Heat and The Driver's Internal Engine: Part 3

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In our three-part series *Heat and the Driver's Internal Engine*, our first segment focused on how the hot environment in a racecar affects the driver's physical well-being and their abilities on the track. Segment 2 looked at how the body reacts to and handles this excessive heat. Here in our final segment, we look at the more popular cooling methods, what works well, what doesn't work so well and what is best.

As stated previously, it has been estimated that temperatures inside a racecar's cockpit can soar to a sweltering 140 to 160 degrees. It is not uncommon for drivers to endure blisters and burns due to the excessive heat flooding into the cockpit. But besides the obvious affects on the outside of your body, it's what's happening internally that can cause extreme illness and even death.

Alternative cooling methods must come into play if you as the driver are to remain safe from heat exhaustion and all of its adverse effects. Keeping you cool and controlling your core temperature is as much an important protection as are your *roll cages, 5-point harnesses, fire suits and nomex underwear*. All of your safety devices only protect you IF YOU CRASH. Driver cooling systems can keep you more mentally alert, less fatigued and actually prevent that crash.

Let's look at a few of the cooling methods that have been tried over the years and how they really work:

Air blower systems to the helmet: **the majority of these systems blow uncooled air to the driver's helmet. They provide somewhat fresh air though, unless expensively filtered, this air could still contain carbon monoxide, dirt, dust, etc. These systems give the driver some "feels good" relief because of the airflow but they are truly ineffective in affecting the body's core temperature. In fact, they could actually prove to be detrimental to the driver under certain conditions. When the air temp is above 95 degrees, as it would be in most racecars on even mild temperature days, this hot air can actually have the same effect as a convection oven – causing the driver to become even hotter than he would be without it. All in all, ineffective cooling that does not help cool the blood that is rushing to the skin's surface for cooling. And cooling this blood is what will directly affect the core temperature and help prevent heat exhaustion and stroke.**

Cool air systems blowing cool air to the helmet: **Pretty much the same as the above except the temperature of the air is cooler, so the convection effect does not come into play. However, it feels better to the driver since it is somewhat cooler so they have the perception that it is helping. It is not. Again, it is still not cooling the blood at the skin's surface nor is it affecting the core temperature in any way. Add to that the fact that these systems generally cost several thousand dollars and pull significant amperage from the car's ignition system, and overall these are not an effective way to prevent heat exhaustion and keep you, the driver, safe.**

A 3" or 4" air hose forcing outside air with or without a blower to your face or chest: **Yes, there are some drivers still using these types of systems. They act basically the same as the simple air blower systems mentioned above and have no significant effect on the drivers core temp nor do they lower the risk of heat exhaustion or stroke.**

Ice packs on your chest or on the back of your neck: **These are an interesting concept as they do actually feel really good to the driver initially. The downside is that they cool in one spot only and as such once again do not affect the core temperature. I know that this sounds like a broken record, but if constant "active" cooling does not cover at least 30-40% of the skin's surface (preferably from the neck to abdomen) it will not help maintain or reduce the core temp. It is a waste of time and effort, period. In fact, using ice packs on the back/base of the neck can actually be detrimental to the driver as this is where the hypothalamus gland is located (see segment 2 concerning the hypothalamus gland and it role in regulation of the body temperature). Placing ice packs near that gland can actually fool the hypothalamus into thinking that the body is getting too cold and cause it to pull blood back from the skin's surface to keep warm, cause shivering in an attempt to keep the body warm and generally take actions that are the exact opposite of what the intent was with the ice packs in the first place – not good.**

Passive cooling systems that are 65 degrees: **"Passive" cooling systems are similar to the ice pack method discussed above, but these systems utilize garments that have several gel packs, ice packs or areas of phase change material that spread the cooling out more evenly via a vest or similar garment. They are mildly effective in maintaining core temp, but for shorter periods of time (45 mins to 1.5 hours). Their cooling properties begin to decrease the moment you put them on as your body temperature begins to melt or warm their cooling areas. As well, these devices can only offer initial cooling down to about 60-65 degrees F. Per NASA studies done for astronaut cooling in the 1960's, the optimum cooling temperature to maintain a safe core temperature and prevent heat exhaustion is 45-55 degrees F. These are the two major differences between "passive" cooling and "active" cooling, where the cooling temperature remains a consistent 45-55 degrees as the system runs.**

Cool Suits: **Bottom-line: the most effective driver cooling available. As briefly mentioned above, NASA conducted extensive studies on astronauts and their struggle with heat in their space suits. Totally encapsulating the body in the space suit, body heat could not dissipate or evaporate via sweating or conduction (see segment two of this series), so NASA knew that alternative cooling was necessary to maintain their safety. After much time, effort and expense, their studies concluded overwhelmingly that the best method for maintaining the astronaut's core temperatures at safe levels over long periods of time was through active, constant cooling. They determined the best way to accomplish this was to cover 30-40% of the body with cool water between 45-55 degrees F – not too cold and not too warm. As the astronaut heated up, his blood ran to the skin's surface for cooling, drawing it away from the major organs (heart, brain, lungs, etc). This can cause brain fade, increased heart and breathing rate, etc. So they developed cool suits that provided that optimum temperature for cooling from the neck to the waistline to cool that blood effectively.**

It was on that concept that COOL SHIRT® Driver Cooling Systems were designed. **Why reinvent the wheel? NASA spent the money and time, we all reap the benefits! Worn against the skin under the driver's firesuit, the COOL SHIRT®**

has more than 45 feet of medical-grade capillary tubing stitched to it. This tubing provides a constant flow of 45-55 degree water supplied to it from a purpose-built cooling unit mounted in the race car. It is a 12V pumping system that draws 2.7A of power thus does not affect the performance of the car, only the performance of the driver. Ice and water are placed in the cooler, an internal pump with a specially restricted flow consistently maintains the water going to the shirt within the optimum temperature range for the life of the ice – normally between 2.5 hours to 6 hours depending on the size of the cooler chosen.

COOL SHIRT® Systems have been independently tested and proven to provide:

- ***Better reaction times***
- ***Faster decision making***
- ***Less mistakes***
- ***Reduced sweating***
- ***Reduced dehydration***
- ***Reduced heart rate***
- ***Help in maintaining a safe core body temperature***

COOL SHIRT® Systems work and they work very well. Ask any driver who uses one if he would race without one now. And don't take our word for it, see what your fellow SCCA racers are saying about COOL SHIRT®:

"I have installed and test-driven your Cool Shirt® through 4 days of 100+ temperatures at California Speedway. This has been the BEST investment I have made in my racing!" - ***Dan Miller – Race Car Driver***

"The Cool Shirt® doesn't make you faster for just a single lap; it makes you faster at the end of the race when it counts. Football players talk about winning the game in the fourth quarter. When I get to my "fourth quarter", I'm able to make good decisions and maintain my pace because of the Cool Shirt® System." - ***Butch Kummer – 2-Time SCCA SPO National Champion*** - ***Butch Kummer – 2-Time SCCA SPO Champion***

"I installed my Cool Shirt® System this weekend at VIR and was amazed – not only in making me feel more comfortable, but I definitely experienced the fatigue-reducing benefits as well. Thanks!" - ***M. Haupt – GT1 Driver***

We hope that the information provided in this series of articles helped you gain a better understanding of the importance of driver cooling and what works best to help you stay safe, healthy and win races. Why not take a COOL SHIRT® System for a test drive? For more information on COOL SHIRT® products, visit us on-line at www.coolshirt.net or give us a call at 800-345-3176. Let us show you how we make racing safer.