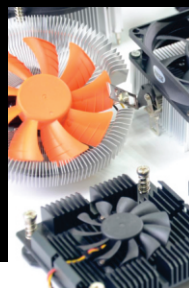
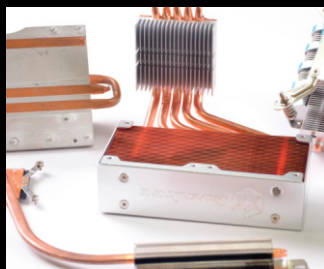


COOLTRON®



Heat Sink
Quality Thermal Solution

Origin of COOLTRON

New Heat Sink Business

Since the incept in 1999 in Walnut, California, USA, COOLTRON has been devoted to Research & Development and Manufacturing of Electronics Cooling products, such as DC/AC Fan, Blower, and accessories products for over 15 years, and has also won recognition and reputation among many world class customers by strict product quality controls and customer-oriented services.

To cope with today's Electronics device design trends going more demanding for new Electronics Cooling Solutions as fast cooling speed as fans and blowers, while much quieter, more flexible in size and application system integration, and more important, Worry Free in case of power or fan failures, COOLTRON began adding Heat Sink products to its new Thermal Product line in 2011. Thanks to COOLTRON's dedication to Technology Innovation and Quality Reliability, and years' over Millions US dollars investments on manufacturing facilities, COOLTRON's heat sink business has grown surprisingly and substantially during such a short time period – over 50% heat sink sales growth over these three recent years.

For COOLTRON's long-term commitments to providing Excellent but Affordable cooling solutions for the industry supply chain, COOLTRON has been investing significant amounts of resources in state-of-the-art thermal technologies research and development, employing most updated Extrusion, Forging, Stamping, CNC machines, and proficient technicians and assembly workers, holding strict Quality Control Policies and enforcements.

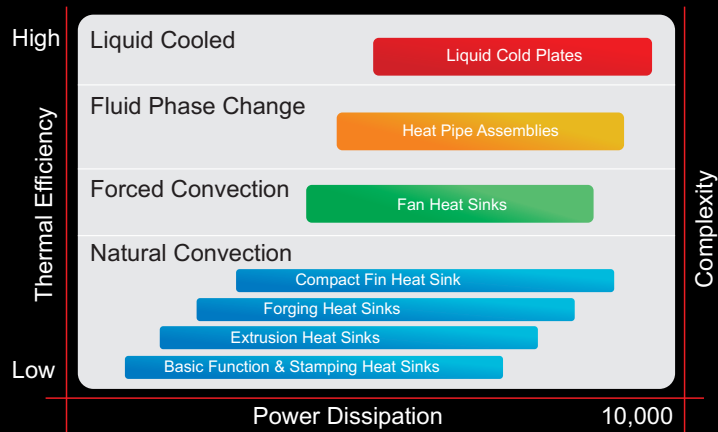
Besides the strict QC control enforcements and ISO9001:2008 Quality Management certification awarded, COOLTRON is also aware of its social responsibility to environmental sustainability and has been trying every effort to comply with all necessary Environmental Protection Requirements, such as RoHS and others from servicing World Class customers like MSI, Philip, Asus, and ECO (Germany).

Currently, COOLTRON has two hundreds employees dedicated to Heat Sink production, which include Senior Engineers, proficient Machines Operators, and skillful Assembly Workers.

- Location: Dongguan, Guangdong Province, China
- Factory Area: 65,000 square feet
- Employee: About 200 employees for Heat Sinks manufacturing



Thermal Solution



The graph above illustrates the relationship between the Power Dissipated in an application versus the Thermal Efficiency of a given solution. The X Axis indicates the total amount of power to be removed, while the Y Axis can be defined as the relationship of thermal resistance with respect to total power, unit volume, and heat flux density. This tool serves as the starting point for solving thermal problems by narrowing the field of available solutions. Suitable technologies for an application can be identified by plotting the expected Power Dissipation on the X Axis and considering the entire range of intersecting along the Y Axis. Dependent upon the power used and the dynamics of the system configuration, there may be more than one appropriate cooling mechanism to solve your thermal problem.

