

Advanced Power Electronics

Thermal Management for Electric Motors and Inverters

Background

Under the direction of the U.S. Department of Energy's FreedomCAR and Vehicle Technologies Program, Oak Ridge National Laboratory (ORNL) is conducting power electronics and electric machinery research and development (R&D) for the next generation of automotive applications.

Thermal management of electric vehicle drive motors and inverters is becoming an increasingly important factor in reducing size and increasing power density. Insufficient cooling necessitates oversizing the motors and inverters to provide a means of dissipating the high levels of heat generated. Consequently, cost is increased, and efficiency and life expectancy are reduced.

ORNL is actively working towards new thermal management technologies for both electronics and electric motors.

The Technology

The ORNL electric vehicle thermal management research and development effort has resulted in

patents pending on the following technologies:

- total thermal management system,
- new power inverter,
- three-zone cooling,
- hermetic terminal, and
- manufacturing methods for hermetic terminals.

These novel new packaging and cooling techniques are being evaluated in the laboratory.

Commercialization

Because this work is in its early stages, there are no commercialization plans at present. However, ORNL is working closely with U.S. auto manufacturers to ensure that the research and development program includes a clear pathway to commercialization.



Less dependence on foreign oil, and eventual transition to an emissions-free, petroleum-free vehicle



Glass vessel test unit

*vehicle systems**fuels & lubricants**engines & emission control*

Benefits

This thermal management investigation will enable the successful accomplishment of FreedomCAR objectives:

- Small motor and inverter sizes
- A more than 15-year life expectancy
- High efficiency
- Low cost
- Easy maintenance

Where Can I Find More Information?

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Refrigerant circulation system

A Strong Energy Portfolio for a Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.



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Energy Efficiency and Renewable Energy

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