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Alternative Fuel Technologies Take The Stage

By Bill Milliken

The Ann Arbor area continues to make headlines with its contributions to new technologies for alternative fuel vehicles in the U.S.

Millions of dollars worth of military contracts are flowing to Ann Arbor's Adaptive Materials for sophisticated fuel cell systems they have pioneered. The U.S. Army announced January 22 that it awarded the company a $2.9 million contract for charging devices that will enable personnel to re-charge various pieces of battery-powered equipment ground forces carry. The U.S. Air Force, many of whose unmanned aerial vehicles are powered by Adaptive Materials fuel cells, also awarded the company a new $3 million contract for "small power" fuel cells in December.

"Over the last 10 years, Adaptive Materials has been a leader in the development and delivery of portable, lightweight fuel cells to the U.S. military, and we continue to drive the innovation of fuel cell technology," said chief business officer Michelle Crumm. She added that AMI is projecting sales of $12 million this year, a fifty percent increase over 2009 sales.

Gov. Granholm announced at the North American International Auto Show last month that A123 Systems struck an agreement with Fisker Automotive to produce an advanced lithium-ion battery for Fisker's new premium hybrid sedan -- the Karma. A123 will build the batteries at its new 300,000 square foot plant in Livonia. The company has Ann Arbor ties by virtue of its 2006 acquisition of TJ Technologies, which was founded by Ann Arbor entrepreneurs Maria and Levi Thompson. Maria Thompson today serves as general manager of A123's advanced research and government solutions group.

Inc. Magazine put University of Michigan engineering professor Ann Marie Sastry on its November cover as part of an electric car feature story. Dr. Sastry, the CEO of Ann Arbor-based Sakti3, has partnered with General Motors in the development of lithium-ion batteries for the hybrid electric Chevrolet Volt. Her company's goal is the development of an advanced solid-state rechargeable lithium-ion battery – smaller and lighter than any batteries in production today. Sakti3 was named a Center for Energy Excellence winner by Gov. Granholm in 2008, and has raised a total of $15 million in capital from the Michigan Economic Development Corporation and

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Detroit Electric E46: Pure electric 5-door hatchback is currently manufactured in Malaysia and sold in Europe and Asia. Accelerates to 60 mph in 7.0 seconds.

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private equity sources.

The University of Michigan, always at the forefront of technology, has committed $2.5 million of stimulus funds to academic programs for battery research. The School of Engineering has also pioneered a master's program for energy systems engineering.

The traditional lead-acid battery was first pressed into service in the automobile a hundred years ago. Battery technology has since moved ahead by quantum leaps, bringing us nickel metal hydride batteries (Ni-MH) and now the first generation of lithium-ion and lithium polymer batteries. They are lighter, have a high energy density, a long cycle life and, as such, are best-suited for electric vehicle (EV) use. Sakti3, according to Dr. Sastry, is hard at work on a second generation of lithium-ion batteries.

Commercial viability of any generation of batteries is dependent upon increased demand pushing production levels to the point where unit production costs drop. Estimates today are that battery sets in an alternative fuel vehicle may cost as much as $10,000. But the consumer marketplace is rife with examples of new, expensive technologies whose prices plummet once they gain buyer acceptance.

Most advanced battery production has been done in central Asia. "We need to focus on creating customer demand in the U.S." Ravi Shanker, president & CEO of Dow Kokam, told a panel at the North American International Auto Show last month. "We're in the process of creating a supply chain and a real battery industry here in the U.S." he added. Dow Kokam is a 2009 joint venture between Dow Chemical Company and Kokam America, sister company of Kokam Engineering Co., Ltd. in S. Korea.

There are several different drive systems engineers can select for alternative fuel vehicles. Hydrogen fuel cells have proven less commercially viable, in part because of their infrastructure requirements.

Hybrid vehicles come in two varieties: Full hybrids (Ford Escape and Fusion) have an electric drive and a gasoline engine on board to recharge the batteries when they are depleted. Plug-in hybrids (Chevrolet Volt) come with a gasoline engine, a large lithium-ion battery and a plug-in system to charge it. The engine's job is solely to generate electricity, as needed. Battery electric vehicles (EV) eliminate the gasoline engine completely and rely solely on their electric motor for propulsion – and off-duty battery charging.

