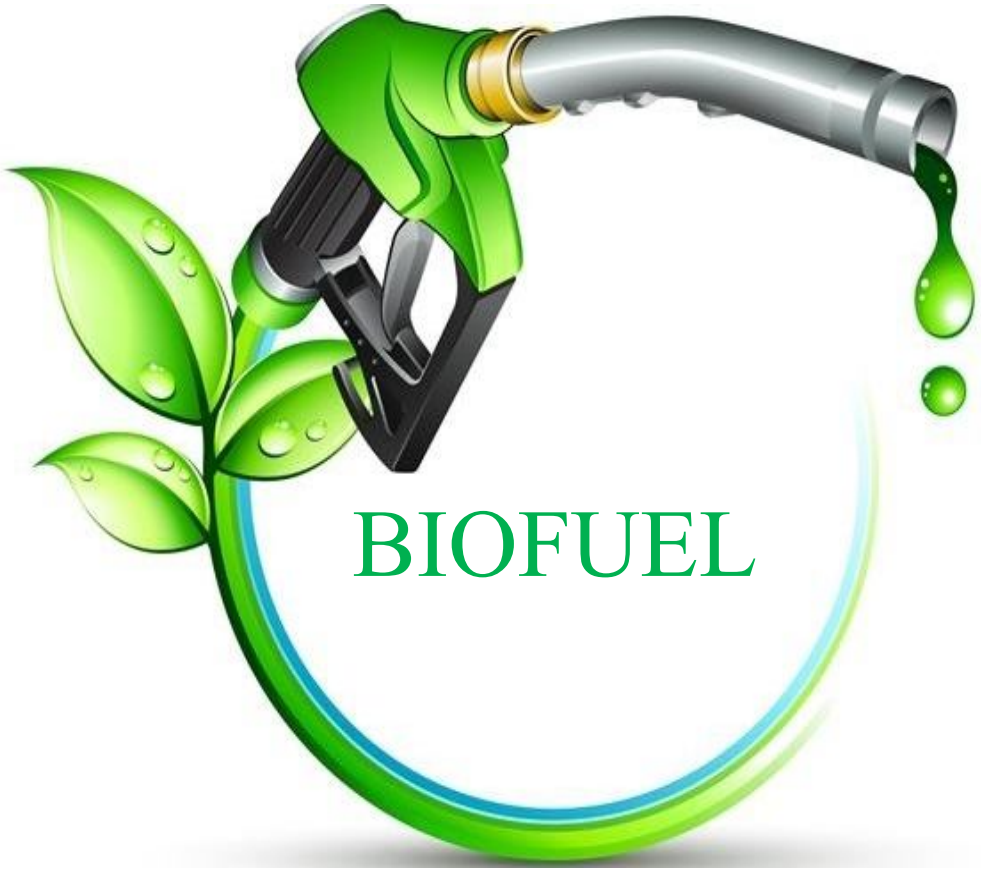


BIOFUEL

Iranian Oil,Gas and Petrochemical

Products Exporters' Union

Article — Research ☑

A fossil fuel is not considered renewable because it takes millions of years to form and thr users really can't wait that long. Biofuel, on the other hand, comes from biomass, which can be generated year after year through sustainable farming practices. This means biomass and biofuel are renewable (we can replace used biofuel over a very short period of time). It is important to note that 'renewable' energy must not be considered as 'green' energy. Renewable energy simply won't run out in a short period time, like biofuels, hydroelectric, wind, and solar. A "green" energy is one that is also good for the planet because it does not harm ecosystems, contribute to acid rain, or worsen global warming. Solar energy is a 'green' energy. All 'green' energies are considered renewable, but not all renewable energies are green. Biofuels are examples of renewable energy sources that aren't always green because they generate greenhouse gases.

