

CASE STUDY:

Extending the life of a data center: Liquid cooling for the Fraunhofer Heinrich Hertz Institute

Fraunhofer is Europe's largest application-oriented research organization. The research efforts are geared entirely to improving lives, whether it be health, security, communication, energy or environmental. Fraunhofer's creative approach shapes technology, improves product design, furthers methods and techniques and opens up new vistas. Fraunhofer researchers and developers have a significant impact on communities: in short, Fraunhofer units all over Germany forge the future. One such unit, the Fraunhofer Heinrich Hertz Institute (Fraunhofer HHI), is a world leader in the development of mobile and fixed broadband communication networks and multimedia systems. From photonic components and systems through fiber optic sensor systems to video coding and transmission, the Fraunhofer HHI works with its international partners from both research and industry sectors.

The Challenge

Fraunhofer HHI and its system integrator partner, Boston-IT Deutschland (Boston), approached CoolIT Systems (CoolIT) with a cooling dilemma. Fraunhofer HHI's Berlin-based office required an upgrade to its High Performance Computing systems, but its data center could neither handle nor fit any additional air cooling. Located on the fifteenth floor, the data center supports the research study needs of Fraunhofer HHI's 500 employees. Fraunhofer HHI risked disrupting its innovative research if it chose to find a new home for the facility. The client needed to pack more powerful, more heat producing servers into the same amount of space without installing any additional AC units.

The Solution

Together, CoolIT and Boston delivered a Direct Contact Liquid Cooling (DCLC™) solution to 3 existing racks. CoolIT's Rack DCLC™ CHx40 Module was selected to meet Fraunhofer HHI's requests. This 2U, rack-mounted, liquid-to-liquid heat exchanger is capable of managing 40kW+ of heat load per rack using warm water cooling. The modular solution removes 71% of the total server heat. The remaining heat load is managed by part of the original air-cooling system. CoolIT's passive R4 coldplate assembly directly cools each of the 432 Intel® Xeon® E5-2690 v2 processors using patented Split-Flow technology to rapidly capture heat within specialized coolant. Each of the three racks uses one CHx40 Heat Exchange Module to reject heat through a facility water feed. This feed is cooled year round by free air.

This solution significantly extends the capabilities and overall lifespan of the data center and thereby allows Fraunhofer HHI to remain in its current office space for the next 5 to 10 years. Server racks are now optimized for 100% density with warm water cooling. Installation was completed in April, 2016.

A Modular Approach

CoolIT Systems Rack DCLC™ CHx40 is a three module solution which includes:

- Server Module:** Patented Split-Flow technology in the form of CoolIT Systems R4 Passive Coldplate Assemblies directly cool each of the Intel® Xeon® E5-2690 v2 processors in-server. Every Server Module features Stäubli Quick Disconnects, that enable simple and 100% dripless removal of the server from its cabinet without affecting any other network servers.

- **Manifold Module:** A pair of vertical manifolds were installed at the back of each rack, one on the right side and one on the left side of the cabinet, allowing simple decoupling of a single server without the need to remove a neighboring system.
- **Heat Exchange Module:** Each rack is outfitted with a 2U, Rack DCLC CHx40 Module (rack-mount liquid-to-liquid heat exchanger) which circulates coolant through the racks and servers and rejects this energy to an adiabatic cooler connected to the heat exchanger.

Customer Benefits

By deploying CoolIT Systems Rack DCLC™ solution, Fraunhofer HHI secured its data center's and efficiently increased its compute density without raising its data center footprint or air cooling capacity.

CoolIT Systems has saved the institute from the inconvenience and extreme capital costs of setting up new office spaces. In place of relocation costs, a relatively small investment achieved 100% density in the 3 racks that were previously only 1/3 full of servers. As a result, the solution has more than tripled the data centers compute power by enabling the integration of higher-powered Intel® Xeon® E5-2690 v2 Processors.

The Institute is now less environmentally-impactful, which meets European expectations for climate responsibility, and matches the advanced technological nature of the Fraunhofer Society.

HPC Setup

- 3 CoolIT Systems Rack DCLC™ CHx40 Modules
- 432 Intel® Xeon® E5-2690 v2 Processors
- 216 servers across 3 racks
- 23-40° C temperature fluid supply water, depending on outside air temperature
- 42°C inlet supply temperature

Results

- 71% of total IT load managed by liquid cooling
- 120kW total heat load managed (40kW per rack)
- 100% rack utilization, previously only 33% full
- Enabled 3x compute power of previous set up
- Extended data center life by 5-10 years

“Integrating liquid cooling was not only the most convenient and beneficial solution for our data center, but also required the lowest capital investment. Thanks to CoolIT Systems innovative technology, Fraunhofer did not have to relocate its offices, and the organization even has a lower environmental impact despite harnessing far more powerful processing capacities.”

Dr. Ing. Lars Thiele, Head of System Level Innovations
Fraunhofer Heinrich Hertz Institute