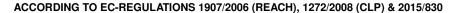
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SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1 Product identifier

Product Name MTBE

Product Description V4033a-MTBE-MTBE

Trade Name MTBE

Product code V4033a, MTBE

Chemical Name Methyl Tertiary Butyl Ether

CAS No. 1634-04-4 EC No. 216-653-1

REACH Registration No. -

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

alla uses auvise

 Identified Use(s)
 No.
 Exposure Scenario
 Page:

 1
 Distribution of MTBE (Industrial)
 11

 2
 Formulation of MTBE
 15

Uses Advised Against Anything other than the above.

1.3 Details of the supplier of the safety data sheet

Company Identification Vitol SA

Place des Bergues 3 P.O. Box 2056 1211 Geneva 1 Switzerland

 Telephone
 +31 10 498 7200

 Fax
 +31 10 452 9545

 E-Mail (competent person)
 xrea ch@vitol.com

1.4 Emergency telephone number

Emergency Phone No. +44 (0) 1235 239 670, 24/7
Languages spoken All official European languages.

SECTION 2: HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

2.1.1 Regulation (EC) No. 1272/2008 (CLP) Flam. Liq. 2; H225 Skin Irrit. 2; H315

2.2 Label elements According to Regulation (EC) No. 1272/2008 (CLP)

Product Name V4033a-MTBE-MTBE

Hazard Pictogram(s)





Signal Word(s) Danger

Hazard Statement(s) H225: Highly flammable liquid and vapour.

H315: Causes skin irritation.

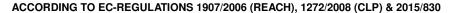
Precautionary Statement(s) P210: Keep away from heat, hot surfaces, sparks, open flames and other

ignition sources. No smoking.

P240: Ground/bond container and receiving equipment. P243: Take precautionary measures against static discharge.

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P280: Wear protective gloves/protective clothing/eye protection/face protection. P302+P350: IF ON SKIN: Gently wash with plenty of soap and water. P403+P233: Store in a well-ventilated place. Keep container tightly closed.

2.3 Other hazards

May form explosive mixture with air. The vapour is heavier than air; beware of pits and confined spaces. Releases flammable vapors below normal ambient temperatures.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

SUBSTANCE	CAS No.	EC No.	REACH Registration No.	%W/W
Tert-Butyl Methyl Ether	1634-04-4	216-653-1	-	<u>></u> 99.9 - <u><</u> 100

Hazard impurities

SUBSTANCE	CAS No.	EC No.	%W/W	Hazard classification
Methanol	67-56-1	200-659-6	> 0.0 - < 0.1%	Flammable Liquid, Category 2; H225: Highly flammable liquid
				and vapour.
				Acute toxicity, Category 3; H301: Toxic if swallowed.
				Acute toxicity, Category 3; H311: Toxic in contact with skin.
				Acute toxicity, Category 3; H331: Toxic if inhaled.
				Specific target organ toxicity — single exposure, Category 1;
I				H370: Causes damage to organs.

SECTION 4: FIRST AID MEASURES



4.1	Description of	first aid	measures
-----	----------------	-----------	----------

Self-protection of the first aider If it is suspected that fumes are still present, the responder should wear an

appropriate mask or self-contained breathing apparatus.

Inhalation IF INHALED: If breathing is difficult, remove victim to fresh air and keep at rest in

a position comfortable for breathing. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical advice/attention if

you feel unwell.

Skin Contact IF ON SKIN (or hair): Remove contaminated clothing immediately and wash

affected skin with plenty of water or soap and water. If irritation (redness, rash,

blistering) develops, get medical attention.

Eye Contact IF IN EYES: Flush eyes with water for at least 15 minutes while holding eyelids

open. Remove contact lenses, if present and easy to do. Continue rinsing. If eye

irritation persists, get medical advice/attention.

Ingestion IF SWALLOWED: Do not induce vomiting because of risk of aspiration into the

lungs. If vomiting occurs spontaneously, keep head below hips to prevent

aspiration into the lungs. Get medical attention immediately.

4.2 Most important symptoms and effects, both acute

and delayed

Inhalation: Irritation of the respiratory tract. Coughing, Wheezing. The effect of

inhalation may be delayed.

Skin Contact: Causes skin irritation. Repeated exposure may cause skin

dryness or cracking.

Ingestion: Aspiration into the lungs may cause chemical pneumonitis, which can be fatal. Ingestion may cause irritation of the gastrointestinal tract. Headache,

Dizziness, Nausea, Fatigue, Weakness.

4.3 Indication of any immediate medical attention and special treatment needed IF SWALLOWED: Do NOT induce vomiting, if vomiting does occur, have victim lean forward to reduce risk of aspiration.

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Notes to a physician:

In case of ingestion the stomach should be emptied by gastric lavage under qualified medical supervision. At high doses, effects on the CNS are possible.

SECTION 5: FIREFIGHTING MEASURES

5.1	uishina	

Suitable Extinguishing media

Unsuitable extinguishing media

5.2 Special hazards arising from the substance or mixture

5.3 Advice for fire-fighters

Extinguish with sand or dry chemical. Foam, Carbon dioxide, Water fog or dry powder

Do not use water jet. Direct water jet may spread the fire.

