

ETHYLBENZENE

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

Date of issue: 5/5/2017

Revision date:

Supersedes: 2/2/2016 Version: 13.6

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

1.1. Product identifier

Product form : Substance
 Substance name : ETHYLBENZENE
 EC No : 202-849-4
 CAS No : 100-41-4
 REACH registration No : TP France (01-2119489370-35-0007) - Total Raffinage France (01-2119489370-35-0019)
 Synonyms : 100-41-4
 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
 Distribution of substance
 Synthesis intermediate
 Solvent
 For the detailed uses of the product see annex of the safety data sheet

1.2.2. Uses advised against

No additional information available

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 +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 2 H225
 Acute toxicity (inhalation:vapour) Category 4 H332
 Specific target organ toxicity — Repeated exposure, Category 2 H373
 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

Highly flammable liquid and vapour. May be fatal if swallowed and enters airways. Harmful if inhaled. Harmful to aquatic life with long lasting effects.



ETHYLBENZENE

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

2.2. Label elements

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

Hazard pictograms (CLP) :



Signal word (CLP) :

Danger

Hazard statements (CLP) :

H225 - Highly flammable liquid and vapour
H304 - May be fatal if swallowed and enters airways
H332 - Harmful if inhaled
H373 - May cause 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. Substance

Name : ETHYLBENZENE
CAS No : 100-41-4
EC No : 202-849-4

Name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP]
Ethylbenzene	(CAS No) 100-41-4 (EC No) 202-849-4	> 99.7	Flam. Liq. 2, H225 Acute Tox. 4 (Inhalation:vapour), H332 STOT RE 2, H373 Asp. Tox. 1, H304 Aquatic Chronic 3, H412

Full text of H-statements: see section 16

3.2. Mixture

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 victim to fresh air and keep at rest in a position 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 : Remove/Take off immediately all contaminated clothing. Wash with plenty of soap and 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.



ETHYLBENZENE

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

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 and wash before reuse.

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.



ETHYLBENZENE

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

7.3. Specific end use(s)

Recommended to professional users.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Ethylbenzene (100-41-4)		
EU	IOELV TWA (mg/m ³)	442 mg/m ³
EU	IOELV TWA (ppm)	100 ppm
EU	IOELV STEL (mg/m ³)	884 mg/m ³
EU	IOELV STEL (ppm)	200 ppm
Ireland	OEL (8 hours ref) (mg/m ³)	442 mg/m ³
Ireland	OEL (8 hours ref) (ppm)	100 ppm
Ireland	OEL (15 min ref) (mg/m ³)	884 mg/m ³
Ireland	OEL (15 min ref) (ppm)	200 ppm
United Kingdom	WEL TWA (mg/m ³)	441 mg/m ³
United Kingdom	WEL TWA (ppm)	100 ppm
United Kingdom	WEL STEL (mg/m ³)	552 mg/m ³
United Kingdom	WEL STEL (ppm)	125 ppm
USA - ACGIH	ACGIH TWA (ppm)	20 ppm
USA - ACGIH	Biological Exposure Indices (BEI)	0.7 g/g Kreatinin (Medium: urine - Time: end of shift at end of workweek - Parameter: Sum of mandelic acid and phenylglyoxylic acid (nonspecific, semi-quantitative) (Medium: end-exhaled air - Time: not critical - Parameter: Ethyl benzene (semi-quantitative))

ETHYLBENZENE (100-41-4)	
DNEL/DMEL (Workers)	
Acute - local effects, inhalation	293 mg/m ³
Long-term - systemic effects, dermal	180 mg/kg bodyweight/day
Long-term - systemic effects, inhalation	77 mg/m ³
DNEL/DMEL (General population)	
Acute - local effects, inhalation	175 mg/m ³
Long-term - systemic effects, oral	1.6 mg/kg bodyweight/day
Long-term - systemic effects, inhalation	104 mg/m ³
Long-term - systemic effects, dermal	242 mg/kg bodyweight/day
PNEC (Water)	
PNEC aqua (freshwater)	0.1 mg/l
PNEC aqua (marine water)	0.01 mg/l
PNEC aqua (intermittent, freshwater)	0.018 mg/l
PNEC aqua (intermittent, marine water)	0.018 mg/l
PNEC (Sediment)	
PNEC sediment (freshwater)	13.7 mg/kg dwt
PNEC (Soil)	
PNEC soil	2.68 mg/kg dwt
PNEC (STP)	
PNEC sewage treatment plant	9.6 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.



