



Alternative Fuels: An Introduction

Fuels are materials that are used to create energy. They may be burned or used up in other ways. For example, car engines burn gasoline to make energy. Oil is used for fuel. Oil is also known as *petroleum*. Fuels that come from oil are *petroleum products*. Some fuels do not come from petroleum. These other fuels are known as *alternative fuels*. They provide a different way to get energy. Some alternative fuels are natural gas, propane, hydrogen, biofuels, and alcohol. The sun, water, and wind can also be used to create energy.

Global Energy Crisis

Our energy use, or *consumption*, has been growing. Most of this energy comes from burning petroleum or other *fossil fuels*. Fossil fuels are oil, coal, and natural gas. Each year people buy millions of cars and other vehicles. Most run on petroleum products. There are about 230 million vehicles in the United States. That number grows every year. This means our need for oil is growing. Soon there will be less oil. Over time, there will be even less. Fossil fuels are *nonrenewable* sources of energy. It takes millions of years to create these fuels. Soon there will be a global energy crisis.

Vanishing Resources

Nonrenewable energy resources cannot be easily replaced by nature. Once they are used up, they are gone. Coal, oil, and natural gas take millions of years to form naturally. These resources are found inside the Earth. Nonrenewable resources are slowly vanishing from our planet.

The Need to Go Alternative

More global energy use has led to more demand for energy resources like oil. Most countries, like the United States, have to *import* oil. Also, burning oil gives off *greenhouse gases*. These gases, such as carbon dioxide, harm the environment. They could cause *global warming*. Using alternative fuels and natural renewable energy resources reduces these problems.





Vegetable Oil Versus Petroleum

Compared to petroleum, vegetable oil gives off:

- 100% less sulfur dioxide
- 78% less carbon dioxide
- 48% less carbon monoxide

Did you know?

Vegetable oil can be used as motor oil. This improves gas mileage by over 3%. It also reduces nitrogen oxide, which causes smog.

How to Use Vegetable Oil Properly and Safely

- Mix the vegetable oil with diesel fuel or gasoline and then use.
- Use vegetable oil in a special two-tank system. The oil is heated first and then used.

Extraordinary Vegetable Oil

Soaking your finger in vegetable oil for a few minutes can remove a splinter. It can even soften your feet. A few tablespoons of oil on water surfaces keeps mosquitoes away.



Peanut Oil

Peanut oil is a clear oil made from crushed peanuts. It can be used as an alternative fuel in diesel engines. Peanut oil is nontoxic, safe, and clean. It is also biodegradable and eco-friendly.



U.S. Peanut Production

The United States is producing more and more peanuts. Peanuts are grown in Virginia, the Carolinas, and the southwest. Peanuts need well-drained, light-colored, loose soil to grow. The soil has to have a lot of calcium.

