



Valvoline™ & Iceotope Unleash Performance Utilizing Cutting Edge Technology

As high-performance computing continues to push the limits of thermal management, Valvoline Global Operations partnered with Iceotope to demonstrate the power of liquid cooling. By integrating Iceotope's "direct to everything" liquid cooling technology, engineered to meet AI's strict computing demands, with Valvoline's HTF-DE1 immersion fluid, the collaboration showcases how precision fluid formulation and innovative cooling design can deliver reliable, efficient performance in next-generation computing environments.

Why Immersion Cooling Now?

With the new wave of modern HPC systems, air cooling is no longer enough to handle the extreme temperatures. AI rack power densities are expected to exceed 100 kW by 2026 and may reach 200 kW by 2030, necessitating highly stable immersion fluids for long-term deployment. With over 150 years in the fluid industry, Valvoline has developed an immersion formulation known as HTF-DE1 to meet the high-performance demands of the future while offering reliability and performance that align with industry expectations.

Test Parameters and Takeaways

Real-World Validation: 18-Month Test

Rigorous in-application test using Iceotope's MicroDC system configured with nVidia A40 GPUs and HPE DL380 servers.

Goals:

- Verify thermal stability and performance under pressure
- Confirm hardware compatibility
- Validate OCP compliance

Samples taken from startup to 18 months.

Outcomes



Reliable dielectric protection maintained across all test intervals.



Forensic analysis displayed no hardware or fluid degradation.



Color remained clear from material or component leaching.



No detectable odor change was observed.



Validated by Valvoline and Iceotope for compatibility.

CASE STUDY

Proven Performance Under Pressure

HTF-DE1 met or exceeded all Open Compute Project and vendor specifications.



—UP TO—
6X
GREATER
COMPUTE
DENSITY

- Exceptional performance with a 5.2 kW power load
- No corrosion or material damage found in forensic analysis
- Approval with Iceotope systems



Built for the Future of HPC



Valvoline and Iceotope showcased what's possible when innovation aligns.

With HTF-DE1 fluid and MicroDC hardware working in unison, the solution delivers reliable, spec-compliant performance built for the demands of modern HPC and AI.

Consistent and stable kinematic viscosity measurements indicated Valvoline's HTF-DE1 strong thermal performance over 18 months. Displays consistency and long-term stability of DE1 in a high-performance computing environment (see Figure 1 at right). ▶

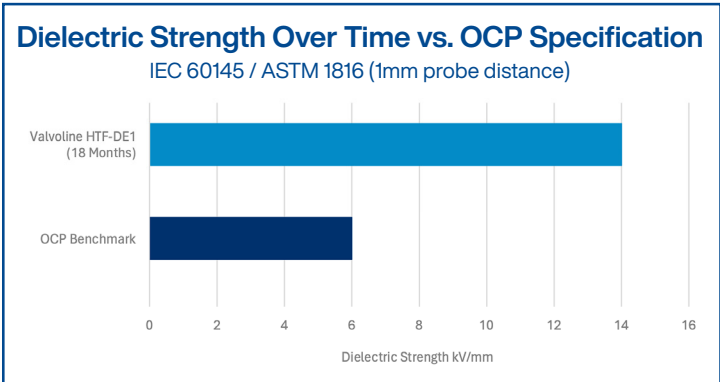


Figure 2: The fluid's dielectric strength exhibited minor expected variation while maintaining dielectric performance significantly above the OCP minimum of 6 kV/mm.

▲ Despite minor expected changes, the fluid consistently maintains dielectric performance significantly above the OCP minimum of 6 kV/mm (see Figure 2 below).

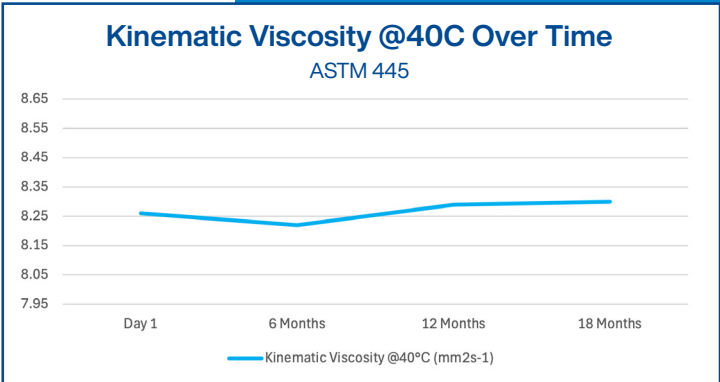


Figure 1: Kinematic viscosity at 40°C remains steady throughout 18 months of operation, reflecting the formulation's stability and reliability in long-term operation.

**ICEOTOPE®**

Liquid Cooling Benefits

UP TO **40% LESS**

 **POWER USAGE**

UP TO **96% LESS**

 **WATER USAGE**

UP TO **83% LOWER**

 **COOLING COSTS**



HTF DE1

2.9x OVER

INDUSTRY MINIMUM

To learn more, please visit:
ValvolineGlobal.com
Iceotope.com