ETHYLBENZENE

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

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	: 106 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	: -95 °C
Freezing point	: No data available
Boiling point	: 136 °C
Flash point	: 15 °C
Auto-ignition temperature	: 430 °C
Decomposition temperature	: No data available
Flammability (solid, gas)	: No data available
Vapour pressure	: 9.5 hPa (20°C)
Relative vapour density at 20 °C	: 3.7
Relative density	: No data available
Density	: 868 kg/m ³
Solubility	: insoluble. Water: 152 mg/l
Log Pow	: 3.6
Viscosity, kinematic	: < 1 mm ² /s
Viscosity, dynamic	: No data available
Explosive properties	: No data available
Oxidising properties	: No data available
Explosive limits	: 1 - 6 vol %

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

Highly flammable liquid and vapour.



ETHYLBENZENE

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

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

Ethylbenzene (100-41-4)	
LD50 oral rat	3500 mg/kg
LD50 dermal rabbit	15354 mg/kg
LC50 inhalation rat	17.2 mg/l/4h

Skin corrosion/irritation : Not classified
Serious eye damage/irritation : Not classified
Additional information : May cause 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 : Not classified
Additional information : Based on available data, the classification criteria are not met
Reproductive toxicity : Not classified
Additional information : Based on available data, the classification criteria are not met
Specific target organ toxicity (single exposure) : Not classified
Specific target organ toxicity (repeated exposure) : May cause 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 aspirated into the lung and induce a chemical pneumonitis developing over a few hours

ETHYLBENZENE (100-41-4)	
Viscosity, kinematic	< 1 mm ² /s

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.

Ethylbenzene (100-41-4)	
LC50 fish 1	11.0 - 18.0 mg/l (Oncorhynchus mykiss)
LC50 fish 2	4.2 mg/l (Oncorhynchus mykiss)
EC50 Daphnia 1	1.8 - 2.4 mg/l (Daphnia)
EC50 other aquatic organisms 1	4.6 mg/l (Pseudokirchneriella subcapitata)
EC50 other aquatic organisms 2	> 438 mg/l (Pseudokirchneriella subcapitata)
NOEC (chronic)	1 mg/l (Daphnia)



ETHYLBENZENE

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

12.2. Persistence and degradability

ETHYLBENZENE (100-41-4)

Persistence and degradability Inherently biodegradable.

12.3. Bioaccumulative potential

ETHYLBENZENE (100-41-4)

Log Pow 3.6

Ethylbenzene (100-41-4)

BCF fish 1 15

Log Pow 3.118

12.4. Mobility in soil

ETHYLBENZENE (100-41-4)

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				
1175	1175	1175	1175	1175
14.2. UN proper shipping name				
ETHYLBENZENE	ETHYLBENZENE	Ethylbenzene	ETHYLBENZENE	ETHYLBENZENE
Transport document description				
UN 1175 ETHYLBENZENE, 3, II, (D/E)	UN 1175 ETHYLBENZENE, 3, II	UN 1175 Ethylbenzene, 3, II	UN 1175 ETHYLBENZENE, 3, II	UN 1175 ETHYLBENZENE, 3, II
14.3. Transport hazard class(es)				
3	3	3	3	3
				
14.4. Packing Group				
II	II	II	II	II
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) : 11
Excepted quantities (ADR) : E2
Packing instructions (ADR) : P001, IBC02, R001
Mixed packing provisions (ADR) : MP19
Portable tank and bulk container instructions (ADR) : T4

5/31/2017

EN (English)

SDS Reference number: STYR-002

7/28



ETHYLBENZENE

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

Portable tank and bulk container special provisions (ADR) : TP1
Tank code (ADR) : LGBF
Vehicle for tank carriage : FL
Transport category (ADR) : 2
Special provisions for carriage - Operation (ADR) : S2, S20
Hazard identification number (Kemler No.) : 33
Orange plates :



