Ansys + Hyperloop UPV

"Ansys software enabled our team to achieve what initially seemed impossible: winning the EHW by creating the best vehicle in the competition. All of this was thanks to the speed and reliability of the software, which gave us invaluable insights into the behavior and robustness of our systems, making simulation an indispensable part of our process."

— **David Balsalobre**
Structures & Mechanisms Project Manager **/** Hyperloop UPV

/ Hyperloop UPV Wins the European Hyperloop Week With Support from Ansys

The European Hyperloop Week (EHW) is a competition in which student teams design and build hyperloop vehicles, which are revolutionary means of transport that consist of a capsule that levitates while traveling inside a vacuum tube.
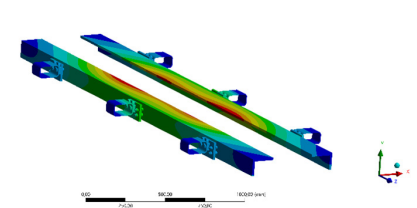
For travel to take place, it is essential to ensure the safety and performance of the vehicle. Ansys software enables the team to optimize each part of the vehicle in an easy, quick, and reliable way by simulating almost every component.
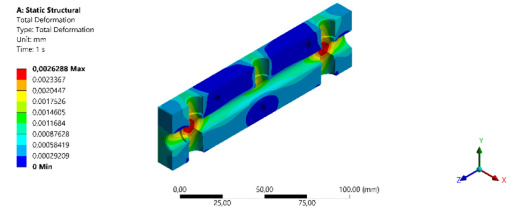
High-pressure air manifold structural simulation

/ Challenges

The team required structural analysis software to assess the strength, safety factors, and deformations of the components during vehicle operation, which is where Ansys Workbench™ simulation integration software proved invaluable. Additionally, for modal analysis of critical components to determine their natural frequencies, Workbench software was once again the solution.

For thermal simulations to evaluate the temperatures and performance of our liquid cooling system, they utilized Workbench software in combination with Ansys Fluent® fluid simulation software. Lastly, for computational fluid dynamics (CFD) studies on vehicle aerodynamics, Fluent software was the go-to tool.


Structural simulation of the vehicle's track rails

/ Technology Used

- Ansys Fluent software
- Ansys Workbench software
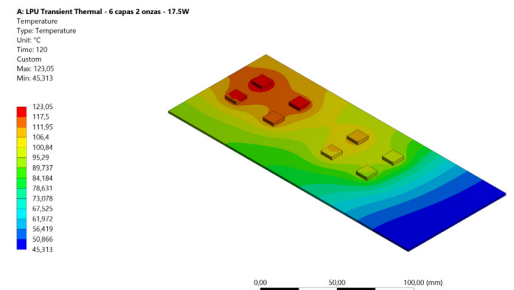
Temperature reached by a printed circuit board (PCB) inside the vehicle

/ Engineering Solutions

- The team used Workbench software's static structural analysis functionality to make sure all the mechanical components of the vehicle were safe to use and performed as expected.

- Workbench software's modal analysis tool was used to obtain the natural frequencies of vibration of some critical components.

- The team used Workbench software's thermal analysis capability to determine the temperatures of some electronic components in the vehicle.

- Hyperloop UPV used Fluent software to design a custom liquid cooling system able to keep the electronics at a safe temperature.

- The team also used Fluent software to perform CFD simulations of the aeroshell of the vehicle, which helped determine its aerodynamic performance.
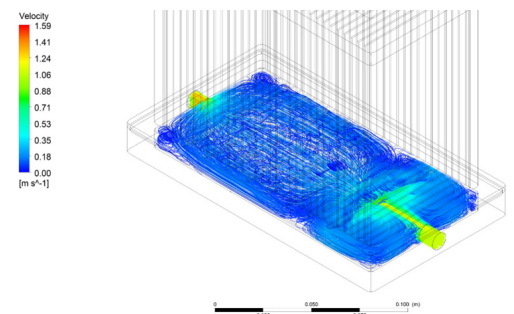
Waterblock simulation
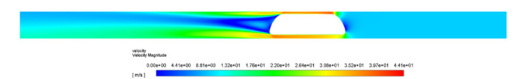
Aeroshell simulation

Benefits

- Thanks to computer simulations, the team was able to perform studies of complex bodies and multibody geometries in a very short time. Depending on the simulation, the time can vary between a few seconds and several hours, but because the calculations required would be impossible to do by hand, the team saves hundreds of hours thanks to Ansys simulation software.

- CFD analysis that would also be impossible to calculate by hand is now possible.

- Students gain real-world experience and knowledge, as Ansys is widely used all over the world in industrial applications.

Company Description

Hyperloop UPV is a 10-year-old team that desings and builds fully functional hyperloop vehicles. They compete in the European Hyperloop Week, a competition in which universities from all over the world come to present and demonstrate the performance of the hyperloop vehicles they create.

In the last competition (Zurich, July 2024), Hyperloop UPV won the competition by obtaining the most valuable prize: the best complete system. For a team to win this prize, they must demonstrate that their vehicle is capable of performing in terms of speed, stability, scalability, and safety ahead of other teams.
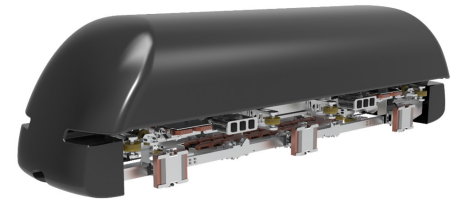
Vehicle render
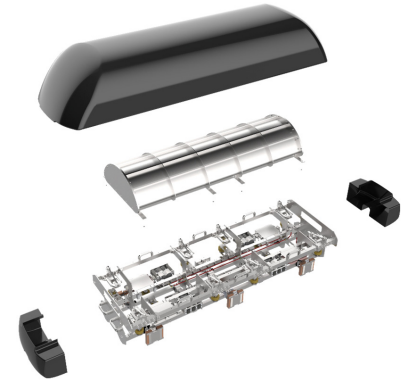
Vehicle render (expanded)

Hyperloop UPV team picture

Hyperloop UPV's vehicle

When visionary companies need to know how their world-changing ideas will perform, they close the gap between design and reality with Ansys simulation. For more than 50 years, Ansys software has enabled innovators across industries to push boundaries by using the predictive power of simulation. From sustainable transportation to advanced semiconductors, from satellite systems to life-saving medical devices, the next great leaps in human advancement will be powered by Ansys.

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