

CFD Airflow Analysis Verifies Cooling Solutions for High Power Density Cabinets in Data Centers

Case Study

CLIENT PROFILE

Chatsworth Products, Inc. (CPI), headquartered in Westlake Village, California, provides structural support systems used to organize, store and secure valuable computer, data and communications equipment. Structural support products include racks, cabinets, cable pathway products, cable management solutions, and enclosures for zone cabling and wireless networks.

BUSINESS CHALLENGE

Heat loads in server cabinet spaces are increasing at an exponential rate and it is becoming extremely difficult and costly to maintain appropriate temperatures using traditional cooling approaches. CPI's challenges were to:

- provide customer solutions that control the flow of air through cabinet spaces to provide improved cooling
- verify that the CPI Passive Cooling™ design is superior to those that used supplemental liquid or active cooling systems
- provide a means to illustrate the concept to customers in a way that clearly demonstrates the credibility of the solution

ENGINEERING SOLUTION

Not only can physical testing and experimental evaluation of various server cabinet configurations be expensive and time-consuming, they can be impossible to obtain in real-world conditions. CPI turned to our consulting services group to build a virtual model to analyze the airflow and temperature distribution within and around the cabinet. Our consulting team used Airpak® airflow simulation software to:

- create a 3D geometric model of a thermal test bed with a cabinet to predict distribution of airflow patterns, air temperature and air pressure
- establish a baseline analysis of an industry-standard server cabinet to determine the improved cooling effectiveness of CPI's Passive Cooling™ design

RESULTS ACHIEVED

Following the simulation work, CPI received:

- confirmation of actual data center tests at cabinet heat loads of 20kW and higher
- confirmation that the maximum heat load dissipated by an air-cooled cabinet – 6kW according to industry conventional knowledge – can be far exceeded with a properly designed, passive air management system
- verification of thermal test bed results that industry-standard server cabinets without the CPI Passive Cooling™ solution have top servers receiving air in excess of 100 F (38 C)
- verification that CPI's solution provides 2-20+ kW of cooling without the use of supplemental liquid or active cooling systems, representing paradigm-shifting cooling performance
- a significant reduction in time and resources by reducing the trial and error process of design and physical testing on a thermal test bed



COMPANY

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INDUSTRY

Structural support systems for information technology equipment

SOLUTION

Consulting Services + Airpak
Airflow Modeling Software

KEY IMPACTS

- faster, lower cost assessment of cooling effectiveness for cabinet cooling solutions
- offers a more illustrative presentation of solution benefits to customers
- valuable insight into the operation of high power density cabinets – leading to better designs



Simulation showing a typical data center server cabinet without airflow management; hot air recirculates over the top of the cabinet causing the top servers to receive air in excess of 100° (38°C)

CS107

