



Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

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

Product information

Product Name : Sulfolane - A Anhydrous
 Material : 1119688, 1119687, 1115722, 1114955, 1100709, 1098522,
 1093880, 1024635, 1024637, 1024641, 1024640, 1024644,
 1024636, 1024639, 1024638, 1032498, 1024634

EC-No.Registration number

| Chemical name | CAS-No. EC-No. Index No. | Legal Entity Registration number |
|---------------|---------------------------------------|--|
| Sulfolane | 126-33-0 204-783-1 016-031-00-8 | Chevron Phillips Chemicals International NV 01-2119565139-32-0000 |

Relevant Identified Uses Supported : Distribution
 Use as an aromatics extraction solvent - industrial
 Use in acid gas purification – industrial
 Formulation
 Use as a cleaning agent – industrial

Company : Chevron Phillips Chemical Company LP
 Specialty Chemicals
 10001 Six Pines Drive
 The Woodlands, TX 77380

Local : Chevron Phillips Chemicals International N.V.
 Airport Plaza (Stockholm Building)
 Leonardo Da Vincilaan 19
 1831 Diegem
 Belgium

SDS Requests: (800) 852-5530
 Technical Information: (832) 813-4862
 Responsible Party: Product Safety Group
 Email:sds@cpchem.com

Emergency telephone:

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

Health:

866.442.9628 (North America)

1.832.813.4984 (International)

Transport:

CHEMTREC 800.424.9300 or 703.527.3887(int'l)

Asia: +800 CHEMCALL (+800 2436 2255) China:+86-21-22157316

EUROPE: BIG +32.14.584545 (phone) or +32.14583516 (telefax)

South America SOS-Cotec Inside Brazil: 0800.111.767 Outside Brazil: +55.19.3467.1600

Responsible Department : Product Safety and Toxicology Group
 E-mail address : SDS@CPChem.com
 Website : www.CPChem.com

SECTION 2: Hazards identification**Classification of the substance or mixture****REGULATION (EC) No 1272/2008**

Acute toxicity, Category 4

H302:

Harmful if swallowed.

Reproductive toxicity, Category 1B

H360:

May damage fertility or the unborn child.

Label elements**Labeling (REGULATION (EC) No 1272/2008)**

Hazard pictograms :



Signal Word : Danger

Hazard Statements :

H302

Harmful if swallowed.

H360

May damage fertility or the unborn child.

Precautionary Statements :

Prevention:

P201

Obtain special instructions before use.

P202

Do not handle until all safety precautions have been read and understood.

P264

Wash skin thoroughly after handling.

P280

Wear protective gloves/ protective clothing/ eye protection/ face protection.

Response:

P308 + P313

IF exposed or concerned: Get medical advice/ attention.

Disposal:

P501

Dispose of contents/ container to an approved waste disposal plant.

Hazardous ingredients which must be listed on the label:

- 126-33-0 Sulfolane

Additional Labeling:

The following percentage of the mixture consists of ingredient(s) with unknown acute toxicity: 1 %

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

The following percentage of the mixture consists of ingredient(s) with unknown hazards to the aquatic environment: 1 %
Restricted to professional users.

SECTION 3: Composition/information on ingredients

Synonyms : Tetramethylene Sulfone
Sulfolane Anhydrous
Tetrahydrothiophene 1,1-dioxide

Molecular formula : C₄H₈SO₂

Mixtures**Hazardous ingredients**

| Chemical name | CAS-No. EC-No. Index No. | Classification (REGULATION (EC) No 1272/2008) | Concentration [wt%] |
|---------------|---------------------------------------|---|------------------------|
| Sulfolane | 126-33-0 204-783-1 016-031-00-8 | Acute Tox. 4; H302 Repr. 1B; H360 | 99 - 100 |

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

General advice : Move out of dangerous area. Show this material safety data sheet to the doctor in attendance. Do not leave the victim unattended.

If inhaled : If unconscious place in recovery position and seek medical advice. If symptoms persist, call a physician.

In case of eye contact : Flush eyes with water as a precaution. Remove contact lenses. Protect unharmed eye. Keep eye wide open while rinsing. If eye irritation persists, consult a specialist.

If swallowed : Induce vomiting immediately and call a physician. Keep respiratory tract clear. Do not give milk or alcoholic beverages. Never give anything by mouth to an unconscious person. If symptoms persist, call a physician.

SECTION 5: Firefighting measures

Flash point : 166 °C (331 °F)
Method: Cleveland Open Cup

Autoignition temperature : No data available

Unsuitable extinguishing media : High volume water jet.

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

- Special protective equipment for fire-fighters : Wear self-contained breathing apparatus for firefighting if necessary.
- Further information : Standard procedure for chemical fires. Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
- Fire and explosion protection : Normal measures for preventive fire protection.
- Hazardous decomposition products : Carbon oxides. Sulfur oxides.

SECTION 6: Accidental release measures

- Environmental precautions : Prevent further leakage or spillage if safe to do so. If the product contaminates rivers and lakes or drains inform respective authorities.
- Methods for cleaning up : Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Keep in suitable, closed containers for disposal.

SECTION 7: Handling and storage**Handling**

- Advice on safe handling : Do not breathe vapors/dust. For personal protection see section 8. Smoking, eating and drinking should be prohibited in the application area. Dispose of rinse water in accordance with local and national regulations.
- Advice on protection against fire and explosion : Normal measures for preventive fire protection.

Storage

- Requirements for storage areas and containers : Keep container tightly closed in a dry and well-ventilated place. Electrical installations / working materials must comply with the technological safety standards.

SECTION 8: Exposure controls/personal protection**Ingredients with workplace control parameters****Chevron Phillips Chemical Company LP**

| Ingredients | Basis | Value | Control parameters | Note |
|-------------|--------------|-------|--------------------|------|
| Sulfolane | Manufacturer | TWA | 0,37 ppm, | |

LT

| Komponentai | Pagrindas, bazė | Vertė | Kontrolės parametrai | Pastaba |
|-------------|-----------------|-------|----------------------|---------|
| Sulfolane | LT OEL | IPRD | 40 mg/m3 | |

- DNEL : Routes of exposure: Skin contact
Potential health effects: Chronic effects, Systemic effects

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

| | |
|------|---|
| | Value: 7,8 mg/kg |
| DNEL | : Routes of exposure: Inhalation Potential health effects: Chronic effects, Systemic effects Value: 9 mg/m3 |
| PNEC | : Fresh water Value: 0,1 mg/l |
| PNEC | : Marine water Value: 0,01 mg/l |
| PNEC | : Fresh water sediment Value: 0,39 mg/kg |
| PNEC | : Marine sediment Value: 0,039 mg/kg |
| PNEC | : Soil Value: 0,02 mg/kg |

Engineering measures

Adequate ventilation to control airborne concentrations below the exposure guidelines/limits. Consider the potential hazards of this material (see Section 2), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

Personal protective equipment

| | |
|--------------------------|---|
| Respiratory protection | : Wear a supplied-air NIOSH approved respirator unless ventilation or other engineering controls are adequate to maintain minimal oxygen content of 19.5% by volume under normal atmospheric pressure. Wear a NIOSH approved respirator that provides protection when working with this material if exposure to harmful levels of airborne material may occur, such as: Air-Purifying Respirator for Dusts and Mists / P100. Use a positive pressure, air-supplying respirator if there is potential for uncontrolled release, exposure levels are not known, or other circumstances where air-purifying respirators may not provide adequate protection. |
| Hand protection | : The suitability for a specific workplace should be discussed with the producers of the protective gloves. Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. Also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion, and the contact time. Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough. |
| Eye protection | : Eye wash bottle with pure water. Tightly fitting safety goggles. |
| Skin and body protection | : Choose body protection according to the amount and concentration of the dangerous substance at the work place. |

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

Wear as appropriate: Lightweight protective clothing.

