

Team #33: 2018 Shell Eco-Marathon

Kevin Castrinos • Brendan Costner • Ziyad Frangie • Aminat Momodu • Mark Loreno • Nathan Richardson • Brent Villavaso

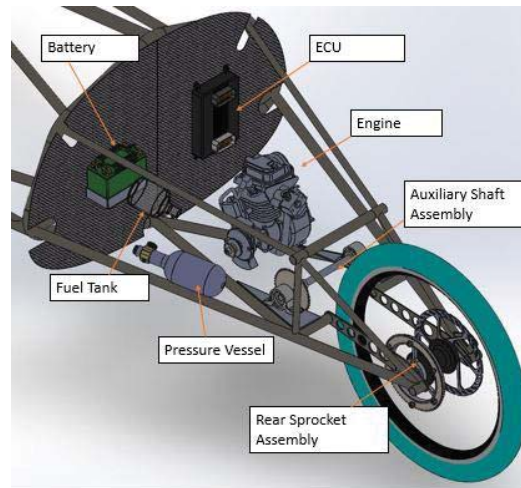
Jack Rettig

Objective

- Compete in, and win, 2018 the Shell-Eco Marathon competition
- Design, build, and test ultra-energy efficient vehicle
- Using the previous year's body and chassis, perform analysis to design, implement, and test a power train
- Develop an energy consumption model to achieve an efficient driving strategy

Engineering Specifications

Average Speed	15 mph
Horsepower	1.5 hp
Torque	15-18 lb-ft
Transmission Gear Ratio	14:1-18:1
Miles Per Gallon	1,500 mpg
Drivetrain Weight	15 lbs

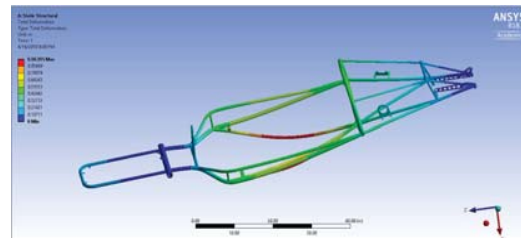


Engineering Requirements

- Must use body and chassis from 2017 team
- Electronic fuel injection
- Clutch for idling purposes
- Fuel provided by competition, no additives

FEA Analysis

- Static FEA analysis done on chassis to analyze the effects of the forces on the car
- Drivetrain force = 12lbs
- Distributed pressure from driver weight:
 $P = W/2LD = 3.515 \text{ psi}$
- Max deformation = 0.964 psi



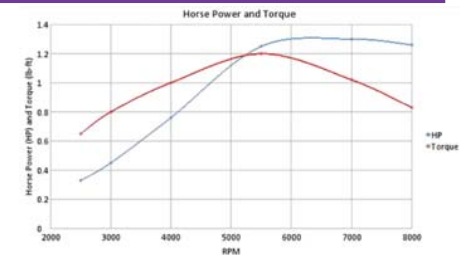
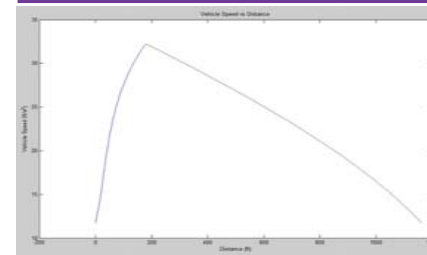
Safety Specifications

- Electric equipment properly fused
- Internal /external kill switches
- Exhaust gases directed outside of the vehicle
- Chain guard for transmission
- Fireproof metal tray for Lithium Iron battery

Driving Strategy

- Find an efficient speed range
- Accelerate to desired maximum speed
- Shut engine off
- Coast to desired minimum speed
- Start the engine
- Repeat the cycle

Matlab Results



- The plot above shows the distance covered while accelerating and coasting for a flat track

$$\text{Acceleration distance} = \frac{(V_{max}^2 - 214)}{2 * \text{Accel}}$$

$$\text{Deceleration distance} = \frac{(1586 - V_{min}^2)}{2 * A2}$$

$$\text{With } A2 = \frac{Ff + W * \sin\theta + Fdrag}{\text{mass of vehicle}}$$



- Horsepower equation:

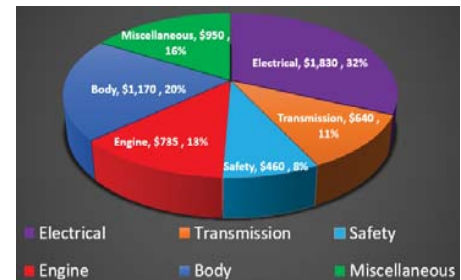
$$\text{Power} = \frac{(F_{eng} - F_f - F_e - F_{drag}) * v}{550}$$

$$F_{eng} = P_{engine}/v \quad F_f = W * \mu * \cos\theta$$

$$F_{drag} = 0.5 * c_d * a_f * v^2 \quad F_e = W * \sin\theta$$

$v = \text{velocity of car}$

Budget: \$7,400



Complete Design Selection by October

Complete Procurement Process by December

Running Vehicle by February

Tune and Test Vehicle through March

Competition Ready Prototype Vehicle in April

Shell Eco-Marathon Competition April

Advisers: Dimitris Nikitopoulos, Shyam Menon, Taylor Robnet, Steven Rogeou

Sponsors: Jack Rettig