



BENEFITS OF ASETEK LIQUID COOLING FOR DATA CENTERS

Asetek has leveraged its expertise as the world-leading provider of efficient liquid cooling systems to create its RackCDU and ISAC direct-to-chip liquid cooling solutions for data centers.

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ABOUT ASETEK

Asetek is the world leading provider of energy efficient liquid cooling systems for data centers, servers, workstations, gaming and high performance PCs. Its products are used for reducing power and green house emissions, lowering acoustic noise, and achieving maximum performance by leading OEMs and channel partners around the globe.

Asetek's products are based upon its patented all-in-one liquid cooling technology with more than 1.5 million liquid cooling units deployed in the field. Founded in 2000, Asetek is headquartered in Denmark with offices in San Jose, California, China and Taiwan. For more information, visit <http://www.asetek.com>.

INTRODUCTION

Data centers around the globe are being mandated to simultaneously increase energy efficiency, consolidate operations and reduce costs. Asetek has leveraged its expertise as the world-leading provider of liquid cooling systems to create solutions for data centers around the globe. Working in tandem with its RackCDU™ hot water liquid cooling system, Asetek's D2C™ (Direct-to-Chip) removes up to 80% of the heat from the data center while ISAC™ (In-Server Air Conditioning) removes 100%. This report takes a closer look at how Asetek's solutions address these mandates by providing energy savings, cost savings, density increases, and noise reduction.

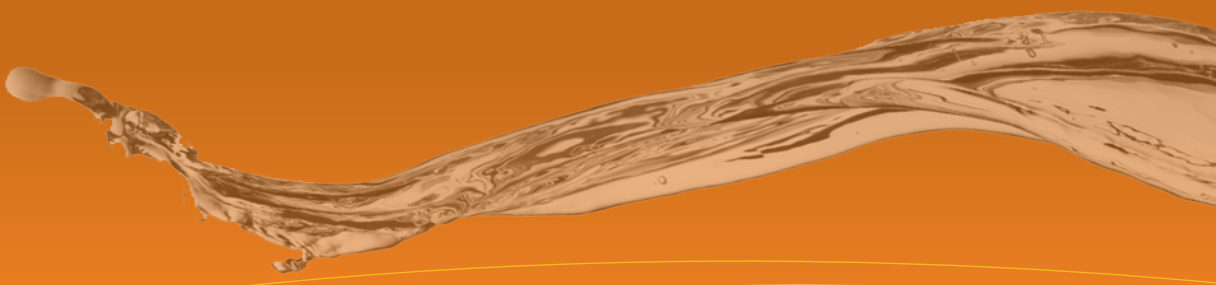
ENERGY SAVINGS

With the explosive growth of cloud computing, data center cooling is one of the world's fastest-growing energy problems. Global data center electricity consumption is equivalent to 100 times the average annual energy production of the Hoover Dam. In fact, up to 50 percent of the energy consumed by data centers is just for cooling. Federal and State incentives (and mandates) are driving increased data center energy efficiency and renewable energy deployment. In addition, the European Commission has announced an initiative to reduce EU greenhouse gas emissions by 40% by 2030.



Asetek RackCDU Installed on a 42U Rack Containing 38 Servers

LIQUID
COOLING
Done right!



