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Ethanol Fuel and Hybrid Vehicles: The Answers to Our Problems?

Fuel supplies in the world are running low and given the world's current situation in the Middle East things are only bound to get worse. The United States in particular is one country that is greatly dependent on oil from this region used to produce gasoline. If the world's oil supply were depleted, the United States would be in serious trouble. The United States is dependant on foreign oil to power its automobile vehicles. An additional problem with the current oil situation is that as the supply dwindles and the tensions in the Middle East continue to escalate, the prices of fuel will continue to skyrocket. As oil becomes less abundant we are eventually going to need to find some other source of energy.

In addition to the possible shortage of fuel in the world, there are also many problems associated with the burning of this fossil fuel in engines. Many of the world's environmental problems can be traced to traditional fossil fuel powered vehicles. Carbon monoxide, the by-product of these cars, contributes to the greenhouse effect, the destruction of the ozone layer, and it makes the air that we breathe unhealthy and smoggy. The more gas-run cars there are on the streets, the worse the quality of the air gets. In Los Angeles the roadways are overcrowded with traditional automobiles, and as a result the sky is always

cloudy because of the large amounts of smog in the air. If something is not done soon, then what has happened in Los Angeles will be typical all over the country. In an effort to prevent this from happening, cities such as LA have encouraged people to use other means of travel, like public transportation. Train systems and subways have appeared all over the country. By reducing the amount of cars on the street, the amount of pollutants released into the air will also decrease. Unfortunately, these projects have not been as successful as hoped, and as long as large amounts of gas run vehicles roam the streets these efforts will be in vain. Excess pollution and a shortage of fuel supplies are serious issues that must not be overlooked.

A possible new source for fuel is ethanol. Ethanol is a alcohol based fuel alternative that has several important advantages over current our current fuel sources. One of those advantages is that ethanol is produced by fermenting and distilling starch crops that have been converted into simple sugars.¹ In other words, making ethanol is very similar to making beer, heat and yeast are used to break down complex sugars in order to make more simple sugars. Ethanol can be made for agricultural products such as sugarcane, corn, potatoes, and fruits. Additionally, ethanol can be made from paper and yard clippings and any other agricultural waste products. This means that it would be possible to produce ethanol with products grown in the United States meaning

¹ "Outlook for Biomass Ethanol Production and Demand"
<http://www.eia.doe.gov/oiaf/analysispaper/biomass.html>

that the US would no longer have to depend on foreign oil sources.²

Another advantage of using ethanol as a fuel source is that it would be much less detrimental to the environment. When used as fuel for internal combustion engines, ethanol burns much more cleanly, and it is utilized more efficiently. Ethanol emits much less carbon monoxide and other air pollutants into the atmosphere. Furthermore, using ethanol as a fuel source would reduce greenhouse gas emissions. This is because using ethanol would be a closed carbon cycle. Carbon dioxide is released into the atmosphere as a result of combustion in internal combustion engines, but the plants grown to produce ethanol need carbon dioxide to grow. Therefore we would no longer be releasing additional carbon dioxide into the atmosphere, and this would no longer contribute to the greenhouse effect.³

Ethanol fuel has been in use in the United States since as early as 1908. Originally, Henry Ford's Model T could be modified to run on ethanol. Even up to the 1920s and 1930s efforts were made to start a United States ethanol program. Ethanol fuel stations were common throughout the Midwest region of the United States. After the second World War, interest in crop based fuels decreased as other fuel sources became more readily available, and efforts to sustain an ethanol fuel program failed. This was mainly due to the higher costs associated with its production in comparison with fossil fuel based gasoline. Given our current technologies, ethanol production is somewhat expensive and as a result,

² "Use of Ethanol Fuel for Cars." <http://energy.saving.nu/biomass/carsbiofuel.shtml>

³ Vaughn, Eric. "The Case For Ethanol In Automotive Fuel Cells." <http://www.evworld.com/archives/oped/vaughn.html>

fuel prices for the consumer would be higher than most people are accustomed to paying. As new technologies are developed, the price of producing ethanol will be reduced. Currently, there are some people who choose to use ethanol fuel in their cars in spite of its costs. There are conversion kits that can be purchased which allow standard fossil fuel powered vehicles to operate off of ethanol fuel. The change in efficiencies in these vehicles after the kit is installed is minimal.

