

Data Center Cooling: The Impact of Water Impurities

Addressing Data Center Cooling Challenges
and the Reliable Solutions to Overcome Them

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 **AUTOBrine**[®]

a Peak Industries Division

Manufactured by The Cope Company Salt





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Introduction

Data centers face challenges in cooling its infrastructure efficiently. This white paper will explore how to overcome this challenge with a focus on mitigating the impact of hard water, a pervasive issue that undermines cooling system effectiveness. It will also introduce a solution to water conditioning and the impact it has on a data center's efficiency.

It aims to demonstrate how advanced cooling technologies can transform data center management, improving reliability and efficiency while reducing operational costs.

Scope

- Current trends and challenges in data center cooling.
- The effects an inefficient cooling system can cause.
- Consequences of data center downtime.
- Solutions to implementing advanced cooling technologies.
- Case studies demonstrating real-world applications.

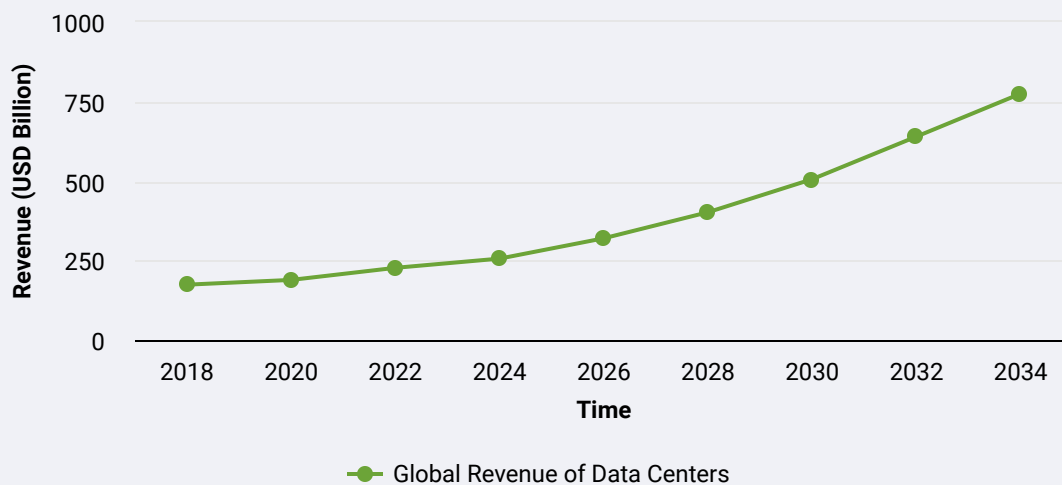


300,000 gallons

used a day by data centers to keep cool

Industry Overview

The data center industry is rapidly expanding, with global data usage increasing exponentially. These data centers play a critical role for organizations as they safely store massive amounts of information for business operations. Efficient cooling is critical to prevent overheating and ensure the continuous operation of servers. With the market for data centers **expected to grow over 10% annually**, implementing new technologies is crucial to keep these servers operating.



Current Trends

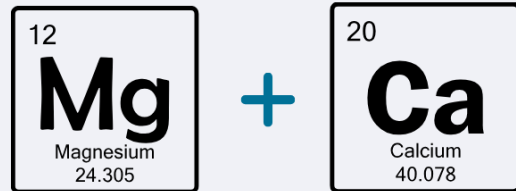
- Increasing demand for sustainable and energy-efficient solutions
- Growing adoption of advanced cooling technologies
- Rising demand for AI and machine learning
- Emphasis on reducing carbon footprint and operational costs
- Liquid cooling technologies are on the rise

Challenges in Cooling

Data centers consume vast amounts of water for cooling, and hard water presents a significant challenge. Hard water contains minerals like calcium and magnesium, which cause limescale buildup in cooling systems, reducing heat transfer efficiency and increasing energy consumption.

This not only elevates operational costs but also risks overheating and potential downtime. Proper water management is essential to prevent mineral impurities from accumulating, causing corrosion or scaling, resulting in failures and decreasing the efficiency of cooling systems.

