

Optimizing AI Compute with Shell Immersion Cooling Fluid



Partner Alliance Solution Brief

As artificial intelligence (AI) workloads drive unprecedented demand for high-performance computing, data centers and edge environments face significant challenges in managing heat dissipation and energy consumption. Cisco Engineering Alliances, in collaboration with Shell, Green Revolution Cooling (GRC), and Asperitas, delivers advanced immersion cooling solutions powered by Shell Immersion Cooling Fluids. These solutions optimize thermal management for Cisco's AI compute infrastructure, enhancing efficiency, sustainability, and performance in both centralized and edge deployments.

The Challenge

Modern AI compute solutions, such as those powered by Cisco's UCS servers, generate substantial heat due to high-density processing. This challenge is amplified in edge AI environments, where space constraints, limited power availability, and environmental factors demand compact, efficient cooling. Traditional air-cooling methods are energy-intensive, costly, and often insufficient for next-generation data centers and edge nodes. Immersion cooling, where IT hardware is submerged in dielectric fluids, offers a sustainable and scalable solution.

Shell Immersion Cooling Fluid:

Shell Immersion Cooling Fluid, developed using proprietary Gas-to-Liquids (GTL) technology, is a synthetic, single-phase dielectric fluid engineered for high-performance cooling. Its advanced formulation delivers exceptional thermal and chemical properties, making it ideal for Cisco's AI compute environments, including edge deployments.

About Cisco

Cisco (NASDAQ: CSCO) is the worldwide leader in technology that powers the internet. Cisco inspires new possibilities by reimagining your applications, securing your enterprise, transforming your infrastructure, and empowering your teams for a global and inclusive future.

About Shell

Shell is a global energy company with over a century of expertise in oil, gas, and chemical innovations. Through its advanced Gas-to-Liquids (GTL) technology, Shell produces high-performance immersion cooling fluids, supporting cutting-edge applications like AI compute infrastructure.

Single phase immersion cooling technology as an integrated solution offers up to

48%

Reduction in energy footprint

Immersion Cooling Fluid S3 X Process

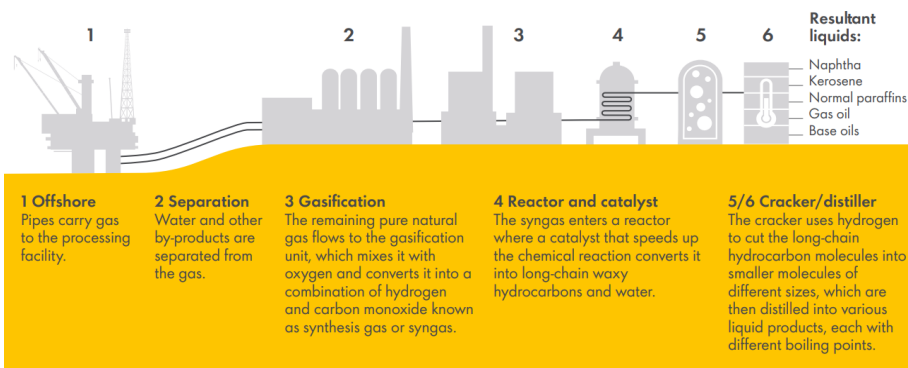


Image from Shell

Key technical specifications:

Designed for single-phase immersion cooling, the fluid requires no phase change and is compatible with diverse hardware configurations, making it suitable for both data centers and edge environments



Thermal Conductivity and Heat Capacity:

With a thermal conductivity of ~0.14 W/m·K and high specific heat capacity, the fluid efficiently transfers heat via natural convection or forced circulation, reducing hotspot formation on high-power components like GPUs and CPUs.



Dielectric Strength: Exceeding 40 kV, the fluid ensures electrical insulation, protecting sensitive Cisco UCS and edge server components from short circuits during submersion.



Low Viscosity: A kinematic viscosity of ~2 cSt at 40°C minimizes flow resistance in forced circulation systems, reducing pump energy requirements and enhancing efficiency in compact edge setups.



Chemical Stability: The GTL-based fluid offers superior oxidation and thermal stability, with a flash point above 200°C, ensuring safe operation under high thermal loads and a lifespan exceeding 10 years under normal conditions.



Environmental Profile: Virtually free of sulfur, nitrogen, and aromatics, it meets NSF/ANSI 60 food-grade standards and has a low global warming potential (GWP), supporting sustainable operations.



Material Compatibility: Extensively tested for compatibility with metals, polymers, and elastomers used in Cisco hardware and GRC/Asperitas systems, preventing corrosion or degradation.

Cisco Engineering Alliances: Collaborative Innovation

Cisco's partnerships with Shell, GRC, and Asperitas create a robust ecosystem for delivering immersion cooling tailored to AI compute solutions:

- **Shell:** Supplies the GTL-based immersion cooling fluid, leveraging expertise in lubricant and fluid technology. Shell's LubeAnalyst platform provides real-time fluid condition monitoring, optimizing performance for Cisco's infrastructure.
- **Green Revolution Cooling (GRC):** GRC's ICEraQ and ICEtank systems integrate Shell's fluid to cool high-density Cisco UCS servers. These modular designs support up to 100 kW per rack, ideal for both data centers and space-constrained edge nodes [<https://www.grcooling.com>].
- **Asperitas:** Asperitas' Immersed Computing® AIC24 21" platform uses Shell Immersion Cooling Fluid S5 X in a natural convection-driven system, eliminating fans and chillers to reduce energy consumption and enable heat reuse [<https://www.asperitas.com/solution>]

Conclusion

Shell Immersion Cooling Fluids, in partnership with GRC and Asperitas, empower Cisco Engineering Alliances to deliver cutting-edge cooling for AI compute solutions in data centers and edge environments. By combining advanced thermal performance, sustainability, and scalability, this collaboration enables efficient, reliable AI workloads while reducing costs and environmental impact. For more information, contact Cisco or visit the partners' websites: Shell, GRC, Asperitas.