Tunnel restriction code (ADR) : D/E
EAC code : 3YE

- Transport by sea (IMDG)

Limited quantities (IMDG) : 1 L
Excepted quantities (IMDG) : E2
Packing instructions (IMDG) : P001
IBC packing instructions (IMDG) : IBC02
Tank instructions (IMDG) : T4
Tank special provisions (IMDG) : TP1
EmS-No. (Fire) : F-E
EmS-No. (Spillage) : S-D
Stowage category (IMDG) : B
Flash point (IMDG) : 22°C c.c.

- Air transport (IATA)

PCA Excepted quantities (IATA) : E2
PCA Limited quantities (IATA) : Y341
PCA limited quantity max net quantity (IATA) : 1L
PCA packing instructions (IATA) : 353
PCA max net quantity (IATA) : 5L
CAO packing instructions (IATA) : 364
CAO max net quantity (IATA) : 60L
ERG code (IATA) : 3L

- Inland waterway transport

Classification code (ADN) : F1
Limited quantities (ADN) : 1 L
Excepted quantities (ADN) : E2
Carriage permitted (ADN) : T
Equipment required (ADN) : PP, EX, A
Ventilation (ADN) : VE01
Number of blue cones/lights (ADN) : 1

- Rail transport

Classification code (RID) : F1
Limited quantities (RID) : 1L
Excepted quantities (RID) : E2
Packing instructions (RID) : P001, IBC02, R001
Mixed packing provisions (RID) : MP19
Portable tank and bulk container instructions (RID) : T4
Portable tank and bulk container special provisions (RID) : TP1
Tank codes for RID tanks (RID) : LGBF
Transport category (RID) : 2
Colis express (express parcels) (RID) : CE7
Hazard identification number (RID) : 33



ETHYLBENZENE

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

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

Not applicable

SECTION 15: Regulatory information

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

15.1.1. EU-Regulations

No REACH Annex XVII restrictions

ETHYLBENZENE is not on the REACH Candidate List

ETHYLBENZENE 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: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
Flam. Liq. 2	Flammable liquids, Category 2
STOT RE 2	Specific target organ toxicity — Repeated exposure, Category 2
H225	Highly flammable liquid and vapour
H304	May be fatal if swallowed and enters airways
H332	Harmful if inhaled
H373	May cause 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.



ETHYLBENZENE

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

Annex to the Safety Data Sheet

Product exposure scenario(s)

ES Type	ES title
Worker	Manufacture of substances
Worker	Formulation as process solvent
Worker	Use as an intermediate
Worker	Use as process solvent

1. Exposure scenario ES1

Manufacture of substances

ES Ref.: ES1	Company ES code: Total
ES Type: Worker	
Version: 1.0	
Revision date: 05/10/2015	

Use descriptors	SU3, SU8, SU9 PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC15 ERC1 ESVOC SPERC 1.1.v1
Processes, tasks, activities covered	

2. Operational conditions and risk management measures

2.2 Contributing scenario controlling environmental exposure (ERC1, ESVOC SPERC 1.1.v1)

ERC1	Manufacture of substances
ESVOC SPERC 1.1.v1	Manufacture of substances : Industrial(SU8, SU9)

Product characteristics

No additional information

Operational conditions

Amounts used	Regional use tonnage (tonnes/year):	5600000
	Maximum daily site tonnage (kg/day):	349000
	Fraction of EU tonnage used in region:	10 %
	Fraction of Regional tonnage used locally:	21.786 %
Frequency and duration of use	Emission Days (days/year):	365 Continuous release
Environmental factors not influenced by risk management	Local freshwater dilution factor:	10
	Local marine water dilution factor:	100
	Receiving surface water flow (m ³ /day):	18000
Other given operational conditions affecting environmental exposure	Release fraction to air from process	0.1 %
	Release fraction to wastewater	0.002 %
	Release fraction to soil from process	0.01 %

