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Harnessing computer heat can cut energy bills

Companies often spend large sums cooling network servers, but Swiss scientists have found a way to cut those costs by using computer-generated heat to warm buildings.

Physicists at the Federal Institute of Technology in Zurich (ETH) working with IBM have created a liquid-cooled server system that can slash energy bills by as much as half while generating heat with little to no additional carbon emissions.

Traditional servers are typically cooled with electrical fans and chillers designed to dissipate high temperatures that can completely destroy expensive hardware. Such systems are energy hogs, and keeping them cool can eat up 80 per cent or more of some firms' total energy costs. Combined, the world's information technology industries and data centres consume two per cent of the world's energy – about the same as global air traffic. The Swiss scientists hope to change those figures with a robust server that can do approximately 10.26 trillion calculations a second.

Micro channels filled with water keep the system functioning optimally while collecting heat that can be funneled for use elsewhere. Starting in December, ETH will use a rack of such servers to help heat 60 campus buildings. The system should be available commercially soon.

The liquid-cooled system will likely cost about ten to 30 per cent more than traditional servers but the energy savings would make the system pay for itself after less than two years. It cannot be retrofitted into older systems.

The concept behind the server takes cues from how our own bodies work. The prototype system has a pump that pushes ten litres of water through micro channels that closely resemble capillaries. The pump has about the same efficiency as a human heart.

Computers today convert virtually 100 per cent of the electricity they consume into heat, making them an excellent energy source while crunching data. But temperature of the hardware cannot exceed 85 degrees Celsius without a serious risk of destroying it.

The liquid-cooled system pushes water through the capillaries in hermetically sealed channels that come within a few hundredths of a millimetre of hot components. The water siphons off about five degrees of heat with 85 per cent efficiency. That heat, which pushes the water temperature from 60 to 65 degrees Celsius, can then be pumped into main heating systems.

The excess heat isn't enough to warm an entire building on its own, but for data centres this can help cut costs to cool servers as well as heating costs for energy savings of 50 per cent.

Liquid-cooled computers themselves are not new but the Zurich team's approach to coupling the system with a heating unit is unique. In general, liquid-cooled systems have not been practical in the past due to relatively cheap energy costs compared with hardware prices.

That is changing. As energy prices climb and data centres require larger server banks to produce the computing power they need, liquid-cooled servers and their energy savings could become necessary for growing firms.

The business benefits are also environmentally friendly, especially for universities and dense urban areas, like Manhattan, that often have "district" or "neighbourhood" heating networks that link buildings with ducts that distribute heat from one source more efficiently. Pouring the heat siphoned off servers into those systems can help greatly reduce overall annual carbon-dioxide emissions.

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