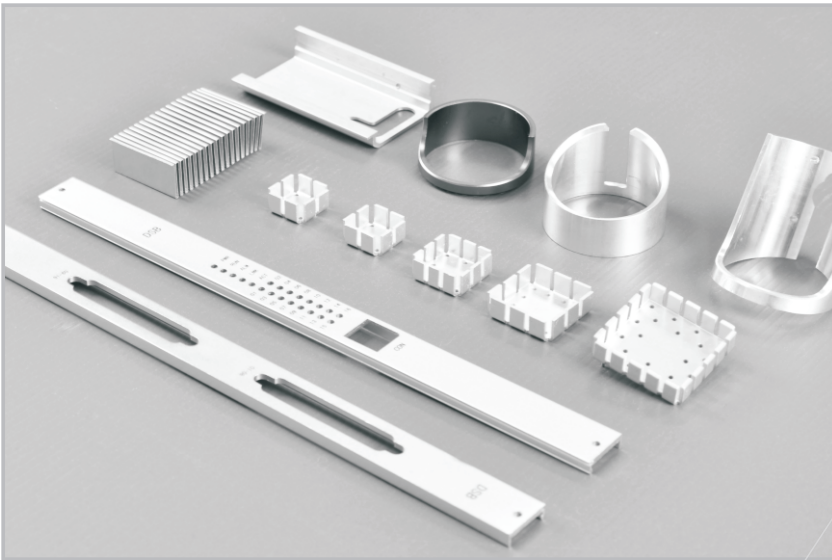
Four Primary Cooling Mechanisms

- Natural Convection applications do not rely on a specified local air velocity for heat dissipation. Typical natural convection heat sinks are passive in nature and manufactured from copper or aluminum sheet, extruded aluminum, machined or cast alloys, as well as fin assemblies.
- Forced Convection applications require forced air velocity generated through the incorporation of either a dedicated or system level fan(s) in order to increase thermal efficiency.
- Fluid Phase Change applications, also known as re-circulating, typically employ closed loop heat pipes which allow the rapid exchange of heat transfer through evaporation and condensation.
- Liquid Cooling applications comprise channeled cold plates along with a heat exchanger and pump system in order to circulate fluids past a heat source. It is a physical loop.

Natural Convection

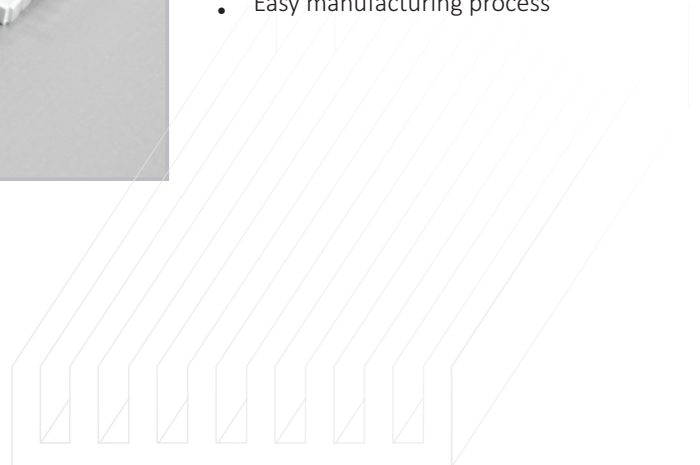
1. Basic Function & Stamping Heat Sinks

Basic Stamping Heat Sinks provide an economical solution to low power density thermal problems. They include BGA, simple Stamping heat sinks. Stamping is a high volume manufacturing techniques, and it can ensure the lowest cost.



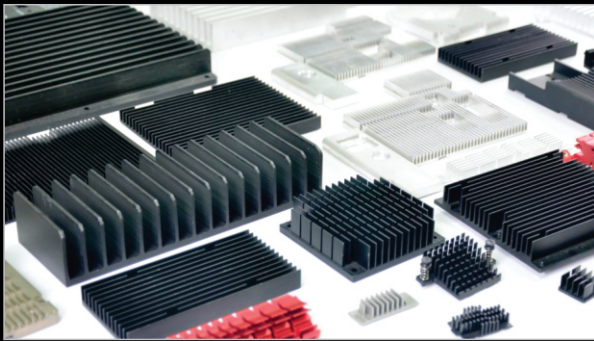
Why Basic Function & Stamping Heat Sinks?

