



CASE STUDY /

Ansys + BME Solar Boat Team

“Ansys simulation tools allowed our team to validate designs in a virtual environment before building the new hydrofoil wing, saving us time and money while giving us the confidence needed to move forward with real-life testing. From this experience, we developed a simulation skillset that will help our team members as they venture into their future engineering careers after graduation.”

Ádám Kiss

Simulation Engineer / BME Solar Boat Team

Designing a Solar Boat Wing Using Ansys Fluent

The purpose of a boat wing is to reduce drag, which increases the boat's speed and range. Compared to conventional boats at high speeds, a wing boat can reduce drag by up to 70% at 8 m/s. The Budapest University of Technology and Economics (BME) Solar Boat Team previously focused on parts necessary for an operational boat, but this year we took on the challenge of developing the first-ever wing design for our solar boat project.

/ Challenges

Our team needed software that was capable of simulating water and airflow simultaneously while calculating forces acting on the hull and wing. Due to its ease of use and multiphase flow capabilities, we chose to use Ansys Fluent to help design and optimize the boat wing.

/ Ansys Products Used

- Ansys SpaceClaim
- Ansys Fluent

/ Engineering Solution

- Ansys SpaceClaim was used to simplify the geometry of the wing and the boat to reduce computational capacity required.
- The Combine feature of SpaceClaim was used to create the required flow field.
- The flow field was meshed in Ansys software using tetra elements.
- In the setup, the mesh was transformed into a polyhedral mesh, which reduces the number of elements and decreases convergence time.
- Multiphase flow behaviors were applied to properly simulate the boat's environment.
- The inbuilt drag and lift calculator was used to determine the forces acting on the boat.

/ Benefits

Ansys' simulation software gave us the tools needed to test our designs in a virtual environment. This helped our team rule out less effective models, resulting in saved time and money. Our team also had no experience prior to joining the team in designing a hydrofoil boat. Comparing our calculations with Ansys results gave us confidence in our design before real-world testing.

Additionally, being able to use the same simulation software used in industry was great experience for our team. We now possess simulation skills that can be used in our future engineering careers.

/ Company Description

The BME Solar Boat Team was created in 2014 with the purpose of designing and building an electric racing boat powered by solar energy.

Our aim is to raise awareness of the possibilities of renewable energy sources and to create an infrastructure and knowledge base that helps newer generations take part in electric vehicle development projects.



Figure 1: Detailed computer-aided design model of the solar boat.

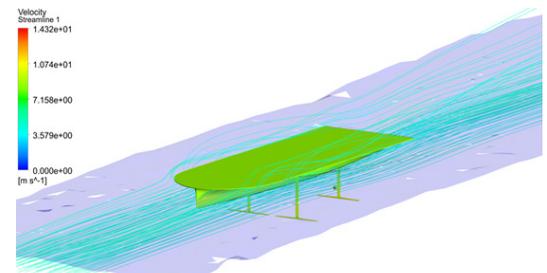


Figure 2: Simplified model of the boat in 7 m/s speed flow. The water's surface and some of the streamlines are visible.

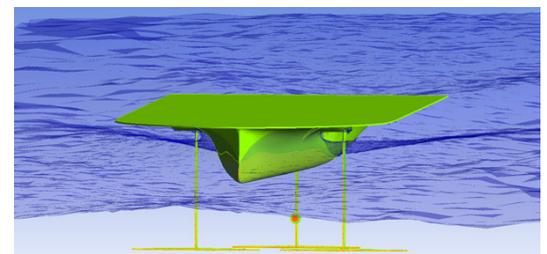


Figure 3: On the surface of the boat, the absolute pressure distribution can be seen both under and over the water's surface.



Figure 4: BME Solar Boat Team in Monaco, 2021

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