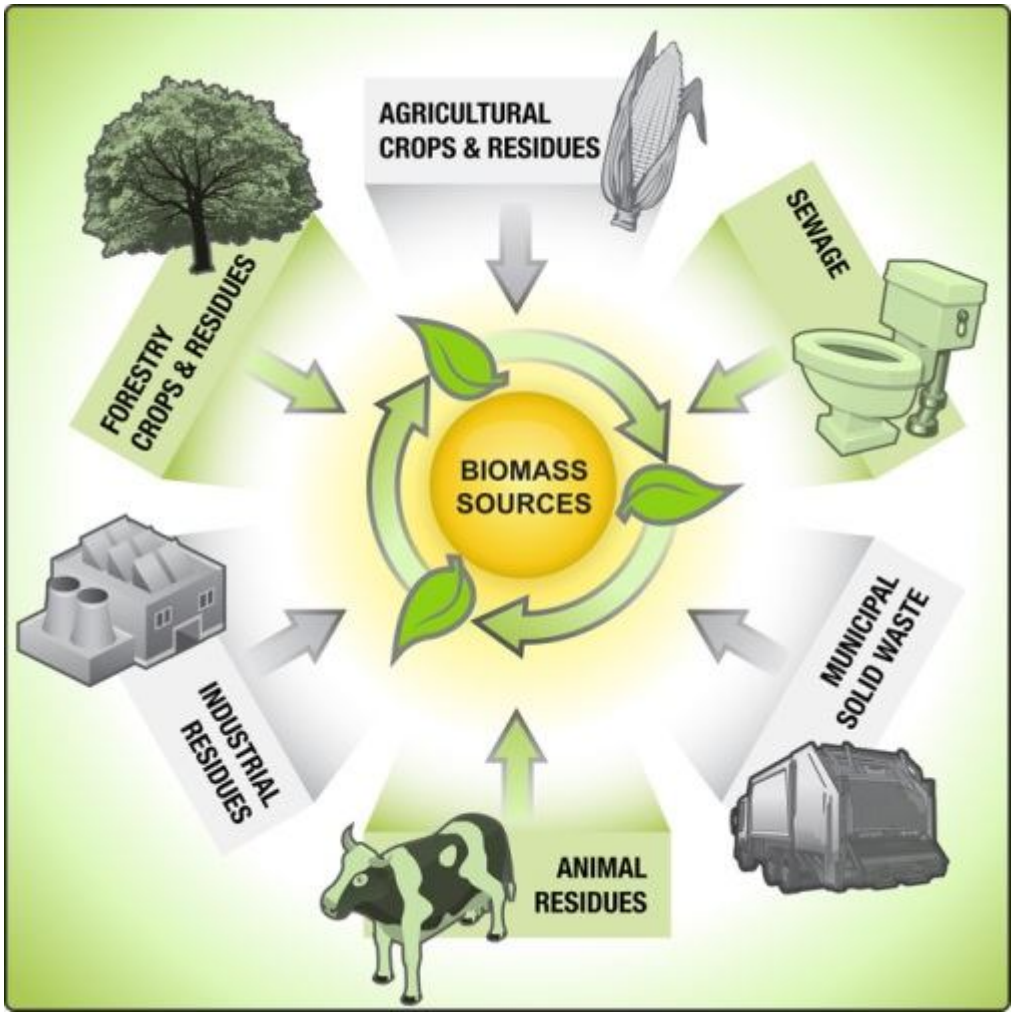
Biofuel

A biofuel is a kind of fuel that is produced through recent biological processes such as agriculture and anaerobic digestion, rather than a fuel produced by geological processes of formation of fossil fuels, such as coal and petroleum, from prehistoric biological substances. Biofuels can be derived directly from plants or indirectly from agriculture, commercial, domestic and / or industrial wastes. Renewable biofuels generally involve contemporary carbon fixation such as those that occur in plants or microalgae through the process of photosynthesis. Other renewable biofuels are made through the usage or conversion of biomass (referring as living organisms, most often referring as plants or plant-derived materials). This biomas can be converted to convenient energy containing substances in three different ways: thermal conversion, chemical conversion and biochemical conversion. Biomass conversion can be resulted in fuel in solid, liquid or gas form. This new biomass can also be used directly for biofuels. Bioethanol is an alcohol produced through fermentation,

mostly carbohydrates produced in sugar or starch crops such as corn, sugarcane or sweet sorghum. Cellulosic biomass derived from non-food sources such as trees and grasses, is also being developed as a feed stock for ethanol production. Ethanol can be used as a fuel for vehicles in its pure form, but it is usually used as a gasoline additive to increase octane and improve vehicle emissions. Bio-ethanol is widely used in the USA and Brazil. Bio-diesel can be used as a fuel for vehicles in its pure form, but it is used as a diesel additive to reduce levels of particulates carbon monoxide and hydrocarbons from diesel-powered vehicles. Bio-diesel is produced from oils or fats using transesterification and it's the most common biofuel in Europe.

