Research paper on hybrid cars in the us engineering essay

Engineering

The cars we use all over the world are detrimental to our Earth's environment. In the United States, air quality often fails to meet federal standards. Air pollution, water pollution, global warming, and ozone depletion are some of the problems we face each day that reflect the consequences of our actions. The cars we drive emit exhaust gas, whose harmful elements cause acid rain and global warming. As a result of growing environmental concerns, the US government has been trying to resolve these problems. One such solution is the Hybrid car, which can save resources by giving off less emission. However, among the many benefits of Hybrid cars, there are also some drawbacks as well. Hybrids still exhaust some emissions, and their large batteries require frequent replacement. Now, fortunately, many companies are thinking of ways to improve Hybrid cars because if we don't stop driving gasoline powered vehicles, the earth's resources will be destroyed. Driving a car is the worst pollutant. Despite attempts to make engines more fuel efficient and the increase in antipollution devices, emissions from passenger vehicles are increasing in Canada and the US. The main cause of this problem is that cars are getting bigger and consumers are driving pick-up trucks and sports vehicles instead of smaller, lighter passenger vehicles. The average new car in 2001 consumed more fuel than the average car in 1988. In 1987 cars averaged 25. 9 miles to the gallon in the US. Fuel efficiency plunged to 24. 6 miles/gallon by 1998 and continues to drop as larger vehicles replace smaller ones. Exhaust from all combustion engines combine to produce harmful effects on people and the environment. The burning of fossil fuels from the unlimited use of vehicles has turned cities into huge deposits of toxic

chemicals. The major car pollutants are carbon monoxide, hydrocarbons, nitrous oxides, carbon dioxide, and particulates. Carbon monoxide is a colorless, odorless, and poisonous gas. In 1992, levels of carbon monoxide surpassed the Federal air quality standard in 20 U. S. cities with a collective total of more than 14 million inhabitants. Hydrocarbons react with nitrogen oxides and sunlight to form ground-level ozone, a major component of smog, which irritates the eyes, impairs lung tissues, and intensifies respiratory disease. Smog can also hinder plant growth and injure crops and forests. Many exhaust hydrocarbons are toxic and can potentially cause cancer. Nitrogen oxides, like hydrocarbons, contribute to the formation of ozone. They are also precursors to the formation of acid rain. Catalytic converters, the part of car exhaust systems that breaks down nitrogen gases, form nitrous oxide, which is 300 times more powerful than carbon dioxide as a greenhouse gas. The USA EPA stated in a study published in spring 1998 that nitrous oxide composes about 7. 2 % of the gases responsible for global warming. Vehicles with catalytic converters created nearly half of that nitrous oxide. Carbon dioxide (as mentioned above) is a greenhouse gas that traps the earth's heat and contributes to global warming, which can potentially disrupt global weather patterns and ecosystems and cause flooding, severe storms, and droughts. However, the effects of global warming are not yet certain. Particulate matter can be directly released or can be created in the atmosphere when gaseous pollutants such as sulfur dioxide and nitrogen oxides react to form fine particles. Exposure to particulate matter can potentially cause effects on breathing and respiratory systems, damage to lung tissue, cancer, and premature death. Air pollution

is responsible for about 6% of deaths each year in Austria, France, and Switzerland, according to a study published in the Lancet medical journal. The study discovered that half of those deaths were caused by pollution from vehicles. The researchers also estimated that the health cost of vehicle pollution in the three countries totaled 1. 7 % of the gross domestic product. The adverse health effects of car exhaust are invasive and difficult to asses. The concept of hybrid vehicles first originated in 1905 when an American engineer filed for a patent on a car that would use an electric motor to boost the power of the traditional gasoline engine. However, as the development of gasoline engines progressed, interest in hybrid cars faded. By the time the patent was issued, gasoline engines were greatly improved, and equipment to start the car with a crank made this type of vehicle even more popular. The oil crisis in the 1970 s sparked renewed interest in hybrid and electric vehicles, which would consume less oil, enabling the US, and domestic manufacturers to rely less on foreign oil. Interest again diminished until 1993 when the U. S. Department of Energy (DOE) and " Big Three" American auto manufacturers: General Motors, Ford, and DaimlerChrysler, as a five-year cost-shared partnership, established The Hybrid Electric Vehicle (HEV) Program. This program embarked on a plan to produce production-feasible HEV propulsion systems by 1998, first-generation prototypes by 2000, and market-ready HEVs by 2003. Ultimately, the program sought to develop production feasible HEVs that attained double the fuel economy of similar gasoline vehicles and had similar performance, safety, and costs. President Clinton s administration established the Partnership for a New Generation of Vehicles (PNGV), which would research and develop automobiles. This

