contributing scenario controlling worker exposure (PROC8b)

Material transfers. Waste management	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	

Volatility	medium	
Operational conditions		
Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.12 Contributing scenario controlling worker exposure (PROC9)

Small package filling	
PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	1-5%	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.13 Contributing scenario controlling worker exposure (PROC15)

Laboratory activities	
PROC15	Use as laboratory reagent

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.2 Contributing scenario controlling environmental exposure (ERC6c)

ERC6c	Industrial use of monomers for manufacture of thermo-plastics
Product characteristics	

No additional information

Operational conditions		
Amounts used	Daily amount per site	483000 kg/day
	Fraction of EU tonnage used in region:	10 %
	Fraction of Regional tonnage used locally:	60 %
	Annual site tonnage (tonnes/year):	2420000 t/yr
Frequency and duration of use	Emission Days (days/year):	300
Environmental factors not influenced by risk management	Local freshwater dilution factor:	10
	Local marine water dilution factor:	100
	Receiving surface water flow (m³/day):	18000
Other given operational conditions affecting environmental exposure	Release fraction to air from process	0.102 %
	Release fraction to wastewater	0.000012 %
	Release fraction to soil from process	0 %
Risk Management Measures		
Conditions and measures related to sewage treatment plant	Assumed domestic sewage treatment plant flow (m³/d):	2000 m³/d
	Efficiency	91.9 %

3. Exposure estimation and reference to its source

3.1. Health

Information for contributing exposure scenario	
2.1.1	Qualitative approach used to conclude safe use
2.1.2	Qualitative approach used to conclude safe use
2.1.3	Qualitative approach used to conclude safe use
2.1.4	Qualitative approach used to conclude safe use
2.1.5	Qualitative approach used to conclude safe use
2.1.6	Qualitative approach used to conclude safe use
2.1.7	Qualitative approach used to conclude safe use
2.1.8	Qualitative approach used to conclude safe use
2.1.9	Qualitative approach used to conclude safe use
2.1.10	Qualitative approach used to conclude safe use
2.1.11	Qualitative approach used to conclude safe use
2.1.12	Qualitative approach used to conclude safe use
2.1.13	Qualitative approach used to conclude safe use

3.2. Environment

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

4.1. Health

Guidance - Health	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures

4.2. Environment

Guidance - Environment	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures

1. Exposure scenario ES12-Sty

Production of other Styrene based polymeric dispersions

ES Ref.: ES12-Sty ES Type: Worker Version: 1.0	Company ES code: Total Date of issue: 15/04/2016

Use descriptors	SU3 PROC2, PROC3, PROC8a, PROC8b, PROC9, PROC15 ERC6c
Processes, tasks, activities covered	Industrial use

2. Operational conditions and risk management measures

2.1.1 Contributing scenario controlling worker exposure (PROC8a)

Process sampling	
PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	100 %
Volatility	medium

Operational conditions

Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Provide extract ventilation to material transfer points and other openings	80 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.2 Contributing scenario controlling worker exposure (PROC2)

Material transfers. Storage	
PROC2	Use in closed, continuous process with occasional controlled exposure

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	100 %
Volatility	medium

Operational conditions

Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures

Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.3 Contributing scenario controlling worker exposure (PROC2)

Material transfers. Waste management	
PROC2	Use in closed, continuous process with occasional controlled exposure

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.4 Contributing scenario controlling worker exposure (PROC3)

Material transfers. Charging reactor via pipeline	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.5 Contributing scenario controlling worker exposure (PROC3)

Batch process. Dissolving and polymerisation reactor	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are	

	trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.6 Contributing scenario controlling worker exposure (PROC3)

Batch process. Suspension reactor	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.7 Contributing scenario controlling worker exposure (PROC3)

Batch process. Washed and dried tanks	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.8 Contributing scenario controlling worker exposure (PROC8b)

Material transfers. Loading tank storage from road, rail or boat transport	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	

	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Clear transfer lines prior to de-coupling	
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.9 Contributing scenario controlling worker exposure (PROC8b)

Equipment maintenance	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.10 Contributing scenario controlling worker exposure (PROC8b)

Bulk transfers	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	1-5%	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.11 Contributing scenario controlling worker exposure (PROC8b)

Material transfers. Waste management	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	

Volatility	medium	
Operational conditions		
Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.12 Contributing scenario controlling worker exposure (PROC9)

Small package filling	
PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	1-5%	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.13 Contributing scenario controlling worker exposure (PROC15)

Laboratory activities	
PROC15	Use as laboratory reagent

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.2 Contributing scenario controlling environmental exposure (ERC6c)

ERC6c	Industrial use of monomers for manufacture of thermo-plastics
Product characteristics	

No additional information

Operational conditions		
Amounts used	Daily amount per site	483000 kg/day
	Fraction of EU tonnage used in region:	10 %
	Fraction of Regional tonnage used locally:	60 %
	Annual site tonnage (tonnes/year):	2420000 t/yr
Frequency and duration of use	Emission Days (days/year):	300
Environmental factors not influenced by risk management	Local freshwater dilution factor:	10
	Local marine water dilution factor:	100
	Receiving surface water flow (m³/day):	18000
Other given operational conditions affecting environmental exposure	Release fraction to air from process	0.102 %
	Release fraction to wastewater	0.000012 %
	Release fraction to soil from process	0 %
Risk Management Measures		
Conditions and measures related to sewage treatment plant	Assumed domestic sewage treatment plant flow (m³/d):	2000 m³/d
	Efficiency	91.9 %