Besides the higher prices associated with ethanol fuel there are several other disadvantages. One of those is that ethanol is highly volatile. It is less likely to vaporize at lower temperatures. This means that it is better suited for climates with warmer temperatures where cold start would not be such an issue. This is a problem that can easily be taken care of with engine design.

Another concern about ethanol fuel is that there is currently one company in the Midwest, Archer Daniels Midland Company, produces over forty-one percent of America's ethanol. Should the United States turn to ethanol based fuel in the near future, this company is poised to become one of the most powerful companies in the world. Additionally, coastal states such as California and New York are concerned about the high costs of transporting ethanol across the country.⁴ These shipping costs would likely be transferred to the consumers in these coastal states. This would make the exact same gas more expensive in states such as California solely because of its location. There is not enough

⁴ "From Stalk to Fuel Tank, Ethanol a Net Energy Gain"
<http://www.evworld.com/databases/print.cfm?pageid=news070802-01>

agricultural land available in states such as New York to produce the amount of fuel necessary to meet every citizen's need, so the fuel would have to be transported in from another location.

In spite of these few drawbacks overall, ethanol has huge potential to change the entire fuel industry in America. It would allow the United States to become self dependent on its own oil, and it would produce a limitless supply of fuel, which is very important in today's society. It has been predicted that the current oil supplies in the world are only enough to last for another twenty years or so. This means that in the next few years the United States needs to immediately beginning planning to gradually become less dependant on fossilized fuel sources. Two ways to do so are the find alternative sources of fuel, and to begin driving vehicles that use fuel more efficiently.

One of the biggest threats to our current fuel supplies is American's fixation on buying bigger, less fuel efficient vehicles, namely sports utility vehicles. In recent years sport utility vehicles have become very popular, as they have become the latest fad. SUVs are also commonly misused. Advertisements show that the purpose of SUVs is to use them for off road activities. Commercials show sports utility vehicles driving through snow, mountains, and canyons. In reality, this is not how most SUV owners use their vehicles. SUVs are most commonly seen in streets and highways just like any other vehicles. People use them for their everyday commute. This includes things like driving to and from work, going to the store, and everyday errands.

In addition to consuming large amounts of fuel, SUVs also release large

amounts of pollutants into the atmosphere. As the most common hazard to the environment, gas run vehicles--which emit the toxin carbon monoxide-- have taken center stage in this push. The obvious solution to impede the environmental damage caused by traditional cars is the electric vehicle. However, the electric vehicle technology is not currently advanced enough to make driving them practical, and until electric vehicles do become practical the only convenient solution is the hybrid car, which is a combination of gas and electric cars.

In order for people to stop driving traditional vehicles a new solution must be introduced that will not require people to pay unreasonable amounts of money and cause a huge inconvenience. Electric vehicles are the obvious solution to the environmental problems created by traditional gas run vehicles.

Electric vehicles have been around since the beginning of the 20th century. From 1900 until about 1920 electric vehicles were more common place than gas vehicles. However, as the expectations for automobile performance increased, electric vehicle technology was not able to keep up with the demand. People wanted cars that were more powerful and that traveled faster. The creation of the internal combustion engine was the deathblow to electric cars. By the year 1930, the production of electric cars had stopped, and electric cars vanished from the streets. It was not until the 1960s that interest in electric vehicles returned as a result of growing concerns about the earth's environment and the impact of gas run vehicles on it. The curiosity died down again once a device was created that reduced the amount of emissions that gas vehicles

released into the environment. Most recently concerns over the amount of vehicles on the roads and their contribution to the greenhouse effect have focused more attention on electric vehicles and their capabilities.

