Data centers in the AI era: The cooling challenge also involves refrigerant management

The digital transition, driven above all by the development of artificial intelligence, is transforming the cooling requirements of data centers infrastructures. A-Gas, a global leader in Lifecycle Refrigerant Management (LRM), supports operators as a strategic partner throughout this evolution.

BY A-GAS

THE global digital transition is accelerating rapidly, driven by the rise of artificial intelligence (AI) and the migration of activities to the cloud. As a result, electricity consumption associated with data centers is also increasing: in 2024, electricity demand reached around 415 TWh, equivalent to 1.5% of total global electricity consumption. According to projections by the International Energy Agency (IEA, Energy and AI, 2025), this figure is expected to double to 945 TWh by 2030 and triple to 1,300 TWh by 2035.

Increasingly powerful servers are concentrating growing amounts of heat in smaller spaces, making cooling an essential function for ensuring uptime, efficiency and reliability. Sustainable and circular refrigerant management is therefore becoming increasingly important. This is the field in which A-Gas operates as a global leader in Lifecycle Refrigerant Management (LRM), with more than 30 years of experience serving customers around the world. Founded in 1993 in Bristol, United Kingdom (UK), it is present in 15 countries across various continents. Its approach moves beyond the traditional linear “buy, use and dispose” model, replacing it with a circular one based on recovery and reclaiming refrigerants through advanced proprietary technologies.

Data centers: more power, more heat to manage
Almost 100% of the electricity consumed by servers is converted into heat. If this heat is not continuously removed, temperatures can rise within minutes, forcing chips to reduce their performance through thermal throttling and potentially leading to structural failures and system shutdowns, with costs of millions of dollars per hour for operators. Ensuring 24/7 cooling is therefore vital to the efficiency and uptime of the entire sector, but it is also highly energy intensive: cooling can account for as much as 30–40% of a facility’s total energy consumption.

The growth of AI is making the challenge even more complex. Higher power density in racks—the modular metal structures that house servers—means that more heat is concentrated in the same space. In a relatively short time, the sector has moved from the few kW associated with traditional systems to high-density racks rated at 20–50 kW, while AI racks can exceed 100 kW.

A circular approach to refrigerant management

Refrigerants remain an essential part of the cooling infrastructure and therefore still need to be managed throughout their entire lifecycle, taking into account the evolving regulatory framework. The European Union's F-Gas Regulation (2024/573) has introduced a progressive phase-down of HFCs placed on the market, with a 95% reduction by 2030 compared with the 2015 baseline. Similar measures are in place around the world, with phase-down targets of 79% by 2030 in the UK, 85% by 2036 in the US, and 85% by 2035 in Australia.

As a result, virgin high-GWP refrigerants such as R410A and R134a are expected to become increasingly scarce and expensive, making maintenance of existing systems increasingly challenging. The transition towards HFC/HFO blends and pure hydrofluoroolefins (HFOs) with very low GWP, such as R1234ze and R1234yf, is therefore accelerating. These new compounds represent a long-term option for new systems and new-build projects, offering a lower-impact alternative to legacy technologies.

At the same time, reclaimed refrigerants are also taking on an increasingly strategic role: because they are exempt from the quotas imposed by the F-Gas Regulation, they represent a reliable resource for maintaining the uptime of legacy cooling systems.

Reclaimed refrigerant: A sustainable choice

Various life-cycle assessment studies demonstrate that the overall greenhouse gas emissions resulting from the reclamation process for used refrigerants are significantly lower than those associated with the production of virgin refrigerant (a process that is energy-intensive and generates high GHG emissions). Studies (*) have shown that the carbon footprint of R410A refrigerant reuse is around 72% lower compared to virgin production, and for refrigerants such as R134a and R32, reductions can reach up to 90%.

Furthermore, the reclamation process prevents the improper disposal or venting of refrigerants into the atmosphere, thereby directly mitigating climate impacts and preventing high-GWP refrigerants from entering the atmosphere.

From supply to recovery: A-Gas solutions

To address these challenges, A-Gas positions itself as a single accountable partner, taking responsibility for the operational and regulatory risks associated with refrigerants and removing the need for customers to coordinate a complex network of different suppliers for refrigerant supply, recovery and disposal. For data centers operators, this transforms regulatory compliance from a complex cost into an integrated and planned competitive advantage.

