SIZE DOES MATTER

At Least When It Comes to Radiators,

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Despite what you may have heard, I'm here to tell you that size does matter, especially when choosing the correct radiator for the application. In fact, this is one of the few instances where bigger is not necessarily better.

Placing a hopped-up 283 into my '63 Chevy II, I was advised to replace the small 2-row radiator that cooled the 194 6-cylinder with a massive 4-row radiator from a V-8 Impala or Caprice with air conditioning. After customizing the mounting brackets and searching every jobber outlet for hoses that would work, I had the radiator in and functioning.

Overheating problems soon followed and I was convinced that the radiator I had obtained from the junkyard was bad. I removed the radiator and took it to a local shop where it was rodded out, cleaned and repainted. With the refurbished rad installed, the car ran slightly cooler on the highway but still overheated at idle and in slow moving traffic. I went through the entire system replacing the water pump, thermostat and radiator cap to no avail. The car still ran hot and overheated in traffic or at idle.

With the radiator removed, I showed up at the junkyard bright and early Saturday morning. The guy informed me that he had no more radiators like that one, but was willing to swap me even-up for a smaller radiator from a V-8 Chevelle without A/C. Reluctantly I accepted his offer and handed over the sparkling Caprice radiator for the grimy Chevelle unit. After even more mounting modifications I had the replacement rad installed. I started the car and went for a ride expecting to see the temp gauge peg at any moment. It never happened. In fact the car ran cooler than it ever had and never overheated no matter what the traffic conditions.

Bigger was not better in this case. A lesson that I did not fully comprehend until almost 25 years later when I visited a Winston Cup engine shop.

In the following article, reprinted with permission from Professional NASCAR Garage magazine you'll read and understand what it took me 25 years to learn.

COOL RADIATORS

Handling the heat of competition is easy when you have the right equipment

By Bob BissleR

In NASCAR competition, staying cool is the way to race. Radiators play a vital role in keeping hot cars cool at high speeds. While the radiators in your customers' vehicles can often last the life of the car, a NASCAR radiator will live out its usefulness after just a few races. And while the debris on a street radiator is likely to consist of a lot of dead insects (especially during Summer months), the debris is quite different on a NASCAR radiator.

"If everything goes well, a NASCAR radiator will last maybe about four races," said Scott Jordan, finish fabricator at Dale Earnhardt Inc. (DEI). "We'll bring the car back to the shop after a race and we'll put the radiator in a vat that boils all the rubber out. You'll get rubber, sand and oil dry in there so the vat boils it all out."

All radiators need coolant to function, and NASCAR radiators are unique in that they run on water as opposed to the antifreeze/water mixture in a street vehicle. This is done in the name of safety. In the heat of NASCAR competition cars will sometimes overheat, spilling coolant onto the track. Antifreeze would make the track surface too slick. To further reduce slickness problems, NASCAR Officials allow teams to relocate the radiator overflow tube at the rear of the car. But whether the tube is at the front or the rear, NASCAR rules state that a one-half gallon minimum overflow container must located at the end of the overflow tube.

Tubes, fins, fittings and coolant add up to the NASCAR formula for performance.

"The radiator overflow tube can be relocated at the rear of the vehicle to keep coolant from draining onto the tires and causing traction loss," stated Paul Verdile of Visteon Auto-motive Systems, a manufacturer of high performance radiator cores for C&R Racing.

"If you have a heat problem it's to try to keep the fluid off the rear tires," said DEI's Jordan. "If you've got it in front the water can get on the tires so we usually run it through the back, behind the tires. That way it won't dump any water on your rear tires."

Today's consumer radiators reflect the many advances in radiator construction and design that have taken place over the years. Many of those improvements have come about as a result of NASCAR racing.