Releases flammable vapors below normal ambient temperatures..Prevent liquid entering sewers, basements and any watercourses. Vapours are heavier than air and may travel considerable distances to a source of ignition and flashback. Fight fire with normal precautions from a reasonable distance. Fire fighters should wear complete protective clothing including self-contained breathing apparatus. Keep containers cool by spraying with water if exposed to fire. Avoid release to the environment. Dike fire control water for later disposal.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures Caution - spillages may be slippery. Eliminate sources of ignition. No open flames, no sparks and no smoking. Stop leak if safe to do so. Ensure suitable personal protection during removal of spillages. Avoid all contact. Keep upwind. Beware of vapors accumulating to form explosive concentrations. Vapors can accumulate in low areas.

6.2 Environmental precautions

Avoid release to the environment. Do not allow to enter drains, sewers or watercourses. Spillages or uncontrolled discharges into watercourses must be alerted to the Environment Agency or other appropriate regulatory body.

6.3 Methods and material for containment and cleaning up

Extremely flammable. Adsorb spillages onto sand, earth or any suitable adsorbent material. Use non-sparking equipment when picking up flammable spill. Ensure that the equipment is adequately grounded. Sweep up and shovel into waste drums or plastic bags. Transfer to a lidded container for disposal or recovery.

Reference to other sections See Section: 8,13

SECTION 7: HANDLING AND STORAGE

7.1 Precautions for safe handling

6.4

Keep away from sources of ignition - No smoking. Use only outdoors or in a well-ventilated area. Prevent vapour build up by providing adequate ventilation during and after use. Light hydrocarbon vapours can build up in the headspace of containers. These can cause flammability / explosion hazards. Take precautionary measures against static discharge. Use only non-sparking tools. Ground/bond container and receiving equipment. The vapour is heavier than air; beware of pits and confined spaces. Avoid all contact. Do not breathe gas. Do not ingest. Use personal protective equipment as required. See Section: 8. Keep good industrial hygiene. Wash hands thoroughly after handling. Contaminated clothing should be thoroughly cleaned.

Maintenance

Observe precautions pertaining to confined space entry. Isolate, vent, drain, wash and purge systems or equipment before maintenance or repair.

7.2 Conditions for safe storage, including any incompatibilities

Light hydrocarbon vapours can build up in the headspace of containers. These can cause flammability / explosion hazards. Bund storage facilities to prevent soil and water pollution in the event of spillage. Keep only in original container. Keep containers properly sealed when not in use. Protect from sunlight. Containers of this material may be hazardous when empty since they retain product residue. Containers must not be punctured or destroyed by burning, even when empty.

Storage temperature Storage measures Incompatible materials

Keep only in original container. Suitable materials:Carbon steel

Materials to avoid: Most plastics, Viton, Flourel

Keep away from oxidising agents.

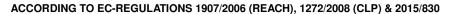
Stable at ambient temperatures.

7.3 Specific end use(s)

See Section: 1.2 and/or Exposure Scenario.

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SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

8.1.1 Occupational Exposure Limits

SUBSTANCE	CAS No.	LTEL (8 hr TWA ppm)	LTEL (8 hr TWA mg/m³)	STEL (ppm)	STEL (mg/m³)	Note
Methyl tert-butyl ether	1634-04-4	25	92	75	275	WEL
Methanol	67-56-1	200	266	250	333	WEL, Sk

Source: WEL: Workplace Exposure Limit (UK HSE EH40). Note: Sk; Can be absorbed through the skin. The assigned substances are those for which there are concerns that dermal absorption will lead to systemic toxicity.

8.1.2 Biological limit value

Not established.

8.1.3 PNECs and DNELs

DNEL MTBE	Oral (mg/kg bw/day)	Inhalation (mg/m³)	Dermal (mg/kg bw/day)
Industry - Long Term - Systemic effects	-	178.5	5100
Industry - Short term - Local effects	-	357	-
Consumer - Long Term - Systemic effects	7.1	53.6	3570
Consumer - Long Term - Local effects	-	214	-

PNEC	MTBE
Aquatic Compartment	PNEC aqua (freshwater) 5.1 mg/L
	PNEC aqua (marine water) 0.26 mg/L
	PNEC aqua (intermittent releases) 47.2 mg/L
	PNEC STP 71 mg/L
	PNEC sediment (freshwater) 23 mg/kg sediment dw
	PNEC sediment (marine water) 1.17 mg/kg sediment dw
Terrestrial Compartment	PNEC soil 1.56 mg/kg soil dw

8.2 Exposure controls

8.2.1 Appropriate engineering controls

Ensure adequate ventilation. Guarantee that the eye flushing systems and safety showers are located close to the working place.

8.2.2 Individual protection measures, such as personal protective equipment (PPE)

Fuels are typically used, transferred and transported in closed systems. If exposure is likely (i.e. during sampling) the following advice may be appropriate. Good hygiene practices and housekeeping measures

Eye/ face protection

Wear eye protection with side protection (EN166).