Hygiene measures : When using do not eat or drink. When using do not smoke.
Wash hands before breaks and at the end of workday.

SECTION 9: Physical and chemical properties**Information on basic physical and chemical properties****Appearance**

Form : Liquid
Physical state : Liquid
Color : Clear
Odor : Mild

Safety data

Flash point : 166 °C (331 °F)
Method: Cleveland Open Cup

Lower explosion limit : No data available

Upper explosion limit : No data available

Oxidizing properties : no

Autoignition temperature : No data available

Molecular formula : C₄H₈SO₂

Molecular weight : 120,18 g/mol

pH : Not applicable

Freezing point : 26 °C (79 °F)

Pour point : No data available

Boiling point/boiling range : 282 - 288 °C (540 - 550 °F)

Vapor pressure : 1,14 MMHG
at 37,8 °C (100,0 °F)

Relative density : 1,26
at 30 °C (86 °F)

Density : 1,26 G/ML

Water solubility : Partly soluble

Partition coefficient: n-octanol/water : No data available

Viscosity, kinematic : No data available

Relative vapor density : 3
(Air = 1.0)

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

Evaporation rate : 1
 Percent volatile : > 99 %

SECTION 10: Stability and reactivity

Chemical stability : This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.

Possibility of hazardous reactions

Conditions to avoid : No data available.
 Materials to avoid : May react with oxygen and strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.
 Hazardous decomposition products : Carbon oxides
 Sulfur oxides
 Other data : No decomposition if stored and applied as directed.

SECTION 11: Toxicological information**Acute oral toxicity**

Sulfolane : LD50: 2.068 mg/kg
 Species: Rat
 Sex: male and female
 Method: OECD Test Guideline 401

Acute inhalation toxicity

Sulfolane : LC50: > 12 mg/l
 Exposure time: 4 h
 Species: Rat
 An LC50/inhalation/4h/rat could not be determined because no mortality of rats was observed at the maximum achievable concentration.
 LC50: > 12000 mg/m³Exposure time: 4 h
 Species: Rat
 Sex: male and female
 Test atmosphere: vapor

Acute dermal toxicity

Sulfolane : LD50: >2000 mgKg
 Species: Rat
 Method: Directive 67/548/EEC, Annex V, B.3.

Skin irritation

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

Sulfolane : No skin irritation

Eye irritation

Sulfolane : No eye irritation

Sensitization

Sulfolane : Did not cause sensitization on laboratory animals.

Repeated dose toxicity

Sulfolane : Species: Rat
Application Route: Oral
Dose: 60, 200, 700 mg/kg bw/day
Exposure time: 28 days
Number of exposures: Daily
NOEL: 200 mg/kg bw/day
Lowest observable effect level: 700 mg/kg bw/day

Species: Rat
Application Route: Inhalation
Dose: 2.8, 4.0, 20 mg/m³
Exposure time: 90-110 days
Number of exposures: 23 hrs/d, 7d/wk
NOEL: 20 mg/m³

Reproductive toxicity

Sulfolane : Species: Rat
Sex: female
Application Route: oral gavage
Dose: 60, 200, 700 mg/kg
Number of exposures: Daily
Test period: 2 wk pre mating to lactation D4
Method: OECD Guideline 421
NOAEL Parent: 200 mg/kg bw/day
NOAEL F1: 60 mg/kg bw/day
Decrease birth index and number of pups

Developmental Toxicity

Sulfolane : Species: Rat
Application Route: oral gavage
Dose: 60, 200, 700 mg/kg
Number of exposures: Daily
Test period: 2 wk pre mating to lactation D4
NOAEL Teratogenicity: 60 mg/kg bw/day
NOAEL Maternal: 200 mg/kg bw/day

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

Species: Rat
 Application Route: oral gavage
 Dose: 100, 200, 500 mg/kg/day
 Number of exposures: Daily
 Test period: GD 1 - 19
 NOAEL Teratogenicity: 200 mg/kg
 NOAEL Maternal: 100 mg/kg
 May damage the unborn child.

**Sulfolane - A Anhydrous
Aspiration toxicity**

: No aspiration toxicity classification.

CMR effects

Sulfolane

: Carcinogenicity: Not available
 Mutagenicity: Did not show mutagenic effects in animal experiments.
 Teratogenicity: Clear evidence of adverse effects on sexual function and fertility, and/or on development, based on animal experiments
 Reproductive toxicity: No toxicity to reproduction

**Sulfolane - A Anhydrous
Further information**

: No data available.

SECTION 12: Ecological information**Toxicity to fish**

Sulfolane

: LC50: > 100 mg/l
 Exposure time: 96 h
 Species: *Oryzias latipes* (Orange-red killifish)
 static test Method: OECD Test Guideline 203

Toxicity to daphnia and other aquatic invertebrates

Sulfolane

: EC50: 852 mg/l
 Exposure time: 48 h
 Species: *Daphnia magna* (Water flea)
 static test Method: OECD Test Guideline 202

Toxicity to algae

Sulfolane

: EC50: 500 mg/l
 Exposure time: 72 h
 Species: *Pseudokirchneriella subcapitata* (green algae)
 Method: OECD Test Guideline 201

NOEC: 171 mg/l
 Exposure time: 72 h
 Species: *Pseudokirchneriella subcapitata* (green algae)
 Method: OECD Test Guideline 201

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

Bioaccumulation

Sulfolane : Bioconcentration factor (BCF): < 1,3
This material is not expected to bioaccumulate.

Biodegradability

Sulfolane : Result: Not readily biodegradable.
10,1 %
Testing period: 14 d
Method: OECD Test Guideline 301C

Ecotoxicology Assessment**Results of PBT assessment**

Sulfolane : Non-classified vPvB substance, Non-classified PBT substance

Additional ecological information : This material is not expected to be harmful to aquatic organisms.

SECTION 13: Disposal considerations

The information in this SDS pertains only to the product as shipped.

Use material for its intended purpose or recycle if possible. This material, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA under RCRA (40 CFR 261) or other State and local regulations. Measurement of certain physical properties and analysis for regulated components may be necessary to make a correct determination. If this material is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.

Product : Do not dispose of waste into sewer. Do not contaminate ponds, waterways or ditches with chemical or used container. Send to a licensed waste management company.

Contaminated packaging : Empty remaining contents. Dispose of as unused product. Do not re-use empty containers.

SECTION 14: Transport information

The shipping descriptions shown here are for bulk shipments only, and may not apply to shipments in non-bulk packages (see regulatory definition).

Consult the appropriate domestic or international mode-specific and quantity-specific Dangerous Goods Regulations for additional shipping description requirements (e.g., technical name or names, etc.) Therefore, the information shown here, may not always agree with the bill of lading shipping description for the material. Flashpoints for the material may vary slightly between the SDS and the bill of lading.

US DOT (UNITED STATES DEPARTMENT OF TRANSPORTATION)

NOT REGULATED AS A HAZARDOUS MATERIAL OR DANGEROUS GOODS FOR TRANSPORTATION BY THIS AGENCY.

IMO / IMDG (INTERNATIONAL MARITIME DANGEROUS GOODS)

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

NOT REGULATED AS A HAZARDOUS MATERIAL OR DANGEROUS GOODS FOR TRANSPORTATION BY THIS AGENCY.

IATA (INTERNATIONAL AIR TRANSPORT ASSOCIATION)

NOT REGULATED AS A HAZARDOUS MATERIAL OR DANGEROUS GOODS FOR TRANSPORTATION BY THIS AGENCY.

ADR (AGREEMENT ON DANGEROUS GOODS BY ROAD (EUROPE))

NOT REGULATED AS A HAZARDOUS MATERIAL OR DANGEROUS GOODS FOR TRANSPORTATION BY THIS AGENCY.

