

Energy Conservation And Alternative Fuel

ENERGY CONSERVATION AND **ALTERNATIVE FUEL**

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What Are Alternative Fuels

In the simplest form, an alternative fuel is one that is not produced by using crude oil. They are simply fuels that replace conventional gasoline as a means of powering vehicles. Alternative fuels have desirable energy efficiency and pollution reduction features. The 1990 Clean Air Act encourages development and sale of alternative fuels.

More specifically, the Energy Policy Act (EP Act) of 1993 gave a more in-depth definition of what they consider to be alternative fuels. The United States Department of Energy recognizes the following as alternative fuels:

- Mixtures containing 85% or more by volume of alcohol fuel, including methanol and denatured ethanol
- Natural gas (compressed or liquefied)
- Liquefied petroleum gas (propane)
- Hydrogen
- Coal-derived liquid fuels
- Fuels derived from biological materials
- Electricity (including electricity from solar energy)
- 100% Biodiesel (B100)

Pure biodiesel (B100) is considered an alternative fuel under EP Act. Lower-level biodiesel blends are not considered alternative fuels, but covered fleets can earn one EP Act credit for every 450 gallons of B100 purchased for use in blends of 20% biodiesel or higher.

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Through the Alternative Fuel Petition Program, third parties can petition the Department of Energy to add alternative fuels to the above list. People are always on the lookout for new ways to combat rising fuel prices and develop fuels that are not only good for the environment, but for the consumer's checkbook as well.

Basically, alternative fuels include methane, propane, ethanol, and compressed gas among others. We'll examine some of these a little later in the book, but alternative fuels don't fall into one compact category other than the one that defines them as an option over gasoline.

It's kind of exciting to think about the fact that we can now power our vehicles using things like vegetable oil, animal fats, and even wood! It brings to mind the movie "Back to the Future" where Doc would power his DeLorean time machine using garbage as fuel!

Why Are Gas Prices So High

There are three main grades of gasoline: regular, mid-grade, and premium. Each grade has a different octane level. Price levels vary by grade, but the price differential between grades is generally constant.

The cost to produce and deliver gasoline to consumers includes the cost of crude oil to refiners, refinery processing costs, marketing and distribution costs, and finally the retail station costs and taxes. The prices paid by consumers at the pump reflect these costs, as well as the profits (and sometimes losses) of refiners, marketers, distributors, and retail station owners.

In 2005 the price of crude oil averaged \$50.23 per barrel, and crude oil accounted for about 53 percent of the cost of a gallon of regular grade gasoline. In comparison, the average price for crude oil in 2004 was \$36.98 per barrel, and it composed 47 percent of the cost of a gallon of regular gasoline. The share of the retail price of regular grade gasoline that crude oil costs represent varies somewhat over time and among regions.

Federal, State, and local taxes are a large component of the retail price of gasoline. Taxes (not including county and local taxes) account for approximately 19 percent of the cost of a gallon of gasoline. Within this national average, Federal excise taxes are 18.4 cents per gallon and State excise taxes average about 21 cents per gallon. Also, eleven States levy additional State sales and other taxes, some of which are applied to the Federal and State excise taxes.

Additional local county and city taxes can have a significant impact on the price of gasoline. Refining costs and profits comprise about 19 percent of the retail price of gasoline. This component varies from region to region due to the different formulations required in different parts of the country.

Distribution, marketing and retail dealer costs and profits combined make up 9 percent of the cost of a gallon of gasoline. From the refinery, most gasoline is shipped first by pipeline to terminals near consuming areas, and then loaded into trucks for delivery to individual stations.

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Some retail outlets are owned and operated by refiners, while others are independent businesses that purchase gasoline for resale to the public. The price on the pump reflects both the retailer's purchase cost for the product and the other costs of operating the service station. It also reflects local market conditions and factors, such as the desirability of the location and the marketing strategy of the owner.

Because gasoline is made of crude oil, the biggest reason for the fluctuation in gas prices has to be the price of that crude oil. Essentially, crude oil prices are determined by supply and demand. However, world events can certainly affect the price of crude oil. The price on a barrel of oil rose sharply during the following world events:

- The Arab oil embargo in 1973
- The Iranian revolution in 1978
- The Iran/Iraq War in 1980
- The Persian Gulf Conflict in 1990
- The Iraq War currently being fought today

The turmoil occurring in these countries during these difficult times certainly affected production of oil and thus affected oil prices as well.

Believe it or not, even environmental and weather problems can affect gas prices. When Hurricane Katrina hit in 2005, some crucial oil refineries located in the region were devastated. That meant that oil had to be refined elsewhere and then transported. This increased fuel costs with the distance involved during this process.

