
PROJECT PLAN

IPRO 326 – Spring 2005
Hybrid Electric Vehicles: Simulation, Design, and Implementation

Submission Date: February 5, 2005
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Objectives

The IPRO 326 Project aims at systematically testing both parallel and series vehicle configurations of the Hummer and HMMWV (High-Mobility Multipurpose Wheeled Vehicle) to find the optimum hybridization factor specific to each configuration. An additional objective of the team is to work in coordination with Ph.D. students to simulate a hybrid electric bus system that is scheduled to have practical implementations by the end of the year. All vehicle simulations and structured testing will be performed using ADVISOR, as well as other software packages available in the Power Electronics and Motor Drives Laboratory at IIT. Related work done by previous student teams shall be reviewed and integrated into this project.

Background

Increasing use of electrical power to drive automobile subsystems, which historically have been driven by a combination of mechanical, hydraulic, pneumatic, and electrical power transfer systems, is seen as a dominant trend in advanced automotive power systems. This is the concept of More Electric Cars (MEC). The need for improvement in comfort, convenience, entertainment, safety, security, and communications is already providing the impetus to improve the performance of automobiles and their reliability. As a result, the MEC concept is seen as the direction of automotive technology. The most practical and promising solution feasible for the automotive industry to achieve very high fuel economy and very low emissions through the MEC concept is Hybrid Electric Vehicles (HEV) technology. Hybrid electric vehicles have electric propulsion system(s) other than the conventional ICE (Internal Combustion Engine). Design characteristics will be provided to the students at the beginning of this project based on practical models from leading automobile companies such as GM, Ford, Toyota, Honda, and Nissan.

Methodology

The team will approach its primary objective by systematically testing parallel and series configurations of the Hummer and HMMWV vehicles using ADVISOR. The structured testing will be used to determine the optimal hybridization factor for each individual vehicle configuration. For example, the hybridization factor of the HMMWV vehicle can be determined by repeatedly testing the power out of an electric motor from 0 to 100 kW. As for the hybrid electric bus simulations, ADVISOR will once again be heavily used. Research of mechanical drive train designs for buses will also be done to achieve the best possible method of integrating the motor into the bus drive train.

Expected Results

The results of this IPRO will consist of optimal hybridization factors for the vehicles studied. These optimal factors will be based upon maximum performance and fuel efficiency for the purpose of the vehicle. This will give estimates of cost of hybridization based on recommendations of optimal components.

Schedule of Tasks

In addition to the weekly IPRO meetings, the technical team members will meet once a week with their individual objective-oriented sub-teams to conduct research and testing pertaining to their chosen objective. Technical issues will be studied in detail at that time. The team leader of each sub-team

will be responsible for reporting progress and concerns to the project team leader, as well as contacting potential sponsors for the project.

Budget

At this period in time there is no planned budget for this project because the vast majority of the research material related to this project has already been obtained. Other expenses should be limited to the expense associated with the construction of the professional poster and the final presentation.

Deliverables

Project Plan.....	February 4
Team Website (Introductory/Mid/Final).....	Feb 18/Mar 20/Apr 22
ADVISOR Simulations (Initial/Final).....	Feb 24/Apr 22
Mid-Term Progress Report (Final).....	March 25
One-Page Abstract (Final).....	April 25
Final Oral Presentation (Final).....	April 27
Professional Exhibit (Final).....	April 25
Team Information (Final).....	May 6
Comprehensive Deliverables CD.....	May 6
Final Project Report (Final).....	May 6
IPRO Debriefing Session.....	May 2

Responsibilities

Jeffrey Parks.....	ADVISOR Simulations for Hybrid Bus Team Leader , Project Plan, Abstract
Trevor Waller.....	ADVISOR Simulations for Hybrid Bus Power Point Presentation
Steffany Evanoff.....	ADVISOR Simulations for Hybrid Bus Power Point Presentation
Antonis Antoniou.....	ADVISOR Simulations for HMMWV Team Vice Leader, Project Plan, Abstract
Justin Bench.....	ADVISOR simulations for HMMWV Website
Jonathan Komyathy.....	ADVISOR simulations for HMMWV Poster
Ovidiu Tisler.....	ADVISOR simulations for H3 Mid and Final Progress Reports
Murat Ozcan.....	ADVISOR simulations for H3 Mid and Final Progress Reports

Nikunj Panchal.....ADVISOR Simulations for H3
Website, Team Information

Mayank Bhatia.....ADVISOR Simulations for H3
Team Information

Brandon Seaton.....ADVISOR Simulations for H3
Poster