Ansys + Nhanz

"Ansys simulation has helped us as budding startup to develop highly efficient and cost-optimized drivetrain solutions in the e-mobility sector with its affordable startup package. In fact, we wouldn't have ventured into prototyping a 60-kW air-cooled inverter unless we got simulation confirmation and good correlation confidence with Ansys Icepak software in prior projects. Further, we optimized the parasitics in the switching circuits with Ansys Q3D Extractor software. We were able to handle 400 Arms, even though the product planning target was only 220 Arms."

— **Riaz Ahamed N A**
CEO / Nhanz Systems Private Limited

CASE STUDY

Nhanz Optimizes 80-kVA Air-cooled Motor Drive Inverter with Ansys Software

In electric vehicles, most systems delivering power of more than 40 kVA move to liquid cooling due to higher power dissipation. Because of this, drivetrain cost of a hatchback car or small commercial vehicle would increase by at least 60% with the addition of cooling infrastructure. To drive EV adoption in these vehicles, an air-cooled, low-cost solution is needed.

Challenges

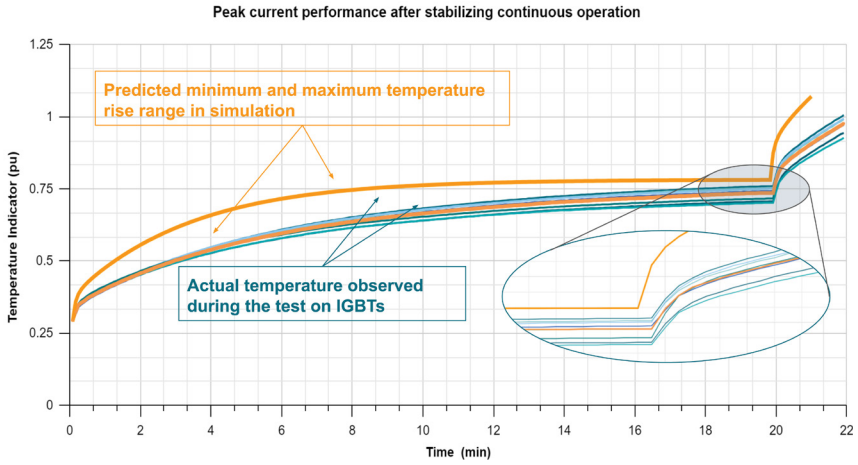
In electronics component performance with respect to thermal dependency, efficiency and reliability are key challenges that must be addressed in the design workflow. The team's main challenge was to ensure practical thermal performance of the controller up to an adverse ambient condition of 55 °C. The design also needed to ensure reliable short-duty peak operation while providing stable, continuous functionality. An additional but important challenge is keeping all paralleled components balanced and operating at same temperature, even in worst-case scenarios.

Technology Used

- Ansys Q3D Extractor software
- Ansys Icepak software

Engineering Solutions

To address these challenges, the team used Ansys simulations. Ansys Q3D Extractor software was used to compute the circuit parasitic. The model was used to optimize the inductance to ensure dynamic current sharing for parallel components. Ansys Icepak simulation software was used to evaluate the thermal performance for defined ambient conditions.



Benefits

- Using simulation, predicted performance was achieved with the concept prototype itself.
- Paralleling optimization, which is almost impossible with empirical methods or by optimization during testing, was achieved with simulation.
- The team tested 60% more current with inductance optimization. However, as losses are higher and cannot be handled by air cooling, liquid cooling is required to meet thermal performance.

Company Description

Nhanz Systems Private Limited (NSPL) is registered by the Ministry of Micro, Small, and Medium Enterprises (MSME) in India and based in Bengaluru. Founded in 2017, Nhanz first offered services to automotive and manufacturing firms inline to motor and other drivetrain components. In 2021, product development kicked off to manufacture drivetrain components for electric vehicles. Nhanz is currently moving into producing developed motor controllers, motors, gearboxes, and chargers for low voltage and validating its high-voltage offerings.

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