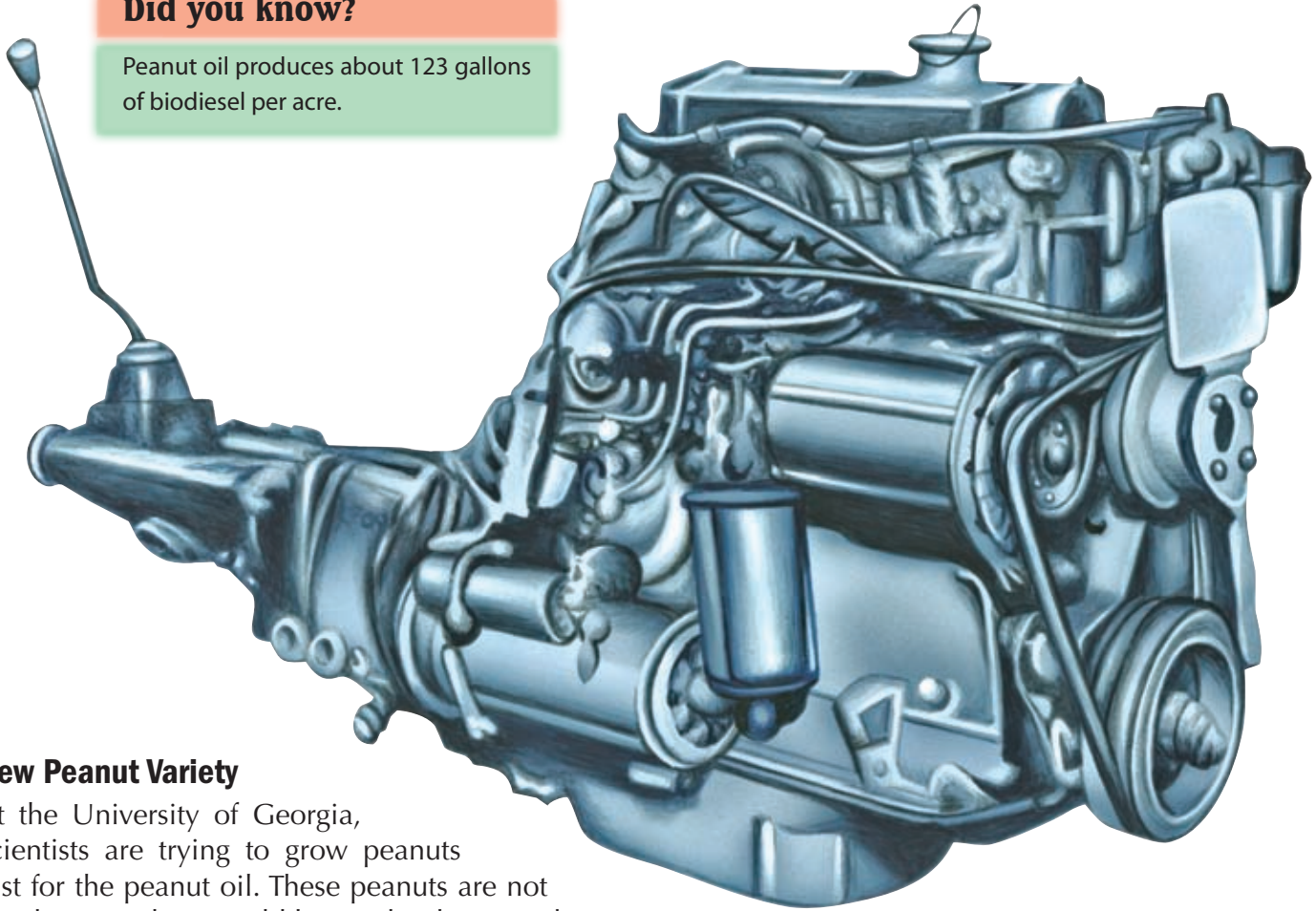
Disadvantages of Peanut Oil

Peanut oil costs more than other alternative fuels. Peanut oil does not work well in the cold. Peanut oil can also harm parts of an engine. When not mixed right, peanut oil causes engines to give off more nitrogen oxide.



Did you know?

Peanut oil produces about 123 gallons of biodiesel per acre.



New Peanut Variety

At the University of Georgia, scientists are trying to grow peanuts just for the peanut oil. These peanuts are not good to eat. They would be used only to produce biodiesel. Growing these peanuts for oil would mean that other peanuts would not be used for biodiesel. This would keep peanuts available for cooking and eating.

Peanut Biodiesel and Fossil Fuel-Based Biodiesel

Peanut biodiesel can be mixed with fossil fuel-based biodiesel. Engines running on peanut oil get 2% to 5% fewer miles per gallon than engines running on fossil fuel-based biodiesel. This can be improved by changing diesel engines.

Rudolf Diesel

Rudolf Diesel was a German inventor and engineer. In 1892, he invented the diesel engine, which was named after him. He was interested in using vegetable oil or coal dust as fuel in his engines. He made the first engine that ran on peanut oil. He showed it at the World Exhibition in Paris in 1900.





Why use wood fuel?

Wood is a renewable resource. It gives off less carbon dioxide into the air. Wood fuel is cheaper than fossil fuels. Using more wood can create jobs and improve forest care. Wood fuel can be made near where it is used. Then it costs less to transport the fuel.

Wood in Africa

People in most parts of Africa use wood as a main form of energy in their homes. For example, in one area in South Africa, 80% of the people use wood as the only energy source for cooking and heating.

Did you know?

A unit of wood fuel is called a *cord*. One cord of wood fuel gives about 22,000,000 Btu (British thermal units) of heat. This is second only to coal.