Skin protection



Hand protection: Wear impervious gloves (EN374). Recommended: Nitrile rubber. Gloves should be changed regularly to avoid permeation problems. Breakthrough time of the glove material: refer to the information provided by the gloves' producer.

Body protection: Fire retardant clothing is appropriate for routine occupational use.

In case of insufficient ventilation, wear suitable respiratory equipment.

High concentrations/Aerosol or mist formation: Wear suitable respiratory protection (conforming to EN140 with Type A filter or better) and gloves (type EN374) if regular skin contact likely.

Thermal hazards

Respiratory protection

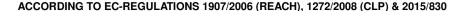
8.2.3 Environmental Exposure Controls

Not applicable.

Avoid release to the environment.

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SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance Liquid, Colourless
Odour Characteristic terpene-like

Odour threshold Not established.

pH Not established.

Melting point/freezing point - 108.6 °C

Initial boiling point and boiling range 55.3 °C

Flash point - 28 °C

Evaporation rate Not established.
Flammability (solid, gas) Not applicable - Liquid

Upper/lower flammability or explosive limits Flammable Limits (Upper) (%v/v): 8.4

Flammable Limits (Lower) (%v/v): 1.6

Vapour pressure 33000 Pa @ 25°C
Vapour density Not established.
Relative density 0.74 g/cm³ @ 20 °C

Solubility(ies) Water 41850 mg/l @ 20 °C Partially soluble.

Partition coefficient: n-octanol/water 1.06 log P Auto-ignition temperature 460 °C

Decomposition Temperature Not established.

Viscosity 0.464 mm²/s (static) at 20 °C 0.409 mm²/s (static) at 40 °C

Explosive properties Not explosive.(Vapour may create explosive atmosphere.)

Oxidising properties Not oxidising.

9.2 Other information None known.

SECTION 10: STABILITY AND REACTIVITY

10.1 Stability and reactivity Stable under normal conditions. Reacts with - Strong oxidising agents

10.2 Chemical stability Stable under normal conditions.

10.3 Possibility of hazardous reactions None known.

10.4 Conditions to avoid Contact with strong acids can decompose this material and generate extremely

flammable isobutylene.

10.5 Incompatible materials Acids. Keep away from oxidising agents.
 10.6 Hazardous decomposition product(s) Carbon monoxide, Carbon dioxide

SECTION 11: TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicityBased upon the available data, the classification criteria are not met.IngestionNot classified. LD50 > 2000 mg/kg bw/day (rat) OECD 401 BM 1996aInhalationNot classified. LC50 85 mg/l @ 4 hour(s) (rat) OECD 403 Industrial Bio-test

Laboratories, Inc. (1969a)

Skin Contact Not classified. LD50 > 2000 mg/kg bw/day (rabbit) OECD 402 RBM (1996c)

Skin corrosion/irritation Skin Irrit. 2: OECD 404 (rabbit) Hüls, 1985a

Mean erythema score :4 Mean edema score : 4

Serious eye damage/irritation Based upon the available data, the classification criteria are not met. Hüls, 1985b

Mean conjuctivae score: 1.3 Mean chemosis score: 0.4 Mean cornea score: 0 Mean iris score: 0

Respiratory or skin sensitization Based upon the available data, the classification criteria are not met.

Skin sensitization Negative OECD 406 1% MTBE/ Water solution Inveresk Research International,

1979b

Respiratory sensitization No data.

Germ cell mutagenicity Based upon the available data, the classification criteria are not met.

In Vivo Negative UDS test Bushy Run Research Center, 1994

In Vitro 10,000 μg/ml No effects are observed at this level OECD 476 Life Science

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Carcinogenicity

Ingestion

Skin Contact





Research (1989b)

Based upon the available data, the classification criteria are not met. NOAEL: 330 mg/kg bw/day) (chronic; rat) Dodd DE, Layko DK, Bermudez E

Inhalation NOAEC: 1465 mg/m3 (chronic; rat)

Non-classified Human Carcinogen Cruzan et al (2007)

No data.

Reproductive toxicity Based upon the available data, the classification criteria are not met.

Toxicity for reproduction NOAEC 400 ppm Bevan et al., 1997a **Developmental Toxicity** NOAEC 8,000 ppm Bevan et al., 1997b =

> Developmental toxicity evaluation of methyl tertiary-butyl ether (MTBE) by inhalation in mice and rabbits. Journal of Applied Toxicology, 17, S21-9. Bevan C, Tyl RW, Neeper-Bradley TL, Fisher LC, Panson RD, Douglas JF & Andrews

LS

STOT - single exposure Based upon the available data, the classification criteria are not met.

No effects in humans. Prah DJ, Goldstein GM, Devlin R, Otto D, Ashley D,

House D. Cohen (1994)

STOT - repeated exposure Based upon the available data, the classification criteria are not met. Ingestion Liver / Kidneys NOAEL: 209 mg/kg bw/day (subchronic; rat) CIIT, 2007 Inhalation

Liver / Kidneys NOAEC: 2856 mg/m³ (subchronic; rat) Bushy Run Research

Center, 1989a

Skin Contact No data.

