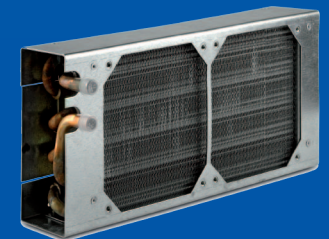
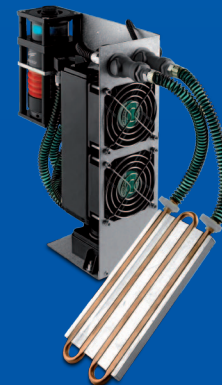
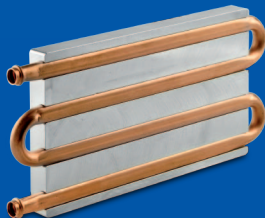




COOLTECH

The liquid cooling specialists

liquid cooled plates
liquid cooling systems
heat exchangers



Introduction

COOLTECH designs and manufactures liquid cooled COLD PLATES, liquid, thermoelectric and compressor-based cooling systems for industrial, electronic and medical industries.

COOLTECH, specialized in the engineering and production of cooling systems and cold plates and FIRA, a well known vacuum brazing company in the high end markets are industrial partners for the manufacturing of vacuum brazed aluminum cold plates and radiators.

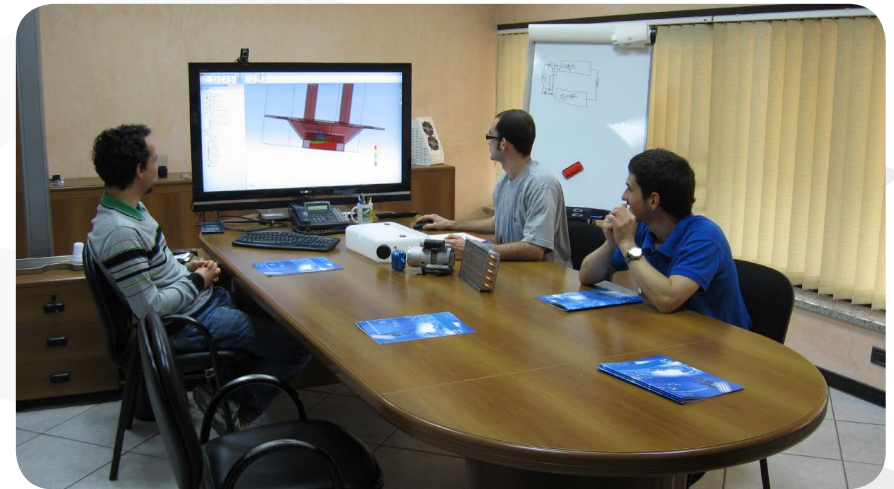
Engineering + Machining + Vacuum Brazing from specialized partners

COOLTECH performs

- engineering of components and systems
- 3D mechanical design
- CFD simulations and optimizations of components and systems
- Extendend testing capabilities
- Assembling of systems and components
- CNC milling throw INTEMA

FIRA performs

- vacuum brazing of aluminum cold plates
- manufacturing of aluminum vacuum brazed air to liquid heat exchangers.



We are active in the thermal management of

- High power IGBTs with our ACS and Cold plates product lines.
- High power LEDs with our ACS and Coldplates product lines.
- LASER systems with our ACS and CCS product lines.
- portable/small size medical equipments with our thermoelectric solutions.
- semiconductor industry with our Cold plates product line.
- Imaging systems with our ACS and Cold plates product lines.