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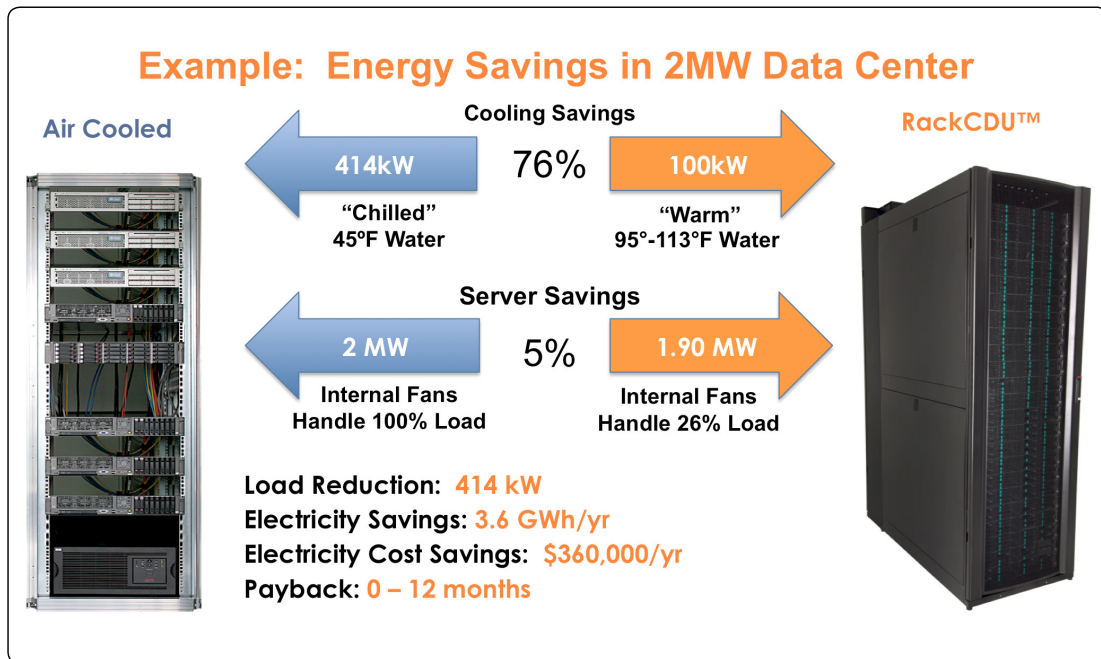
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Most data centers rely on air conditioners for cooling by blowing cold air through each server to remove the heat. This method of cooling is extremely inefficient and results in spending as much energy cooling a data center as running the actual hardware. Luckily, there is a better way. Asetek's data center cooling technology has the ability to reduce global data center energy consumption by up to 50 billion kilowatt-hours annually, equaling the output of almost six nuclear power plants, leading to a savings of more than \$10bn per year.

Data centers around the world generate more than 400trn BTUs of unused waste heat each year. Asetek's

data center liquid cooling technology removes heat from CPUs, GPUs, memory modules and other hot spots within servers and takes it all the way out of the data center using liquid. There it can be cooled for free using outside ambient air or recycled for building heat or hot-water. Asetek's solutions takes advantage of free outdoor ambient air cooling in almost any climate in the world and no power is used to actively chill the water. The water that comes out of the servers is surprisingly hot, at a temperature around 140 degrees Fahrenheit (60 degrees Celsius), enabling data centers to reuse this heat as an energy source for other applications such as central heating or hot water.





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COST SAVINGS

Asetek is changing the paradigm of liquid cooling for data centers by making it cost-effective for all data centers, not just the small handful of enormous supercomputers that use it today. No matter how good for the environment a given technology might be, the fact is that most data center are being asked to reduce costs. The cost of an Asetek data center liquid cooling system can typically be repaid within a period of less than 12 months through a combination of energy, equipment and maintenance savings.



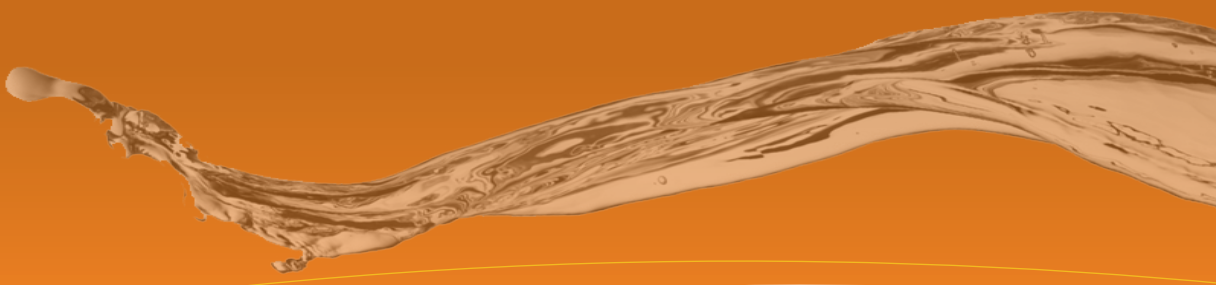
Asetek Direct-to-Chip Liquid Cooling

In addition, data centers benefit financially from the reliability and serviceability of Asetek's data center liquid cooling solutions. Designed to be deployed as simple drop-in replacements for stock heat sinks, the coolers can easily be installed into standard commercial servers as a retrofit during a server refresh cycle or on the manufacturing line at time of server assembly. Tubes exit through an unused PCIe slot and dual in-series pumps provide redundancy with hot swappable pump motors.