Aspiration hazard Based upon the available data, the classification criteria are not met. Not classified. LD50 > 2000 mg/kg bw/day (rat) OECD 401 BM 1996a

11.2 Other information None.

SECTION 12: ECOLOGICAL INFORMATION

12.1 **Toxicity** Not classified as a Marine Pollutant.

Aquatic Compartment Acute LC50 for freshwater fish: 672 mg/L Geiger DL, Call DJ & Brooke LT (1988)

LC50 for marine water fish: 574 mg/L Ben Kinney MT, Barbieri JF, Gross JS &

Naro PA (1994)

Aquatic Compartment Chronic 31-d NOEC freshwater fish: 299 mg/l ENSR (1999b)

12.2 Persistence and degradibility Not readily biodegradable.

Not readily biodegradable. 28d: 69% (Unamed publication 2006) Water Soil Not readily biodegradable. 151d 69% (Unamed publication 2006)

12.3 Bioaccumulative potential The substance has low potential for bioaccumulation. Bioconcentration factor

(BCF): 1.5 Fujiwara et al., 1984

Fugacity: Water 6.04% European Commission (2002) 12.4 Mobility in soil

Results of PBT and vPvB assessment Not classified as PBT or vPvB. 12.5

12.6 Other adverse effects None known.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste treatment methods 13.1

Dispose of this material and its container as hazardous waste (2008/98/EEC). Do not empty into drains, dispose of this material and its container at hazardous or special waste collection point. Disposal should be in accordance with local, state or national legislation. Containers of this material may be hazardous when empty since they retain product residue. Containers must not be punctured or destroyed by burning, even when empty. Allocation of a waste code number, according to the European Waste Catalogue, should be carried out in agreement with the regional waste disposal company. Waste code: 16 05 06

Ш

SECTION 14: TRANSPORT INFORMATION

ADR/RID IMDG/ADN 14.1 **UN number** UN 2398 UN 2398 14.2 **Proper Shipping Name** METHYL tert-BUTYL ETHER METHYL tert-BUTYL ETHER

14.3 Transport hazard class(es) 3 Ш 14.4 Packing group

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14.5 Environmental hazards Not classified as a Marine Pollutant.

14.6 Special precautions for user Special Precautions: Refer to Chapter 7 'Handling and Storage' for special

precautions which a user needs to be aware of, or needs to comply with, in

connection with transport.

14.7 Transport in bulk according to Annex II of MARPOL Product N

73/78 and the IBC Code

Product Name: Methyl tert-butyl ether

Pollution Category: Z

Ship type: 3

14.8Additional InformationHIN: 33EmS: F-E, S-DTunnel Code: 3 (D/E)Limited Quantity: 1L

Limited Quantity: 1L

SECTION 15: REGULATORY INFORMATION

15.1 Safety, health and environmental

regulations/legislation specific for the substance or

mixture

15.1.1 EU regulations

CoRAP Substance Evaluation Tert-Butyl Methyl Ether: Yes - Substance evaluated in 2014; evaluating Member

State has proposed to ask the registrants to provide further information Methanol: Yes - Substance evaluated in 2012; evaluating Member State has

proposed to ask the registrants to provide further information.

Seveso Tert-Butyl Methyl Ether: Upper Tier: 50000 tonnes, Lower Tier: 5000 tonnes

Methanol: Upper Tier: 5000 tonnes, Lower Tier: 5000

15.1.2 National regulations Not applicable.

15.2 Chemical Safety Assessment A REACH chemical safety assessment has been carried out. This safety data

sheet contains more than one ES in an integrated form. Contents of the exposure scenarios have been included into sections 1.2, 8, 9, 12, 15 and 16 of

this safety data sheet.

SECTION 16: OTHER INFORMATION

The following sections contain revisions or new statements:

Header and Section 1.3

Page Header Updated version and date Section 14 Updated 14.6 and 14.7

References:

Existing ECHA registration(s) for MTBE (CAS No. 1634-04-4) and Chemical Safety Report. EH40 – UK Occupational Exposure Limits. Existing ECHA registration(s) for Methanol (CAS No. 67-56-1).

This Safety Data Sheet was prepared in accordance with EC Regulation (EC) 1907/2006 (REACH), 1272/2008 (CLP) & 2015/830.

LEGEND

LTEL Long Term Exposure Limit
STEL Short Term Exposure Limit
DNEL Derived No Effect Level

PNEC Predicted No Effect Concentration

PBT PBT: Persistent, Bioaccumulative and Toxic PPB very Persistent and very Bioaccumulative

OECD Organisation for Economic Cooperation and Development

Training advice: Consideration should be given to the work procedures involved and the potential extent of exposure as they may determine whether a higher level of protection is required.