Wood and the Environment

Wood fuel is better for the environment than fossil fuels. It gives off less carbon dioxide. Also, the smoke from burning wood is less harmful to the environment. Wood fuels also reduce the amount of sulfur and heavy metals in the air. These chemicals can cause acid rain.

Wood in Europe

Some countries in Europe, like Sweden and Austria, use wood to generate electricity. In Finland, people use wood waste, such as pellets, to produce energy for homes and companies.



Biodiesel



Biodiesel is an alternative fuel. It is made from vegetable oils or animal fats mixed with alcohol. Biodiesel can be used as fuel in diesel vehicles. Diesel engines usually do not need to be changed to use biodiesel. In the United States, most biodiesel is made from soybean oil. Many companies make biodiesel from used oils, fats, and even grease. Biodiesel can be used alone or mixed with diesel.



Why biodiesel?

Biodiesel is an environmentally friendly, biodegradable, and nontoxic alternative fuel. It burns cleanly. It produces fewer *pollutants* such as carbon monoxide, particulates, and hydrocarbons. Pollutants are materials that can harm the environment. Biodiesel contains no sulfur. It also smells better and produces less black smoke.

Producing Biodiesel

Biodiesel is made from oils or fats. Oils and fats are chemicals that have carbon and hydrogen in them. The oils and fats are *hydrocarbons*. To make biodiesel, first the oils or fats are filtered. This cleans them. Then they are mixed with an alcohol. A *catalyst* such as sodium or potassium hydroxide is then added. A catalyst speeds up a chemical reaction. The catalyst does not become part of the biodiesel. It just makes it form faster. The final product from the chemical reaction is a biodiesel fuel.



Heating Oil

Biodiesel is becoming more popular as a heating oil. Many Americans use biodiesel instead of household heating oil. It costs less than conventional heating oil.

Labeling Biodiesel

The letter “B” along with a number is used to label biodiesel fuel. The number is the percentage of biodiesel in the mixture of biodiesel and petroleum. For example, a mixture of 40% biodiesel and 60% petroleum is labeled B40. The most common biodiesel fuel is B20.



Biodiesel Versus Fossil Fuels

Compared to fossil fuel, biodiesel releases:

- 50% less hydrocarbon
- Fewer sulfur oxides and sulfates
- 50% less carbon monoxide
- 75% to 85% fewer chemicals that cause cancer

Did you know?

The National Biodiesel Board reports that the United States produces around 75 million gallons of biodiesel every year.



Biomass

*B*iomass is organic material that comes from plants and animals. It can be used as a fuel. It is a clean and renewable energy resource. Biomass can also be used to produce heat and electricity.

Applications of Biomass Energy

- Biomass is used as an alternative source of energy. Cattle dung is used in India to produce *biogas*, which is used in cooking.
- Wood, the most common biomass, is used for room heating and cooking.
- Biomass is used in homes for fireplaces, hot water heating, and space heating. It is also used in industries to make electricity.



What is biomass made of?

- *Wood residues* are the parts left after wood is cut to be used for other things, such as building materials. Wood chips, sawdust, and shavings are wood residues.
- *Agricultural residues* are left from farming activities. They include pieces of crops left after the harvest. They also include vegetable or food-processing residues and livestock slurry.
- *Energy crops* are grown to be a source of biomass. Some grasses, fast-growing tree crops, and cereal crops are grown just to become biomass fuel.

Why use biomass?

Biomass helps reduce global warming and acid rain. It gives off less carbon dioxide and sulfur dioxide. Carbon dioxide is a greenhouse gas that causes global warming. Sulfur dioxide causes acid rain. The use of biomass also reduces the demand for petroleum imported from other countries.

How much biomass is used for energy today?

Biomass is the fourth-largest source of energy after coal, oil, and natural gas. Most of the biomass is used in the pulp and paper industries. Only 7% of the biomass produced each year is used by the total world population.

Did you know?

One pound of dry plant mass can produce as much energy as a half pound of coal.



Biomass Materials

Used to Produce Electricity

- Leftover sawmill wood
- Leftover paper and wood waste from paper mills
- Farm waste such as corn stalks, corn cobs, and seed corn
- Paper and cardboard that cannot be recycled
- Fast-growing crops and trees