The Truth About Digital Technology Sustainability (And What We Can Do About It)

Digital technology makes modern business possible, but at an environmental cost. Some of these issues can be addressed by immersion cooling in data centers.

Improving the Efficiency of Data Centers

Data centers accounted for [1.8% of the United States' total electricity consumption](#) in 2014, according to the U.S. Department of Energy. That translates to some 70 billion kilowatt-hours! Smaller data centers are major contributors to this consumption. In addition to housing around 50% of all servers, their energy management is generally quite poor.

Energy efficiency must rank as a key priority for data centers, as it affects everything from the wider environment to an enterprise's bottom line. This wide ripple shows just how important it is for data centers to be constantly innovating and improving their systems.

GRC's liquid immersion cooling offers a revolutionary way to cut operational expenses, *while* also delivering greater efficiency gains than the alternatives. Immersion cooling uses a safe-for-electronics liquid coolant instead of air; removing heat at a fraction of the cost to your budget.

[This cooling method is literally over a thousand times more effective](#) at conducting heat away from servers than conventional air cooling; which translates to substantial direct and indirect cost savings.

Why Data Center Efficiency Matters

Quite simply, inefficiency wastes money and natural resources. The physical efficiency of operational processes dictates how well data centers can convert electricity into computational capacity—and thus into profit.

As customers demand more powerful processing, the only viable way to keep energy

use in check is to increase efficiency. Data centers have begun to improve this metric in the past few decades; however, they have faced challenges in developing it further. We're reaching the crucible, where conventional data centers can no longer meet the computational needs of the economy.

At the same time, as data centers struggle to perform better, energy efficiency matters even more. Facilities are growing in number and size. They're using more electricity and producing more emissions just as these sustainability issues have captured the public's attention.

Efficiency directly correlates to variables that matter to both data centers and the public: financial and environmental health. Data centers need to find ways to raise efficiency. Enter GRC's liquid immersion cooling solutions.

Upgrade to Liquid Immersion Cooling

Data center cooling represents one of the main energy uses and operational costs dragging down efficiency. As such, it also represents a key area for implementing massive upgrades to operational efficiency.

The reason cooling takes such a large percentage of data center electricity and finances is that conventional air cooling is extremely inefficient. It's a legacy solution that still works, yes—but not well enough to meet modern demands. Newer and more effective methods like liquid immersion cooling are here to bridge the gap.

Improvements to cooling technology account for much of data center efficiency upturns in recent decades; for instance, the development of cold-plate and rear-door heat exchanger technologies. This process continues with GRC's liquid immersion cooling, which brings unprecedented efficiency to the data center industry.

Immersion cooling only consumes around 2-3% of the energy a data center needs to function. By contrast, a legacy cooling system may double or even triple the energy that data centers use.

There's no better way to see the effects of energy efficiency than to look at an extreme case. A scientific supercomputer project systematically measured the different available cooling options and found GRC immersion cooling to be much more efficient than all the alternatives.

Using liquid immersion, the Vienna Scientific Cluster cut costs while increasing computational ability. They reduced their infrastructural requirements and resource consumption *and* built the strongest supercomputer in Austria!

Improve Cost-Effectiveness

When you upgrade to a more energy-efficient cooling solution, your data center runs on less electricity, which cuts the costs of operation. For example, switching to GRC's immersion cooling can reduce your operating expenses by as much as 50%!

Your entire data center becomes more lightweight, enabling your business to save on the total capital budget too. You don't need to buy wasteful generators and batteries for an overbuilt air cooler. The liquid immersion tanks fit into a compact space, minimizing floor use.

There are other financial benefits to liquid immersion cooling. It reduces wear on parts, so you spend less on maintenance and replacement. However, the main advantage of its extreme efficiency is in the smaller electricity bill: immersion cooling uses a mere 5% of the electricity that air cooling requires.

The cost advantages of liquid cooling combine with savings from other efficiency improvements that can be implemented throughout the data center. For instance, if you use more energy-efficient processors to save on electricity, you'll see synergistic cost savings from these processors and immersion cooling.

Safeguard the Environment

Energy efficiency is measured by the sum of environmental resources needed to achieve the desired end, such as powering data centers. Using unnecessary resources isn't only about financial costs. It also drives damaging extractive activities, such as strip mining, and increases the burden of fossil fuel emissions on the environment.

