SAFETY DATA SHEET

Date of issue: 15/11/2010 Version: 5.2 Revised: 16/06/2016

Section 1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Trade name: **Crude tall oil (CTO)**

Other means of identification (alternative names, numbers, company product codes, or other unique identifiers):
Alternative names: Crude tall oil
CAS number: N/A
EC number: 931-433-1
REACH registration number: 01-2119494863-23-0049

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

Identified use(s):
Manufacture of Crude Tall Oil
Fractionation
Fuel in energy generation
Formulations

The following scenarios were addressed in the chemical safety report (CSR) for CTO as prepared as part of the registration dossier required by the EU REACH Regulation:

Scenario 1. Manufacture and on-site uses of crude tall oil with releases to water
Scenario 2. Manufacture and on-site uses of crude tall oil with no releases to water
Scenario 3. Use in fractionation
Scenario 4. Use as a fuel in energy generation, including formulation
Scenario 5. Use in generic formulations

1.3. Details of the supplier of the safety data sheet

UPM-Kymmene Seven Seas Oy
Address: P.O. Box 380, 00101 Helsinki, Finland
Telephone: +358 (0)204 15 111
E-mail: msds@upm.com

1.4. Emergency telephone number

+358 (0)9 471 977
Myrkytystietokeskus, PL 790 (Tukholmankatu 17)
00029 HUS

Section 2. Hazards identification

2.1. Classification of the substance or mixture

According to 1272/2008/EC
Skin Sens., 1; H317

2.2. Label elements

Pictogram(s):

Signal word: **Warning**

Hazard statements: H317
May cause an allergic skin reaction.

Precautionary statements:
Prevention: P261, P272, P280*, P284*
Avoid breathing dust/fume/gas/mist/vapours/spray.
Contaminated work clothing should not be allowed out of the workplace.
Wear protective gloves/protective clothing/eye protection/face protection
In case of inadequate ventilation wear respiratory protection

Response: P302+P352*, P333+313*, P363*
IF ON SKIN: Wash with plenty of soap and water.
If skin irritation or rash occurs: Get medical advice/attention.
Wash contaminated clothing before reuse.

Disposal: P501
Dispose of contents/container in accordance with local/regional/national regulations.

*recommended to be used on the label in line with article 28 §3 of Regulation (EC) No. 1272/2008 on the classification, labelling and packaging of substances and mixtures (CLP) limiting the precautionary statements to six; the decision on which 6 precautionary statements to use on the label is however the responsibility of the labeller.

2.3. Other hazards

Hot tall oil or tall oil in contact with hot material may self-combust, especially if the tall oil is immersed in mineral wool.
The substance can contain small amounts of extremely flammable and very toxic hydrogen sulphide (H_2S). The gas can accumulate over time in the headspace of storage container or tanks or similar closed equipment.

Section 3. Composition/information on ingredients

Crude Tall Oil (CTO): A complex combination of tall oil rosin and fatty acids derived by acidification of crude tall oil soap and including that which is further refined. Contains at least 10% rosin. Full composition is given in section 16.

3.1. Substances

Classification of substances according to CLP, 1272/2008/EC

Hazardous substances	Content, %	CAS No	EC No	Hazard class(es)/ Category code(s)	Hazard statements
Crude tall oil	100	-	931-433-1	Skin Sens. 1	H317

Hazard statements, full text; H317 = May cause an allergic skin reaction.

Section 4. First aid measures

4.1. Description of first aid measures

Inhalation

Move the exposed person to fresh air. Seek medical attention.

Skin contact

Wash off immediately with plenty of soap and water. Remove contaminated clothing. Seek medical attention if irritation or symptoms persist.

Contact with eyes

Immediately flush eyes with plenty of lukewarm water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse until irritation stops or the substance has been removed. Seek medical attention if irritation or symptoms persist.

Ingestion

Seek medical attention if irritation or symptoms persist. DO NOT INDUCE VOMITING.

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

Inhalation

Irritating to respiratory system. Inhalation may cause coughing, tightness of the chest and irritation of the respiratory system.

Skin contact

May cause an allergic skin reaction.

Eye contact

May cause temporary irritation to the eyes.

Ingestion

Ingestion may cause nausea and vomiting.

4.3 Indication of any immediate medical attention and special treatment needed

As a general rule, and in all cases of doubt or when symptoms persist, always seek medical attention. Never give anything by mouth to an unconscious person.

Section 5. Fire-fighting measures

5.1. Extinguishing media

5.1.1. Suitable extinguishing media:

Use extinguishing media appropriate to the surrounding fire conditions.

Use as appropriate: carbon dioxide (CO_2), foam, water spray.

5.1.2. Unsuitable extinguishing media:

No specific recommendations.

5.2. Special hazards arising from the substance or mixture

Fire hazards: Burning produces irritating, toxic and obnoxious fumes consisting mainly of carbon dioxide and water and small amounts of carbon monoxide, sulfur dioxide and nitrogen oxides.

5.3. Advice for fire-fighters

Protective equipment: Wear suitable respiratory equipment when necessary.

Section 6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Ensure adequate ventilation of the working area. Wear suitable protective equipment (see section 8).

6.2. Environmental precautions
Do not allow product to enter drains. Prevent further spillage if safe.

6.3. Methods and material for containment and cleaning up
Clean up methods: Absorb with inert, absorbent material. Sweep up. Transfer to suitable, labeled containers for disposal. Clean spillage area thoroughly with plenty of water.

6.4. References to other sections
Section 13 on disposal considerations. Section 7 and 8 on risk management measures.

Section 7. Handling and storage

7.1. Precautions for safe handling
CTO can contain small amounts of hydrogen sulphide (H_2S). The gas can accumulate over time in the headspace of CTO storage tanks and truck tanks. Its presence can pose a significant hazard to humans and the risk has to be recognized and managed. Appropriate risk management measures include local exhaust ventilation, the setting of standard protocols for proper venting of the tank before entrance, use of workspace and personal gas detectors/alarms, documented safe working procedure/restricted working areas, clearly placed placards and use of appropriate respiratory protective equipment.

7.1.1 Protective measures
Avoid contact with eyes and skin. Ensure adequate ventilation of the working area.
Keep away from heat. Keep away from sources of ignition - No smoking.
Adopt best Manual Handling considerations when handling, carrying and dispensing.