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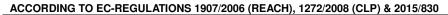
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Annex to the extended Safety Data Sheet (eSDS)

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Tert-Butyl Methyl Ether

CAS No. 1634-04-4 EC No. 216-653-0

Summary of Parameters

Physical parameters				
Vapour pressure (hPa)			33	
Partition Coefficient (log K _{ow})		1.06	
Aqueous solubility (m	ng/l)		41850	
Molecular weight			88.15	
Biodegradability			Not readily biodegradable.	
Human Health (DNE	EL)			
	Short term	Inhalation (mg/m³)	357 (100 ppm)	
Workers	Short term	Dermal (mg/kg bw/day)	Not defined	
Workers	Lang Tarm	Inhalation (mg/m³)	178.5 (50 ppm)	
	Long Term	Dermal (mg/kg bw/day)	5100	
	<u> </u>	Inhalation (mg m ⁻³)	53.6	
Consumer		Dermal (mg kg ⁻¹ bw day ⁻¹)	3570	
		Oral (mg kg ⁻¹ bw day ⁻¹)	7.1	
Environmental Para	meters (PNECs)			
STP (mg/l)			71	
freshwater (mg/l)			5.1	
marine water (mg/l)			0.26	
freshwater sediment (mg/kg dry weight))	23	
marine sediment (mg	J/kg dry weight)		1.17	
Soil (mg/kg dry weigh	nt)		1.56	

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Exposure scenario 2	Formulation of MTBE	15

Contributing Scenarios

Contributing Scenarios

PROC1 Use in closed process, no likelihood of exposure

PROC2 Use in closed, continuous process with occasional controlled exposure

(Storage) Use in closed, continuous process with occasional controlled exposure, bulk Storage

PROC3 Use in closed batch process (synthesis or formulation)

(Sampling) Use in closed batch process (synthesis or formulation). Sample collection at ventilation at ventilated sample points.

(elevated) Use in closed batch process (synthesis or formulation). Batch process at elevated temperature with sampling.

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

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

Clean down and maintenance of vessels and containers.

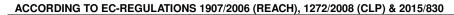
(bulk) Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities. Bulk open loading and unloading.

(Drum/batch transfers) Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities. Drum/batch transfers

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

(Drum/batch transfers) Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities. PROC15 Use as laboratory reagent

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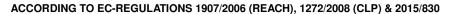


Exposure Scenario 1 – Industrial distribution of MTBE and gasoline containing MTBE

1.0 Contributing Scenarios	
Sector of uses SU	SU3 Industrial uses: Uses of substances as such or in preparations at industrial sites
Process category [PROC]	1 2 2 (Storage) 3 3 (Sampling) 4 8a (maintenance) 8a (bulk) 8b (bulk) 9 15
Chemical product category [PC]	not applicable
Article Categories [AC]	not applicable
Environmental release categories [ERC] ERC1 Manufacture of substances ERC2 Formulation of preparations	
Specific Environmental Release Categories SPERC	ESVOC 3

2.0 Operational conditions and risk manage	ement measures		
2.1 Control of worker exposure			
Product characteristics			
Physical form of product	Liquid		
Concentration of substance in product	Covers concentrations up to 1	00%	
Human factors not influenced by risk mana	gement		
Potential exposure area	Not defined		
Frequency and duration of use			
Evenous direction pay day	PROC1, PROC2, PROC4, PROC8a (maintenance), PROC8a (bulk), PROC9, PROC15	Covers daily exposures up to 8 hours (unless stated differently).	
Exposure duration per day	PROC3	Covers exposure up to 4 hours	
	PROC2 (Storage), PROC8b (bulk)	Covers exposure up to 1 hour(s)	
	PROC3 (Sampling)	< 0.25 hours	
Exposure duration per year	300 days per year		
Other operational conditions affecting work			
Area of use	PROC1, PROC2, PROC2 (Storage), PROC3, PROC3 (Sampling) PROC8a (maintenance), PROC8a (bulk), PROC8b (bulk)	Outdoor	
	PROC4, PROC9, PROC15	Indoor	
Characteristics of the surroundings	Not defined		
General measures applicable to all activities Provide basic employee training to prevent / m		skin problems that may develop.	
Technical conditions of use			
Common practices vary across sites thus cons	servative process release estima	ates used.	
Organisational measures	-		
PROC8a Drain down and flush system prior to equipment break-in or maintenance. Efficiency of at least 90%			
Risk management measures related to hun			
Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employ training to prevent /minimise exposures and to report any skin problems that may develop.			

