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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 V4033-MTBE-MTBE

Trade Name MTBE
Product code V4033, MTBE

Chemical Name Methyl Tertiary Butyl Ether

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

REACH Registration No. 01-2119452786-27-xxxx

1.2 Relevant identified uses of the substance or mixture

and uses advised against

Mo.Exposure ScenarioPage:1Distribution of substance: MTBE (Industrial)112Formulation of preparations (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 1201 Geneva Switzerland +31 10 498 7200 +31 10 452 9545

xreach@vitol.com

E-Mail (competent person)

1.4 Emergency telephone number

Telephone

Fax

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

SECTION 2: HAZARDS IDENTIFICATION

Hazard Pictogram(s)

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 V4033-MTBE-MTBE





Signal Word(s) DANGER

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

H315: Causes skin irritation.

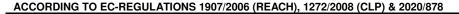
Precautionary Statement(s) P210: Keep away from heat, hot surfaces, sparks, open flames and other

ignition sources. No smoking.

P240: Ground/bond container and receiving equipment.

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P243: Take precautionary measures against static discharge.

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	01-2119452786-27-xxxx	<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%	Flam. Liq. 2; H225
				Acute Tox. 3; H301
				Acute Tox. 3; H311
				Acute Tox. 3; H331
				STOT SE 1; H370

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

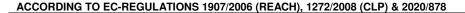
dryness or cracking.

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.

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4.3 Indication of any immediate medical attention and special treatment needed

Notes to a physician:

IF SWALLOWED: Do NOT induce vomiting, if vomiting does occur, have victim lean forward to reduce risk of aspiration.

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 Extinguishing media

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

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

6.3

7.2

Avoid release to the environment. Do not allow to enter drains, sewers or watercourses. Spillages or uncontrolled discharges into watercourses must be

Caution - spillages may be slippery. Eliminate sources of ignition. No open

Methods and material for containment and cleaning

alerted to the Environment Agency or other appropriate regulatory body. 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

6.4 Reference to other sections

See Section: 8,13

recovery.

SECTION 7: HANDLING AND STORAGE

7.1 Precautions for safe handling

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

Conditions for safe storage, including any incompatibilities

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

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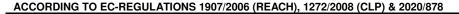
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Storage temperature

Incompatible materials

Specific end use(s)

Storage measures





product residue. Containers must not be punctured or destroyed by burning,

even when empty.

Stable at ambient temperatures.

Keep only in original container. Suitable materials:Carbon steel

Materials to avoid: Most plastics, Viton, Flourel

Keep away from oxidising agents.

See Section: 1.2 and/or Exposure Scenario.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

7.3

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 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 release) 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). Gloves should be changed regularly to avoid permeation problems. Breakthrough time of the glove material: refer to the information provided by the gloves' producer. Protective index 6, corresponding > 480 minutes of permeation time.

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Recommended: Nitrile rubber (Minimum thickness 0.4mm)

Body protection: Wear anti-static clothing and shoes.

small scale: Wear suitable coveralls to prevent exposure to the skin.

large scale: Chemical protection suit

Respiratory protection 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 Not applicable.

8.2.3 **Environmental Exposure Controls** Avoid release to the environment.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

> Physical state Liquid Colour Colourless

Odour Characteristic terpene-like

- 108.6 °C Melting point/freezing point Boiling point or initial boiling point and boiling range 55.3 °C

Flammability

Not applicable - Liquid Lower and upper explosion limit Flammable Limits (Upper) (%v/v): 8.4

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

- 28 °C Flash point

460 °C Auto-ignition temperature Decomposition temperature Not established. No data available

Not established. No data available На Kinematic viscosity 0.464 mm²/s (static) at 20 °C

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

Partition coefficient: n-octanol/water (log value) 1.06 log P 33000 Pa @ 25°C Vapour pressure Density and/or relative density 0.74 g/cm3 @ 20 °C

Relative vapour density Not established. No data available Particle characteristics Not established. No data available

9.2 Other information None known.

SECTION 10: STABILITY AND REACTIVITY

10.1 Reactivity Stable under normal conditions. Reacts with - Strong oxidising agents

Chemical stability Stable under normal conditions. 10.2

Possibility of hazardous reactions 10.3 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 products Carbon monoxide, Carbon dioxide

SECTION 11: TOXICOLOGICAL INFORMATION

11.1 Information on hazard classes as defined in

Acute toxicity - Inhalation

Regulation (EC) No 1272/2008 Acute toxicity - Ingestion

Not classified. LD50 > 2000 mg/kg bw/day (rat) OECD 401

Based upon the available data, the classification criteria are not met. Not classified. LC50 85 mg/l @ 4 hour(s) (rat) OECD 403

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

Acute toxicity - Skin contact Based upon the available data, the classification criteria are not met.