On the supply side, the company's global network provides reliable access to both virgin and reclaimed refrigerants.

For operational needs, Rapid Recovery is a high-speed, on-site refrigerant recovery programme delivered by highly specialised technicians using purpose-built proprietary technologies, trucks equipped with 120-metre flexible recovery hoses and other company assets, including 1,000-litre drums and high-performance vacuum pumps. The service removes refrigerant significantly faster than standard commercial recovery systems, at speeds of up to ten times those of traditional processes, while operating in full compliance with local and international regulations. It also includes comprehensive support with all required documentation.

The service can be adapted to applications of any size, from individual residential air-conditioning systems to cooling equipment of different sizes and designs, and is available 24 hours a day, 7 days a week. To ensure the best possible outcome, the A-Gas team works in close collaboration with the customer's staff and, where necessary, can also recharge the refrigeration system with refrigerant.

The Rapid Recovery service is particularly important for the data centre sector, where A-Gas works with a wide range of customers, from operators managing their own infrastructure to facility management companies responsible for managing cooling systems. The sector has specific requirements in terms of speed and efficiency, which A-Gas is able to address promptly, keeping server downtime to a minimum. In this context, one aspect that is often

➤ A-Gas' circular refrigerant model, supply, use, recover, and reclaim (or destroy), keeps valuable molecules in circulation longer, shrinking Scope 1 emissions and easing quota-driven supply constraints for data centers.

underestimated is the logistical complexity involved in challenging environments such as hyperscale data centres and edge infrastructure. In these cases, decommissioning or retrofit operations may involve large quantities of refrigerant and require rapid intervention to minimise disruption to operations, which could otherwise result in significant inconvenience and substantial financial losses.

Environmental and economic benefits

Refrigerants recovered during maintenance, retrofit or decommissioning are analysed at A-Gas's 12 in-house laboratories, reclaimed and processed through 20 reclamation plants and 8 separation plants worldwide, and then returned to the market. The AHRI 700 purity standard certifies that the performance of the reclaimed product is equivalent to that of virgin refrigerant.

Where end-of-life refrigerants cannot be reclaimed, A-Gas ensures their certified destruction using specific technologies approved by the UN and certified by the TEAP (Technology and Economic Assessment Panel), thereby preventing the potentially harmful release of high-GWP refrigerants into the atmosphere.

A-Gas's approach also delivers further environmental and economic benefits. Customers can convert recovered refrigerants that might otherwise have been released into the atmosphere into verified carbon credits, in accordance with international registries such as Verra, Climate Action Reserve (CAR) and American Carbon Registry (ACR). This enables data centers operators to quantify and report real CO_2 savings within their sustainability and ESG reporting.

Towards the future

The relentless expansion of digitalisation, driven by AI, is placing the data centers sector at the centers of a radical shift in which computing capacity, uptime and reduced environmental impact must go hand in hand. A-Gas supports this transition, demonstrating that it is possible to maintain the uptime of critical digital systems, reduce their embedded carbon footprint and maintain compliance with international environmental regulations. The company continuously monitors key regulatory frameworks, including the AIM Act in the US, the F-Gas Regulations in the EU and UK, and the Kigali Amendment, while keeping up to date with the refrigerants compliant with local requirements in the different geographical markets in which it operates.

Security of supply and end-of-life management, simplified compliance and maximised circularity are some of the key principles underpinning A-Gas's LRM approach. Only through responsible models such as this can the digital economy continue to grow sustainably, supporting global innovation without compromising the resources of our planet.

➤ On-site A-Gas Rapid Recovery® services help data center operators recover refrigerant quickly and safely during service, retrofit, and decommissioning projects, reducing unplanned emissions and preserving refrigerant as a strategic asset.

DATA CENTRE COOLING IN THE AI ERA

Keep Cooling Online. Managed for Life.

A-Gas delivers end-to-end solutions across the data centre value chain, specialising in the supply and complete lifecycle management of refrigerants.

VIRGIN & RECLAIMED REFRIGERANTS
Supply for every system

RECOVERY & RECLAMATION
Rapid solutions to reduce emissions

END-OF-LIFE MANAGEMENT
Certified and compliant

INTEGRATED MANAGEMENT

A-GAS®
TOGETHER WE CAN

Keep your facility online