7.1.2 Advice on general occupational hygiene
Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

7.2. Conditions for safe storage, including any incompatibilities
Storage: Keep in a cool, dry, well ventilated area. Keep containers tightly closed. Store in correctly labeled containers.

7.3. Specific end use(s)
See exposure scenarios attached to this Safety Data Sheet.

Section 8. Exposure controls/personal protection

8.1. Control parameters
Occupational exposure limit value

Threshold Limit Values not established.

DNEL for workers

Exposure pattern	Route	Descriptors	DNEL	Most sensitive endpoint
Acute - systemic effects	Dermal	Not quantifiable	-	No effects
	Inhalation	Not quantifiable	-	No effects
	Oral	Not quantifiable	-	No effects
Acute - local effects	Dermal	DNEL	16.75 µg/cm^2	Sensitisation
	Inhalation	Not quantifiable	-	No effects
Long-term - systemic effects	Dermal	DNEL	>10 mg/kg/d	Repeated-dose toxicity
	Inhalation	DNEL	>35.3 mg/m^3	Repeated-dose toxicity
Long-term – local effects	Dermal	Not quantifiable	-	No effects
	Inhalation	Not quantifiable	-	No effects

DN(M)ELs for the general population

Exposure pattern	Route	Descriptors	DNEL/DMEL (appropriate unit)	Most sensitive endpoint
Acute - systemic effects	Dermal	Not quantifiable	-	No effects
	Inhalation	Not quantifiable	-	No effects
	Oral	Not quantifiable	-	No effects
Acute - local effects	Dermal	DNEL	8.2 µg/cm^2	Sensitisation
	Inhalation	Not quantifiable	-	No effects
Long-term - systemic effects	dermal	DNEL	>5 mg/kg/d	Repeated-dose toxicity
	Inhalation	DNEL	>8.7 mg/m^3	Repeated-dose toxicity
	oral	DNEL	>5 mg/kg/d	Repeated-dose toxicity
Long-term – local effects	Dermal (mg/cm^2)	Not quantifiable	-	No effects
	Inhalation (mg/m^3)	Not quantifiable	-	No effects

Aquatic PNECs

As CTO is a UVCB (Substance is of Unknown or Variable composition, Complex reaction product or Biological origin) derivation of a single, representative PNEC value for this substance using conventional methods is not possible. PNECs for the aquatic compartment should therefore be based on data for the blocks of constituents rather than on data for the whole substance.

Aquatic PNECs for CTO constituent blocks

Block (see section 16)	PNEC for this assessment (mg/L)
1	0.20
2	0.20
3	0.14
4	0.027
5	0.024
6	0.027
7	0.00011
8	0.0078
9	Effects unlikely*
10	0.0054
11	0.010
12	Effects unlikely*
13	Effects unlikely**
14	Effects unlikely**
15	0.013

*Toxic concentrations are above the water solubility of the constituents
**High molecular weight constituents; uptake unlikely

8.2. Exposure controls

8.2.1. Appropriate engineering controls

CTO can contain small amounts of hydrogen sulphide (H_2S). The gas can accumulate over time in the headspace of CTO storage tanks and truck tanks. Its presence can pose a significant hazard to humans and the risk has to be recognized and managed. Appropriate risk management measures include local exhaust ventilation, the setting of standard protocols for proper venting of the tank before entrance, use of workspace and personal gas detectors/alarms, documented safe working procedure/restricted working areas, clearly placed placards and use of appropriate respiratory protective equipment.

8.2.2. Individual protection measures, such as personal protective equipment

a) Eye/face protection

Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or gases.

b) Skin protection

Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Recommended glove material is nitrile. For splatter or exposure up to 10 min a thickness of at least 0.12 mm is recommended. For exposure up to 4 hours a thickness of at least 0.38 mm is recommended. Warranties regarding breakthrough times of the glove material may vary between glove manufacturers, therefore always follow provided recommendations from your supplier.

c) Respiratory protection

Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard.

8.2.3 Environmental exposure controls
See section 13.

Section 9. Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance	Liquid (at room temperature and pressure) The substance is a UVCB, variations in the physical appearance (colour) of the substance may occur depending on the natural variation in composition of the substance
Colour	Dark brown to dark amber
Odour	Sulphur compounds
Odour threshold	Not determined
pH	Not determined
Melting point / freezing point	-26 - +13°C (247 - 286K)
Pour point	- 3.15°C (270 ± 3K) (pour point) (OECD TG 102 and EU method A1)
Boiling point / range	346.85°C (620 K) (OECD TG 103 and EU method A2)
Flash point	121 – 185°C (closed cup, ASTM D3278)
Evaporation rate	Not determined
Flammability (solid, gas)	No indication on the basis of structure and experience in handling and use that the substance has pyrophoric properties or is flammable in contact with water.
Explosion limits	Not applicable (no chemical groups associated with explosive properties present in the molecule)
Vapour pressure whole substance	22.7 Pa (at 25°C) (PFA 2010b)
Vapour pressure individual constituents	4.1E-11 to 5.4E+2 Pa (at 25 °C) QSAR
Vapour density	Not determined
Relative density	958.7 – 969.4 kg/m^3 (ASTM D1475)
Solubility in water	7.35 x 10^{-2} g/l 20°C (pH 4.6 - 5.5) (OECD TG 105)
Solubility in other solvents	Acetone, diethyl ether, ethanol (from SDS)
Partition coefficient: n-octanol/water	Log K_{ow} = 3.4-8 QSAR
Auto-ignition temperature	276°C (at 99.19–100.85 kPa, 19–20°C) (EU method A.15)
Decomposition temperature	Not determined
Viscosity	203–825 cP (at 22°C), 49–121 cP (at 50°C) (ASTM D2196)
Explosive properties	Not applicable (no chemical groups associated with explosive properties present in the molecule)
Oxidising properties	Not applicable (based upon chemical structure of the constituents of CTO, and experience in use and handling, CTO is considered non-oxidising)

9.2. Other information

Surface tension	66.7 mN/m (at 21°C) (OECD TG 115)

Section 10. Stability and reactivity

10.1. Reactivity
The substance is not reactive under recommended storage and handling conditions (see section 7).

10.2. Chemical stability
The substance is stable under recommended storage and handling conditions (see section 7). The substance is not flammable but combustible.