RID (REGULATIONS CONCERNING THE INTERNATIONAL TRANSPORT OF DANGEROUS GOODS (EUROPE))

NOT REGULATED AS A HAZARDOUS MATERIAL OR DANGEROUS GOODS FOR TRANSPORTATION BY THIS AGENCY.

ADN (EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY INLAND WATERWAYS)

NOT REGULATED AS A HAZARDOUS MATERIAL OR DANGEROUS GOODS FOR TRANSPORTATION BY THIS AGENCY.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

SECTION 15: Regulatory information**National legislation****Chemical Safety Assessment**

Ingredients : tetrahydrothiophene 1,1-dioxide A Chemical Safety Assessment 204-783-1 has been carried out for this substance.

Major Accident Hazard Legislation : 96/82/EC Update: 2003 Directive 96/82/EC does not apply

Water contaminating class (Germany) : WGK 2 water endangering

Notification status

| | | |
|-------------------------------|---|---|
| Europe REACH | : | On the inventory, or in compliance with the inventory |
| United States of America TSCA | : | On the inventory, or in compliance with the inventory |
| Canada DSL | : | On the inventory, or in compliance with the inventory |
| Australia AICS | : | On the inventory, or in compliance with the inventory |
| New Zealand NZIoC | : | On the inventory, or in compliance with the inventory |
| Japan ENCS | : | On the inventory, or in compliance with the inventory |
| Korea KECI | : | On the inventory, or in compliance with the inventory |
| Philippines PICCS | : | On the inventory, or in compliance with the inventory |

Sulfolane - A Anhydrous

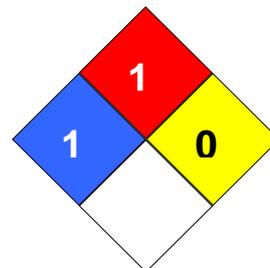
Version 3.3

Revision Date 2016-06-22

China IECSC : On the inventory, or in compliance with the inventory

SECTION 16: Other information

NFPA Classification : Health Hazard: 1
Fire Hazard: 1
Reactivity Hazard: 0

**Further information**

Legacy SDS Number : 34190

Significant changes since the last version are highlighted in the margin. This version replaces all previous versions.

The information in this SDS pertains only to the product as shipped.

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Key or legend to abbreviations and acronyms used in the safety data sheet

| | | | |
|--------|---|-------|---|
| ACGIH | American Conference of Government Industrial Hygienists | LD50 | Lethal Dose 50% |
| AICS | Australia, Inventory of Chemical Substances | LOAEL | Lowest Observed Adverse Effect Level |
| DSL | Canada, Domestic Substances List | NFPA | National Fire Protection Agency |
| NDSL | Canada, Non-Domestic Substances List | NIOSH | National Institute for Occupational Safety & Health |
| CNS | Central Nervous System | NTP | National Toxicology Program |
| CAS | Chemical Abstract Service | NZIoC | New Zealand Inventory of Chemicals |
| EC50 | Effective Concentration | NOAEL | No Observable Adverse Effect Level |
| EC50 | Effective Concentration 50% | NOEC | No Observed Effect Concentration |
| EGEST | EOSCA Generic Exposure Scenario Tool | OSHA | Occupational Safety & Health Administration |
| EOSCA | European Oilfield Specialty Chemicals Association | PEL | Permissible Exposure Limit |
| EINECS | European Inventory of Existing Chemical Substances | PICCS | Philippines Inventory of Commercial Chemical Substances |
| MAK | Germany Maximum Concentration Values | PRNT | Presumed Not Toxic |
| GHS | Globally Harmonized System | RCRA | Resource Conservation Recovery Act |
| >= | Greater Than or Equal To | STEL | Short-term Exposure Limit |
| IC50 | Inhibition Concentration 50% | SARA | Superfund Amendments and Reauthorization Act. |
| IARC | International Agency for Research | TLV | Threshold Limit Value |

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

| | | | |
|-------|--|-------|--|
| | on Cancer | | |
| IECSC | Inventory of Existing Chemical Substances in China | TWA | Time Weighted Average |
| ENCS | Japan, Inventory of Existing and New Chemical Substances | TSCA | Toxic Substance Control Act |
| KECI | Korea, Existing Chemical Inventory | UVCB | Unknown or Variable Composition, Complex Reaction Products, and Biological Materials |
| <= | Less Than or Equal To | WHMIS | Workplace Hazardous Materials Information System |
| LC50 | Lethal Concentration 50% | | |

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

H302 Harmful if swallowed.
H360 May damage fertility or the unborn child.

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

Annex**1. Short title of Exposure Scenario: Distribution**

| | | |
|--------------------------------|---|--|
| Main User Groups | : | SU 3: Industrial uses: Uses of substances as such or in preparations at industrial sites |
| Sector of use | : | SU8, SU9: Manufacture of bulk, large scale chemicals (including petroleum products), Manufacture of fine chemicals |
| Process category | : | PROC1: Use in closed process, no likelihood of exposure PROC2: Use in closed, continuous process with occasional controlled exposure PROC3: Use in closed batch process (synthesis or formulation) PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC8b: Transfer of substance or preparation (charging/discharging) from/ to vessels/ large containers at dedicated facilities PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC15: Use as laboratory reagent |
| Environmental release category | : | ERC1: Manufacture of substances |
| Further information | : | Loading (including marine vessel/barge, rail/road car and IBC loading) and repacking (including drums and small packs) of substance, including its sampling, storage, unloading distribution and associated laboratory activities. |

2.1 Contributing scenario controlling environmental exposure for:ERC1: Manufacture of substances**Product characteristics**

Viscosity, dynamic : 10,34 mPa.s at 30 °C

(Msafe) : 111.000 kg/day

Environment factors not influenced by risk management

Flow rate : 18.000 m3/d

Dilution Factor (River) : 10

Dilution Factor (Coastal Areas) : 100

Other given operational conditions affecting environmental exposure

Number of emission days per year : 300

Emission or Release Factor: Air : 0,001 %

Emission or Release Factor: Water : 0,001 %

Emission or Release Factor: Soil : 0,001 %

Technical conditions and measures / Organizational measures

Air : Treat air emission to provide a typical removal efficiency of (%): (Effectiveness: > 90 %)

Remarks : Prevent environmental discharge consistent with regulatory

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

Water requirements.
: No onsite wastewater treatment prior to discharge to sewage treatment plant.

Conditions and measures related to municipal sewage treatment plant

Type of Sewage Treatment Plant : Municipal sewage treatment plant
 Percentage removed from waste water : 0 %
 Procedures to limit air emissions from Sewage Treatment Plant : No data available
 Remarks : Domestic sewage treatment is not assumed.

Conditions and measures related to external treatment of waste for disposal

Waste treatment : External treatment and disposal of waste should comply with applicable local and/or national regulations.

Conditions and measures related to external recovery of waste

Recovery Methods : External recovery and recycling of waste should comply with applicable local and/or national regulations.

2.2 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC3: Use in closed process, no likelihood of exposure, Use in closed, continuous process with occasional controlled exposure, Use in closed batch process (synthesis or formulation)**Product characteristics**

Physical Form (at time of use) : Liquid substance
 Vapor pressure : > 0,5 kPa

Amount used

Remarks : Not applicable

Frequency and duration of use

Remarks : Covers daily exposures up to 8 hours (unless stated differently)

Other operational conditions affecting workers exposure

Remarks : Assumes a good basic standard of occupational hygiene is implemented., Assumes use at not more than 20°C above ambient temperature, unless stated differently.

Technical conditions and measures

Ensure operation is undertaken outdoors.

