Clean Technology

Full Coverage Spray and Drainage System for Orientation-independent Removal of High Heat Flux

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WARF: P04140US

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing an improved spray cooling system and method for cooling electronic circuitry.

Overview

Removal of heat from electronic circuitry is one of the limiting factors in the design and performance of most computer systems. One current method of heat removal involves using a cone-shaped spray to deliver a thin layer of a dielectric fluid directly onto computer chips and then boiling off some fraction of the liquid; however, the limits of these systems to effectively remove heat have been reached.

The Invention

UW-Madison researchers have developed an improved spray cooling system and method for cooling electronic circuitry in high-performance computers and other similar systems. The method involves directing a spray of cooling fluid onto the surface of a chip at an angle. The cooling fluid then flows in one direction along the circuitry toward the drainage point(s). Directing the spray along the chip with high momentum allows the system to be portable, because a uniform layer of coolant is maintained even when the orientation of the system varies. The cooling fluid is efficiently delivered by several fan-shaped sprays that are positioned to cover the entire heated surface without allowing interaction between the spray plumes that could otherwise lead to coolant buildup and poor heat transfer.

Applications

- Provides enhanced spray cooling performance for the next generation of computers
- Potentially valuable for the cooling of laser arrays and high-powered weaponry, in cryogenic devices, and as an aid to laser-assisted surgical procedures
- Potentially useful in almost any type of heat exchanger

Key Benefits

- Maintains a thin, uniform layer of coolant and adequate coolant drainage despite variations in the orientation of the system being cooled
- Avoids creating areas where coolant sprays from different nozzles interact, thus minimizing coolant buildup, poor heat transfer, and possible circuit failure
- Uses significantly less pressure, energy, and fluid volume than conventional spray nozzles
- May be implemented in an otherwise conventional evaporative cooling system
- Any liquid-to-liquid heat exchanger such as those used in supermarket or water chilling applications can be made much smaller using this system, saving both space and money

Stage of Development

The development of this technology was supported by WARF Accelerator. WARF Accelerator selects WARF's most commercially promising technologies and provides expert assistance and funding to enable achievement of commercially significant milestones. WARF believes that these technologies are especially attractive opportunities for licensing.

Publications

- Click here for a news release describing this technology.

Tech Fields

- Clean Technology : Energy storage, delivery & resource efficiencies
- Information Technology : Hardware

For current licensing status, please contact Emily Bauer at emily@warf.org or 608-960-9842