Electric cars are the only type of zero emissions vehicle, which means that they do not directly release any toxins into the environment. They do not have a tailpipe, so they do not release any exhaust, and the operation of these vehicles does not create any chemical waste. They can be driven for miles without releasing pollutants into the environment.⁵

The only pollution created from the usage of electric vehicles is that which is created at the plant where electricity is produced. There are many different ways to produce electricity, and the amount of pollution created varies with how the electricity is generated. Currently, the most common method of production is the burning of fossil fuel and coal. This means of generating electricity is harmful to the environment in the same manner as gas run electric vehicles. Just like gas run vehicles, these plants release toxins into the air such as carbon monoxide. The research team that wrote *Electric Vehicles: Technology, Performance, and Potential*, has studied the impact of these plants.⁶ They found that if all of the vehicles that are on the roads today were electric vehicles that used electricity generated from power plants that burned fossil fuel, the amount of pollutants released into the air would be about the same as they are now. The difference

⁵ Andrea Oppenheimer Dean, "Competition Explores Impact of Electric Cars," *Progressive Architecture* 74 (1993): 25.

⁶ *Electric Vehicles: Technology, Performance, and Potential* (France: OECD, 1993) 148.

between these two situations is that gas run vehicles will always release this amount of pollutants, while this is a worse case scenario for electric cars. As far as preserving the environment goes, burning coal and fossil fuels are the worst mode of producing electricity.⁷ Other methods such as hydro and nuclear power emit a drastically smaller amount of pollutants into the air. As long as we use these methods to produce electricity, then electric vehicles will be cleaner to the environment.⁸

In addition to being cleaner to the environment, electric cars are also cheaper to maintain than traditional cars. Unlike gas-run vehicles, electric cars do not need to be fueled; therefore, there is no need to purchase, which constantly fluctuates in price. The only thing that electric cars need to operate is electricity. Electricity is cheaper than gas. In fact, it would currently cost an average of \$.0256 a mile on electricity verses the \$.075 a mile that is currently spent on today's outrageous gasoline prices. In addition to being cheaper, electricity is also abundant. Unlike gasoline, which is formed from natural resources which will eventually vanish, electricity is produced. Therefore, we can make as much as we need to and never run out.⁹

⁷ "Paying at the Plug" Online Newhour 20 August 1997.
http://www.pbs.org/newshour/bb/transportation/july-dec97/cars_8-20.html

⁸ Andrea Oppenheimer Dean, "Competition Explores Impact of Electric Cars," *Progressive Architecture* 74 (1993): 25.

⁹ Dick Russell, "Car Wars (alternative electric vs. traditional gas-run cars)," *Amicus Journal* 17 (1996): 31.

While true that electric cars will impede the continuation of the problems that are created by traditional gas run cars, at this time the technologies do not exist for electric cars to offer the same convenience and practicality of electric cars. For example, the Ford Ecostar is a two-passenger van type electric vehicle. It performs similarly to any other vehicle on the road, but it is a basic van with no luxuries and costs \$105,000 dollars. You can buy a house for that price. The average American would not be able to afford this car, and it is most likely that if the average American could afford this car he or she would not purchase it. Who would want a two person cargo van with no features when they can have a Rolls Royce, Jaguar, Lamborghini, or a house? In order for people to purchase electric vehicles, they must be reasonably priced.¹⁰

Not only are electric cars outrageously expensive, they also create a huge inconvenience. The electric vehicles that are currently around are constantly in need of a charge. Cars similar to the Ford Ecostar can only travel about 100 miles before they have to be recharged. That's fine for most daily travel around the city, but that is not suitable for any sort of long road trip. One hundred miles of travel will barely get a person around the Bay Area. In addition, these vehicles can only travel at speeds of 60 miles an hour.¹⁰ That's not even the maximum speed limit on most highways. If we are to switch to electric vehicles, then this is a problem that must be solved. No one would be willing to drive a vehicle that costs more, travels more slowly, and always needs to be charged.

