Electrochemical Analysis and Diagnostics Laboratory

Independent, standardized performance evaluations

Batteries

The Electrochemical Analysis and Diagnostics Laboratory (EADL) in the Chemical Engineering Division has been providing battery developers with reliable, independent, and unbiased performance evaluations of their cells, modules, and battery packs since 1976. These evaluations have been performed for the U.S. Department of Energy (DOE), government and industry consortia, and industrial developers to provide insight into the factors that limit the performance and life of advanced battery systems. Recently, our capabilities have expanded to fuel cell testing.

The EADL is an extensive facility designed to test large numbers of both small and large batteries and fuel cells designed within and outside of Argonne National Laboratory. It is now the only known facility with capabilities to conduct 120 concurrent advanced battery studies under operating conditions that simulate electric-vehicle (EV), electric-hybrid vehicle (HEV), utility load-leveling and standby/uninterruptible power source applications. Each battery is independently defined, controlled and monitored to impose charging regimes and discharge load profiles that simulate the types of dynamic operating conditions found during actual use. The testing of groups of cells/batteries is controlled by computers that communicate over high-speed networks with central servers and are controlled by other PC workstations.

The EADL has evaluated many different battery technologies, such as Na/S, LiAl/FeS, LiAl/FeS2, Li/polymer, Li-ion, Zn/Cl2, Zn/Br2, Ni/Fe, Ni/Zn, Ni/MH, Ni/Cd, and Pb-acid. These represent technologies from battery developers throughout the world.

Fuel Cells

Fuel cell developers, fuel cell users, automakers, and government and private agencies all need some way to obtain an unbiased assessment of the fuel cell technologies currently being developed for transportation. Argonne National Laboratory's Fuel Cell Testing Facility can fill that bill, providing independent, standardized testing and evaluation.

The Facility draws on Argonne's extensive experience evaluating batteries and battery test equipment, and provides the same high-quality testing for fuel cells. Equipped with extensive and specialized hardware and computing power, the Facility is ideally suited to the complex task of testing fuel cell systems, including how well fuel cell stacks and supporting components interact. The Facility provides a standard test environment for benchmarking new fuel cell stacks and systems. Since the evaluations are independent as well as standardized, the test results help validate the capabilities of a particular fuel cell technology and allow for its direct comparison with competing fuel cell technologies.

Designed to Automotive Power Criteria

The Fuel Cell Test Facility has been specifically designed to automotive power criteria. It is equipped to test fuel cell stacks and systems up to 80 kW, the size needed for a passenger car.

The brain of the facility is a computer-controlled electronic load system that can simulate the power demands of a vehicle. The heart of the facility is a sophisticated gas management system that supplies air and fuel to the fuel cell with precise control of flow rate, pressure, temperature, and humidity and can simulate the rapid gas-flow changes found in actual driving conditions, as cars accelerate and brake. The fuel can be hydrogen, gasoline or simulated reformate.

(Reformate is the output gas of a device that produces hydrogen from other fuels, such as methanol, gasoline, or natural gas.)

Most recently, Argonne's Fuel Cell Test Facility has begun testing fully integrated fuel cell systems that incorporate their own fuel processing and air supply subsystems.

In our fuel cell work, we have evaluated stacks and complete systems from many developers. These ranged from 0.72-kW stacks (hydrogen-fueled) to a 50-kW complete system (gasoline- fueled).

The Fuel Cell Test Facility is part of the Electrochemical Analysis and Diagnostics Laboratory (EADL). The EADL was established by DOE's Office of Energy Efficiency and Renewable Energy, FreedomCAR and Vehicle Technologies Office.

For More Information

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