Sandia National Laboratories

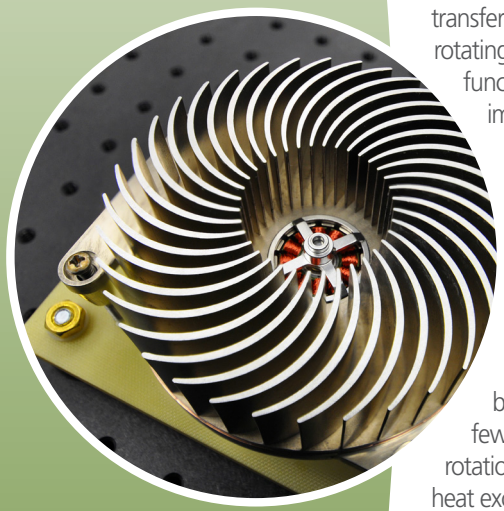
Energy, Climate & Infrastructure Security

SAND2012-0372P

Increase Building and Efficiency

Air Bearing Heat Exchanger

The "Sandia Cooler" represents a fundamental breakthrough in heat transfer technology for microelectronics, and will significantly reduce the energy needed to cool processor chips in data centers and large-scale computing environments.



Sandia's radically different approach to a CPU cooler overcomes the heat transfer bottleneck of "dead air" that clings to cooling fins, generating a several-fold improvement in cooling performance in a device that is smaller, quieter, and immune to clogging by dust.

The "Sandia Cooler"

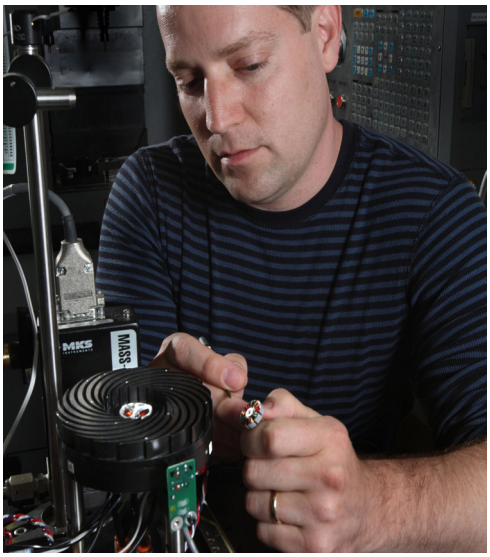
In a conventional CPU cooler, the heat transfer bottleneck is the boundary layer of "dead air" that clings to the cooling fins. This insulating layer is largely unaffected by the impinging airflow generated by the fan.

In this new device architecture, heat is efficiently transferred from a stationary base plate to a rotating (ccw) structure that combines the functionality of cooling fins with a centrifugal impeller. This direct drive approach, in which relative motion between the cooling fins and ambient air is created by rotating the heat exchanger, provides a drastic improvement in aerodynamic and thermodynamic efficiency. Dead air enveloping the cooling fins is subjected to a powerful centrifugal pumping effect, providing a 10x reduction in boundary layer thickness at a speed of a few thousand rpm. Additionally, high speed rotation completely eliminates the problem of heat exchanger fouling.

Benefits

Sandia Cooler technology, which is patent-pending, will significantly reduce the energy needed to cool processor chips in data centers and large-scale computing environments. The yearly electricity bill for air conditioning in U.S. data centers is currently on the order of seven billion dollars and continues to grow.

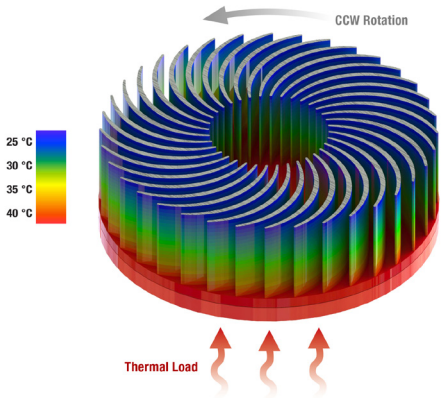
The Sandia Cooler also offers benefits in other applications where thermal management and energy efficiency are important, particularly heating, ventilation and air-conditioning (HVAC). If Air Bearing Heat Exchanger technology proves amenable to size scaling, it has the potential to decrease overall electrical power consumption in the U.S. by more than seven percent.



Commercialization Path

Sandia tech transfer officers are now seeking U.S. companies to license and commercialize the device for electronics chip cooling.

Companies interested in licensing the Sandia Cooler are invited to contact Sandia's IP team for more information. Although Sandia is first focused on licensing in the field of electronics chip cooling, Sandia will soon establish a separate process for exploring partnerships and/or licensing opportunities for other heat transfer applications.



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U.S. DEPARTMENT OF ENERGY

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