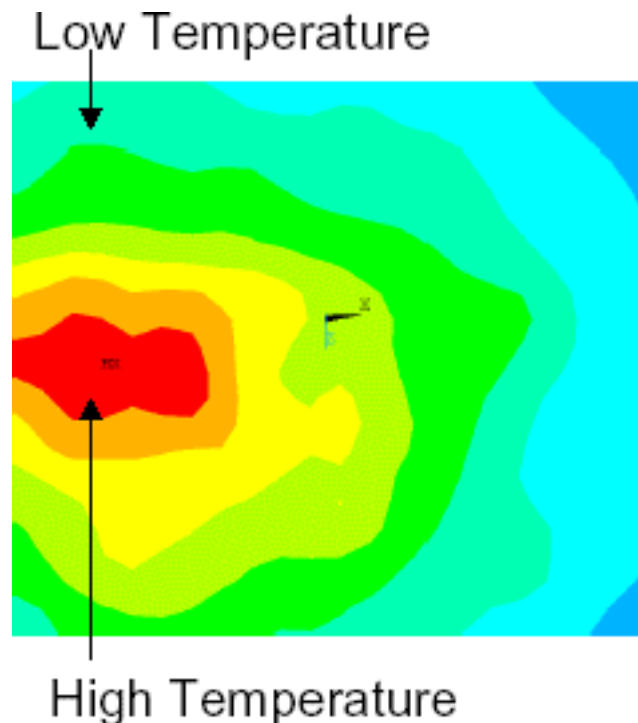


Heat Capacity:

One of the most important characteristics of a good heat transfer medium is a high heat capacity, or “specific heat”.

What exactly is the heat capacity of a material, and how does it affect cooling of a circuit board or in a data center? Heat capacity is an intrinsic characteristic of a material, and refers to the amount of heat, measured in joules or calories, that must be input into a material in order to raise its temperature by a certain amount. Different materials hold different amounts of heat (again, measured in joules or calories), even when they’re at the same temperature. Think of heat capacity as the “thermal mass” of a material, if you will.

A heat capacity means that a relatively small mass of fluid carries a large amount of energy away, per unit temperature drop. A fluid with a lower heat capacity would need a greater temperature drop or greater flow rate with more heat exchanger surface to transfer the same amount of heat away.



A good analogy is to think of standing in 65-degree air – it’s pretty comfortable. But if you jump into a swimming pool at the same 65 degrees, the water feels really cold. That’s because air has a low heat capacity and doesn’t hold much heat. It doesn’t draw heat from you or transfer heat to you very well either. The temperature of air rises a few degrees with only a few joules of energy input, so it’s not a very good heat transfer medium. Water, however, has a high heat capacity, and can absorb a lot of energy before its temperature rises. When you jump into the 65-degree pool, it feels much colder than the air did because the water pulls the heat away from your body more efficiently. And so, it is with heat transfer media; a high heat capacity makes for more efficient heat transfer, all other things being equal. When using a heat transfer medium that has a low heat capacity, a lot more of the medium has to be used to pull the same amount of energy out of the circuitry.