2.2 Contributing scenario controlling worker exposure for: PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities**Product characteristics**

Physical Form (at time of use) : Liquid substance
 Vapor pressure : > 0,5 kPa

Amount used

Remarks : Not applicable

Frequency and duration of use

Remarks : Covers daily exposures up to 8 hours (unless stated differently)

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

Other operational conditions affecting workers exposure

Remarks : Assumes a good basic standard of occupational hygiene is implemented., Assumes use at not more than 20°C above ambient temperature, unless stated differently.

Technical conditions and measures

Provide enhanced general ventilation by mechanical means.

Organizational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out operation for more than 4 hours.

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

Wear suitable gloves tested to EN374.

2.2 Contributing scenario controlling worker exposure for: PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities**Product characteristics**

Physical Form (at time of use) : Liquid substance
Vapor pressure : > 0,5 kPa

Amount used

Remarks : Not applicable

Frequency and duration of use

Remarks : Covers daily exposures up to 8 hours (unless stated differently)

Other operational conditions affecting workers exposure

Remarks : Assumes a good basic standard of occupational hygiene is implemented., Assumes use at not more than 20°C above ambient temperature, unless stated differently.

Technical conditions and measures

Provide enhanced general ventilation by mechanical means.

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

Wear suitable gloves tested to EN374.

2.2 Contributing scenario controlling worker exposure for: PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)**Product characteristics**

Physical Form (at time of use) : Liquid substance
Vapor pressure : > 0,5 kPa

Amount used

Remarks : Not applicable

Frequency and duration of use

Remarks : Covers daily exposures up to 8 hours (unless stated differently)

Other operational conditions affecting workers exposure

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

Remarks : Assumes a good basic standard of occupational hygiene is implemented., Assumes use at not more than 20°C above ambient temperature, unless stated differently.

Technical conditions and measures

Provide enhanced general ventilation by mechanical means.

2.2 Contributing scenario controlling worker exposure for: PROC15: Use as laboratory reagent**Product characteristics**

Physical Form (at time of use) : Liquid substance
Vapor pressure : > 0,5 kPa

Amount used

Remarks : Not applicable

Frequency and duration of use

Remarks : Covers daily exposures up to 8 hours (unless stated differently)

Other operational conditions affecting workers exposure

Remarks : Assumes a good basic standard of occupational hygiene is implemented., Assumes use at not more than 20°C above ambient temperature, unless stated differently.

Technical conditions and measures

Ensure operation is undertaken outdoors.

Organizational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out operation for more than 4 hours.

3. Exposure estimation and reference to its source**Environment**

| Contributing Scenario | Exposure Assessment Method | Specific conditions | Compartment | Value type | Level of Exposure | Risk characterization ratio |
|-----------------------|----------------------------|---------------------|---------------------|------------|-------------------|-----------------------------|
| ERC1 | EUSES | | Freshwater | | 0,00103 mg/L | 0,01 |
| | | | Marine water | | 0,000103 mg/L | 0,01 |
| | | | Freshwater sediment | | 0,000884 mg/kg | 0,01 |
| | | | Marine sediment | | 0,0000878 mg/kg | 0,01 |
| | | | Soil | | 0,000216 mg/kg | 0,01 |

ERC1: Manufacture of substances

Workers/Consumers

| Contributing Scenario | Exposure Assessment Method | Specific conditions | Value type | Level of Exposure | Risk characterization ratio |
|-----------------------|----------------------------|---------------------|---|-------------------|-----------------------------|
| PROC1, CS15 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 0,01 ppm | 0,0 |
| | | | Worker – dermal, long- | 0,34 mg/kg/d | 0,1 |

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

| | | | | | |
|--------------------|---------------------|--|---|--------------|------|
| | | | term – systemic | | |
| | | | Worker – long-term – systemic Combined routes | | 0,10 |
| PROC2, CS15, CS67 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 0,70 ppm | 0,4 |
| | | | Worker – dermal, long-term – systemic | 1,37 mg/kg/d | 0,4 |
| | | | Worker – long-term – systemic Combined routes | | 0,77 |
| PROC3, CS2 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 1,47 ppm | 0,8 |
| | | | Worker – dermal, long-term – systemic | 0,34 mg/kg/d | 0,1 |
| | | | Worker – long-term – systemic Combined routes | | 0,90 |
| PROC8a, CS39 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 0,13 ppm | 0,1 |
| | | | Worker – dermal, long-term – systemic | 2,74 mg/kg/d | 0,8 |
| | | | Worker – long-term – systemic Combined routes | | 0,85 |
| PROC8b, CS14, CS39 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 1,05 ppm | 0,6 |
| | | | Worker – dermal, long-term – systemic | 1,37 mg/kg/d | 0,4 |
| | | | Worker – long-term – systemic Combined routes | | 0,97 |
| , CS6 | ECETOC TRA | | Worker – inhalation, long-term – systemic | 1,05 ppm | 0,6 |
| | | | Worker – dermal, long-term – systemic | 1,37 mg/kg/d | 0,4 |
| | | | Worker – long-term – systemic Combined routes | | 0,97 |
| PROC15, CS36 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 0,30 ppm | 0,2 |
| | | | Worker – dermal, long-term – systemic | 0,34 mg/kg/d | 0,1 |
| | | | Worker – long-term – systemic Combined routes | | 0,26 |

PROC1: Use in closed process, no likelihood of exposure
 CS15: General exposures (closed systems)

PROC2: Use in closed, continuous process with occasional controlled exposure
 CS15: General exposures (closed systems)
 CS67: Storage

PROC3: Use in closed batch process (synthesis or formulation)
 CS2: Process sampling

PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities
 CS39: Equipment cleaning and maintenance

PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities
 CS14: Bulk transfers
 CS39: Equipment cleaning and maintenance

: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
 CS6: Drum and small package filling

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

PROC15: Use as laboratory reagent
 CS36: Laboratory activities

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

Confirm that RMMs and OCs are as described or of equivalent efficiency.
 When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1

1. Short title of Exposure Scenario: Use as an aromatics extraction solvent - industrial

| | | |
|--------------------------------|---|---|
| Main User Groups | : | SU 3: Industrial uses: Uses of substances as such or in preparations at industrial sites |
| Sector of use | : | SU8, SU9: Manufacture of bulk, large scale chemicals (including petroleum products), Manufacture of fine chemicals |
| Process category | : | PROC1: Use in closed process, no likelihood of exposure PROC2: Use in closed, continuous process with occasional controlled exposure PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC8b: Transfer of substance or preparation (charging/discharging) from/ to vessels/ large containers at dedicated facilities PROC15: Use as laboratory reagent |
| Environmental release category | : | ERC1, ERC4, ERC6a: Manufacture of substances, Industrial use of processing aids in processes and products, not becoming part of articles, Industrial use resulting in manufacture of another substance (use of intermediates) |
| Further information | : | Manufacture of the substance or use as a process chemical or extraction agent. Includes recycling/ recovery, material transfers, storage, maintenance and loading (including marine vessel/barge, road/rail car and bulk container), sampling and associated laboratory activities |

2.1 Contributing scenario controlling environmental exposure for:ERC1, ERC4, ERC6a: Manufacture of substances, Industrial use of processing aids in processes and products, not becoming part of articles, Industrial use resulting in manufacture of another substance (use of intermediates)**Product characteristics**

| | | |
|--------------------|---|----------------------|
| Viscosity, dynamic | : | 10,34 mPa.s at 30 °C |
| (Msafe) | : | 200 kg/day |

Environment factors not influenced by risk management

| | | |
|---------------------------------|---|--------------------------|
| Flow rate | : | 18.000 m ³ /d |
| Dilution Factor (River) | : | 10 |
| Dilution Factor (Coastal Areas) | : | 100 |

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

Other given operational conditions affecting environmental exposure

Number of emission days per year : 300
 Emission or Release Factor: Air : 0,001 %
 Emission or Release Factor: Water : 1 %
 Emission or Release Factor: Soil : 0,01 %

Technical conditions and measures / Organizational measures

Air : Treat air emission to provide a typical removal efficiency of (%): (Effectiveness: > 90 %)
 Remarks : Prevent environmental discharge consistent with regulatory requirements.
 Water : No onsite wastewater treatment prior to discharge to sewage treatment plant.

