Hunka Hunka Hybrid Luv, Phase II: Design and Construction of a Multipurpose Scalable Power Electronics Module for Electric or Hybrid Electric Vehicles

Prevost, Drew

Hybrid-electric vehicles are the state of the art in the automotive industry because they increase efficiency and reduce the negative environmental impacts of burning fossil fuels. The long range goal of this project is to develop an expandable hybrid-electric automotive system. The problem solved by this year of the project is that the electronics industry lacks a general purpose power electronics module. This makes it more difficult and expensive to develop electric vehicles. By first developing a reusable, modular, multipurpose building block for power systems, the later years of vehicle design will be simplified. The project's development process included four phases: design, simulation, prototype, and testing. Tools such as LTSpiceIV (circuit simulation), KiCAD (schematic capture), SciLab (mathematical models), Eclipse (C++ IDE) and Google Sketchup (3D models) were learned and used. Test equipment included a 100MHZ Tektronics oscilloscope, homemade benchtop power supply, and homemade dynamometer. All tests were microprocessor controlled to ensure repeatability. Dynamometer testing demonstrated that the power module was capable of accurately and predictably controlling series, compound, and separately excited wound-stator DC motors. Testing also demonstrated regenerative braking capabilities. The power electronics module presented in this project benefits the electronics industry by simplifying research and development. When this power module is used, it significantly reduces the design phase and allows the designer to focus on systems-level development. This saves time and money. The project was a success, because the design goal was met and the electronics industry has been presented with a general purpose power electronics module.

Awards Won:

Second Award of $2,000