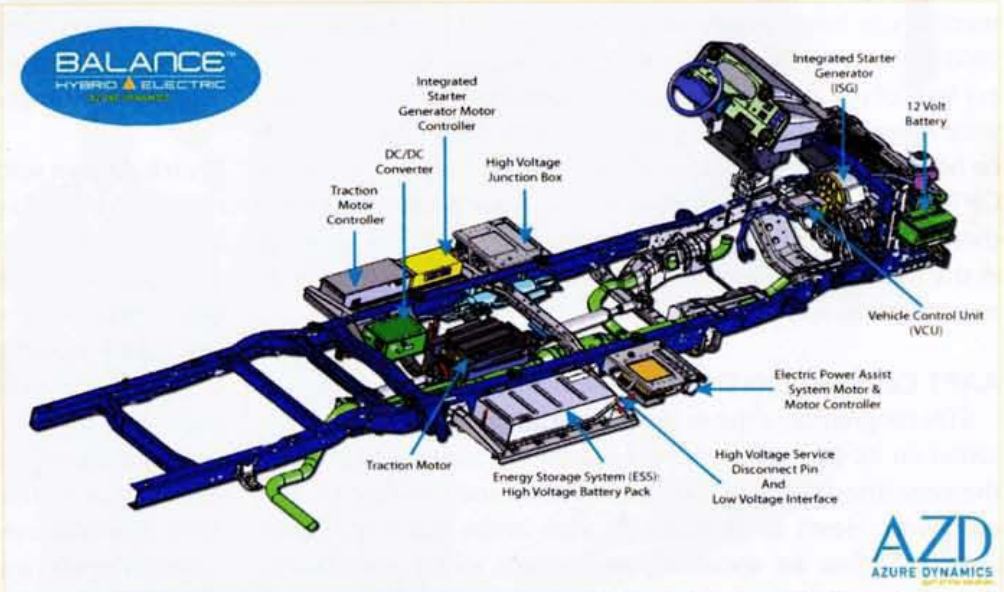
Hybrid Technology Coming to the Small School Bus

By Bill Siuru, PhD, PE



A schematic of the Azure Dynamics hybrid electric chassis for the Ford E-450 that Collins Bus Corporation will use in its Type As.

Up until an announcement made by Collins Bus Corporation in early April, hybrid electric school buses had been limited to large, diesel-powered Type C buses. Those diesel vehicles of the electric variety from IC Bus and Thomas Built Buses have demonstrated substantially reduced diesel fuel use, emissions and greenhouse gases.

Entering the market offering a gasoline hybrid option, the first of its kind for Type A school buses, Collins partnered with Azure Dynamics Corporation, an exclusive chassis manufacturer for Ford. While the certified Type A bus chassis was still in development, Kent Tyler, president of Collins, said a finished product featuring Azure's new Balance Hybrid Electric drive train could be released later this summer. The technology would be available for the Collins and Mid Bus brands in the United States and Corbeil buses in Canada.

"We have the best bus distributors in the U.S. and Canada, and some of them have been looking for hybrid solutions for their customers," said Tyler. "We are excited about being able to soon offer a solution to this demand."

Working with Ford, Azure Dynamics developed the Balance parallel hybrid drive system for the Ford E-450 Cutaway and Strip Chassis. The system combines a 100-kilowatt AC induction traction motor, power electronics, an integrated starter/generator and a 288-volt nickel metal hydride (NiMH) battery pack with the conventional 5.4-liter Triton V8 gasoline engine and 5-speed automatic TorqShift transmission.

Collins and Azure Dynamics estimate the Balance hybrid system could increase gasoline fuel economy by up to 40 percent and reduce maintenance costs by 30 percent. These improvements result primarily from regenerative braking, which takes advantage of the school bus duty cycle with its frequent stops and starts and reduces brake wear and tear. The gas hybrid chassis also promises to cut the carbon footprint by up to 30 percent. Much of this can be attained by reduced idling emissions while loading and unloading students, either at the school bus stop or in school parking lots.

"With this system, lights, heating, cooling, and communications equipment still operate without the engine running," added John Doswell, Collins' vice president of sales and marketing.

The Collins hybrid gasoline bus could virtually operate in silent mode via an electric-only mode at low speeds and for short distances — from an eighth of a mile to a quarter mile. An electric launch-assist can save fuel on takeoffs. Like Ford, Honda, Toyota and other hybrid cars and SUVs, the Collins vehicles won't need to be plugged into electrical outlets to charge the batteries, as they would contain stand-alone, charge-sustaining systems.

While still in the early developmental phase, Collins said the hybrid is based on proven technology.

"Azure brings expertise and a proven system to the school bus market, and Collins is proud of this partnership," Tyler said.

Besides school buses, the chassis and drive train is used for box vans, package delivery vans and shuttle buses. Approximately 160 have been built and are currently in service for FedEx, AT&T and Purolator in Canada. Shuttle bus production recently started.

The Azure Balance technology mated to the Ford E-450 chassis has also completed an accelerated durability test that simulates seven years and 200,000 miles of duty in a few months time. The testing was performed at the Federal Transportation Administration's Altoona (Pa.) Bus Research and Testing Center. Here, harsh road conditions mimic real-world conditions encountered by a commercial shuttle bus.

Jay A. Sandler, Azure Dynamic's vice president for sales, said the Balance drive train will utilize a NiMH until the fall of 2010, when the company will switch to Lithium-ion batteries from Johnson Controls–Saft strictly for cost reasons.

And in the not-too-distant future, diesel hybrid electrics could be a reality for small bus operators.

"We may consider doing a diesel application of the Balance Drive on the Ford Diesel platform once Ford decides on what diesel engine it will use for 2010 and beyond," said Sandler. "Currently, that is not clear, since it has announced its separation from Navistar Engines. We are studying the E-350 platform and considering volume and customer base to determine if there is a sufficient market to form a business case." ■

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