Conditions and measures related to municipal sewage treatment plant

Type of Sewage Treatment Plant : Municipal sewage treatment plant
 Percentage removed from waste water : 0 %
 Procedures to limit air emissions from Sewage Treatment Plant : No data available
 Remarks : Domestic sewage treatment is not assumed.

Conditions and measures related to external treatment of waste for disposal

Waste treatment : External treatment and disposal of waste should comply with applicable local and/or national regulations.

Conditions and measures related to external recovery of waste

Recovery Methods : External recovery and recycling of waste should comply with applicable local and/or national regulations.

2.2 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC15: Use in closed process, no likelihood of exposure, Use in closed, continuous process with occasional controlled exposure, Use as laboratory reagent

Product characteristics

Physical Form (at time of use) : Liquid substance
 Vapor pressure : > 0,5 kPa

Amount used

Remarks : Not applicable

Frequency and duration of use

Remarks : Covers daily exposures up to 8 hours (unless stated differently)

Other operational conditions affecting workers exposure

Remarks : Assumes a good basic standard of occupational hygiene is implemented., Assumes use at not more than 20°C above ambient temperature, unless stated differently.

2.2 Contributing scenario controlling worker exposure for: PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

Product characteristics

Physical Form (at time of use) : Liquid substance
 Vapor pressure : > 0,5 kPa

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

Amount used

Remarks : Not applicable

Frequency and duration of use

Remarks : Covers daily exposures up to 8 hours (unless stated differently)

Other operational conditions affecting workers exposure

Remarks : Assumes a good basic standard of occupational hygiene is implemented., Assumes use at not more than 20°C above ambient temperature, unless stated differently.

Technical conditions and measures

Provide enhanced general ventilation by mechanical means.

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

Wear suitable respiratory protection (conforming to EN140 with Type A filter or better) and gloves (type EN374) if regular skin contact likely.

2.2 Contributing scenario controlling worker exposure for: PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities**Product characteristics**

Physical Form (at time of use) : Liquid substance

Vapor pressure : > 0,5 kPa

Amount used

Remarks : Not applicable

Frequency and duration of use

Remarks : Covers daily exposures up to 8 hours (unless stated differently)

Other operational conditions affecting workers exposure

Remarks : Assumes a good basic standard of occupational hygiene is implemented., Assumes use at not more than 20°C above ambient temperature, unless stated differently.

Technical conditions and measures

Provide enhanced general ventilation by mechanical means.

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

Wear suitable gloves tested to EN374.

3. Exposure estimation and reference to its source**Environment**

| Contributing Scenario | Exposure Assessment Method | Specific conditions | Compartment | Value type | Level of Exposure | Risk characterization ratio |
|-----------------------|----------------------------|---------------------|--------------|------------|-------------------|-----------------------------|
| ERC1, ERC4, ERC6a | EUSES | | Freshwater | | 0,0893 mg/L | 0,9 |
| | | | Marine water | | 0,00894 mg/L | 0,9 |
| | | | Freshwater | | 0,0764 mg/kg | 0,9 |

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

| | | | | | | |
|--|--|--|-----------------|--|------------------|-------|
| | | | sediment | | | |
| | | | Marine sediment | | 0,00764 mg/kg | 0,9 |
| | | | Soil | | 0,00149 mg/kg | 0,083 |

ERC1: Manufacture of substances

ERC4: Industrial use of processing aids in processes and products, not becoming part of articles

ERC6a: Industrial use resulting in manufacture of another substance (use of intermediates)

Workers/Consumers

| Contributing Scenario | Exposure Assessment Method | Specific conditions | Value type | Level of Exposure | Risk characterization ratio |
|-----------------------|----------------------------|---------------------|---|-------------------|-----------------------------|
| PROC1, CS15 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 0,01 ppm | 0,0 |
| | | | Worker – dermal, long-term – systemic | 0,34 mg/kg/d | 0,1 |
| | | | Worker – long-term – systemic Combined routes | | 0,10 |
| PROC2, CS15, CS67 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 0,70 ppm | 0,4 |
| | | | Worker – dermal, long-term – systemic | 1,37 mg/kg/d | 0,4 |
| | | | Worker – long-term – systemic Combined routes | | 0,77 |
| PROC15, CS36 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 0,30 ppm | 0,2 |
| | | | Worker – dermal, long-term – systemic | 0,34 mg/kg/d | 0,1 |
| | | | Worker – long-term – systemic Combined routes | | 0,26 |
| PROC8a, CS39 | ECETOC TRA | | Worker – inhalation, long-term – systemic | 0,21 ppm | 0,1 |
| | | | Worker – dermal, long-term – systemic | 2,74 mg/kg/d | 0,8 |
| | | | Worker – long-term – systemic Combined routes | | 0,90 |
| PROC8b, CS14, CS39 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 1,05 ppm | 0,6 |
| | | | Worker – dermal, long-term – systemic | 1,37 mg/kg/d | 0,4 |
| | | | Worker – long-term – systemic Combined routes | | 0,97 |

PROC1: Use in closed process, no likelihood of exposure

CS15: General exposures (closed systems)

PROC2: Use in closed, continuous process with occasional controlled exposure

CS15: General exposures (closed systems)

CS67: Storage

PROC15: Use as laboratory reagent

CS36: Laboratory activities

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

CS39: Equipment cleaning and maintenance

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

CS14: Bulk transfers

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

CS39: Equipment cleaning and maintenance

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

Confirm that RMMs and OCs are as described or of equivalent efficiency.

When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1 Confirm that RMMs and OCs are as described or of equivalent efficiency.

When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1

1. Short title of Exposure Scenario: Use in acid gas purification – industrial

| | | |
|--------------------------------|---|---|
| Main User Groups | : | SU 3: Industrial uses: Uses of substances as such or in preparations at industrial sites |
| Sector of use | : | SU8, SU9: Manufacture of bulk, large scale chemicals (including petroleum products), Manufacture of fine chemicals |
| Process category | : | PROC1: Use in closed process, no likelihood of exposure PROC2: Use in closed, continuous process with occasional controlled exposure PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC8b: Transfer of substance or preparation (charging/discharging) from/ to vessels/ large containers at dedicated facilities PROC15: Use as laboratory reagent |
| Environmental release category | : | ERC1, ERC4, ERC6a: Manufacture of substances, Industrial use of processing aids in processes and products, not becoming part of articles, Industrial use resulting in manufacture of another substance (use of intermediates) |
| Further information | : | Manufacture of the substance or use as a process chemical or extraction agent. Includes recycling/ recovery, material transfers, storage, maintenance and loading (including marine vessel/barge, road/rail car and bulk container), sampling and associated laboratory activities |

2.1 Contributing scenario controlling environmental exposure for:ERC1, ERC4, ERC6a: Manufacture of substances, Industrial use of processing aids in processes and products, not becoming part of articles, Industrial use resulting in manufacture of another substance (use of intermediates)**Product characteristics**

Viscosity, dynamic : 10,34 mPa.s at 30 °C

(Msafe) : 200 kg/day

Environment factors not influenced by risk management

Flow rate : 18.000 m3/d

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

Dilution Factor (River) : 10
 Dilution Factor (Coastal Areas) : 100

Other given operational conditions affecting environmental exposure

Number of emission days per year : 300
 Emission or Release Factor: Air : 0,001 %
 Emission or Release Factor: Water : 1 %
 Emission or Release Factor: Soil : 0,01 %

Technical conditions and measures / Organizational measures

Air : Treat air emission to provide a typical removal efficiency of (%) (Effectiveness: > 90 %)
 Remarks : Prevent environmental discharge consistent with regulatory requirements.
 Water : No onsite wastewater treatment prior to discharge to sewage treatment plant.

