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Ripe for innovation

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CEO Scott Harrison credits his strong work ethic and love of technology to his father, who was a GM machine technician.

When Scott Harrison talks about his company's hybrid propulsion system delivering a 40% improvement in fuel efficiency, he's not dreaming. Nor is he speculating about something that only exists in CAD data. His words are based on real-world experience in hundreds of vehicles in daily fleet service. Hundreds more are slated for 2009 delivery.

"Our value proposition is this: Fuel costs are going to go higher and the regulatory environment is going to get tougher," explained Harrison, the CEO of **Azure Dynamics**, maker of hybrid and electric propulsion systems for medium-duty commercial vehicles. "We can show 30% reductions in greenhouse gas emissions and maintenance costs, compared with conventional trucks."

While scores of start-up companies are hoping to break into the hybrid and EV spaces, Azure Dynamics (AZD) has been there for 12 years. The Vancouver-based company was spun off from a British Columbia electric utility R&D project in 1997. Along the way it acquired EV specialist Solectria—itself an **MIT** progeny. AZD has more than 100 engineers and technical staff at facilities in Vancouver, Boston (where it manufactures power electronics and electric drives), and the Detroit suburb of Oak Park, which is Harrison's headquarters and AZD's production engineering base.

When AZD entered the commercialization stage a few years ago, company leaders decided to focus solely on the medium-duty (Class 3 through 6) sector. Harrison describes it as "ripe for innovation." Delivery vans, airport shuttle buses, and vocational-use vehicles represent about 8% of the total vehicle miles driven in cities, but they're responsible for 25% of the mobile emissions—most of which are while idling, he noted.

Growing by LEEPs and bounds

Purolator Courier Ltd. in Canada collaborated with AZD on prototype testing in 2003. Purolator has since purchased 155 hybrid vans (19 diesel, the rest gasoline engines) for daily fleet use and has ordered more than 200 units for 2009 delivery. **FedEx**, **AT&T**, and **Pennsylvania's Dept. of Transportation** also operate AZD-powered fleets. For the past six years the **U.S. Postal Service** has operated 40 vans powered by AZD's pure-electric "Force Drive" drivetrain in Manhattan.

Fleet service managers have reported vehicle uptime averaging 96%. The hybrids' regenerative brakes have greatly extended foundation brake life. And because they launch on battery power, customers are also realizing longer starter-motor life.

AZD also has begun selling an electrified system known as LEEP which allows specialized vehicles to function as a mobile power generator.

Hybrid sales in 2007 and 2008 were roughly $3 million each year, Harrison noted, and financial analysts' reports have been bullish on AZD's growth prospects, particularly given aggressive new fuel efficiency and emissions policies coming into play in the U.S. Currently fleet operators in the U.S. benefit from a 10% tax incentive for vehicles proven to deliver a minimum 30% fuel efficiency improvement, as the AZD powertrain does.

Harrison is an E/E whose 18 years in the auto industry began at **GM**'s **Delco** Chassis Div. His career includes positions at **Fisher Scientific** and a group presidency at **Hayes Lemmerz** before joining AZD. He believes the market, rather than regulations, will ultimately drive AZD's book of business.

He said AZD's powertrain, called the Balanced Hybrid Drive, adds about $30,000 to the cost of a standard gasoline-V8 chassis. With gas at $3 a gallon, the payback to buyers through fuel-cost savings takes approximately 4½ years, he said, given the typical 20,000 miles annual vehicle use. When fuel prices rise to $4 per gallon, the payback drops to about three years. Vehicles in AZD's target markets typically remain in service for 10-12 years.

When it was ready for production, AZD partnered with **Ford**, which provides its ubiquitous E-Series chassis for hybridization. "As industry veterans, we understand the importance of getting our technologies on the right platforms," Harrison explained. Ford has a 50% share in medium-duty trucks in North America.

Collaborating with Ford

As Ford's hybrid "upfitter," AZD ships its powertrain set, including its proprietary DC-DC converter, power electronics, traction motor, and a liquid-cooled **Cobasys** nickel-metal hydride (NiMH) battery pack, to medium-truck specialist **Utilimaster**, which assembles the system into Ford's E-Series chassis. From Utilimaster, the chassis goes to a body builder.

The AZD package includes an auxiliary cooling system and auxiliary electric power steering and brakes for use when the ICE is off. The system's integrated starter-generator starts the engine when battery state of charge drops to a minimum level and, along with the regen brakes, recharges the battery as the vehicle is moving.

"We're the hybrid systems integrator," said Harrison. "We have a manufacturing engineer on site at Utilimaster and we have a quality control plan. The beauty is, it doesn't take a lot of cash from Azure to set up this supply chain. We can ramp up rapidly and efficiently. And from the end customer's viewpoint, this is how they've been ordering their vehicles for decades."

Harrison chuckles at the suggestion that AZD is serving as Ford's hybrid engineering group for medium trucks. "But that's a great way of describing it," he said. "People outside the industry wonder why everything can't be a hybrid immediately, but it takes enormous resources, and Ford's focusing where the volume is—passenger cars. With the new CAFE, they don't have the resources to focus on trucks too. So it opens up an opportunity for our company."

Ford has warranty responsibility on the vehicle chassis, and AZD covers the hybrid system.The nonbinding relationship enables AZD to sell its hybrid powertrains to other OEMs.

Like the rest of the mobility industry, AZD expects great things from upcoming lithium battery chemistry. Last January the company announced a strategic partnership with **JCI-Saft** for supply of Li-ion technology. Harrison said lithium will allow AZD to reduce systems weight, develop plug-in hybrid systems, and improve the payback equation with the aim of a three-year payback.

"Our breakeven where we start generating cash is roughly $100 million—that's about 3,000 vehicles per year," he noted. "We've got work to do, but it's not a high hurdle.