Cooling System Additives - Cooling Agent Show Down- Garage

We Find Out How Well Cooling System Additives Really Work And Which Is Best

writer: Aaron Bonk
photographer: Aaron Bonk



The human body doesn't like to overheat and engine's aren't much different. Temperature can determine just how much power an engine can make, how efficiently it will run, and whether or not it will hold together. Excessive cooling system temperatures can cause hoses to burst, headgaskets to blow and even cylinder heads and engine blocks to warp; the fact that they'll lose significant amounts of power goes without saying. It's not good. That's why it's important to keep water temperatures under control. Common cool-down methods include larger frontal area and/or thicker aluminum radiators, which have the ability to dissipate more heat quickly, but can also be fairly expensive. Sometimes adding a larger or secondary cooling fan will help alleviate low-speed or idling cooling issues. But even adding another fan or a larger one will cost you a bit of cash and may cause problems when it comes time to fitting it in place. Either way, if your engine is overheating, it has to be taken care of otherwise you'll end up with expensive problems that make the price of an aluminum radiator seem more on par with the amount of change you've got under your couch cushion.



The modern day gasoline engine isn't all that efficient, at least not as much as we'd like it to be. Fuel energy that could potentially be used to produce additional power is constantly lost through the cooling system. The process is called heat rejection, and if it didn't take place, thermal breakdown of the pistons, cylinders and cylinder head could occur. Call it a tradeoff. Cooling is also important when it comes to the ignition process and the combustion chamber. As combustion chamber temperatures increase, higher octanes of fuel or retarded spark timing are needed. The density of the air/fuel ratio is also decreased as heat rises. To compensate, some vehicles pull out ignition timing automatically as cooling system temperatures rise. In other words, high temperatures rob horsepower.

We're not typically fans of miracle products that come in a bottle, or a can for that matter. But over the years we've become accustomed to using cooling system wetting agents, as they've been proven to work almost every time. Unlike ring sealers in a can and other mysterious leak sealing products that never seem to work, cooling system additives generally do work. But to answer the question as to just how well some of these additives get the job done and which reigns supreme, we decided to put four of them to the test.



Our test apparatus took the form of an EG Honda Civic with an H22A4 Prelude engine stuffed into place. A classic recipe for overheating since many

transplant owners fail to upgrade the radiator despite the more than 40-percent larger displacement engine not to mention its sheer physical size increase. Our test vehicle took the necessary precautions - sort of. A thicker Del Sol Si VTEC radiator was swapped into place as was a higher flowing cooling fan, but that doesn't stop the Civic from escalating cooling system temps. With a 50/50 mix of Honda antifreeze and distilled water, temperatures soared to 215 F routinely while sitting in the drive-thru, and never really dropped below the 200 mark even under normal low engine speed driving conditions. Cylinder head temperatures were equally as scorching in the case of our Honda measuring in at nearly 210 F. As such, our radiator proved rather inefficient, only able to drop the system's temperature by a factor of five percent.



For our test we rounded up four of the most popular cooling additive products on the market: Red Line Water Wetter, DEI Radiator Relief, Hy-per Lube Super Coolant, and Justice Brothers Radiator Cooler. We tested these products mixed with both a 30/70 antifreeze/water mixture and mixed with water alone. The key to any successful test is keeping as many of the variables the same as possible, and performing as many tests as possible. Two days and nearly 300 miles later and we had our results, and some nasty burn marks on our arms. Note to self: allow more than two days when changing radiator fluid almost 10 times. Aside from outside air temperatures, which remained fairly constant during our testing, we were able to control almost everything else. We kept to the same roads, and stabilized load conditions by repeating similar engine and vehicle speeds for each test. We performed four tests for each mixture: Low rpm, low mph street driving; 4000rpm, 75mph freeway speeds; 5000rpm hill climbs; and extended idling. We also performed temperature readings for both radiator inlet and outlet temperatures and cylinder head temperatures. Now would be a good time to mention that none of these products are designed to perform miracles, and if your radiator isn't up to the task, don't expect anything but a new or larger radiator to fix the problem.



The results? This stuff works. All of them, but to different degrees and in slightly different ways. But there were stipulations. When mixed with coolant, our temperature drops were negligible, but still there. But with straight water, the temperature drops were nothing short of impressive. We expected this. There's no glycol-based antifreeze, or any liquid cooling agent for that matter, that we're aware of that can dissipate or transfer heat as well as plain old water. But you can't run plain old water, at least not without rusting or destroying your engine. Here are the highlights.

How They Work

Cooling system additives work by transferring heat more efficiently through the radiator. They can be used with an antifreeze/water mix or with water alone. They get their job done by reducing the surface tension of the cooling system mixture, which promotes thermal conductivity, or heat transfer by being able to penetrate heat-prone metal surfaces better. The process, called metal wetting, is also aided by an anti-foaming agent. We can run straight water with any of these products since they all have a corrosion inhibitor, which stabilizes the mixture's pH level. By balancing these negative acidic effects, you don't have to worry about rust, electrolysis, and deposits commonly associated with straight water mixes.

No Additive

We began our testing with a 50/50 mix of Honda antifreeze and distilled water. Under stock conditions, cooling system temps skyrocketed to 215 F and stayed there. Before the Prelude engine swap, this Civic rarely saw anything over 185 F on a hot day. This happened despite our pleasant 72 F Southern California temperatures outdoors. We also realized cylinder head temps in the neighborhood of 210 F and idle temperatures that never seemed to want to stop climbing. With the stock mixture, our radiator

showed a minimal decrease in cooling system temperature. The car was drivable, but not something we wanted to get stuck in extended traffic with.