Risk Management Measures

Conditions and measures related to sewage treatment plant	Size of the STP : 2000 m ³ /day (by default)	
Conditions and measures related to external treatment of waste for disposal	Sewage Sludge incineration	100 %

2.1.1 Contributing scenario controlling worker exposure (PROC1)

General exposures. General exposures (closed systems). Continuous, no sampling	
PROC1	Use in closed process, no likelihood of exposure

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	> 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 (cm ²) : 240 (one hand, face)	

5/31/2017

EN (English)

SDS Reference number: STYR-002

10/28

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ETHYLBENZENE

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

	side only)	
Other given operational conditions affecting workers exposure	Maximum process temperature	70 °C
	Indoors	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Open doors and windows	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	

2.1.2 Contributing scenario controlling worker exposure (PROC2)

General exposures. Process sampling. Continuous		
PROC2	Use in closed, continuous process with occasional controlled exposure	

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	> 25 %
Volatility	High

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	Maximum process temperature	70 °C
	Indoors	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Provide extract ventilation to points where emissions occur	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	
	IF exposed:	> 1 h Wear a respirator conforming to EN140 with Type A/P2 filter or better

2.1.3 Contributing scenario controlling worker exposure (PROC3)

General exposures. Batch process (closed systems)		
PROC3	Use in closed batch process (synthesis or formulation)	

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	> 25 %
Volatility	High

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 (cm ²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Maximum process temperature	70 °C
	Indoors	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Provide extract ventilation to points where emissions occur. Ensure samples are obtained under containment or extract ventilation. Ensure material transfers are under containment or extract ventilation	
	Good standard of general ventilation. Efficiency	90 %
Conditions and measures related to personal protection, hygiene and health evaluation	Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	

2.1.4 Contributing scenario controlling worker exposure (PROC4)

General exposures. Batch process (open systems)		
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according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

PROC4	Use in batch and other process (synthesis) where opportunity for exposure arises
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Product characteristics

Physical form of product	Liquid
Concentration of substance in product	> 25 %
Volatility	High

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 (cm ²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Maximum process temperature	70 °C
	Indoors	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Closed system. Provide extract ventilation to points where emissions occur. Ensure samples are obtained under containment or extract ventilation	
	Good standard of general ventilation. Efficiency	90 %
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	

2.1.5 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	> 25 %
Volatility	High

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	Maximum process temperature	70 °C
	Indoors	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Transfer via enclosed lines. Clear transfer lines prior to de-coupling. Retain drain downs in sealed storage pending disposal or for subsequent recycle	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	
	IF exposed:	> 1 h Wear a respirator conforming to EN140 with Type A/P2 filter or better

2.1.6 Contributing scenario controlling worker exposure (PROC8b)

Bulk transfers. Dedicated facility.	
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	> 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 (cm ²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	



ETHYLBENZENE

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Provide extract ventilation to points where emissions occur. Efficiency	95 % Inhalation
	Use bulk or semi-bulk handling systems	
	Efficiency	90 % in contact with skin
Organisational measures to prevent /limit releases, dispersion and exposure	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. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	

2.1.7 Contributing scenario controlling worker exposure (PROC8b)

Bulk transfers. Dedicated facility.		
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	> 25 %
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	Use bulk or semi-bulk handling systems	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	
	IF exposed: Wear a respirator conforming to EN140 with Type A/P2 filter or better	

2.1.8 Contributing scenario controlling worker exposure (PROC8b)

Bulk transfers. Dedicated facility. Transport by road/rail		
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	> 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 (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	Use bulk or semi-bulk handling systems. Use dry break couplings for material transfer. Ensure material transfers are under containment or extract ventilation	
Organisational measures to prevent /limit releases, dispersion and exposure	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. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	

2.1.9 Contributing scenario controlling worker exposure (PROC15)

Laboratory activities		
PROC15	Use as laboratory reagent	



ETHYLBENZENE

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	> 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 (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	Handle in a fume cupboard or under extract ventilation	
Organisational measures to prevent /limit releases, dispersion and exposure	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. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	

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

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
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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
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ETHYLBENZENE

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

1. Exposure scenario ES2

Formulation as process solvent

ES Ref.: ES2	Company ES code: Total
ES Type: Worker	
Version: 1.0	
Revision date: 05/10/2015	

