

Azonix Reduce Number of Thermal Prototypes from Up to 12 to 1

MECHANICAL ANALYSIS
Engineering Fluid Dynamics

Azonix used FloEFD to reduce the number of thermal prototypes required from up to 12 to 1 on its new Terra embedded computer.

Design Challenge

Azonix is a division of Crane Co. and a leading provider of highly engineered computers and displays designed for extremely harsh environments. The Terra is a new embedded computer designed for use in the transportation industry that is, like other Azonix products, completely sealed from the elements and designed for use in very hot environments. "As with most of our products, we were limited to conduction and natural convection cooling," said James Young, Design Engineer at Azonix. "This presents a difficult challenge for modern electronics equipment."

Solution and Benefits

"We opened the SolidWorks model in FloEFD and defined the heat dissipation sources, material properties and the ambient temperature outside the enclosure at the product's design limit of 60°C," said Young. "Then we defined the goals and performed a thermal simulation. The software analyzed the CAD model, automatically identified fluid and solid regions and allowed the entire flow space to be defined and gridded without user interaction and without adding extra objects to the CAD model. The software took about five hours to generate simulation results. The results showed, as expected, that temperatures on the surfaces of key components exceeded the allowable limit of 90°C."

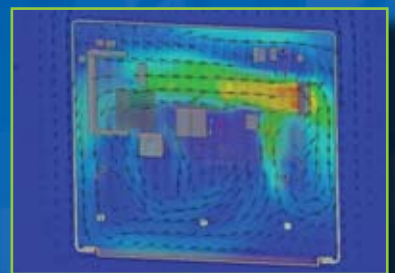
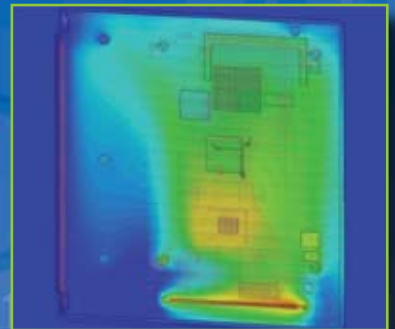
The conduction path from the heat dissipating components to the heat sink and heat sink geometry were the primary design parameters that were available to improve thermal performance. The cross-section of the heat spreader was increased and changed from aluminum to copper. Gap type thermal interface material was inserted at the interfaces between the components and the heat spreader. The thermal interface material was modeled as a contact resistance, reducing the number of cells, rather than conduction through material. "These changes substantially reduced the surface temperatures on the dissipating components but not enough to meet the thermal requirements," Young said. "Then we optimized the design of the heat sink." After about a half dozen different iterations, in each case changing the spacing and height of the fins, the heat sink was optimized and the internal component temperatures were minimized.

"The changes to the heat sink reduced the surface temperatures below the maximum allowable levels," Young said. "The result was that we were able to complete the thermal design prior to building the first prototype. When the prototype was built and tested, the measurements were within 5% of the simulation predictions. As a result, this was the only thermal prototype that needed to be built. This is a good example of how the new generation of embedded CAD tools can save money and time by enabling design engineers to optimize the design from a thermal standpoint early in the design process."

Customer Testimonial

"FloEFD computational fluid dynamics (CFD) software enables design engineers without a fluid analysis background to perform thermal simulation. The result is that we got the design right the first time, only had to make one prototype and avoided expensive design changes that typically occur in the late stages of the development process."

James Young, Design Engineer
Azonix



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