TATA ELXSI

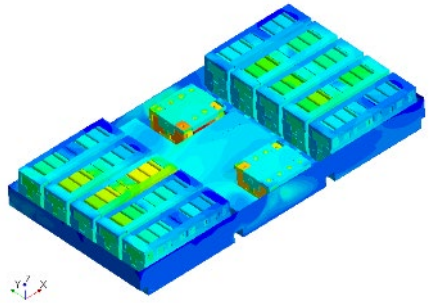
CASE STUDY

Battery Pack Thermal Simulation

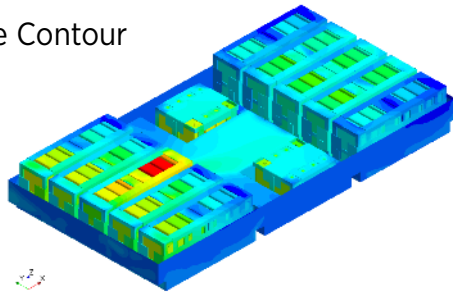
BACKGROUND AND CHALLENGE

Efficient cooling systems are critical for a battery pack as it is continuously exposed to high-impact forces and thermal runaways from the transmission of mechanical vibrations. As a result, EV players need the competence and prior experience to –

- Identify and optimize the thermal performance of the electric drive unit, battery pack, and passenger thermal comfort
- Develop failure scenarios to test Li-ion and other chemistry batteries to assess the impact forces
- Design and develop the cooling system for an EV battery pack using the existing HVAC system to meet the desired temperature targets



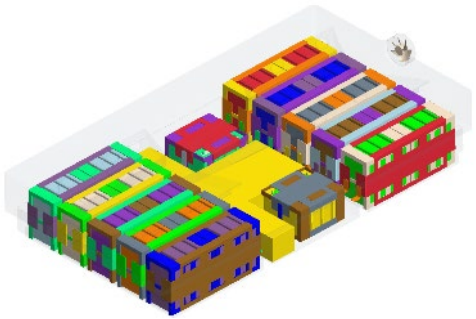
Optimized: Temperature Contour



Actual :Temperature Contour

SCOPE OF WORK

- Design the integrated cooling system for the battery pack and the HVAC system
- Simulate and evaluate the thermal behavior and optimize the design to meet the temperature targets
- Provide feasible solutions for serviceability and manufacturability



EV Battery Pack

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SOLUTION

TATA ELXSI developed a design validation solution that enabled –

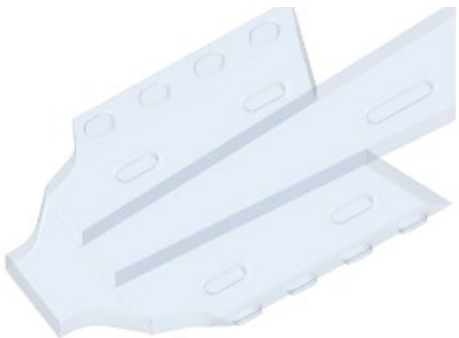
- The battery pack to meet the temperature targets and with the help of the existing HVAC system
- Modification in the design of cooling ducts to meet the targets within the available architectural space

TOOLS USED

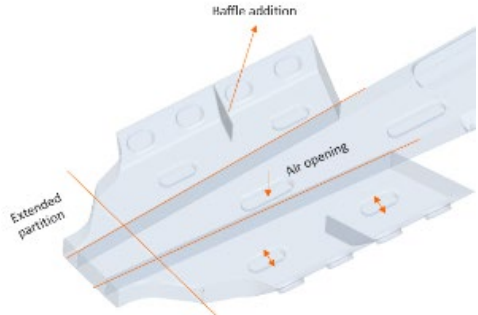
- ANSA/Hypermesh
- StarCCM+/Fluent

IMPACT

- Reduced the battery pack's maximum temperature by 10°C through internal modifications in the cooling ducts
- Improved battery performance within the perimeters of the existing architectural space
- Met the temperature target acceptance criteria of 25°C to 45°C with the existing HVAC system capacity



Actual model



Modified model with internal flaps