

Automobiles and the Fuel Cell

In North America, companies such as Stanley Steamer, Detroit Electric (Figure 1), and Ford developed the first steam-, electric-, and gasoline-powered vehicles.

In the early 1900s, the first steam-driven automobile and then the electric-powered car enjoyed popularity over gasoline-powered vehicles. In fact, in 1912, 30 000 electric cars were on the road in the United States, and 6000 new ones were made each year. However, steam and electric cars were not without problems. Steam-powered cars needed water that would not freeze in cold weather. Electric cars could not travel very far before the batteries had to be recharged (Figure 2).

- Why did gas-powered automobiles replace the steam- and electric-powered cars?
- How are the batteries connected (series or parallel) in Figure 2? Explain.

Electric Cars in the Future

Pollution and a shortage of fossil fuels are two reasons why electric cars may become more popular in the future. The battery for electric cars remains a problem because it would have to be very large to work for long distances. Car manufacturers are looking at other options.

One solution has been to produce a vehicle called the hybrid electric vehicle, or HEV, that uses gasoline and electric power. Many car manufacturers began building these vehicles (Figure 3) in the 1990s. However, HEVs use fossil fuels and produce some pollution, so they are not perfect.

- List the problems that must be fixed to make a practical electric vehicle.
- What are the advantages of HEVs compared with vehicles with only gas engines?
- Why are HEVs not a permanent solution to replacing vehicles with gas engines?

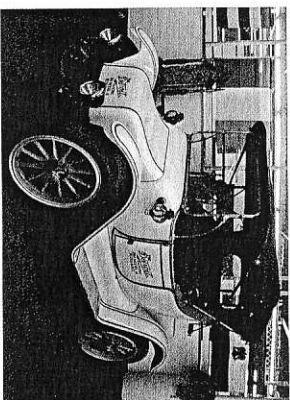


Figure 1 This is a 1914 Detroit Electric Model 46 Roadster.

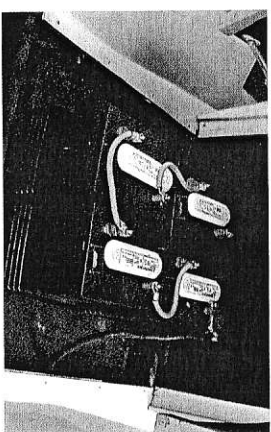


Figure 2 Four batteries powered the 1914 Detroit Electric Model 46 Roadster.

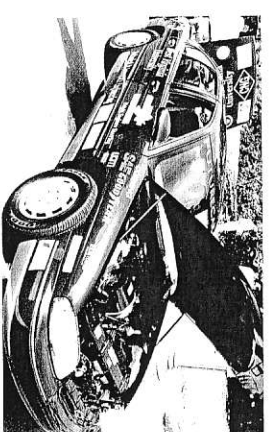


Figure 3 Hybrid electric vehicles (HEVs) are highly fuel efficient and combine gas and electric power.

Fuel Cells: A Practical Solution

Governments in Canada and the United States have passed laws that require car manufacturers to increase the efficiency of their vehicles while at the same time reducing pollution.

The future of electric vehicles appears to depend on fuel cell technology (Figure 4).

Most advances in this field are being made in Canada. For example, Ballard Power Systems is working with car manufacturers to make a fuel cell (Figure 5). Fuel cells produce electricity from hydrogen and oxygen. The only other products created by the fuel cell are heat and water. A fuel cell-powered car would not create any harmful byproducts and could run on clean and renewable fuels such as hydrogen or methanol. The fuel cells would be connected in series to power the vehicle. The number of fuel cells needed would depend on the size and performance of the vehicle.

- What have governments done to encourage manufacturers to produce electric cars?
- Why are fuel cells the most likely power source for the vehicles that we will drive in the future?

A Versatile Energy Source

Fuel cells, and their ability to produce electricity from hydrogen, open up many applications. Imagine electrical generators the size of refrigerators that could provide electrical energy for isolated buildings! This innovation would be invaluable in remote communities. Fuel cells can even run on the methane produced in sewage treatment plants and landfill sites around the world.

- Why would it be helpful if fuel cells ran on the methane produced from sewage treatment plants and landfill sites?

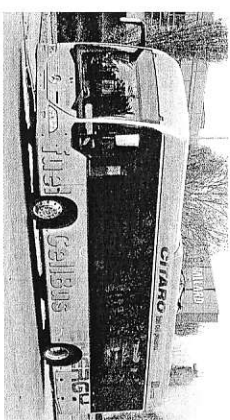


Figure 4 A city bus powered by a fuel cell

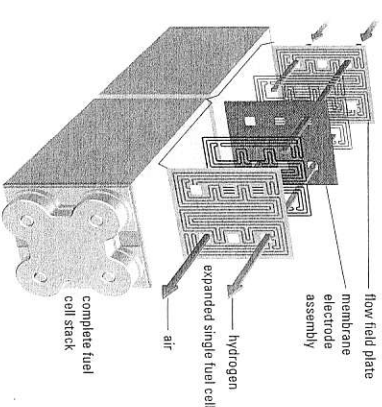


Figure 5 Hydrogen interacts with the membrane in a fuel cell to produce electricity, water, and heat.

Making Connections

- Brainstorm a list of other practical applications for fuel cell technology.
- What other raw materials could provide the hydrogen needed to run a fuel cell? How could this be useful for farms in isolated areas?

Exploring

- Research on the Internet and in the library to find out more about fuel cells. Will the future energy source that powers vehicles be fuel cells? What are the advantages and disadvantages of this technology?