Our capabilities

COOLTECH is focused in value added process as, for example :

CFD Analysis and 3D mechanical design

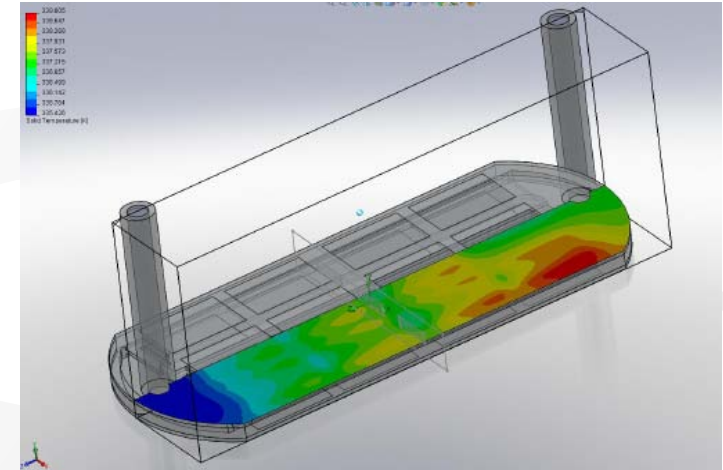
- We perform CFD simulations using Floworks from Dassault Systems and products are designed using Solidworks 3D CAD software

Helium leaktesting

- Detect leak rates as small as 1×10^{-6} mbar l / s
- 100% dry test
- 100% automated test, no risks of operator's negligence

Enviroinmental test chamber

- Temperature simulation from 180°C to -40°C
- Humidity control
- Data acquisition system.



Liquid Cooled Plates

VACUPLATE | Vacuum-brazed aluminium liquid cooled plates for high-powered applications

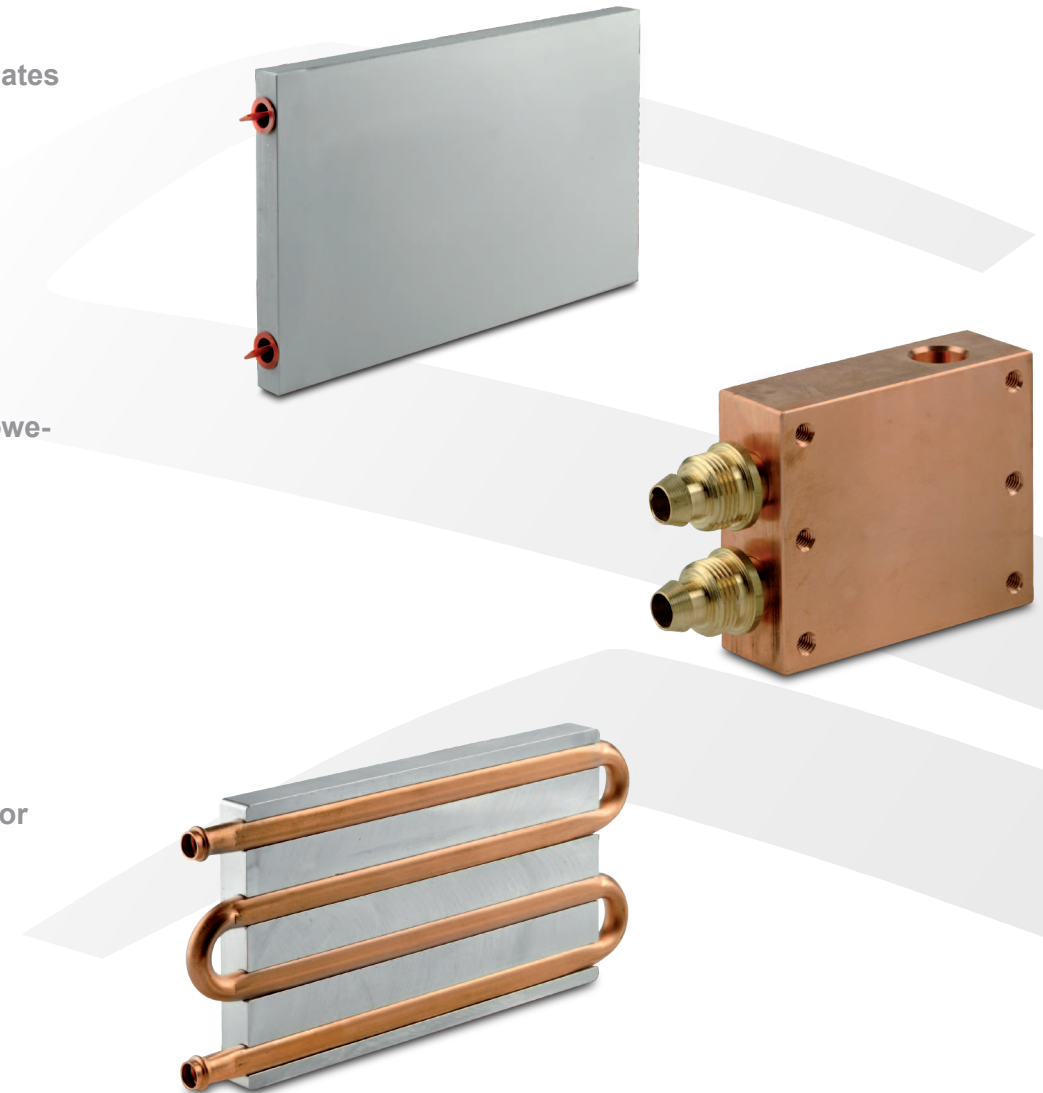
- Cooling of IGBT high-powered modules
- Power supplies
- Electric vehicles
- Traction
- UPS

