ADDRESSING MODERN DATA CENTER CHALLENGES AND HPC/AI WORKLOAD DEMANDS

HPCwire

DDC SOLUTIONS

Executive Summary

The explosion of high-performance computing (HPC) and artificial intelligence (AI) workloads is expanding what people expect from data centers. The intensity of these tasks is unlike previous workloads, and as such traditional cooling and monitoring systems are struggling to keep pace.

In this paper, we will discuss how DDC's S-Series cabinet combined with DCIM monitoring software provides a comprehensive solution to these challenges. The S-Series cabinet features ultra-high-density data center cooling of up to 100kW for air cooling and 400kW liquid-to-chip cooling ready per cabinet. This enables enormous flexibility for the diverse HPC and AI workloads of today's data center. The cabinet's modular design also allows operators to scale efficiently while reducing capital and operating expenditures. What's more, DDC's DCIM software enables real-time monitoring and dynamic cooling adjustments, extending equipment life and optimizing energy efficiency. With over 1,100 global deployments, DDC's solutions deliver reduced operational risks, lowered total cost of ownership, and future-proofed adaptability.

LIQUID TO THE CHIP READY | up to 400kW

UP TO 100 KW AIR-COOLED

1– 1000+ SCALABLE INSTALLATION

What Are Data Center Operators Struggling With Today?

Although data center operators have many areas in which to focus their attention, there are a few challenges that seem to be widespread within the industry. To begin, the increased demand for HPC and AI workloads is pushing operators to accommodate different workloads across their data centers. HPC and AI deployments now typically demand 50-70kW in a single rack, and that number is growing rapidly. Thus, traditional air-cooling and monitoring methods simply can't keep up utilizing room-level cooling only, particularly when combining these high-density HPC applications with traditional servers.

Additionally, data center operators must accommodate dynamic workloads. Today's jobs are no longer static, and cooling needs are constantly changing as these workloads ramp up. This makes it extremely difficult to monitor and optimize a data center at the room level. These issues are compounded by legacy data center monitoring systems being so complex and hard to use that they require highly skilled operators to operate.

Another dramatic change when HPC comes to traditional data centers is dealing with the vastly increased asset value per cabinet. A typical CPU rack could contain several hundred thousand dollars of equipment. With HPC applications, the asset value per cabinet can easily range into the millions. The DDC S-series cabinet further enhances the protection of these high-value HPC assets by incorporating multiple heat exchanger coils and fans into the integrated heat exchanger. This adds critical redundancy cooling architecture at the cabinet level. Furthermore, the S-series cabinets are NEMA 3R rated, isolating the assets in the cabinet from the data center floor environment. This means that any event that triggers the room-level sprinkler will not impact the equipment in the DDC cabinets. Furthermore, DDC's integrated fire suppression will prevent the propagation of an issue within a cabinet to any other.

DDC's S-Series cabinet, along with its DCIM monitoring solution, show a transformative way forward to modernize data center deployments and avoid costly challenges.

Overall, as equipment runs hotter, data center cooling systems are running in overdrive. This adds exponential costs to an already expensive operation. Traditional data center engineering also requires a huge capital output, for equipment that may need to be ripped and replaced when new technology emerges. These traditional solutions are not designed to accommodate new cooling methods – like a hybrid approach with air cooling and liquid-to-chip cooling – as data center cooling needs evolve.

What Does the Data Center of the Future Look Like?

With so many challenges facing data centers, operators must look to the future and imagine innovative ways to overcome these issues. Data center operators need a flexible building block "platform" that can scale as the data center adds additional equipment and customers. Operators will no longer need to rip and replace as the technology evolves around them. Additionally, as HPC and AI continue to strain data centers, cabinets must be equipped to handle every sized load. Each self-contained cabinet will be able to efficiently handle workloads with less than 100kW requirements with air-only cooling technology and will also be able to accommodate those compute-intensive workloads with liquid-to-chip capabilities for up to 400kW of total heat abatement.

