This four-page undergraduate paper examines the past, present, and future development of fuel-efficient cars. The author discusses the economic, market, political, and technological factors involved, and identifies some of the problems that make the fuel-efficiency issue so complex.

Fuel-Efficient Cars: An Analysis of Development

The development of fuel-efficient cars was primarily in response to the OPEC oil crisis of the nineteen-seventies and the resulting dramatic rise in gasoline prices for American motorists. Up until the Yom Kippur War of 1973, Americans drove high-powered, gas-guzzling cars, and since gasoline was so cheap no consumers were interested in buying fuel-efficient cars. Subsequently, the Detroit automakers didn't design or produce any, for there was very little market demand. That all changed within a few years, for skyrocketing oil prices made fuel-efficient cars a necessity, not only in the eyes of consumers, but in the eyes of the auto industry and the American government as well.

For nearly a century, vehicles have been powered by internal combustion engines that operate by burning its fuel inside the engine. The most common internal combustion engine type is gasoline powered, while others include those fueled by diesel, hydrogen, methane, or propane. From a technological perspective, gasoline-powered internal combustion engines have limits in terms of performance and fuel-efficiency, and will sooner or later have to be replaced by power systems that don't rely on internal combustion technology.

A major problem with fuel-efficiency is that the technology that developed today's gasoline engines is nearly a century old. In a rather primitive sequence of events, a

mixture of gasoline and air is sprayed into a cylinder. This is compressed by a piston and at optimal point in the compression stroke, a spark plug creates an electrical spark that ignites the fuel. The combustion of the fuel results in the generation of heat, and the hot gases that are in the cylinder are then at a higher pressure than the fuel-air mixture and so drive the piston back down.

One of the problems at the present time is that there is very little federal government support for either hybrid or natural-gas-only vehicles (Seal). But the upcoming 2004 elections may compel the Bush Administration to back away from claims that global warming and fuel economy aren't problems. The White House has opposed any increase in fuel-economy standards, which of course influences domestic automakers and reduces the likelihood of consumers seeing the rapid development of more fuel-efficient cars or alternative fuel powered cars.

In terms of future developments, the focus is shifting from making cars more fuel-efficient to developing cars that don't run on traditional fuels at all. In this context, the Bush Administration announced last year "that it will work with the country's Big Three car companies to accelerate the development of hydrogen fuel-cell vehicles. Success in that admittedly ambitious endeavor could remove cars and trucks from the energy and environmental debates altogether" (Brown).

This alternative has perhaps the most potential, for using hydrogen fuel cells for power eliminates the need for fossil fuels such as oil, and would involve tapping an unlimited source of fuel. Instead of lining up at the gas pump, owners of vehicles with hydrogen fuel cells will buy tanks of liquid or gaseous hydrogen. In a hydrogen fuel cell,

hydrogen is joined to oxygen taken from the air, and the only waste material is water. The hydrogen needed is made from water using electricity.

There are options available for future development in addition to hydrogen fuel cell vehicles. Cars that run on natural gas have potential, primarily because the other alternative fuels are in very short supply or don't exist at all. "Natural gas is cleaner and it's in better supply worldwide—far better—than oil. And it is correspondingly cheaper on a miles-per-dollar basis. It is much better than gasoline. With the natural-gas Honda engine we have, we are routinely getting 250 miles between fill-ups" (Seal).

Electrical cars are one option, but present models are not ideal because the batteries they use cannot hold the same amount of energy as a car powered by fuel-injection, so they cannot travel as many miles without having the driver having to stop to recharge the battery. Another disadvantage of electric cars is that they take several hours to recharge the battery before they can run again.

One thing is clear. The 1975 Corporate Average Fuel Economy program, which was designed to promote fuel-efficient cars, has in fact produced more fuel-efficient vehicles. "But it did nothing to decrease gasoline consumption in a country where a gallon of unleaded can be purchased for less than the price of a half liter of Penta water. CAFE simply made gasoline cheaper, which largely is why more Americans began buying more trucks and higher horsepower cars" (Brown).

In other words, the development of fuel-efficient cars always has and always will depend upon a variety of political, legal, consumer, environmental, and technological factors. Experience has shown that each of these factors may be dominant at a certain time, and then lose importance as conditions change. This volatility makes an assessment

of future development difficult to predict with any accuracy, but the general trend over the next twenty years or so will be towards increased fuel-efficiency and improved alternative fuel designs.

But American automakers will not likely be enthusiastic about it, for their lack of interest in producing fuel-efficient cars is demonstrated by the fact that in 2003, Japanese models made by Toyota, Honda, Suzuki, and Subaru are still the most fuel-efficient cars on the American road (Busch). If the past is any indication, Japanese automakers will continue to set the pace in developing more fuel-efficient cars, and in pioneering technology that will make alternative fueled cars much more practical than they are at the present time ("Consumer").

In conclusion, the development of fuel efficient cars increased during the nineteen-seventies because of the dramatic rise in gasoline prices and increasing consumer demands for cars that had better miles-per-gallon performance. Skyrocketing oil prices made fuel efficient cars a necessity, not only in the eyes of consumers, but in the eyes of the auto industry and the American government as well. After a slow start, the American auto industry improved fuel-efficiency significantly over the next twenty years, but as the economy boomed throughout the nineteen-nineties, fuel-efficiency became less of an issue again economically and politically.

Future developments will depend upon market demand, political stability or instability in the Middle East, and government positions on fuel economy. But from a longer term perspective, it is a certainty that gasoline powered cars will go the way of the horse and buggy, for technology offers many alternatives for powering vehicles, including hydrogen fuel cells and other innovative technologies.

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