CADFEM Consulting

Electronic Cooling with ANSYS® Icepak®

Case Study of a Control Unit

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Task

In today's era of high-power electronics, all classes of electronics equipment like desktop computers, servers, telecom and avionics enclosures tend to pack in more power in the least amount of space possible. This presents enormous challenges to the thermal management of these systems and subsequently, the need to develop new methodologies in thermal analysis of such systems. The foremost among such needs is how to cope with the geometrical complexities that have become common features in electronics equipment. The thermal analyst has to perform flow and heat transfer analysis on a complex system consisting of components of various sizes in a geometrically complex space.

Solution

For simulation of the complete control unit, a simplified cover model has been created manually from polygonal blocks. The CAD information was employed to set up the vertices of the polygonal blocks.

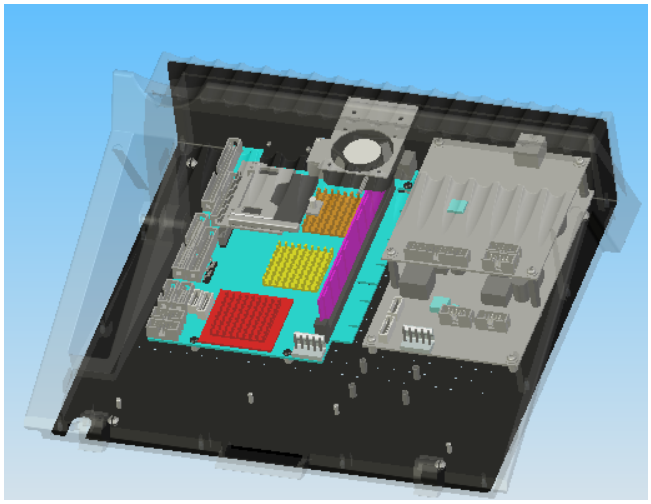
The transformation of PCBs and components was made automatically in ANSYS® Icepro™. Most of components have been represented in simplified fashion using rectangular blocks but the heat sinks have been imported with all the details.

Non-conformal meshing has been employed to reduce the number of nodes in the final mesh.

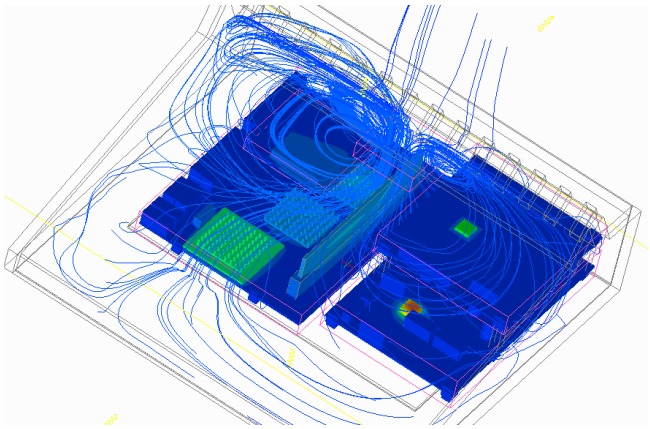
The forced convection from the fan in the control unit, free convection over the device, heat conductivity and radiation have been considered in ANSYS® Icepak®.

Customer Benefit

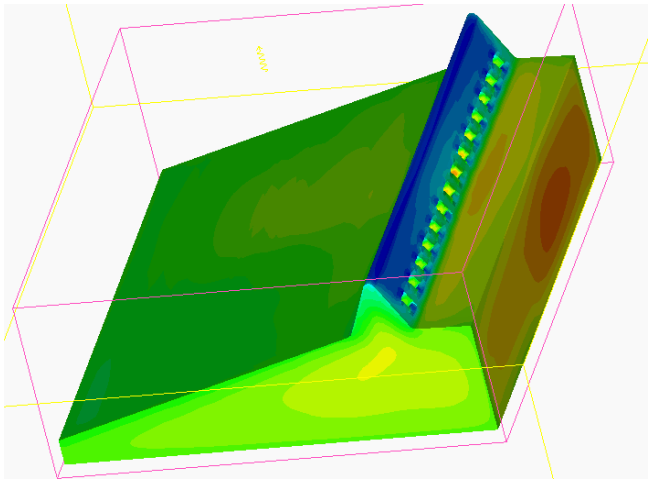
Nowadays it is possible to start with a CAD model and then convert it to a simplified form appropriate for a CFD simulation. This allows us to evaluate the temperature distribution and predict the components temperatures. This improves design performance, reduces the need for physical prototyping, and cuts time-to-market.



The original model



Temperature distribution and flow in the control unit.



Temperature distribution on the enclosure.