Use descriptors	SU3, SU10 PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC9, PROC15 ERC2 ESVOC SPERC 2.2.v1
Processes, tasks, activities covered	

2. Operational conditions and risk management measures

2.2 Contributing scenario controlling environmental exposure (ERC2, ESVOC SPERC 2.2.v1)

ERC2	Formulation of preparations
ESVOC SPERC 2.2.v1	Formulation & packing of preparations and mixtures: Industrial (SU10)

Product characteristics

No additional information

Operational conditions

Amounts used	Regional use tonnage (tonnes/year):	840
	Maximum daily site tonnage (kg/day):	280
	Fraction of EU tonnage used in region:	10 %
	Fraction of Regional tonnage used locally:	100 %
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 (m ³ /day):	18000
Other given operational conditions affecting environmental exposure	Release fraction to air from process	1 %
	Release fraction to wastewater	0.2 %
	Release fraction to soil from process	0.01 %

Risk Management Measures

Conditions and measures related to sewage treatment plant	Size of the STP : 2000 m ³ /day (by default)	
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2.1.1 Contributing scenario controlling worker exposure (PROC1)

General exposures. Continuous process. no sampling	
PROC1	Use in closed process, no likelihood of exposure

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	> 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 (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	Open doors and windows	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	

2.1.2 Contributing scenario controlling worker exposure (PROC2)

Bulk transfers. Dedicated facility	
PROC2	Use in closed, continuous process with occasional controlled exposure

Product characteristics



ETHYLBENZENE

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

Physical form of product	Liquid
Concentration of substance in product	> 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 (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	Use dry break couplings for material transfer	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	

2.1.3 Contributing scenario controlling worker exposure (PROC3)

General exposures. Batch process. (closed systems)	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	> 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 (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	Handle substance within a closed system. Provide extract ventilation to points where emissions occur. Ensure samples are obtained under containment or extract ventilation	
	Local exhaust ventilation - efficiency of at least [%]:	90 Inhalation
	Local exhaust ventilation - efficiency of at least [%]:	90 in contact with skin
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	

2.1.4 Contributing scenario controlling worker exposure (PROC4)

General exposures. Batch process. (open systems)	
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	> 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 (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	Handle substance within a predominantly closed system provided with extract ventilation. Provide	
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ETHYLBENZENE

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

(source) to prevent release	extract ventilation to points where emissions occur. Ensure samples are obtained under containment or extract ventilation	
	Local exhaust ventilation - efficiency of at least [%]:	90 Inhalation
	Local exhaust ventilation - efficiency of at least [%]:	90 in contact with skin
Conditions and measures related to personal protection, hygiene and health evaluation	Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	

2.1.5 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	> 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 (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	Handle substance within a closed system. Ensure samples are obtained under containment or extract ventilation	
	Local exhaust ventilation - efficiency of at least [%]:	90 Inhalation
	Local exhaust ventilation - efficiency of at least [%]:	99 in contact with skin
Conditions and measures related to personal protection, hygiene and health evaluation	Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	

2.1.6 Contributing scenario controlling worker exposure (PROC8a)

Equipment cleaning and maintenance. Daily maintenance. Lines are drained before opening	
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	> 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 (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	Transfer via enclosed lines. Clear transfer lines prior to de-coupling. Drain down and flush system prior to equipment break-in or maintenance. Retain drain downs in sealed storage pending disposal or for subsequent recycle	
	Efficiency	80 % Inhalation
Conditions and measures related to personal protection, hygiene and health evaluation	Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	

2.1.7 Contributing scenario controlling worker exposure (PROC8b)

Bulk transfers. Dedicated facility. Ship loading/unloading with vapour recovery	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities



ETHYLBENZENE

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

Product characteristics		
Physical form of product	Liquid	
Concentration of substance in product	> 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 (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	Local exhaust ventilation - efficiency of at least [%]:	90 Inhalation
	Local exhaust ventilation - efficiency of at least [%]:	90 in contact with skin
	Provide extract ventilation to points where emissions occur	
	Use bulk or semi-bulk handling systems. Use dry break couplings for material transfer	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	