Alternative Fuel Vehicles

There are two types of alternative fuel vehicles – those that are originally designed to run on these new fuels and those that have been converted to run on alternative fuels. Car companies will also make hybrid vehicles that can run on either gasoline or other fuels. Many people call these cars “green vehicles” because of their positive effect on the environment.

Since the trend is toward producing and buying environmentally friendly vehicles, nearly every major car manufacturer has at least one green vehicle in their inventory. We’re relatively sure that as alternative fuels become more and more popular because of the cost and the positive effects on our environment, the number of green vehicles will dramatically increase in the next few years.

As of 2006, here is a list of some of the green vehicles manufactured by some of the major car companies:

- Honda Insight
- Honda Accord Hybrid
- Dodge Ram Pickup 1500 Series
- Dodge Stratus Sedan
- Dodge Durango SUV
- Dodge Caravan Minivan
- Ford Taurus
- Ford F-150 Pickup
- Ford Escape SUV
- GM Impala
- Chevrolet Silverado 4 x 2
- Chevrolet Tahoe SUV
- Chevy Yukon SUV
- Nissan Titan Pickup
- Toyota Highlander SUV
- Toyota Prius

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Many of the vehicles listed above are hybrid vehicles which mean that they can run on both conventional gasoline as well as alternative fuels. As we said, the above list is for 2006 vehicles. The list for 2007 is much larger.

There are also two other types of AFVs that are becoming more and more popular. First, there is the electric vehicle. This car is exactly what it says it is. You plug it into an electrical outlet to charge the battery and then drive without using any fuel at all. However, these vehicles are generally not meant to travel at high speeds.

A second type of AFV is the fuel cell vehicle. These cars get electrical energy from a fuel cell instead of from a battery. There are different kinds of fuel cell vehicles, but most manufacturers prefer cells that use a proton exchange membrane that uses hydrogen to produce an electrical current to run the motor. The only type of exhaust with this type of vehicle is water – believe it or not!

Besides the obvious advantages to owning an AFV, the government is also stepping in to make it even more advantageous. People who buy these types of vehicles are given tax breaks on their income taxes. Additionally, many states also offer incentives and car manufacturers even offer rebates or discounts.

Gasoline And Oil

In the United States and the rest of the industrialized world, gasoline is definitely a vital fluid. It is as vital to the economy as blood is to a person. Without gasoline and diesel fuel, the world as we know it would grind to a halt. The U.S. alone consumes about 130 billion gallons of gasoline per year!

This could get a little technical here, but we think it's important. Gasoline is known as an aliphatic hydrocarbon. In other words, gasoline is made up of molecules composed of nothing but hydrogen and carbon arranged in chains. Gasoline molecules have from seven to 11 carbons in each chain.

When you burn gasoline under ideal conditions – meaning with plenty of oxygen - you get carbon dioxide from the carbon atoms in gasoline, water from the hydrogen atoms, and lots of heat. A gallon of gasoline contains about 132×10^6 joules of energy, which is equivalent to 125,000 BTU or 36,650 watt-hours.

To illustrate this concept, consider the following:

- If you took a 1,500-watt space heater and left it on full blast for a full 24-hour day, that's about how much heat is in a gallon of gas.
- If it were possible for human beings to digest gasoline, a gallon would contain about 31,000 food calories -- the energy in a gallon of gasoline is equivalent to the energy in about 110 McDonald's hamburgers!

Now, stick with us through this next part! It can get a little confusing!

Gasoline is made from crude oil. The crude oil pumped out of the ground is black liquid called petroleum. This liquid contains hydrocarbons, and the carbon atoms in crude oil link together in chains of different lengths.

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It turns out that hydrocarbon molecules of different lengths have different properties and behaviors. For example, a chain with just one carbon atom in it (CH_4) is the lightest chain, known as methane. Methane is a gas so light that it floats like helium. As the chains get longer, they get heavier.

The first four chains -- CH_4 (methane), C_2H_6 (ethane), C_3H_8 (propane) and C_4H_{10} (butane) -- are all gases, and they boil at -161, -88, -46 and -1 degrees F, respectively. The chains up through $\text{C}_{18}\text{H}_{32}$ or so are all liquids at room temperature, and the chains above C_{19} are all solids -- such as fats - at room temperature.

The different chain lengths have progressively higher boiling points, so they can be separated out by distillation. This is what happens in an oil refinery -- crude oil is heated and the different chains are pulled out by their vaporization temperatures.

The chains in the C_5 , C_6 and C_7 range are all very light, easily vaporized, clear liquids called naphthas. They are used as solvents. Cleaning products can be made from these liquids, as well as paint solvents and other quick-drying products.

Environmental Damage

It took over 200 million years for the oil beneath the earth's surface to form. In the past 200 years, we have already used half of that reserve. If current rates of consumption continue, the world's remaining oil would be used up in 40 years.