DEI Radiator Relief

Our first test additive, DEI's Radiator Relief mixed with distilled water, brought us down to a cool and much more manageable 183 F during low-rpm street driving. Under heavy load conditions we watched temperatures rise to about 205 F, but they stabilized - unlike our initial stock setup, which didn't seem to want to stop climbing. We also saw cylinder head temperatures drop here to 191 F - a good thing since our H22A4 has a knock sensor that was probably pulling timing out from knock due to excessive combustion chamber heat with the stock cooling mixture. We suspect a slight power increase here too. Radiator Relief performed best when mixed with water alone. Once antifreeze was added to the mix, temperatures rose by a factor of about two percent, but only when subjected to extreme load and rpm. So, unless you're interested in a race-only application, there's little to lose here from adding antifreeze to the mix.



It's important to bleed the cooling system anytime it's drained. In addition to draining the radiator and block in between tests, we bled the system of air bubbles to avoid the additional heat they can create

Red Line Water Wetter

Red Line's Water Wetter is one of the first cooling agents we came across years ago, and have always had good results with. We've just never tested it against other cooling agents, or against itself when mixed with straight water as opposed to antifreeze, for that matter. The Water Wetter produced similar results to DEI's Radiator Relief and was only slightly bettered by it when mixed with water alone. But when the products were mixed with Honda antifreeze, Red Line took the lead - over everyone in fact. We realized temperatures only 3 F higher than DEI's straight water mix in most cases even when combined with our 70/30 antifreeze/water mixture. This was quite impressive to see an antifreeze cooling agent mixture come this close

to a pure water-based cooling system, which typically runs at least 10 F cooler. And the good thing about Red Line's Watter Wetter is that it passed the ASTM D2570 Simulation Service Corrosion testing. What the hell does that mean? It means this product passed the same tests the big coolant companies passed and it won't corrode your engine when mixed with water alone.



Hy-Per Lube Super Coolant
Hy-Per Lube's Super Coolant wasn't far off from Red Line's Water Wetter, also producing positive results when mixed with antifreeze and water. When subjected to our pure water test, DEI's Radiator Relief still took the lead in comparison. But the Hy-Per Lube impressed us, especially under extended idling conditions where it posted the lowest number for any of the agents when combined with antifreeze - 204 F. Even when subjected to heavy load conditions and when mixed with antifreeze, the Hy-Per Lube mix wouldn't let us go any higher than 207 F.

Justice Brothers Radiator Cooler
The Justice Brothers Radiator Cooler, which brought us down to 177 F at several points during our test drive and usually hovered in the low 180 F zone, caught us off guard. We weren't expecting results that low after testing some of the other products. These readings were all taken when using pure distilled water mixed with the cooling agent alone. When subjected to an antifreeze mix, as expected, the results weren't as impressive but still reduced temperatures a bit. We saw a similar temperature increase just like we did with DEI's Radiator Relief. The water-based Justice Brothers solution not only produced the lowest cruising temperatures but also the lowest temperatures at freeway speeds and high-load hill climbs. As for cylinder head temperatures, Justice Brothers' Radiator Cooler came in second place at 193 F.



And The Winner Is...
So who's the overall winner? Well, that depends on what's most important to you, since each product performed best in different ways when subjected to different conditions. For the best in overall cooling when mixed with water alone, Justice Brothers' Radiator Cooler takes the lead. Its cruising and freeway temperatures were the lowest, which is where we spent most of our test time. But DEI's Radiator Relief wasn't far off. And to be fair, Radiator Relief was subjected to 5 F hotter temperatures outside during its test period. This could explain some of the discrepancy between the two products when mixed with pure water. But despite the hotter outside temperature, Radiator Relief still outshone the competition with the lowest cylinder head temperature and by far the lowest idling temperature. As for Red Line's Water Wetter and Hy-Per Lube's Super Coolant, these two proved to be the best of all products when subjected to an antifreeze mixture. Temperatures were naturally hotter than when tested with pure water, but negligibly. As far as our test results are concerned, we see no reason not to run an antifreeze mixture when it comes to these two.

DEI's Radiator Relief gave our Civic the lowest cylinder head temperatures and lowest idling temperatures out of the bunch when mixed with pure distilled water. It also came in second place as far as average temperatures go when mixed with straight water.

Red Line's Water Wetter proved to be the best all around cooling agent when mixed with a 30/70 antifreeze/water mix. We saw readings as low as 197 F at the cylinder head and the most efficient heat transfer through the radiator at just over eight percent.

Hy-Per Lube's Super Coolant was almost identical to Red Line's Water Wetter as far as results go when mixed with antifreeze, but it did better the Water Wetter when it came to heavy load and lengthy idling - not by much though.

Justice Brothers' Radiator Cooler gave us the lowest temperature during our testing - 177 F - and provided the lowest average temperatures overall when mixed with water alone.

Results

	STOCK	DEI	RED LINE	JUSTICE BROTHERS	HY-PER LUBE
Mixture	50/50*	Water	30/70*	Water	30/70*
Outside Temp.	72F	70F	62F	65F	65F
Cruising Temp.	196F	183F	187F	181F	188F
4000 rpm / 75 mph	198F	190F	186F	183F	187F
5000 rpm Hill Climb	215F +	205F	208F	203F	207F
Extended Idling	215F +	200F	205F	205F	204
Cylinder Head Temp.	208F	191F	197F	193F	198F
Radiator Temp. Drop	5%	7%	8%	8%	7%

* antifreeze/water