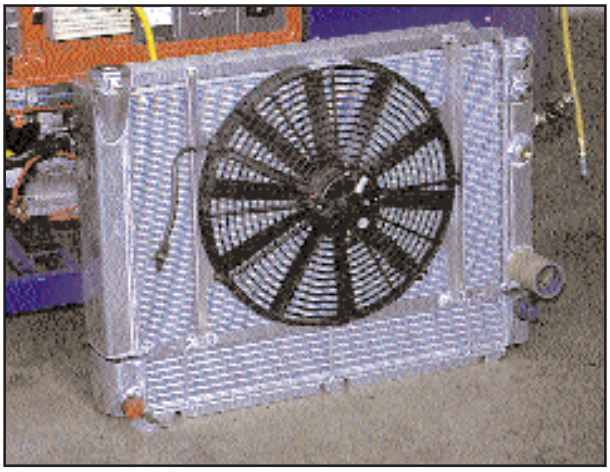
In NASCAR and street radiators alike, tubes are the primary source of cooling. Heat dissipates from the coolant through the tube walls, and also secondarily through the fins. Air passing through the fins carries away heat, allowing tubes and fins to absorb more heat from the coolant.

Because of high heat conductivity, copper brass construction with a round tube design was used on stock vehicles in the old days. Over time greater cooling efficiency was realized by modifications to tube designs such as using wider tube walls and wider tubes. But wider, thicker tubes meant more weight, and by the '80s manufacturers began emphasize what NASCAR teams had been doing for years — making their cars as light as possible.

In order to build a radiator with wider, thicker tubes that still ends up being lightweight, manufacturers turned to aluminum. An aluminum radiator built with one-inch wide tubes with a .016" tube wall is approximately 60% lighter than the same copper brass radiator. Also, the one-inch tube increases direct tube-to-fin contact and cooling capacity by about 25%.

The state of the art engineering advantages of the increased tube-to-fin contact are far superior to the lead joint found on copper brass radiators. The welded aluminum construction has also proven to be stronger than the lead-soldered copper brass radiator. Today all vehicle manufacturers incorporate aluminum radiators with wide tubes in their designs.

"Most of the consumer vehicle radiators are made of plastic and aluminum that are maybe one inch thick in the core," Jordan explained. "Race radiators are all aluminum and range anywhere from 3-1/2 inches thick to 7 inches thick in the core, with the standard intermediate track radiator being 3-1/2 inches thick."
The various race tracks on NASCAR circuits necessitate the differences in NASCAR radiator core thicknesses. Teams have one kind of radiator for short track racing and another for speedways.



NASCAR radiators are constructed of welded aluminum and range from 3-1/2" to 7", depending on the type of track being raced on.

"The speedway radiator is usually thicker," said Joey Cogdell of Griffin Thermal Products. "The high speeds force air through them, whereas the short track radiator needs to be thinner to get the maximum amount of airflow."
In the quest to get the maximum airflow on short tracks, crew chiefs have the option of installing radiators at an angle. According to NASCAR rules, the angle cannot exceed two inches from vertical.
"A short track radiator is smaller and it's usually got an angle in it," Jordan explained. "Supposedly it creates downforce when you install them at an angle. We lay it back around five degrees. In a speedway car, however, you'd mount it in there straight.."

The superspeedway radiator is normally a seven-inch radiator, mounted straight up. One of the advantages of the bigger radiators is for qualifying when teams run more water and tape up the grille to run their qualifying lap more quickly. While air moving through the radiator helps keep things cool, during qualifying it's more important for a car to have that air going over the car. Putting tape on the grill helps the aerodynamics of the front end by putting downforce on the front end and reducing drag.

"If the air is going over the car instead of through the car it is going to go faster," said Jordan. "It is that extra speed that is needed for one lap of qualifying. That means it doesn't cool the engine as well because there is no air running through the radiator. You have to get the engine real cold so it can run just on the water capacity of the engine and the radiator."

The nature of NASCAR racing has led to the development of several innovations to enhance radiator performance. The radiator dust screen is one of them. Radiator dust screens are installed in front of the radiator inside the nose of the race car. The screens prevent debris from being drawn onto the face of the radiator core, which may puncture the tubes or reduce efficiency. The screens also collect rubber divots and the oil dry instead of the radiator doing it and clogging up the fins, thus producing an overheating condition.

Even with screens to keep them from clogging up, a NASCAR radiator will have to be replaced after about four races. While costs vary depending on the manufacturer and the amount of customization a team puts into a radiator, a new short track radiator can run anywhere from $200-$800, while a speedway radiator can cost between $950-$1,200.

In NASCAR competition, it's cool to win, and a cool-running car has the best chance of racing to victory. The cool role played by the NASCAR radiator is critical in the heat of competition. •