organization includes three of the largest car manufacturers and hundreds of smaller technical firms. According to PNGV's website, its goal is to form a partnership that would increase competitiveness among US automaker firms through advancements in technology, creating a new breed of car. Long term goals are to create a car with up to three times the fuel efficiency of conventional vehicles while maintaining current standards of cost, performance, safety, and comfort. With similar goals in mind, PNGV joined DOE as the FreedomCAR program. The focal point of DOE is on long-term, high-risk, pre-competitive research and development in fuel cells and hydrogen infrastructures and technologies. The National Renewable Energy Laboratory (NREL) is the technical manager of the program. After General Motors, Ford, and DaimlerChrysler presented the HEVs as their final contract requirement in 1999, the NREL has continued to help the auto industry with HEV development in several ways. NREL offers technical expertise in battery thermal management, vehicle simulation/analysis, and vehicle auxiliary load reduction. Today, in response to environmental problems, Hybrid cars have become more and more popular. Hybrid electric vehicles (HEVs) combine the internal combustion engine of a gas emission vehicle with the battery and electric motor of an electric vehicle, resulting in double the fuel economy of gasoline powered vehicles. This combination provides the extended range and quick refueling that consumers get from a conventional vehicle, with most of the energy and environmental benefits of an electric vehicle. The benefits of HEVs include improved fuel economy and lower emissions compared to gas emission vehicles. The intrinsic flexibility of HEVs will permit them to be used in a variety of applications, from personal

transportation to commercial shipping. Hybrid power systems were created to compensate for the insufficient battery life of electric cars. Since batteries could provide only enough energy for short trips, an onboard generator, powered by an internal combustion engine, could be installed and used for longer trips. Previously, battery-electric power, provided through wall-plug electricity, was thought to be the ultimate in efficiency and low emissions until, of course, better batteries were invented. It was concluded that with better batteries, we would not need hybrids at all. However, after 20 years of examination, hybrids are taking lead over electric vehicles, which are only being used in niche market applications where shorter distances are traveled. The beneficial effects of more efficient cars on the environment and the deterioration of city air have compelled regulators to require cleaner cars. Using HEVs will reduce the national average of smog-forming pollutants. Although Hybrids will never be true zero-emission vehicles because of their internal combustion engine, they will cut emissions of global-warming pollutants by a third to a half, and newer models may cut emissions by even more. HEVs have many benefits over conventional gasoline powered vehicles. Regenerative braking capabilities reduce energy loss and replenish the energy used to stop a vehicle. Upon braking, the motor begins to act as a generator, using the kinetic energy of the vehicle to generate electricity, which can then be stored in the battery for later use. Therefore, time and energy are saved because there is no need for an outside power source to recharge the battery. By having two power sources, a hybrid can run on only one power source if necessary, and the gas engine can be turned off at red lights and on other occasions. Low-rolling resistance

