



CASE STUDY /

Ansys + IIT Bombay

“Winning the Engineering Design event at Formula Student 2020 was possible in part to using Ansys simulation. With the use of Ansys Fluent our team was able reduce the weight of our radiators by over 24 percent and cell temperature by 15 percent, improving our team’s overall race car for the Formula Student competition. Not only did Ansys tools improve our car’s design, but it gave our team members the experience and the confidence to tackle real-world problems using the same tools as used in the industry.”

Arvind Manimurugan

Design Engineer, Cooling Systems / IIT Bombay Racing

Designing the Cooling System for the Motor, Motor-controller and Accumulator of a Formula Student Electric Race Car

Ansys has played a key role in developing nearly every component employed in IIT Bombay Racing’s electric race car. Representing the Cooling Systems division, our team of thermal engineers find Ansys Fluent indispensable. The software has enabled us to make the right decisions while designing components including automobile radiators. Additionally, it helped design our complete cell thermal management system and the electronics in our accumulator.

/ Challenges

We needed to optimize the angle of inclination of the radiators to balance the air flow through the core and the resultant drag. Lacking the infrastructure to test the system in a real-world scenario, we turned to simulation, which enabled us to assess the flow rate and drag at different inclination angles in our radiators. Another challenge that we faced was uneven air flow within our accumulator leading to creation of local “hot” spots. We needed a tool to visualize the air flow inside the accumulator to diagnose the problem

/ Technology Used

- Ansys Fluent

/ Engineering Solution

- Ansys Fluent was used to dimension sidepods and optimize the angle of inclination of the radiators, enabling us to strike the right balance between drag and the air flow rate through the radiators.
- Porous media simulation also helped us employ a more accurate model of the radiators in the full-car aerodynamic simulation to more accurately find the air flow rate through the radiator core.
- Ansys Fluent helped us make design changes to the accumulator cooling system to ensure uniform distribution of air, resulting in a higher overall heat transfer coefficient and decreased cell temperature.

/ Benefits

Ansys was an indispensable tool that made winning the Engineering Design event at Formula Student 2020 possible while developing us into industry-ready engineers. With the use of Ansys Fluent, our team reduced the overall size and weight of our radiators by over 24 percent and reduce the cell temperature by 15 percent.

/ Company Description

IIT Bombay Racing are the winners of the 2020 FSUK competition’s Engineering Design Event, placing 4th overall. We have received the Formula Student Award every year for the past five years.

IIT Bombay Racing’s Cooling Systems division drives the design and fabrication of components used for the thermal management and monitoring of key electrical and electronic components for our Formula Student electric race car.

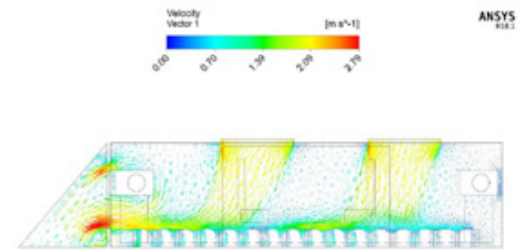


Figure 1: Flow visualization to identify problems in the accumulator cooling system.

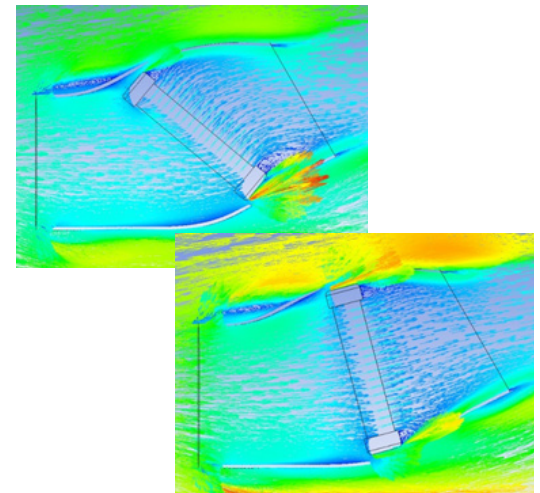


Figure 2a & 2b: Simulation of air flow through a radiator, using porous media modelling to compute actual flow rate through radiator core and drag for different angle of attack.

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