

In this race, distance isn't everything, it's the only thing

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Swarthmore engineering student Neil McFarland works on a hydrogen-powered car, April 16, 2014, in Swarthmore, Pa., that he will enter in the Shell Eco-marathon Americas. Ron Tarver/Philadelphia Inquirer/MCT

PHILADELPHIA — Its top speed is 35 miles per hour and it has less horsepower than a lawn mower.

Nevertheless, the bright-red, fiberglass-paneled contraption in a Swarthmore College basement is very much a race car — in a race to use as little energy as possible.

The svelte, three-wheeled vehicle is headed to Houston this week to compete among 125 entrants in the Shell Eco-marathon Americas.

Proud of how many miles to the gallon your family's hybrid gets? Take a backseat. Some of the cars in the running can achieve thousands — yes, thousands — of miles per gallon of gasoline. In the 2013 contest, Laval University in Quebec took top honors with 3,587 mpg.

Swarthmore's machine is less efficient — it gets what translates into a little less than 1,300 mpg. A direct comparison with gasoline engines is tricky, however, since the car is powered by a hydrogen

fuel cell.

Urban And Experimental

And don't get the idea that these curiosities will be showing up on an expressway near you. The Swarthmore car weighs just 137 pounds and is only 8 1/2 feet long.

"It's a demonstration," said engineering professor Nelson Macken, who has been guiding the project. It is "totally unrealistic."

Still, the race offers an idea of what might be possible on the roadways of the future. As in the competition, the cars of tomorrow are likely to be sleek and efficient, and powered by a variety of fuels. They likely will come in several forms, depending on where you live in the country and which energy sources are most readily available.

The Eco-marathon cars are divided into two main types. "Urban concept" vehicles are required to look like modern passenger cars, with four wheels and a roof over the driver's head. Creators of experimental vehicles, such as Swarthmore's, have freer rein.

Entrants must complete 10 laps of a 0.6-mile course laid out on the streets of Houston, for a total of six miles. Shell first held the "Americas" edition of the race in 2007; a sister event in Europe dates to 1985.

Swarthmore graduate Eric Verhasselt started building the school's car in 2012, and welded its aluminum frame in the summer before his senior year.

The most expensive part of the car is the \$10,000 fuel cell, which the college already owned.

Tweaking And Testing

Verhasselt took the car to Houston last year for its first Shell competition. He placed third among six hydrogen-powered vehicles.

Junior Neil Macfarland is continuing the effort this year. He helped Verhasselt with the initial design, and now is tweaking and testing the car to maximize its performance. As it turns out, the car runs best at just 15 miles per hour.

Also helping are junior Andrew Grasberger and freshman Persis Ratouis, among others.

Don't forget secret weapon Winnie Ngo, a junior from Oakland, Calif., who will be behind the wheel.

The computer science major weighs just 95 pounds and stands 4 feet, 10 1/2 inches, allowing her to fit into the small car with room to spare. The rules require the driver to be at least 110 pounds, so Macfarland will have to add some weight to the vehicle to compensate.

Much better than having the 6-foot-1 Macfarland drive. Since his long limbs do not fit inside the cockpit, he had to remove the car's body panels to take it for a brief spin on campus.

"People were turning and staring," Ngo said.

"Chasing Electric Gremlins"

The hydrogen for Swarthmore's car is stored in a cylindrical tank behind the driver's seat. It generates electricity in the fuel cell, a black box mounted nearby.

The principle of a fuel cell is the reverse of that stock experiment in high school chemistry class, of zapping water with electricity to separate it into hydrogen and oxygen. A fuel cell combines hydrogen and oxygen, yielding water and electricity.

Fuel cell cars are non-polluting, as they don't give off any smoke or gasses. Their true level of greenness, however, depends on the type of energy used to produce the hydrogen.

One day last week, Macfarland had a more pressing concern: The car wouldn't start.

"Right now, we're chasing electric gremlins around the car," Macfarland joked. Gremlins are little mythical creatures fond of damaging machinery.

The problem turned out to be an emergency shut-off switch that had jammed, and Macfarland had it working again in short order.

The three-day competition opened on Friday.

Start your engines! Or fuel cells.