

Liquid Cooling: Powering AI-ready data centers



As Artificial Intelligence (AI), High-Performance Computing (HPC) and next-generation workloads continue to increase rack densities and power consumption, traditional air-cooling approaches are reaching their operational and economic limits. Organizations are increasingly focused on supporting high-performance computing environments while optimizing energy consumption, improving sustainability and maintaining operational reliability.

Liquid cooling has emerged as a critical enabler for modern data centers by delivering significantly higher thermal efficiency, supporting higher compute densities and enabling scalable infrastructure for AI-driven workloads. By removing heat more effectively than conventional air-based systems, liquid cooling helps organizations unlock greater performance while reducing energy consumption and infrastructure constraints.

HCLTech enables organizations to design, deploy and operate advanced liquid cooling environments through an end-to-end services approach tailored for both greenfield and brownfield data centers. Our solutions help enterprises transition from traditional cooling limitations to scalable, high-performance and energy-efficient infrastructure capable of supporting next-generation AI workloads.



The growing cooling challenge

The rapid growth of AI, machine learning and GPU-intensive workloads is fundamentally changing data center requirements. Today's high-density computing environments generate significantly more heat than traditional enterprise workloads, placing unprecedented demands on cooling infrastructure.

Many organizations are finding that conventional air-cooling systems can no longer efficiently support the power densities required by modern AI platforms. As a result, data center operators face increasing operational costs, infrastructure constraints and sustainability pressures while striving to maintain performance and reliability.

Organizations commonly face challenges such as:

- Traditional air cooling is struggling to support high rack densities
- Rising power and cooling-related operational costs
- Thermal inefficiencies leading to performance throttling and downtime risks
- Sustainability and regulatory pressures to reduce energy consumption and carbon footprint
- Limited readiness of existing facilities for next-generation workloads
- Complexity in integrating cooling solutions with existing IT and facilities infrastructure
- Lack of specialized operational expertise for liquid-cooled environments



A smarter approach to high-density cooling

Successfully adopting liquid cooling requires more than deploying new cooling technologies. Organizations must carefully assess existing infrastructure, align cooling strategies with workload requirements and ensure seamless integration across facilities, power systems and IT operations.

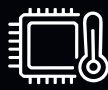
HCLTech delivers comprehensive liquid cooling solutions across the full lifecycle—from assessment and architecture design to deployment, operations and continuous optimization. Our approach helps organizations select and implement the most appropriate cooling strategy while minimizing disruption and maximizing long-term value.

Our portfolio includes:



Direct-to-Chip (D2C) cooling

Direct-to-Chip cooling removes heat directly from high-performance processors using liquid-cooled cold plates attached to CPUs and GPUs. This approach significantly improves thermal efficiency while enabling support for increasingly dense AI and HPC workloads.



Immersion cooling

Immersion cooling submerges IT equipment in specially engineered dielectric fluids, enabling highly efficient heat transfer and supporting extreme compute densities. This approach can substantially reduce cooling energy requirements while maximizing data center capacity.



Hybrid cooling architectures

Hybrid cooling combines traditional air cooling with liquid cooling technologies to create flexible and scalable environments. This model is particularly valuable for organizations looking to modernize existing facilities while accommodating both legacy and next-generation workloads.

Our liquid cooling framework



1. Assess and mobilize

Every successful liquid cooling journey begins with a comprehensive understanding of the existing environment. HCLTech evaluates current infrastructure, workload demands, thermal performance and operational objectives to determine the most effective cooling strategy.

Key activities

- Thermal and energy assessments
- Rack density and workload analysis
- Existing infrastructure evaluation
- Power and cooling baseline analysis
- TCO, ROI and sustainability modeling

Key outcomes

- Cooling readiness assessment
- Business case and recommendation report



2. Plan and engage

Based on assessment findings, HCLTech designs future-ready cooling architectures that align with both immediate operational needs and long-term business growth objectives. The focus is on creating scalable, resilient and efficient environments that support evolving AI and high-density computing requirements.

Key activities

- D2C, immersion and hybrid cooling architecture design
- Integration planning across power, racks and monitoring systems
- Brownfield retrofit strategy development
- Governance, risk mitigation and deployment planning

Key outcomes

- Future-state cooling architecture
- Deployment roadmap
- Integration blueprint



3. Deploy and sustain

HCLTech supports end-to-end deployment, commissioning and ongoing operations of liquid-cooled environments. Through continuous monitoring and optimization, organizations can maintain peak performance while adapting to changing workload demands.

Key activities

- Deployment and commissioning
- Testing and performance validation
- 24x7 monitoring and predictive maintenance
- Fluid management and operational support
- Continuous optimization aligned to workload growth

Key outcomes

- Optimized cooling operations
- Reduced energy consumption
- Sustained infrastructure performance

How does Liquid cooling benefit your business?

Liquid cooling removes heat directly at the source, enabling organizations to achieve higher levels of performance, efficiency and sustainability than traditional cooling approaches. Beyond addressing immediate thermal challenges, liquid cooling creates a foundation for future AI growth and data center modernization.

Organizations can realize measurable benefits across operational, financial and environmental dimensions:

- Improved cooling efficiency through direct heat removal
- Reduced energy consumption and cooling-related OPEX
- Support for higher rack densities and better space utilization
- Reduced thermal throttling and improved workload performance
- Improved uptime and operational reliability
- Lower carbon footprint and stronger sustainability outcomes
- Future-ready infrastructure for AI, HPC and next-generation workloads



Why HCLTech

Delivering successful liquid cooling initiatives requires expertise across both IT infrastructure and facilities management. HCLTech brings together deep domain knowledge, proven delivery capabilities and a strong ecosystem of technology partners to help organizations accelerate their transition to AI-ready infrastructure. From strategy and design through deployment and ongoing operations, HCLTech provides a vendor-agnostic approach that maximizes performance, efficiency and long-term business value.

Our differentiators

- Deep expertise across IT and facilities convergence
- Proven experience supporting AI-ready and high-density environments
- Vendor-agnostic and solution-focused delivery approach
- Strong ecosystem partnerships with leading OEMs and cooling technology providers
- Global delivery capabilities across design, deployment and operations
- Focus on sustainability, efficiency and long-term value realization

Our Partners



To know more about our liquid cooling solutions, write to us at HCBU-PMG@hcltech.com

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