

Introduction

A leader in the consumer electronics market asked Aavid, Thermal division of Boyd Corporation, to design and build a Liquid Cooling system to cool a CPU and a 2.5" format hard drive in a small enclosure.

The Challenge

Reduce the overall volume of the standard thermal solution by 20% and design a liquid cooled system capable of cooling 100W.

To keep the CPU and the hard drive (HDD) under their maximum temperature limits.

The Solution

Aavid worked closely with the customer to quickly complete the design and fabrication of prototypes. The design included a custom sheet metal enclosure, 2 liquid-air heat exchangers, an CPU cold plate, a Hi-contact cold plate for the HDD and a liquid pump.

The Deliverables/Results

Six liquid cooled units were built into a simplified sheet metal enclosure. The first 3 units were designed to be smaller in footprint than the original enclosure along with being 10mm shorter in height. The final 3 units were even shorter than the first.

A detailed CFD model was used to simulate the system. Using the prototypes, testing was performed to gather data. Data from the prototype was used to further refine and finalize the CFD model based on the results.

Each unit consisted of a 12VDC Aavid fan (Part #PSAD1A225BH), a liquid pump, two custom liquid cold plates (one for the CPU and another for the HDD) along with two liquid to air heat exchangers.

The overall thermal performance of each Liquid Cooled Heat Sink system was able to keep the CPU well under its maximum temperature along with keeping the HDD under its maximum temperature.

Pump speed did not have a significant effect on the overall performance. For instance, if the liquid pump was run at 50% speed it would have provided almost the same thermal performance if it were run at 100%. This is very important because it extends the life of the pump, uses less power and it reduces system noise.

