



## DualLoop Cooling System for Electronics

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**WARF: P110174US01**

[View U.S. Patent Application Publication No. US-2012-0324911 in PDF format.](#)

**The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a dual-loop cooling system that includes a vapor-compression loop and a liquid-evaporation loop.**

### OVERVIEW

Methods for maintaining electronic devices within a safe and desirable operating temperature range have been a topic of research since the invention of the transistor. Many refrigeration-based cooling systems have been proposed. These systems all have a spray apparatus that is placed in series with the compressor and condenser. However, oil circulates with the cooling liquid to lubricate hardware parts, which can affect the electronics being cooled. In addition, these traditional systems aren't easily adapted to other cooling technologies such as two-phase impinging jets or single-phase microchannels without significant additions of system components.

### THE INVENTION

A UW-Madison researcher has developed a dual-loop, refrigeration-based cooling system for thermal management. This system improves the efficiency of spray cooling technologies by controlling the temperature and pressures within the system in a more accurate way than in traditional systems.

The system contains two loops, rather than one loop in series, which separates refrigeration from thermal management. The key is that the liquid leaving the pump is cold and at relatively high pressure, so that once expanded through the nozzles, the fluid will be liquid. This is ideal for two-phase impinging jets. However, for a spray cooling system, the liquid needs to be at a specific saturation condition before entering the nozzles so vapor will be generated. To achieve this, the liquid leaving the pump needs to be heated. This can be done with a heat exchanger and a second stream of warm fluid using a vapor mixer, which is found in the new loop in the system. A detector also is added to help identify when the saturation condition is met.

### THE WARF ADVANTAGE

Since its founding in 1925 as the patenting and licensing organization for the University of Wisconsin-Madison, WARF has been working with business and industry to transform university research into products that benefit society. WARF intellectual property managers and licensing staff members are leaders in the field of university-based technology transfer. They are familiar with the intricacies of patenting, have worked with researchers in relevant disciplines, understand industries and markets, and have negotiated innovative licensing strategies to meet the individual needs of business clients.



## APPLICATIONS

- Liquid cooling systems for electronics, e.g., in hybrid vehicles, military vehicles, navy ships and processors

## KEY BENEFITS

- Oil circulation is managed easily, helping to prevent excess oil from coming into contact with the devices being cooled.
- Multiple heat loads are added or removed easily.
- Redundancy is inherent, making the system more reliable.
- Control and operation, particularly for multiple heat loads, are simplified significantly, as there is only one expansion valve to control.
- The system is reconfigurable to run as a heat pump for applications in which a constant temperature is desired, i.e., where both heating and cooling may be needed.
- The system is adaptable to a wide range of cooling technologies, including impinging jets and microchannels.

## 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.

## ADDITIONAL INFORMATION

### Related Portfolios

[WARF Accelerator Program Technologies](#)

### Tech Fields

Information Technology - Hardware

Clean Technology - Energy & resource efficiencies

## CONTACT INFORMATION

For current licensing status, please contact Emily Bauer at [emily@warf.org](mailto:emily@warf.org) or 608-960-9842.