- Lowest cost thermal solutions
- Ideal for Printed Circuit Boards
- Simple assembly processing and reduce cost
- Easy manufacturing process



2. Extrusion Heat Sinks

Extrusion Heat Sinks provide a greater range solution for higher power components and systems. Complex fin structures can be created through an extrusion die. These complex fin profiles allow greater heat dissipation through increased surface area.



Why Extrusion Heat Sinks?

- More efficient than stamping heat sinks
- Lower cost than fully machined assemblies
- Many standard shapes and sizes assure availability
- Easily customized for any application

3. Forging Heat Sinks

Forging Heat Sinks include cold and heat forging, which provide a greater range solution for higher power components and systems. This solution can increase 20% heat conduction performance, and plus the material is pure aluminum. The heat dissipation is very good. The forging technology can strengthen the Aluminum structure and tighten the aluminum molecules, and make the hardness stronger. Even using high ton pressure to make the aluminum forming, it is also easy to plate and processing.

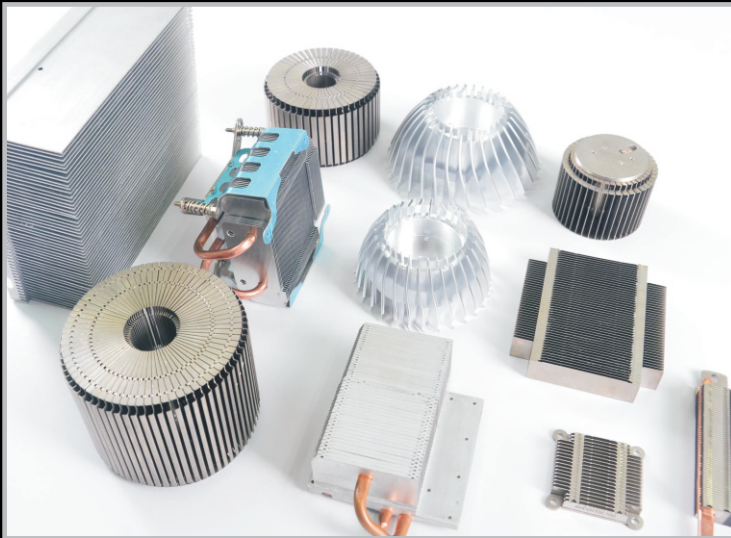


Why Forging Heat Sinks?

- Enhance the strength of aluminum structure
- Increase 20% heat conduction performance
- Suit for diverse custom design applications

4. Compact Fin Heat Sinks

Compact Fin Heat Sinks provide increased efficiency by creating greater volumetric surface area. These heat sinks can be assembled using a variety of fin types such as stamped, folded, or zipper, which are attached to a base using bonding, brazing, or soldering.



Why Compact Fin Heat Sinks?

- High power heat dispersion demand in space constrained areas
- Increase fin height, reduce thickness
- Lighter weight
- Good heat dissipation effect

Forced Convection

Fan Heat Sinks

Fan Heat Sinks provide significant component cooling benefits over system level fans. When the heat conduction velocity is enough and the cooling speed still cannot meet the requirements, it will need to add a fan to enhance cooling effect. By matching fan performance to a variety of extrusion or other fabricated fin bases, fan heat sinks can be designed to meet specific application requirements.



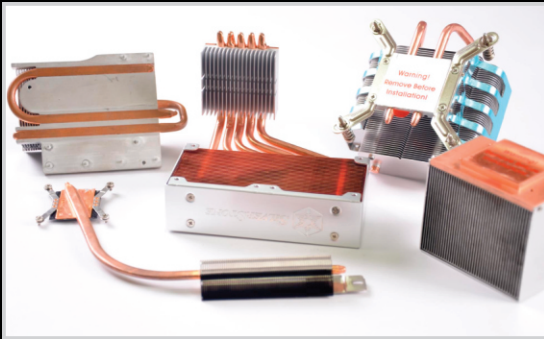
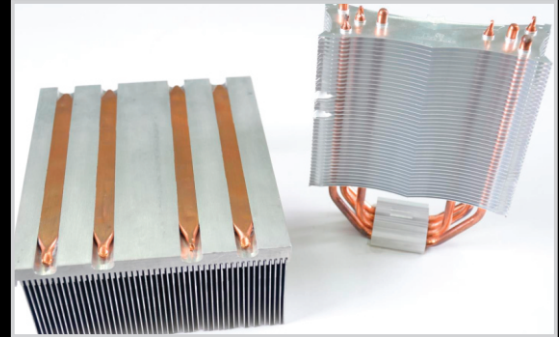
Why Fan Heat Sinks?