10.3. Possibility of hazardous reactions
No specific hazardous reactions are expected to occur.

10.4. Conditions to avoid
Avoid high temperatures and direct sunlight. Hot tall oil or tall oil in contact with hot material may self-combust, especially if the tall oil is immersed in mineral wool.
Avoid direct contact with air.

10.5. Incompatible materials
Contact with strong oxidising agents may cause hazardous reactions.

10.6. Hazardous decomposition products
H_2S gas can accumulate over time in the headspace of CTO storage tanks and tank trucks. In contact with air oxidation products with sensitizing properties may be formed.

Section 11. Toxicological information

11.1. Information on toxicological effects

11.1.1. Substances
11.1.1.1. The relevant hazard classes, for which information shall be provided, are:
(a) Acute toxicity
CTO is not classified for acute toxicity.
Oral LD_{50}, rat: > 2000 mg/kg.
Dermal LD_{50}, rabbit: > 2000 mg/kg.
There were no clinical signs of toxicity, no signs of local irritation and no necropsy findings in either one of these tests.

(b) Skin corrosion/irritation
CTO is judged to be non-irritant to rabbit skin.
No skin reactions were reported in a skin irritation test where observations were made up to and including the 72 hour observation.
In an *in vitro* test targeted at skin corrosion (OECD TG 430), the mean TER of CTO treated skins was 21.2 kΩ, which is above the threshold of 5 kΩ for classification.

(c) Serious eye damage/irritation
CTO is considered to be non-irritant to rabbit eyes.
Minor effects were observed in an eye irritation test at the 1 hour observation, but at no other time point.

(d) Respiratory or skin sensitization
CTO is a (weak) skin sensitizer.

The skin sensitizing potential of CTO was shown in the local lymph node assay (OECD 429).

(e) Germ cell mutagenicity

CTO is not genotoxic.

The available information for the substance indicates that when tested in vitro, CTO does not induce mutations in bacterial or mammalian cells, nor chromosome aberrations in mammalian cells.

Gene mutation (Bacterial reverse mutation assay / Ames test): negative with and without activation in all strains tested (OECD TG 471).

Cytogenicity in mammalian cells: negative in cultured human lymphocytes (OECD TG 473)

Mutagenicity in mammalian cells: negative in L5178Y cells (OECD TG 476)

(f) Carcinogenicity

No data are available for the carcinogenicity of CTO. However, further testing is not considered necessary because:

The substance is not classified for mutagenicity; and

There is no evidence from the repeated dose studies that constituents of CTO are able to induce hyperplasia or pre-neoplastic lesions.

(g) Reproductive toxicity

Not a reproductive toxicant.

Fertility/Developmental toxicity:

No relevant reproductive toxicity or developmental toxicity studies have been conducted for CTO as whole product. However, data are available for the constituent parts of CTO and related substances (unpublished laboratory studies and information published in the public domain). These data are sufficient to demonstrate that none of the constituents of CTO require classification for reproductive toxicity or developmental toxicity. Any effects that were observed on reproductive parameters in the available studies were minor and associated with dose levels where systemic effects were observed.

(h) STOT-single exposure

None of the constituents of CTO fulfil the criteria to be classified as STOT SE.

(i) STOT-repeated exposure

None of the constituents of CTO fulfil the criteria to be classified as STOT RE.

No relevant repeated dose toxicity studies have been conducted for CTO as whole product. However, data are available for the constituent parts of CTO and related substances.

NOAEL (chronic, rat): 200 mg/kg bw/d.

(j) Aspiration hazard

The substance does not fulfil the criteria for aspiration hazard.

Section 12. Ecological information

12.1. Toxicity

Reliable short-term have been determined in tests conducted with water-accommodated fractions (WAFs):

$LL_{50/96h}$, fish (*Danio rerio*): 20 mg/L

NOELr, fish (*Danio rerio*): 6.25 mg/L

$EL_{50/48h}$, *Dapnia magna*: 32 mg/L

$EL_{50/72h}$, algae (*Desmodesmus subspicatus)*: > 100 mg/L

NOELr, algae (*Desmodesmus subspicatus)*: ≥ 100 mg/L

NOELr$_{21d}$, *Daphnia magna*: ≥ 1 mg/L

There are no data for long-term toxicity to fish but it is not expected that fish would be any more susceptible to the effects of the substance than invertebrates or algae.

12.2. Persistence and degradability

Abiotic degradation:

On the basis of structural examination, none of the constituents of CTO contain functional groups that are susceptible to hydrolysis under conditions relevant to the environment. This fate process will not contribute to a measurable degradative loss of these substances from the environment

The substance constituents can therefore be considered as stable under hydrolytic conditions.

Biodegradation:

CTO is readily biodegradable.

Five ready biodegradation studies are available for samples of CTO. Ready biodegradation of 79.4 - 83% meeting the '10-day window' criterion (measured as percentage of theoretical oxygen demand, TOD) was achieved in 28 days using a method consistent with OECD Guideline 301 F (manometric respirometer).

12.3. Bioaccumulative potential

There is no data on the bioaccumulation of CTO as a whole substance. There are however data on some of the constituents. Some of the constituents of block 10 (Aldehydes) meet the criteria for PBT (resin aldehydes) or vPvB (neoabietal). Some of the constituents of block 12 (Sitosterol and analogues) meet the criteria for vPvB.

12.4. Mobility in soil

The adsorption/desorption of CTO as a whole substance is not scientifically necessary or meaningful for the purpose of environmental assessment.

Calculated values for the constituents of CTO were obtained using KOCWIN.

The highest individual K_{oc} was calculated for block 12 (Sitosterol and analogues): 4.96E+06

12.5. Results of PBT and vPvB assessment

It is concluded that this typical CTO composition substance should not be considered as a SVHC.

- There are no constituents of CTO that meet the criteria for CMR category 1 or 2
- Some of the constituents of block 10 (Aldehydes) meet the criteria for PBT (resin aldehydes) or vPvB (neoabietal).
- Some of the constituents of block 12 (Sitosterol and analogues) meet the criteria for vPvB.
- Some CTO constituents, in particular β-sitosterol, might also fall into the category of being a substance of very high concern (SVHC) on the grounds that they have potential endocrine disrupting properties. However these constituents occur naturally and endemic organisms are therefore adapted to their presence and indeed may utilise them. Some plant-derived sterols are also present in and/or deliberately added to foodstuffs for human and animal consumption and so unless this practice is stopped it seems unlikely that authorisation could be based on grounds of concerns arising from incidental exposure via the environment.

