Ford Accelerates Electric Vehicle Battery Testing With Wireless Monitoring Systems

DEARBORN, Mich., /PRNewswire-FirstCall/ -- Ford is using two proprietary wireless monitoring methods to improve lithium-ion battery capability and durability by collecting real-time performance data and making software updates on its battery systems in the lab and on vehicles in the field.

Remote monitoring has significantly reduced test-fleet downtime and allowed Ford to more than double its battery lab-testing capability. Ford is conducting rigorous lifecycle tests of new lithium-ion battery systems to evaluate the technology's ability to recharge under a broad range of environmental conditions.

The advanced battery and fleet vehicle research supports Ford's global electrification plan, which includes five new vehicles in North America by 2012 and Europe by 2013: the Transit Connect Electric and Focus Electric, two next-generation hybrids and a plug-in hybrid.

Ford Motor Company is leveraging the Internet and wireless technology to accelerate testing and refinement of the advanced lithium-ion battery systems that will power its upcoming plug-in hybrid and electric vehicles.

Ford's rapid progress is enabled by two monitoring methods that allow engineers to collect real-time performance data from batteries in the lab and on vehicles in the field via a secure Internet server, and wirelessly update system software to improve capability and durability. These proprietary methods have significantly reduced test-fleet downtime and allowed Ford to more than double its battery lab-testing capability.

"Remote monitoring allows us to access real-time data and make continuous improvements very quickly," said Sherif Marakby, Ford director, Electrification Program and Engineering. "This degree of efficiency would have been unthinkable a few years ago and will help Ford bring more fuel-efficient, low-emission vehicles to market more quickly than ever before."

Ford's future hybrid and electric vehicles will use new lithium-ion battery systems that offer about twice the energy content of the nickel-metal-hydride systems used today, and take up less space inside the vehicle. Although lithium-ion batteries are widely used in the consumer electronics industry, the larger systems to be used in vehicles are designed to manage greater electrical loads under harsher conditions. Only through rigorous testing can the new systems be properly calibrated.

Ford's battery researchers are focusing on lithium-ion technology's ability to recharge under a range of conditions including state of charge (from empty to full), battery age (from new to old) and environmental temperatures (from freezing cold

to scorching hot). Understanding how lithium-ion's material properties perform under a variety of conditions is a critical step toward determining system control algorithms that will allow quick, efficient recharging while minimizing cell deterioration to maximize battery life.

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"So far, we've been impressed by our system's exceptionally low internal resistance, which means the battery charges very quickly and efficiently," said Ted Miller, manager, Advanced Energy Storage Technology. "As we continue our testing, we will be able to calculate the system's optimal recharge rate while maximizing battery life."

Whether testing battery systems in the lab or fleet vehicles on the road, Ford engineers use the remote battery and vehicle test monitoring system to collect real-time data and identify opportunities to implement software updates to manage thermal load and maximize power capability, energy capacity and lifecycle durability.

System-specific engineers are notified via email whenever these software update opportunities occur, based on adaptive event monitoring that can detect conditions of interest and automatically collect relevant data. This method has already led to at least 20 major design improvements for Ford's future plug-in hybrid and all-electric vehicles.

"The data we've collected have helped us understand how lithium-ion battery cells behave under various temperatures and states of charge," said Jas Dhillon, global electric vehicle fleet manager. "And the monitoring system allows us to make software updates to the fleet vehicles while they recharge. What used to be logistically complicated and time consuming can be accomplished now with a click of a mouse."