- Enhanced performance in less space
- Increased life and reliability of critical high power components
- System airflow or space is restricted

Fluid Phase Change

1. Heat Pipe

Heat Pipe Assemblies provide greater thermal efficiency by embedding heat pipes into an assembly to transport heat away from a concentrated source. Heat pipes passively facilitate this transfer by employing an evaporator and condenser in a closed loop mechanism, spreading heat evenly within a base to peripheral fins. A variety of basic heat sink technologies benefit from integrating heat pipes which improve conduction paths, reduce overall weight, and raise thermal performance without increasing volume.



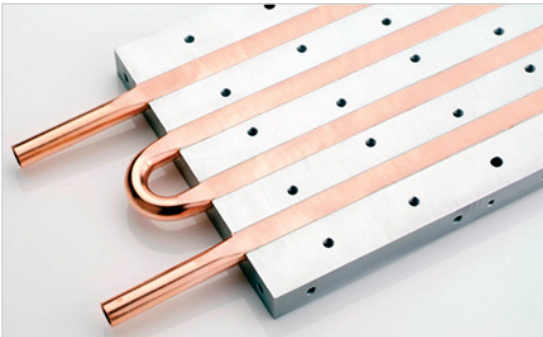
Why Heat Pipe Heat Sinks?

- Fast heat conduction, reduce heat transfer time
- Satisfy the demand of high heat dissipation products
- Reduce the size of heat sink
- No leaking problem

Liquid Cooling

Liquid Cold Plates

Liquid Cold Plate Heat Sinks provide the best heat dispersion per unit volume. Cold plates take advantage of the increased heat conduction properties of liquid by actively circulating fluids past a heat source through a closed loop system.



Why Liquid Cold Plates?

- Most compact and efficient cooling method available
- Quiet and reliable
- Compatible with water, glycol, or other cooling fluids
- Standard models and custom designs available



Equipment & Process

Stamping Workshop



The biggest tonnage of stamping equipments at COOLTRON factory is 350T.

The maximum size of products is 39" (L) X 19.5" (W).

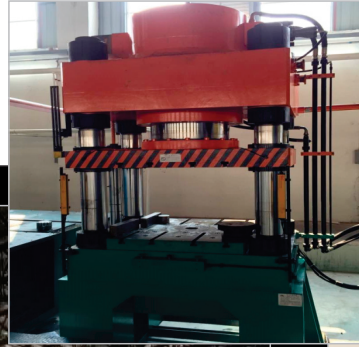
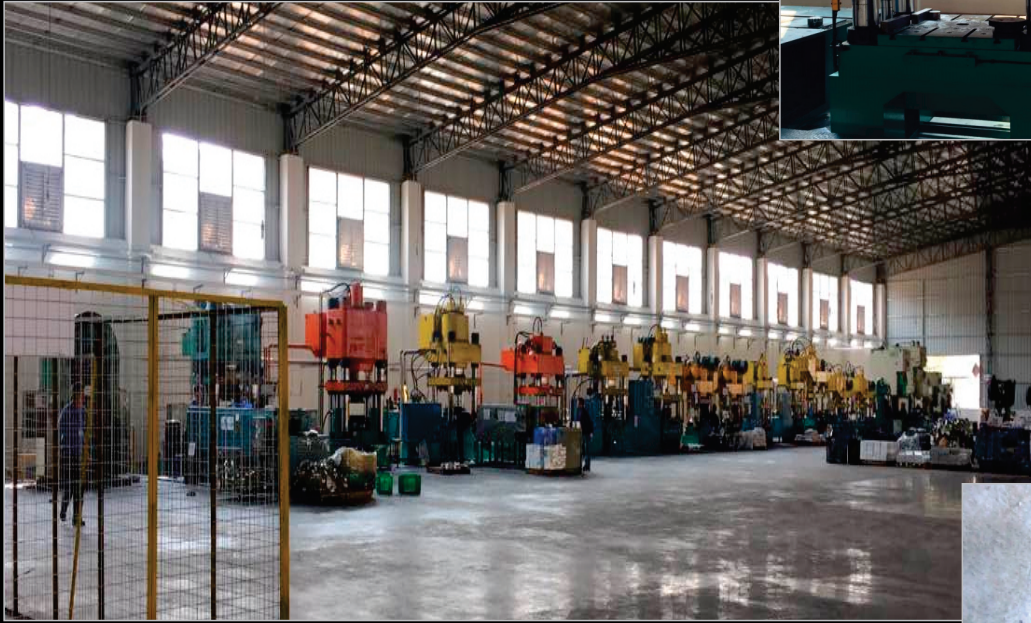
Extrusion Workshop

