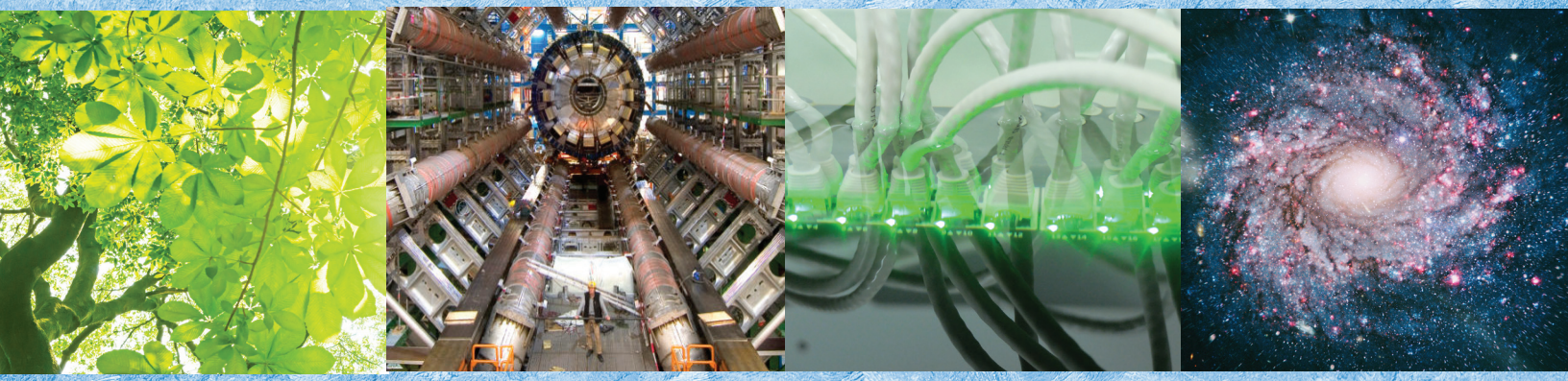
Case Study

Super-Cooling Powers Supercomputing for Port d'Informació Cientifica

Discover how a world-acclaimed tech center overcame significant cooling issues and paved the way for great scientific accomplishments with single-phase immersion cooling.



PIC
port d'informació
científica

GRC
THE IMMERSION COOLING AUTHORITY®

A Scientific Situation

The list of conventional data center challenges is a short but familiar one to most I&O professionals: cooling ever-increasing heat loads; the high cost of power; sustainability; along with the ability to scale quickly and easily. But when you're operating a supercomputer in support of important scientific research across the European continent, those issues can become — well, super-crucial.

Such is the case for Port d'Informació Cientifica (PIC), a scientific-technological center specializing in data-intensive research. Part of the Spanish Supercomputing Network (RES), it is located on the Universitat Autonoma de Barcelona campus and sustained through an agreement with two of the country's famed public research institutions: CIEMAT and IFAE.

Needless to say, given PIC's vital role in Europe's scientific community, addressing concerns like data center power consumption, cooling capacity and sustainability was mission critical.