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Skin corrosion/irritation

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Not classified. LD50 > 2000 mg/kg bw/day (rabbit) OECD 402

Skin Irrit. 2: OECD 404 (rabbit)

Mean erythema score :4 Mean edema score : 4

Serious eye damage/irritation

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

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

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

Skin sensitization Negative OECD 406 1% MTBE/ Aqueous solution

Respiratory sensitization No data

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

In Vivo Negative UDS test

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

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

Ingestion NOAEL: 330 mg/kg bw/day) (Chronic; Rat)
Inhalation NOAEC: 1465 mg/m³ (Chronic; Rat)
Non-classified Human Carcinogen

Skin Contact No data.

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

Toxicity for reproductionNOAEC 400 ppm **Developmental Toxicity**NOAEC 8,000 ppm

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.

STOT - Repeated ExposureBased upon the available data, the classification criteria are not met.

Ingestion Liver / Kidneys NOAEL: 209 mg/kg bw/day (Chronic; Rat)
Inhalation Liver / Kidneys NOAEC: 2856 mg/m³ (Chronic; Rat)

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

11.2 Information on other hazards

11.2.1 Endocrine disrupting properties This substance does not have endocrine disrupting properties with respect to

humans.

11.2.2 Other information None.

SECTION 12: ECOLOGICAL INFORMATION

12.1 Toxicity Not classified as a Marine Pollutant.

Aquatic Compartment Acute LC50 Freshwater Fish: 672 mg/L LC50 Marine Fish: 574 mg/L

Aquatic Compartment Chronic 31-d NOEC Freshwater Fish: 299 mg/l

12.2 Persistence and degradability Not readily biodegradable.

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

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

(BCF): 1.5

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

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

12.6 Endocrine disrupting properties This substance does not have endocrine disrupting properties with respect to

non-target organisms.

12.7 Other adverse effects None known.

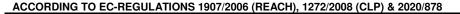
SECTION 13: DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

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,

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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 EU Waste Codes: HP3, HP4

IMDG/ADN

Waste classification according to Directive 2008/98/EC (Waste Framework Directive)

SECTION 14: TRANSPORT INFORMATION

		ADN/NID	INDG/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	3
14.4	Packing group	II	II
14.5	Environmental hazards	Not classified as a Marine Pollutan	t.
14.6	Special precautions for user		oter 7 'Handling and Storage' for special be aware of, or needs to comply with, in
14.7	Maritime transport in bulk according to IMO	Product Name: Methyl tert-butyl et	her
	instruments	Pollution category: Z	
		Ship type: 3	
14.8	Additional Information	HIN: 33	EmS: F-E, S-D
		Tunnel Code: 3 (D/E)	Limited Quantity: 1L
		Limited Quantity: 11	

ADD/DID

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

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

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

proposed to ask the registrants to provide further information. Tert-Butyl Methyl Ether: Upper Tier: 50000 tonnes, Lower Tier: 5000 tonnes

Seveso

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

National regulations 15.1.2

15.2 **Chemical Safety Assessment** Not applicable. 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: New SDS Regulation 2020/878 format, all sections have been updated to include new information. Please review SDS with care.

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).