The combined effects of scale and corrosion can shorten the lifespan of cooling equipment, leading to more frequent replacements and potential disruptions to data center operations.



+



=

replacements
obstruction
inefficiency
maintenance costs
corrosion
disruptions **buildup**

Impact of the Problem

Inefficient cooling can result in:

- Increased energy costs
- Reduced lifespan of equipment
- Higher risk of downtime and data loss
- Negative environmental impact

Consequences of Data Center Downtime

Downtime for a data center has severe consequences – from financial losses to inefficient productivity, these outages have an average cost of \$5,600 per minute^[1]. If this downtime becomes more frequent or is prolonged, businesses may become unsatisfied and lose trust. It impacts stakeholders both internally and externally as employees cannot operate efficiently while customers are unable to access their systems and end up losing opportunities. These downtimes can result in data loss or breaches, especially if the data was not backed up onto other servers.

Cooling failures are a significant cause of downtime, leading to overheating and equipment shutdowns. The consequences of these downtimes can vary depending on several factors, but mitigating these risks and having a plan is crucial to decreasing any impact it could have. Here's how data center downtimes have impacted different businesses:

- 1. Southwest Airlines:** Due to weather conditions, a data center in Dallas had downtime that resulted in 1,311 delayed flights.^[2]
- 2. Google:** Google's data center in London experienced a major outage due to a cooling system malfunction in 2022, disrupting services and systems reaching temperatures of 104F.^[3]
- 3. Microsoft Azure:** A cooling problem led to cloud outages and affected around 40 Azure services in San Antonio, which effected customers in the South Central U.S. cloud region.^[4]

[1] <https://www.netcov.com/average-cost-of-data-loss-data-center-outages/>

[2] <https://www.usatoday.com/story/travel/airline-news/2024/05/29/southwest-airlines-flights-delayed-power-outage/73900237007/>

[3] <https://www.datacenterdynamics.com/en/news/googles-london-data-center-outage-during-heatwave-caused-by-simultaneous-failure-of-multiple-redundant-cooling-systems/>

[4] <https://www.datacenterknowledge.com/outages/microsoft-blames-severe-weather-for-azure-cloud-outage>

Solution

Proper water management through a brine delivery system

Q: How can a brine delivery system improve the reliability of data center cooling systems?

A: It automates the approach to water conditioning and ensures consistent water softness.

Enter AUTOBrine.

AUTOBrine is a brine delivery system that automatically provides brine to water conditioning equipment that would normally require bags of salt manually loaded for the regeneration processes.



Below-ground systems also available.

\$ \$25M+ savings through reduced labor, salt, and risk costs

56M+ pounds of CO2 reduction

Solution

Benefits of AUTOBrine® for Data Centers

Implementing AUTOBrine systems in data centers provides several benefits:

- **Cost Savings:** Reduces labor and logistics costs associated with salt handling and minimizes maintenance expenses due to less frequent equipment failure.
- **Employee Safety:** Lowers the risk of workplace injuries related to lifting and handling heavy salt bags.
- **Operational Efficiency:** Ensures continuous and optimal performance of cooling systems, preventing costly downtimes.
- **Environmental Impact:** Supports green initiatives by reducing waste and carbon emissions.

A Deeper Explanation

1. **Reliability and Efficiency:** Efficient cooling systems are crucial for maintaining the performance of data centers. This brine system ensures consistent water softness, preventing scale buildup and corrosion in cooling systems. This consistency is vital for optimal heat transfer, leading to significant energy savings and enhanced reliability. Traditional systems often suffer from inefficiencies due to scale and corrosion, which can cause frequent maintenance issues and operational disruptions. The system's technology addresses these problems effectively, ensuring smooth and uninterrupted operations.