3. Exposure estimation and reference to its source

3.1. Health

Information for contributing exposure scenario	
2.1.1	Qualitative approach used to conclude safe use
2.1.2	Qualitative approach used to conclude safe use
2.1.3	Qualitative approach used to conclude safe use
2.1.4	Qualitative approach used to conclude safe use
2.1.5	Qualitative approach used to conclude safe use
2.1.6	Qualitative approach used to conclude safe use
2.1.7	Qualitative approach used to conclude safe use
2.1.8	Qualitative approach used to conclude safe use
2.1.9	Qualitative approach used to conclude safe use
2.1.10	Qualitative approach used to conclude safe use
2.1.11	Qualitative approach used to conclude safe use
2.1.12	Qualitative approach used to conclude safe use
2.1.13	Qualitative approach used to conclude safe use

3.2. Environment

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

4.1. Health

Guidance - Health	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures

4.2. Environment

Guidance - Environment	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures

1. Exposure scenario ES13-Sty

Production of filled Polyols

ES Ref.: ES13-Sty ES Type: Worker Version: 1.0	Company ES code: Total Date of issue: 15/04/2016

Use descriptors	SU3 PROC2, PROC3, PROC8a, PROC8b, PROC9, PROC15 ERC6c
Processes, tasks, activities covered	Industrial use

2. Operational conditions and risk management measures

2.1.1 Contributing scenario controlling worker exposure (PROC8a)

Process sampling	
PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	100 %
Volatility	medium

Operational conditions

Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Provide extract ventilation to material transfer points and other openings	80 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.2 Contributing scenario controlling worker exposure (PROC2)

Material transfers. Storage	
PROC2	Use in closed, continuous process with occasional controlled exposure

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	100 %
Volatility	medium

Operational conditions

Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	

Risk Management Measures

Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.3 Contributing scenario controlling worker exposure (PROC2)

Material transfers. Waste management	
PROC2	Use in closed, continuous process with occasional controlled exposure

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.4 Contributing scenario controlling worker exposure (PROC3)

Material transfers. Charging reactor via pipeline	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.5 Contributing scenario controlling worker exposure (PROC3)

Batch process. Dissolving and polymerisation reactor	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are	

	trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.6 Contributing scenario controlling worker exposure (PROC3)

Batch process. Suspension reactor	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.7 Contributing scenario controlling worker exposure (PROC3)

Batch process. Washed and dried tanks	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Good standard of general ventilation	30 %
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.8 Contributing scenario controlling worker exposure (PROC8b)

Material transfers. Loading tank storage from road, rail or boat transport	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	

	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Clear transfer lines prior to de-coupling	
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.9 Contributing scenario controlling worker exposure (PROC8b)

Equipment maintenance	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.10 Contributing scenario controlling worker exposure (PROC8b)

Bulk transfers	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	1-5%	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.11 Contributing scenario controlling worker exposure (PROC8b)

Material transfers. Waste management	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	

Volatility	medium	
Operational conditions		
Frequency and duration of use	Avoid carrying out activities involving exposure for more than 1 hour	
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.12 Contributing scenario controlling worker exposure (PROC9)

Small package filling	
PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	1-5%	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.1.13 Contributing scenario controlling worker exposure (PROC15)

Laboratory activities	
PROC15	Use as laboratory reagent

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	100 %	
Volatility	medium	
Operational conditions		
Frequency and duration of use	Exposure duration	> 4 h/day
	Use frequency	5 days/week
Human factors not influenced by risk management	Exposed skin surface (cm²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
Risk Management Measures		
Organisational measures to prevent /limit releases, dispersion and exposure	Assumes a good basic standard of occupational hygiene is implemented. Ensure operatives are trained to minimise exposures	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Use suitable eye protection and gloves	

2.2 Contributing scenario controlling environmental exposure (ERC6c)

ERC6c	Industrial use of monomers for manufacture of thermo-plastics
Product characteristics	

No additional information

Operational conditions		
Amounts used	Daily amount per site	483000 kg/day
	Fraction of EU tonnage used in region:	10 %
	Fraction of Regional tonnage used locally:	60 %
	Annual site tonnage (tonnes/year):	2420000 t/yr
Frequency and duration of use	Emission Days (days/year):	300
Environmental factors not influenced by risk management	Local freshwater dilution factor:	10
	Local marine water dilution factor:	100
	Receiving surface water flow (m³/day):	18000
Other given operational conditions affecting environmental exposure	Release fraction to air from process	0.102 %
	Release fraction to wastewater	0.000012 %
	Release fraction to soil from process	0 %
Risk Management Measures		
Conditions and measures related to sewage treatment plant	Assumed domestic sewage treatment plant flow (m³/d):	2000 m³/d
	Efficiency	91.9 %

3. Exposure estimation and reference to its source

3.1. Health

Information for contributing exposure scenario	
2.1.1	Qualitative approach used to conclude safe use
2.1.2	Qualitative approach used to conclude safe use
2.1.3	Qualitative approach used to conclude safe use
2.1.4	Qualitative approach used to conclude safe use
2.1.5	Qualitative approach used to conclude safe use
2.1.6	Qualitative approach used to conclude safe use
2.1.7	Qualitative approach used to conclude safe use
2.1.8	Qualitative approach used to conclude safe use
2.1.9	Qualitative approach used to conclude safe use
2.1.10	Qualitative approach used to conclude safe use
2.1.11	Qualitative approach used to conclude safe use
2.1.12	Qualitative approach used to conclude safe use
2.1.13	Qualitative approach used to conclude safe use

3.2. Environment

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

4.1. Health

Guidance - Health	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures

4.2. Environment

Guidance - Environment	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures