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# Understanding Your Alternative Fuel Choices

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# Chapter 1

## Introduction

With the price of gasoline now more expensive than ever and with no sign of any relief in sight people are now paying almost double what they were just two short years ago.

Many people are obviously concerned and unsure about what they should do in the future. People can't afford to continue paying these prices and higher as well as the direct cost it also has on goods in the supermarket. Most people, especially those with families, still need a vehicle for regular day to day tasks and if not that, even just for emergencies.

Many people are showing an interest in alternative fuel vehicles as well as more fuel efficient vehicles that can get you where you need to go with less gas being used but still retaining many of the features that we have come to expect in a vehicle these days.

Can you believe that people are even able to [make their own biodiesel at home](#)...and it works..

There are a number of options when it comes to fuel efficient vehicles and a number of different variables when it comes to environmental effect of some of the alternative fuel choices.

Understanding the origins of each of the main fuels and what the plans are to improve on them and the potential for mass production will help you decide in the future which option is right for you.

## Chapter 2

### Alternative Fuel

Since burning fossil fuels like petroleum and diesel are known to increase greenhouse gas concentrations in the atmosphere and the increasing demand of fuels for vehicles and other uses, every one is in search of exploiting other modes of energy sources. As we know, the majority of the known petroleum reserves are located in the Middle East. It is said that worldwide fuel shortages could intensify the unrest that exists in the region, leading to further conflicts and wars. So it is inevitable to exploit other forms of energy. Alternative fuel (alternate fuel), also known as non-conventional fuel, is any material or substance that can be used as a fuel, other than fossil fuels, or conventional fuels of petroleum (oil), coal, propane, hydrogen, and natural gas.

Some of the common alternative fuels include biodiesel, ethanol, butanol, chemically stored electricity (batteries and fuel cells), hydrogen, methane, natural gas, wood, vegetable oil, biomass, and peanut oil. The term "alternative fuels" usually refers to a source of which energy is renewable. Renewable energy is the energy from renewable sources like wind power, solar power, tidal power, geothermal power, hydro power or thermal depolymerization. There is growing social interest, and an economic and political need for the development of alternative fuel sources. This is due to general concerns of sustainability, environmental, economic, and geopolitical reasons. Two major concerns are that of the rising cost of fossil derived fuels caused by an era of growing energy consumption and of what experts are quick to tell us is a global warming crisis. Either way, the smart thing to do is to invest in smarter technology anyway.

The major advantage of alternative fuel is that it burns cleaner than the traditional petroleum fuels. It also helps to reduce such emissions as carbon monoxide, organic compounds, nitrogen oxide, sulfur and particulate matter. Other

advantages of alternative fuels are that these fuel costs less, maintenance is cheaper and engines last longer. Most of the alternative fuels have greater conductivity and will increase the lubrication of engine parts depending on its performance.

One of disadvantages of alternative fuel is that it can be expensive to incorporate this technology into our already set up infrastructure. Compatibility is one of the major concerns of alternative fuels. The production of alternative fuels can have widespread effects. For example, the production of corn-based ethanol has created an increased demand for the feed stock, causing rising prices in almost everything made from corn. Whatever may be its advantages and disadvantages, due to the emerging needs of fuel, these renewable energy sources are better hope for us to solve the fuel crisis of the present and future.

## Chapter 3

### Biodiesel

Biodiesel is a renewable fuel produced from agricultural resources such as vegetable oils and it is a clean burning alternate fuel. Mostly, biodiesel is made from soybean oil; however canola oil, sunflower oil, recycled cooking oils and animal fats are also used. Biodiesel is made from the process called "esterification" in which industrial alcohol (ethanol or methanol) and a catalyst (substance that enables a chemical reaction) use to convert the base oil into biodiesel. In the initial stage of this process, biodiesel is known as "neat biodiesel" or B100. One of the advantages of biodiesel is that it can be blended with conventional diesel. Almost all the diesel engines can run on biodiesel without needing any special additional equipment.

Rudolf Diesel was the one who demonstrated a Diesel engine running on peanut oil built by the French Otto Company at the World Fair in Paris, France in 1900. Though it powered by peanut, that was not biodiesel. Lots of researches were done on biodiesel all through this time. But in 1977, Expedito Parente, a brazilin scientist produced biodiesel using transesterification with ethanol. In 1979, South Africa initiated the research into the use of transesterified sunflower oil and refining it to diesel fuel standards. By 1983, the process for producing fuel-quality, engine-tested biodiesel was completed and published internationally. Large number of Bio diesel plants were opened in many countries including Germany, Sweden and Czech Republic in the 90s.

It is proved that Vehicles have similar horsepower and torque as conventional diesel when running on biodiesel. The price of biodiesel blends can vary depending on geographic area, base material (corn, soybeans, etc.), and supplier. Biodiesel has many advantages over the conventional diesel. Biodiesel is harmless, eco-friendly and biodegradable. The biodiesel has a very high cetane number and this high cetane numbers of biodiesel assists to easy cold

starting and low idle noise. Other major advantage is that the life of diesel engines is extended with the biodiesel, because it is more lubricating and additionally, power output is comparatively unaltered by biodiesel. Finally, the eco-friendly biodiesel fuel substitutes the exhaust odor of petroleum diesel with a more pleasant smell of popcorn or French fries.

Now, biodiesel is slowly becoming available in almost all countries. In United States approximately 800 locations are serving the various blends of biodiesel. Price of the biodiesel is also low compared to other conventional petroleum products. As it is the eco friendly alternative fuel, it would be our main source of fuel in the near future.

## Chapter 4

### Biogas

Biogas is a type of gas that is formed by the biological breakdown of organic matter in an oxygen deficient environment. It is counted as an eco friendly biofuel. Biogas is an alternative fuel for powering vehicles as a substitute to petrol and diesel. Biogas is a mix mainly of methane and carbon dioxide and is produced naturally when organic matter decomposes in the absence of oxygen. Biogas is produced from Land filling and through anaerobic digestion. Depending on place where it is produced, biogas can also be called swamp gas, marsh gas, and landfill gas or digester gas.

Anaerobic digestion is one of the methods through which biogas is produced. Biogas can be produced utilizing anaerobic digesters. Here, the plants can be fed with energy crops such as maize silage or biodegradable wastes including sewage sludge and food waste; whereas, the landfill gas is produced by organic waste decomposing under anaerobic conditions in a landfill. Gobar Gas is the other form of biogas generated out of cow dung. This type of biogas is produced mainly in the households of India and Pakistan.

Biogas has many advantages over other alternative fuels. One of the main advantages of biogas is that the technology is cheaper and much simpler than those for other biofuels. Recovery of the methane is spontaneous as the gas automatically separates from the substrates. Dilute waste materials can be used as substrate. In the process of making biogas, organic pollutants are removed from the environment and used to generate useful biogas and this actually cleans the environment. Aseptic conditions are not needed for operation. Other advantage of biogas is that it will not produce any unpleasant odours. Electricity can be generated with biogas 24 hours a day. There is reduced risk of explosion as compared to pure methane and any biodegradable matter can be used as substrate for producing biogas.

As it has many advantages, biogas too has few disadvantages as well. One among them is that the product (biogas) value is rather low and this makes it an unattractive commercial activity. This process is not very attractive economically (as compared to other biofuels) on a large industrial scale. Biogas contains some gases as impurities, which are corrosive to the metal parts of internal combustion. Other major disadvantage of biogas is that its yields are lower due to the dilute nature of substrates. Nevertheless, Biogas can become a great substitute for other conventional energy sources.

## Chapter 5

### Ethanol

As our energy consumption, hike in prices of petroleum products, and the queue in petrol bumps increases day by day, everyone is in search of an alternative fuel source. Here comes the alternative, Ethanol, to substitute our traditional forms of fuel resources. Ethanol fuel is actually a kind of alcohol found in alcoholic beverages. The process of manufacturing ethanol is very simple. Usually, it is made from the common crops such as sugar cane and maize and it can also be produced from bagasse, miscanthus, sugar beet, sorghum, grain sorghum, switchgrass, barley, hemp, kenaf, potatoes, sweet potatoes, cassava, sunflower, fruit, molasses, corn, Stover, grain, wheat, straw, cotton etc.

The process of making ethanol is not so expensive. As we know plants make glucose by the process called photosynthesis, but in the ethanol fermentation glucose is decomposed into ethanol and carbon dioxide. During the combustion ethanol reacts with oxygen to produce carbon dioxide, water and heat. Generally Ethanol is considered as renewable energy as it is the result of the conversion of sun's energy. Ethanol is now commonly used to power automobiles. USA, Brazil, China, India and France are the five top ethanol producers in the world and in it Brazil and USA are the top most with 70 percent of ethanol production. First vehicle which used ethanol as fuel was Fiat 147 built in July 1979.

There are lots of advantages in using Ethanol as a fuel substitute. We can manufacture ethanol from common plants and crops. The manufacturing process is not so complex. Almost the price of Ethanol fuel will be cheaper compared to other fuels. Availability is the greatest advantage of this alternative fuel. After all, it will strengthen the vehicle by giving more mileage and less maintenance.