¹⁰ Sheldon R. Shacket, *The Complete Book of Electric Vehicles* (Chicago: Domus Books, 1979)

Many of the inconveniences that are associated with electric cars can be traced to the electrically charged battery that powers the car. Electric cars are like overgrown versions of the Power Wheels toy car. Power Wheels are battery-powered, with a rechargeable battery. In between excursions --typically overnight-- these cars are plugged into an electrical socket so that the electricity can recharge the battery. Electric cars work in the exact same manner only on a larger scale. Electric vehicle sockets have to be installed in homes, but some sockets have appeared in newer parking lots. The theory behind this is that by allowing people to charge their car while it is parked they will not lose any time waiting for their car to recharge. The problem with these batteries is that currently, our technologies have not allowed researchers to create efficient batteries. The batteries use large amounts of energy in a short amount of time. This is why the batteries need to be charged after a relatively small amount of travel. The only way that better batteries will be developed is if major companies spend more money on the research and development of these batteries.

Part of the reason that electric cars may currently be so unappealing is because automobile makers and gas companies are purposely making them that way. According to industry experts, J. A. Savage and Dick Russell, companies such as Ford and Mobil are "deliberately trying to sabotage the growth of alternative fuel vehicles"¹¹. This is probably part of the reason that the Ford Ecostar costs more than \$100,000. In May of 1996, Mobil Oil Company took out

¹¹ J.A. Savage, "The Road Warriors: Utilities and Automakers Square Off On Alternative Fuel Vehicles," *Business and Society Review* 88 (1994)

an ad in the New York Times claiming that electricity needed to power electric cars would increase the emissions of greenhouse gases along with other pollutants. It is easy to understand why oil companies would want to give electric vehicles a bad name. Electric vehicles would mean the end of their profits as a company. It's not quite as obvious why Ford would want to hinder the development of electric cars, but it all comes down to profits as well.¹²

Ford's alleged attempts to sabotage the development of electric cars is a reaction to the California emissions act passed in 1993. The act required that by the year 1998 at least 2 percent of all vehicles sold in the state of California be zero emission vehicles. Major automobile companies protest against this act on the grounds that they are not capable of producing a zero emissions vehicle that is convenient. In order for these companies to produce a convenient electric car, they would have to put millions of dollars into researching and developing. In other words, companies are unwilling to do this because it forces them spend more money, which means that they make less profit.

At this time the only reason that electric cars should not be mass-produced is because of the inconveniences associated with them. Once electric cars are cheaper, more efficient, and more practical, they should be mass-produced immediately. Until that time comes, the best current solution is to use the hybrid car. A hybrid car is one that is both gas and electrically powered. It avoids the inconveniences of electric cars, yet it does an adequate job of

¹² David Knott, "Hypercara: a Threat to the Oil Industry?" Oil and Gas Journal 93 (1995): 29.

subduing the concerns created by traditional vehicles.¹³

The first hybrid vehicle was created around 1905 by a man named H. Piper. His vehicle used electricity to increase the power of the gasoline engine. His main concern was to create a vehicle that was more powerful, but once better gasoline engines were developed his vehicle became obsolete. It was not until 1990s that the interest in hybrid vehicles reappeared. The goal of these vehicles was to create a car that received better fuel efficiency.¹⁴

Hybrid cars are ideal because they run on both gas and electricity. They are fueled with gasoline just like any other traditional car, but they have a built on electric generator that produces its own electricity to power the car. The gasoline is used mainly as an energy source for the generator. Once the generator starts operating, the car is able to charge itself as you drive. As a result, hybrid vehicles receive many more miles to the gallon of gas than traditional cars. Because they get more miles off of every gallon of gas, hybrid vehicles use less gas and emit less pollution into the environment. In fact, hybrid vehicles release such a small amount of pollution into the environment that newer versions are classified as ultra low emissions vehicles.¹⁵

In addition, hybrid cars are much cheaper than electric cars. Hybrid cars cost around the same price as traditional cars and they don't require so much

¹³ <http://cascadia.times.org/archives/2000/hybridcars.htm>

¹⁴ Victor Wouk, "Hybrid Electric Vehicles." Scientific American.
<http://www.sciam.com/1097issue/1097wouk.html>