As these workloads increase and decrease, DCIM software will predict equipment needs based on real-time monitoring inside the cabinet itself and will dynamically adjust airflow and water temperatures before equipment becomes overheated, thus maintaining a constant temperature throughout the cabinet. This translates to big savings in cooling costs.

Similarly, real-time equipment monitoring will take place at the equipment level instead of the "vast-space approach". This reduces risk and improves sustainable operations with real-time condition monitoring from top to bottom of each individual cabinet, plus the ability to zoom out for a panoptic view of your entire data center from a single screen.

DDC's Complete Data Center Solution

Data center operators who wish to get ahead of these challenges can look to implementing DDC's complete data center solution by integrating the S-Series cabinets with DCIM monitoring software. The S-Series cabinet, combined with DCIM monitoring, offers a complete, turnkey, and scalable solution. The scalable S-Series Data Center Cabinet Platform from DDC features one of the world's highest-density air-cooled systems.

In fact, a representative from Tierpoint stated that "DDC allowed Tierpoint to deliver the highest density with the lowest cost to build."

Meeting both current and future demands, S-Series cabinets have high-density air-cooled capabilities and are engineered to support up to 100kW of cooling – all while also being adaptable for liquid-to-chip cooling solutions. The modular design of the S-Series cabinets enables operators to scale their operations efficiently, adding capacity as needed without racking up excessive capital expenditures. What's more, the S-Series is engineered with reinforced sealing between hot and cold decks to optimize internal cooling and minimize heat transfer. Additionally, the cabinets have stronger tops so that technicians can walk on top of the cabinets for maintenance, servicing, and rigging. Additionally, DDC's S-Series cabinets are NEMA 3R certified, have built-in fire suppression, and offer real-time monitoring and security, all designed to reduce operating and financial risk.

Below is a list of stats from the S-Series cabinets:

- Ultra-high-density air-cooled cabinets up to 100kW

- Liquid-to-chip ready up to 400kW per cabinet

- Lowers TCO and construction costs

- Reduces operating and financial risk

- Increases efficiency with lower PUE

- Operates within non-evaporative systems for lower WUE sustainability initiatives

- Ensures scalable installation of 1 or 1,000+ cabinets

- Delivers multiple motors and coils avoiding a single point of failure

- Allows modular design to build as you grow

The S-Series cabinet platform provides exceptional service due to its ability to manage dynamic workloads across a single data center environment. Considering the increasing demand for HPC and AI work, operators must accommodate varying workloads that can change rapidly. The closed-loop design of the S-Series enables operators to upgrade their data centers beyond the average of 50-70kW, bringing

them up to 400 kilowatts while maintaining a commitment to water usage efficiency and power usage effectiveness. This variability ensures that as the equipment evolves and workloads increase, the data center infrastructure can adapt and change without compromising either efficiency or sustainability.

