First Affordable Fuel Cells for Mobile Gear

Medis Technologies has a cheap, disposable power pack. Others aren't far behind

According to the U.S. Fuel Cell Council, an industry association, there are at least 40 different fuel cells for portable, stationary, and transportation applications. But as recently as last August, industry analysts were saying that fuel cells that were both small and cheap enough to power cellphones, PDAs, and digital cameras were still "a year or so away."

Medis Technologies, in New York City, seems to have proved them wrong. That August the company started selling a recyclable fuel cell with a reusable power management cable for US $34.99, with fresh power packs for $20. This makes Medis the first to market. But competition is coming later this year from a number of companies.

The initial version of Medis's cell, the Power Pack Portable Charger, provides 1 watt and is intended for only the low-power end of the gadget market—no touch screens, for example—and only four or five full charges at that. Medis subsequently released its higher-powered Xtreme 24/7 Portable Power Generator, which can charge a wider range of products, including iPhones.

While far from perfect—Medis's power packs can't be refilled—the cell is a breakthrough, says Bob Wichert, technical director of the U.S. Fuel Cell Council. "The difficulties in bringing fuel cells to the product stage have been greater than many people anticipated," he says.

In fuel cells, hydrogen reacts with oxygen over a catalyst to make electricity and water, but because a canister of hydrogen is difficult to come by, many fuel cells start with the hydrogen bound up in a hydrogen-rich fuel such as methanol and produce carbon dioxide as a by-product. Medis's technology is unusual in that it combines a hydrogen-rich liquid, borohydride, with oxygen to generate electricity, water, and the mineral borax."

Borohydride is expensive compared to methanol, but it's probably the least technologically demanding to bring to market," says Louis Stuhl, an inorganic-chemistry consultant and founder of ChemMotif, in Concord, Mass. Borohydride chemistry prevents carbon monoxide from poisoning the fuel cell catalyst, which can be a big problem for many other technologies, such as methanol fuel cells.
In methanol-based fuel cells, the fuel is diluted with more than nine parts water to one part fuel in order to release the methanol’s hydrogen. “We can have a much higher fuel concentration,” says Mark Kinkelaar, Medis’s senior vice president for technology and operations. Because no dilution is needed, “our fuel goes right to the anode, with no valves or pumps,” he says. Pumps reduce efficiency and add complexity—and cost. Moreover, methanol fuel cells can exceed 400 °C, whereas the Medis unit operates close to the ambient temperature—another reason it’s easier and cheaper to manufacture.

So the Medis Power Pack is cheaper, but is it cheap enough? The obvious comparison is to a sealed-unit AA battery pack. Medis’s start-up cost is on a par with, say, the Duracell Instant Power Charger, which can be had for $30. Then there’s the $20 you spend for every four or five charges. The Medis fuel cell may make sense only when you don’t expect to have access to a recharge outlet or if the added weight of a recharging unit is a concern—all-day air travel, for example, or a camping trip.

While Medis can claim to be the first with a consumer-priced fuel cell for mobile devices, it may not be the only player for long. At the January Consumer Electronics Show in Las Vegas, Horizon Fuel Cell Technologies showed its MiniPak fuel cell, which it hopes to market sometime in 2009 for an expected price of $50. The charger will use drop-in solid-state metal-hydride cartridges of different sizes that will cost about $1 per watt-hour. And Jadoo Power, which makes a 12-watt-hour recharger, unfortunately requiring a 2-kilogram hydrogen canister, has a whole new line of fuel cell products coming out this year.

Medis isn’t standing still either. It’s working on a cartridge-based version of its power pack and plans to work on a refuelable version; each would cut the total cost. “We know 20 places to make it better, but we need to start to launch,” says Kinkelaar.

About the Author
DANIEL P. DERN wrote for us in December 2008 about his search for the perfect ultralight laptop. In January, he spent a good portion of this year’s Consumer Electronics Show looking at new battery technologies that would add hours—but not ounces—to small gadgets. As he reports in Update, a number of sophisticated battery-recharging systems are almost ready for widespread adoption.