tires provide hybrids with stiffer and more inflated tires that result in less drag than conventional tires. The HEVs on the market are very cost competitive with similar conventional vehicles. Engines can hold an average load, not peak load, which reduces the engine's weight. Buyers spend less money on gas. Fuel efficiency is greatly increased (hybrids require significantly less fuel than vehicles powered only by gasoline). An average HEV can get up to 100 miles per gallon. Emissions are greatly reduced. Hybrids can decrease dependency on fossil fuels because they can run on alternative fuels. HEVs are made with special lightweight materials such as aluminum, magnesium, or carbon fibers to reduce the overall weight of the vehicle. A lightweight car requires less energy to accelerate it. Any cost premium associated with HEVs of the future can be compensated with overall fuel savings and government incentives, such as a tax deduction of $2, 000 for buying an HEV. According to the U. S. Department of Energy, if 22 % of the total number of vehicles in U. S. were replaced with electric hybrid vehicles, about one million barrels of oil per day could be spared. According to Congress man Jim Nussle, since 1992, U. S. oil production is down 17 % and consumption is up 14 %. In 1990, there were 657 working U. S. oilrigs. In 2000, there were 153. Each hybrid car will produce thousands fewer pounds of pollutants than traditional vehicles. According to the department of energy estimates, a hybrid car driven 12, 000 miles per year will cut carbon dioxide emissions by 4, 700 pounds of gasoline powered cars. To effectively market these HEVs to consumers, auto manufacturers are making these cars with comparable performance, safety, and cost. The combination of gasoline with electric power provides the hybrids with the

same or greater range than conventional combustion engines. The HEV functions with about twice the efficiency of conventional vehicles. Honda's Insight can run 700 miles on one tank of gas. The Honda Civic hybrid can go 650 miles on one tank of gas, while the Toyota Prius can run about 500 miles. Hybrids present drivers with similar or better performance than conventional vehicles. Most importantly, hybrids are a great way for consumers to help clean up the environment. There are many variations of HEVs. Basically, a hybrid uses an energy storage system, a power unit, and a vehicle propulsion system. The best options for energy storage include batteries, ultracapacitors, and flywheels. Although batteries are the most popular kind of energy storage, other energy storage areas are still being examined. Hybrid power unit options include spark ignition engines, compression ignition direct injection engines, gas turbines, and fuel cells. The power split device is the core of the Hybrid. This clever tool links the gasoline engine, generator, and electric motor together. It enables the car to function like a parallel hybrid, in which the electric motor can power the car by itself, the gas engine can power the car by itself, or they can power the car together. The power split device also permits the car to function like a series hybrid, in which the gasoline engine can work independently of the vehicle speed, charging the batteries or supplying power to the wheels as needed. It also acts as a continuously variable transmission (CVT), removing the need for a manual or automatic transmission. Finally, because the power split device enables the generator to start the engine, the vehicle does not require a starter. HEVs have several transmission choices, depending upon what efficiency is desired. A hybrid's efficiency and emissions rely on the

particular combination of subsystems, how these subsystems are incorporated into a complete system, and the control strategy that assimilates the subsystems. A hydrogen fuel cell hybrid, for example, would produce only water as a by-product and drive more efficiently than a battery-electric vehicle that uses wall-plug electricity. However, the hydrogen fuel cell hybrid is not a good choice because fuel cell stacks are too fragile and expensive for automobile use. Also, any leakage of hydrogen from the vehicle can damage the ozone layer. HEVs are growing leaders in transportation technology development. Hybrids have great potential for growth in improving the automotive industry, while also reducing serious resource consumption, reliance on foreign oil, air pollution, and traffic congestion. Hybrids have become increasingly popular in the United States. Their global saturation into the automotive market fluctuates mainly on the economics of producing a complex hybrid power system, rather than the innate abilities of the technology itself. The hybrid's complexity, and the fact that some of the best storage and conversion systems have yet to be fully developed, ignites varied opinions on hybrids' ultimate impact in the marketplace. As with any new technology, consumers may be reluctant at first to try out new options. However, as time goes by, the advancements of the automotive industry are becoming more commonplace. The Honda Insight, a parallel hybrid priced at around $18, 000, and the 2004 Honda Civic hybrid, priced at around $20, 000, are available in United States now, and have been receiving a lot of positive feedback. The Toyota Prius, a parallel hybrid selling for $20, 000, is also a hot seller on the market. GM is using the technology first in buses and is considering hybrid versions of full-