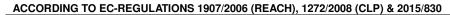
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PROC1. General exposures (closed systems)	No specific r	measures identified		
PROC2 General exposures (closed systems) with	140 apoonio I	nododroo idontinod		
sample collection & Storage. General exposures	Ensure oner	Ensure operation is undertaken outdoors		
(closed systems) with sample collection.				
PROC3 Process sampling		Ensure operation is undertaken outdoors. Avoid carrying out activities involving exposure for more than 15 minutes, or, Wear a respirator conforming to EN140 with Type A filter or better.		
PROC3 General exposures (closed systems). Use		•	· ·	
in contained batch processes with sample			d carrying out activities involving exposure for	
collection	more than 4	more than 4 hours, or, Wear a respirator conforming to EN140 with Type A filter or better.		
PROC 4 General exposures (open systems)				
Batch process with sample collection. Filling /	Provide extra	act ventilation to points where emis	ssions occur. Ensure samples are obtained	
preparation of equipment from drums or	under contai	nment or extract ventilation.		
containers.				
PROC 8a Bulk open loading and unloading. Non-dedicated facility.		erial transfers are under containme to EN140 with Type A filter or bette	ent or extract ventilation. or, Wear a respirator er.	
PROC8a. Equipment cleaning and maintenance. Non-dedicated facility.		and flush system prior to equipmer		
PROC8b. Bulk closed loading and unloading.			d carrying out activities involving exposure for	
Dedicated facility			ming to EN140 with Type A filter or better.	
PROC9. Drum and small package filling.		umps. Fill containers/cans at dedicates	ated till points supplied	
Dedicated facility.	with local ex	tract ventilation.		
PROC15. Laboratory activities, Cleaning, Wiping, Rolling, Brushing	Handle in a	fume cupboard or under extract ve	ntilation	
Other operational conditions affecting worker ex	(nosure			
Provide basic employee training to prevent/minimise		nd to report any skin problems that	may develop Assumes a good basic standard	
of occupational hygiene is implemented. Assumes u				
Common practices vary across sites thus conservat			ataro, armoso statou amorontiy. Catabor acor	
2.2 Control of environmental exposure				
Amounts used				
Fraction of EU tonnage used in region:		0.57		
Regional use tonnage (tons/year):		6.59E+05		
Fraction of Regional tonnage used locally: tons/year	•	1		
Annual site tonnage (tons/year):		6.59E+05		
Average daily use (kg/day)		1,805,479		
Environment factors not influenced by risk man	agement			
Flow rate of receiving surface water (m³/d):		Not defined (default = 18,000)		
Local freshwater dilution factor:	-	10		
Local marine water dilution factor:		100		
Operational conditions		Distribution	Storage	
Emission days (days/year):		300	300	
Release fraction to air from process (initial release process):		0.0001	0	
Release fraction to wastewater from process (initial to RMM):		0.00001	8.4kg/day	
Release fraction to soil from process (initial release RMM):	· 	0.05	0	
Technical onsite conditions and measures to red Treat air emission to provide a typical removal effici		oiscnarges, air emissions and re	eleases (U SUII	
	• ,			
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%):		Distribution: ≥ 95 Storage: ≥ 99		
Treat soil emission to provide a typical removal efficiency of (%): not applicable - no direct release to soil			e to soil	
	Common practices vary across sites thus conservative process release estimates used.			
Organisational measures to prevent/limit release from site				
Prevent discharge of undissolved substance to or recover from onsite wastewater. Prevent leakages and spillages to soil. Conditions and measures related to municipal sewage treatment plant				
Size of municipal sewage system/treatment plant (m³/d) 2000				
Degradation effectiveness (%) Not defined.				
Conditions and measures related to external treatment of waste for disposal				
Not defined				
Substance release quantities after risk management measures				
Release to waste water from process (mg/l) Not defined				

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Maximum allowable site tonnage (MSafe) (kg/d):	Not defined				
2.2b Control of environmental exposure (Distribution of substance)					
Amounts used					
Fraction of EU tonnage used in region:	0.57				
Regional use tonnage (tons/year):	6.59E+05				
Fraction of Regional tonnage used locally: tons/year	0.02				
Annual site tonnage (tons/year):	13,180				
Average daily use (kg/day)	37,657				
Environment factors not influenced by risk management					
Flow rate of receiving surface water (m³/d):	Not defined (default = 18,000)				
Local freshwater dilution factor:	10				
Local marine water dilution factor:	100				
Operational conditions					
Emission days (days/year):	300				
Release fraction to air from process (initial release prior to RMM):	1.0E-04				
Release fraction to wastewater from process (initial release prior to RMM):	1.0E-05				
Release fraction to soil from process (initial release prior to RMM):	1.0E-05				
Technical onsite conditions and measures to reduce or limit of	discharges, air emissions and releases to soil				
Treat air emission to provide a typical removal efficiency of (%):	0				
Treat onsite wastewater (prior to receiving water discharge) to	Transport: ≥ 95				
provide the required removal efficiency of (%):	Storage: ≥ 99				
Treat soil emission to provide a typical removal efficiency of (%):	0				
Common practices vary across sites thus conservative process re	lease estimates used.				
Organisational measures to prevent/limit release from site					
Prevent discharge of undissolved substance to or recover from onsite wastewater.					
Conditions and measures related to municipal sewage treatment plant					
Size of municipal sewage system/treatment plant (m³/d)	2000				
Degradation effectiveness (%)	Not defined.				
Conditions and measures related to external treatment of waste for disposal					
Not defined					
Substance release quantities after risk management measures					
Release to waste water from process (mg/l)	Not defined				
Maximum allowable site tonnage (MSafe) (kg/d):	Not defined				