While some forward-thinking data center operators have already taken it upon themselves to make their facilities environmentally sustainable, this trend is quickly becoming the norm. Public opinion and government regulations are increasingly pressuring the industry to minimize their resource utilization.

The use of [innovative technologies that simultaneously serve the financial interests of businesses](#) has emerged as the best way to safeguard the environment. This lets you improve the energy efficiency of your data center and go green while simultaneously cutting back on expenses. Incidentally, your servers will run faster, quieter, and more reliably too!

GRC's liquid immersion cooling glides by with half as much electricity as other cooling options. This is because liquids transport heat far more effectively than air. It also allows you to [productively reuse server heat](#) for various environmentally friendly (and profitable) functions. Moreover, immersion-cooled data centers require less water from the environment—in some cases, none at all.

These same synergies have ecological benefits equal to their economic ones. For example, energy-efficient processors running in liquid immersion cooling tanks will slash carbon waste, water waste, pollution, and other negative environmental impacts that data centers must consider.

Boost Data Center Efficiency With GRC

With enhanced efficiency, it's possible to boost profits while also doing your bit for the environment. Every step you take to make your data center more energy-efficient will result in a substantial return on investment. And one of the biggest steps you can take right now is to upgrade to liquid immersion cooling.

Immersion cooling uses less electricity to deliver immensely more computational power. GRC has the history, global presence, and expertise you need to increase performance, while saving your data center half its total operational costs. Enjoy these results now—[get started with GRC today](#).

Data Center Management: What the Industry Isn't Telling You About Waste

Data center management involves the careful administration of resources. Liquid immersion cooling cuts many types of waste by operating more efficiently.

LICAM 2022 Guest Blog: Data Centers and

Greenhouse Gas Emissions

As part of GRC's 2022 Liquid Immersion Cooling Awareness Month, we are proud to share this guest blog from [Mohsen Al-Aqeil](), Managing Director with GRC partner [Al Marjeia Trading Group](). Thank you, Mohsen, for sharing your perspectives with our LICAM audience!

It's difficult for the deadly wildfires to go undetected now that climate change is no longer a laughing matter; we've all seen the devastation caused by global warming all over the world. In 2019, the entire world witnessed the wildfire that struck Siberia, which was considered the third largest wildfire in the twenty-first century covering an area of more than 7,000,000 acres. Roughly the size of Belgium, the wildfire affected air quality and disrupted air travel in nearby cities, with smoke reaching as far as Alaska and the western coast of Canada. That is in addition to the Arctic fires or the so-called "zombie fires," all of which are directly related to the significant influence on the climate brought on by the rise in greenhouse gas emissions globally.

Energy, despite the critical role it plays in the global economy, has the highest percentage of green-house gas emissions, according to the EU Environment Agency. Yet, with today's lifestyle, it's unavoidable to accidentally harm mother nature while going about one's daily business. Demand is on the rise and all businesses are trying to satisfy this demand by applying more technology and constant modernization of the whole supply chain to ensure seamless operations. However, without a strong ICT foundation, advancements in the ICT sector's technical facets like artificial intelligence, machine learning, blockchain, virtual reality, 5G, etc. will only be possible in theory. According to an Enerdata analysis done in 2018, ICT, as an industry, accounts for between 5% and 9% of total world power consumption, while Lancaster University showed in a study completed in 2021 that it is responsible for between 2% and 3.9% of total global greenhouse emissions.

The Data Center is the essential physical component of the burgeoning and ongoing Industrial Revolution 4.0. According to a Supermicro research study done in 2018, data centers account for around 3% of worldwide power consumption, and 2% of total global greenhouse emissions. Cooling is not only an energy-intensive component of data center life, it is also a critical aspect in managing the excessive heat created by IT equipment and providing flawless operation, since hot spots are

regarded as the primary "electronics killer". With the increased demand for digital services, it has become more difficult for traditional cooling systems to accommodate the exponential growth in server density to cope with the aforementioned applications from AI/ML, Big Data, IoT, VR/AR, and so on, complicating how data centers are designed and run.

But thankfully, there is a solution: liquid immersion cooling, which drastically simplifies how a data center is now conceived and built by eliminating the need for energy-intensive air conditioners, huge generators, and raised floors.

