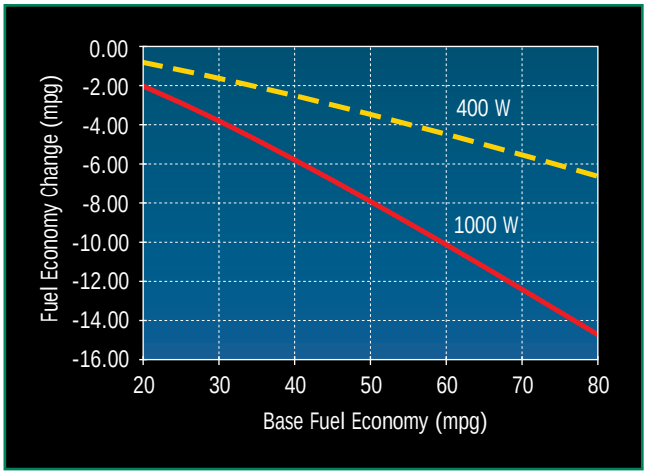
Reducing Vehicle Auxiliary Loads

Today's tough emissions and fuel economy standards present a challenge to automobile manufacturers and their suppliers—to meet the standards while maintaining affordability, performance, comfort, and safety. Consumers' comfort is important, but stringent corporate average fuel economy (CAFE) and emissions standards must also be met, or the consequences may be costly to auto manufacturers. Reducing vehicle auxiliary loads holds the key to meeting the sensitive conflicting goals of high fuel economy, low emissions, and consumer expectations.

The National Renewable Energy Laboratory's (NREL) Center for Transportation Technologies and Systems (CTTS) is leading an effort to develop innovative techniques for managing and reducing peak and average vehicle auxiliary loads.



Small reductions in auxiliary loads will increase the mpg of a vehicle substantially.

Why is NREL Developing These Techniques?

Peak auxiliary loads, which can be as high as 6 kilowatts for air-conditioning systems, significantly reduce vehicle fuel economy. Decreasing the auxiliary load by only 400 Watts can increase the fuel economy of a 40-mpg vehicle by 2.3 mpg. As technology progresses, and auto manufacturers develop more advanced vehicles with smaller, more lightweight engines, vehicle auxiliary loads will affect fuel economy even more. Auxiliary loads must be reduced to achieve high fuel economy. As the figure above shows, even small reductions in auxiliary loads will substantially increase the fuel economy of a vehicle.

How Do They Work?

In today's vehicles, the air conditioner is designed to cool a car's interior after the sun has heated it. Our techniques are designed to prevent a vehicle's interior from overheating in the first place, maintaining

NREL uses techniques developed for measuring solar loads and infiltration into buildings to evaluate and optimize novel load reduction concepts.

Ren Anderson, NREL/PIX 04161

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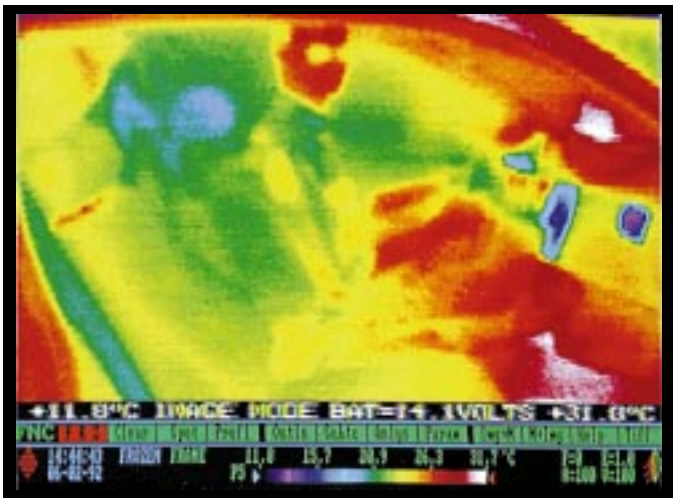

Infrared imaging is one of several techniques the CTTS staff uses to measure temperature distributions within a vehicle.

comfort more easily and efficiently. In addition to increased passenger comfort and higher fuel economy, our techniques will increase the life of interior materials by decreasing peak surface temperatures and blocking ultraviolet radiation, allowing component manufacturers to use less expensive materials.

To reach these goals, we are developing and evaluating numerous advanced techniques for reducing auxiliary loads, including electrochromic windows, photovoltaics, energy storage, thermal boundary control, passenger comfort/vehicle climate modeling, and cabin air cleaning.

Why Choose NREL?

We have the expertise to help you, our partner, increase passenger comfort, manage vehicle auxiliary loads, increase fuel economy, reduce vehicle emissions, meet CAFE standards, reduce vehicle interior manufacturing costs, and increase the lifetime of vehicle interior systems. We are expert in:

- Vehicle simulations
- Computational fluid dynamics
- Finite element analysis
- Optimization techniques
- Thermal analysis and testing (infrared imaging and liquid crystal techniques)
- Flow visualization
- Load avoidance techniques
- Energy storage and management
- Photovoltaic systems
- Air quality (photocatalytic oxidation)
- Heating and cooling systems (including desiccants)
- Advanced glazings, such as electrochromic windows.

In addition, we have a proven track record of working with industry to overcome challenges. As an example, we provide technical oversight for the Chrysler, Ford, and General Motors subcontracts for the U.S. Department of Energy's $375-million Hybrid Electric Vehicle Propulsion Systems Program.

For more information on how to work with CTTS, contact:

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