

GLOBAL HYBRID ELECTRIC CHALLENGE

The Global Hybrid Electric Car Challenge is a competition aimed at educating students about renewable energy in transportation. The main purpose is to travel the longest distance in a fixed amount of time and with a fixed amount of fuel and stored electrical energy.

The car is a one-person racing vehicle that runs on battery power in parallel with a petrol engine generator power when being charged. The GHEC organization offers a kit to all teams, composed of all major components (chassis, outer shell, motor, batteries). The engineering challenge is to assemble and integrate these parts to achieve the highest reliability and efficiency. For the Khalifa University team from the United Arab Emirates (UAE), the project offered insight on a discipline of engineering that is not introduced through classroom lectures and theories, a part in which they had to relate the knowledge they had to real car racing issues and tasks.

This was not the first time the co-ed team competed in the challenge. "We have always been the lead in the UAE in such competitions and we've always participated in automotive challenges like this." The last race, held in November 2018, was the third time the KU team has competed in the GHEC race held in UAE. Through the support of the university, the team has been able to give themselves a bigger challenge each year, by innovating more on the basic components and design of the vehicle.

The team had a general understanding of designing and building the vehicle through the components available in the purchased kit including the vehicle chassis, electrical components, plastic shell and even the batteries. However, when they needed to explore weight reduction for the chassis and reducing energy consumption, they knew that a better way of designing and testing was required before building the car. They determined the best way was to design the chassis using CAD software, simulating possible collisions through FEA. This allowed the team to carry out any



"My main motivation to take part of this team is that I wanted to experience being part of a racing team, as well as get hands-on experience with actual electromechanical systems."

—Melad Fahed, a Mechanical Engineer (Master of Science) at Khalifa

necessary adjustments to the geometry on the spot whenever needed without having to redo any calculations. The team used Abaqus (student version) to model the integrity and strength of the chassis of the vehicle as they changed the material from carbon steel to aluminum alloy.

At the first stage of the project, the team began with SolidWorks to model and simulate the chassis. Then, as needs arose for more advanced structural simulation, they decided to use Abaqus due to its availability at the campus and its capabilities to run all needed simulations on the chassis, as well as test any modifications made.

NEXT STEPS

For future challenges, the team plans on taking the development of the car chassis even further by looking at weight reduction and distribution, better car handling and even customizability for wheel setup. They also hope to improve the aerodynamics of the chassis by performing detailed CFD analysis. As the 2019 challenge approaches in November, the KU team hopes not only for a win but for a deeper understanding of hybrid and electric vehicles.

For More Information

<http://uae.globalhechallenge.org/pages/About.aspx>

