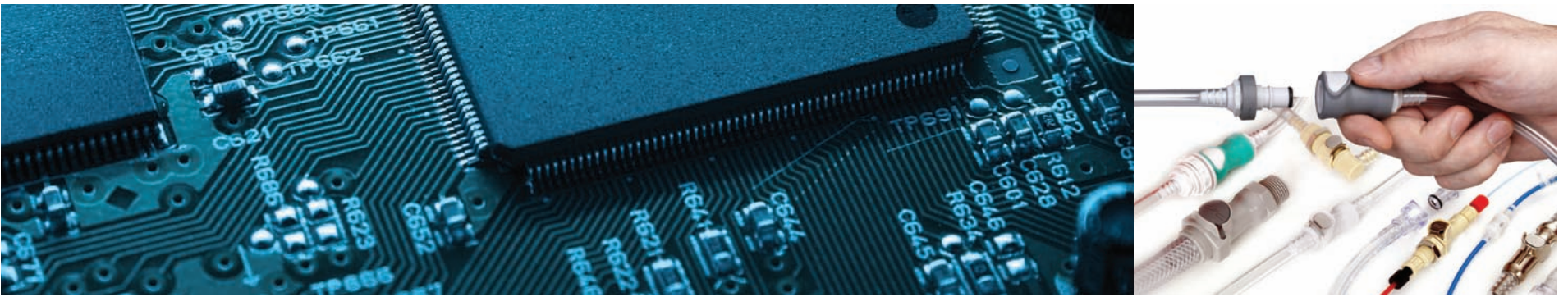


FEATURE ARTICLE



New Connectivity Options: LIQUID COOLED THERMAL MANAGEMENT SYSTEMS FOR ELECTRONIC EQUIPMENT

By Andy Hass, Industrial Business Unit Manager, Colder Products Company

The trend toward faster, more compact electronic equipment with increased power capacity is not going away. Neither is the need to find ways to cool it. Companies involved in the design and manufacture of high-value electronic equipment that generates heat, such as servers, medical imaging systems and super computers, know that effectively cooling these systems is critically important and that liquid cooling of these electronics offers huge benefits over air cooled systems. Connectors, material types and coolant composition are just some of the elements that must be considered when designing a liquid cooling system for electronic equipment.



LIQUID COOLING OVERVIEW

There are different ways to manage the cooling of electronics and finding the best solution for each type of equipment can be a challenge. Manufacturers of chip testers, lasers and oncology equipment have been using liquid cooling for many years. These types of equipment circulate liquid through a cold plate to remove heat, using a remote heat exchanger, in order to maintain desired system temperature. This same concept can be applied to cooling larger equipment such as super computers and MRI equipment.

Since even the smallest of spills can cause irreparable damage to electronics, and subsequently expensive equipment downtime, these systems need to be leak-free. Designing thermal management systems with hard-plumbed components can produce a leak-free cooling solution. However, when maintenance is required, there can be significant downtime. In addition, these systems are generally inflexible and don't allow for design changes or extensions, which may hamper engineers' efforts to quickly bring the next product version to market.

As an alternative, fluid line connectors such as

quick disconnect couplings, can be integrated to make maintenance friendly systems. Quick disconnect couplings used in liquid cooling systems also provide ultra-low spillage rates (the amount of liquid released upon disconnect), which can prevent costly equipment damage or downtime.

WHY USE A QUICK DISCONNECT COUPLING?

Quick disconnect couplings bring several advantages to liquid cooling system design. First, a coupling enables coolant lines to be easily disconnected for maintenance. For example, if a mechanical or electronic component needs to be repaired or replaced, fluid lines can be quickly disconnected, even under pressure. The system then can be serviced and the lines reconnected with minimal downtime and no loss of fluid. Quick disconnect couplings also increase system safety with low air inclusion (the amount of air allowed into the system upon connection). This eliminates the potential for a large air bubble to enter the system, which could cause inconsistent cooling and system failure. Couplings also increase ease of assembly and enable modular design.

Another benefit of using quick disconnect couplings to connect fluid lines in liquid cooling systems is that they can be mechanically keyed or color coded to help prevent accidental tubing misconnects. Highly visible color coding keeps connection confusion to a minimum and can add distinctive visual appeal to high-tech electronics and computer systems.

