Advanced Powertrain Research and Testing

When designing new vehicle engines and component systems, one of the biggest challenges is integrating elements from different sources for optimum performance. Systems that work well independently may perform differently when integrated into a full powertrain system. There is a need for test systems that can benchmark individual components as well as integrated systems. This unique facility is the only one of its kind in North America outside the U.S. auto industry.

The APRF's state-of-the-art equipment is available to all component and vehicle test cells to support model development, hardware-in-the loop testing, and technology validation. It includes:

- Light- and heavy-duty engine dynamometers
- 2WD and 4WD chassis dynamometers
- Battery/fuel cell emulator (150kW)
- Precision-controlled environment (STP)
- SULEV emissions measurement capability
- Low-emissions raw emissions bench
- Ultra-fast (<5 ms) HC, NOx measurement
- Fast (10Hz) direct fuel measurement
- Fast (10Hz) particulate measurement; unique Laser-Induced Incandescence (LII) measurement
- Mini-dilution PM measurement
- Scanning Mobility Particle Sizer (SMPS)

HEV Test Capabilities

Argonne's modular testing environment allows for easy interchanging of parts without the need for complete system teardowns. The facility is based on a 190-hp motoring dynamometer, which is controlled by an Argonne-designed computer system that simulates the behavior of a vehicle under any driving cycle. The dynamometer maps the energy flows through the individual components and through the powertrain system as a whole. It can also add power to the system to simulate conditions like regenerative braking. Simultaneous emissions testing is built into the test bed configuration. The U.S. Department of Energy (DOE) will be using data generated at the APRF to verify HEV simulation programs and to test prototype systems developed by DOE research partners.

A researcher uses the Argonne-designed computer system to evaluate system performance in the Advanced Powertrain Research Facility (APRF).

The Honda Insight HEV during testing at Argonneís APRF.

Four-Wheel Drive Chassis Dynamometer Testing

Argonne's state-of-the-art four-wheel-drive (4WD) chassis dynamometer offers controlled testing capabilities for highly accurate measurement of exhaust emissions and fuel performance. This facility can benchmark the most advanced powertrains for 4WD cars and trucks, including super ultra low emission vehicles (SULEVs), hydrogen- and natural gas-fueled vehicles, diesel-engined vehicles, and those using alcohol fuels. It also incorporates a dilution tunnel for measuring diesel particulate matter.

The APRFís 4WD chassis dynamometer can benchmark powertrains for 4WD cars, trucks, and SULEVs.

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