12.6. Other adverse effects

No other adverse effects are observed.

Section 13. Disposal considerations

13.1. Waste treatment methods

13.1.1 Product / Packaging disposal:

Product residues and uncleaned empty containers should be packaged, sealed, labelled, and disposed of or recycled according to relevant national and local regulations. Where large quantities are concerned, consult the supplier. When uncleaned empty containers are passed on, the recipient must be warned of any possible hazard that may be caused by residues. For disposal within the EC, the appropriate code according to the European Waste List (EWL) should be used. It is among the tasks of the polluter to assign the waste to waste codes specific to industrial sectors and processes according to the European Waste List (EWL).

13.1.2 Waste treatment options:

Examine possibilities for reutilisation or recycling.

14. Transport information

Not classified as dangerous goods under relevant international transport regulations **(**ADR**,** RID**,** IATA**,** IMDG**).**

14.1. UN number: N/A
14.2. UN proper shipping name: N/A
14.3. Transport hazard class(es): N/A
14.4. Packing group: N/A
14.5. Environmental hazards: N/A
14.6. Special precautions for user: N/A
14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

15. Regulatory information

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

Council Directive 94/33/EC of 22 June 1994 on the protection of young people at work- ***applicable to CTO***

Regulation (EC) No 1005/2009 of the European Parliament and of the Council of 16 September on substances that deplete the ozone layer – ***not applicable to CTO***

Regulation (EC) No 850/2004 of the European Parliament and of the Council of 29 April 2004 on persistent organic pollutants and amending Directive 79/117/EEC – ***not applicable to CTO***

Regulation (EU) No 649/2012 of the European Parliament and of the Council of 4 July 2012 concerning the export and import of dangerous chemicals – ***not applicable to CTO***

National Inventories

USA (TSCA): Listed
Canada (DSL): Listed
Canada (NDSL): Not applicable. Listed on the DSL.
European Union (EINECS/ELINCS): Listed
Japan (ENCS): Listed
Korea (ECL): Listed
Australia (AICS): Listed
New Zealand (NZ): Listed

Philippines (PICCS): Listed
China (CLECS): Listed

15.2. Chemical Safety Assessment

The supplier has performed a Chemical Safety Assessment (CSA) for this substance as required under the EU REACH Regulation.

16. Other information

Key literature references and sources for data

Chemical Safety Report (CSR) for CTO (REACH)

CTO constituent blocks

The environmental classification is based on the block approach and the following 15 blocks are identified.

Block number	Constituents
1	Low boiling fatty acids
2	C16 saturated - C18.3 unsaturated fatty acids
3	C18 saturated - C24 saturated and unsaturated fatty acids
4	Abietic acid
5	Palustric acid
6	Pimaric acid
7	Sesquiterpene
8	Abietol
9	Tetracosanol and dehydrated sterol
10	Aldehydes
11	Dimethoxystilbene
12	Sitosterols and analogue
13	Polymeric acids*
14	Polymeric neutrals*
15	Terpenes

*High molecular weight

Annexes to the Safety Data Sheet

The exposure scenarios (ES) below were addressed in the chemical safety report (CSR) for CTO as part of the registration dossier required by the EU REACH Regulation and are attached as Annexes:
Scenario 1. Manufacture and on-site uses of CTO with releases to water
Scenario 2. Manufacture and on-site uses of CTO with no releases to water
Scenario 3. Use in fractionation
Scenario 4. Use as a fuel in energy generation, including formulation
Scenario 5. Use in generic formulations

Indication of changes

Sections 2.1, 4.1, 4.2, 5.1, 10.2, 10.4 and 10.1.1.1 d have been slightly edited.
P285 has been deleted from section 2.2.
P284 has been added to section 2.2.
Instruction has been added for P321 in section 2.2.
Sections 2.3 and 6.4 have been added.

Abbreviations and acronyms

SAFETY DATA SHEET

UVCB	Substances of Unknown or Variable composition, Complex reaction products or Biological material
DNEL	derived no-effect level
TOS	Tall Oil Soap
CTO	Crud Tall Oil
PNEC	Predicted No Effect Concentration
STOT SE	Specific Target Organ Toxicity Single Exposure
NOAEL	No Observed Adverse Effect Level
EL50/48h	Effect Level where 50% of the test population is immobilized in 48 h
EL50/72h	Effect Level where 50% of the test population is immobilized in 72 h
LL50/96h	Lethal Loading 50% in 96 h
NOELr	No Observed Adverse Effect Loading Rate
vPvB	very Persistent and very Bioaccumulative
PBT	Persistent, Bioaccumulative and Toxic
Kow	Octanol/water partition coefficient
SVHC	Substance of very high concern
CMR	carcinogenic, mutagenic or toxic for reproduction
STP	Sewage treatment plant, waste water treatment plant (WWTP)

End of safety data sheet

Exposure Scenario (taken from section 9 of the Chemical Safety Report (CSR) for CTO)

9.1. Manufacture and on-site uses of CTO with release to water

9.1.1. Exposure scenario

1. Short title of Exposure Scenario	
Manufacture and on-site uses of CTO with releases to water	
2. Description of activities/process(es) covered in the Exposure Scenario	
Sector of use	**SU 3** (Industrial uses: uses of substances as such or in preparations at industrial sites) **SU 8** (Manufacture of bulk, large scale chemicals)
Product category	Not applicable
Process category	**PROC 1** (Use in closed process, no likelihood of exposure) **PROC 2** (Use in closed, continuous process with occasional controlled exposure (e.g. sampling)) **PROC 3** (Use in closed batch process (synthesis or formulation)) **PROC 8b** (Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities)
Article category	Not applicable
Environmental release category	**ERC 1** (Manufacture of substances)
3. Operational conditions	
3. 1 Duration and frequency of use for which the ES ensures control of risk	
Duration of exposure at workplace:	8 h/d (ECHA default)
Frequency of exposure at workplace:	Up to 240 d per year
Annual amount used per site	Up to 30 000 tonnes
Emission days per site:	Up to 300 days/year
4. 1 Physical form of product in which the substance is contained	
Typically liquid. Hydrogen sulphide may sometimes be evolved in the headspace of storage vessels.	
4.2 Concentration of substance in preparation or article	
Not applicable	
4.3 Amount used per time or per activity for which the RMMs, in combination with other operational conditions of use ensure control of risk (if applicable)	
Respiration volume under conditions of use:	10 m^3/d
Area of skin contact with the substance under conditions of use	PROC 2 and PROC 8b: 480 cm^2 PROC3: 240 cm^2
Body weight	70 kg
5. Other operational conditions determining exposure, e.g. temperature, capacity of receiving environment (water flow; room size x ventilation rate), emission or release factors to the relevant compartments	
No other operational conditions apply.	
6. Risk Management Measures that, in combination with the operational conditions of use, ensure control of risk related to the different target groups	
6.1 Risk management Measures related to workers	

