Tech Talk Article 25
"Chilling Out: How to Keep Cool Through a Long, Hot Summer"
by David Reher

What's wrong with this picture? I am walking through the staging lanes at high noon on a sweltering summer day. All around me people are wearing shorts and T-shirts, with wet shop rags wrapped around their foreheads to keep the heat at bay. Super Comp drivers sit in their dragsters with umbrellas strategically placed to ward off the sun, while electric fans circulate the heat inside a dozen Super Gassers like convection ovens. As I head toward the starting line, I hear engines running on all sides as racers warm up their engines.

Wait a minute! It's hot enough to cook an omelet on the starting line, so why are drivers warming up their engines?

It's no wonder that some racers have problems keeping their engines cool in the summer. If the temperature gauge is already at 160 or 180 degrees when you pull out of the staging lanes, chances are it will be pegged by the time you get to the time slip booth.

Some racers believe that a warm engine makes more power than a cold engine. Others think that a warm engine is more consistent. In fact, heat is the enemy of performance. A motor will make more power if you run it cold - and it can still be consistent.

My fellow back-page columnist Warren Johnson has described the chemistry of internal combustion in detail. An engine is really a vessel that contains the energy released by chemical reactions. Petroleum is the remains of prehistoric plants, plankton and protozoa. Eons ago, these organisms banked the sun's energy in their cells. We harvest this stored energy to heat our homes, cook our dinners and propel our race cars.

As W.J. noted, gasoline molecules release energy when they break down into water and carbon dioxide - lots of energy. Every gallon of gasoline contains roughly 114,000 British Thermal Units (BTU) of heating value, enough energy to raise the temperature of 1,000 pounds of water by 140 degrees.

Where does this energy go? Roughly 25 percent is converted to useful work, five percent is used to overcome the engine's internal friction and five percent is radiated directly into the air. The largest portion, about 35 percent, goes out the tailpipes as exhaust heat. The remaining 30 percent is heat that must be dissipated by the engine's cooling and lubrication systems.

Most drag race cars have cooling systems that are hard pressed to deal with such a
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staggering amount of heat. We typically use tiny radiators (or sometimes no radiator at all), low-speed electric water pumps and inefficient fans and shrouds because we are more concerned with reducing weight and minimizing parasitic losses than with cooling capacity. In contrast, the belt-driven water pump in a typical street car moves 100 gallons of coolant per minute through a thick-core radiator with a properly engineered fan and shroud system.

Think about how much heat energy is released in your engine's cylinders in just a few seconds of full-throttle acceleration - and remember that 25 percent of those BTUs go straight into the cooling system. Even though a drag racing engine runs only a relatively short time, it's hardly surprising when the heat of combustion overtaxes the cooling system.

The ritual of warming up an engine is really a holdover from the days when we ran "molasses" in our motors. Back when racers used 20W-50 and 10W-30 mineral-based oil in their engines, there was a valid reason to warm up an engine. Those thick petroleum oils caused big pumping losses. In contrast, today's off-the-shelf synthetic oils do not need an extended warm-up. Even on a freezing morning at the Winternationals, all you need to do is take the chill off when you use synthetic oil. Further heating synthetic oil makes no
difference - it just needlessly puts heat into internal engine components and the coolant.

If you are not using synthetic oil in your 800-horsepower Super Gas, Super Comp or Top Sportsman engine, you should be. A serious racing engine deserves serious racing oil, not whatever is on sale at the local discount store. Why jeopardize a $20,000 engine with $1 oil?

Our dyno and track tests have repeatedly shown that a drag racing engine runs best with thin oil and cold water. No one is more obsessed with horsepower than Pro Stock racers. Do you see Pro drivers warming their engines in the staging lanes? Never. We tow our cars through the pits, push them in the staging lanes, and fire them up at the last possible minute. After the burnout, the staging process and a six-second quarter-mile run, the water temperature rarely exceeds 150 degrees.

In Pro Stock, a stone-cold engine is best. The fact that Pro engines are often on the ragged edge of detonation is certainly a factor. We have also dyno tested literally hundreds of sportsman engines, however, and it appears that a coolant temperature around 120 degrees at the start of a run is ideal.

I recognize that Pro Stock teams have the
luxury of 90 minutes between runs, and that it's tough for a sportsman racer to keep the engine cool during round-robin eliminations. That's just another reason to have an effective cooling system and to refrain from putting unnecessary heat in the engine by warming it up. Once the water temperature reaches a certain point, the cooling system can be overwhelmed. It's like sitting in a traffic jam and watching the needle on your street car's temperature gauge steadily climb. When it reaches the critical point, the cooling system loses its ability to control the temperature. The result is a toasted engine.

I've watched racers warm up their engines and then turn off the electric pump and fan to keep heat in the motor. My advice is to leave the pump and fan running to pull heat out of the cylinder heads, which need to be cool. You won't pull much heat out of the oil because it's sitting in the sump of the oil pan. My recommendations to sportsman racers on surviving the long, hot summer are to use synthetic oil and run your engine as cool as you can.