¹⁵ Elizabeth Grossman, "Hybrid Cars, the Way to Go" Cascadia Times 2000.

money to keep them fueled. A tank of fuel in a hybrid car would go so much farther than in a regular car. In fact, hybrid cars get about 55 miles for every gallon of gas. The average for traditional cars is 24 miles per gallon. Unlike the original hybrid vehicles, which needed to be plugged in addition to being fueled, newer hybrid vehicles have a built in generator that produces electricity so car owners do not have to pay any extra money for electric power. Since all of the electric elements are built into the car, the hybrid vehicle is just like having a traditional gas car that has twice the fuel efficiency and does less damage to the environment.

An example of a hybrid car is the Honda Insight. The Insight is a two passenger coupe that cost about \$20,000. It averages between 60 and 70 miles per gallon of gasoline, and it releases a minimal amount of pollutants into the environment. The Insight is Honda's replacement for its EV-Plus, an electric vehicle that was taken off of the American market due to low sales. The EV-Plus was a two-passenger vehicle, and was leased for \$500 a month. In comparison, the Insight is much cheaper.¹⁶ The Toyota Prius is a similar hybrid vehicle. It has the same statistics as the Insight, except it comes as a four-door sedan. Both of these cars offer conveniences that no electric car is currently capable of offering. The only two let downs of these vehicles is their lack of power, and the fact that

¹⁶ Bruce Grant, "Gaining some insight: Honda's hybrid combines the best of gas and electric fuels to lower emissions and increase vehicle range." The Sacramento Bee. http://www.sacbee.com/ib/news/old/ib_news06_20000512.html

they still emit a small amount of pollutants.¹⁷

One of the major weaknesses of the hybrid vehicle is the fact that the motors used to power the vehicles are not very strong. The Honda Insight, for instance, only contains a 12 valve, 73 horse power engine. When traveling up hills, drivers must be prepared to shift up and down gears when necessary. This reduction in power is the biggest drawback to hybrid vehicles, but it may become less of an issue in the near future. Some automobile companies have looked at ways to produce hybrid vehicles without sacrificing power. General Motors is developing a hybrid truck that is due out in 2004. Instead of sacrificing power, GM designers decided to give up some of the utility of the vehicle, so it is possible to create hybrid vehicles that just as powerful as commercial vehicles, but something else must be given up.¹⁸

Hybrid vehicles are such a convenient solution to the dilemma that gas powered vehicles have caused they bring up the question: Are hybrid vehicles a better alternative than electric vehicles even if electric vehicle technology was fully developed? After all, hybrid vehicles run in the exact same manner as the cars that dominate the roads today, and they will not require people to change their daily habits or develop a new way of life. Hybrid vehicles meet the same

¹⁷ Bruce Grant, "Coming to America: Toyota prepares hybrid sedan for the U.S.

Market." The Sacramento Bee http://www.sacbee.com/ib/news/old/ib_news06_20000512.html

¹⁸ "Hybrid Truck Demonstrates Better Gas Mileage and a Host of Other Advantages, without Compromises." http://www.gm.com/company/gmability/environment/gm_and_the_env/releases/hybrid_trucks_052201.html

goals as electric cars without all of the expenses and hassles. But in spite of this, electric vehicles are still the ideal car. Hybrid vehicles release tailpipe pollution, even though it is a minimal amount. Electric vehicles have no direct emissions, and as long as the method in which the electricity is produced is not through the burning of fuel, electricity is better for the environment. Hybrid cars are the perfect temporary solution, but electric cars are the vehicles of the future. Electric vehicles may never be capable of offering the same conveniences as hybrid and tradition gas vehicles, but if we are willing to make a sacrifice for anything, it should be our environment. Each of us in some way has contributed to the destruction of our environment, and it is up to all of us to work together to preserve it. If we are forced to rely on fuel consuming engines then it only make sense to combine hybrid vehicle technology with ethanol fuel sources. Hybrid vehicles and ethanol fuel appears to the most practical solution to solving our current crisis involving the decreasing fuel supplies and our deteriorating environment.
