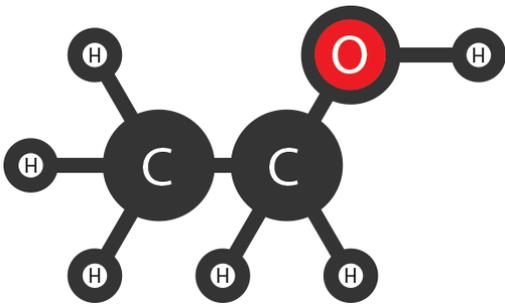


# FUEL TYPES

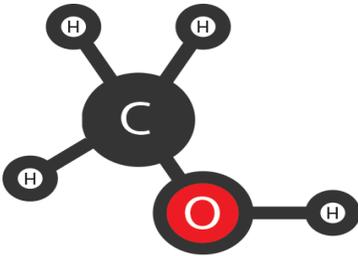


## Ethanol

This flammable, colorless liquid is made by the fermentation of sugars in certain plants. In the United States, most ethanol— some 14 billion gallons in 2014 — is made from corn. In Brazil, sugarcane is used.

Most of the gasoline we buy every day already contains ethanol – up to 10 percent. Adding ethanol to gasoline increases octane, which boosts engine power and performance.

Ethanol can be made from a variety of plants, including grasses, corn, and some varieties of cactus. Ethanol has less energy content than gasoline, but the engine efficiency gains from ethanol mean that it can cost less per mile to use.



## Methanol

This flammable, colorless liquid is the simplest alcohol. It is simpler and less expensive to process than ethanol. Anything that once was biomass can be converted to methanol for use as a fuel

such as coal, natural gas and farm waste. Unlike ethanol, methanol is toxic and not fit for humans to drink. It's used in making antifreeze, solvent and window cleaner. Racecar drivers use methanol because it has a higher octane and a lower flashpoint than traditional gasoline, making it safer in a crash.

## Gasoline

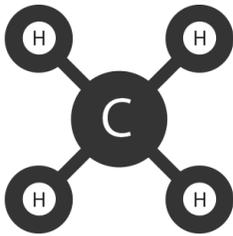
Only 19 gallons out of every 42-gallon barrel of crude oil ends up as gasoline. After being extracted from the ground, crude is shipped to an oil refinery, where it is heated and distilled into gasoline. Then it is blended with additives to boost its low octane. Although lead was used as an additive in the US, it was banned for causing brain damage. Most gasoline currently sold in the United States is blended with aromatics, ethanol, or some combination of the two to boost its octane rating.



# Diesel



Like gasoline, diesel fuel must be refined before it's ready for use, with approximately 12 gallons of diesel being made from every 42-gallon barrel of crude oil. While diesel is more efficient than gasoline and emits fewer greenhouse gases, diesel engines have trouble starting in cold weather and produce more NO<sub>x</sub>, one of the main components in smog.



## Natural gas

Methane (CH<sub>4</sub>) is the main component of natural gas, and it's often found in the same wells that bring up oil. Methane is a simple molecule that burns cleanly, and currently there's so much of it underground in the United States that oil drillers find it unprofitable to capture, so it's burned off into the atmosphere. As a fuel, methane, in its gas form, has to be compressed (CNG) to be used in vehicles.



## Hydrogen

The most common element on Earth, hydrogen (H<sub>2</sub>) is used as a transportation fuel when it's contained inside electrochemical cells. There are several types of "fuel cell" vehicles on the market, including the Mercedes F-Cell and Toyota's new Mirai. Hydrogen is pumped into the fuel cell as a gas, and when it ignites, it combines with oxygen to produce only water and heat, with zero toxic emissions. It is easy to detonate and burns very quickly. Leaks can be very dangerous. These vehicles are also much more expensive than vehicles that run on gasoline or alcohols.



## Biodiesel

This is vegetable oil that is processed to use in vehicles. Cold weather can cause the fuel to gel. Biodiesel replaces diesel fuel, not gasoline.