

Keeping your engine running in the optimum temperature range has always been an important part of any racing program. With today's technology continually increasing the horsepower in Dirt Late Model engines, being able to keep the engine in the optimum temperature range has become critical. To find out just what it takes to keep things cool we paid a visit to Performance Rod and Custom and talked to PRC's owner Duane Davis about the ins and outs of cooling today's Dirt Late Model engines.

Up until the early 90's radiators used in high performance applications as well as your family car were made from brass and copper. They were not only heavy, their ability to dissipate heat, although usually good enough for the lower horsepower applications, were not able to adequately cool high performance engines. In the early 90's aluminum was introduced as a material that would increase the cooling ability of radiators. By 1999 it had become the material of choice for radiators used in high performance/high horsepower applications.

COMPONENTS:

When dealing with cooling engines a good rule of thumb is, more horsepower needs more cooling and more cooling requires a high volume radiator. As Dirt Late Model engine builders keep adding horsepower it takes a top quality aluminum radiator to cool it. The following components should be part of this radiator. A furnace brazed core, which is a tough core and there is no epoxy that can crack and cause a leak. Fabricated tanks that allows for overall dimension control and enable the manufacturer to build custom applications. Billet filler necks that have tighter tolerances and are more durable than the stamped and or cast filler necks.

The tubing that the water travels through and the fins that transfer the heat are very important if not the most important component in the radiator. In a Dirt Late Model radiator there are two rows of 1" wide and an eighth of an inch

KEEPING YOUR COOL

By Bob Appelget



Brad Richardt begins the labor-intensive process by deburring the core. After he finishes, there are nine additional steps before the finished radiator goes into the box and is shipped.

high tubes, totaling more than 110' of tubing. The tubing needs to be as thin as possible to facilitate heat transfer. However if it is too thin it can deform under pressure. A good thickness for tubing is seven thousandths of an inch. The optimum number of fins for a Dirt late Model is 12-14 FPI (fins per inch). The fins should be louvered for maximum heat transfer. There are 23,000, give or take a few, individual fins in a Dirt Late Model radiator.

"In Dirt Late Model radiators using 12-14 FPI allows maximum cooling while allowing some dirt to pass through which helps keep the radiator from stopping up as quickly," said Davis. "A F1 radiator may have 35 or 40 FPI, but if you put that radiator on a Dirt Late Model you would last about a lap before it would be clogged."

RADIATORS:

In order to compensate for the difference in temperatures, cooler in the spring and fall and hotter in the summer, there are single pass and double pass radiators available. The hot water from the engine comes into a single pass radiator on the upper left, circulates through the radiator and returns to the engine from the lower right. In a double pass radiator there is a baffle in the middle of the radiator and the water from the engine enters in the upper right makes two passes before going back to the engine from the lower right.

The temperature range in a Dirt Late Model engine runs from 180 to 230 degrees. Ideally the engine should run from 190 to 200 degrees, which is what you want your radiator and other components of your cooling system to provide. There are times early and late in the season when the weather is cooler that it is difficult to get an engine up to 180 degrees. You have seen the teams warming the cars in the pits with everything from cardboard to custom crafted logo encrusted devises in front of radiators as well as blocking off a portion of the radiator.

"The double pass radiator will cool the water by 10 to 15 degrees

Photo by Bob Appelget

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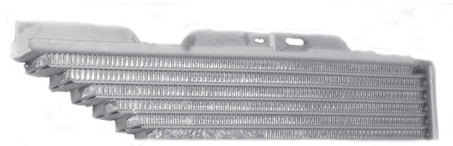
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(a) The 1" by 1/8" tube is doubled for over 110' of tubing in a standard size (19"X27") radiator used in Dirt Late Models. The fins are 12-14 FPI for over 23,000 individual fins. (b) The single pass radiator receives hot water from the engine in the upper left corner, circulated through the core before it returns cooled water to the engine. (c) The double pass radiator has two chambers. The additional circulation, second pass, will achieve water temperatures going back to the engine 10 to 15 degrees cooler than a single pass radiator.

more than the single pass radiator. In cooler weather there are times you have to block off as much as 2/3s of the radiator to get to the desired operating temperature. A number of the better funded teams will run a single pass early and late in the season when it is cooler and a double pass during the heat of summer.

The idea that if a little is good, then a lot is better, doesn't apply here. Three pass radiators have been tried, but they restrict water flow and you need a high volume of water flow to cool these engines," continued Davis.

