

# Chipset Chiller System by Infinity Turbine

Infinity Turbine  
LLC

[ TEL ] 608-238-6001

[ Email ] greg@infinityturbine.com

<https://infinityturbine.com/chiller-on-a-chip-by-infinity-turbine.html>

Data Centers Cooling with chiller on a chip.



This webpage QR code

PDF Version of the webpage (maximum 10 pages)

---

## Revolutionizing Chip Cooling: The Potential of a Micro-Size CO<sub>2</sub>-Based Chiller for Nvidia GPUs

As AI workloads and crypto mining demand ever-greater computational power, cooling these high-performance Nvidia chipsets becomes a significant challenge. The heat generated by GPUs during extended periods of processing can degrade performance and reduce the lifespan of the hardware. Conventional cooling methods—air or liquid cooling—are effective but have their limitations in handling the high heat generated in such compact spaces.

Enter the concept of a micro-size chiller, using supercritical CO<sub>2</sub> in a closed-loop cooling system, leveraging cavitation disc technology to achieve ultra-efficient cooling directly at the source. This article explores the potential of this innovation and the challenges that come with implementing it at a micro-scale.

---

### The Cooling Challenge: Nvidia GPUs and High-Performance Computing

Whether it's for training AI models or mining cryptocurrencies, Nvidia GPUs are the workhorses of many industries. These GPUs generate significant amounts of heat, which can lead to thermal throttling, inefficiency, and potential damage to the hardware. Efficient cooling is essential, particularly in environments where rack density is high, and conventional air-cooling methods struggle to dissipate heat quickly enough.

Traditional cooling solutions, such as air-cooling systems or larger liquid cooling loops, rely on fans and liquid circulation to keep temperatures in check. While effective, these methods may not always deliver the highly localized, efficient cooling needed for high-density computational workloads. This is where a micro-scale cooling system could provide a more direct and efficient solution.

---

### The Concept: Micro-Size Chiller with CO<sub>2</sub> as the Working Fluid

The innovative cooling solution proposed uses CO<sub>2</sub> as the working fluid within a microfluidic system that could be placed directly underneath or above the Nvidia chipsets. CO<sub>2</sub> is a highly efficient refrigerant with low Global Warming Potential (GWP) and excellent thermodynamic properties, especially when it is used in its supercritical state.

#### Why CO<sub>2</sub>?

CO<sub>2</sub> (R-744) is a favorable refrigerant in terms of sustainability and efficiency. In its supercritical state (when it is above 31°C and 73.8 bar), CO<sub>2</sub> behaves as both a liquid and a gas, allowing it to efficiently absorb and transfer heat. This makes it ideal for high-intensity applications where space is limited, and effective thermal management is critical. Supercritical CO<sub>2</sub> has been gaining popularity in industrial refrigeration systems, and applying it in a micro-scale cooling loop for chipsets would be an evolution of its use.

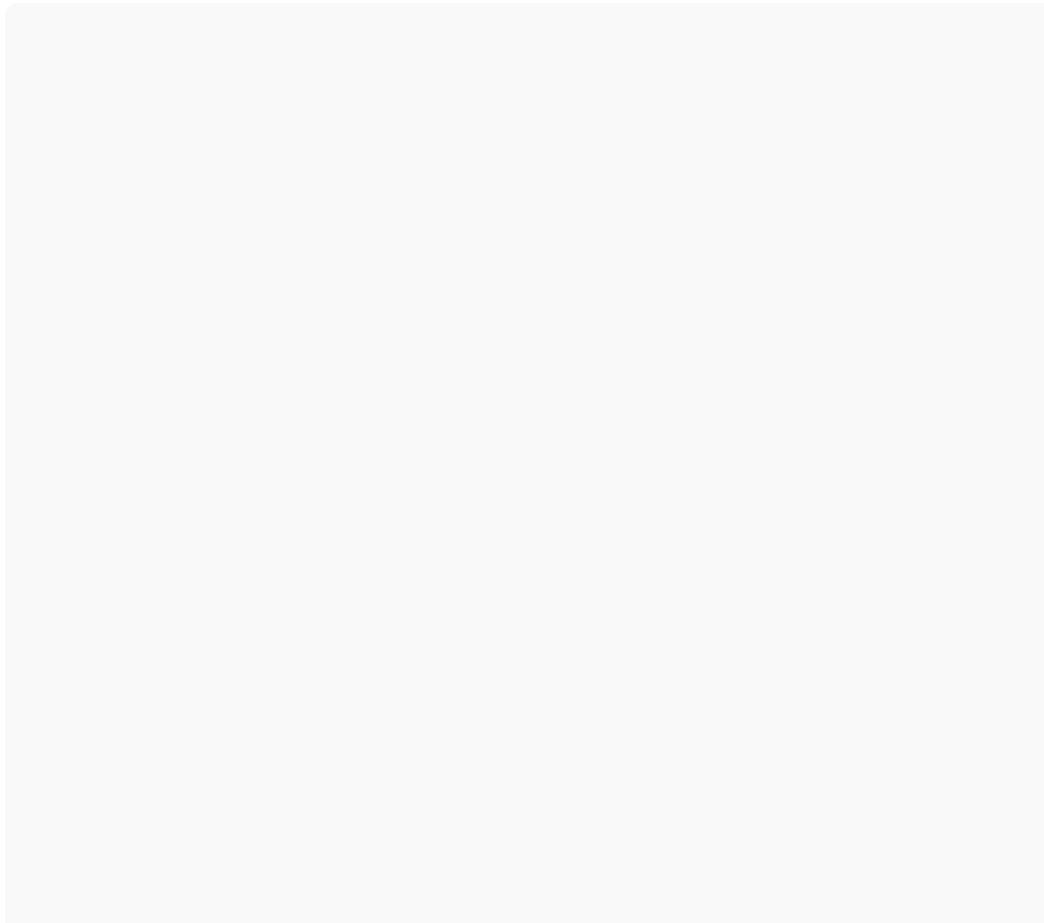
---

### Cavitation Disc Technology: Achieving Supercritical CO<sub>2</sub>

One of the critical innovations in this cooling concept is the use of a cavitation disc. The cavitation disc, driven by an electric motor, would induce cavitation within the liquid CO<sub>2</sub>, which helps transition it to a supercritical state. In this phase, CO<sub>2</sub> can absorb significant amounts of heat before expanding to provide the cooling effect.

#### The process works as follows:

1. **Cavitation Disc Rotation:** The rotating disc creates cavitation, forming small bubbles from and collapse within the liquid CO<sub>2</sub>.



---

---

---

---

---

---

---

---

---

---