

Global Product Strategy (GPS) Safety Summary

Ethyl-tert-Butyl Ether (ETBE)

This GPS Safety Summary is a high-level summary intended to provide the general public with an overview of product safety information on this chemical substance. It is not intended to provide emergency response, medical or treatment information, nor to provide an overview of all safety and health information. This summary is not intended to replace the Safety Data Sheet. For detailed guidance on the use or regulatory status of this substance, please consult the Safety Data Sheet and the Product Stewardship Bulletin (PSB).

Chemical Identity

Name: Ethyl-tert-Butyl Ether (ETBE)
Brand names: Ethyl-tert-Butyl Ether (ETBE)
Chemical name (IUPAC): Tert-butyl ethyl ether
CAS number: 637-92-3
EC number: 211-309-7
Molecular formula: C₆H₁₄O

Uses and Applications

ETBE has many properties which make it a good gasoline blending component for cleaner burning 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 VOCs (Volatile Organic Compounds) and PM (particulates). Reducing these pollutants improves air quality.

As an octane enhancer, ETBE is an effective replacement for aromatics in gasoline.

Physical / Chemical Properties

ETBE is a pale yellow liquid with a characteristic terpene-like odor. The liquid is lighter than water, but moderately soluble in water (16.4 g/l), while vapors are heavier than air. Based on the boiling point of 73°C (163°F) and the flash point of -19°C (-2°F), ETBE is classified as a highly flammable liquid under the Globally Harmonized System on classification and labeling (GHS).

Health Effects

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 (commonly observed with short-chain ether exposure) are observed with exposure to high levels, for which it has been classified under GHS. 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	Low acute toxicity but narcotic effects possible at very high concentrations
Irritation / corrosion Skin / eye/ respiratory tract	Non-irritating to the eye and skin
Sensitization	Not considered to be sensitizing
Toxicity after repeated exposure Oral / inhalation / dermal	Effects on liver, clinical chemistry and haematological parameters at exposures of > 500 ppm (inhalation) or > 121 mg/kg bodyweight (oral)
Genotoxicity / Mutagenicity	Not mutagenic / genotoxic
Carcinogenicity	Not considered to be a human cancer concern
Toxicity for reproduction	No adverse effects on fertility and not selectively toxic to the fetus

Environmental Effects

ETBE is inherently biodegradable under certain conditions in aquatic aerobic environments,

Overall ETBE is 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	Not bio-accumulative
PBT / vPvB conclusion	Not considered to be either PBT or vPvB.

PBT = Persistent, Bio-accumulative and Toxic in the environment.

vPvB = very Persistent and very Bio-accumulative in the environment.

Exposure

Human health

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.

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

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

Industry use, production and formulation

For detailed guidance on the use of ETBE, the Safety Data Sheet should be consulted.

ETBE should only be handled by knowledgeable and trained personnel.

When using chemicals make sure that there is adequate ventilation. Always use appropriate chemical-resistant gloves to protect hands and skin, always wear eye protection such as chemical goggles and always wear flame-retardant clothing. Do not eat, drink, or smoke where chemicals are handled, processed, or stored. Wash hands and skin following contact. If the substance gets into the eyes, rinse eyes thoroughly for at least 15 minutes with tap water and seek medical attention.

In the case of transfer or maintenance operations, always 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 may be necessary, such as the use of a complete suit protecting against chemicals and supplied air, a self-contained breathing apparatus or respirator.

Consumer use

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.

Environmental

In case of accidental release or spill, clear the spill immediately and do not allow the product to enter sewers, surface water or ground water.

Regulatory Information / Classification and Labeling

This substance has been registered under REACH by relevant companies of LyondellBasell in the European Union.

For a detailed overview of the regulatory status of this substance, please refer to the Product Stewardship Bulletin available from the LyondellBasell corporate website.

Under the Globally Harmonized System on classification and labeling (GHS) substances are classified according to their physical, health and environmental hazards. The hazards are communicated via specific labels on the product packaging and the Safety Data Sheet. GHS attempts to standardize hazard communication so that the intended audience (workers, consumers, transport workers, and emergency responders) can better understand the hazards of the chemicals in use.

For a detailed overview of the classification and labeling of this substance, please refer to the regional Safety Data Sheet, which can be found on the LyondellBasell corporate website.

Conclusion Statements

- ETBE has many properties which make it a good gasoline component for cleaner burning and more sustainable 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 observing the appropriate Risk Management Measures, the ETBE concentrations to be expected at workplaces and to the general public/consumer are below the recommended exposure limits.

Contact Information within Company

For further information on this product in general, please consult the LyondellBasell corporate website (www.lyb.com).

Date of issue

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Disclaimer

Before using a product sold by a company of the LyondellBasell family of companies, users should make their own independent determination that the product is suitable for the intended use and can be used safely and legally.

SELLER MAKES NO WARRANTY; EXPRESS OR IMPLIED (INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY WARRANTY) OTHER THAN AS SEPARATELY AGREED TO BY THE PARTIES IN A CONTRACT.

This product(s) may not be used in:

- (i) any U.S. FDA Class I, Health Canada Class I, and/or European Union Class I medical devices, without prior notification to Seller for each specific product and application; or
- (ii) the manufacture of any of the following, without prior written approval by Seller for each specific product and application: U.S. FDA Class II Medical Devices; Health Canada Class II or Class III Medical Devices; European Union Class II Medical Devices; film, overwrap and/or product packaging that is considered a part or component of one of the aforementioned medical devices; packaging in direct contact with a pharmaceutical active ingredient and/or dosage form that is intended for inhalation, injection, intravenous, nasal, ophthalmic (eye), digestive, or topical (skin)

administration; tobacco related products and applications, electronic cigarettes and similar devices, and pressure pipe or fittings that are considered a part or component of a nuclear reactor. Additionally, the product(s) may not be used in: (i) U.S. FDA Class III Medical Devices; Health Canada Class IV Medical Devices; European Class III Medical Devices; (ii) applications involving permanent implantation into the body; (iii) life-sustaining medical applications; and (iv) lead, asbestos or MTBE related applications. All references to U.S. FDA, Health Canada, and European Union regulations include another country's equivalent regulatory classification.

Users should review the applicable Safety Data Sheet before handling the product.

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