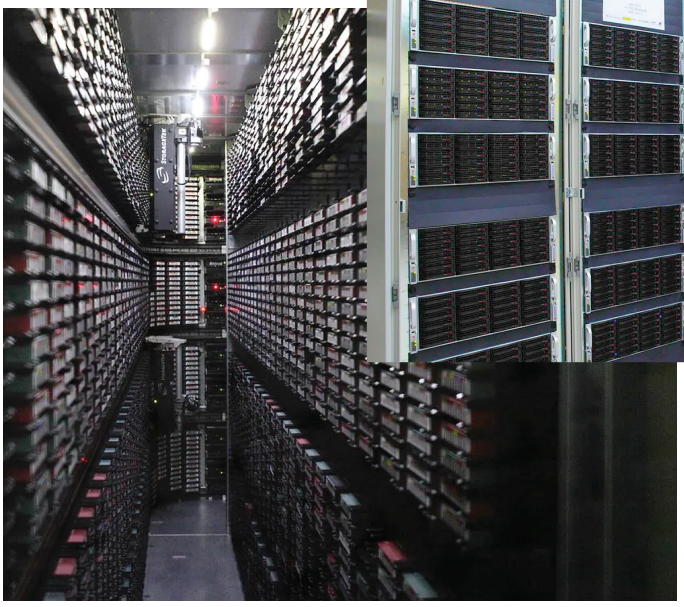
Challenges Abound

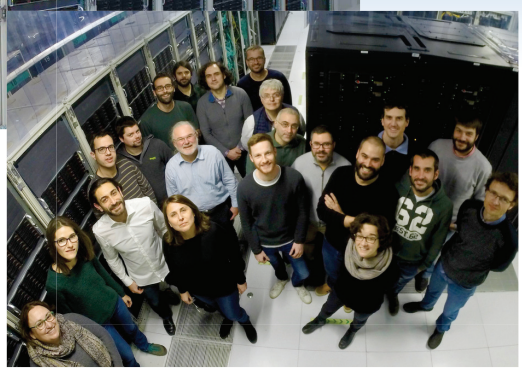
Although its computing capabilities and core mission exceeded that of many data centers at the time, PIC faced two immediate challenges today's operators well understand:

High power consumption continually taxed their cooling system. CPU-laden racks had hot spots that were difficult to cool. What's more, the emergence of GPU-based computing demanded they begin looking for a more energy-efficient cooling system. With restricted space and power for any additional high-density compute, PIC's air-cooled infrastructure had run its course.

PIC Pre-Immersion Cooling Snapshot

- Storage and core services deployed in adiabatic-free air-cooled room
- pPUE: 1.5
- Annual network traffic: 70 petabytes





Quest for the "Coolest" Solution

In searching for a solution to their data center cooling and energy-use challenges, PIC considered many factors, notably total rack compute capacity, cost of power, system reliability, and sustainability.

Having experienced the limitations of air cooling, PIC knew that immersion had the potential to meet all their primary objectives. They wanted to avoid incorporating a mix of cooling modalities in their data center. Plus, to give themselves more flexibility to handle future demands, they also sought the ability to use servers from different manufacturers.

As with any new technology — especially one often touted as a "breakthrough," PIC was duly skeptical about immersion cooling and conducted solid due diligence.

At the time, both single- and two-phase immersion cooling systems were available for consideration. However, after careful research PIC concluded that two-phase options on the market had not yet been proven to their satisfaction and, further, that the 3M Novec™ fluid used in that method had not been thoroughly tested.

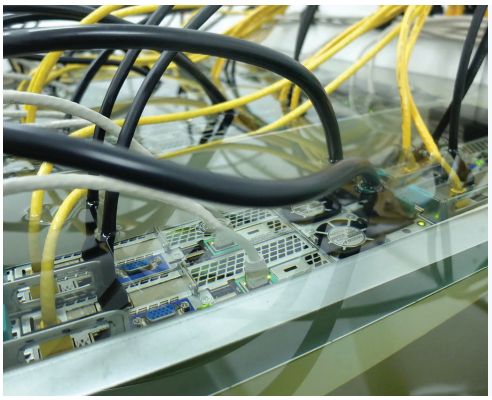
Thus, single-phase liquid immersion cooling ultimately emerged as the winning cooling technology.

Comparing the Two Immersion Cooling Technologies

Key Considerations	Two-Phase	Single-Phase
Improved Energy Efficiency		
High-Density Cooling Performance		
Low Acquisition Cost		
Sustainability		
Minimal Complexity		
Server Reliability		
Simplified O&M Practices		
Location Flexibility		

GRC's Single-Phase System Provides Proven Performance

At the conclusion of their vetting process, including observing the Vienna Scientific Cluster, a GRC immersion-cooled installation in Austria, who had a similar set of circumstances three years earlier, PIC decided to partner with Austin, Texas-based GRC. PIC also considered these benefits of single-phase immersion cooling:



Why PIC Chose GRC

- Total system cooling capacity of 200 kW[1]
- Low pPUE
- Flexibility, expandability, and sustainability
- Reduced CapEx and OpEx
- Rare ITE failure and high system reliability
- Server agnostic solution
- Successful worldwide installations

PIC also appreciated the fact that GRC's solution was compatible with any OEM server.

GRC installed an ICEraQ® micro-modular, single-phase liquid immersion cooling system at PIC in 2017 in support of eight Intel H2000G servers. It wasn't too long before the tech center affirmed that they had made the right decision. As Vanessa Acin Portella, PIC's IT Team Leader explains, "We had limited space, power and cooling. GRC's technology made it possible to add capacity while reducing power requirements by 30%."

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—Vanessa Acin Portella, PIC IT Team Leader

[1]Using a chilled water system.

