

TECH OFFER

Spray Cooling System For Data Centres



KEY INFORMATION

TECHNOLOGY CATEGORY:

Energy - Sensor, Network, Power Conversion, Power Quality & Energy Management
Sustainability - Low Carbon Economy

TECHNOLOGY READINESS LEVEL (TRL): **TRL4**

COUNTRY: **SINGAPORE**

ID NUMBER: **TO174564**

OVERVIEW

Data centres in Singapore consume about 7% of the electricity generated annually. A large proportion of the energy consumption (~50%) is for the cooling system necessary to keep the servers operating reliably under Singapore's hot and humid ambient conditions. Current cooling systems rely on energy-demanding chillers and computer room air handlers to produce cold air which is passed through the IT equipment to mitigate the heat generated via sensible cooling.

The technology owner has developed a spray cooling system that aims to eliminate the need for chillers and reduce the energy requirements of the other associated equipment in the data centre cooling application. The spray cooling system uses dielectric coolant which is dispersed in small droplets through a spray nozzle that directly impinges on electronic components and absorbs heat from the operating heated server by evaporative or droplet impingement cooling mechanism. The vaporised coolant is then recovered by a condensing coil cooled by ambient temperature water (i.e. no cooling required by chillers) from a cooling tower, through which the heat is rejected to the environment.

The technology owner is seeking industry partners to co-develop and pilot the technology for data centre applications and in space or equipment that require high heat load cooling applications.

TECHNOLOGY FEATURES & SPECIFICATIONS

Technical features:

- The newly developed spray cooling system architecture enables data centre server racks to operate under tropical climatic conditions (~30°C) without the need for high energy demanding chiller-based cooling system while also achieving lower operating temperature of server components compared to conventional air-cooling system.
- Spray cooled system uses combination of target spray on processors and distributed spray on rest of the server components to achieve overall cooling of a server.

Advantages:

- Low coolant requirement. The only power consuming equipment in the spray cooled system are pumps and fans.
- Increased computing capability under reduced operating temperature.
- Increased heat load rejection capacity per server rack, enabling higher computational performance per unit space.
- Eliminates thermal interface resistance and maintains temperature uniformity within server rack due to evaporative cooling mechanism.

POTENTIAL APPLICATIONS

The patented spray cooling system design is applicable for following areas:

- Data centre cooling – the energy efficient spray cooled system can retrofit or replace conventional air-cooling system implemented for server rack cooling in data centres.
- High end computing electronics – the system can be adapted to cater for specific targeted cooling requirements of high performance, high heat flux electronics.
- Spray cooled system can be adapted to space constraint high heat load cooling applications that requires less coolant usage and tighter temperature control.

UNIQUE VALUE PROPOSITION

Spray cooled system developed for data centre cooling application has following benefits:

- Less cooling energy requirements translates to significant savings in operating expenditure.
- High density heat load rejection capability translates to more efficient usage of white space in data centre.
- Elimination of chiller and reduced cooling system complexity translates to less gray space requirement.
- Increased electronic component reliability due to effective hot spot management and lower operating temperature.
- Less noise level inside spray cooled data centre due to the elimination of server fans.