A high volume of water flow is needed to eliminate hot spots and keep the engine cool. If you have ever watched a pan of water just before it boils you have seen millions of little bubbles forming on the bottom of the pan. Under each bubble is an air space and that space is a hot spot. In the engine this is what is going on in the heads over the combustion chambers. The water needs to flow fast enough to break away these bubbles and eliminate the hot spots to properly cool the engine.

Before aluminum you didn't want the water to go through the system fast because it wouldn't dissipate the heat and cool the water. With aluminum and because everything is so thin, the water gets cool even though it is going through the

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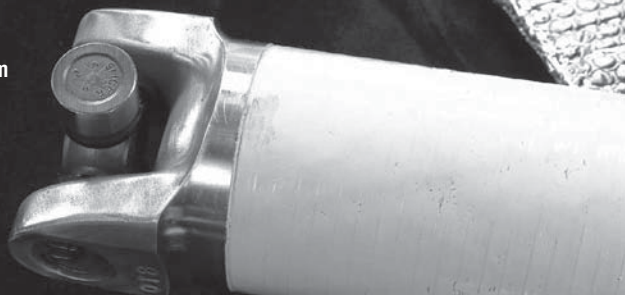
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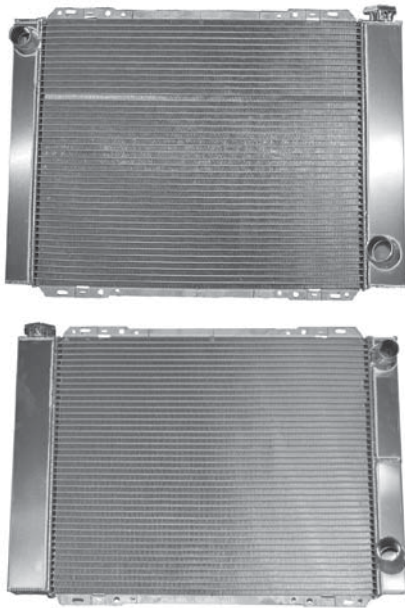


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Photo by Bob Applegate



system very fast.

Check with your engine builder to make sure you are using a water pump that compliments the system.

CARE AND CLEANING:

Nothing transfers heat better than water. However, glycol will help slick up the surfaces and make it easier to break up the bubbles. A quart of anti freeze in the system will assist in eliminating the hot spots by breaking the surface tension and help lubricate things.

“Be real careful of additives. If you are going to use them follow instructions and don’t put in more than is recommended,” said Davis. “We get radiators back all the time that the teams tell us aren’t cooling. We will open them up and they will be full of pink flakes and the radiator is 60% stopped up.”

How many times have you seen a team at the track go into the hauler and return with a battered box holding a radiator and change it with the one in the car? In most cases the radiator in the box that replaces the radiator in the car is not a new one. It is one that was in the car that had been cleaned and caressed before going back into the box.

In order for a radiator to function properly, especially with a dirt track application, it needs to be cleaned on a regular basis.



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To get the red clay out of the fins the radiator needs to be soaked in water and or a solution of water and a mild degreaser. After the clay is softened up use a low pressure hose and wash in both directions repeatedly. After washing, the fins need to be straightened with a fin comb or flat nose tweezers. Note: If you don't soak the radiator and use a high-pressure hose you are asking for trouble.

Check your radiator cap. For every pound of pressure put on the system raises the boiling point three degrees. A good quality 22 to 24 pound radiator cap is recommended. Anything higher could balloon the water tubes creating a host of problems. Check the cap and if there is any damage to the rubber seal replace it.


Keep the radiator clean inside. Inspect and flush a new radiator before installing. Always use clean water and be careful with additives. Flush the cooling system every couple of weeks.

THINGS TO LOOK FOR:

Check the quality of the core. Make sure the fins go all the way to the end of the tubes. Check the welds and if they are tig welded you are on the right track. Check the filler neck. Stamped or cast filler necks have a tendency to distort and that can keep your cap from sealing properly. Billet filler necks are the way to go.

A good quality single pass Dirt Model radiator with all the good stuff should run in the neighborhood of \$200. Like everything else you get what you pay for. If you find a deal on a radiator that sounds too good to be true, check it out because it probably is.

Knowing, understanding and buying the right radiator is one way to keep your cool. Performing proper maintenance on a regular basis is another. Still another, as oil is a coolant as well as lubricant, is keeping your oil cool. But that is another story.

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