

What's the Big Problem with Cars?

Cars Cause Problems

Kevin's mom drives him to school and picks him up again on Monday, Wednesday, and Friday. On Tuesday and Thursday, she picks him up after school and drives him to soccer practice. Saturday morning the family drives to Kevin's soccer game. On Sunday, Kevin's family usually hops in the car to visit cousins who live on the other side of town. Does your family need the car almost every day the way Kevin's family does?

If you live in Santiago, Chile, you are not allowed to drive your car every single day. Cars cause so much air pollution in Santiago that people are only allowed to drive them six out of seven days. Would this make your life difficult?

One of the major causes of air pollution around the world is exhaust from automobiles. Cars cause at least 60% of air pollution in Central America. Gases from cars and power plants have destroyed huge amounts of forests in northern and eastern Europe. This polluted air is unhealthy. Besides making the air unhealthy for people, car exhaust also makes the air unhealthy for our planet. Remember the **greenhouse effect**? You can imagine how much cars contribute to this!

Cars Make Air Pollution

We all know that automobiles now use gasoline. This gas is made from **fossil fuels**. Fossil fuels are the remains of plants and animals that lived millions of years ago on the Earth. These remains are transformed into coal, natural gas, and oil.

The car you ride in probably burns gas. Gas is made from fossil fuels. Cars use gas for power by a process called **internal combustion**. Internal combustion in very simple terms is just a lot of tiny explosions that happen in the engine of the car.

These little explosions release energy. This energy causes parts to move that in turn, move the car.

To help you understand this process, think about a hand egg beater. When your hand turns the crank, this powers the gears so the egg beaters turn.



It's like this with a car engine, too. Only instead of a hand turning the crank, the little explosions turn the crank. Then everything works together so that the drive shaft turns and the car then moves.

The big problem is that these explosions release not just power for the car, but they release pollutants, too! They release **carbon dioxide** and other gases into the air along with **particulates**. Transportation sources make more than half of the amount of pollution in the United States.

An Old Idea with New Twists

Way back in 1839 a man named Sir William Grove came up with an idea for a **fuel cell**. But fuel cells were not used right away because they were very expensive to make.

Fuel cells run on **hydrogen** and **oxygen**. Of course, hydrogen and oxygen are naturally occurring elements all around us!

They are not fossil fuels. These two common elements mix together at a high temperature so that a voltage occurs. The engine then moves. This is a chemical reaction. It is not a little explosion like an internal combustion engine makes.

Let's skip ahead over one hundred years to the 1960's. It is the age of space exploration and **NASA** decides that fuel cells would be useful as a power source for rockets. Cost was not a main concern for NASA. They were interested in fuel cells because they are reliable and useful. Fuel cells are also very clean and efficient.

Tang Anyone?

Ask your parents what the drink of the astronauts was. Chances are they will answer, Tang! This easily packed orange powder had to be mixed with water. Guess what the only "waste" material from a fuel cell is? You got it - water! This was another reason why NASA liked fuel cells. They produced water that astronauts could drink!

Imagine a car with a fuel cell instead of an internal combustion engine. Dangerous pollutants wouldn't be released into the air. We wouldn't have to mine the limited amount of fossil fuels to produce gasoline. Now, because we are so concerned about the harmful affects of getting and burning these fossil fuels, many companies are trying to find practical ways to use fuel cells as the power source for cars.

The Big Question

You might be asking yourself, "If fuel cells can help the environment so much, why aren't we using them now?" One of the major reasons that fuel cells aren't in widespread use is that researchers need to find ways to get the hydrogen and store it in a cheap, easy way.

A step toward a true fuel cell is to use what is called a "**reformer.**" A reformer lets you use gasoline and separates the

needed hydrogen from the gas. There is still pollution released by the reformer, but not as much as there is in a regular internal combustion engine.

Looking at these steps to true fuel cells is important because right now a true fuel cell is still very expensive and doesn't always work as well as a regular internal combustion engine. Ideally, it would be great to get hydrogen from water rather than getting it from gasoline. It is hoped that we could eventually use **solar energy** to get hydrogen from water. Then there would not be any harmful by-products.

Differences Between Engines and Fuel Cells

This chart will help you to better understand the differences between an internal combustion engine and a fuel cell.

	Internal Combustion Engines	Fuel Cells
How difficult is it to get the fuel?	There is a limited amount of fossil fuel. We must drill and pump fossil fuels and transport them to be converted into gasoline.	There is lots of hydrogen and oxygen - all around us! We are still working to find a good way to get and store hydrogen.
Are the emissions harmful?	Yes, the by-products hydrocarbons, nitrogen oxides, carbon monoxide, sulfur oxide, carbon dioxide, and particulates can cause health problems and add to the greenhouse effect.	No, you can even drink the by-product which is water!
Do we know how to make this power source?	Yes, we have well developed technology to make internal combustion engines and produce gasoline.	We are still trying to make a workable fuel cell that gives us the power we are used to getting.
Can we afford it?	Internal combustion engines and gas are relatively cheap.	It is still expensive to make fuel cells.

The Search is On!

Ford Motor Company has been concerned about the environment for a long time. Starting with its founder, Henry Ford, this company has a long history of searching for “A better idea” that will help its customers and the environment. Today, Ford Motor Company is searching for a low cost, practical fuel cell for the cars we drive everyday.

They have developed a car called the P2000 that can seat 5 people. It uses a fuel cell that has no harmful emissions. The only thing it produces is water vapor! Right now this car is only for research.

Ford does have a car that is a step between the fuel cell car (P2000) and a car with a regular internal combustion engine (like your family’s car). This car is called the Prodigy. It is very fuel efficient and can drive up to 70 miles on just one gallon of gas. It also feels like it has the power of cars we are used to riding in.

Of course, the goal is to make a true fuel cell car that is practical to sell. Until that time, Ford Motor Company is looking into different types of fuel cells and car designs to try to find a low cost one that works well and is safer for us and our planet!

You’re An Expert!

1. Read about Henry Ford. Think about what he would say if he could visit your classroom today. How would he feel about pollution caused by cars? How would he feel about fuel cells? Dress up as Henry Ford and give a speech to your class or write an essay for your local newspaper describing a Henry Ford visit.
2. Find out more about internal combustion engines. ***The New Way Things Work***, by David MacCauley is a good place to start. Make a model or draw a diagram showing how an internal combustion engine works. Think about

how the “perfect” fuel cell might work. Design your “dream” fuel cell.

3. Make a brochure for Ford Motor Company advertising the Prodigy. Be sure to include all the reasons that people who care about the environment should buy this car.

Taking Action...

Think about how your family can reduce the amount of pollution your car puts into our air. With the help of family members, make a list of ways you can change your family’s habits. Post the list in your house. Check the list weekly to see how your family is doing. Let Maggie know!