EU Classification: This Safety Data Sheet was prepared in accordance with EC Regulation (EC) 1907/2006 (REACH), 1272/2008 (CLP) & 2020/878

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ACCORDING TO EC-REGULATIONS 1907/2006 (REACH), 1272/2008 (CLP) & 2020/878



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Legend

ADR ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road
ADN ADN: European Agreement on the International Transport of Dangerous Goods by Inland Waterways
CLP Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures

DNEL Derived no effect level

IATA IATA: International Air Transport Association
ICAO ICAO: International Civil Aviation Organization
IMDG IMDG: International Maritime Dangerous Goods

LTEL Long term exposure limit

PBT PBT: Persistent, Bioaccumulative and Toxic

PNEC Predicted No Effect Concentration

REACH Registration, Evaluation, Authorisation and Restriction of Chemicals

RID: Regulations concerning the international railway transport of dangerous goods

STEL Short term exposure limit

vPvB vPvB: very Persistent and very Bioaccumulative

OECD Organisation for Economic Cooperation and Development

Hazard classification / Classification code:

Flam. Liq. 2, Flammable liquid, Category 2
Acute Tox. 3, Acute Toxicity, Category 3
Acute Tox. 3, Acute Toxicity, Category 3
Skin Irrit. 2, Skin irritation, Category 2
Acute Tox. 3, Acute Toxicity, Category 3

STOT SE 1, Specific target organ toxicity - Single exposure, Category 1

Hazard Statement(s)

H225: Highly flammable liquid and vapour.

H301: Toxic if swallowed. H311: Toxic in contact with skin. H315: Causes skin irritation. H331: Toxic if inhaled.

H370: Causes damage to organs.

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.

Disclaimers

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Annex to the extended Safety Data Sheet (eSDS)

See below -

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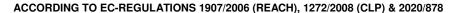
Tert-Butyl Methyl Ether CAS No.

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

Summary of Parameters

Physical Parameter	rs			
Vapour pressure (hPa)			33	
Partition Coefficient (log K _{ow})			1.06	
Aqueous solubility (n	ng/l)		41850	
Molecular weight			88.15	
Biodegradability			Not readily biodegradable.	
Human Health (DN	EL)			
	Short term	Inhalation (mg/m³)	357 (100 ppm)	
Mankana	Short term	Dermal (mg/kg bw/day)	Not defined	
Workers	Lang Tayer	Inhalation (mg/m³)	178.5 (50 ppm)	
	Long Term	Dermal (mg/kg bw/day)	5100	
		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	ameters (PNECs)			
STP (mg/l)			71	
freshwater (mg/l)			5.1	
marine water (mg/l)			0.26	
freshwater sediment (mg/kg dry weight)		t)	23	
marine sediment (mg/kg dry weight)			1.17	
Soil (mg/kg dry weig	ht)		1.56	

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Contents

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Exposure scenario 1	Distribution of MTBE (Industrial)	11
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 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

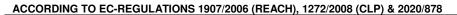
PROC8b (bulk) Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities. Bulk transfers (closed systems).

(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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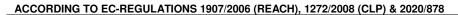


Exposure Scenario 1 – Industrial Distribution of MTBE and Gasoline containing MTBE

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 mana	gement 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 mai	nagement		
Potential exposure area	Not defined		
Frequency and duration of use			
Exposure duration per 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 wo	rker exposure		
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	1	
General measures applicable to all activit Provide basic employee training to prevent /		skin problems that may develop.	
Technical conditions of use			
Common practices vary across sites thus co	nservative process release estima	ates used.	
Organisational measures			
PROC8a		prior to equipment break-in or maintenance. Efficiency of at least 90%	
Risk management measures related to hu			
General measures (skin irritants)	eral measures (skin irritants) 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		

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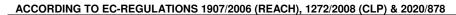


as soon as they occur. Wash off any skin contamination immediately. Provide basic employee