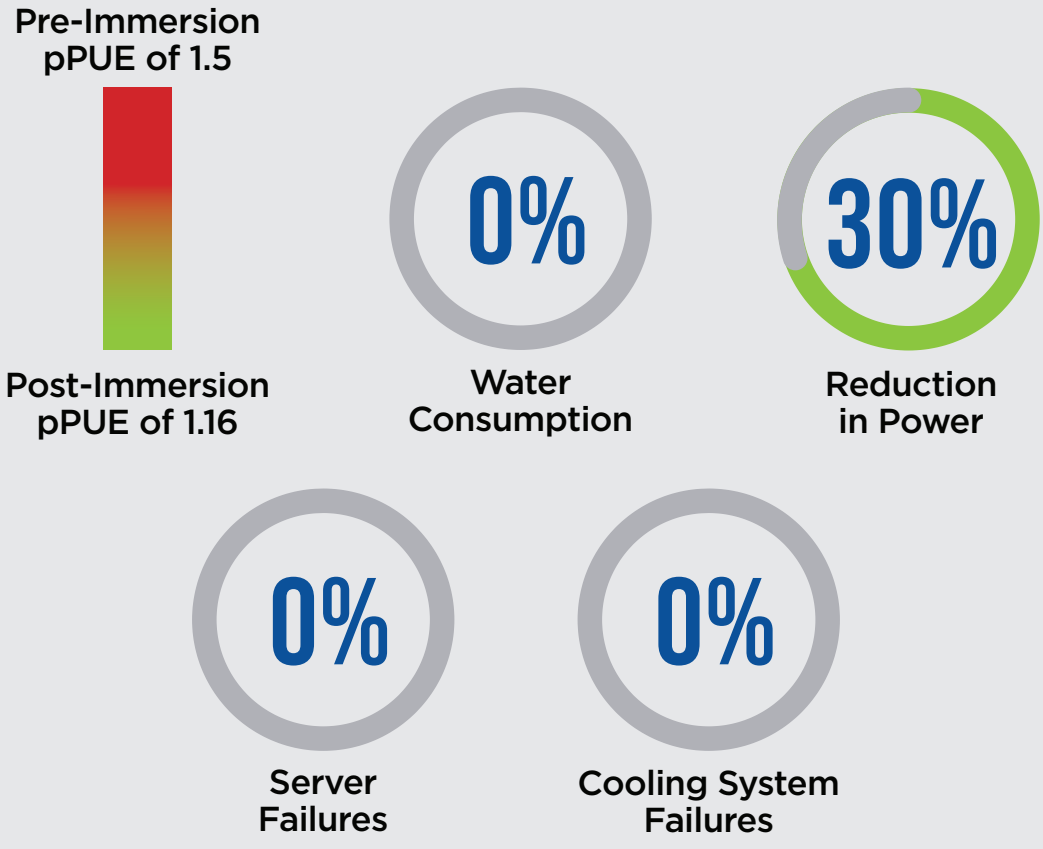
Topline Post-Installation Gains

Since installing GRC's ICEraQ single-phase immersion cooling system in 2017, PIC has seen impressive outcomes — results that far exceeded their dual objectives of advanced cooling and improved energy consumption.

Where energy efficiency is concerned, they have achieved a pPUE of 1.16, effectively reducing data center power consumption by some 30%. And they can foresee cutting that down to 1.05 with the addition of more servers.

Since PIC's ICEraQ system can easily cool up to 200 kW of compute[2], they are well prepared to take on not just pending projects requiring an estimated 50 kW of compute, but far ever more ambitious ones as well.