Electric vehicle advocates see military and public sector demand as enormous catalysts for penetration of the marketplace. Quantum Technologies, for instance, is introducing the Aggressor, a fuel cell hybrid truck for military use. Alan Niedzwiecki, president & CEO says this brute develops 1,700 ft/lbs of torque, compared to a modest 600 ft./lbs. in a Dodge Charger. The U.S. Department of Defense and the Department of Energy are both expected to have significant leadership roles in creating electric vehicle demand.

Vehicle fleets are prime candidates for hybrid and electric vehicles, either by converting them from internal combustion engines or simply replacing them. Taxi cab fleets, waste disposal trucks and airport fire & rescue vehicles are examples of stop-and-go and short trip usage in which experts say an alternative fuel vehicle could be economically feasible.

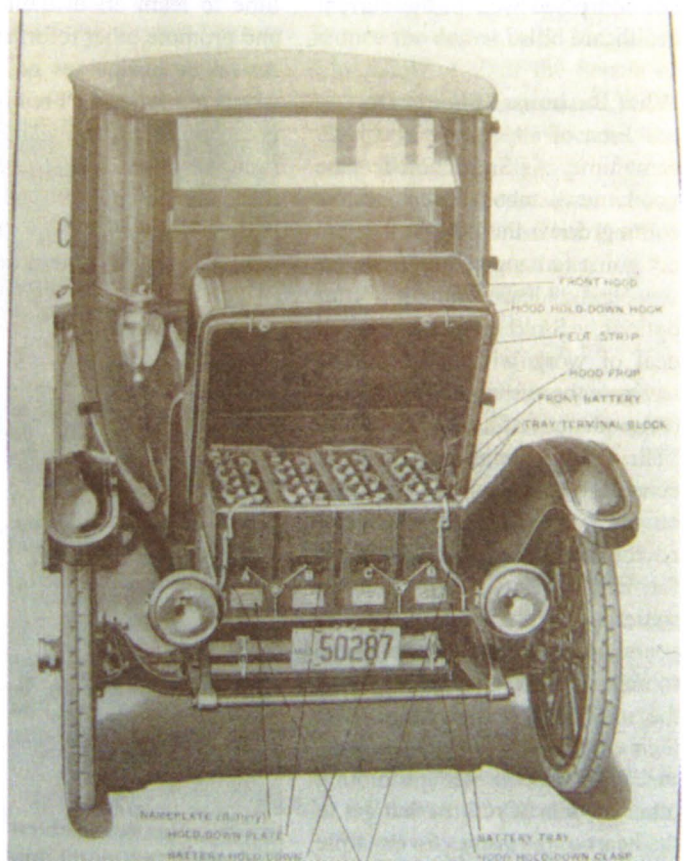
2010 Fisker Karma Hybrid: Billed as the "premium green automobile", the $100,000 Fisker's two electric motors can whisk it to 125 mph. Production in Finland is scheduled later this year.

Ann Arbor's Downtown Development Authority is factoring electric charging demand into its specifications for the new 680 car underground parking structure it is building on Fifth Avenue next to the Ann Arbor Public Library. Susan Pollay, DDA director, says the facility will have ten charging stations when it opens, and the capacity to expand to 300.

An emerging EV in Michigan this year is Detroit Electric, a new, private and international company that has set its sights on the U.S. market. Detroit Electric is producing electric cars in Malaysia in partnership with automaker Proton Holdings for the European and ASEAN markets.

Detroit Electric's CEO, Don Graunstadt, says they are seeking to establish a large southeast Michigan engineering and technology center this year in which to design cars for the U.S. market. The company's business plan calls for acquiring a manufacturing plant by 2012 – also in Michigan – that would give them the capability of producing 100,000 cars a year. A patented electric drive system, coupled with lithium battery technology, will give the cars a 200+mile range on a single charge, according to Graunstadt. Retail pricing will be from $26,000 to $38,000.

The original Detroit Electric, America's oldest electric car company, produced cars in Detroit for over thirty years, beginning in 1907. It sold as many as 2,000 cars annually, many of them to women who were thus spared the indignity of having to wrestle with a gasoline-powered car and its crude crank starter. But Thomas Edison owned a Detroit Electric. So did John D. Rockefeller, Jr., who owned two of them. ▲



1916 Detroit Electric Model 61: This is a rendering from the service manual of a 1916 Detroit Electric, showing the layout of its electric batteries. Over 1,000 pounds of batteries (in 42 lead acid battery cells), located in the cars front and rear battery compartments, were standard equipment. The car boasted a range of 80 miles at speeds of up to 20 mph.