Conditions and measures related to municipal sewage treatment plant

Type of Sewage Treatment Plant : Municipal sewage treatment plant
 Percentage removed from waste water : 0 %
 Procedures to limit air emissions from Sewage Treatment Plant : No data available
 Remarks : Domestic sewage treatment is not assumed.

Conditions and measures related to external treatment of waste for disposal

Waste treatment : External treatment and disposal of waste should comply with applicable local and/or national regulations.

Conditions and measures related to external recovery of waste

Recovery Methods : External recovery and recycling of waste should comply with applicable local and/or national regulations.

2.2 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC15: Use in closed process, no likelihood of exposure, Use in closed, continuous process with occasional controlled exposure, Use as laboratory reagent**Product characteristics**

Physical Form (at time of use) : Liquid substance
 Vapor pressure : > 0,5 kPa

Amount used

Remarks : Not applicable

Frequency and duration of use

Remarks : Covers daily exposures up to 8 hours (unless stated differently)

Other operational conditions affecting workers exposure

Remarks : Assumes a good basic standard of occupational hygiene is implemented., Assumes use at not more than 20°C above ambient temperature, unless stated differently.

2.2 Contributing scenario controlling worker exposure for: PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

Product characteristics

Physical Form (at time of use) : Liquid substance
 Vapor pressure : > 0,5 kPa

Amount used

Remarks : Not applicable

Frequency and duration of use

Remarks : Covers daily exposures up to 8 hours (unless stated differently)

Other operational conditions affecting workers exposure

Remarks : Assumes a good basic standard of occupational hygiene is implemented., Assumes use at not more than 20°C above ambient temperature, unless stated differently.

Technical conditions and measures

Provide enhanced general ventilation by mechanical means.

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

Wear suitable respiratory protection (conforming to EN140 with Type A filter or better) and gloves (type EN374) if regular skin contact likely.

2.2 Contributing scenario controlling worker exposure for: PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities**Product characteristics**

Physical Form (at time of use) : Liquid substance
 Vapor pressure : > 0,5 kPa

Amount used

Remarks : Not applicable

Frequency and duration of use

Remarks : Covers daily exposures up to 8 hours (unless stated differently)

Other operational conditions affecting workers exposure

Remarks : Assumes a good basic standard of occupational hygiene is implemented., Assumes use at not more than 20°C above ambient temperature, unless stated differently.

Technical conditions and measures

Provide enhanced general ventilation by mechanical means.

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

Wear suitable gloves tested to EN374.

3. Exposure estimation and reference to its source**Environment**

| Contributing Scenario | Exposure Assessment Method | Specific conditions | Compartment | Value type | Level of Exposure | Risk characterization ratio |
|-----------------------|----------------------------|---------------------|-------------|------------|-------------------|-----------------------------|
| ERC1, ERC4, | EUSES | | Freshwater | | 0,0893 mg/L | 0,9 |

SDS Number:100000014122

25/37

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

| ERC6a | | | | | |
|-------|--|--|---------------------|---------------|-------|
| | | | Marine water | 0,00894 mg/L | 0,9 |
| | | | Freshwater sediment | 0,0764 mg/kg | 0,9 |
| | | | Marine sediment | 0,00764 mg/kg | 0,9 |
| | | | Soil | 0,00149 mg/kg | 0,083 |

ERC1: Manufacture of substances

ERC4: Industrial use of processing aids in processes and products, not becoming part of articles

ERC6a: Industrial use resulting in manufacture of another substance (use of intermediates)

Workers/Consumers

| Contributing Scenario | Exposure Assessment Method | Specific conditions | Value type | Level of Exposure | Risk characterization ratio |
|-----------------------|----------------------------|---------------------|---|-------------------|-----------------------------|
| PROC1, CS15 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 0,01 ppm | 0,0 |
| | | | Worker – dermal, long-term – systemic | 0,34 mg/kg/d | 0,1 |
| | | | Worker – long-term – systemic Combined routes | | 0,10 |
| PROC2, CS15, CS67 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 0,70 ppm | 0,4 |
| | | | Worker – dermal, long-term – systemic | 1,37 mg/kg/d | 0,4 |
| | | | Worker – long-term – systemic Combined routes | | 0,77 |
| PROC15, CS36 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 0,30 ppm | 0,2 |
| | | | Worker – dermal, long-term – systemic | 0,34 mg/kg/d | 0,1 |
| | | | Worker – long-term – systemic Combined routes | | 0,26 |
| PROC8a, CS39 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 0,21 ppm | 0,1 |
| | | | Worker – dermal, long-term – systemic | 2,74 mg/kg/d | 0,8 |
| | | | Worker – long-term – systemic Combined routes | | 0,90 |
| PROC8b, CS14, CS39 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 1,05 ppm | 0,6 |
| | | | Worker – dermal, long-term – systemic | 1,37 mg/kg/d | 0,4 |
| | | | Worker – long-term – systemic Combined routes | | 0,97 |

PROC1: Use in closed process, no likelihood of exposure

CS15: General exposures (closed systems)

PROC2: Use in closed, continuous process with occasional controlled exposure

CS15: General exposures (closed systems)

CS67: Storage

PROC15: Use as laboratory reagent

CS36: Laboratory activities

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

CS39: Equipment cleaning and maintenance

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities
 CS14: Bulk transfers
 CS39: Equipment cleaning and maintenance

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

Confirm that RMMs and OCs are as described or of equivalent efficiency.
 When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1

1. Short title of Exposure Scenario: Formulation

| | | |
|--------------------------------|---|--|
| Main User Groups | : | SU 3: Industrial uses: Uses of substances as such or in preparations at industrial sites |
| Sector of use | : | SU 10: Formulation [mixing] of preparations and/ or re-packaging (excluding alloys) |
| Process category | : | PROC1: Use in closed process, no likelihood of exposure PROC2: Use in closed, continuous process with occasional controlled exposure PROC3: Use in closed batch process (synthesis or formulation) PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC14: Production of mixtures or articles by tableting, compression, extrusion, pelletization; Industrial setting; PROC15: Use as laboratory reagent |
| Environmental release category | : | ERC2: Formulation of preparations |
| Further information | : | Formulation, packing and re-packing of the substance and its mixtures in batch or continuous operations, including storage, materials transfers, mixing, tableting, compression, pelletisation, extrusion, large and small scale packing, sampling, maintenance and associated laboratory activities. |

2.1 Contributing scenario controlling environmental exposure for:ERC2: Formulation of preparations**Product characteristics**

Viscosity, dynamic : 10,34 mPa.s at 30 °C

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

Maximum allowable site tonnage :
 (MSafe) based on release
 following total wastewater
 treatment removal (tonnes/day):
 (Msafe)
 Remarks : Not applicable

Technical conditions and measures / Organizational measures

Remarks : Not applicable

2.2 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC15: Use in closed process, no likelihood of exposure, Use in closed, continuous process with occasional controlled exposure, Use as laboratory reagent
Product characteristics

Physical Form (at time of use) : Liquid substance
 Vapor pressure : > 0,5 kPa

Amount used

Remarks : Not applicable

Frequency and duration of use

Remarks : Covers daily exposures up to 8 hours (unless stated differently)

Other operational conditions affecting workers exposure

Remarks : Assumes a good basic standard of occupational hygiene is implemented., Assumes use at not more than 20°C above ambient temperature, unless stated differently.