Technical measures Organisational measures	H_2S gas can accumulate over time in the headspace of CTO storage tanks and tank trucks. Its presence can pose a significant hazard to humans and the risk has to be recognised and managed. Appropriate risk management measures include local exhaust ventilation, the setting of standard protocols for proper venting of the tank before entrance, use of workspace and personal gas detectors, and use of respiratory protective equipment.
Respiratory protection	Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard.
Hand protection	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Eye protection	Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or gases.
Hygiene measures	Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.
6.2 Environment related measures; type and efficiency of single options or combination of options on exposure to be quantified; options to be phrased as instructive guidance	
Organisational measures	
Abatement measures waste water	Standard size waste water treatment plant for highly industrial sites.
Abatement measures waste air	Substance has low volatility and so releases to air are expected to be minimal.
Soil	The spreading of sludge is assumed as a worst-case scenario.
7. Waste related measures needed to ensure control of risk at the different life cycle stages of the substances (including preparations or articles at the end of service life)	
Type of waste Disposal technique	Aqueous waste Details of the treatment of aqueous waste vary at different production sites but as a minimum it is assumed that the effluent is treated off-site in a waste water treatment plant before discharge to waste water. Discharge to marine water without biological treatment cannot be ruled out, but for such sites the dilution is known to be in excess of 1000.
Fraction released to environment during waste treatment	Negligible
8. Prediction of exposure resulting from the conditions described above (entries 3-6) and the substance properties	
Workers (oral) **Workers (dermal)** PROC 2 PROC 3 PROC 8b	No significant oral exposure. Estimated by the means of the ECETOC TRA model. Only values with LEV are shown. 0.137mg/kg/day 0.034 mg/kg/day 0.69 mg/kg/day
Workers (inhalation)	CTO is assigned to the 'low fugacity' category according to the ECETOC TRA definitions, based on the estimated vapour pressure of 22.7 Pa. This value represents a contribution from a low fraction of volatiles; many constituents are of lower vapour pressure. Therefore, for human health, the exposures via the vapour phase are overestimates. The Guidance does not

	set out how to deal with UVCBs in respect of human exposure. Only values with LEV are shown.
PROC 2	1.20 mg/m³
PROC 3	3.59 mg/m³
PROC 8b	1.79 mg/m³
	Some exposures (both dermal and inhalation) without local exhaust ventilation (LEV) lead to possible risk for PROC 3 and 8b. However it is possible to reduce these risks by reducing the exposure time to between 15 minutes and 1 hour.
Environment	
Water (fresh-water)	(EUSES 2.1.1)
Soil	0.471 mg/kg w.w. (Block 12, maximum value)
STP	0.288 mg/kg w.w. (Block 2, maximum value)
	0.032 mg/l (Block 4, maximum value)
Humans via the environment	Calculations for exposure of man via the environment have not been carried out owing to the limited dispersive use

Annex

Exposure Scenario (taken from section 9 of the Chemical Safety Report (CSR) for CTO)

9.2. Manufacture and on-site uses of CTO with no releases to water

9.2.1. Exposure scenario

1. Short title of Exposure Scenario	
Manufacture and on-site uses of CTO with no releases to water	
2. Description of activities/process(es) covered in the Exposure Scenario	
Sector of use	**SU 3** (Industrial uses: uses of substances as such or in preparations at industrial sites) **SU 8** (Manufacture of bulk, large scale chemicals)
Product category	Not applicable
Process category	**PROC 1** (Use in closed process, no likelihood of exposure) **PROC 2** (Use in closed, continuous process with occasional controlled exposure (e.g. sampling)) **PROC 3** (Use in closed batch process (synthesis or formulation)) **PROC 8b** (Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities)
Article category	Not applicable
Environmental release category	**ERC 1** (Manufacture of substances)
3. Operational conditions	
3. 1 Duration and frequency of use for which the ES ensures control of risk	
Duration of exposure at workplace:	8 h/d (ECHA default)
Frequency of exposure at workplace:	Up to 240 d per year
Annual amount used per site	Up to 30 000 tonnes
Emission days per site:	Up to 300 days/year
4. 1 Physical form of product in which the substance is contained	
Typically liquid. Hydrogen sulphide may sometimes be found in the headspace of storage vessels.	
4.2 Concentration of substance in preparation or article	
Not applicable	
4.3 Amount used per time or per activity for which the RMMs, in combination with other operational conditions of use ensure control of risk (if applicable)	
Respiration volume under conditions of use:	10 m^3/d
Area of skin contact with the substance under conditions of use	PROC 2 and PROC 8b: 480 cm^2 PROC3: 240 cm^2
Body weight	70 kg
5. Other operational conditions determining exposure, e.g. temperature, capacity of receiving environment (water flow; room size x ventilation rate), emission or release factors to the relevant compartments	
No other operational conditions apply.	

