O2 vs H20

By Chris Williams, President, Karis Technologies | 08.31.05

Trying to balance a business computing need within the constraints of a budget is not an easy task. There are two primary enclosure cooling options for today's server rooms: water cooled and air cooled cabinets. For a business to decide which of these two options best meets its needs, several key factors must be taken into account. Let's take a look at the pros and cons of each option.

Water cooled solutions

For their part, water cooled solutions are a very efficient means of mitigating heat loads in a fully loaded, high-density rack. There are manufacturers that claim to be able to handle up to 30kw per cabinet. Most companies addressing air cooled solutions claim to handle up to 8kw per rack, while a select few claim up to 15kw per rack. The main problems encountered by manufacturers of chilled water systems are cost and the introduction of water to data center environments.

Water solutions are specialized and require highly specialized components. Because they come in customized structures and do not make use of a business's current investment in computer cabinets, their cost increases accordingly.

Infrastructure requirements for water are also more extensive than air. This is not a plug-and-play solution – it is an engineered solution. Water solutions involve larger capex, construction costs, and opex. They must be designed, built, and monitored for leaks and failures. Because they are a hard-wired solution, portability is not an attribute. Locations must be predetermined, and moving the cabinets is not practical without considerable reworking of the infrastructure.

Further complicating the use of water cooling is the specialized service water cooled solutions require. Because of the risk involved in introducing water to a data center environment, it's necessary for service people to monitor and maintain the water cooled cabinets. In a mission-critical, lights-out facility, this can get expensive. Maintenance windows tend to be off-hour shifts, which generally increases the cost of maintenance. Servicing is done by vendor-trained technicians, so a service agreement is in order. This again adds to the cost of using a water solution. After years of designing data centers to keep technicians out, the water solution forces them not only back into the data center, but directly into the server cabinets.

One last point to remember when considering water cooled solutions is exit strategy cost. Obviously, the specific facility in question dictates what may or may not be required upon leaving, but a typical requirement is restoring the space to its original condition – this again adds cost to the water environment.

Air cooled solutions

Air solutions are more general. One of the main misconceptions with air cooled units is that they require a large amount of airflow from the data center – which is measured in Cubic Feet per Minute (CFM). The truth is they don't require any more air than the equipment being put inside the cabinet. This is a key point. Whether or not an air cooled cabinet is used, the air requirement to cool the electrical load is still the same. The purpose of air cooled solutions is to efficiently deliver that air to where it is needed most. In essence, they are air distribution systems. That being said, not all air solutions are the same.

The better air solutions are portable, meaning they can utilize your existing investment in computer cabinets. The products can be installed in minutes by anyone able to rack a computer. The ideal solution creates a useable air environment. By that I mean it delivers the correct temperature of air, to the right location, in the right quantity (CFM) at the right pressure. But this is easier said than done.

Many air solutions fail because they have to penetrate the raised floor, thereby compromising the static pressure underneath the floor. Others attempt to draw the air out the top of the cabinet. The ideal solution does not require floor penetrations. It must utilize the ambient air from the floor or from overhead without any modifications. It must be able to deliver the same amount of air as is needed by the equipment inside the cabinet in a positive pressure environment. In order to be effective, air solutions need to be correctly installed and operated. I have been in many data centers that use air cooled enclosures, yet only fill them up half way, eliminating some of the cost advantage versus a chilled water system.

Infrastructure requirements for air cooled units are typically low. Each cabinet draws about two amps and requires the same amount of air that the equipment inside it requires. Some unique air solutions offer multiple air sources to allow for tighter environmental control to implement in a full room. This allows for a lower density requirement for the entire room, yet allows for higher density on a cabinet-by-cabinet basis.

Serviceability is usually accomplished by replacing fans. No special service technicians or agreements are required. Air cooled enclosures typically address lower heat densities than water cooled enclosures, but are available at a much lower sticker price.

In the cabinet industry, manufacturers must take into consideration the saleability of the enclosure. As a rule, a water-based cabinet costs anywhere between $15,000 and $40,000. And, as mentioned above, there are further infrastructure costs after that. Most companies making air cooled cabinets sell them for approx $2,500 to $7,000.

Which is right for you?

So, the question remains, is water a better cooling solution? The short answer is yes. But will it fit into your budget? Are data center managers keen to introduce water into

their environments? No, but with heat loads steadily increasing, that view is beginning to change. Is air a viable alternative? Yes, but only if it’s done the right way.

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