Because the cooling loops are pre-assembled and filled at the factory, the server liquid cooling loops can be safely installed by an IT staff person. No special skills are required. In fact, IT staff never has to handle liquid and no liquid ever comes in contact with the electronics.

The robust and highly reliable Asetek liquid cooled servers are physically separated from facility water, allowing Asetek to maintain the high quality of the coolant going inside the servers and through the micro-channel cold plates. The liquid pressure inside the servers is extremely low – improving reliability while maximizing overall cooling performance. In addition, Asetek's patented quick connects are double sealed at every position, providing an extra measure of protection.

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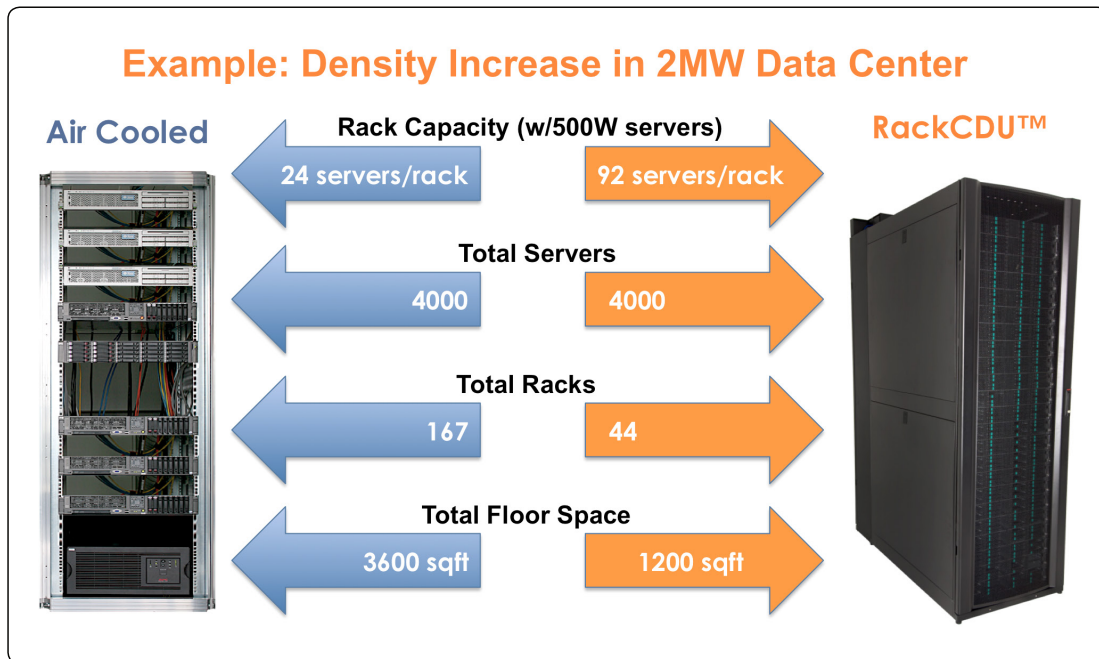
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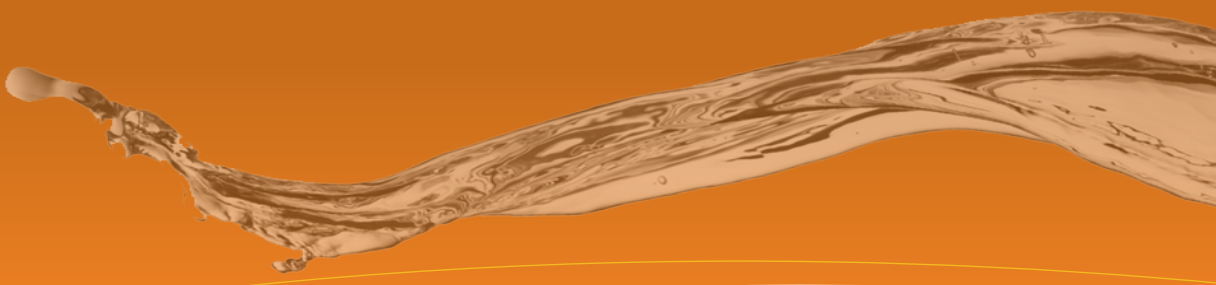
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DENSITY INCREASES