6. Risk Management Measures that, in combination with the operational conditions of use, ensure control of risk related to the different target groups	
6.1 Risk management Measures related to workers	
Technical measures Organisational measures	H_2S gas can accumulate over time in the headspace of CTO storage tanks and tank trucks. Its presence can pose a significant hazard to humans and the risk has to be recognised and managed. Appropriate risk management measures include local exhaust ventilation, the setting of standard protocols for proper venting of the tank before entrance, use of workspace and personal gas detectors, and use of respiratory protective equipment.
Respiratory protection	Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard.
Hand protection	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Eye protection	Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or gases.
Hygiene measures	Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.
6.2 Environment related measures; type and efficiency of single options or combination of options on exposure to be quantified; options to be phrased as instructive guidance	
Organisational measures	
Abatement measures waste water	There are no emissions to wastewater. All waste are collected and burnt in the incineration.
Abatement measures waste air	Substance has low volatility and so releases to air are expected to be minimal.
Soil	There are no emissions to wastewater. All waste are collected and burnt in the incineration.
7. Waste related measures needed to ensure control of risk at the different life cycle stages of the substances (including preparations or articles at the end of service life)	
Type of waste	All waste are collected and burnt in the incineration.
Disposal technique	All waste are collected and burnt in the incineration.
Fraction released to environment during waste treatment	Negligible
8. Prediction of exposure resulting from the conditions described above (entries 3-6) and the substance properties	
Workers (oral)	No significant oral exposure.
Workers (dermal)	Estimated by the means of the ECETOC TRA model. Only values with LEV are shown.
PROC 2	0.137 mg/kg/day
PROC 3	0.034 mg/kg/day

PROC 8b	0.69 mg/kg/day
Workers (inhalation)	CTO is assigned to the 'low fugacity' category according to the ECETOC TRA definitions, based on the estimated vapour pressure of 22.7 Pa. This value represents a contribution from a low fraction of volatiles; many constituents are of lower vapour pressure. Therefore, for human health, the exposures via the vapour phase are overestimates. The Guidance does not set out how to deal with UVCBs in respect of human exposure. Only values with LEV are shown.
PROC 2	1.20 mg/m³
PROC 3	3.59 mg/m³
PROC 8b	1.79 mg/m³
	Some exposures (both dermal and inhalation) without local exhaust ventilation (LEV) lead to possible risk for PROC 3 and 8b. However it is possible to reduce these risks by reducing the exposure time to between 15 minutes and 1 hour.
Environment	(EUSES 2.1.1)
Water (fresh-water)	No release to water
Soil	No release to water
STP	No release to water
Humans via the environment	Calculations for exposure of man via the environment have not been carried out owing to the limited dispersive use

Exposure Scenario (taken from section 9 of the Chemical Safety Report (CSR) for CTO)

9.3. Use in fractionation

9.3.1. Exposure scenario

1. Short title of Exposure Scenario	
Use in fractionation.	
2. Description of activities/process(es) covered in the Exposure Scenario	
Sector of use	**SU 3** (Industrial uses: uses of substances as such or in preparations at industrial sites) **SU 8** (Manufacture of bulk, large scale chemicals)
Product category	Not applicable
Process category	**PROC 1** (Use in closed process, no likelihood of exposure) **PROC 2** (Use in closed, continuous process with occasional controlled exposure (e.g. sampling)) **PROC 3** (Use in closed batch process (synthesis or formulation)) **PROC 4 (**Use in batch and other process (synthesis) where opportunity for exposure arises) **PROC 8b** (Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities) **PROC 9** (Transfer of substance or preparation into small containers (dedicated filling line, including weighing))
Article category	Not applicable
Environmental release category	**ERC 1** (Manufacture of substances)
3. Operational conditions	
3. 1 Duration and frequency of use for which the ES ensures control of risk	
Duration of exposure at workplace:	8 h/d (ECHA default)
Frequency of exposure at workplace:	Up to 240 d per year
Annual amount used per site	Up to 240 000 tonnes
Emission days per site:	Typically 300-360 days/year
4. 1 Physical form of product in which the substance is contained	
Typically liquid. Hydrogen sulphide may sometimes be found in the headspace of storage vessels.	
4.2 Concentration of substance in preparation or article	
Not applicable	
4.3 Amount used per time or per activity for which the RMMs, in combination with other operational conditions of use ensure control of risk (if applicable)	
Respiration volume under conditions of use:	10 m^3/d
Area of skin contact with the substance under conditions of use	PROC 2, 8b and 9: 480 cm^2 PROC3: 240 cm^2
Body weight	70 kg
5. Other operational conditions determining exposure, e.g. temperature, capacity of receiving environment (water flow; room size x ventilation rate), emission or release factors to the relevant compartments	
No other operational conditions apply.	

6. Risk Management Measures that, in combination with the operational conditions of use, ensure control of risk related to the different target groups	
6.1 Risk management Measures related to workers	
Technical measures	
Organisational measures	H_2S gas can accumulate over time in the headspace of CTO storage tanks and tank trucks. Its presence can pose a significant hazard to humans and the risk has to be recognised and managed. Appropriate risk management measures include local exhaust ventilation, the setting of standard protocols for proper venting of the tank before entrance, use of workspace and personal gas detectors, and use of respiratory protective equipment.
Respiratory protection	Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard.
Hand protection	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Eye protection	Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or gases.
Hygiene measures	Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.
6.2 Environment related measures; type and efficiency of single options or combination of options on exposure to be quantified; options to be phrased as instructive guidance	
Organisational measures	
Abatement measures waste water	Standard size waste water treatment plant for highly industrial sites.
Abatement measures waste air	Substance has low volatility and so releases to air are expected to be minimal.
Soil	The spreading of sludge is assumed as a worst-case scenario.
7. Waste related measures needed to ensure control of risk at the different life cycle stages of the substances (including preparations or articles at the end of service life)	
Type of waste	Aqueous waste
Disposal technique	Details of the treatment of aqueous waste vary at different fractionation sites but as a minimum for a generic site it is assumed that the effluent is treated off-site in a waste water treatment plant.
Fraction released to environment during waste treatment	Negligible
8. Prediction of exposure resulting from the conditions described above (entries 3-6) and the substance properties	
Workers (oral)	No significant oral exposure.
Workers (dermal)	Estimated by the means of the ECETOC TRA model. Only values with LEV are shown, except for PROC 1.
PROC 1	0.343 mg/kg/day (no Local Exhaust Ventilation)
PROC 2	0.137 mg/kg/day
PROC 8b	0.686 mg/kg/day
PROC 9	0.686 mg/kg/day
Workers (inhalation)	CTO is assigned to the 'low fugacity' category according to the ECETOC TRA definitions, based on the estimated vapour pressure of 22.7 Pa. This value represents a contribution from a low fraction of volatiles; many

	constituents are of lower vapour pressure. Therefore, for human health, the exposures via the vapour phase are overestimates. The Guidance does not set out how to deal with UVCBs in respect of human exposure. Only values with LEV are shown, except for PROC 1.
PROC 1	0.12 mg/m³ (no Local Exhaust Ventilation)
PROC 2	1.20 mg/m³
PROC 8b	1.80 mg/m³
PROC 9	5.90 mg/m³
	Some exposures (both dermal and inhalation) without local exhaust ventilation (LEV) lead to possible risk for PROC 8b and 9. However it is possible to reduce these risks by reducing the exposure time to between 15 minutes and 1 hour. The use of gloves will further reduce the risk.
Environment	(EUSES 2.1.1)
Water (fresh-water)	0.264 mg/kg w.w. (Block 12, maximum value)
Soil	0.16 mg/kg w.w. (Block 2, maximum value)
STP	0.0178 mg/l (Block 4, maximum value)
Humans via the environment	Calculations for exposure of man via the environment have not been carried out owing to the limited dispersive use