Right now, two-thirds of the oil used around the world powers transportation vehicles, and half goes to passenger cars and light trucks. Being conscious of our fuel use will help to conserve resources for future generations.

Transportation involves the combustion of fossil fuels to produce energy translated into motion. Pollution is created from incomplete carbon reactions, unburned hydrocarbons or other elements present in the fuel or air during combustion.

These processes produce pollutants of various species, including carbon monoxide, soot, various gaseous and liquid vapor hydrocarbons, oxides of sulphur and nitrogen, sulphate and nitrate particulates, ash and lead. These primary pollutants can, in turn, react in the atmosphere to form ozone, secondary particulates, and other damaging secondary pollutants. Combustion also produces carbon dioxide, the primary greenhouse gas.

These environmental concerns about the country's transportation habits have been studied extensively. The tailpipe emissions from cars and trucks account for almost a third of the air pollution in the United States.

Although smog is produced by many factors, including sunlight, temperatures, winds and "basin" effects the air pollution caused by transportation is a major contributor. In their Sprawl Report 2001, the Sierra Club graded the car and truck smog in America's 50 largest cities using data from the EPA.

The area containing New York City scored best, believe it or not, with a grade of C+, creating 54 pounds of smog from cars and trucks per person per year. Twelve of the top 50 cities earned a grade of F, including, surprisingly, Louisville, Kentucky, which has 137 pounds of smog from cars and trucks per person per year.

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The Clean Air Act of 1970 gave the U.S. Environmental Protection Agency broad authority to regulate motor vehicle pollution, and since then, emission control policies have become progressively more stringent. In addition, the EPA has published various fact sheets, such as "Your Car and Clean Air: What YOU Can Do to Reduce Pollution."

Global Warming

Former Vice President of the United States, Al Gore, has brought the issue of global warming to the forefront of people's minds with his Oscar winning documentary, "An Inconvenient Truth." While there are some people who have been concerned about global warming for years, but this movie helped make the phenomenon more "famous" if you will.

If you've never thought about global warming, consider the following facts:

- Since the 1970's, there has been a 100 percent increase in the intensity and duration of hurricanes and tropical storms.

- According to the U.S. Geological Survey predictions, by the year 2030, Glacier National Park will have no glaciers left at all.

- 400,000 square miles of the Arctic Sea have melted in the last thirty years. That is roughly the size of Texas and is threatening polar bear habitats.

- By the year 2050, 15 to 17 percent of animal and plant species will be wiped out by global warming

- The United States is the number one global warming polluter in the world.

- Six former United States Environmental Protection Agency leaders say that the U.S. isn't doing enough to reduce pollution that contributes to global warming. This is supported by the fact that the United States Congress has not passed one piece of legislation related to the reduction of global warming.

Basically, global warming is an observable progressive warming of the average temperature of the Earth over a period of time. While some people might think is a great thing envisioning mild winters, but the truth is that global warming is a disturbing phenomenon.

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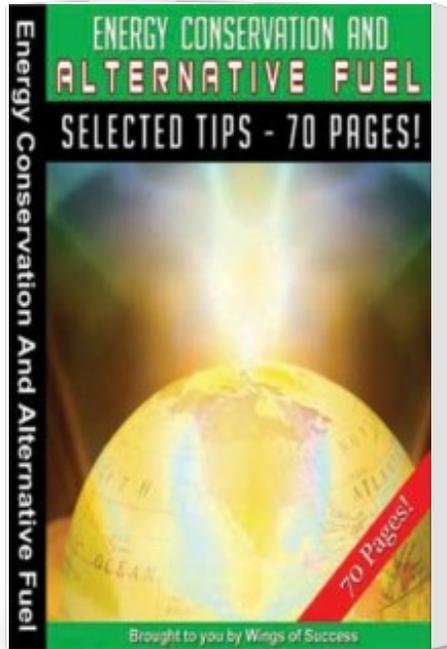
The rising temperatures can cause changes like rising sea levels, an increase in the frequency and intensity of severe weather, decreased agricultural yields, and glacial retreats and/or disappearances. Global warming is also projected to cause the eventual extinction of many plant and animal species as they struggle to survive in warmer climates that they aren't used to.

Global warming is caused mostly by the release of methane gas into the environment. Methane is a greenhouse gas that traps heat in the Earth's atmosphere. Methane gas is naturally released from arctic tundra and wetlands.

However, the biggest contributing factors toward global warming are man-made. Man-made causes bring about the most damage when considering the global warming trend.

Pollution is one of the biggest man-made problems. Pollution comes in many shapes and sizes. Burning fossil fuels is one thing that causes pollution. Fossil fuels are fuels made of organic matter such as coal, or oil. When fossil fuels are burned they give off a green house gas called carbon dioxide (CO₂).

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