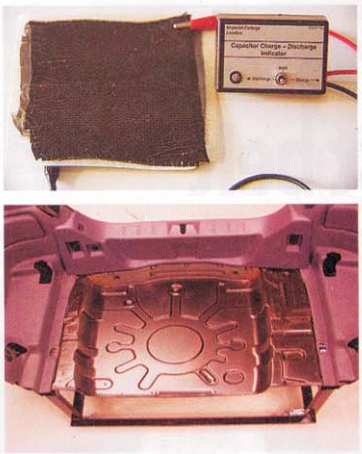
An electric car that uses its own body as an energy source could be the answer to doubts about the practicality of the vehicle

By Heath Reidy

Hidden power



Weight saver: The composite (top) could replace metal in the wheel well (below)

When it comes to buying a car that fills the driver with confidence, electric vehicles are rarely likely to be at the top of the prospective purchaser's shopping list.

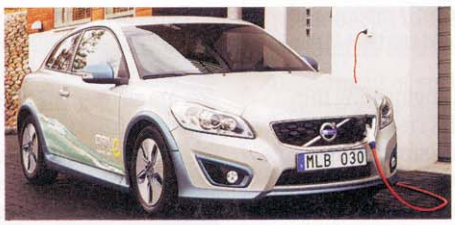
Let's face it. The idea of being stuck on some lonely road in the middle of the countryside because of a drained battery on a cold winter's night and without a charging point in sight is enough to put off even the greenest of engineers from purchasing an electric car.

But London's Imperial College may have an answer that could make the most sceptical of drivers of petrol-powered cars think differently about electric vehicles – a composite material that allows the car body to act as a power supply itself.

The prototype material is being developed as part of a €3.4 million EU-funded project, led by Imperial College, called Storage. Among the nine partners in the three-year project is Volvo Cars, which is looking at using the material to help power its cars in the future.

The idea is that the material will store energy in different parts of an electric, or hybrid electric, vehicle and use it to power everything from the brake lights to the satnav. It could mean fewer and smaller batteries being used to power electric vehicles, which could last for a longer period without having to be charged. The result would be a much more lightweight, compact and reliable energy-efficient car.

Project co-ordinator Dr Emile Greenhalgh (pictured below), of the department of aeronautics at Imperial College, says: "If you make the bonnet, the roof, the car doors out of this material, it can be used to store energy in the car that can be used to drive. Rather than making that [car part] out of steel you would make it out of this [composite] material and connect it into the systems of the car. This would be an alternative source for the car to get energy to drive the systems."



Material gain: The material could fit the C30

The composite consists of two layers of carbon fibre lamina, separated by a glass fibre layer. Energy is stored in the composite by attaching it to a circuit, which moves the ions within the material to the electrodes, producing a voltage across them. During charging, the glass fibre acts as an insulator, allowing the ions to move but not the electrons. Consequently, on discharging, the voltage across the electrodes will drive them around the circuit, while the ions move back through the glass layer. The electrical energy is stored.

> "You win a lot of weight and volume with this storage"

Greenhalgh says that when fitted to a car the material will still need to be charged like any conventional rechargeable battery. But it will store and discharge large amounts of energy much more quickly than conventional batteries.

The material could also be charged when the car is on the move, recycling energy created when the car brakes or stops.

A particular area Greenhalgh and his team is looking at for the composite is in the wheel well to replace the metal flooring in the boot. The Storage team is developing a composite wheel well component that Greenhalgh says could lead to a 15% reduction in a car's weight.

He goes on to say that in the future the whole car battery could be replaced with a structural power material consisting of the composite, creating an even bigger saving in weight. The Tesla Roadster, a car that weighs 1.2 tonnes, for instance, could be reduced to 750kg. These kinds of developments are a long way off into the future, though, he says.

Volvo is investigating the possibility of fitting the composite wheel well component into its prototype electric cars to put the material to the test. Per-Ivar Sellergren, a senior testing engineer at Volvo Cars and the firm's team leader on the project, says: "Two great advantages are that you win a lot of weight and volume with this storage. Another is you get a high efficiency.

"The battery development with the latest electrolyte invented by researchers from Imperial will hopefully take us a step closer to the point where most EV [electric vehicle] and HEV [hybrid electric vehicle] customers will be satisfied."

Greenhalgh hopes other car manufacturers will follow in Volvo's footsteps. Developments are in the offing to take the technology from a small lab-size laminate to a much larger scale. UK company Advanced Composite Materials (ACG), one of the partners in Storage, aims to start research in mass production of the composite material later this year.

Greenhalgh admits that the technology is still its infancy and says there is a lot of work to be done to get to this level. He expects to see the composite being used to power electric and hybrid vehicles in about a decade. So that fear of being stuck in the middle of nowhere in your electric car may not be gone just yet.

"It's a risky technology because it is fairly immature but the principle is something that is revolutionary," he says. "Potentially, if we can address the material issues and how to volume-produce the material, the benefits could be huge.

"I'm anticipating that this will offer significant improvements in the range of electrical and hybrid cars once these materials are mature enough. In 10 years we would find this in cars. That's my feeling." ■