2.1.8 Contributing scenario controlling worker exposure (PROC8b)

Bulk transfers. Dedicated facility. Ship loading/unloading without vapour recovery		
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	> 25 %	
Volatility	medium	

Operational conditions		
Frequency and duration of use	Exposure duration, 15 min - 1h	
	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	Use bulk or semi-bulk handling systems. Use dry break couplings for material transfer	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	
	IF exposed:	> 1 h Wear a respirator conforming to EN140 with Type A/P2 filter or better

2.1.9 Contributing scenario controlling worker exposure (PROC9)

Material transfers. Dedicated facility. Drum and 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	> 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 (cm ²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	



ETHYLBENZENE

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Transfer via enclosed lines. Ensure that task is semi-automated or automated. Provide extract ventilation to material transfer points and other openings	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	

2.1.10 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	> 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 (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	Handle in a fume cupboard or under extract ventilation	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	

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

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
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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
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Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

1. Exposure scenario ES3

Use as an intermediate

ES Ref.: ES3	Company ES code: Total
ES Type: Worker	
Version: 1.0	
Revision date: 05/10/2015	

Use descriptors	SU3, SU8, SU9 PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC15 ERC6a ESVOC SPERC 6.1a.v1
Processes, tasks, activities covered	

2. Operational conditions and risk management measures

2.2 Contributing scenario controlling environmental exposure (ERC6a, ESVOC SPERC 6.1a.v1)

ERC6a	Industrial use resulting in manufacture of another substance (use of intermediates)
ESVOC SPERC 6.1a.v1	Manufacture of substances : Industrial(SU8, SU9)

Product characteristics

No additional information

Operational conditions

Amounts used	Regional use tonnage (tonnes/year):	5600000
	Maximum daily site tonnage (kg/day):	349000
	Fraction of EU tonnage used in region:	10 %
	Fraction of Regional tonnage used locally:	21.786 %
Frequency and duration of use	Emission Days (days/year):	350 Continuous release
Environmental factors not influenced by risk management	Local freshwater dilution factor:	10
	Local marine water dilution factor:	100
	Receiving surface water flow (m ³ /day):	18000
Other given operational conditions affecting environmental exposure	Release fraction to air from process	0.02 %
	Release fraction to wastewater	0.002 %
	Release fraction to soil from process	0.01 %

Risk Management Measures

Conditions and measures related to sewage treatment plant	Size of the STP : 2000 m ³ /day (by default)	
Conditions and measures related to external treatment of waste for disposal	Sewage Sludge incineration	

2.1.1 Contributing scenario controlling worker exposure (PROC1)

General exposures. Continuous process	
PROC1	Use in closed process, no likelihood of exposure

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	> 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 (cm ²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Maximum process temperature	70 °C
	Indoors	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Open doors and windows. Handle substance within a closed system	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	

2.1.2 Contributing scenario controlling worker exposure (PROC2)

General exposures. with sample collection	
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ETHYLBENZENE

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

PROC2	Use in closed, continuous process with occasional controlled exposure
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Product characteristics

Physical form of product	Liquid
Concentration of substance in product	> 25 %
Volatility	High

Operational conditions

Frequency and duration of use	Exposure duration, 15 min - 1h	
	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	Maximum process temperature	70 °C
	Indoors	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Handle substance within a closed system. Provide extract ventilation to material transfer points and other openings. Ensure samples are obtained under containment or extract ventilation	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	
	IF exposed:	> 1 h Wear a respirator conforming to EN140 with Type A/P2 filter or better

2.1.3 Contributing scenario controlling worker exposure (PROC3)

General exposures. Batch process (closed systems)	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	> 25 %
Volatility	High

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 (cm ²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Maximum process temperature	70 °C
	Indoors	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Handle substance within a closed system. Provide extract ventilation to points where emissions occur. Ensure samples are obtained under containment or extract ventilation	
	Local exhaust ventilation - efficiency of at least [%]:	90 Inhalation
	Local exhaust ventilation - efficiency of at least [%]:	90 in contact with skin
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	