COOLPLATE | Brazed liquid cooled plates for medium powered applications

- Cooling of thermoelectric modules
- Medical systems
- Optoelectronic systems
- Lithography machines
- Computers
- Transformers

COOLTUBE | Liquid cooled plates with pressured tubes for low and medium-powered applications

- Cooling of low-powered IGBTs
- Power Drivers
- Frequency converters
- Electronic amplifiers
- Feeders



Liquid cooling

ACS Series | Water cooling systems for over-ambient temperature applications

ACS liquid cooling systems are complete with recirculation and cooling of the liquid in a closed loop. Thanks to the all-in-one structure, ACS is a ready-to-use non-pressurized unit and can directly be connected to any compatible cold plate. The system is extremely easy to use and can be serviced on field without any tools. ACS systems can easily be customized for OEM customers.

- Machine tools
- Cooling of high-powered LEDs
- Printing machines
- Medical machines

ACS-COMPACT Series | Pressurized liquid cooling systems for OEM applications

ACS-COMPACT is a compact liquid system for cooling electronic components. Thanks to our EXV pressurized compensator and the construction of the pump, this unit can work in any position. Maintenance intervals are reduced thanks to the low permeability of the used materials.

ACS-COMPACT can be connected to various types of cold plates and can easily be customized for OEM customers. The possibility to helium test the sealed loop permits to carefully evaluate the necessary maintenance interval.

- Recirculation systems



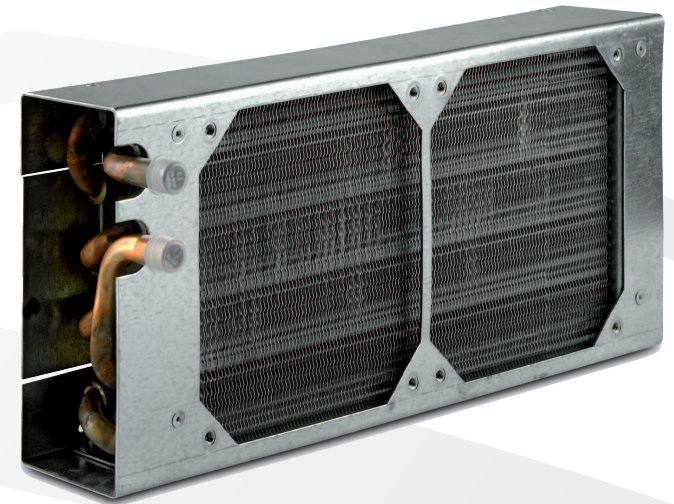
Heat Exchangers

TFR TUBE FIN RADIATOR | Liquid to air heat exchangers with expanded tubes

TFR consists of copper or stainless steel tubes expanded into aluminium or copper fins and they are designed for high liquid-air flow systems.

Thanks to their construction, these radiators are cost-effective and easily customizable. TFR are available in many configurations and they can be easily arranged for OEM applications.