The tonnage of extrusion equipments at COOLTRON factory are 1,600T, 3,600T and 6,500T.

The maximum size of products is 21" (W) X 4" (H), which is around 30lbs/foot.



Forging Workshop



The biggest tonnage of forging equipments at COOLTRON factory is 3,500T.
The maximum size of products is 15.5" (L) X 11.5" (W) X 6" (H).



Skiving Workshop



The maximum size of skiving products is 7.5" (W) X 2" (H).

Post Processing Workshop

Milling / Bonding Fin / Packing



CNC workshop



Bonding



Packing Line



Milling

Drilling Machine and Tester



Drilling Machine



Thermal Resistance Tester

Application

LED Lighting

LED lighting fixtures are rapidly replacing legacy incandescent and fluorescent lighting systems as upfront cost have declined considerably.



LED lighting offers advantages over legacy systems in almost every respect including cleaner, whiter light; they are more efficient (more lumens per watt), which reduce ongoing operating cost and is better for the environment; and they last much longer, which reduces the time and cost associated with replacement.

Effective heat dissipation extends LED longevity and reduces the total cost of the LED lighting systems by minimizing the frequency of replacement and by allowing fixtures to operate at higher power levels, thereby reducing the number of diodes that must be used in the fixtures. COOLTRON offers a wide range of advanced air cooling technologies designed specifically for LED applications using custom extrusion heat sinks, cast heat sinks and heat pipe thermal modules. COOLTRON can custom design cooling solutions for your LED needs.

Residential / Consumer

In a relatively short time span, the global LED industry has become extremely competitive. With this increasing competition and the threat of commoditization, those within the LED industry need to bring new products and solutions to the market faster and more efficiently. COOLTRON is able to partner with these companies, offering innovation, streamlined product development and design for cost and manufacturability. The residential/consumer LED market includes home entertainment, indoor lighting, and gaming markets among many others.

Commercial / Industrial

Some have predicted a growth of 40% per year through 2016 within the commercial/industrial LED markets. COOLTRON thermal solutions are found in LED applications in the commercial/industrial LED market including aviation, automotive, advertising, architectural lighting, as well as transportation infrastructure and many more.

Power

Today's power industry includes applications related to power generation, conditioning, conversion and storage.



As well as uninterruptible power supplies (UPS), backup power generators, and static switches those are critical in several high-reliability settings such as hospitals and power plants. COOLTRON works within the power industry to provide the complex thermal solutions necessary in this ever growing and changing industry.

Smart Grids

Modernization of power grids to improve the efficiency and reliability of electricity services through local-level metering and monitoring has created a greater need for complex thermal management solutions. Inverters used for power conversion and adjustment in high voltage DC (HVDC) transmission systems, flexible AC Transmission systems (FACTS), and grid storage generate significant heat and require advanced thermal management solutions. COOLTRON's energy efficient liquid cooling solutions and advanced heat pipe technologies are just some of the solutions offered with the global smart grid market.

Renewable Energy

Power semiconductor modules in wind turbine controllers are used to "clean" generated electricity into "grid quality" power by converting it from AC to DC and back to AC again. Similarly, solar inverters are used in solar power installations to convert DC power generated by solar panels to AC power used throughout the grid. Both of these applications face significant heat challenges that require sophisticated thermal management solutions that are made more difficult as power densities increase. COOLTRON's solutions in this market range from high performance customized air cooled solutions utilizing various metal joining technologies as well as our advanced heat pipe technology. COOLTRON's energy efficient liquid cold plates are also highly effective in cooling applications within the renewable energy industry.