2.1.4 Contributing scenario controlling worker exposure (PROC4)

General exposures. Batch process (open systems)	
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	> 25 %
Volatility	High

Operational conditions

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



ETHYLBENZENE

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

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	Maximum process temperature	70 °C
	Indoors	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Provide extract ventilation to points where emissions occur. Ensure samples are obtained under containment or extract ventilation. Ensure material transfers are under containment or extract ventilation	
	Local exhaust ventilation - efficiency of at least [%]:	90 Inhalation
	Local exhaust ventilation - efficiency of at least [%]:	90 in contact with skin
Conditions and measures related to personal protection, hygiene and health evaluation	Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	

2.1.5 Contributing scenario controlling worker exposure (PROC8a)

Equipment cleaning and maintenance. Daily maintenance. Lines are drained before opening	
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	> 25 %
Volatility	High

Operational conditions

Frequency and duration of use	Exposure duration, 15 min - 1h	
	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	Maximum process temperature	70 °C
	Indoors	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Transfer via enclosed lines. Clear transfer lines prior to de-coupling. Drain down and flush system prior to equipment break-in or maintenance. Retain drain downs in sealed storage pending disposal or for subsequent recycle	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	
	IF exposed:	> 1 h Wear a respirator conforming to EN140 with Type A/P2 filter or better

2.1.6 Contributing scenario controlling worker exposure (PROC8b)

Bulk transfers. Dedicated facility. Ship loading/unloading without vapour recovery	
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	> 25 %
Volatility	medium

Operational conditions

Frequency and duration of use	Exposure duration, 15 min - 1h	
	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	Maximum process temperature	70 °C
	Indoors	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Transfer via enclosed lines. Clear transfer lines prior to de-coupling. Drain down and flush system prior to equipment break-in or maintenance. Retain drain downs in sealed storage pending disposal or for subsequent recycle	
Conditions and measures related to personal	Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear	



ETHYLBENZENE

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

protection, hygiene and health evaluation	eye or face protection	> 1 h Wear a respirator conforming to EN140 with Type A/P2 filter or better
	IF exposed:	

2.1.7 Contributing scenario controlling worker exposure (PROC8b)

Bulk transfers. Dedicated facility. Transport by road/rail		
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	> 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 (cm ²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Maximum process temperature	70 °C
	Indoors	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Ensure material transfers are under containment or extract ventilation. Use dry break couplings for material transfer	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	

2.1.8 Contributing scenario controlling worker exposure (PROC8b)

Bulk transfers. 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	> 25 %
Volatility	High

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 (cm ²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Maximum process temperature	70 °C
	Indoors	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Transfer via enclosed lines. Provide extract ventilation to points where emissions occur. Clear transfer lines prior to de-coupling. Ensure material transfers are under containment or extract ventilation	
	Efficiency	80 % Inhalation
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	

2.1.9 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	> 25 %
Volatility	medium

Operational conditions

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



ETHYLBENZENE

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

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	Maximum process temperature	70 °C
	Indoors	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Provide extract ventilation to points where emissions occur	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	

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

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
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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
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ETHYLBENZENE

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

1. Exposure scenario ES4

Use as process solvent

ES Ref.: ES4	Company ES code: Total
ES Type: Worker	
Version: 1.0	
Revision date: 05/10/2015	

Use descriptors	SU3 PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC15 ERC4 ESVOC SPERC 4.3a.v1
Processes, tasks, activities covered	

2. Operational conditions and risk management measures

2.2 Contributing scenario controlling environmental exposure (ERC4, ESVOC SPERC 4.3a.v1)

ERC4	Industrial use of processing aids in processes and products, not becoming part of articles
ESVOC SPERC 4.3a.v1	Uses in Coatings : Industrial (SU3)

Product characteristics

No additional information

Operational conditions

Amounts used	Regional use tonnage (tonnes/year):	840
	Maximum daily site tonnage (kg/day):	280
	Fraction of EU tonnage used in region:	10 %
	Fraction of Regional tonnage used locally:	100 %
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 (m ³ /day):	18000
Other given operational conditions affecting environmental exposure	Release fraction to air from process	98 %
	Release fraction to wastewater	0.7 %
	Release fraction to soil from process	0 %