size pickups in the future. To help encourage sales, federal and state incentives are in place to compensate for some of the HEV purchase costs. However, hybrids still have yet to be improved. Among the many benefits, there are still disadvantages, which hinder consumers from choosing hybrids. Hybrid Cars accelerate at much slower speeds than conventional vehicles completely powered by gasoline. It is unsafe for hybrid drivers if their vehicles are incapable of keeping pace with traditional vehicles. Batteries have a short life span of about 80, 000 miles before replacement is needed, which then costs an estimated $5, 000 to $8, 000, depending on the model. Hybrid vehicles are smaller and made of lightweight materials, which make them more susceptible to complete destruction in a car accident than larger, steel reinforced vehicles. HEVs are not sold in all areas of the country, and the few places that do have them have limited quantities. Also, the government does not offer deductions for buying an HEV because there is still some gasoline present in the combustion process. Converting a gasoline powered engine to electric power costs about $7, 500, not including the cost of labor. The process also consists of 17 steps, which can take up to 75 hours of manual, hard labor. The hybrid parts, which most car repair shops do not carry, included in the conversion are: batteries ($1, 000 to $2, 000), motor ($1, 000 to $2, 000), controller ($1, 000 to $2, 000), and adapter plate ($500 to $1, 000). However, as hybrids become more commonly used, its parts will become less expensive and more easily accessible. Despite these problems; however, there is a bright future in store for the hybrid. To resolve the expense of a short battery life, car manufacturers are considering replacing the nickel-metal batteries of hybrids with lithium batteries, which have 2-4

times the energy density and are much less expensive. The development and usage of a lithium-ion battery would make hybrid vehicles much more feasible to mass produce. Another possibility for hybrid cars is to replace their gasoline fuel with E85, an ethanol-gasoline fuel, which has at least 80% energy density as gasoline, needing to be refueled more often; however, with a hybrid, the other energy source (electric) can compensate for the lack of energy density. Because of its high oxygen content, E85 burns cleaner than oxygen, reducing production of smog and respiratory illnesses. It decreases carbon dioxide and other greenhouse gases that contribute to climate change by 39% to 46% compared to gasoline. It is also non-toxic, water soluble, and biodegradable. Using E85 will benefit the US economy and make it more energy independent. Producing ethanol from crops grown within the US will create more jobs for US workers, and prices will stabilize. Within the near future agricultural waste will be used, increasing income for farmers. Using home-grown crops to produce ethanol enables the US to meet energy demands and decrease dependence on other countries without forfeiting energy consumption. Ethanol is advantageous for consumers as well. By burning cleaner, engines will last longer, increasing efficiency as well as horsepower. It is also easy to use since it resembles gasoline and fuels in the same way, making it easier to change to this type of fuel. Also several automakers have begun making flexible-fuel cars, which have the option of either using E85 or gasoline, making it even more expedient for consumers to use. The use of E85 in vehicles in general has many benefits, and combined with the natural advantages of current hybrids, it makes these improved hybrids even more appealing. In conclusion, hybrid cars are better

than traditional gasoline powered vehicles, however they still have problems. Currently hybrid cars seem to be the best solution in combating the devastating global effects of exhaust emissions. With lower emissions and improved fuel economy along with government incentives, hybrids are a great way to travel. However, these lightweight cars are more vulnerable to traffic fatalities and still give off some emissions. They also accelerate at a slower pace than conventional vehicles. Hybrids have a short battery life, and their parts are expensive and not easily accessible, but hopefully as hybrids become more popular, this will change. Each year car manufacturers are thinking of ways to improve hybrids. Hybrid trucks and SUVs should make a huge impact on the market, satisfying the consumer's need for extra safety and security on the road. Already car manufacturers are considering using lithium batteries for greater efficiency and E85 as an alternative fuel in the construction of hybrids. These changes would solve many of the current shortcomings of hybrid vehicles and increase market awareness and success. Even without these changes yet in place, hybrid vehicles are the only way to efficiently help reduce pollutants in our earth's atmosphere. As a biocentric person, I believe that all living organisms have inherent values and rights regardless of whether they are useful to us; therefore, we need to cherish them as we would ourselves. If we don't preserve nature's resources, our careless habits will not only contribute to the destruction of earth but also of all human kind since we depend upon nature for survival.