Shell Eco-Marathon

Overview
The Shell Eco-Marathon challenges the design team to design and build the most fuel efficient vehicles in the world. Teams can compete in both the Prototype and Urban Concept vehicle categories. The Prototype vehicles are stream-lined, ultra-high mileage vehicles (+1000 mpg!), while the Urban Concept vehicles more closely resemble vehicles of today.

Objectives
This semester’s objective was to replace both powertrains in both the Prototype and Urban Concept Penn State vehicles. Both systems in last year’s vehicles were over-powered and needed to be redesigned.

Approach
- Review existing vehicles and reports on their design to gather understanding into the fundamentals of the project.
- Talk to project sponsor about design goals and constraints
- Brainstorm and generate concepts for motor sizing and type.
- Brainstorm and generate ideas for improving other aspects of the vehicles’ design.
- Compare and contrast generated concepts in terms of meeting customer needs and meeting budget requirements.
- Use Microsoft Excel and MatLab to calculate dimensions and power of motors needed to overcome rolling resistance, drag force, transmission losses, and reach top speed.
- Create mock-ups from cardboard to test fit new parts into existing infrastructure.
- Create CAD models and engineering drawings of parts to be machined in order to retro-fit new systems into existing hardware.
- Test fit components and electrical systems and troubleshoot as necessary.
- Measure speed of vehicle with a tachometer under no load, and correct result for speed under load.
- Test drive both vehicles to assess drive-ability.
- Compare test results with calculated expectations.

Outcomes
- New, smaller motors were successfully installed in both the Prototype and Urban Concept vehicles.
- Both vehicles successfully reach and exceed minimum speed requirements.
- New Urban Concept motor saves approximately 80lbs in payload!