

KEEPING COOL UNDER PRESSURE

KEYSOURCE'S CFD SECURED OPTIMAL COOLING FOR HIGH-DENSITY DATA HALL

ABOUT THE PROJECT

Keysource collaborated with a leading data centre facility in Norway to enhance the design of a state-of-the-art 1250kW data hall. Employing cutting-edge technology, Keysource utilised **Computational Fluid Dynamic (CFD)** assessments to validate the cooling strategy and rack layout. The exploration also extended to high-density configurations, reaching up to 30kW per rack position. This thorough evaluation surpassed standard operating conditions, encompassing simulations of normal and failure scenarios, along with layout modifications to proactively identify and address potential thermal issues before the construction phase.

Keysource's proactive approach, fuelled by CFD expertise, successfully identified and addressed concerns related to rack temperatures and airflow under both normal and failure scenarios. This led to design adjustments before construction, ensuring optimal cooling performance and safeguarding the critical IT infrastructure.

CHALLENGES

- **High density environment:** The data hall aimed for a maximum load of 1250kW within a confined slab-to-slab height of 3.25 meters. Managing this dense configuration posed challenges in maintaining ideal rack temperatures and preventing hot air recirculation.
- **Limited cooling information:** Initial design details included information on rack layout and density but lacked specifics on fan wall unit positioning and control strategies.
- **Anticipating potential failures:** Accounting for equipment failures was crucial to ensure the data hall's resilience and reliability.

SERVICES DELIVERED

- ✓ ADVANCED CFD MODELLING AND SIMULATION
- ✓ DETAILED THERMAL ANALYSIS OF THE DATA HALL ENVIRONMENT
- ✓ IDENTIFICATION AND MITIGATION OF POTENTIAL COOLING AND AIRFLOW ISSUES
- ✓ RECOMMENDATIONS FOR DESIGN OPTIMISATION AND OPERATIONAL PROCEDURES

THE KEYSOURCE SOLUTION

Our experienced CFD engineers constructed a detailed model of the data hall, incorporating:

- **Accurate representation of cooling units:** Utilising the provided cooling unit specifications, including airflow, capacity, and control strategies, we modelled their impact on the thermal environment.
- **Dynamic rack load modelling:** The model accounted for varying rack loads, including higher-density zones and empty positions, with blanking panels accurately represented.
- **Scenario-based simulations:** We ran simulations for both normal operation and a "worst-case" scenario with a failed ACU unit. This allowed us to assess the cooling system's adaptability and identify potential weaknesses.

RESULTS

- **Normal operation:** Simulations demonstrated excellent performance with the mean inlet temperature within the recommended range and meeting the service level agreement. Despite slightly elevated temperatures in top rows, the strategy effectively contained hot exhausts within the containment system.
- **Proactive mitigation:** The "failure scenario" simulation identified potential overheating issues in specific rows upon unit loss. This knowledge enabled implementing redundancies and adjusting procedures to address such situations.
- **Increased confidence in design:** By not only identifying and addressing potential issues before construction KeySource's CFD analysis also played a crucial role in maximising rack power density. This involved optimising contiguous rack footprints and achieving per-rack maximums of up to 35kW, ensuring an efficient and resilient high-density configuration.

QUOTE

"KeySource's inhouse CFD expertise and proactive approach were invaluable in ensuring the optimal cooling performance of our new data hall. Their simulations revealed issues we wouldn't have identified otherwise, allowing us to make informed adjustments that will save us time, money, safeguard our clients critical infrastructure and unlock new higher density rack opportunities."

Project Manager

By leveraging our in-house CFD expertise, combined with advanced cooling controls, we were able to accurately model, simulate various scenarios and expertly analyse the results to help achieve the client's high-density cooling goals with complete confidence.

This demonstrates the power of KeySource's unique blend of in-house, offering invaluable insights that can guide you whether you're building a new data centre from scratch or optimising an existing one. With KeySource, you can create a reliable, efficient, and high-performing environment for your critical IT equipment, maximizing its lifespan and optimising your data centre's overall performance.