



High-Efficiency Electric Vehicle

Rice Electric Vehicle

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Project Objective

Design, Build, and Race High-Efficiency Vehicle for the Shell Eco Marathon

Target Specifications

- Urban Concept**
 - Road ready vehicle, consumer features
- Zero Emissions**
 - Battery electric
- High Efficiency**
 - Lowest energy over 6.3 miles



Constraints

Target Values

Weight	< 250 lbs
Max Dimensions	134 x 50 x 50 in
Trunk Space	8 x 16 x 20 in
Driver Egress	< 10 sec

Brakes

Hydraulic Disk Brakes

- Separate line for each wheel
- Two master cylinders on one pedal
- DOT4 brake fluid



Drivetrain

Hub Motor

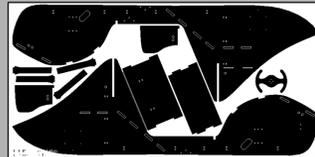
- 600-1200W motor
- High efficiency
- Weight:** 30 lbs

Battery

- 12S LiPo
- 48V nominal voltage
- Easily charged
- Powers entire car
- Weight:** 15 lbs



Chassis



Carbon Fiber Panels

- Three layers of twill weave
- Honeycomb Nomex core

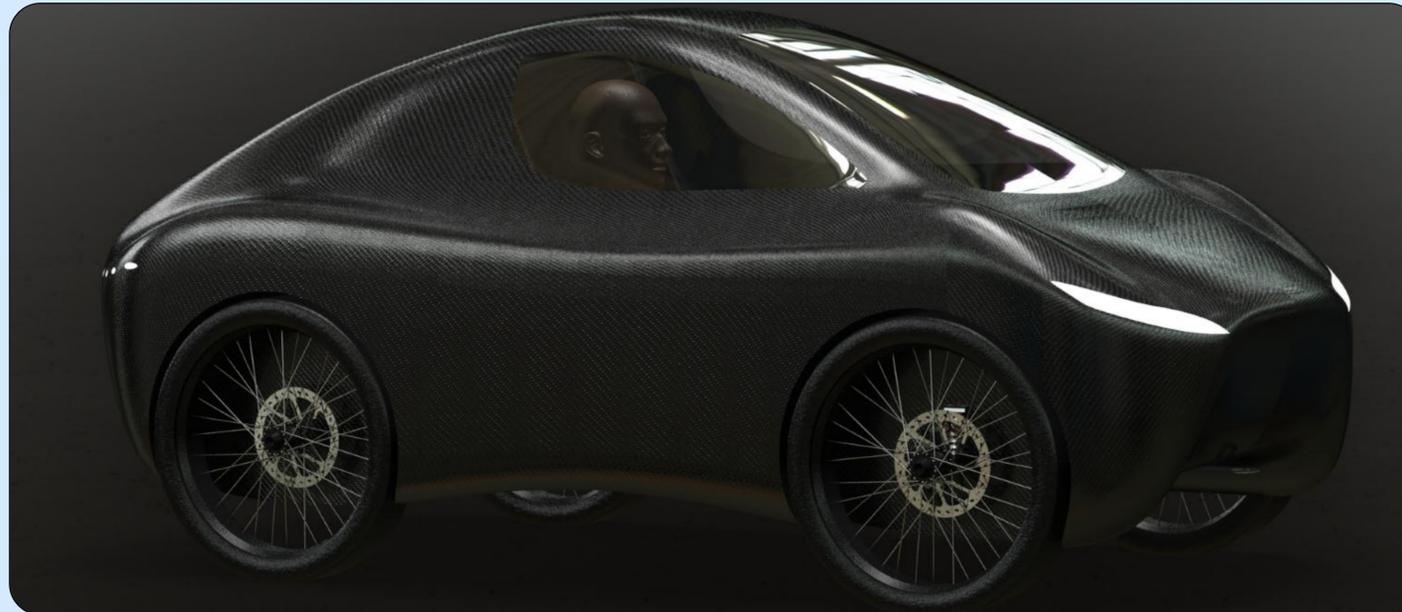
Manufacturing

- Core CNC Milled
- Prefab panels for easy assembly
- Bonded with carbon fiber strips and epoxy



Panel Testing

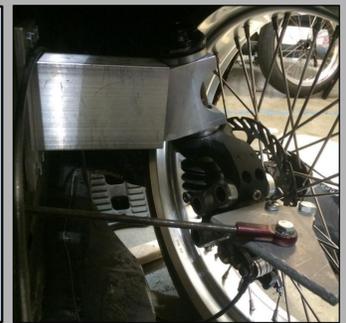
- Compression testing on chassis panels
- Determined best method of bolting to carbon fiber-Nomex
- Double shear test to analyze layer thickness for layup
- Confirmed strength of carbon fiber Nomex panels



Front Suspension

Prefab System

- Elastomer dampers
- Chassis Integration**
 - Aluminum truss and adapter assembly
 - Simple steering assembly



Rear Suspension

Aluminum Truss

- Easy to change for different designs
- Rigid structure reduces flex
- Simple construction
- Easy maintenance



Motor Controller

System Board

- Brushless control using TI technology
- Custom designed and fabricated
- Fully programmable



Body

Aerodynamic Shell

- 3 Layers, 5.7 oz carbon fiber
- Honeycomb Nomex reinforcement
- Two halves joined with extra Nomex and carbon fiber
- Door and trunk cut from final shell
- Weight:** 30 lbs

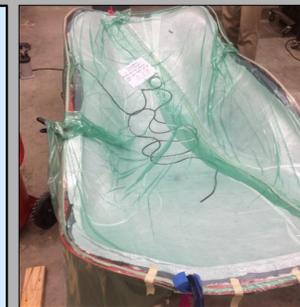


Mold Preparation

- Positive plug CNC machined from EPS
- Fiberglass negative mold used for layup

Wet Layup

- Epoxy resin applied to each layer which is then placed in mold
- Vacuum applied to press layers together



Acknowledgements