2.2 Contributing scenario controlling worker exposure for: PROC3: Use in closed batch process (synthesis or formulation)
Product characteristics

Physical Form (at time of use) : Liquid substance
 Vapor pressure : > 0,5 kPa

Amount used

Remarks : Not applicable

Frequency and duration of use

Remarks : Covers daily exposures up to 8 hours (unless stated differently)

Other operational conditions affecting workers exposure

Remarks : Assumes a good basic standard of occupational hygiene is implemented., Assumes use at not more than 20°C above ambient temperature, unless stated differently.

Technical conditions and measures

Provide enhanced general ventilation by mechanical means.

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

2.2 Contributing scenario controlling worker exposure for: PROC4, PROC8b, PROC9, PROC14: Use in batch and other process (synthesis) where opportunity for exposure arises, Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities, Transfer of substance or preparation into small containers (dedicated filling line, including weighing), Production of mixtures or articles by tableting, compression, extrusion, pelletization; Industrial setting;

Product characteristics

Physical Form (at time of use) : Liquid substance
 Vapor pressure : > 0,5 kPa

Amount used

Remarks : Not applicable

Frequency and duration of use

Remarks : Covers daily exposures up to 8 hours (unless stated differently)

Other operational conditions affecting workers exposure

Remarks : Assumes a good basic standard of occupational hygiene is implemented., Assumes use at not more than 20°C above ambient temperature, unless stated differently.

Technical conditions and measures

Provide enhanced general ventilation by mechanical means.

Organizational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out operation for more than 4 hours.

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

Wear suitable gloves tested to EN374.

2.2 Contributing scenario controlling worker exposure for: PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

Product characteristics

Physical Form (at time of use) : Liquid substance
 Vapor pressure : > 0,5 kPa

Amount used

Remarks : Not applicable

Frequency and duration of use

Remarks : Covers daily exposures up to 8 hours (unless stated differently)

Other operational conditions affecting workers exposure

Remarks : Assumes a good basic standard of occupational hygiene is implemented., Assumes use at not more than 20°C above ambient temperature, unless stated differently.

Technical conditions and measures

Ensure material transfers are under containment or extract ventilation.

Organizational measures to prevent /limit releases, dispersion and exposure

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

Avoid carrying out operation for more than 4 hours.

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

Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.

3. Exposure estimation and reference to its source**Workers/Consumers**

| Contributing Scenario | Exposure Assessment Method | Specific conditions | Value type | Level of Exposure | Risk characterization ratio |
|-----------------------|----------------------------|---------------------|---|-------------------|-----------------------------|
| PROC1, CS15 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 0,01 ppm | 0,0 |
| | | | Worker – dermal, long-term – systemic | 0,34 mg/kg/d | 0,1 |
| | | | Worker – long-term – systemic Combined routes | | 0,10 |
| PROC2, CS15 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 1,00 ppm | 0,5 |
| | | | Worker – dermal, long-term – systemic | 1,34 mg/kg/d | 0,4 |
| | | | Worker – long-term – systemic Combined routes | | 0,93 |
| PROC15, CS36 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 1,5 ppm | 0,8 |
| | | | Worker – dermal, long-term – systemic | 0,34 mg/kg/d | 0,1 |
| | | | Worker – long-term – systemic Combined routes | | 0,92 |
| PROC3, CS15 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 0,90 ppm | 0,5 |
| | | | Worker – dermal, long-term – systemic | 0,34 mg/kg/d | 0,1 |
| | | | Worker – long-term – systemic Combined routes | | 0,59 |
| PROC4, CS55 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 0,90 ppm | 0,5 |
| | | | Worker – dermal, long-term – systemic | 1,37 mg/kg/d | 0,4 |
| | | | Worker – long-term – systemic Combined routes | | 0,88 |
| PROC8b, CS14 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 0,90 ppm | 0,5 |
| | | | Worker – dermal, long-term – systemic | 1,37 mg/kg/d | 0,4 |
| | | | Worker – long-term – systemic Combined routes | | 0,88 |
| PROC9, CS4 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 0,90 ppm | 0,5 |
| | | | Worker – dermal, long-term – systemic | 1,37 mg/kg/d | 0,4 |
| | | | Worker – long-term – systemic Combined routes | | 0,88 |
| PROC14, CS4 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 0,90 ppm | 0,5 |
| | | | Worker – dermal, long-term – systemic | 0,69 mg/kg/d | 0,2 |
| | | | Worker – long-term – | | 0,69 |

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

| | | | | | |
|--------------|---------------------|--|---|--------------|------|
| | | | systemic Combined routes | | |
| PROC8a, CS14 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 0,84 ppm | 0,5 |
| | | | Worker – dermal, long-term – systemic | 1,37 mg/kg/d | 0,4 |
| | | | Worker – long-term – systemic Combined routes | | 0,85 |

PROC1: Use in closed process, no likelihood of exposure

CS15: General exposures (closed systems)

PROC2: Use in closed, continuous process with occasional controlled exposure

CS15: General exposures (closed systems)

PROC15: Use as laboratory reagent

CS36: Laboratory activities

PROC3: Use in closed batch process (synthesis or formulation)

CS15: General exposures (closed systems)

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

CS55: Batch process

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

CS14: Bulk transfers

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

CS4: Dipping, immersion and pouring

PROC14: Production of mixtures or articles by tableting, compression, extrusion, pelletization; Industrial setting;

CS4: Dipping, immersion and pouring

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

CS14: Bulk transfers

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

Confirm that RMMs and OCs are as described or of equivalent efficiency.

When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1

1. Short title of Exposure Scenario: **Use as a cleaning agent – industrial**

| | |
|------------------|---|
| Main User Groups | : SU 3: Industrial uses: Uses of substances as such or in preparations at industrial sites |
| Sector of use | : SU 3: Industrial uses: Uses of substances as such or in preparations at industrial sites |
| Process category | : PROC1: Use in closed process, no likelihood of exposure PROC2: Use in closed, continuous process with occasional controlled exposure PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises |

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

| | |
|--------------------------------|--|
| | <p>PROC7: Industrial spraying</p> <p>PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities</p> <p>PROC8b: Transfer of substance or preparation (charging/discharging) from/ to vessels/ large containers at dedicated facilities</p> <p>PROC10: Roller application or brushing</p> <p>PROC13: Treatment of articles by dipping and pouring</p> |
| Environmental release category | : ERC4: Industrial use of processing aids in processes and products, not becoming part of articles |
| Further information | : Covers the use as a component of cleaning products including transfer from storage, pouring/unloading from drums or containers. Exposures during mixing/diluting in the preparatory phase and cleaning activities (including spraying, brushing, dipping, wiping, automated and by hand), related equipment cleaning and maintenance. |

2.1 Contributing scenario controlling environmental exposure for:ERC4: Industrial use of processing aids in processes and products, not becoming part of articles**Product characteristics**

| | |
|--------------------|------------------------|
| Viscosity, dynamic | : 10,34 mPa.s at 30 °C |
| (Msafe) | : 396 kg/day |

Environment factors not influenced by risk management

| | |
|---------------------------------|---------------|
| Flow rate | : 18.000 m3/d |
| Dilution Factor (River) | : 10 |
| Dilution Factor (Coastal Areas) | : 100 |

Other given operational conditions affecting environmental exposure

| | |
|-----------------------------------|----------|
| Number of emission days per year | : 300 |
| Emission or Release Factor: Air | : 30 % |
| Emission or Release Factor: Water | : 0,01 % |
| Emission or Release Factor: Soil | : 0 % |

Technical conditions and measures / Organizational measures

| | |
|---------|--|
| Air | : Treat air emission to provide a typical removal efficiency of (%): (Effectiveness: > 70 %) |
| Remarks | : Prevent environmental discharge consistent with regulatory requirements. |
| Water | : No onsite wastewater treatment prior to discharge to sewage treatment plant. |

Conditions and measures related to municipal sewage treatment plant

| | |
|---|---|
| Type of Sewage Treatment Plant | : Municipal sewage treatment plant |
| Percentage removed from waste water | : 0 % |
| Procedures to limit air emissions from Sewage Treatment Plant | : No data available |
| Remarks | : Domestic sewage treatment is not assumed. |

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

Conditions and measures related to external treatment of waste for disposal

Waste treatment : External treatment and disposal of waste should comply with applicable local and/or national regulations.