Consumer Electronics

The electronic products available to the consumer in this digital age are as varied as the semi-conductors that drive them.

It seems every generation in the product development cycle must produce designs that are twice as fast, half the size and half the cost of the previous generation. Innovation in this industry means giving consumers products they are clamoring for and products they have not even dreamed of. Thermal Management of today's products must meet the challenges presented by the growing processing power and shrinking size of electronic devices at a cost that will drive adoption in the market.



PC

Historically the personal computing space has been dominated by desktop and laptop systems. Innovative approaches to value engineering are necessary to keep these market segments relevant in the face of a market migration to tablets and smart phones. These smart devices are becoming more powerful with every generation and require new approaches to thermal management that include rethinking thermal components, materials and system integration.



Gaming

The gaming industry pushes micro processing to its limits but with two very different approaches to the market. When processor speed is paramount gamers turn to over-clocking personal computers. Top performing air or liquid cooled systems are given more space in large desktop enclosures. In contrast, dedicated gaming consoles have mass market appeal by providing maximum processor and graphic performance at the best value. Gaming system designers are cost conscious because the console is simply a platform to deliver the gaming and other content.



Home Entertainment

The processing power for today's home entertainment devices is increasing as the home entertainment experience becomes more connected to on-line content. Media management and delivery systems, set-top boxes and even televisions themselves require new thermal solutions. The home entertainment environment and the competitiveness of the market require thermal solutions that are both quiet and cost effective. The variety of form factors used in this space creates unique challenges in thermal design.

Transportation

Moving people and goods from point to point has never been easier than in today's technological age.

The trend for more efficient and greener methods has resulted in higher power density electronics and batteries that generate more heat and heat density. This has required reliable, novel, high performance, and design intensive advanced thermal solutions to cool insulated gate bipolar transistors (IGBT's), traction systems, power converters and invertors, chargers, and high performance Li-ion batteries. COOLTRON partners and collaborates with industry leading scientist and engineers to develop the enabling cooling technology for these systems to operate.



Electric & Hybrid Electric Vehicles

This relatively new segment in the transportation market has the potential to transform the way people travel from point A to point B. This market encompasses buses, passenger vehicles and charging stations. Compared to fuel injection vehicles these vehicles depend on high performance power electronics and high power density Li-Ion batteries to operate. The power electronics in a typical electric vehicle requiring cooling solutions are the battery charger and DC/DC invertors. High power density Li-Ion batteries require cooling as each individual cell generates tremendous heat thus requiring novel and complex thermal solutions given the small, enclosed spaces and high cost of failure. Charging stations have similar power electronics that must be cooled. As infrastructure is developed and deployed to support rapid charging stations the need for innovative thermal management will become more demanding. COOLTRON is uniquely positioned to support your thermal management needs in this market with energy efficient liquid cold plates that can cool the latest highest performing chargers, invertors and Li-Ion batteries. Our liquid cold plates are customized to meet specific power and size requirements.



Rail & Mass Transit

Electric, high-speed electric and diesel-electric locomotives are used all over the world as an efficient means of transporting goods and people. Technology has enabled locomotives and people movers to travel further, faster, lighter, greener and more efficient than ever before. An enabling technology of this revolution was the switch from GTO to IGBT based traction systems. There is an on-going trend for IGBT's to have higher power density thus creating more heat and heat density. COOLTRON's thermal solutions for IGBT traction systems utilize advanced cooling technologies that are high performing, reliable and cost effective. Some of these technologies include high performance air cooled solutions utilizing various metal joining technologies as well as our advanced heat pipe technology. COOLTRON's energy efficient liquid cold plates can cool the latest and highest performing IGBT's.



Mining

AC and DC electric drive mining trucks are used to move material in mines, construction and quarries. These electric drive systems offer lower operating cost, greater reliability and better performance compared to traditional mechanical drives. Mining trucks rely on the ability of an IGBT to switch power to drive the traction system. Technology has enabled mining trucks to haul more gross tonnage without sacrificing safety. COOLTRON's thermal solutions for IGBT traction systems utilize advanced cooling technologies that are high performing, reliable and cost effective. Some of these technologies include high performance customized air cooled solutions utilizing various metal joining technologies as well as our advanced heat pipe technology. COOLTRON's energy efficient liquid cold plates can cool the latest and highest performing IGBT's.