TFR Tube Fins can be customised based on customer's needs.



Liquid cooling system for inkjet printers

Italy

Target :

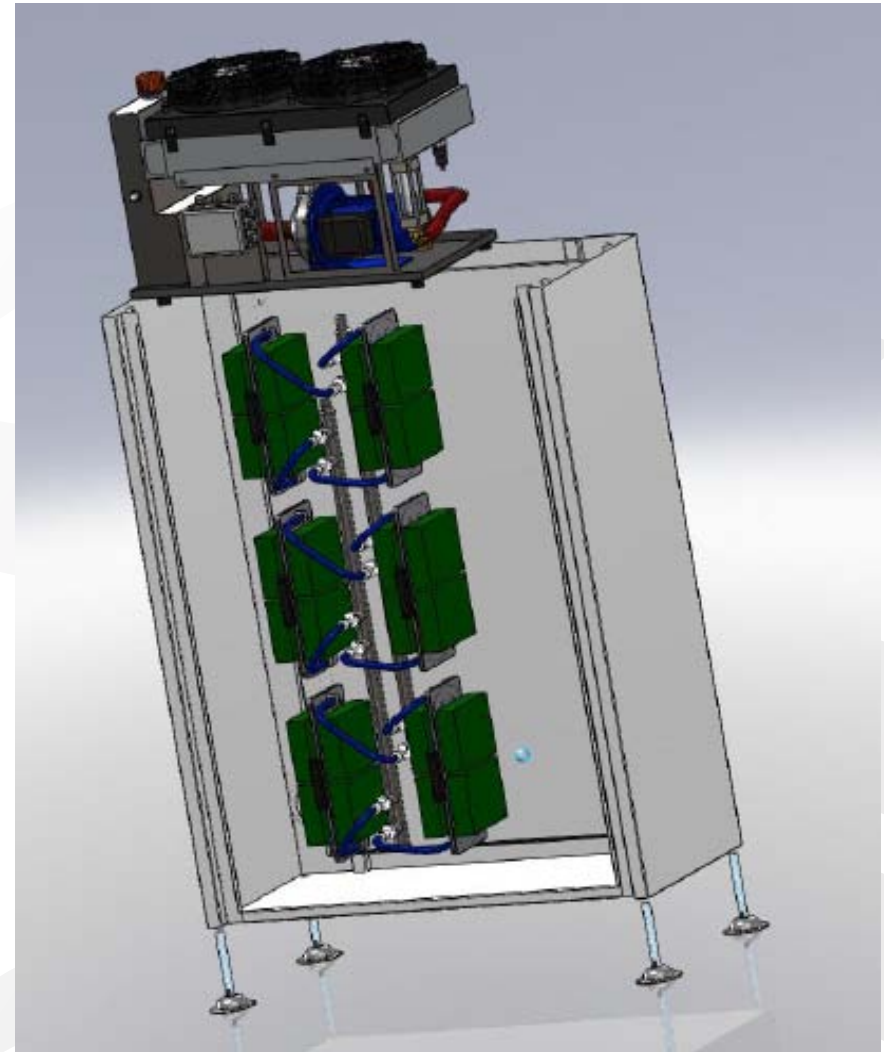
- Cooling of 132 x power amplifiers with a total thermal power of 8kW
- Maximum baseplate's temperature of 70°C
- Ambient temperature 50°C

