How to Choose an Aftermarket Radiator

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What's more frustrating than sitting on the side of the road with an overheated vehicle?

Whether it's the sight of the steam coming from the hood or the smell of hot coolant splattered all over your engine compartment (or puddled underneath your vehicle), few things put a damper on weekend cruise like an overheated engine.

We'd strongly advise you to avoid this situation, and you can start by having a strong, healthy radiator for your vehicle. With help from the Summit Racing technical department, we've put together an overview of common radiator styles, materials, and designs. This basic knowledge will put you on the road to picking the optimum aftermarket radiator.

Crossflow vs. Downflow Radiators

Radiators are often broken down into two main styles: crossflow and downflow.

A crossflow radiator consists of a vertical tank on each side with a series of cooling tubes and fins making up its

core. The coolant travels horizontally across the core from the inlet side to the outlet side with the help of your water pump.In contrast, a downflow radiator has tanks running horizontally at the top and bottom. The coolant enters the top of the radiator and travels vertically through the core and leaves through the outlet at the bottom. Because the coolant flows from the top down, the water pump is

aided by gravity, which allows the coolant to travel more quickly through the radiator.So which is better for your vehicle?

“When it comes to design, crossflow is typically more efficient due to the speed—or lack thereof—with which it moves the coolant,” said Mike Bosiljcic of Summit Racing’s technical department. “Unlike a downflow radiator, which has gravity working against it, a crossflow radiator holds on to the coolant just a little longer, allowing it to dissipate heat a little better.”

Because of its heat dissipation abilities, along with its (typically) larger core surface area, the crossflow radiator is often the best choice for high-rpm, high-output engines.

“One other reason the crossflow design has really taken off in popularity is the sleeker hood lines on today’s vehicle,” Bosiljcic said. “The downflow radiator is simply too tall to fit into lower-profile configuration.”

On the other hand, downflow radiators can provide an original, nostalgic appearance and can often fit where crossflow radiators will not. Cramming a crossflow radiator into an older engine compartment designed for a downflow will often require fabrication.

As always, you’ll need the proper fan, water pump, and thermostat to maximize your radiator, whether it’s a crossflow or downflow design.

Aluminum vs. Copper-Brass

The two main types of radiator materials are aluminum and copper-brass.

Copper-brass radiators came standard on older vehicles and were found on some vehicles all the way into the 1980s. For a vintage or period-correct look, it's hard to beat a copper-brass radiator. It's also hard to beat copper-brass for heat conductivity.

So why the switch to aluminum radiators in recent years?

While copper-brass is a great heat conductor, it is also a relatively weak material when compared to aluminum. To avoid ballooning or bursting under pressure, the diameter of the copper-brass tubes that carry coolant needs to be kept small. And that's a big problem when it comes to cooling capabilities.

Because aluminum is stronger material than copper-brass, aluminum tube diameter can be increased to flow more coolant. That means more coolant is exposed to the heat exchange process, giving the radiator a greater cooling capacity.

A second—and more obvious—advantage to an aluminum radiator is weight. Because aluminum weighs approximately 60 percent less than copper-brass, an aluminum radiator is often the ideal choice for high performance and competition engines.

There's one more advantage to aluminum radiators: reduced row quantity within the radiator core.

Row Quantity vs. Tube Size

As we mentioned earlier, radiators consist of a row or several rows of tubes and fins, which transport the coolant. Because aluminum is much stronger than

copper-brass, tube diameter can be increased without having to add thickness to the tube walls (a necessity when increasing the size of copper tubes). As a result, a two-row aluminum radiator with one-inch tubes will dissipate heat at about the same rate and efficiency as a five-row copper-brass radiator with smaller, half-inch diameter tubes.

This two-row design also causes less air restriction through the core, allowing your vehicle's fan to more effectively aid in the cooling process.

"Most high performance radiator manufacturers have abandoned the idea of more rows being better," Bosiljcic said. "Now it is about core thickness and cooling tube size—even when comparing aluminum radiators. The larger tube radiator is much more capable of displacing heat just due to it's increased capacity and the only difference that may be noticed is that the core is slightly thicker."

The Verdict: Choosing the Right Radiator

We've covered the basic radiator styles, materials, and designs. In general, aluminum radiators are the ideal choice for high performance, high-output vehicles, competition cars, and custom street rods. Copper-brass radiators make a great choice for restorations or a nostalgic look.

According to Bosiljcic, there are a couple more rules of thumb:

"Bigger is always better when it comes to radiator selection," he said. "People should also remember that universal radiators are just that—universal. This makes a direct-fit radiator a much better option in the end if available."

To narrow down the choices for your specific application, here are few things you should know when you begin shopping for a radiator:

- Available space within the engine compartment
- Engine size and compression ratio
- Engine performance—horsepower output and torque production
- Intended vehicle use
- Type of fan—electric or flex fan
- Transmission type—automatic transmissions will require a transmission cooler