Telecom

Discrete platforms of actively participating in the rapid evolution of communications technologies connect Telecom, TV, and IP networks, converging into a single network.

The electronic equipment is the same network used to watch TV, text your peers, or even place an emergency 911 call. As our need for interconnectivity surges, the obligation to provide a dependable network is paramount.

The reliability of this electronic hardware is a direct function of its temperature, so a smart thermal design is vital to the life expectancy of the equipment. Enclosure and chassis designs are now driven by their thermal performance due to the increasing power densities. Plus, this network equipment must be deployed in a broad range of environmental conditions at the Central Office, Customer Premise, and Outdoor Base Station. COOLTRON is the largest provider of thermal design services and heat sink solutions in the Telecom and IP equipment industry. COOLTRON provides unique solutions in the following segments which have their own unique challenges:



Radio Access

Wireless base stations are evolving to keep up with the ever-increasing number of subscribers and data rates now driven by smart phone usage and multi-mode schemes. The advent of 4G LTE networks moved the RF power amplifiers and transceivers from indoor rack-mounted units cooled by forced convection, to pole-mounted enclosures termed Remote Radio Heads (RRH) dependent on natural convection to cool. In order to streamline pole-mounted equipment, RRH components have also been integrated into the antenna, which is known as an active antenna (AA), or Active Integrated Radio (AIR) antenna. Furthermore, the RF Power Amplifiers are getting hotter and smaller, so in order to dissipate heat efficiently in a traditional casting enclosure, COOLTRON focuses on solutions to overcome the lateral spreading limitations. These enclosures must remain weather proof and EMC compliant, so the end-solution is a "Thermal Enclosure" that can provide both functions effectively.



Fixed Access

Cooling solutions are also required for Ethernet and Ultra-broadband components to meet the increasing speed and bandwidth demands in both optical and copper access equipment. TV set top boxes have joined part of the converged network as 1080p and 4k resolutions are streamed live or recorded to DVR's simultaneously with multi-tuner units. Set top boxes have also shifted from natural convection to forced convection cooling using low-noise fans to prevent interruptions.



Core Networks

The central office and data center environment is much more benign than outdoor or premise. However, this is where the highest performance equipment is required which also has the greatest power and heat density. Every chassis must be designed to stay cool and operate even if the air conditioning system fails. Multiple heat-generating semiconductor components, such as CPU's, ASICs, and memory, all must be placed closely together for the best electrical performance, and yet, also be cooled within this close configuration. COOLTRON is able to provide a safe operating environment by utilizing the high thermal conductivity (50,000 W/mK) of heat pipes to dissipate these high heat fluxes.



Transport Networks

Optical and Microwave Backhaul equipment transmits signals over the longest distances with the greatest bandwidth, so continuous advances to leap from Gigabit to Terabit speeds can only be possible by incorporating the thermal design in early stages of product design. (say something about COOLTRON Design's Services) Microwave equipment faces the same thermal challenges as Radio Access equipment. Optical hardware requires a premium amount of space which leaves little room for the thermal hardware. Optical transceiver modules, such as CFP's, also require precision thermal solutions to overcome the high contact resistance stemming from hot-pluggable interfaces.

Computer

Enterprise Systems Demand Innovative, Design Intensive, Application Specific Thermal Solutions



The mission-critical role of Enterprise Computing in the 21st century is seen everywhere. Business, scientific, e-commerce, and social networking applications require enterprise servers and systems that are powerful, fast, and always reliable, with zero down-time. In all of these applications, data is retrieved, processed, and stored for split second retrieval. This requires reliable, innovative, high performance, and design intensive advanced thermal solutions to cool the microprocessors, graphics processors, chipsets, memory, and on board power that are the key building blocks of today's systems. The ongoing trends toward smaller and more powerful systems, which in turn generate more heat and heat density, have caused traditional cooling methods to be replaced with combinations of new advanced technologies which are green and energy efficient. These new technologies deliver optimal combinations of performance, capital cost, operating costs, and reliability. COOLTRON partners and collaborates with the industry's top scientists and engineers in each segment of this industry to help develop and market increasingly more powerful and reliable enterprise systems.