	0011800
3. Exposure estimation and reference to its	Source

3.1 Human exposure prediction

Exposure assessment (method/calculation model) ECETOC TRA v2.0 Worker

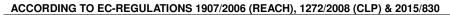
	Inhalation		De	rmal	General Comment Regarding All Tables
Process category [PROC]	inhalation exposure 8 hour (ppm)	Risk characterisation ratio (RCR)	dermal exposure (mg/kg bw/day)	Risk characterisation ratio (RCR)	Risk characterisation ratio (RCR)
PROC 1	0.01	<0.01	0.03	< 0.001	<0.01
PROC 2	18	0.35	0.27	<0.001	0.35
PROC 3	21	0.42	0.082	< 0.001	0.42
PROC 3 (sampling)	3.4	0.07	0.013	< 0.001	0.07
PROC 4	10	0.2	0.13	< 0.001	0.2
PROC 8a	25	0.5	0.27	< 0.001	0.5
PROC 8a (maintenance)	25	0.5	2.7	< 0.001	0.5
PROC 8b	21	0.42	0.54	< 0.001	0.42
PROC 9	4	0.08	0.13	< 0.001	0.08
PROC 15	5	0.1	0.0068	< 0.001	0.1

Exposure assessment (method/calculation model) EUSES

Storage

environmental STP freshwater marine water soil freshwater marine sediment

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MTBE V4033a

exposure					sediment	
PEC Environment	0.00978	0.00182	0.000208	0.00902	0.00174	0.000198
RCR	1.38E-04	3.57E-04	8.00E-04	6.54E-03	3.48E-04	7.92E-04

Human exposure prediction

Route of Exposure	Exposure	RCR
Oral	2.7 mg/kg/day	<0.001
Inhalation	25 ppm / 8 hr	0.5

Distribution

environmental exposure	STP	freshwater	marine water	soil	freshwater sediment	marine sediment
PEC Environment	0.00964	0.00181	0.00542	0.00164	0.00173	0.00531
RCR	1.36E-04	3.55E-4	2.08E-02	1.19E-03	3.46E-04	2.12E-02

Human exposure prediction

Route of Exposure	Exposure	RCR
Oral	2.7 mg/kg/day	<0.001
Inhalation	25 ppm / 8 hr	0.5

4. Evaluation guidance to downstream user				
For scaling see	are managed to at least equivalent Available hazard data do not supp	easures/Operational Conditions are adopted, then users should ensure that risks tevels. ort the need for a DNEL to be established for other health effects. rol technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-		
Exposure assessment	Workers ECETOC TRA			
instrument/tool/method	environmental exposure	EUSES		

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ACCORDING TO EC-REGULATIONS 1907/2006 (REACH), 1272/2008 (CLP) & 2015/830



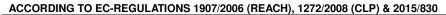
Exposure Scenario 2 – Formulation of MTBE

1.0 Contributing Scenarios	
Sector of uses SU	SU3 Industrial uses: Uses of substances as such or in preparations at industrial sites
Process category [PROC]	1 2 2 (Storage) 3 3 (elevated) 4 5 8a (manual) 8a (maintenance) 8b (bulk) 8b (Drum/batch transfers) 9 15
Chemical product category [PC]	not applicable
Article Categories [AC]	not applicable
Environmental release categories [ERC]	ERC2 Formulation of preparations
Specific Environmental Release Categories SPERC	not applicable

2.0 Operational conditions and risk manag	ement measures		
2.1 Control of worker exposure			
Product characteristics			
Physical form of product	liquid		
Concentration of substance in product	Covers concentrations up to 100%		
Human factors not influenced by risk man	agement		
Potential exposure area	Not defined		
Frequency and duration of use			
	PROC2 (Storage), PROC8a (maintenance)	Covers exposure up to 1- 4 hours	
Exposure duration per day	All other PROC's	Covers daily exposures up to 8 hours (unless stated differently).	
Exposure duration per year	300 days per year		
Other operational conditions affecting wor	ker exposure		
Area of use	Not defined (default = Indoor)		
Characteristics of the surroundings	Not defined		
	es nimise exposures and to report any skin problems	that may develop.	
Technical conditions of use	Late to the second		
PROC 1	No specific measures identified.		
PROC2 (closed systems, sample collection)	Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Efficiency of at least 30%		
PROC2 (Storage, closed system, sample collection)	Avoid carrying out activities involving exposure for more than 4 hours. Alternatively: Wear a full face respirator conforming to EN140 with Type A filter or better.		
PROC 3 (closed systems, batch processes, sample collection) PROC 4, PROC 5	Provide extract ventilation to points where emissions occur.		
PROC 3 (open systems, batch processes elevated temperature, sample collection)	Provide extract ventilation to points where emissions occur. Formulate in enclosed or ventilated mixing vessels		
PROC3 (Sampling)	Provide extract ventilation to points where emissions occur. Avoid carrying out activities involving exposure for more than 15 minutes. Alternatively: Wear a full face respirator conforming to EN140 with Type A filter or better.		
PROC15	Use fume cupboard. Efficiency of at least 90%		
PROC 8b (Dedicated facility)	Provide extract ventilation to material transfer points and other openings.		
PROC 8b (Drum/batch transfers, Dedicated facility)	Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Avoid carrying out activities involving exposure for more than 1 hour. Alternatively: Wear		