DESIGN CONSIDERATIONS

When designing couplings or connectors into a liquid cooling system, it is important to consider material type. Available in either metal or plastic, there are a variety of connectors suitable for liquid cooling applications. Each material has unique benefits, so it is important to review the







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system in its entirety to determine which will work best in the final design.

Metal connectors are often chosen over plastic due to their durability.

However, there are other considerations when incorporating a metal connector into a liquid cooled system, such as the potential for galvanic corrosion. If the final design incorporates other components of a different metal, corrosion could jeopardize the integrity of the cooling fluid.

It is important to review basic chemical compatibility of all the components of the system to ensure that no chemical attack will occur. Plastic connectors are lighter than metal couplings but offer a level of strength and durability appropriate for most low-pressure liquid cooling systems.

Some manufacturers combine metal and plastic in their connection solutions: plastic, high-flow valves incorporated into a metal housing result in a high-flow, cost-effective and durable coupling. These types of non-spill couplings can be an especially effective solution in critical applications such as liquid cooling of super computers and other equipment where actual (or perceived) durability and superior performance are required.

For the equipment owner, quick disconnect couplings make maintenance of liquid cooled equipment much more cost effective since they add flexibility and leak-free operation to the system. Reduced service calls and service call duration can have a significant impact on total ownership cost. Couplings also make the equipment easier for operators to use through ergonomic, leak-free and flexible connections that are visually easy to identify.

FUTURE MIGRATION TO SMALLER EQUIPMENT

Next-generation equipment for medical device, consumer electronics, fuel cell and printing applications will require more advanced and consumer friendly liquid cooling systems. Electronic equipment is getting smaller and smaller, yet generating more and more heat. As a result, the opportunities for using liquid cooled components are rising, along with the need to engineer thermal management systems that are flexible, safe and leak free.

Designing effective cooling systems for high-value electronics will pay dividends in better performance and reduced downtime, repair and replacement

costs for owners. For the electronics equipment manufacturers, these factors may provide a compelling competitive advantage.

Andy Hass has contributed to the success of Colder for more than 13 years in a variety of capacities, included new and custom product development and business development. Andy holds a Bachelor of Science degree in mechanical engineering from the University of Minnesota Institute of Technology and an MBA from the University of St. Thomas.

Contact Colder Products at www.colder.com.

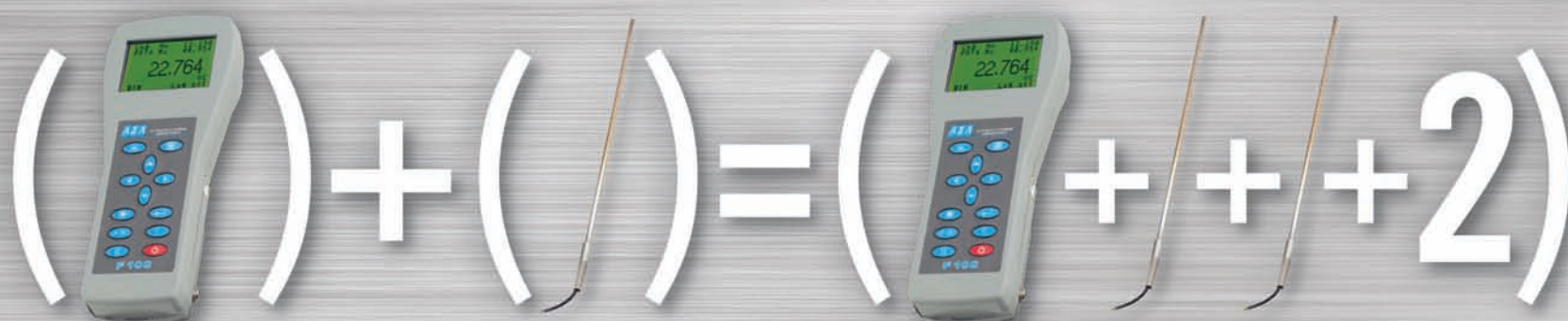
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