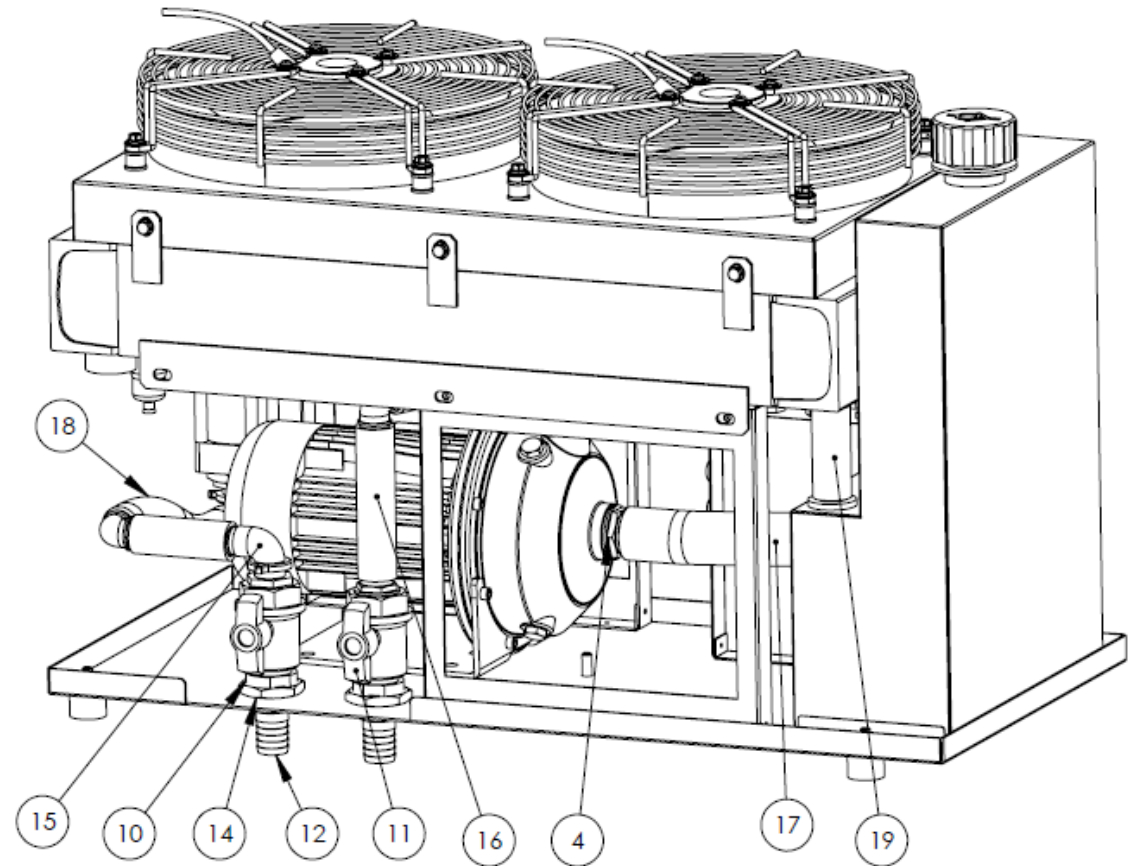
Challenge :

- Keep a low delta T between ambient cold plate's surface.
- Do not use a compressor-based chiller. (less reliable, expensive)
- Amplifiers are installed into a sealed box with poor convection
- 50.000 hours MTBF

Solution :

- ACS (ambient Cooling System) with high efficiency aluminum radiator and 6 x Vacuum brazed cold plates with low deltaP
- Centrifugal pump with high MTBF but low head (this option was made possible thanks to the very low pressure drop through the cold plates)
- Vacuum Brazed Cold Plates (VACUPLATEs) with internal turbo-lators
- All components were Helium leaktested in order to guarantee 100% leaktighness