The main concern regarding ethanol is that it needs arable land required for crops and it reduces world's overall supply of grain and other food products. Ten

percentage of Ethanol is not compatible with non E85 ready fuel system components and marine crafts. It also can affect the electric fuel pumps by increasing internal wear. The carbon dioxide and harmful nitrous oxide emitted during fermentation and combustion create air pollution. Other major concerns are the costs of growing feedstock, transporting the feedstock to the factory and processing the feedstock into bioethanol.

## Chapter 6

### Ethanol Fuel Research

The introduction of Ethanol fuel is a great solution in an effort to reduce our dependence on petroleum products as well as to reduce carbon dioxide emission, which is harmful to our health and contributes to global warming. Ethanol is a viable, homegrown energy alternative to fossil fuel and is available today in E10 (10 percent ethanol/90 percent gasoline) and E85 (85 percent ethanol/15 percent gasoline) blends. Used as a clean-burning fuel additive, ethanol is a renewable fuel made from plants, usually from sugar cane and maize. There are five parts to the ethanol process; Conversion, fermentation, distillation, filtration and dehydration.

The University of Florida has been involved in biomass-to-energy research for about 20 years. New research at UF by Dr. Lonnie Ingram on variety of plant waste products proves that they are suitable for "cellulosic" ethanol production. The same kind of ethanol produced from this experiment too; but the source and process are different, allowing more efficient use of organic wastes for fuel production. It is proved that Ethanol blends are higher in octane than regular gas, about 100 compared to 87. Though we can see the difference in the reduction in fuel economy and less mileage per gallon, but the engine stays cooler, runs cleaner and produces less pollution.

Recent studies proved that it reduces the global warming due to its clean burning and cuts the greenhouse gas emissions by 18 percent to 29 percent a gallon. It powers flex fuel vehicles. Ford, General Motors and DaimlerChrysler have announced to producing 50 percent of their new vehicles as flex-fuel vehicles powered by E85 ethanol by 2010. Indy 500 utilized 100 percent ethanol in the tanks of 33 cars used in 2007 race and the drivers said that the use of ethanol improved the mileage by 30 percent.

The software genius Bill gates invested in Pacific Ethanol to help fund the construction of an ethanol plant in Madera County, California. Virgin Atlantic Airways' Richard Branson has also invested in cellulosic ethanol plants to make fuel which is from the waste product of the plant and measured to be the next energy step after corn ethanol. DuPont plans to open its first pilot plant to manufacture cellulosic ethanol in 2008.

## Chapter 7

### Fuel Cell Research & Technologies

Fuel cells are devices that directly convert the chemical energy in a fuel, such as hydrogen or methanol, into electricity. They can even bring more energy per volume and weight than batteries, even when counting the volume and weight of the stored fuel. It is said that in future almost all the vehicles will operate on fuel cells alone or with hybrid systems using both batteries and fuel cells in which the battery supplies power for acceleration and speed. Now all the major automotive manufacturers are on the process of developing fuel cells as the replacement for the conventional automobile engine to provide advantage of high efficiency of fuel cells.

A team of scientists used microfabrication technology in order to produce low-cost, high-volume production of fuel cells rather than building them by hand. The goal is to fabricate fuel cells in a manner similar to the way that many types of integrated circuits are presently manufactured. Scientists are on the verge of developing an advanced version of the fuel cell, which would use methanol as a fuel to provide far greater energy storage capability. In future, the new miniature fuel cell could be used in everything from automobiles to cell phones and computers.

The polymer exchange membrane fuel cell (PEMFC) is one of the futuristic fuel cell technologies. This type of fuel cell will probably power up cars, buses and maybe even our houses. The PEMFC uses one of the simplest reactions of any fuel cell. Scientists are in their effort to boost fuel efficiency by taking different approaches to the cell design. One of the successful approaches is to combine fuel cell and battery powered vehicles. Even Ford Motors and Airstream are developing this concept vehicle powered by a hybrid cell named Hyseries Drive. Meanwhile, Ford claims that vehicles have a fuel economy comparable to 41

miles per gallon .These vehicles use a lithium battery to power the cars, as the fuel cell recharges the battery.

United Technology corp. was the first company to manufacture the fuel cell for use as a co-generation power plant in hospitals, universities and large office buildings. Fuel cell applications are now used in many things such as Base load Power plants, Electric and hybrid vehicles, auxiliary power, off grid power supply, note book computers, portable charging docks and smart phones.

## Chapter 8

### Electric Car Conversions

As the environmental concerns and impending shortage of conventional fuels increase day by day, more people are looking for other fuel options. If we have sufficient money, we can go for a new hybrid or electric car. But, most of the people are economically uncomfortable or love their present car too much to part with it. In such a scenario, people can opt for other options that can allow them to keep their present car by electric conversion, which will give them the benefits of an electric car.

