

Ethanol as a transportation fuel and an additive

- Ethanol is more oxygenated compared to gasoline – disadvantage
- Its combustion generates less energy.
- Occupies a larger volume
- High octane number – Why is it important? – high engine efficiency
- Ethanol combustion generates increased volume of combustion products per unit energy.
- E10 requires no modifications to standard gasoline engines.
- Ethanol revolution in Brazil- Program -Pró-Álcool- ([Portuguese](#): Programa Nacional do Álcool), launched in 1975, was a nationwide program financed by the government to phase out automobile fuels derived from fossil fuels, such as gasoline, in favor of ethanol produced from sugar cane.
- In 1980, PROALCOOL: sales of alcohol powdered vehicles reached 96% of total sales in 1980.
- Fiat, VW, MB, GM and Toyota produced 250 000 EtOH powdered cars in 1980 and 350 000 in 1982.
- 1993- a law passed that all gasoline sold in Brazil would have a minimum of 20% ethanol by volume.
- Currently 86% of the fuels used comprises 51-83% ethanol.
- Ethanol's tendency to separate from gasoline in the presence of water currently prevents gasoline-ethanol blends from being shipped through pipelines, causing ethanol to be transported primarily by rail at up to four times the cost of products shipped by pipeline. A water concentration of 1% will cause ethanol to separate from gasoline in E85 blends, while just 0.5% is sufficient in E10 gasoline.

BIOREFINERY APPROACH

Similar to current petroleum refineries, a biorefinery aims to integrate various biomass conversion technologies to separate biomass resources into its building blocks and process these separate fractions to obtain a variety of products (i.e., fuels and chemicals) with maximum efficiency.

Biorefineries are expected to become energy- and cost-competitive with petroleum refineries, when lignocellulosic biomass, which does not compete with food resources, can be utilized in a manner that makes the most value of its three different constituents: cellulose, hemicellulose, and lignin. Two approaches have been exploited for this purpose. The three portions are processed together in the first approach through strategies like gasification and pyrolysis, offering simplicity of operation, and lower operating costs. The alternative approach is to separate the three fractions of lignocellulose from each other by adopting various pretreatment strategies and process them separately.

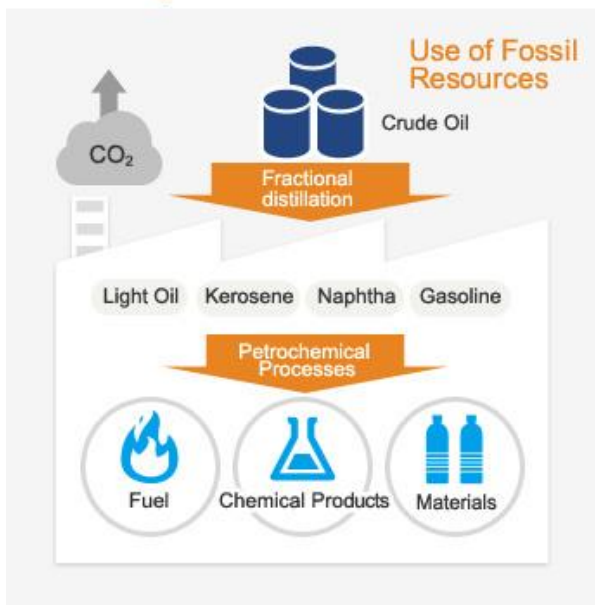
Benefits of biorefineries are:

- Security in energy
- Reduction in greenhouse gas emissions and benefits related to climate change
- Sustainable waste management
- Valuable chemicals co-production
- Economical development for rural areas

Challenges are:

- Production costs for energy crops
- Costs related to the biomass transportation
- Deforestation and problems about available land
- Food prices
- Feedstock's diversity
- Difficulties in subsidizing the facilities
- More research is required
- Biomass has a highly varying composition
- Higher oxygen content compared to petroleum

Oil Refinery



Biorefinery