In addition to the S-Series cabinets, DDC implements a DCIM monitoring solution that enhances operational efficiency by providing predictive, dynamic management of airflow and cooling needs. Workloads are very often in flux and changing within the data center, and as such this DCIM software monitors real-time conditions within each cabinet to adjust airflow and water temperatures accordingly. This ability not only prevents overheating but also extends the lifespan of important hardware by ensuring optimal operating conditions. The integration of built-in sensors within the S-Series cabinets enables unprecedented visibility into hardware performance, thereby offering operators detailed insights that traditional open-air cooling systems can't provide.
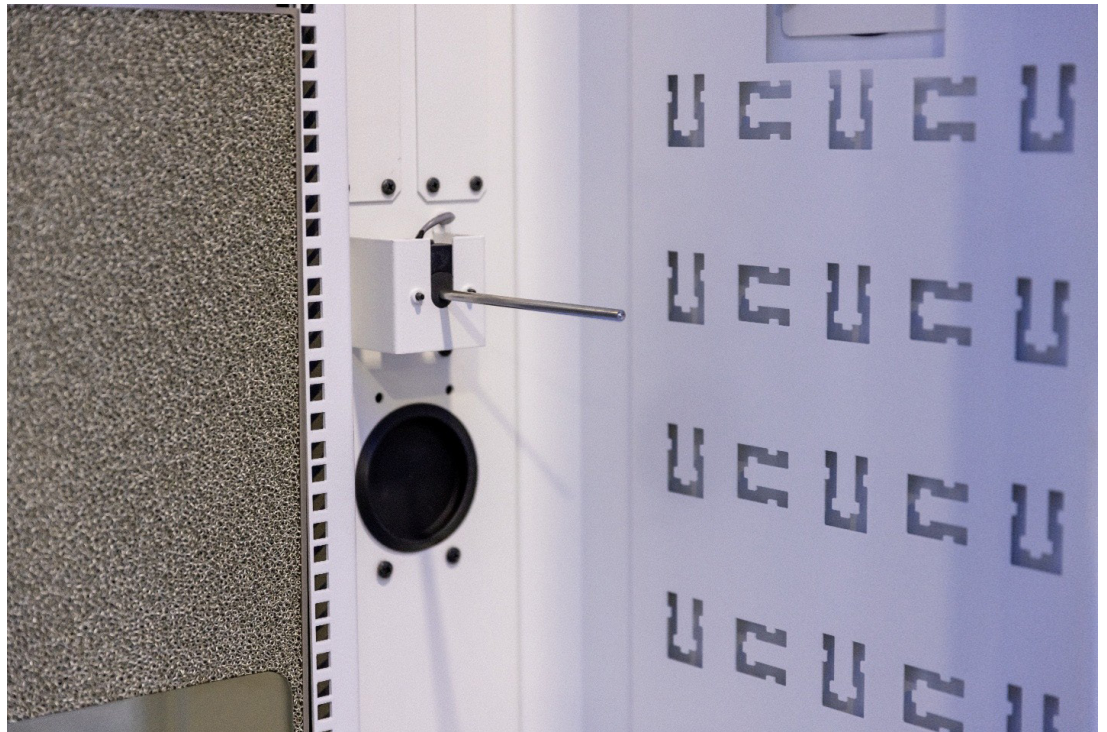
DDC's complete data center solution provides immense business value to data center operators, who can expect to reduce operational risks while optimizing their facilities for sustainability. This capability to accommodate diverse workloads side by side – ranging from low-density to high-density configurations – ensures that organizations can scale their operations without needing extensive modifications or even complete overhauls of existing infrastructure. DDC's modular design also allows for a lower total cost of ownership, with an average of 40% savings per megawatt compared to traditional data center solutions.

Most importantly, the DCIM monitoring solution for the S-Series cabinets is easy to use. Secure, browser-based access is available from any desktop, tablet, or smartphone. The user-friendly navigation and graphical interface facilitate quick identification and response to any situation, regardless of user location.

Conclusion

DDC's S-Series cabinet, along with its DCIM monitoring solution, show a transformative way forward to modernize data center deployments and avoid costly challenges. With HPC and AI applications changing data center operations, addressing the increasing demands of these workloads will require solutions that provide a scalable, modular, and future-proof infrastructure that meets both current and evolving needs. The S-Series cabinet's ability to support high-density air cooling up to 100kW and liquid-to-chip cooling up to 400kW ensures flexibility for diverse workloads while ensuring both efficiency and sustainability. This hardware, combined with DDC's DCIM software's real-time monitoring and predictive management capabilities, gives data center operators a complete solution that reduces risk, optimizes performance, and lowers the total cost of ownership. Regardless of whether an operator is retrofitting an existing facility or building a new data center, DDC's solutions empower users to meet today's challenges while preparing for the demands of tomorrow.

DDC Solutions' patented, S-Series cabinet technology offers ultra-high-density air and liquid-to-chip ready cooling. DDC's S-Series cabinets are NEMA 3R certified, have security and built-in fire suppression, and offer dynamic management and real-time monitoring DCIM software. Designed to reduce operating and financial risk, the S-Series lowers your loss footprint from an entire Data Center to a single cabinet.

Mitigate Risk with DDC S-Series cabinets and protect your total Data Center investment! Learn more from our Risk Mitigation Video and Blog at www.ddcsolutions.com/solutions/riskmitigation.