Annex

Exposure Scenario (taken from section 9 of the Chemical Safety Report (CSR) for CTO)

9.4. Use as a fuel in energy generation, including formulation

9.4.1. Exposure scenario

1. Short title of Exposure Scenario	
Use as a fuel in energy generation	
2. Description of activities/process(es) covered in the Exposure Scenario	
Sector of use	**SU 3** (Industrial uses: uses of substances as such or in preparations at industrial sites) **SU 10** (Formulation [mixing] of preparations and/or re-packaging) **SU 23** (Electricity, steam, gas water supply and sewage treatment)
Product category	**PC 13** (Fuels)
Process category	**PROC 2** (Use in closed, continuous process with occasional controlled exposure (e.g. sampling)) **PROC 3** (Use in closed batch process (synthesis or formulation)) **PROC 5 (**Mixing or blending in batch processes (multistage and/or significant contact)) **PROC 8a** (Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities) **PROC 8b** (Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities) **PROC 9** (Transfer of substance or preparation into small containers (dedicated filling line, including weighing)) **PROC 16** (Using material as fuel sources, limited exposure to unburned product to be expected)
Article category	Not applicable
Environmental release category	**ERC 2** (Formulation of preparations)
3. Operational conditions	
3. 1 Duration and frequency of use for which the ES ensures control of risk	
Duration of exposure at workplace:	8 h/d (ECHA default)
Frequency of exposure at workplace:	Up to 240 d per year
Annual amount used per site	1000 tonnes
Emission days per site:	300 days/year
4. 1 Physical form of product in which the substance is contained	
Typically liquid. Hydrogen sulphide may sometimes be found in the headspace of storage vessels.	
4.2 Concentration of substance in preparation or article	
Not applicable	
4.3 Amount used per time or per activity for which the RMMs, in combination with other operational conditions of use ensure control of risk (if applicable)	
Respiration volume under conditions of use:	10 m^3/d PROC 2, 8b and 9: 480 cm^2 PROC3: 240 cm^2 PROC5: 480 cm^2 PROC8a: 960 cm^2

Area of skin contact with the substance under conditions of use	PROC16 with LEV: 240 cm^2 PROC16 without LEV: 480 cm^2
Body weight	70 kg
5. Other operational conditions determining exposure, e.g. temperature, capacity of receiving environment (water flow; room size x ventilation rate), emission or release factors to the relevant compartments	
Formulation of fuels:	
Fraction of applied amount lost from process/use to waste gas	0.0025 kg/kg (Applied to blocks with vapour pressures of between 0.01 Pa and 100 Pa. 0.01 kg/kg (Applied to blocks with vapour pressures of between 0>100 Pa.
Fraction of applied amount lost from process/use to waste water	0.002 kg/kg (Based on ERC2)
Use of fuels:	
Fraction of applied amount lost from process/use to waste gas	~0 kg/kg (CTO will be destroyed during combustion)
Fraction of applied amount lost from process/use to waste water	0.0005 kg/kg
6. Risk Management Measures that, in combination with the operational conditions of use, ensure control of risk related to the different target groups	
6.1 Risk management Measures related to workers	
Technical measures Organisational measures	H_2S gas can accumulate over time in the headspace of CTO storage tanks and tank trucks. Its presence can pose a significant hazard to humans and the risk has to be recognised and managed. Appropriate risk management measures include local exhaust ventilation, the setting of standard protocols for proper venting of the tank before entrance, use of workspace and personal gas detectors, and use of respiratory protective equipment.
Respiratory protection	Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard.
Hand protection	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Eye protection	Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or gases.
Hygiene measures	Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.
6.2 Environment related measures; type and efficiency of single options or combination of options on exposure to be quantified; options to be phrased as instructive guidance	
Organisational measures	Onsite: Bunded areas and oil water separator assumed to be 90% efficient.

Abatement measures waste water	Default standard waste water treatment plant assumed.
Abatement measures waste air	CTO will be destroyed during combustion.
Soil	The spreading of sludge is assumed as a worst-case scenario.
7. Waste related measures needed to ensure control of risk at the different life cycle stages of the substances (including preparations or articles at the end of service life)	
Type of waste	Aqueous waste
Disposal technique	Details of the treatment of aqueous waste will vary at different sites but as a minimum it is assumed that on-site treatment such as an oil-water separator is used and the effluent is treated off-site in a standard waste water treatment plant.
Fraction released to environment during waste treatment	Emissions to waste water are likely to be very low (<<1 kg/day).
8. Prediction of exposure resulting from the conditions described above (entries 3-6) and the substance properties	
Workers (oral)	No significant oral exposure.
Workers (dermal)	Estimated by the means of the ECETOC TRA model. Only values with LEV are shown.
PROC 2	0.137 mg/kg/day
PROC 3	0.034 mg/kg/day
PROC 5	0.067 mg/kg/day
PROC 8a	0.137 mg/kg/day
PROC 8b	0.686 mg/kg/day
PROC 9	0.686 mg/kg/day
PROC 16	0.034 mg/kg/day
Workers (inhalation)	Only values with LEV are shown.
PROC 2	1.2 mg/m³
PROC 3	3.6 mg/m³
PROC 5	6.0 mg/m³
PROC 8a	12.0 mg/m³
PROC 8b	1.80 mg/m³
PROC 9	6.0 mg/m³
PROC 16	1.2 mg/m³
	Some exposures (both dermal and inhalation) without local exhaust ventilation (LEV) lead to possible risk for PROC 5, 8a,8b and 9. However it is possible to reduce these risks by reducing the exposure time to between 15 minutes and 1 hour. The use of gloves will further reduce the risk.
Environment	(EUSES 2.1.1)
Water (fresh-water)	31.2 mg/kg w.w. (Block 12, maximum value)
Soil	4.8 mg/kg w.w. (Block 2, maximum value)
STP	0.533 mg/l (Block 4, maximum value)
Humans via the environment	Calculations for exposure of man via the environment have not been carried out owing to the limited dispersive use