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	as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop.			
PROC1. General exposures (closed systems)		No specific measures identified.		
PROC2 General exposures (closed systems) with sample collection & Storage.		Ensure operation is undertaken outdoors.		
PROC3 Process sampling		Ensure operation is undertaken outdoors. Avoid carrying out activities involving exposure for		
PROC3 General exposures (closed systems). Use	more than 15 minutes, or, Wear a respirator conforming to EN140 with Type A filter or better.			
in contained batch processes with Sample		Ensure operation is undertaken outdoors Avoid 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 extr	act ventilation to points wh	ere emissions occur. Ensu	e samples are obtained
preparation of equipment from drums or	under conta	inment or extract ventilation	٦.	
containers				
PROC 8a Bulk open loading and unloading. Non-dedicated facility		erial transfers are under co to EN140 with Type A filter		tion, or, Wear a respirator
PROC8a.Equipment cleaning and maintenance. Non-dedicated facility.	Drain down	and flush system prior to e	quipment break-in or maint	enance.
PROC8b.Bulk closed loading and unloading.		ration is undertaken outdoo		
Dedicated facility		hour, or, Wear a respirator		
PROC9. Drum and small package		umps. Fill containers/cans	at dedicated fill points supp	lied with local extract
filling.Dedicated facility.	ventilation.			
PROC15. Laboratory use, Cleaning, Wiping,	Handle in a	fume cupboard or under ex	tract ventilation.	
Rolling, Brushing Other operational conditions affecting worker ex	rnosure			
Provide basic employee training to prevent / minimizer		and to report any skin prob	ems that may develon Ass	umes a good basic standard
of occupational hygiene is implemented. Assumes u				
Common practices vary across sites thus conservat				,,
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	N . I C . I / I C . II . 40	200)	
Flow rate of receiving surface water (m³/d): Local freshwater dilution factor:		Not defined (default = 18	,000)	
Local marine water dilution factor:		100		
Operational conditions		Distribution Distribution	Storage	
Emission days (days/year):		300	300	
Release fraction to air from process (initial release p	orior to	0.0001	0	
Release fraction to wastewater from process (initial to RMM):	release prior	0.00001	8.4kg/day	
Release fraction to soil from process (initial release RMM):	•	0.05	0	
Technical onsite conditions and measures to re-		discharges, air emissions	and releases to soil	
Treat air emission to provide a typical removal effici		0		
Treat onsite wastewater (prior to receiving water discharge) to		Distribution: ≥ 95		
provide the required removal efficiency of (%): Treat soil emission to provide a typical removal efficiency of (%):		Storage: ≥ 99		
, , , , , , , , , , , , , , , , , , ,				
Common practices vary across sites thus conservative process release estimates used. Organisational measures to prevent/limit release from site			21	
Prevent discharge of undissolved substance to or re			eakages and spillages to so	ıll.
Conditions and measures related to municipal sewage treatm				
Size of municipal sewage system/treatment plant (n	ı~/u)	2000 Not defined		
Degradation effectiveness (%) Conditions and measures related to external treations.	atment of wa	Not defined.		
Not defined	ament of was	οιο τοι αισμυσαι		

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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			
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 provide the required removal efficiency of (%):	Transport: ≥ 95 Storage: ≥ 99			
Treat soil emission to provide a typical removal efficiency of (%):	0			
Common practices vary across sites thus conservative process rel	ease estimates used.			
Organisational measures to prevent/limit release from site				
Prevent discharge of undissolved substance to or recover from one	site 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 measure	s			
Release to waste water from process (mg/l)	Not defined			
Maximum allowable site tonnage (MSafe) (kg/d):	Not defined			

3. Exposure estimation and reference to its source

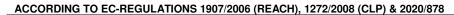
3.1 Human exposure prediction

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

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3.2 Environmental exposure prediction						
Exposure assessment (method/calculation model) EUSES						
Storage						
environmental	STP	freshwater	marine water	soil	freshwater	marine sediment
exposure	U	ii comutator	marmo water	56.11	sediment	marino ocument
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

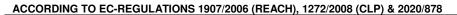
Human exposure prediction

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 equiv Available hazard data do not s	nt Measures/Operational Conditions are adopted, then users should ensure that risks alent levels. support the need for a DNEL to be established for other health effects. control 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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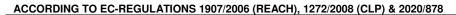
Exposure Scenario 2 – Formulation of MTBE

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				
General measures applicable to all activities					
Provide basic employee training to prevent / r	ninimize exposures and to report any skin problem	s that may develop.			
Technical conditions of use					
PROC 1	No specific measures identified.				
PROC2 (Closed systems, Sample	,	not less than 3 to 5 air changes per hour). Efficiency			
collection)	of at least 30%				
PROC2 (Storage, Closed systems, Sample		or more than 4 hours. Alternatively: Wear a full face			
collection)	respirator conforming to EN140 with Type A filte	r or better.			
PROC 3 (Closed systems, Batch process, Sample collection) PROC 4, PROC 5	Provide extract ventilation to points where emissions occur.				
PROC 3 (Open systems, Batch processes at elevated temperatures, 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%				

