Shell 1 - Battery Electric Vehicle Chassis and Body Design

Overview
The team faced the challenging task of redesigning a previous Penn State Shell Eco-marathon vehicle to accommodate a battery operated powertrain as opposed to the previous hydrogen fuel cell. Since the team was making the vehicle smaller, a smaller more aerodynamic body was designed as well. The vehicle was built and tested for the Shell Eco-marathon competition which was held in Houston, Texas on April 14-17.

Objectives
The objective of this project was to redesign a previous Penn State Shell Eco-Marathon Prototype vehicle to accommodate a smaller powertrain and to design a more aerodynamic body.

Approach
- The team first read through the 2011 Shell Eco-marathon rules to determine the customer needs.
- The team evaluated various frame and body designs to determine the best design based on customer needs and feasibility.
- The team used SolidWorks to analyse the integrity of the frame and the aerodynamics of the body.
- The team performed testing with Ryan Moyer, an independent study student to optimize the powertrain.
- The team constructed the frame and body for the new prototype vehicle.
- The team validated the results at the Shell Eco-marathon competition in Houston, Texas.
- The power output of the battery electric vehicle was captured by attaching a joule meter to the battery to measure the energy used during the competition.

Outcomes
The team successfully represented Penn State at the 2011 Shell Eco-Marathon in Houston, Texas. The team performed better than our projected performance. The Battery Electric Vehicle achieved 129 mi/kWh or 4,720 miles per gallon equivalent.