Liquid Cooling: Exceeding the Limits of Air Cooling to Unlock Greater Potential in High Performance Computing

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More than good business practice, reducing energy consumption and heat is key to computing on a global scale.

Computer chips have been consistently redesigned to break free of performance bottlenecks. Tapping into highly advanced physics and smaller and smaller processor structures, these silicon wonders continually deliver improved features and capabilities that drive ever more impressive applications of technology. Yet CPU or GPU (coprocessor) performance is not the only system element that can create limitations. While every system component has an impact, power is perhaps the most basic yet essential factor in maintaining performance. More than one think tank predicts that computers will need more power than the world can produce by 2040.

The rising level of power being used also generates a significant and increasing amount of heat which, if not effectively addressed, puts future computing advancements at risk. Adopting an efficient process to remove heat is critical to the design of systems that run more complex, higher resolution, and more advanced applications. Solving this challenge is of particular interest to designers of High Performance Computing (HPC) clusters. Battling limitations of heat and energy as primary issues, this kind of dense and superior computing architecture must overcome hurdles to reach its full potential in scenarios in artificial intelligence, genomics research, weather modelling, financial services, government, and more. This landscape is where liquid cooling is poised to have significant impact on long-term computing performance as well as broad design strategies.

What does that mean exactly? Change is on the horizon, as unsustainable power demands are threatening a global infrastructure increasingly reliant on centralised data centre computing resources. The good news is that the right cooling strategies can not only solve the challenge but also keep high density systems performing beyond current thermal limitations – resulting in improved efficiency, extra computing horsepower, and reduced costs.

Sub headings that will be discussed:

- *CPU impact on thermal ingenuity*
- *Liquid cooling in action*
- *Liquid cooling essentials*
- *Turning heat into an asset*
- *Connecting with thermal management innovation*

XENON is at the forefront of this shift, as a vendor agnostic solutions provider closely tracking technology evolution and investing in innovation. The company has played a leadership role in managing the sea change in cooling technologies, particularly as HPC cluster systems have moved from research arenas to big data analytics to the spectrum of enterprise computing demands. A holistic approach is central to XENON's philosophy, solving the whole computing problem including software and hardware layers and facilities design. It's this broad expertise and worldview on technology that is critical to firms working to navigate the significant evolution in HPC technology and its immense cooling requirements.