What PIC Achieved by Deploying ICEraQ Immersion Cooling Systems

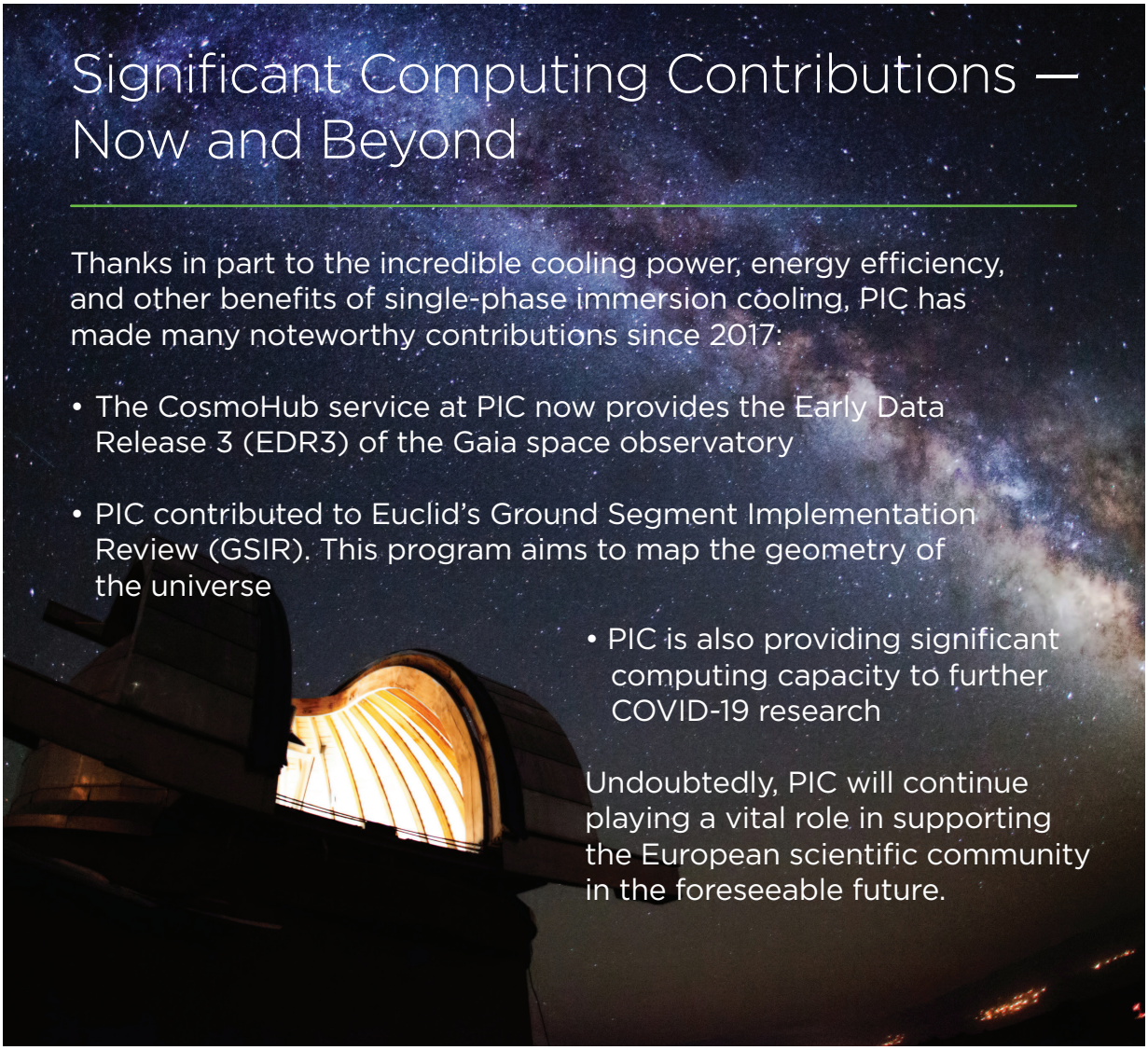


[2]Using a chilled water system.

Technicians Also Benefit

Along with strong objective results, PIC has also enjoyed a range of ancillary benefits with immersion cooling which were unanticipated but nevertheless contributed greatly to their overall operation and satisfaction.

Because immersion-cooled servers operate at much more stable temperatures than their old air-cooled ones, PIC has suffered no hardware failures since switching to GRC's ICEraQ. Connected to a dry cooling system, their ICEraQ system uses no water, which has also contributed to PIC's sustainability goals. And the switch to immersion cooling has also created a much more comfortable work environment for their technicians thanks to lower ambient temperatures and noise levels.



Significant Computing Contributions — Now and Beyond

Thanks in part to the incredible cooling power, energy efficiency, and other benefits of single-phase immersion cooling, PIC has made many noteworthy contributions since 2017:

- The CosmoHub service at PIC now provides the Early Data Release 3 (EDR3) of the Gaia space observatory
- PIC contributed to Euclid's Ground Segment Implementation Review (GSIR). This program aims to map the geometry of the universe
- PIC is also providing significant computing capacity to further COVID-19 research

Undoubtedly, PIC will continue playing a vital role in supporting the European scientific community in the foreseeable future.

Bring the Super-Cooling Power of Immersion Cooling to Your Data Center

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