



Winning the war on corrosion in data center cooling systems

As digital infrastructure scales at record speed, data centers are facing growing challenges beyond processing power alone. The heat generated by high-performance computing makes reliable cooling systems indispensable, and increasingly vulnerable. Understanding how corrosion threatens these systems is the first step toward protecting critical operations and extending equipment life.

By Cortec Corporation

With the unprecedented rise in cloud-computing and AI, the need for data centers and supercomputers is booming. This astronomical output of artificial brain activity demands enormous amounts of power that quickly convert to heat as these mega-computers process billions of “thoughts” per second. The natural consequence is the proliferation of giant cooling towers alongside new data centers, with backup chillers kicking in for hot summer months and going idle during cold weather. Whatever the season, taking proactive steps to fight corrosion is critical to maintaining a healthy system long-term. Cortec® Corporation shares insights on why and how to win the battle.

The problem with corrosion in cooling water systems

Preventing corrosion in data center cooling water systems isn’t just for looks. Corrosion weakens the metal walls of piping and equipment, creating holes over time, shortening the service life of the cooling system, and increasing downtime for repairs—not to mention the potential for water damage from leaks. In addition, corrosion debris threatens to clog the

system or “poison” the water by raising the levels of iron or other metals in the chemistry profile. By avoiding these problems, corrosion prevention can ultimately save significant time, expense, and the headaches that go with them.

Beyond physical damage, corrosion can quietly undermine the efficiency of heat transfer throughout the system. Even thin layers of corrosion products on metal surfaces act as insulation, forcing chillers and cooling towers to work harder to maintain target temperatures. This leads to higher energy consumption, increased operating costs, and unnecessary strain on critical equipment.

In highly sensitive data center environments, even small fluctuations in cooling performance can have ripple effects across servers and network infrastructure. A single failure caused by corroded piping or heat exchangers can trigger emergency shutdowns, lost data, or service interruptions. Addressing corrosion proactively helps protect not only mechanical assets but also business continuity and customer trust.

Corrosion protection during operation

Although corrosion inhibitors are a standard part of water treatment programs for active chillers or cooling towers, they are sometimes overlooked due to a lack of communication or awareness. If facilities find that a corrosion inhibitor is missing, they can add M-640 L or a similar additive. This “building block” for water treatment formulations offers comprehensive protection thanks to the presence of both contact and Vapor phase Corrosion Inhibitors, which protect metals below and above the water level. It is also an excellent replacement for silicates,



phosphates, and nitrite-based compounds where disposal restrictions apply. Routine monitoring is essential to ensure inhibitors remain at the proper concentration. Changes in makeup water, system leaks, or blowdown rates can all dilute treatment levels, leaving metal surfaces exposed. Regular testing and adjustment help confirm that the level of protection is optimal. In addition, modern data centers often operate around the clock, placing constant stress on cooling equipment. Using a well-balanced corrosion inhibitor

program allows facilities to maintain performance while meeting environmental and regulatory requirements. Over time, this reduces emergency maintenance, stabilizes water chemistry, and supports long-term reliability.

Corrosion protection during seasonal layup

Whereas the use of a corrosion inhibitor during operation is the normal practice, preservation of chillers or cooling tower systems that sit idle during cool weather is less widespread than it

should be. With their normal water treatment program inactive, these components are also at higher risk of corrosion from residual moisture or condensation as temperatures and humidity fluctuate. Where temperatures stay above freezing, data centers may prefer to keep chillers on standby via wet layup with Cortec's VpCI®-649, a robust corrosion inhibitor package for wet or dry layup. If freezing is a concern, water treatment professionals can drain the water after applying VpCI®-649, or they can apply the Cooling Tower Frog® to an empty chiller. Both treatments include Vapor phase Corrosion Inhibitors that diffuse throughout the void space and form a protective molecular layer on metal surfaces as long as the system remains closed. When temperatures climb high enough to warrant a return to service, the cooling water systems can easily be restarted without having to remove the product first, all while avoiding complications from corrosion during layup.

Seasonal shutdowns often give the false impression that corrosion "pauses" when equipment is not in use. In reality, stagnant water, trapped air, and changing temperatures create ideal conditions for oxidation and pitting. Without a dedicated layup strategy, systems can suffer significant internal damage before they are ever restarted.

Proper layup protection ensures that equipment emerges from idle periods in the same condition it entered them. This reduces the need for costly



inspections, cleaning, and repairs at startup, while also helping avoid unexpected failures when cooling demand returns. In high-availability environments, this level of preparedness is critical.

Stay cool and fight corrosion

With cloud-computing and AI only promising to get bigger and place more and more cooling towers and chillers on the horizon, now is the time to equip data center managers and water treatment service providers with the tools and knowledge they need to minimize corrosion headaches and help data centers "keep their cool" when it comes to corrosion.

As infrastructure grows, so does the complexity of managing it. Making corrosion prevention a core part of system design, daily operation, and seasonal planning helps ensure that cooling assets can keep pace with technological demands. A proactive approach today safeguards performance, efficiency, and reliability for years to come. ■