MotorWeek Transcripts
AUTOWORLD 'ARGONNE NATIONAL LAB'

DAVIS: With gas prices now skyrocketing, the need to develop new automotive technologies and alternative fuels to reduce our dependence on foreign oil has never been more urgent. A lot of bold predictions have been made about green power for the future coming from fuel cells, biofuels, and advanced technologies, but to see past the hype and hyperbole, we visited one of our nation's foremost research and development facilities, the department of energy's Argonne National Lab. And learned what it really takes to make these clean power sources a viable reality.

Argonne National Lab is actually a collection of many labs, occupying a 1500-acre campus near Chicago and tasked with conducting a wide range of R&D in basic and applied sciences. Early research, under its founding director Enrico Fermi resulted in the world's first controlled nuclear chain reaction in 1942, and helped in the design of nuclear reactors for today's submarines and power generation.

Nuclear power for our cars is still science fiction even here, but solutions for alternative fuels, plug-in hybrids and efficient engines for the not-so-distant future are within reach thanks to work funded by the DOE Vehicle Technologies Office.

Using a team approach, Argonne researchers tackle every problem from multiple angles, with specialists from varying disciplines each lending their unique perspective in search of the best answers. For plug-in hybrids, batteries are the key:

TED BOHN: Our goal here at Argonne Labs is to shrink this battery, make it smaller, more affordable, and to fit into the space in your car without displacing any of the utility. So we have to have both good power for fast acceleration, and good energy to drive long distances without starting the engines.

So part of that is a battery management system that allows us to have high-performance in a very, very small package.

DAVIS: Lithium-Ion batteries currently hold the most promise, but Argonne scientists are creating and testing new cathode materials to make them safer, cheaper and longer-lasting.

PANOS PREZAS: We have over 100 test stations here that basically consist of a power supply and load that simulate a vehicle driving, and how that would affect this battery. Typically, we're testing prototype cells; occasionally we'll even be benchmarking cells that have already been on the market for other applications to see if they can work in automobiles.

DAVIS: Testing of each new prototype is time-consuming and expensive, so Argonne makes extensive use of virtual test equipment that can emulate the parameters of a new battery or component without having to physically install it in a car.

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HENNING LOHSE-BUSCH: This is the Mobile Advanced Technology Test bed which is a modular hybrid test environment for individual components. We have the engine, which is mounted with all the subsystems on the platform. In green we have the electric motor, and then we have the transmission that sits in back. This is coupled to the wheels. And we can test these different components by using this virtual interface.

DAVIS: Software developed at Argonne, called the Powertrain System Analysis Toolkit or P-SAT, is now used by several major automakers to trim new vehicle development time. P-SAT allows testing of various layouts, front-drive, rear-drive, with different engines and transmissions, in a virtual world rather than build a series of prototypes.

Eventually, though, you do have to test new designs in the real world, so at Argonne's Advanced Powertrain Research Facility, they designed and built their own plug-in hybrid vehicle to use as a test bed. This lab is equipped with a 4WD dyno and precise emissions test equipment capable of measuring near zero emissions. In fact, BMW found it to be the only public test facility in the country that could validate their Hydrogen-7's trace emissions levels.

Of course, Argonne is conducting its own research into Hydrogen powered internal combustion engines as well.

THOMAS WALLNER: And what we do on that engine, we investigate combustion concepts with Hydrogen port injection and Hydrogen direct injection to improve the combustion efficiency and the emissions behavior of Hydrogen engines.

DAVIS: For Argonne's fuel cell research, the focus is on finding alternative materials.

DEBBIE MYERS: Two of the main issues to commercialization of the polymer-electric light fuel cells for the automotive use is the high cost of the platinum electric catalyst and also its poor durability. We're developing materials based on noble metals and base metals that will replace the platinum electric catalyst to improve its performance, decrease the cost of the fuel cells and make it viable for commercial applications.

DAVIS: One way to improve the fuel efficiency of existing internal combustion engines is by reducing friction, like what occurs between a piston and ring. Scientists here study wear patterns and develop hardened coatings to reduce the effects of friction in critical areas:

ROBERT ERCK: Tribology is the study of friction and wear. Obviously an engine that has low friction is going to have greater fuel economy and low wear means the engine is going to last longer. So we can characterize both the ring and the worn liner and I don't know if you can see it, but here's a wear scar where it has been sliding back and forth, and we can look at changes in surface texture and look for chemical films that have formed on the surface.

DAVIS: For even greater detail, the Advanced Photon Source, the brightest X-Ray beam in the country, allows researchers to actually see the spray pattern of fuel being injected inside an engine and study how fuel velocity, density and other factors affect the combustion process.

Whether its high-tech or hands-on, the universal goal of all transportation research at Argonne National Lab is to displace petroleum, especially imported oil as an energy source for our vehicles. Despite all we've seen, we've barely scratched the surface of the amount of critical work underway at Argonne. Research into nano fluids, alternative fuels, wear-resistant coatings, the recycling of auto plastics and more all point to a sustainable, clean driving future. And our thanks go to the men and women of Argonne and all of the DOE national science labs, for leading the way!

