Revolutionary green technology bus

July 28 2008

Fisher Coachworks' lightweight hybrid bus, which achieves twice the fuel economy of current hybrid buses, has some Oak Ridge National Laboratory roots. Credit: Fisher Coachworks

Insight from Oak Ridge National Laboratory, commitment from two Michigan companies and funding from the Department of Energy have led to the commercialization of a lightweight urban transit bus with double the fuel efficiency of conventional hybrid buses.

This new green technology 40-foot bus features a high-strength stainless steel body and chassis and a hybrid power system that drives the bus primarily with stored electrical energy. This approach reverses the paradigm of conventional parallel hybrid designs that use electric energy only to supplement the acceleration and torque requirements of a diesel engine.

At the heart of the bus is a chassis made of Nitronic 30, a nitrogen-strengthened stainless steel that is stronger and stiffer than conventional steel. These attributes translate into less material required for a chassis, resulting in reduced weight.

"Nitronic stainless steel is incredibly durable and enables our chassis designs to have significantly longer service life vs. ordinary steel vehicles," said Bruce Emmons, president of Autokinetics (http://www.autokinetics.com/) of Rochester, Mich., which developed the bus. "The fact that stainless is also 100 percent recyclable and more environmentally friendly to produce than aluminum makes this an ideal green raw material for vehicle structures."

Additional advantages of Nitronic 30 include excellent mechanical properties at sub-zero and elevated temperatures along with low-temperature impact resistance and superb resistance to high-temperature oxidation. While this material is more costly than conventional steel, Emmons noted that the additional cost is offset by design innovation, parts consolidation and streamlined manufacturing processes.

"The benefits of improved strength-to-weight performance quickly compound to all other vehicles systems such as smaller tires, lighter brakes, batteries, motors and so on," Emmons said. "By optimizing the total vehicle we have been able to cut the weight almost in half, which has led to performance improvements, most notably fuel economy gains."

In addition to its reduced weight and hybrid power system, the bus will incorporate a number of advanced design features and advantages, said Gregory Fisher, chief executive officer of Fisher Coachworks (http://www.fishercoachworks.com/), which licensed the technology, has produced a prototype and plans full commercialization. The bus made its debut today and deliveries of the bus are expected to begin in 2009.

Some of the advantages are improved vehicle safety for passengers, lower cost, reduced noise and improved ride dynamics. The major advantage, though, will be in cost to operate, according to Fisher.

Specific contributions from ORNL included computer crash studies and infrared thermal imaging to evaluate the quality of some of the initial laser welds in the structure. Early tests showed some problems with the laser welding technique, so Autokinetics chose to use resistance spot welding in most places and tungsten inert gas welding for the remainder of the joining needs.

But even before its technical contributions, Emmons said ORNL had a huge impact.

"ORNL was the first to suggest the possibility of applying Autokinetics' light-weighting ideas and technologies to the bus field," Emmons said. "Without that insight, this program would never have happened."

Phil Sklad of ORNL's Materials Science and Technology Division served as the program manager and technical monitor and noted that DOE's $2.5 million investment in this project is being rewarded with a revolutionary bus.

"This is a perfect example of how the Department of Energy, a national laboratory and the private sector can collaborate to produce something that is potentially of great value to society," Sklad said.

Source: Oak Ridge National Laboratory

Citation: Revolutionary green technology bus (2008, July 28) retrieved 19 April 2024 from https://phys.org/news/2008-07-revolutionary-green-technology-bus.html

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