Shell Eco-Marathon – Urban Concept Vehicle

Overview
The Shell Eco-Marathon is an annual, high-mileage competition which Penn State has successfully participated in for the last several years. The competition challenges students to design, build, and test ultra-energy efficient vehicles to go the furthest using the least amount of energy. The Urban Concept class features several different fuel classes of vehicles that are scaled versions of regular road vehicles. This semester, the team was tasked with preparing the Urban Concept Vehicle, with its new CNG fueled powertrain, for the 2016 Shell Eco-Marathon Americas. The vehicle was designed to conform to the rules and regulations of the Urban Concept category. The powertrain was designed to be reliable and able to withstand the rigors of real city driving while achieving the highest possible fuel efficiency.

Objectives
The main goal of the team was to get the CNG powered engine running efficiently. The team also had to update the other subsystems of the vehicle to successfully compete in the 2016 Shell Eco-Marathon Americas competition in Detroit, Michigan in late April.

Approach
- Reviewed initial CNG powertrain design to gather understanding of its operation
- Talked with sponsor and advisor about vehicle goals and constraints
- Gathered rules and specifications from 2016 Shell Eco-Marathon Rule Book
- Brainstormed and generated ideas for improving all systems of the vehicle
- Designed new components using SolidWorks
- Manufactured new wiring system, brake system, exhaust, intake, and fuel mount/delivery system
- Designed and manufactured a methane detector
- Modified vehicle to provide ample cooling for both driver and engine
- Tested and adjusted new wiring system as necessary
- Tuned engine using ProCAL software
- Test drove vehicle on test track at the Shell Eco-Marathon Competition
- Competed in Shell Eco-Marathon Americas 2016

Outcomes
- Designed and Manufactured a running and driving CNG powered vehicle
- Competed in the 2016 Shell Eco-Marathon Americas
- First CNG powered vehicle to pass Technical Inspection
- First CNG powered vehicle to make official laps in 2016 Eco-Marathon
- Successfully completed 4.75 laps in the 2016 Shell Eco-Marathon Competition
- 3rd best capstone project in Spring 2016 Showcase