Cooling Breakthrough For Computers, Car Electronics

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Researchers at Purdue University have had a breakthrough that may completely change how engineers design cooling systems in everything from computers to electric and hybrid cars.

Using special computer chips from Delphi Electronics, Suresh Garimella, the R. Eugene and Susie E. Goodson Professor of Mechanical Engineering at Purdue University, and doctoral student Tannaz Harirchia, have developed and tested new mathematical formulas concerning the properties of boiling liquids in "microchannels."

It's no secret that engineers, particularly chipmakers and computer manufacturers, have been striving for years to design cooling systems with highly efficient heat-transfer rates.

Microchannels are tiny channels through which fluid is directed in some types of high-power electronic cooling systems. Purdue University researchers have been working on the idea of microchannel heat sinks, as well as liquid-filled chips, for some time. IBM has also been developing a liquid-based chip-cooling concept.

Garimella and Harirchia have now determined that "allowing a liquid to boil in cooling systems dramatically increases how much heat can be removed, compared to simply heating a liquid to below its boiling point," according to their report.

"Boiling occurs differently in tiny channels than it does in ordinary size tubing used in conventional cooling systems," Garimella said in a statement.

Details of the breakthrough will be presented on October 8 in Belgium at Therminic 2009, an annual conference on thermal research and technology for microelectronics.

Having come up with a new way to assess fluid boiling in microchannels, Garimella and Harirchia now plan to concentrate on developing heat-transfer models engineers can use when designing cooling systems for high-power electronics.

Conducted in conjunction with Delphi Electronics, the research was funded by Indiana's 21st Century Research and Technology Fund, and Purdue-based National Science Foundation Cooling Technologies Research Center, a consortium of corporate, academic, and government laboratories. — CNET

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