Brainstorm: Environmental Design

What is the balance, for the engineer, between an environmentally efficient vehicle in operation, and the other aspects of manufacturing, material, and their environmental cost and impact?

Rebecca Winer, Robert Warden, Ben Ciabola

If we want to make vehicles clean and environmentally sound, then we're going to have to look at the entire supply chain, including the fuel, the wells to wheels ratio, and the production and life cycle of the car itself. Another issue is that all these vehicles are test models, and they're being done in very low quantities, so they are more expensive. Supply vs. demand dictates that when people want to buy hybrids, they'll become a lot more affordable. Once you prove you can make it, you can work on making it cheaper.

It's very taxing on the environment to produce all the components, but in time, people will concentrate on that aspect of the supply chain, and results will improve. The technology isn't quite mature yet. We're still in the process of figuring out what the best solution is going to be. The one that gives us the most advantages for the lowest price is eventually going to win out.

Michael Prclek, David Ovelsby, Matthew Young; Mississippi State University

Every design could consider, from the beginning to the end, the extraction of the raw materials, development of the

product, and it's compliance with WEEE directives. With hybrids and electric, the batteries involved are a big issue.

With alternative energy sources, you have to look into what it takes to create that energy. We are using a B20 Biodiesel, which is actually made from soybeans. So they're grown in America, and it's very efficient.

We were required to consider our fuel selection based on a wells to wheels ratio, meaning the efficiency created of extracting the raw materials from its source, and efficiency of the whole system to tune the wheels of the vehicle. We did consider that aspect, but not the WEEE compliance of the product. It was exciting and eye-opening for us when we considered the fuel source from its wells to wheels and emission generation.

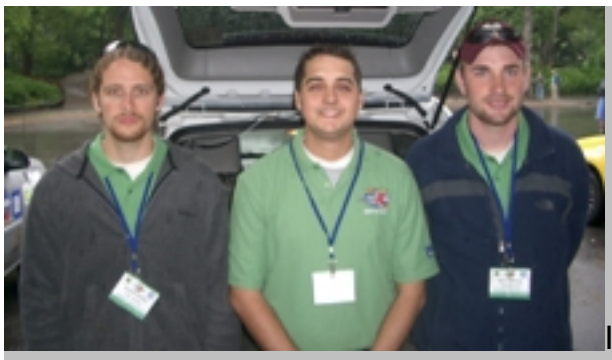
Gary Neil, Mike Jobe, Tom Southerland; Penn State University

You don't want to sacrifice anything, like power and cargo capability when you design a fuel efficient vehicle. So Penn State tried to integrate the fuel efficiency and emissions aspect of it, and still keep all the comforts.

Americans don't want to get rid of their big cars. They're not going to settle for the little hybrids. They want the big stuff. So if we can get cars to mid-size SUVs to be more efficient and a little more ecologically friendly, then that's better for everybody.

The ecological impact is interesting. The percentage of lead-acid batteries now being recycled is in the high 90's. As an economy, we use those batteries, and have a good infrastructure for recycling them. The nickel metal hydride and the lithium ion batteries will more than likely be going into hybrid electric vehicles in mass production. As we get more of those batteries in the fleet, the infrastructure will follow to...recycle those types of products.

Ryan Williams, Josh Frasier, Steven Phillips; Mississippi State University



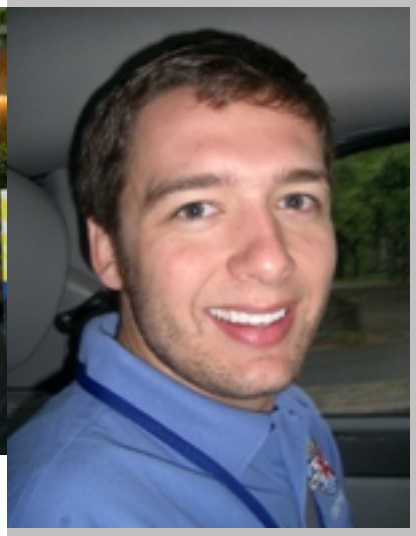
It's important to make advances like hybrid technologies, and when they first come out, they're obviously not at full potential. When you look at the Internal Combustion Engine, it has come quite far over the last hundred years. The ICE has a long history, so it's difficult to compare that with hybrid technologies, which have been on the market only four-five years. As time goes on, the development of hybrids will improve, as will the manufacturing techniques. This is just a stepping stone to get there.

Our vehicle was made for the consumer. Everything, from top to bottom, was made for the consumer. All the features we have in here are top-notch, and that was our goal. That's how we did it. You can go down to the dealership and get most everything we implemented. Of course, an electric motor is going to be in it, and that has to be mass-produced. When you start to implement that into the vehicles, they will start to be mass-produced.

Frank Falcone, Argonne National Laboratory

Many studies that compare and contrast efficiencies of systems with its environmental impact have two flaws. One of them is that they don't put enough miles in the test. They assume that people only drive 10,000-12,000 miles a

Brandon Tarbridge, Sentech



I've heard the Hummer vs. Prius argument, and I consider it unfounded. You have to consider a lot of different things when you're talking about environmental impact. You have to find out where the

Joe Bisbing, Tony Guld, Nick Davis; University of Akron

You have to start somewhere. Obviously, these are experimental prototype vehicles. So when you start out, the materials are going to be more exotic, they're going to cost more, and take a lot more from an ecological standpoint. It's worthwhile because if you didn't start somewhere, you'd never

year. Another issue is that vehicles have about a twelve year attrition rate in the US. Again, the Southwest vehicles drive a lot longer. So when you take it all, multiply the miles, say three years versus twelve years, the gains in efficiency are worth it. But there are a lot of intangibles that aren't in the equation. For example, oil independence versus national security- a little difficult to quantify, but we all agree it's very important.

parts come from, if you can recycle any of those parts, and finally how large the vehicle is. You have to realize that the Hummer is about four times larger than a Prius, so you have four times the materials. To say the Hummer is more environmentally friendly than a Prius is an erroneous conclusion. You'd have to look over the facts again, and ask some unbiased people. I think it's the engineer's role to design a proper vehicle, and it's the supplier's role to provide materials that are more environmentally friendly.

get that advancement. You can make it more environmentally efficient after you get the system working.

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