Cleaner Fuels for Latin America with MTBE and ETBE Advanced Gasoline Components
LyondellBasell has been a pioneer in the development of gasoline components based on tertiary butyl alcohol (TBA). Since the 1970s, these components have been incorporated into gasoline to help meet increasing standards for cleaner burning fuels. Further improvements in air quality and engine performance will require cleaner-burning fuels with lower metal, sulfur, and aromatic contents and improved compatibility with other gasoline components.

LyondellBasell offers methyl tertiary butyl ether (MTBE) and ethyl tertiary butyl ether (bio-ETBE) to improve fuel efficiency and air quality. Both MTBE and bio-ETBE are fully compatible with the existing fuel infrastructure in Latin America.

**Fuel Ethers Are The Answer to Latin America’s Energy & Air Quality Challenges**

**MTBE Delivers Cost-Effective Energy and Improved Air Quality**
- Provides high octane & improved engine performance
- Provides formulation flexibility for refiners
- Helps lower gasoline sulfur & aromatic content
- Improves combustion to reduce tailpipe emissions
- Helps meet low vapor pressure standards to reduce fugitive emissions

**ETBE is the First Choice for Renewable Bio-Fuels**
- Provides 3 times more energy than ethanol*
- Contributes twice the octane value of ethanol*
- Replaces 10 vol.% more aromatics in gasoline*
- Does not absorb water, cause engine damage, or form azeotropes with gasoline components
- Reduces tailpipe hydrocarbon and PM emissions

*at the same oxygen specification
MTBE is the #1 Fuel Ether Globally and a Great Fit for Latin America

MTBE fits perfectly in the existing gasoline infrastructure in Mexico, Asia, Europe, and Latin America. MTBE can be blended directly at the refinery and shipped via pipeline or vessel to local terminals. No separate blending or transportation assets are needed, resulting in lower capital and logistic costs and air pollution.

**Cost-Effective Energy & Octane**
- High octane index
- High energy content vs. ethanol
- 8% more can be blended in fuel

**Fuel Formulation Flexibility**
- Zero sulfur
- Zero aromatics
- Low RVP = more butane

**Available Globally**
- Produced and used by PEMEX in Mexico
- Produced and traded globally
- New LyondellBasell capacity announced on the US Gulf Coast

**Compatible with Gasoline**
- Will not phase separate
- Can be blended at the refinery
- Finished fuel transportable by pipeline and vessel*

*Alcohols must be blended at terminal and shipped by truck to gas station
MEXICO: A 20-Year Success Story
Pollutant Reduction Since MTBE Introduction

1992 - UN declares Mexico City “Most Polluted in the World”

1993 - Mexico chooses MTBE to reduce pollution in all Metropolitan Zones (MZs)

2013 - Key air quality factors significantly reduced despite a doubling of the number of vehicles on the road
MTBE: A Key to Future Air Quality Improvements

MTBE allows refiners to meet stricter specifications for sulfur, aromatics, and RVP, all of which have been shown to significantly improve air quality.

MTBE also improves octane and fuel combustion which improves fuel efficiency and reduces tailpipe emissions especially during cold starts.

**Cleaner Burning Fuels**
- Lower Fuel RVP*
- Improved cold start combustion
- Less sulfur
- Less aromatic content
- Improved distillation properties
- Better overall combustion

**Improve Air Quality**
- Keeps evaporative emissions low
- Less CO from older vehicles
- Improved converter efficiency
- Lowers PM and Ozone formation
- Better fuel efficiency
- Lower overall pollution
Bio-ETBE: The First Choice in Renewable Biofuels

- ETBE is a renewable gasoline component made from bio-ethanol and natural gas
- ETBE is used throughout Europe and in Japan as the preferred bio-fuel
- ETBE is compatible with MTBE and provides improved octane and RVP

ETBE provides significant advantages over ethanol:

- **3X** more energy*
- **2X** the octane*
- **5X** lower Blending Vapor Pressure (BRVP)
- **10%** less aromatics in gasoline*

- **Fully Compatible** with fuel infrastructure
- **Low Water Sensitivity** no phase separation
- **No Azeotropes** with gasoline components
- **Lower hydrocarbon and PM emissions**

*at the same oxygen content
## MTBE & ETBE Properties Close to Gasoline

### MTBE and ETBE: Optimal Properties For Octane Blending

- Higher octane than aromatics
- Low RVP, no waivers needed
- Excellent distillation properties
- Higher energy than alcohols
- Low water affinity
- Lower oxygen than alcohols
Additional Information


8. The European Fuel Oxygenates web site: http://www.efoa.eu


10. MTBE product information: http://www.lyondellbasell.com/Products/ByCategory/refining/MethylTertiaryButylEther

11. ETBE product information: http://www.lyondellbasell.com/Products/ByCategory/refining/EthylTertiaryButylEther/index.htm

About LyondellBasell

LyondellBasell is one of the world’s largest plastics, chemical and refining companies. We are the largest producer of polypropylene and polypropylene compounds; a leading producer of propylene oxide, polyethylene, ethylene and propylene; a global leader in polyolefins technology; and a producer of refined products, including biofuels.

LyondellBasell products and technologies are used to make items that improve the quality of life for people around the world including packaging, electronics, automotive components, home furnishings, construction materials and biofuels.

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). LyondellBasell prohibits or restricts the use of its products in certain applications. This product is highly volatile, partially water soluble and has only a minimal tendency to adhere to soil particles. Even small volumes can pose a threat to the environment and nearby water resources. For further information on restrictions or prohibitions of use, please contact a LyondellBasell representative.

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

U.S. Patent and Trademark Office.
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