

# Bicycling



*Pedal-Powered Electricity Generators*

## High-Voltage Workouts

Thanks to a few tinkering cyclists, pedal-powered electricity generators have finally arrived.

By Bob Parks

It's been a preoccupation of inquisitive geeks for a long time: trying to extract useable electric power from a bicycle. In basements or garages, they have mounted DC generators and Trek 1200s onto yard-sale trainers, testing voltages and waiting for that eureka moment. The quest has become more popular lately, but it has always served as an emblem for lean and desperate times: Think of Gilligan atop a bamboo bike powering the Professor's makeshift radio, Edward G. Robinson wheezing on his trainer to urge a lightbulb to life in *Soylent Green* or ectomorph Ed Begley, Jr. deep into lactate threshold on HGTV to make eco-friendly toast.

The problem is that our legs don't have the raw output to make much juice. If you cycle with a power meter, you know that a fairly strenuous ride yields an average of about 140 watts for an hour. Mount your bike to a generator, slice off 30 percent for mechanical and electrical losses, and you've put out a measly 100-watt average during your sweaty hour. It amounts to around a penny's worth of electricity, one three-hundredth of a typical home's daily use—not enough juice to run the PlayStation for 15 minutes.

Until recently, because of low output and high equipment costs, bike generators were mainly used as green educational tools or feel-good gestures for convention booths. On their own, the gadgets had no hope of producing enough power to pay for their own materials, which start at around \$250, not including the bike. And because most setups utilized lead batteries, the net environmental impact of making electricity this way would have been devastating if everyone did it.

But that all changed one day in 2007, when recreational triathlete and college student Hudson Harr started trolling Craigslist for the parts to take the latest stab at the time-honored experiment. Harr, then 21, was crashing at his mom's house in St. Petersburg, Florida. "I told her I was going to do a little prototyping," he says. "Little did she know the living room was going to be packed with gym equipment and electronics."

After tearing apart several health-club machines, Harr discovered that the Precor elliptical trainer has an onboard generator to power the screen. He began to form an idea for a company, one that wouldn't force gyms to buy new devices to produce pedal-powered electricity. "Making use of what's already there is a big part of the idea's return-on-investment and environmental sustainability," he says. "If our customers had to buy a new piece of gear, it would be the opposite of sustainable. It would be like, 'Hey, throw away your truck, I have your new Prius right here.'"

As Harr started to solicit the expertise of engineers, his design came to include a circuit that sends power directly to the customer's grid, and thus does away with batteries and their environmental issues. But the most crucial breakthrough of all was Harr's choice of venue—health clubs. Because the machines are in near-constant use, they can harness a phenomenon known as "crowd farming"—the collective impact of small contributions from a mass of people. Harr's machines put out just 0.1 kilowatt—but because they're used for 10 hours or more a day, they harvest enough to pay back their owners within 15 years, roughly the same payback as solar electric. Health-club owners immediately saw the financial and marketing advantages of such devices, and Harr's company, ReRev, now has 150 machines at more than a dozen gyms. Each facility creates enough electricity to run a small home, and one recently surpassed a megawatt of utility-grade power. In addition to the electrical infrastructure, the firm installs readouts on every exercise station to let users know how much they produced in a workout. Plans are afoot to let gyms compete against each other for kilowatt-hour bragging rights.

Around the same time the young CEO began his experiments, a group of entrepreneurs in Ridgefield, Connecticut, began prototyping a generator that works with a stationary bike. Their company, Green Revolution, enables Spin classes to monitor their energy production on a wall behind the instructor, with a similar equipment cost and payback schedule as ReRev. By all accounts its modified spinners feel like regular ones, complete with adjustable resistance levels; when you add resistance you also increase the bike's power output. But whatever tech you straddle while waiting out the next snowstorm, it's clear that the grid is in for some jolts of collective leg power. "It's remarkable to watch our data coming through—the ebb and flow of people working out day after day," says Harr.

Meanwhile, individual cyclists continue to experiment to find a domestic role for their pedaling, according to Tamara Dean, whose book, *The Human-Powered Home: Choosing Muscles over Motors*, documents her family's use of bike generators, as well as bike-powered mechanical blenders and grain grinders. Her book, which she wrote using a bike-powered laptop, includes detailed instructions on how to build your own generator. Need serious power on your commute? High Tide Labs, in Palo Alto, California, recently launched a bike-mounted generator called the RollerGen, which puts out more than 30 watts—enough to recharge a laptop computer—as long as you're ride faster than 8 mph.

No matter how accessible pedal power becomes, though, cyclists will probably continue to tinker. In Los Gatos, California, website manager David Butcher, 54, has trained an hour per day nearly every day for the last five years to power his home office equipment, cell phone, electric chainsaw, washing machine and other household gadgets. He started with a simple mock-up 30 years ago, and continues to upgrade his system to increase its efficiency. For instance, he swapped his back wheel for a 36-inch wooden tabletop milled to a perfect circle to drive his generator, and eliminated the chain by bolting the flywheel directly to the crankshaft.

All the modifications still don't make a significant dent in Butcher's overall consumption. But, he says, "The true value of this has to do with intangibles. Rather than relying on power that may not be good for the environment, you know this power is good for you. And you grow a personal connection with the concept of a watt. It inspires me to push a little harder.

"It's like the way people tend a garden just for a couple of tomatoes," Butcher says. "You drive all over town to get supplies and work on it every weekend. Has it really paid off in time or money? No, those tomatoes probably cost \$20 a piece. But you love 'em."

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