Annex

Exposure Scenario (taken from section 9 of the Chemical Safety Report (CSR) for CTO)

9.5. Use in generic formulations

9.5.1. Exposure scenario

1. Short title of Exposure Scenario	
Generic formulations/preparations and use of these preparations.	
2. Description of activities/process(es) covered in the Exposure Scenario	
Sector of use	**SU 3** (Industrial uses: uses of substances as such or in preparations at industrial sites) **SU 10** (Formulation [mixing] of preparations and/or re-packaging) **SU 22** (Professional uses: Public domain (administration, education, entertainment, services, craftsmen)
Product category	**PC 9a** (Coatings and paints, thinners, paint removers) **PC 18** (Ink and toners) **PC 32** (Polymer preparations and compounds) **PC 35** (Washing and cleaning products (including solvent based products))
Process category	**PROC 2** (Use in closed, continuous process with occasional controlled exposure (e.g. sampling)) **PROC 3** (Use in closed batch process (synthesis or formulation)) **PROC 5 (**Mixing or blending in batch processes (multistage and/or significant contact)) **PROC 8a** (Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities) **PROC 8b** (Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities) **PROC 9** (Transfer of substance or preparation into small containers (dedicated filling line, including weighing))
Article category	Not applicable
Environmental release category	**ERC 2** (Formulation of preparations) **ERC 4** (Industrial use of processing aids in processes and products, not becoming part of articles) **ERC 5** (Industrial use resulting in inclusion into or onto a matrix)
3. Operational conditions	
3. 1 Duration and frequency of use for which the ES ensures control of risk	
Duration of exposure at workplace:	8 h/d (ECHA default)
Frequency of exposure at workplace:	Up to 240 d per year
Annual amount used per site	100-300 tonnes
Emission days per site:	100-300 days/year
4. 1 Physical form of product in which the substance is contained	
Typically liquid. Headspace of storage vessels may contain hydrogen sulphide.	
4.2 Concentration of substance in preparation or article	
Not applicable	
4.3 Amount used per time or per activity for which the RMMs, in combination with other operational conditions of use ensure control of risk (if applicable)	

Respiration volume under conditions of use:	10 m^3/d
Area of skin contact with the substance under conditions of use	PROC3: 240 cm^2 PROC 2, 5, 8b: 480 cm^2 PROC 8a: 960 cm^2
Body weight	70 kg
5. Other operational conditions determining exposure, e.g. temperature, capacity of receiving environment (water flow; room size x ventilation rate), emission or release factors to the relevant compartments	
Formulation of preparations:	
Fraction of applied amount lost from process/use to waste gas	0.0025 kg/kg (Applied to blocks with vapour pressures of between 0.01 Pa and 100 Pa. 0.01 kg/kg (Applied to blocks with vapour pressures of between 0>100 Pa.
Fraction of applied amount lost from process/use to waste water	0.002 kg/kg (based on ERC2 with use of oil water separator with 90 % efficiency)
Use of preparations:	
Fraction of applied amount lost from process/use to waste gas	0.0025 kg/kg (Applied to blocks with vapour pressures of between 0.01 Pa and 100 Pa. 0.01 kg/kg (Applied to blocks with vapour pressures of between 0>100 Pa.
Fraction of applied amount lost from process/use to waste water	0.02 kg/kg
6. Risk Management Measures that, in combination with the operational conditions of use, ensure control of risk related to the different target groups	
6.1 Risk management Measures related to workers	
Technical measures	
Organisational measures	H_2S gas can accumulate over time in the headspace of CTO storage tanks and tank trucks. Its presence can pose a significant hazard to humans and the risk has to be recognised and managed. Appropriate risk management measures include local exhaust ventilation, the setting of standard protocols for proper venting of the tank before entrance, use of workspace and personal gas detectors, and use of respiratory protective equipment.
Respiratory protection	Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard.
Hand protection	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Eye protection	Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or gases.
Hygiene measures	Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.
6.2 Environment related measures; type and efficiency of single options or combination of options on exposure to be quantified; options to be phrased as instructive guidance	
Organisational measures	
Abatement measures waste water	Onsite: Oil water separator assumed to be 90% efficient. Default standard waste water treatment plant assumed.
Abatement measures waste air	See section 5.

Soil	The spreading of sludge is assumed as a worst-case scenario.
7. Waste related measures needed to ensure control of risk at the different life cycle stages of the substances (including preparations or articles at the end of service life)	
Type of waste Disposal technique Fraction released to environment during waste treatment	Aqueous waste Details of the treatment of aqueous waste will vary at different sites but as a minimum it is assumed that on-site treatment such as an oil-water separator is used and the effluent is treated off-site in a standard waste water treatment plant. See section 5.
8. Prediction of exposure resulting from the conditions described above (entries 3-6) and the substance properties	
Workers (oral) **Workers (dermal)** PROC 2 PROC 3 PROC 5 PROC 8a PROC 8b **Workers (inhalation)** PROC 2 PROC 3 PROC 5 PROC 8a PROC 8b **Environment** Water (fresh-water) Soil STP Humans via the environment	No significant oral exposure. Estimated by the means of the ECETOC TRA model. Only values with LEV are shown. 0.137 mg/kg/day 0.034 mg/kg/day 0.067 mg/kg/day 0.137 mg/kg/day 0.686 mg/kg/day Only values with LEV are shown. 1.2 mg/m³ 3.6 mg/m³ 6.0 mg/m³ 12.0 mg/m³ 1.80 mg/m³ Some exposures (both dermal and inhalation) without local exhaust ventilation (LEV) lead to possible risk for PROC 3, 5, 8a and 8b. However it is possible to reduce these risks by reducing the exposure time to between 15 minutes and 1 hour. The use of gloves will further reduce the risk. (EUSES 2.1.1) 3.12 mg/kg w.w. (Block 12, maximum value) 0.48 mg/kg w.w. (Block 2, maximum value) 0.533 mg/l (Block 4, maximum value) Calculations for exposure of man via the environment have not been carried out owing to the limited dispersive use