Enterprise & Secure Cloud Computing

Enterprise & Secure Cloud Computing systems are deployed, implemented, and utilized by large global corporations to drive all of their business activities. These corporations include banking, finance, technology, and data mining. The main purpose of these systems is to process, store, and manage large amounts of data. As a result, these systems are highly balanced with powerful and fast processing, mass storage, innovative software, and zero down time. These systems are typically scalable to support business growth and to provide increased data storage over time. COOLTRON's thermal solutions for this segment utilize advanced, high performance cooling technologies that are reliable and cost effective. Some of these technologies include high performance air cooled heat sinks, fan systems, and energy efficient liquid cooling solutions.



High Performance Computing

The High Performance Computing (HPC) segment includes systems from the Supercomputer Top 500 index. The demand for computer modeling to forecast weather, determine new cures for disease, and to perform complex mathematical computations for pursuits such as nuclear fission are just some examples of applications within the HPC segment. HPC systems have massively parallel processing capabilities which achieve incredible performance levels related to the number of threads per core of processing power. COOLTRON's thermal solutions are cost effective, fully integrated with server racks, and balanced with the facilities management of the data center where the system is housed. We develop arrays of customized liquid and air cooling solutions with a focus on reliability, cost, and energy consumption and provide innovative packaging for the extreme density of processing power in these applications.



Public Cloud Computing

This relatively new segment of the Enterprise Computing Systems market touches everyone with PC's, laptops, tablets and smart phones for numerous applications, most notably those related to social networking. The Public Cloud Computing segment specializes in storing and retrieving large amounts of data and information with zero down time. Enormous amounts of unprocessed digital data such as blogs, photos, video, etc. is being added to and stored in these public clouds daily. The user base served by companies in this segment is growing daily, and downtime or a loss of service is not an option for anyone. Enterprise computing equipment for this segment also includes secure cloud and high performance computing, but with an emphasis on redundancy and mass storage. The processing power of the cloud is always important; however most of this data simply needs to be moved quickly rather than being processed. Achieving a green footprint in these public cloud data centers is also critical to meet the expectations of the millions of end-users. COOLTRON's innovative thermal solutions in this segment are often customized to meet the overall cost and performance requirements in the ever growing numbers of public cloud installations.



Work Stations

High levels of computing power in a single or several workstation terminals is critical to run today's sophisticated analytical, engineering and graphics software applications. Since smaller numbers of users' access these workstations compared to much larger enterprise servers, the need for scalability is less critical. Maximum processing power and up-front cost is paramount in this competitive enterprise computing segment. Thermal performance and ambient noise reduction is also crucial to a successful solution as workstations typically sit in close proximity to the user, often in an office environment. There are many unique workstation systems in the market using advanced speed controlled fans and air cooled thermal solutions. COOLTRON is the thermal management partner of choice and an active design resource for the companies marketing these high-end, stand-alone computing products.

Others



Medical

The thermal needs of the medical industry are amongst the most varied and challenging. Medical systems continue to become both smaller and lighter for portability while others increase power demand and reliability requirements. Some of the key considerations within the medical industry are; the use of passive solutions for use in sealed units reducing contamination in clean areas, use of heat pipes for improved heat spreading and the use of liquid cooling loops (pumped systems) in higher power applications.

Military/Aerospace

Thermal applications within the military and aerospace markets are among the most challenging due to the extreme environmental conditions encountered. The balance of the size, weight and power requirements of electronic equipment in these fields pose even more challenges. Consideration of the thermal issues during the design phase is therefore paramount as custom solutions are usually required to meet the exacting demands of these market applications.

Test Equipment

Semiconductor and Integrated Circuits are found in every contemporary electrical device that sustains and bolsters the global economy. The semiconductor stands as the foundation behind every aspect of our lives within mobile phones, computing, gaming stations, memory devices, automotive hardware and beyond. The pass or fail of any single semiconductor or graduated integrated circuits efficiently occurs with the use of highly engineered test systems. These multiple-role systems not only provide basic diagnostic testing but also issue "burn-in" events to the target devices. As a result both the Testing Base Module and the associated test "heads" (where diagnostics are executed) require cooling solutions.

(Source: Parts above contents of applications are from online research.)



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