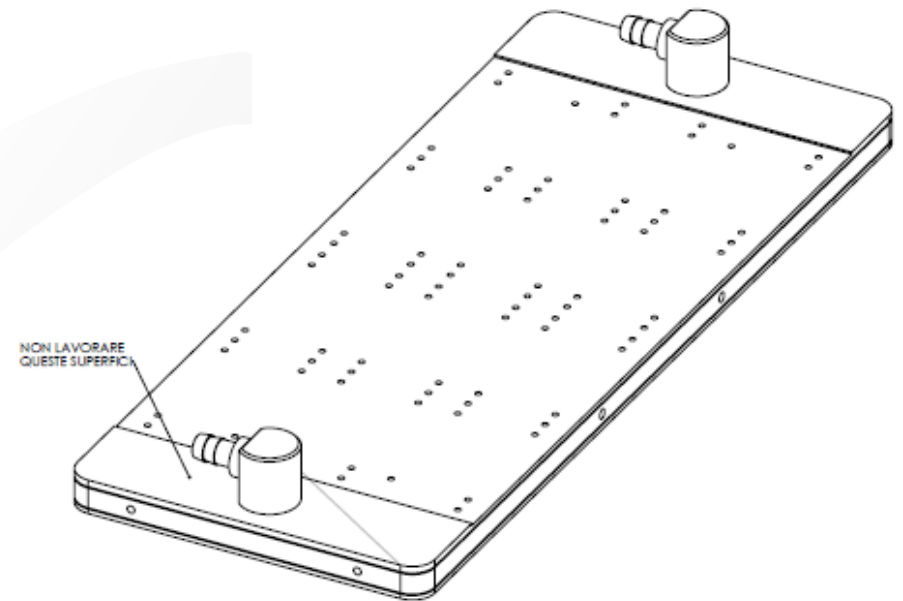


Design of the ambient cooling system : main components

- Centrifugal pump : 70lpm at 1,5 bar
- Aluminum radiator with fans : cools 8kW with $T_{water\ IN} = 62.5^{\circ}C$
- Valves, level switch, flow switch for remote monitoring of important values

Design of the COLD PLATE

- Flow rate throw each cold plate : 10lpm
- All aluminum construction with internal turbolators. Power amplifiers on both sides
- Cooling rate : 1300W, T_{water IN} = 60.5°C, T_{water OUT} = 62.5°C, Pressure drop = 0,24 bar
- Valves, level switch, flow switch for remote monitoring of important values

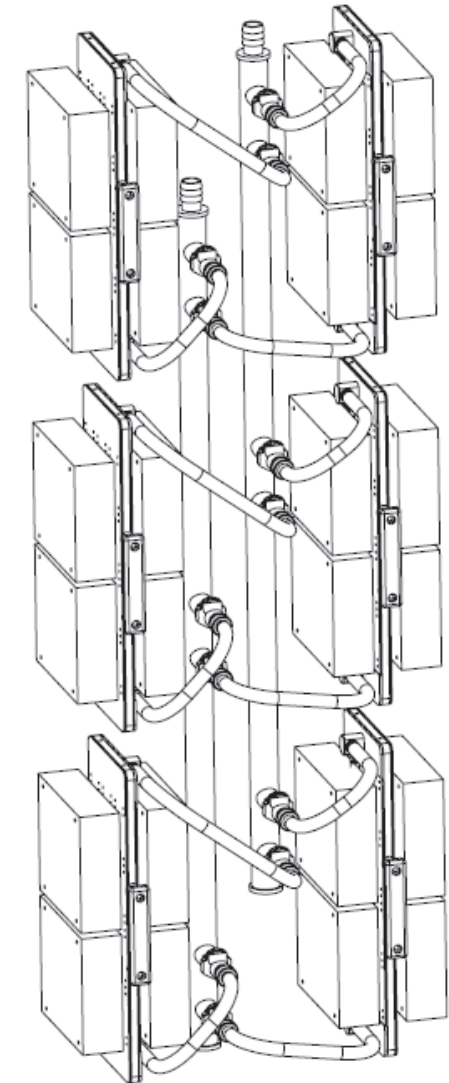


Design of the stack of amplifiers : 6 x Cold plates

- Total flow rate : 60 lpm theoretical
- 2 x Manifold to 3x cold plate's nominal diameter to guarantee balanced flow rate between plates
- Parallel configuration
- CPS quick disconnect coupling
- EPDM tubing for low permeability and material compatibility, 10bar max working pressure

Conclusion

- Ambient Cooling System with high efficiency aluminum radiator and Vacuum brazed Cold plates with internal turbolators met the needs for low delta T between ambient temperature and cold plate's surface temperature, allowing us not to use a more expensive, less reliable chiller.
- Thanks to the low pressure drop of the whole system, we were able to use a long lifetime centrifugal pump
- The system also met the customer's requirements for cost.



Thank you for your attention



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