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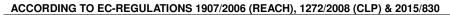




	a full face respirator conforming to EN140 with Type A filter or better. Use drum pumps.				
PROC 9	Fill containers/cans at dedicated fill points supplied with local extract ventilation. Use drum pumps.				
PROC 8a	Avoid carrying out activities involving exposure for more than 4 hours. Alternatively: Wear a full face respirator conforming to EN140 with Type A filter or better. Drain down and flush system prior to equipment break-in or maintenance.				
Organisational measures					
PROC8a (maintenance)	Drain down and flu	ush syste	em prior to equipment break-in or maintenance. Efficiency of at least 90%		
Risk management measures related to hun	nan health				
Respiratory protection	PROC2 (Storage), PROC8a (mainten		If exposure exceeds 4 hours, wear a respirator conforming to EN140 with a type A filter or better. Efficiency of at least 90%		
	PROC1		No specific measures identified.		
Hand and/or Skin protection	All other PROC's		Wear suitable gloves tested to EN374. Efficiency of at least 80%		
Eye Protection	No special measur	res are r			
Other operational conditions affecting work			94464.		
Outdoor use. Common practices vary across s		ve proce	ess release estimates used		
2.2 Control of environmental exposure	sites trius conservati	ve proce	33 release estimates asea.		
Amounts used					
Fraction of EU tonnage used in region:		Fraction	on of EU production volume: 0.25 on of tonnage for application: 0.985 on of chemical in formulation: 0.15		
Regional use tonnage (tons/year):		6.59E-	+05		
Fraction of Regional tonnage used locally: ton	s/year	0.05			
Annual site tonnage (tons/year):		32,950			
Average daily use (kg/day)		109,83	3		
Environment factors not influenced by risk	management				
Flow rate of receiving surface water (m³/d):		Not de	fined (default = 18,000)		
Local freshwater dilution factor:		10			
Local marine water dilution factor:		100			
Operational conditions					
Emission days (days/year):		300			
Release fraction to air from process (initial release RMM):	•	1.0E-0	3		
Release fraction to wastewater from process (to RMM):		3.0E-0	4		
Release fraction to soil from process (initial re RMM):	•	1.0E-0			
from onsite wastewater.			timates used.Prevent discharge of undissolved substance to or recover		
Technical onsite conditions and measures			ges, air emissions and releases to soil		
Treat air emission to provide a typical removal		0			
Treat onsite wastewater (prior to receiving was		> 99			
provide the required removal efficiency of (%):					
Treat soil emission to provide a typical removal efficiency of (%): 0					
Organisational measures to prevent/limit re		oitoo-	towator		
Prevent discharge of undissolved substance to or recover from onsite wastewater.					
Conditions and measures related to municipal sewage treatment plant					
Size of municipal sewage system/treatment plant (m³/d)			2000		
•			fined		
Conditions and measures related to external treatment of waste for disposal External treatment and disposal of waste should comply with applicable local and/or national regulations.					
			cai and/or national regulations.		
Substance release quantities after risk mai	nagement measure		fin and		
Release to waste water from process (mg/l)	ط/،	Not defined Not defined			
Maximum allowable site tonnage (MSafe) (kg/	u).	INOT de	illilea		

3. Exposure estimation and reference to its source				
3.1 Human exposure prediction				
Exposure assessment (method/calculation model)		CETOC TRA		
	Inhalation	Dermal	General Comment Regarding All Tables	

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Process category [PROC]	inhalation exposure 8 hour (ppm)	Risk characterisation ratio (RCR)	dermal exposure (mg/kg bw/day)	Risk characterisation ratio (RCR)	Risk characterisation ratio (RCR)
PROC1	0.01	<0.01	0.03	< 0.001	<0.01
PROC2	18	0.35	0.27	< 0.001	0.35
PROC2 (Storage)	15	0.3	0.16	< 0.001	0.3
PROC3	5	0.1	0.013	< 0.001	0.1
PROC3 (Sampling)	0.5	0.01	0.0013	< 0.001	0.01
PROC4	10	0.2	0.13	< 0.001	0.2
PROC5	25	0.5	0.27	< 0.001	0.5
PROC8a (manual)	5	0.1	0.054	< 0.001	0.1
PROC8a (maintenance)	15	0.3	1.6	< 0.001	0.3
PROC8b (bulk)	7.5	0.15	0.13	< 0.001	0.15
PROC8b (Drum/batch transfers)	0.3	<0.01	0.027	<0.001	<0.01
PROC 9	4	0.08	0.13	< 0.001	0.08
PROC15	5	0.1	0.0068	<0.001	0.1

3.2 Environmental exposure prediction

environmental exposure	STP	freshwater	marine water	soil	freshwater sediment	marine sediment
PEC Environment	0.0101	0.00185	0.000211	0.0995	0.00177	0.000201
RCR	1.42E-04	3.63E-04	8.12E-04	7.21E-02	3.54E-04	8.04E-04

Human exposure prediction

Route of Exposure	Exposure (8 hour)	RCR
Dermal	0.27 mg/kg/day	< 0.001
Inhalation	25ppm	0.5

4. Evaluation guidance to downstream user				
For scaling see	Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. Available hazard data do not support the need for a DNEL to be established for other health effects. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html).			
Exposure assessment	Workers	ECETOC TRA v.2		
instrument/tool/method	environmental exposure	EUSES 2008		

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