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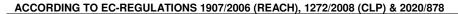
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PROC 8b (Dedicated facility)	Provide extract ve	ntilation	to material transfer points and other openings.		
PROC 8b (Drum/batch transfers, Dedicated facility)	Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Avoid carrying out activities involving exposure for more than 1 hour. Alternatively: Wear 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 hur	man health				
Respiratory protection	PROC2 (Storage), PROC8a (Mainten		If exposure exceeds 4 hours, Wear a respirator conforming to EN140 with Type A filter or better. Efficiency of at least 90%		
Lland and/an Olde metalian	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 measu	res are r			
Other operational conditions affecting wor			•		
Outdoor use. Common practices vary across		ive proce	ess release estimates used.		
2.2 Control of environmental exposure					
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	6.59E+05		
Fraction of Regional tonnage used locally:	tons/year	0.05			
Annual site tonnage (tons/year):		32,950			
Average daily use (kg/day)		109,833			
Environment factors not influenced by risk	k management				
Flow rate of receiving surface water (m³/d):		Not de	efined (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 rel RMM):	•	1.0E-03			
Release fraction to wastewater from process to RMM):	` '	3.0E-04			
Release fraction to soil from process (initial re	•	1.0E-04			
recover from onsite wastewater. Technical onsite conditions and measures			ase estimates used.Prevent discharge of undissolved substance to or		
Treat air emission to provide a typical remova		0	yes, an emissions and releases to som		
Treat onsite wastewater (prior to receiving wa	• , ,	U			
provide the required removal efficiency of (%)	o ,	> 99			
Treat soil emission to provide a typical removal efficiency of (%):		0			
Troat Joil Cilibaioti to Divide a typical ICIIUV		U			
			etawatar		
Organisational measures to prevent/limit r		isite was			
Organisational measures to prevent/limit represent discharge of undissolved substance to	to or recover from on				
Organisational measures to prevent/limit represent discharge of undissolved substance to Conditions and measures related to municipal substances.	to or recover from on cipal sewage treatm	ent plai			
Organisational measures to prevent/limit r Prevent discharge of undissolved substance t Conditions and measures related to munic Size of municipal sewage system/treatment p	to or recover from on cipal sewage treatm	ent plai 2000	nt		
Organisational measures to prevent/limit r Prevent discharge of undissolved substance t Conditions and measures related to munic Size of municipal sewage system/treatment p Degradation effectiveness (%)	to or recover from on cipal sewage treatm llant (m³/d)	2000 Not de	efined		
Organisational measures to prevent/limit r Prevent discharge of undissolved substance t Conditions and measures related to munic Size of municipal sewage system/treatment p Degradation effectiveness (%) Conditions and measures related to extern	to or recover from on cipal sewage treatm lant (m³/d) nal treatment of was	2000 Not de	efined disposal		
Organisational measures to prevent/limit r Prevent discharge of undissolved substance t Conditions and measures related to munic Size of municipal sewage system/treatment p Degradation effectiveness (%) Conditions and measures related to extern External treatment and disposal of waste should be a substantial to the conditions and measures related to extern the conditions and measures related to external treatment and disposal of waste should be a substantial to the conditions and measures related to external treatment and disposal of waste should be a substantial to the conditions and the conditions are conditions are conditions and the conditions are c	to or recover from on cipal sewage treatm clant (m³/d) conal treatment of was comply with appli	2000 Not de ste for de icable lo	efined disposal		
Organisational measures to prevent/limit r Prevent discharge of undissolved substance to Conditions and measures related to munic Size of municipal sewage system/treatment p Degradation effectiveness (%) Conditions and measures related to extern	to or recover from on cipal sewage treatm clant (m³/d) conal treatment of was comply with appli	2000 Not de ste for de icable lo	ofined disposal cal and/or national regulations.		

3. Exposure estimation and reference to its source

3.1 Human exposure prediction

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	Inf	Inhalation Dermal		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)
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