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The Goodyear BHO3—A Car Tire That Generates Electricity

The Achilles heel of all electric vehicles is how far they can travel before their batteries need recharging. At the 85th Geneva International Motor Show, The Goodyear Tire and Rubber Company unveiled their BHO3 prototype tire. This tire has a built-in electricity-generating system that can partially recharge the batteries on an electric vehicle without breaking any of the laws of thermodynamics. (See Photo 1.)

To avoid breaking the laws of thermodynamics, their tire breakthrough has to generate electricity without changing the amount of energy used by the electric motor during the normal operation of the vehicle. Without changing how much energy it takes to roll the tire, the BHO3 prototype turns tire heat and tire deformation—which are caused by the normal rolling of the tire—into electricity.

Tires are usually designed to run as cool as possible. Goodyear has intentionally designed this tire to run as hot as possible to maximize the amount of heat available for conversion into electricity. This tire is de-

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signed to absorb heat even when the car is parked. So even if the car isn't running, its hot tires will be generating electricity to charge the car's batteries. All ambient heat is converted into electricity by a thermo piezoelectric layer that covers the full internal surface of the tire.



Photo 1—The Goodyear BHO3 is a prototype car tire that generates electricity.

Getting the tires hot is a priority, so the outer shell of the tire has a special black texture specifically designed to absorb sunlight and convert it into heat. The tread is also designed to absorb and transmit heat, created by the friction of the road surface, to further raise the tires' temperature. Goodyear

Photo 2—Goodyear introduced the BHO3 at the 85th Geneva International Motor Show.



Photos courtesy Goodyear Tire & Rubber Co.

wanted the inner surface of their tire to be extremely hot and the outer surface to remain reasonably warm. To accomplish this task, the outer layer of the tire has a built-in cooling

system that keeps the outer temperature of the tire reasonable while it is extremely hot inside. The goal here is to not melt the blacktop on the road's surface or burn a person's hand if they touch a tire.

Goodyear's goal is to get every bit of otherwise wasted energy converted into electricity. To convert the physical deformation of the tires where they touch the road, Goodyear built a separate piezoelectric layer that converts into electricity the physical flexing of the tire as it rolls. These tires are extremely rugged and they can run safely at 50 miles per hour for up to 50 miles even after suffering a puncture. Photo 2 shows what the Goodyear BHO3 prototype tire display looked like at the Geneva Switzerland International Motor show. You can view a video introducing the BHO3 at www.youtube.com/watch?v=ViMqrtq4aYg.

The Goodyear press release that I received did not indicate how the electricity will be transferred from the tires to the batteries, how much electricity the system can generate, or how soon this prototype tire will find its way into commercial use. However, down the road, when it is introduced it might increase the range of the all-electric vehicle enough to make the all-electric vehicle practical.

Recalling the Facts

1. Do you think it is possible to build a tire that can generate the to-

tal needs of a future electric vehicle? Why?

2. Does the tire described in this column void any of the laws of thermodynamics? Why? ©