

NEWS

From GEORGIA TECH'S ENGINEERING EXPERIMENT STATION

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TECH WORKS ON STORAGE
FOR POLLUTION-FREE FUEL

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In cities of the future, expressways could be free of harmful automobile exhausts -- free, that is, if cars run on hydrogen instead of gasoline.

Unlike petroleum, hydrogen fuels burn with virtually no pollution.

"Gasoline produces energy when it's mixed with oxygen but in the process of doing this it releases toxic gases into the atmosphere," says Georgia Tech energy researcher Dr. Billy Livesay. "Hydrogen combines with oxygen to do the same thing but the exhaust gas sent into the air is essentially water vapor."

Tech's Engineering Experiment Station is focusing its hydrogen energy research on methods of efficiently storing this fuel. For these systems to be economical, though, researchers at other institutions must develop commercially-acceptable techniques of producing large quantities of hydrogen.

Several weeks ago, an Italian chemical firm announced that it had accomplished just this result. Officials of the company claimed to have developed a solar system which can manufacture commercially-usable quantities of hydrogen from water.

"If this is really true, it's a tremendous breakthrough," says Livesay, who heads up Tech's hydrogen energy program. "The earth's supply of hydrogen would be virtually limitless because it would be recyclable. Hydrogen burns more efficiently than fossil fuels and does not pose the same pollution problems."

Converting standard automobile engines from gasoline to hydrogen is a relatively simple task. In fact, Georgia Tech students have outfitted a car with a hydrogen fuel system for testing purposes. The vehicle stores its supply of hydrogen in a metal alloy known as iron titanium, which is contained in a steel case. Inside this steel container, the gas does not circulate freely but is trapped inside the alloy.

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Hydrogen atoms are small enough to slip easily in spaces between the atoms of the metal alloy's crystal structure, like honey in a beehive. The presence of hydrogen causes the iron titanium to expand and crumble into a powdery substance but this transformation does not affect the metal's capacity to hold hydrogen. The metal powder does this for an indefinite period of time. Surprisingly, it holds a considerably greater volume of hydrogen than a tank of the same size containing liquid hydrogen.

"In a car the iron titanium releases the hydrogen when it is heated," Livesay says. "The hydrogen then is injected directly into the automobile engine with oxygen. The reaction of these two elements produces heat to run the car."

One of the principal problems with hydrogen cars is the burden which heavy storage tanks place on engines. A 20-gallon tank filled with gasoline weighs about 150 pounds while a steel container holding iron titanium and hydrogen may weigh several hundred pounds. Tech is working to find lightweight metals which can effectively store hydrogen in cars.

If hydrogen becomes an economical fuel, car owners won't be the only beneficiaries. Liquid hydrogen would be an ideal airplane fuel and hydrogen-powered rocket engines already are used in the Space Shuttle program.

Livesay believes hydrogen could replace petroleum products in virtually any fuel application, including home heating and the generation of electricity through fuel cells. He says that the nation's network of natural gas pipelines would be an ideal medium for carrying hydrogen throughout America. In fact, hydrogen could be mixed with natural gas to enrich it as the world's natural gas reserves grow smaller.

For industry, hydrogen's greatest importance may be its potential for saving petroleum for manufacturing.

"Petroleum is practically irreplaceable as a feedstock for the production of many modern materials," Livesay explains. "Using hydrogen in cars, airplanes or furnaces would allow us to divert more of our remaining fossil fuels for industrial application."

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