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### Ethyl-Tert- Butyl Ether (ETBE)

The Global Product Strategy (GPS) Safety Summary gives an overview of information on chemical products in the framework of the International Council of Chemicals Association (ICCA) initiative and is focused on the products' basic characteristics related to safe use. All the information for health, safety and environment for this specific product can be found in the extended Safety Data Sheet (e- SDS) provided by Hellenic Petroleum SA to its customers.

#### GENERAL INFORMATION

ETBE is mainly a component in gasoline enhancing octane properties. ETBE is a low molecular weight, highly flammable liquid. In contradiction to other ethers ETBE is stable against peroxide formation. The database for the toxic and eco toxic effects of ETBE is extensive, allowing a reliable evaluation of its hazard properties. ETBE should not enter surface water and soil. If the recommendations under the section below "Risk Management Measures" are applied, the substance can be handled safely.

#### CHEMICAL IDENTITY

Name	Ethyl-Tert-Butyl Ether (ETBE)
Trade name	ETBE
IUPAC Name	2-Ethoxy-2-methyl-propane
CAS Number	637-92-3
EC Number	211-309-7
Molecular formula	C <sub>6</sub> H <sub>14</sub> O

#### USES AND APPLICATIONS

ETBE has many properties which make it an excellent gasoline component for cleaner and sustainable fuels. In addition, through its sustainable and bio-component raw materials, it can serve as a sustainable biofuel. Because of the oxygen in the molecule, when used as part of the gasoline formulation, ETBE leads to a reduction in emissions of exhaust pollutants (such as volatile organic compounds and particulates). Reducing these pollutants improves air quality.

#### PHYSICAL AND CHEMICAL PROPERTIES

ETBE is a pale yellow liquid with a characteristic odor. The liquid is lighter than water, but moderately soluble in water while vapors are heavier than air. Based on its boiling point and flash point, ETBE is classified as highly flammable liquid according to the Globally Harmonized System (GHS) for the classification and labeling of chemicals.

Property	Value
Physical State	Liquid
Color	Pale yellow
Odour	Characteristic
Density	0.75g/cm <sup>3</sup> (15 <sup>0</sup> C)
Boiling point	73.1 <sup>0</sup> C
Flash point	-19 <sup>0</sup> C
Explosive properties	No explosive properties
Self-ignition temperature	392 <sup>0</sup> C
Vapor pressure	17kPa (25 <sup>0</sup> C)
Water solubility	16.4 g/l, at 20 <sup>0</sup> C
Viscosity (kinematic)	0.53 mm <sup>2</sup> /s at 20 <sup>0</sup> C
Octanol-Water partition coefficient (logKow)	1.48 at 20 <sup>0</sup> C

#### HEALTH EFFECTS

##### Human health hazard assessment

The human health toxicological hazards of ETBE indicate low acute toxicity by the oral, dermal and inhalation routes of exposure. Transient signs of altered nervous system function are observed with exposure to high levels. Irritation to eyes and skin has not been observed from contact to liquid. There is no evidence of respiratory irritation with exposure or allergic skin or respiratory reactions. The substance is readily absorbed by oral exposure or respiration but absorption through the skin is expected to be low. The table below gives an overview of the health effects assessment results for ETBE.

Effect Assessment	Result
Acute toxicity Oral/Inhalation/dermal Irritation/corrosion Skin/eye/respiratory tract Sensitization	Low acute toxicity but narcotic effects possible at very high concentrations. Non irritating to the eye and skin
Toxicity after repeated exposure Oral/dermal/inhalation	Not considered to be sensitizing Effects on liver ,clinical chemistry and hematological parameters at exposures of $\geq 500$ ppm (inhalation) or $>121$ mg/kg bodyweight (oral)
Nontoxicity/mutagenicity Carcinogenicity Toxic for reproduction	Not mutagenic/genotoxic Not considered to be a human cancer concern No adverse effects on fertility and not selectively toxic to the fetus.

## ENVIRONMENTAL EFFECTS

### Environmental hazard assessment

ETBE is inherently biodegradable under certain conditions in aquatic aerobic environments. ETBE was found to present a low ecotoxicity hazard based on the results of acute and chronic studies conducted on various aquatic species, including freshwater and marine organisms. The table below gives an overview of the environmental assessment results for ETBE.

Effect Assessment	Result
Aquatic Toxicity	Low toxicity to water organisms
Fate and behavior	Result
Biodegradation	Inherently biodegradable under certain conditions in aerobic environment
Bioaccumulation potential PBT/vPvB conclusion	Not bio-accumulative Neither considered to be PBT nor vPvB

## EXPOSURE

### Human health

**Worker:** Exposure can occur in the manufacturing or formulation facilities, during storage, transport and delivery of ETBE and petrol, and in the use of fuels containing ETBE.

**Consumer:** Exposure to consumers can occur resulting from the use of fuels containing ETBE. However, consumers are not expected to come into contact with harmful levels of ETBE, as the substance is only used at low concentrations in fuels.

### Environment

Exposure to the environment may take place during manufacturing, transport, formulation and storage and during professional and consumer use operations.