Biomass

Biomass is simply organic matter. In others words, it is dead material that was once living. Kernels of corn, mats of algae, and stalks of sugar cane are all biomass. Before global warming related to burning fossil fuels became a major factor in determining where energy came from, the major concern was that fossil fuels, which are considered limited in supply, would run out over the next century. If we could produce needed hydrocarbons through other way, and quickly, then we would meet our energy demands without much problem. This leads to one of the major noticeable factors between a biofuel and a fossil fuel - renewability.



Types of Biofuels

The chemical structure of biofuels can differ as the chemical structure of fossil fuels. For the most part, our interest is in liquid biofuels as they are easy to transport. The table on the other page compares various biofuels with their fossil fuel counterparts.

Biofuel	Fossil Fuel	Differences
Ethanol	Gasoline/Ethane	Ethanol has about half the energy per mass of gasoline, which means it takes twice as much ethanol to get the same energy. Ethanol burns cleaner than gasoline, however, producing less carbon monoxide. However, ethanol produces more ozone than gasoline and contributes substantially to smog. Engines must be modified to run on ethanol.
Biodiesel	Diesel	Has only slightly less energy than regular diesel. It is more corrosive to engine parts than standard diesel, which means engines have to be designed to take biodiesel. It burns cleaner than diesel, producing less particulate and fewer sulfur compounds.
Methanol	Methane	Methanol has about one third to one half as much energy as methane. Methanol is a liquid and easy to transport whereas methane is a gas that must be compressed for transportation.
Biobutanol	Gasoline/Butane	Biobutanol has slightly less energy than gasoline, but can run in any car that uses gasoline without the need for modification to engine components.

The chart above is only a limited list of the available biofuels, covering only the most popular and widely used samples. Ethanol is found in almost all gasoline mixtures. In Brazil, gasoline contains at least 95% ethanol. In other countries, ethanol usually makes up between 10 and 15% of gasoline.

Biofuel versus Fossil Fuel

Biofuels are not new. In fact, Henry Ford had originally designed his Model T to run on ethanol. There are several factors that decide the balance between using biofuel or fossil fuel around the world. Those factors are cost, availability, and food supply. All three factors listed above are actually interrelated. To begin, the availability of fossil fuels has been of concern almost from day one of their discovery. Pumping fuel from the ground is a difficult and expensive process, which adds greatly to the cost of these fuels. Additionally, fossil fuels

are not renewable, which means they will run out at some point. As our ability to pump fossil fuels from the ground diminishes, the available supply will decrease, which will inevitably lead to an increase in price. It was originally thought that bio-fuels could be produced in almost limitless quantity because they are renewable. Unfortunately, our energy needs far out-pace our ability to grown biomass to make bio-fuels for one simple reason, land area. There is only so much land fit for farming in the world and growing bio-fuels necessarily detracts from the process of growing food. As the population grows, our demands for both energy and food will grow. At this point, we do not have enough land to grow enough bio-fuel and enough food to meet both needs. The result of this limitation has an impact on both the cost of bio-fuel and the cost of food. For wealthier countries, the cost of food is less of an issue. However, for poorer nations, the use of land for bio-fuels, which drives up the cost of food, can have a tremendous impact.

The balance between food and bio-fuel is what keeps the relatively simple process of growing and making bio-fuels from being substantially cheaper than fossil fuel. When this factor is combined with an increased ability (thanks to advances in technology) to extract oil from the ground, the price of fossil fuel is actually lower than that of bio-fuel for the most countries of the world.

variety of sources can be roughly divided into four categories of "generations:"

- First generation bio-fuels are made from sugars, starches, oil, and animal fats that are converted into fuel using already-known processes or technologies. These fuels include biodiesel, bio-alcohols, ethanol, and biogasses, like methane captured from landfill decomposition.
- Second generation biofuels are made from non-food crops or agricultural waste, especially ligno-cellulosic biomass like switch-grass, willow, or wood chips.

- Third generation biofuels are made from algae or other quickly growing biomass sources.
- Fourth generation biofuels are made from specially engineered plants or biomass that may have higher energy yields or lower barriers to cellulosic breakdown or are able to be grown on non-agricultural land or bodies of water.