Increasing the density per rack, and for the data center as a whole, enables a data center operator to obtain the most compute power in as little space as possible. Asetek makes deploying high-density racks more practical at a data center scale while simultaneously reducing data center cooling energy consumption. Density is particularly important in HPC and supercomputing applications where large numbers of servers work simultaneously on the same problem. Maintaining short communication paths between servers is critical to the overall performance of these supercomputers.

Density increases can happen on the server or the data center level. With individual servers, Asetek enables the use of higher Thermal Design Power (TDP) CPUs and GPU. This ability to use higher TDP processors translates to higher performance. In addition, smaller form factors can be used without the heat barrier that would be present in a traditional air-cooled system when using high performance processors. Data centers are frequently being mandated and incentivized to consolidate their servers within their existing infrastructure. By increasing the server density within the cluster, floor-space and rack infrastructure requirements are also reduced.





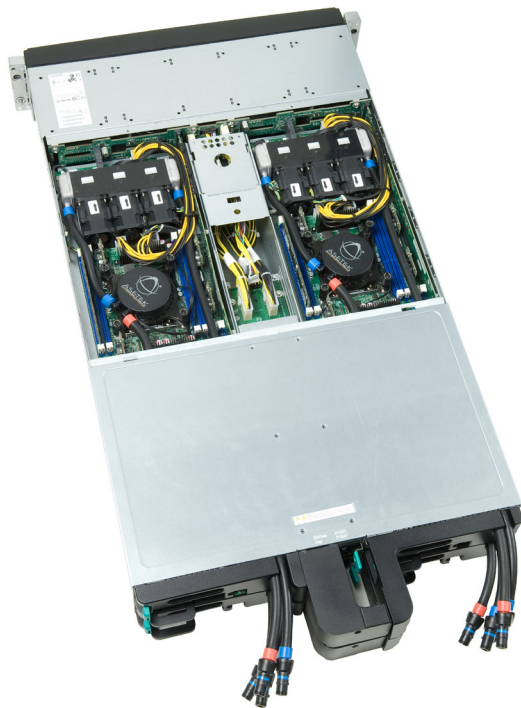
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NOISE REDUCTION

It has been well established in the workstation market that reduced noise leads to increased productivity. What many don't realize is that noise level should also be a concern for data center operators. As more and more servers are added to the data center, the number of fans to keep them cool also increases. Unfortunately, with fans comes noise.



Asetek ISAC
(In-Server Air Conditioning)

Work safety laws are in place around the world to protect workers from being in rooms with harmful noise levels. In the United States, OSHA requires that employees exposed to 85 decibels or

higher for more than eight hours must be provided hearing protection and that the employer must monitor the noise levels. In Europe, actions must be taken at just 80 decibels. In more practical terms, if workers need to raise their voice to be heard by someone standing next to them, it is a good sign that noise levels may be an issue.

With Asetek's data center liquid cooling solutions, data centers that were previously above noise thresholds can now operate within safe noise levels. The reason this is possible is because Asetek's efficient liquid cooling enables fans to spin much slower (leading to an 8-10% power savings in the process). Slower fans translate into lower noise, making data centers quieter, safer and more productive places to work.

LIQUID COOLING DONE RIGHT!

Asetek's data center liquid cooling solutions address the ever-increasing pressure that data centers are facing to modernize their cooling needs in a cost effective way. By enabling energy savings exceeding 50%, Asetek's solutions provide immediate and measurable benefits to large and small data centers alike. Visit Asetek.com or contact questions@asetek.com to learn more about Asetek's data center liquid cooling technology. ■