To do the electric car conversion, we have to get the electric conversion kit. These conversion kits can make a gasoline powered vehicles into an electric vehicles. There are two types of conversion kits in the market, the ones which replace the present mechanism and another is installed along with the present fuel system. An electric car conversion is the modification of a conventional internal combustion engine driven vehicle to battery electric propulsion, creating a battery electric vehicle or plug-in hybrid. Today, one can go for either hybrid electric vehicles or plug-in hybrid electric vehicles. Hybrid electric vehicles are those using both electric motors and other types of engines; whereas plug in hybrids electric vehicles are those vehicles with batteries that can be charged externally.

People have lots of misconceptions on electric car conversions. Some think that it will not only adversely affect their present car mechanisms, but also will reduce the pick up and speed of the cars. Both of these are baseless doubts in the minds of the people. One of the major advantages of electric car conversion is that not only they significantly reduce your fuel costs but also provide a totally pollution free driving experience. If you are installing a gas-cum electric car conversion kit, then you can get the benefits of both the fuels. So when you run

out of gas, you can always rely on the battery power to take you to the next gas station or your destination.

The major disadvantage of completely electric car is that you will only be able to drive about a hundred miles before the charge runs out. Also, it is a bit expensive to convert a conventional car to an electrical car. Other disadvantages of electric car are that, batteries have to be recharged every time, limits on driving distances and the lack of power. But without doubt, we can say that electric cars purely eco-friendly.

## Chapter 9

### Homemade Fuel Additives

As fuel prices are on the rise, the best way to get out of the increasing fuel price is to look at alternative fuel. We have a number of alternatives: Electric Hybrid Cars, Hydrogen Fuel, Solar Powered Cars, [Water4Gas](#), etc. All of them are either too new in their technology curve, or they are too good to be true. Here comes the greater role of home made fuel additives such as bio diesel and hydroxy gas.

One of the very useful home made fuel additives is biodiesel. Main advantages of biodiesel are that it burns cleaner, it has better lubricity, it is longer lasting and environmental friendly. Biodiesel produces better quality fuel compared to diesel and petrol because biodiesel is a non-toxic, biodegradable form of fuel that is made from biological components, rather than diesel. It is generally made from animal fats or vegetable fats from vegetable oil and cooking oil. This viable fuel from waste oils will speed up your vehicles by giving you more mileage without harming the environment.

Home made hydroxyl gas is another homemade fuel additive which is made from water. It is proved that this powerful fuel additive not only increases miles per gallon but it also removes carbon buildup. An efficient homemade fuel cell can be made for less than it costs to fill a 20 gallon tank and the benefits far outweigh the initial costs. It is easy to make homemade hydroxy gas cells and the materials required are readily available. We can build an efficient hydroxy cell within a weekend with a decent set of plans. These cells basically work up water with electricity to produce a hydrogen blend (HHO hybrid hydrogen oxygen). The result from this is the added horsepower mileage and cleaner emissions.

Fuel oil additives can be used as an alternative to save our natural resources of energy. Fuel oil additive in Furnace Oil, LSHS Fuel, Light Diesel Oil and Naphtha

Oil gives more benefits to the users. Some of its benefits are that it prevents sludge formation, it improves the atomization and combustion of fuel and it reduces stack temperature. The home made fuel additives are less expensive with maxim utility and also will reduce our cost and make our planet less polluted.

Hopefully some of these technologies will soon become a reality for mass production and implementation into realistically priced alternative fuel vehicles. Everyone will be able to breathe easier every time they look at the price of fuel.

### **Helpful Links**

- 1) [How To Make Your Own Biodiesel At Home](#) Save Petrol Costs Today!
- 2) [Learn More About Your Alternative Fuel Choices](#)
- 3) [Discover How To Choose The Correct Alternative Fuel](#)
- 4) [Convert Your Car To Burn Water + Gasoline = Double Your Mileage!](#)
- 5) [Half Water Half Gas.](#) Convert Your Car To Burn Water In Addition To Gas And Save Up To 60%.
- 6) [Run Your Car On Water, Make Biodiesel, & Save Money!](#)
- 7) [Renewable Energy Solutions](#) : 1. Build A Wind Generator 2. Biodiesel 3. Install Solar Panels 4. Build Your Own Home 5. Renewable Energy Solutions For Home, Car And Business

- 8) [Alternative Energy Resources](#). Understanding and Installing Your Own Solar Electric System. Includes Worksheets, & Resources.
  
- 9) [Keeping My Earth Green](#). You Can Learn How To Reduce Your Carbon Footprint And Help Reverse The Effects Of Global Warming.
  
- 10) [Solar Power Design Manual](#). Teach Yourself All About Solar Power. Comprehensive Manual By Genuine Expert. Spreadsheet Included.