

# Shell Eco Marathon Capstone

View a refined, updated version of the ASME's Shell Eco Marathon competition vehicle! In this project, the front axle mount has been improved upon in numerous ways.



## PROJECT DESCRIPTION

The Shell Eco-Marathon (SEM) is a global energy efficiency competition in which OSU's American Society of Mechanical Engineers (ASME) participates. Students design, build, and operate energy-efficient vehicles and compete for the best energy efficiency result in their vehicle class and energy category.

The ASME competes in the prototype class under battery electric and has come to this capstone team to improve upon their vehicle. The current vehicle has been worked on in previous capstone projects, resulting in updates to various components, but there is still room for improvement. The client's biggest area of concern is the front tire axle assembly. Since they were constructed last minute, they have large areas for improvement. In addition, the front axle itself is bulky and could be an area for weight reduction. Overall, our design challenge is to improve the front tire axle system with a quantifiable reduction in the number of parts or weight, with part of the system machined using 3D printing.

## PROJECT RESULTS

- 10% weight reduction for the front wheel assembly
- 47% weight reduction for the proposed front axle mount design
- Front axle mount assembly reduced down from 13 parts to 5
- 57% noise reduction
- 100% ASME club approval rating

## FUTURE IMPROVEMENTS

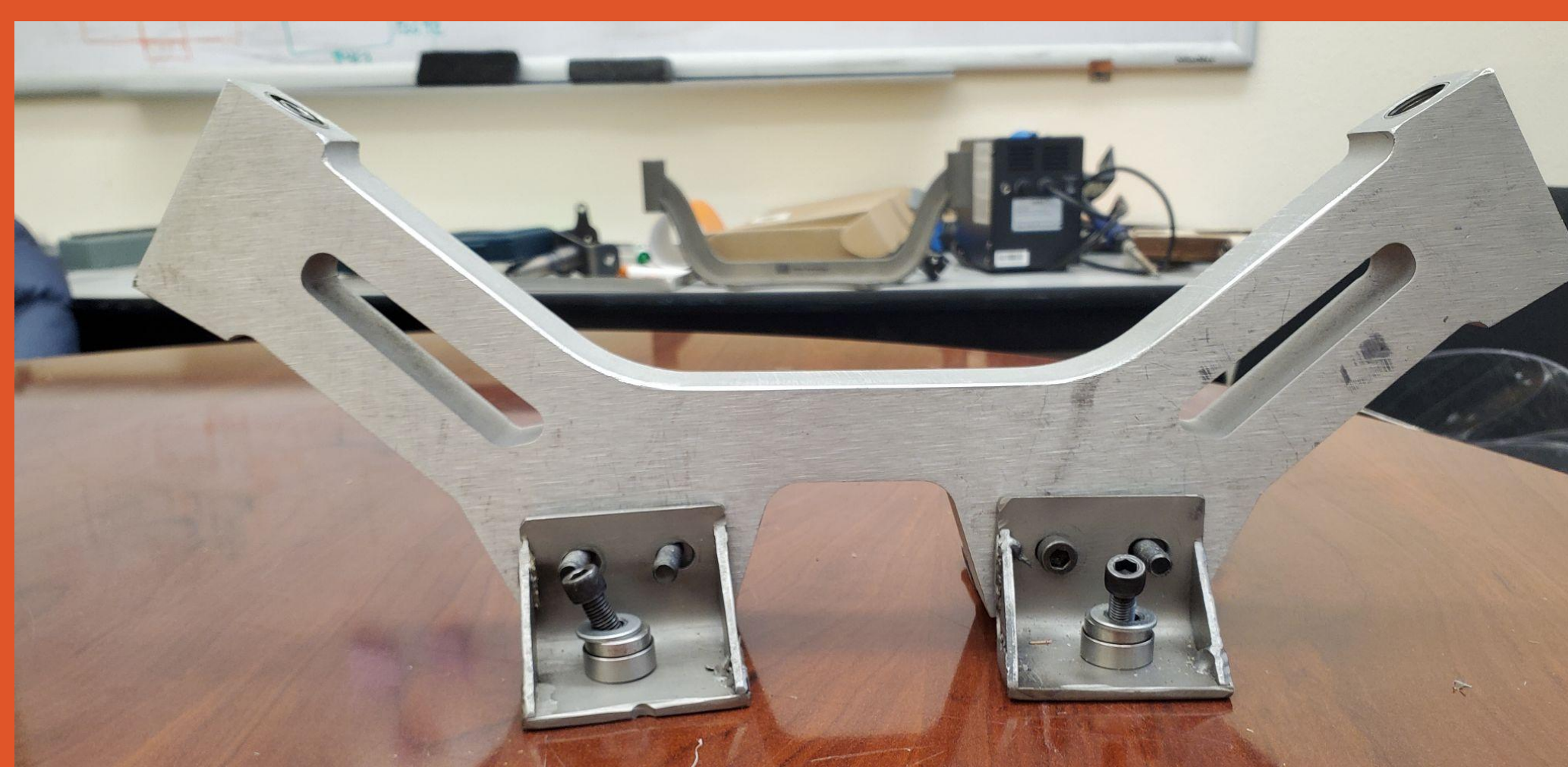
- The steering system needs to be redesigned to account for the required turning radius.
- The chassis itself is asymmetric and could use a redesign.
- The steering arm is unusable in the current condition and needs a redesign.

## PROJECT REQUIREMENTS

- Reduce overall weight
- Increase rigidity of the tire shields
- Simplify front axle mount design
- Improve visual appearance
- Utilize HP's Multi Jet Fusion 3D printer

## TEAM GOALS

- Improve comfort for driver
- Make wheel shields easier to install
- Make wheel shields stationary to stop interference with driver
- Maintain a reasonable factor of safety for front axle mount



## FINAL DESIGN

- Wheel shields
  - Shield mount: Attaches to a fixed point on the axle mount and is printed using PA12 nylon.
  - Reinforced shield plate: A semi-circular ABS sheet attaches to the mounts via epoxy and carbon fiber rods for increased rigidity.
  - Curved edges: Printed using PA12 nylon and epoxied to the ABS sheet in sections.
- Axle mount assembly
  - Frame: Uses much less material and sits lower to the base of the vehicle, increasing room available to the driver
  - Mounting plate: Mounting mechanism was simplified to a flat plate with holes that aligned with mounting locations on Eco-Marathon vehicle