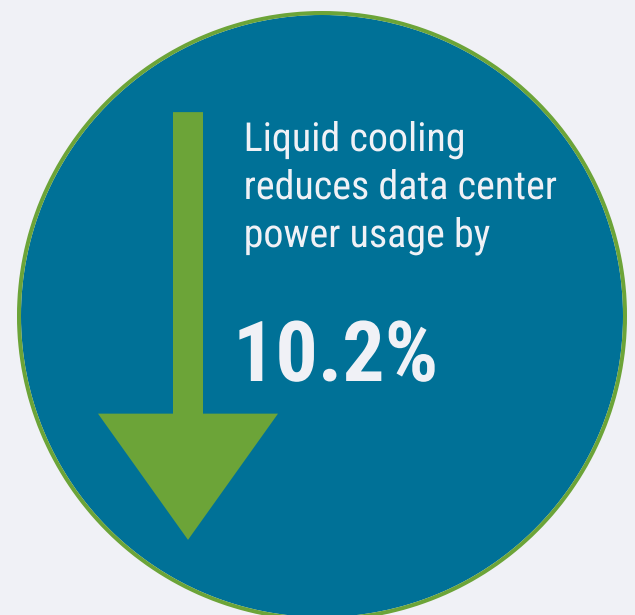
Solution

2. Automated Salt Delivery: This system eliminates the manual handling of salt bags, automatically mixing bulk dry salt with water in a storage tank. Traditional systems require manual handling of salt bags, which is labor-intensive and poses significant risks to workers due to the repetitive heavy lifting involved. It eliminates these issues by automating the entire process. Bulk dry salt is mixed with water in a storage tank, ensuring a continuous supply of fully saturated brine. This not only reduces labor costs but also minimizes the risk of workplace injuries, enhancing overall operational efficiency.

3. Sustainability: In today's world, sustainability is a key consideration for all industries, especially data centers. This solution contributes to sustainability efforts in multiple ways.

- The system reduces the need for plastic salt bags and shrink wrap, significantly cutting down on plastic waste.
- Fewer salt deliveries mean reduced fuel consumption, lowering the overall carbon footprint.

4. Space Savings: Data centers often face space constraints, with every square foot being valuable. Traditional systems that require large storage areas for salt can be inefficient. AUTOBrine® systems optimize space by eliminating the need for bulky salt storage. This space can then be repurposed for other critical infrastructure, enhancing the overall efficiency of the facility. Automating the brine mixing process allows data centers to utilize their space more effectively.



Case Studies

Data Center: A Pennsylvania data center tackled challenges in salt handling and storage for water softening, including security, employee safety, operational costs, and space efficiency. They resolved these by implementing the AUTOBrine® System, automating delivery and mixing of salt brine. Placed outside, it boosted security, reduced injuries, and saved over \$10,000 annually in costs. Repurposing space, it optimized operations and cut the carbon footprint by 11,000 pounds of CO2 annually. The system's automation ensured a steady brine supply, with remote monitoring enhancing maintenance efficiency.

Food & Beverage Industry: In the food and beverage industry, maintaining consistent water quality is crucial. A leading facility in this industry integrated AUTOBrine® systems into their operations. The system's seamless integration and reliable performance significantly reduced the labor involved in salt handling, leading to improved operational efficiency and cost savings.

Fortune 500 Pharmaceutical Company: A large pharmaceutical company faced significant challenges with space limitations and operational efficiency. By implementing AUTOBrine® systems, the company was able to provide brine to multiple water softeners across the plant. This not only solved the space limitations but also improved operational efficiency, leading to significant cost savings of over \$27,600 annually.

Public Water Well Stations: Operators of multiple public water well stations faced challenges with maintaining consistent brine supply due to budget constraints and infrequent site visits. Implementing AUTOBrine® systems allowed these operators to maintain a consistent brine supply, significantly reducing operational costs and improving efficiency. This ensured reliable water treatment processes and enhanced operational performance.

Conclusion

Addressing these challenges requires innovative solutions that mitigate the impact of hard water on cooling systems while improving overall efficiency and sustainability. Through this proposed solution, data centers meet their environmental goals while maintaining high operational standards.

For data center facility managers, integrating AUTOBrine® systems is a strategic move to enhance cooling efficiency, reduce operational costs, and support sustainability goals. By automating the brine delivery process, data centers can achieve reliable and efficient cooling, ensuring seamless operations and long-term savings.

\$775.73 billion

projected revenue for the global
data center market in 2034

+8.45%

projected CAGR
for 2024-2029