Based on an examination of the fate and distribution characteristics, indirect exposure via air, food or water will not pose a risk to humans.

## RISK MANAGEMENT MEASURES


For the detailed Risk Management Measures (RMMs) please consult the extended Safety Data Sheet of this product.

### Industry use, production and formulation

ETBE should only be handled by knowledgeable and trained personnel. Make sure that there is adequate ventilation at workplace. Do not eat, drink or smoke where ETBE is handled or stored. In the case of transfer or maintenance operations, clear transfer lines prior to decoupling and flush/drain to a closed system for recycle prior to opening equipment. In cases where engineering controls cannot maintain airborne substance concentrations below exposure limits or in cases with a risk of accidental exposure, additional risk management measures are necessary, such as the use of a complete overall protecting against chemicals and respirator use.

<b>Consumer use</b>	
ETBE containing fuels are for adult use only. When fueling a car or other vehicle, the safety and handling instructions at the fueling station should be understood and followed.	
<b>Environment</b>	
In case of accidental release, clear the spill immediately. Prevent entry into waterways or sewers. Comply with national legislation for the disposal.	
<b>PERSONAL PROTECTIVE EQUIPMENT AND EMERGENCY MEASURES</b>	
	<ul style="list-style-type: none"> <li>➤ For short term exposure: respirator with organic vapor cartridge</li> <li>➤ For long term exposure : full face respirator with a chin style or a front or back mounted organic vapor canister</li> </ul>
	<ul style="list-style-type: none"> <li>➤ Protective gloves</li> <li>➤ Flame retardant protective overall</li> </ul>
	<ul style="list-style-type: none"> <li>➤ Safety glasses skintight</li> </ul>
<b>First aid measures</b>	<ul style="list-style-type: none"> <li>➤ Implement emergency response procedures. Wash affected skin and eyes with plenty of water. Contaminated clothing should dry before washed.</li> </ul>
<b>Firefighting measures</b>	<ul style="list-style-type: none"> <li>➤ Small fire: carbon dioxide, dry chemicals, water spray, alcohol resistant foam</li> <li>➤ Large fire: water spray, water fog or alcohol resistant foam</li> <li>➤ Unsuitable extinguishing media : water</li> </ul>
<b>Accidental release measures</b>	<ul style="list-style-type: none"> <li>➤ For containment: Absorb or cover with dry earth or sand, transfer to containers</li> <li>➤ For clean up: Use antistatic equipment. Water spray may reduce vapor but may not prevent ignition in closed spaces</li> </ul>

## CLASSIFICATION AND LABELLING

EU-GHS Criteria (European Regulation, CLP No1272/2008)	Ethyl- Tert- Butyl Ether (ETBE)
Pictograms	
Signal word	Danger
Hazard class and category code	Flam.Liq.2 H225 ,STOT SE3; H336
Hazard statement code	H225 Highly flammable liquid and vapor H336 May cause drowsiness or dizziness (Affected Organs: Central Nervous System Route of exposure: Inhalation)
Precautionary statements	<i>Prevention</i> P210 Keep away from heat/sparks/open flames/hot surfaces-No smoking P243 Take precautionary measures against static discharge P261 Avoid breathing gas/mist/vapors/spray P271 Use only outdoors or in a well-ventilated area <i>Response</i> P304+ P340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing <i>Storage</i> P403+P235 Store in a well-ventilated place. Keep cool.

## BASIC TRANSPORT INFORMATION

UN Number :1179

## STATE AGENCY REVIEW

- European Regulation EU-GHS No. 1272/2008, Index-No. :-
- European Regulation No793/93 (risk assessment)
- The substance has been registered under REACH Regulation No 1907/2008
- International Chemical Safety Cards (ICSC)

### CONCLUSIONS

- ETBE has many properties which make it a good gasoline component for cleaner burning fuels.
- ETBE is a highly flammable liquid, has low acute toxicity to human health with possible narcotic effects at high exposures and has low toxicity to water organisms.
- By applying the appropriate Risk Management Measures, the ETBE concentrations to be expected at workplaces and to the general public/consumer are below recommended exposure limits.

### CONTACT INFORMATION

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- For more information on the GPS Safety Summaries follow the link :  
<http://www.icca-chem.org/en/Home/ICCA-initiatives/global-product-strategy/>

### ABBREVIATIONS

ICCA :International Council of Chemical Associations

GPS: Global Product Strategy

GHS: Globally Harmonized System

CLP: Classification, Labelling, Packaging

REACH: Registration, Evaluation, Authorisation of Chemicals

PBT/vPVB: Persistent, Bio accumulative and Toxic/very Persistent and very Bioaccumulative

UN: United Nations

### DISCLAIMER

All information and recommendations provided in this GPS Safety Summary, only concern the specific product as described above, and may not apply for the same material if used in combination with any other material or in any process. They are provided in good faith as recommendations only, and are based on data which Hellenic Petroleum SA has available on the above date. They do not supersede or replace required documents by National or European Legislation. However, Hellenic Petroleum SA cannot guarantee their accuracy and validity and accepts no responsibility for any damage or loss that might arise in connection with the use of this material.