Risk Management Measures

Conditions and measures related to sewage treatment plant	Size of the STP : 2000 m ³ /day (by default)	
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2.1.1 Contributing scenario controlling worker exposure (PROC1)

General exposures. Continuous process	
PROC1	Use in closed process, no likelihood of exposure

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	> 25 %
Volatility	High

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 (cm ²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
	Maximum process temperature	70 °C

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Open doors and windows. Handle substance within a closed system	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	

2.1.2 Contributing scenario controlling worker exposure (PROC2)

General exposures. Process sampling. Continuous	
PROC2	Use in closed, continuous process with occasional controlled exposure

Product characteristics



ETHYLBENZENE

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

Physical form of product	Liquid
Concentration of substance in product	> 25 %
Volatility	High

Operational conditions

Frequency and duration of use	Exposure duration, 15 min - 1h	
	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	
	Maximum process temperature	70 °C

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Open doors and windows	
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	
	IF exposed:	> 1 h Wear a respirator conforming to EN140 with Type A/P2 filter or better

2.1.3 Contributing scenario controlling worker exposure (PROC3)

General exposures. Batch process. (closed systems)	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics

Physical form of product	Liquid
Concentration of substance in product	> 25 %
Volatility	High

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 (cm ²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
	Maximum process temperature	70 °C

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Handle substance within a closed system. Ensure samples are obtained under containment or extract ventilation	
	Local exhaust ventilation - efficiency of at least [%]:	90 Inhalation
	Local exhaust ventilation - efficiency of at least [%]:	90 in contact with skin
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	

2.1.4 Contributing scenario controlling worker exposure (PROC4)

General exposures. Batch process. (open systems)	
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	> 25 %
Volatility	High

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 (cm ²) : 480 (two hands, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
	Maximum process temperature	70 °C



ETHYLBENZENE

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Provide extract ventilation to points where emissions occur. Ensure samples are obtained under containment or extract ventilation. Ensure material transfers are under containment or extract ventilation	
	Local exhaust ventilation - efficiency of at least [%]:	90 Inhalation
	Local exhaust ventilation - efficiency of at least [%]:	90 in contact with skin
Conditions and measures related to personal protection, hygiene and health evaluation	Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	

2.1.5 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	> 25 %
Volatility	High

Operational conditions

Frequency and duration of use	Exposure duration, 15 min - 1h	
	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	
	Maximum process temperature	70 °C

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Transfer via enclosed lines. Clear transfer lines prior to de-coupling. Drain down and flush system prior to equipment break-in or maintenance. Retain drain downs in sealed storage pending disposal or for subsequent recycle	
	Efficiency	80 %
Conditions and measures related to personal protection, hygiene and health evaluation	Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	
	IF exposed:	> 1 h Wear a respirator conforming to EN140 with Type A/P2 filter or better

2.1.6 Contributing scenario controlling worker exposure (PROC8b)

Bulk transfers. 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	> 25 %
Volatility	High

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 (cm ²) : 960 (two hands)	
Other given operational conditions affecting workers exposure	Indoors	
	Maximum process temperature	70 °C

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Transfer via enclosed lines. Clear transfer lines prior to de-coupling. Provide extract ventilation to material transfer points and other openings. Drain down and flush system prior to equipment break-in or maintenance	
	Local exhaust ventilation - efficiency of at least [%]:	90 Inhalation
	Local exhaust ventilation - efficiency of at least [%]:	90 in contact with skin
Conditions and measures related to personal	Personal measures have to be applied in case of	



ETHYLBENZENE

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

protection, hygiene and health evaluation	potential exposure only. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection
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2.1.7 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	> 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 (cm ²) : 240 (one hand, face side only)	
Other given operational conditions affecting workers exposure	Indoors	
	Maximum process temperature	70 °C

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Handle in a fume cupboard or under extract ventilation	
	Local exhaust ventilation - efficiency of at least [%]:	90 Inhalation
Conditions and measures related to personal protection, hygiene and health evaluation	Personal measures have to be applied in case of potential exposure only. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear eye or face protection	

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

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
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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
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