There are two techniques to liquid immersion cooling: single-phase and two-phase. In a system that uses the two-phase immersion cooling system, servers are enclosed inside a bath of specially manufactured fluorocarbon-based liquid. Heat from the servers readily boils the surrounding fluid since the fluid has a low boiling point of roughly 49°C. The boiling of the liquid induces a phase transition from liquid to gas. The vapor is then condensed back to liquid by water-cooled condenser coils fitted into the top of the sealed racks. The condensed liquid drips back into the bath of fluid to be recycled through the system.

In contrast, servers in a single-phase immersion cooling system are mounted vertically in a coolant bath of a hydrocarbon-based dielectric fluid akin to mineral oil. Heat is transmitted to the coolant by direct contact with server components, as with its two-phase cousin. However, unlike two-phase immersion cooling, the coolant does not evaporate. Instead, it remains liquid and is cooled by a heat exchanger in a cooling distribution unit (CDU). When we speak single-phase immersion cooling, who else but GRC "THE IMMERSION COOLING AUTHORITY" comes to mind?

GRC has made dependability one of the ICEraQ® and ICEtank® systems' defining characteristics since pioneering single-phase immersion cooling in 2009. Both of these systems require very little maintenance and can reliably cool 200 kW/rack using the patented dielectric coolant, ElectroSafe®, which is completely inert, non-conductive, non-flammable, non-corrosive, and does not need to be replaced during the life of a normal data center.

Data on hardware reliability for ICEraQ and ICEtank systems demonstrate a considerable improvement in Mean Time Between Failures (MTBF) as compared to standard air-cooled data centers. This growth is due in part to strong collaboration with important OEM partners like Dell, Hewlett Packard Enterprise, 2CRSI, iXSystems, AMAX, and Supermicro.

THE COMPETITIVE ADVANTAGE OF SINGLE-PHASE OVER TWO-PHASE

When it comes to running expenditures, hardware dependability, complexity, and up-front costs, single phase immersion cooling has an advantage over two phase immersion cooling, in addition to the environmental element, which is the purpose of this article Single phase immersion cooling, notably GRC's ElectroSafe the proprietary coolant, is Hydrocarbon-based, giving it an advantage over Fluorocarbon-based two-phase coolants such as 3M Novec in terms of Global Warming Potential (GWP). For those who are unfamiliar with the prior phrase, the United States Environmental Protection Agency (EPA) introduced Global Warming Potential to facilitate comparisons of the global warming consequences of different gases. In more detail, it is a measurement of the amount of energy that 1 ton of a gas will absorb over a certain amount of time in comparison to 1 ton of carbon dioxide (CO_2). The greater the GWP, the more a particular gas heats the Earth in comparison to CO_2 during that time period. For GWPs, a 100-year time frame is typically chosen. GWPs provide a uniform unit of measurement, allowing analysts to add up emissions estimates for various gases (for example, to construct a national GHG

inventory) and policymakers to evaluate emissions reduction prospects across sectors and gases.

Last but not least, it is understood from a logical standpoint that mankind will continue to run in the race of technology since connectivity is highly vital nowadays just to meet the needs of modern everyday living. But we can do it sensibly with little or no impact on the environment since we still have to live on Earth and bear the consequences until we are able to conquer other planets, at which point we should seriously consider whether we want to start afresh.

How Cloud Servers Can Benefit from Immersion Cooling

Liquid immersion cooling lets cloud data centers increase their processing capacity at lower cost. This convenient green technology enables modular growth.

Can Single-Phase Immersion Cooling Enable Sustainability in Data Centers?

Single-phase liquid immersion cooling offers numerous benefits for the environment. Data centers become more sustainable and profitable.

Here's Why Immersion Cooling is Better for Data Centers

Data centers are turning to liquid cooling for its larger cooling capacity and lower cost. This technology also protects the environment and servers.

How Immersion Cooling Helps Reduce Operational Costs in Data Centers

Keep data center costs down with the latest innovation in cooling. Liquid immersion cooling offers energy-efficiency, simplicity, and reliability.

The Right Cooling System for Your Data Center

Data center cooling systems vary in their design. Liquid immersion cooling works ideally for enterprise, hyperscale, cloud, colo, edge, HPC, and crypto.

Ways the Internet of Things is Transforming the Data Center Industry

The Internet of Things (IoT) pushes far more data than ever into the data center industry, requiring more efficient cooling but aiding automation.