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# The fuel of the future?

**GrafTech, Case Western win energy grants for fuel cell research**

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Is there an automotive fuel cell headed for your garage?

The U.S. Department of Energy hopes so, and to make sure, the agency is awarding grants totaling $100 million over the next three years to pay for structured research.

The goal is to make the exotic electrical generator commercially viable as an automotive power plant by 2020 -- and to make sure a fuel source, hydrogen, is available.

Fuel cells combine pure hydrogen with oxygen from the air to produce electricity, heat and water. An automotive fuel cell would have to be relatively inexpensive, light, compact, durable and generate at least 85 kilowatts (8,500 watts) to power electric motors that would actually propel the car.

Nothing like that exists today.

The DOE has chosen 25 research groups and assigned each a specific engineering problem to solve by 2010. Many of the winners are federal labs, but two Cleveland applicants are also on the team.

Parma-based GrafTech International, which already makes fuel cell components, has won $2.3 million, and Case Western Reserve University, which is involved in extensive fuel cell research and now testing, will receive $800,000.

GrafTech will work with Case and two other companies, resin maker Huntsman Advanced Materials of Texas and Ballard Power Systems of British Columbia.

GrafTech is assigning a team at its Parma labs -- up to eight scientists working full time on the project and another dozen or so engineers and technicians as needed, said Lionel Batty, director of corporate research and development.

GrafTech's two major fuel cell components, which it supplies to Ballard and other manufacturers, make up the bulk of a PEM fuel cell.

PEMs are lighter and run cooler than other types of fuel cells, such as the solid oxide fuel cell.

GrafTech's fuel cell components are made of graphite, a carbon-based mineral, which is mined like its relatives, coal and diamonds, or can be made from the leftovers of oil refining.

GrafTech's graphite fuel cell parts are stamped out rather than machined, which makes them less costly than rival metallic parts. They are naturally light, stand up to tremendous amounts of heat and conduct electricity better than copper. And they are corrosion-proof.

GrafTech's researchers will be working to improve those attributes and refine the manufacturing process, Batty said.

To increase efficiency, researchers have decided an automotive fuel cell must operate at about 250 degrees, hotter than smaller fuel cells, such as those that would power a laptop.

So GrafTech's task, said Batty, is to make its components lighter, stronger and able to stand up to the higher temperatures. And, oh yes, they must be less costly to manufacture.

"We have been working on this for some time," said Batty, with money from an Ohio Third Frontier grant. "The Energy Department grant will help us bridge the gap to commercialization."

The government's objective is to develop a prototype automotive fuel cell stack that would cost about $45 per kilowatt to manufacture.

At 85 kilowatts, the average automotive fuel cell would cost under $4,000 - a fraction of today's costs.

If the team is successful, it must prove it to the DOE by building a 10-cell prototype fuel cell stack, he said.

For testing, GrafTech will turn to the Wright Fuel Cell Group, a consortium of state universities and industries hosted by Case at the old Mt. Sinai Medical Center campus.

Fuel cells are built in stacks, one cell at a time, and Case will use part of its grant to improve stack design, according to the DOE.

Other organizations to share in the $100 million include 3M, which makes the thin polymer film in the heart of each fuel cell, and a host of federal labs, including Los Alamos, Argonne, Pacific Northwest and Lawrence Berkely laboratories.

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