Conditions and measures related to external recovery of waste

Recovery Methods : External recovery and recycling of waste should comply with applicable local and/or national regulations.

2.2 Contributing scenario controlling worker exposure for: PROC1, PROC2: Use in closed process, no likelihood of exposure, Use in closed, continuous process with occasional controlled exposure**Product characteristics**

Physical Form (at time of use) : Liquid substance
Vapor pressure : > 0,5 kPa

Amount used

Remarks : Not applicable

Frequency and duration of use

Remarks : Covers daily exposures up to 8 hours (unless stated differently)

Other operational conditions affecting workers exposure

Remarks : Assumes a good basic standard of occupational hygiene is implemented., Assumes use at not more than 20°C above ambient temperature, unless stated differently.

Technical conditions and measures

Provide a good standard of general ventilation. Natural ventilation is from doors, windows etc. Controlled ventilation means air is supplied or removed by a powered fan.

2.2 Contributing scenario controlling worker exposure for: PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises**Product characteristics**

Physical Form (at time of use) : Liquid substance
Vapor pressure : > 0,5 kPa

Amount used

Remarks : Not applicable

Frequency and duration of use

Remarks : Covers daily exposures up to 8 hours (unless stated differently)

Other operational conditions affecting workers exposure

Remarks : Assumes a good basic standard of occupational hygiene is implemented., Assumes use at not more than 20°C above ambient temperature, unless stated differently.

Technical conditions and measures

Provide enhanced general ventilation by mechanical means.

Organizational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out operation for more than 4 hours.

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

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.

2.2 Contributing scenario controlling worker exposure for: PROC7: Industrial spraying**Product characteristics**

Physical Form (at time of use) : Liquid substance
 Vapor pressure : > 0,5 kPa

Amount used

Remarks : Not applicable

Frequency and duration of use

Remarks : Covers daily exposures up to 8 hours (unless stated differently)

Other operational conditions affecting workers exposure

Remarks : Assumes a good basic standard of occupational hygiene is implemented., Assumes use at not more than 20°C above ambient temperature, unless stated differently.

Technical conditions and measures

Ensure material transfers are under containment or extract ventilation.

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

Wear chemically resistant gloves (tested to EN374) in combination with specific activity training.
 Wear a full face respirator conforming to EN140 with Type A filter or better.

2.2 Contributing scenario controlling worker exposure for: PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities**Product characteristics**

Physical Form (at time of use) : Liquid substance
 Vapor pressure : > 0,5 kPa

Amount used

Remarks : Not applicable

Frequency and duration of use

Remarks : Covers daily exposures up to 8 hours (unless stated differently)

Other operational conditions affecting workers exposure

Remarks : Assumes a good basic standard of occupational hygiene is implemented., Assumes use at not more than 20°C above ambient temperature, unless stated differently.

Technical conditions and measures

Provide enhanced general ventilation by mechanical means.

Organizational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out operation for more than 4 hours.

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

Wear suitable gloves tested to EN374.

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

2.2 Contributing scenario controlling worker exposure for: PROC8a, PROC10, PROC13: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities, Roller application or brushing, Treatment of articles by dipping and pouring**Product characteristics**

Physical Form (at time of use) : Liquid substance
 Vapor pressure : > 0,5 kPa

Amount used

Remarks : Not applicable

Frequency and duration of use

Remarks : Covers daily exposures up to 8 hours (unless stated differently)

Other operational conditions affecting workers exposure

Remarks : Assumes a good basic standard of occupational hygiene is implemented., Assumes use at not more than 20°C above ambient temperature, unless stated differently.

Technical conditions and measures

Ensure material transfers are under containment or extract ventilation.

Organizational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out operation for more than 4 hours.

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

Wear chemically resistant gloves (tested to EN374) in combination with specific activity training.

3. Exposure estimation and reference to its source**Environment**

| Contributing Scenario | Exposure Assessment Method | Specific conditions | Compartment | Value type | Level of Exposure | Risk characterization ratio |
|-----------------------|----------------------------|---------------------|---------------------|------------|-------------------|-----------------------------|
| ERC4 | EUSES | | Freshwater | | 0,00137 mg/L | 0,014 |
| | | | Marine water | | 0,000136 mg/L | 0,014 |
| | | | Freshwater sediment | | 0,00117 mg/kg | 0,014 |
| | | | Marine sediment | | 0,000116 mg/kg | 0,014 |
| | | | Soil | | 0,00794 mg/kg | 0,45 |

ERC4: Industrial use of processing aids in processes and products, not becoming part of articles

Workers/Consumers

| Contributing Scenario | Exposure Assessment Method | Specific conditions | Value type | Level of Exposure | Risk characterization ratio |
|-----------------------|----------------------------|---------------------|---|-------------------|-----------------------------|
| PROC1, CS15 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 0,01 ppm | 0,0 |
| | | | Worker – dermal, long-term – systemic | 0,34 mg/kg/d | 0,1 |

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

| | | | | | |
|--------------|---------------------|--|---|--------------|------|
| | | | Worker – long-term – systemic Combined routes | | 0,10 |
| PROC2, CS15 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 1,00 ppm | 0,5 |
| | | | Worker – dermal, long-term – systemic | 1,37 mg/kg/d | 0,4 |
| | | | Worker – long-term – systemic Combined routes | | 0,94 |
| PROC4, CS55 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 0,90 ppm | 0,5 |
| | | | Worker – dermal, long-term – systemic | 0,69 mg/kg/d | 0,2 |
| | | | Worker – long-term – systemic Combined routes | | 0,69 |
| PROC7, CS10 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 0,60 ppm | 0,3 |
| | | | Worker – dermal, long-term – systemic | 2,14 mg/kg/d | 0,6 |
| | | | Worker – long-term – systemic Combined routes | | 0,94 |
| PROC8b, CS14 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 0,90 ppm | 0,5 |
| | | | Worker – dermal, long-term – systemic | 1,37 mg/kg/d | 0,4 |
| | | | Worker – long-term – systemic Combined routes | | 0,88 |
| PROC8a, CS14 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 1,20 ppm | 0,7 |
| | | | Worker – dermal, long-term – systemic | 0,69 mg/kg/d | 0,2 |
| | | | Worker – long-term – systemic Combined routes | | 0,85 |
| PROC10, CS51 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 0,60 ppm | 0,3 |
| | | | Worker – dermal, long-term – systemic | 1,37 mg/kg/d | 0,4 |
| | | | Worker – long-term – systemic Combined routes | | 0,72 |
| PROC13, CS4 | ECETOC TRA Modified | | Worker – inhalation, long-term – systemic | 1,20 ppm | 0,7 |
| | | | Worker – dermal, long-term – systemic | 0,69 mg/kg/d | 0,2 |
| | | | Worker – long-term – systemic Combined routes | | 0,85 |

PROC1: Use in closed process, no likelihood of exposure

CS15: General exposures (closed systems)

PROC2: Use in closed, continuous process with occasional controlled exposure

CS15: General exposures (closed systems)

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

CS55: Batch process

PROC7: Industrial spraying

CS10: Spraying

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

CS14: Bulk transfers

PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers

Sulfolane - A Anhydrous

Version 3.3

Revision Date 2016-06-22

at non-dedicated facilities

CS14: Bulk transfers

PROC10: Roller application or brushing

CS51: Rolling, Brushing

PROC13: Treatment of articles by dipping and pouring

CS4: Dipping, immersion and pouring

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

Confirm that RMMs and OCs are as described or of equivalent efficiency.

When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1