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How Windmills Are Making More Fuel-Efficient Mazdas

BY ERIC TEGLER 09.20.12 6:23 AM

Image: Mazda

What do windmills and Mazdas have in common? More than you'd think. In an effort to boost fuel economy, the Japanese automaker is looking to pilfer the windmill parts bin for the resilient capacitors capable of standing up to fluctuating temperatures and the occasional avian impact.

Mazda is borrowing the windmill capacitor technology for its new "Intelligent Energy Loop" system. Mazda touts i-ELOOP as "the world's first passenger vehicle regenerative braking system that uses a capacitor." The i-ELOOP system will debut on the 2014 Mazda 6, and be branded as part of the company's suite of SKYACTIV technologies which focus on improving the efficiency of its conventionally powered cars.

However, describing i-ELOOP as a regenerative braking system is a bit misleading. As Mazda Vehicle Development Engineer and amateur racer Dave Coleman explains, there's no weird hybrid-esque brake pedal feel with i-ELOOP because there's really no regenerative braking going on. Instead, i-ELOOP is designed to capture energy from the inertia of the car, drawing power from the alternator the moment the throttle is closed.

"It's hard to figure out what to call it," Coleman admits. "i-ELOOP is our best compromise."

Specifically, i-ELOOP features a 12-25V variable voltage alternator, a low-resistance electric double layer capacitor and a DC/DC converter. The system starts to recover kinetic energy the moment the driver lifts off the accelerator and the vehicle begins to decelerate. The variable voltage alternator generates electricity at up to 25V for maximum efficiency before sending it to an Electric Double Layer Capacitor (ELDC) for storage.

The ELDC borrows technology developed for windmill and hybrid heavy equipment applications which brought down the cost of robust, temperature tolerant, vibration and crash resistant capacitors.

The DC/DC converter steps down the electricity from 25V to 12V before it's distributed directly to the vehicle's electrical components. The system also charges the vehicle's battery as necessary, and i-ELOOP reduces the need for the engine to burn extra fuel to generate electricity. The result, Mazda claims, is up to a 10 percent fuel economy improvement.

"That's in a best-case scenario," Coleman allows, "like at night, in winter, when it's raining with the wipers, heater, lights, and radio running and in traffic. On the EPA cycle we get about one MPG with it."

A singular MPG might not seem like much, but taking the accessory load off the engine is a strategy other manufacturers are following to hit ever-higher fuel economy standards. The next steps, according to Coleman, will be moving the air conditioning compressor and water pump from belt drive to electric power, making even the most mundane bits under-hood even more efficient, and reducing fuel consumption in the process.

"So many of the fuel economy technologies out there just make the car dull to drive," laments Coleman, but the i-ELOOP technology should maintain the high level of driver involvement that's crucial to Mazda's brand values, while simultaneously boosting fuel economy and reducing emissions in the process.

Tags: i-eloop, Mazda, mazda i-eloop
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