Advanced Solutions for a Hyperscale Data Center in Central Europe

HiRef has recently contributed to the development of a hyperscale data center in Central Europe, providing cutting-edge technological solutions for cooling and energy management.

THE SYSTEMS

To ensure the cooling of the data center, which is distributed across two areas, HiRef provided 10 full-inverter chillers, each with a nominal capacity of **1,5 MW**, for a total of 6,5 MW per area, configured in an **N+1** setup. These units utilize **R1234ze**, a low-GWP refrigerant, and are equipped with the Glycol-Free Kit, allowing them to operate with pure water inside the data center.

Thanks to the technical features of these chillers, the system can operate in free cooling mode for most of the year, leveraging favorable climatic conditions to optimize energy consumption. Noise reduction was ensured through specially designed soundproof enclosure with acoustic filters and 5 mm panels, achieving a noise level of just 94 dB(A).

The chillers are also equipped with:

- **Dual Power Supply** with an **Automatic Transfer Switch** to ensure operational continuity.
- **Energy Flow Meter** and **Electrical Energy Meter** for monitoring both seasonal and real-time efficiency.
- **Active Harmonic Filters** to reduce harmonic distortion, keeping it below 5% as required by project specifications.

Inside the data center, **100 FanWall units** have been installed, each with a power output of **260 kW**, providing a total cooling capacity of **13 MW with 2N redundancy**. These units feature **dual power supply with an automatic transfer system** and a **pressure-independent valve** for optimized hydraulic flow management.

The system ensures:

- **Fast restart** in case of a blackout.
- **Energy production monitoring** for real-time efficiency tracking.
- **Stable room conditions**, maintaining **return air at 35°C** and an **internal temperature of 24°C**, thanks to a **28-20°C water production cycle**, which also optimizes electrical consumption.

NOTHING LEFT TO CHANCE WITH HINODE

The technological core of the project is the **HiNode** system, designed to optimize the operation of the data center. Thanks to an advanced sensor network, HiNode analyzes real-time workloads and external environmental conditions, adjusting system operations to achieve maximum energy efficiency.

- **Primary side**: all chillers are connected in parallel to maximize operational flexibility.
- **Secondary side**: the FanWalls, positioned in a technical corridor, are distributed across two separate hydraulic loops (50% on each loop).
- **Server room control**: HiNode manages the units to maintain a constant server room temperature of 24°C, adjusting airflow rates to prevent hot spots.

HiNode not only controls the chillers but also coordinates:

- **Pumping systems**, continuously monitoring temperatures in storage tanks and manifolds.
- **FanWalls** implementing specific scenarios and emergency strategies requested by the client.

The system is **fully customizable** to adapt to any future needs of the data center, ensuring flexibility and scalability.

This project represents a perfect integration of **innovation, reliability, and efficiency at the service of the client.** The implemented technologies enable the data center to achieve **high levels of operational performance** under various conditions, optimizing the lifecycle of the infrastructure.

TVA RANGE

TVA is a range of air-cooled chillers designed for energy efficiency and sustainability. Its low environmental impact is achieved through the use of HFO R1234ze refrigerant, with a GWP of only 6 (Global Warming Potential).

The high efficiency-to-footprint ratio is achieved thanks to the unique V-shaped modular coil configuration, ensuring large heat exchange surfaces and, consequently, high thermal efficiency in a compact footprint.

This range is equipped with inverter-driven screw compressors, which allow wide modulation of cooling capacity and high efficiency at partial loads.

The chiller also features a **Free-Cooling configuration** and is equipped with heat exchangers that offer **double the heat exchange surface compared to the market average**. This allows for exceptional performance in Free-Cooling mode.

The **shell-and-tube evaporator**, designed for full counterflow heat exchange, ensures excellent thermodynamic efficiency with a **low Total Equivalent Warming Impact (TEWI)**.

Additionally, the compressor enclosures significantly reduce noise transmission thanks to the use of **high-performance sound-absorbing materials**.

Particular attention has been given to machine **maintainability**, which is now simpler and faster due to the **innovative HiRail removable module**, allowing quick access to the compressors.

FANWALL HBCV

"Inside the data center, 100 FanWall units have been installed, each with a power rating of 260 kW, providing a total cooling capacity of 13 MW with 2N redundancy."

The FanWall HBCV series of chilled water air conditioners is designed for technological environments that require a compact footprint while ensuring high cooling capacity.

Thanks to a thorough CFD fluid dynamic analysis, every structural detail has been optimized to minimize pressure losses in the internal airflow and reduce fan energy consumption. The large surface area of the finned coil heat exchanger ensures effective thermal transfer, minimizing the thermal approach between the incoming air and outgoing water, thereby maximizing overall system efficiency.

To ensure continuous system operation, the FanWall HBCV range features a fully redundant refrigeration circuit: the configuration with a dual coil and dual water control valve allows the server room to remain cooled even in the event of a circuit failure.

A strategic design choice has positioned the finned coil downstream of the fans, improving airflow distribution towards the racks and reducing turbulence for a more uniform and efficient airflow.

All models in the range come standard with heat exchange coils treated with a hydrophilic coating. This special treatment, combined with optimized airflow speed management, enhances the effective collection and drainage of condensate during dehumidification, preventing droplet carryover both inside and outside the unit.

HINODE: CONTROL AND MANAGEMENT OF AIR CONDITIONING SYSTEMS

"The technological core of the project is the HiNode system, designed to optimize the operation of the data center."

HiNode is the exclusive system developed by HiRef for advanced management and supervision of air conditioning systems.

By interfacing with various devices within the system, HiNode creates synergy between units, enabling an effective and efficient response to user demands while ensuring optimal performance.

The system integrates predictive logic for fault analysis and long-term performance monitoring. This type of control allows for timely interventions, ensuring continuous operation. At its core, HiNode features a programmable microprocessor compatible with major communication protocols via serial and/or Ethernet connections. It is equipped with digital and analog inputs and outputs (0-10 V, 4-20 mA), enabling precise control of auxiliary components such as pumps and valves, as well as the acquisition of temperature and pressure signals.

Operational data can be accessed both locally, through an intuitive touchscreen display, and remotely, via an advanced web interface.

The integration of HiNode with the HiNet service enables cloud-based data synchronization, facilitating centralized monitoring and performance analysis.

With HiNode, users can visualize and analyze key operating variables of managed units through interactive charts, record real-time data, and consult historical event logs. Collected data can be exported in multiple formats and automatically sent via email, simplifying management and reporting tasks.

HiNode's advanced control algorithms optimize the distribution of thermal loads among units, even if they belong to different product ranges. The system automatically determines which and how many resources to activate, prioritizing operational simultaneity, partial load operation, and energy recovery, thereby maximizing efficiency and reducing operating costs.