



Cool Under Pressure

VORTECH MAXFLOW CHARGE COOLER FOR SUPERCHARGERS

text and photography by Ricardo Topete

Many Mustang enthusiasts thumbing through this magazine should be familiar with superchargers. A quick look at some of the Mustangs featured will hint at the popularity of superchargers. Of course, blowers (as superchargers are also called) are prevalent among Mustang fanatics due to the performance gains they offer.

Increases of well over 100 hp are easy to achieve with excellent reliability and stock road manners. However, as effective as supercharger kits are, they do leave room for improvement. For that, we'll take a look the basic workings of an intercooler and how it makes a supercharger even more effective.

A supercharger, in its purest form, pumps additional air (boost) into an engine, significantly larger amounts of air than the engine would otherwise ingest on its own. Naturally, as the air gets compressed by the supercharger and forced into the engine, this creates a dramatic rise in air temperatures being fed into the engine. Extremely hot air temperatures make it necessary to reduce the amount of ignition timing and increase the octane rating of the fuel being used so that an engine can

run safely. Failure to decrease timing and raise octane can lead to detonation, a.k.a. "pinging or knocking," which will cause severe engine failure. In the best case scenario, the result will be a blown head gasket. More boost may not necessarily result in more power output due to the hotter air charge temperatures. A simple and effective solution is to add an intercooler to the supercharger system, allowing more ignition timing, higher boost levels, and requiring no increase in octane for noticeable power gains.

Sharp-eyed readers will recognize Charles Abjornson's 2006 V-6 Mustang. Charles' car came to GTR High Performance to give us an inside look at the installation of a Vortech supercharger kit with that install featured on these pages. To summarize that, GTR installed Vortech's hugely popular

S-Trim supercharger, which produces 6psi of non-intercooled boost. The spirited 'Stang was outfitted with an automatic transmission, JBA shorty headers and a dual-exhaust conversion. Everything else was stock. At the end of the story, output on Charles' Mustang had jumped from 173 hp and 196 lb-ft at the wheels to 244 hp and 255 lb-ft at the wheels. Not too shabby, considering the modest boost level.

As is the case with many Mustangers, Charley felt the need for more speed. Once again, he enlisted the services and products of GTR High Performance and Vortech Engineering to give his Pony more kick. The choice was simple: Vortech's Maxflow Charge Cooler system.

Vortech's Charge Cooler is a very effective, simple, and reliable method of reducing air inlet temperatures created by a blower. Utilizing a closed-loop water circulation system with a front-mounted heat exchanger that allows drastic drops in air temperature, gains up to 100 hp are possible, depending on the vehicle, engine and boost level.

Air-to-water intercooling is nothing new in the auto industry, even for



1 First step is to remove the front bumper cover. Several fasteners secure the bumper to the body. Don't forget to disconnect headlamps and turn signals.

2 Chris Balster and "Dan The Man" carefully remove the front bumper cover.

Mustangs. The '03-'04 Cobra, '07 Shelby GT500, supercharged Saleen and Roush Mustangs all use air-water intercooling systems. Arguably, air-water intercooling may be the best solution for a street/race supercharged Mustang.

Vortech offers their Maxflow Charge Cooler for nearly every late-model Mustang on the road; including V-6, 5.0L and 4.6L. The Charge Cooler kit can be purchased separately from the

3 The Vortech inlet tube and filter must be removed and set aside.

4 Next, the discharge tube to the throttle body is removed.

5 Loosen and remove the nuts and bolts that secure the supercharger and mounting bracket to the engine.

Vortech supercharger system, or as part of a complete intercooled supercharged kit. This allows any Mustang owner that currently has a Vortech blower to upgrade to Vortech's Charge Cooler. However, although Vortech's Charge Cooler is designed specifically to work on a Vortech equipped vehicle, their kits can be adapted to other brand superchargers.

For Charley's silver stallion, Vortech

6 The blower and bracket can now be lifted out of the car, as shown by Eli Patronas. Note that the belt and oil lines have also been disconnected.

7 The bracket and idler pulley must be removed from the supercharger unit. The idler pulley will be replaced with a new unit at a later step.

provided the Maxflow Charge Cooler system in a polished finish (PN 8N301-328) to complement his polished Vortech S-Trim huffer. This system is a true bolt-on kit designed for any 2005-2007 4.0 V-6 Mustang. With an MSRP of \$2,015 for the polished Charge Cooler kit and \$1,895 for the satin standard finish, there are options for different budgets. Included with this system is Vortech's exclusive dual pass, air-to-

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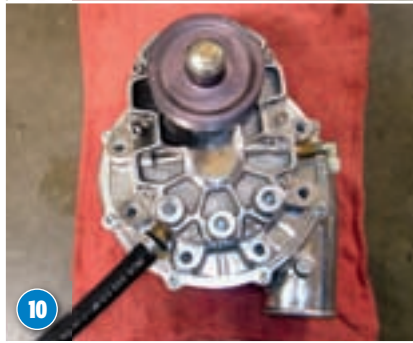
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8 Shown here is the bare Vortech unit with the original 3.6-inch pulley. Note the orientation of the supercharger outlet. Currently, it is pointing to the bottom right corner.

9 It is necessary to “re-clock” the supercharger unit, so loosen and temporarily remove the small Allen bolts and washers that secure against the blower.

10 To “re-clock” the blower, simply twist the case so that the discharge is pointing straight downward as shown.

water cooler unit. Also included is an efficient heat exchanger, a large-capacity water reservoir, heavy-duty water pump, mounting brackets, hoses and hardware. Lastly, a smaller diameter supercharger pulley (3.25-inch diameter to replace the original 3.6-inch diameter) is included to bump the boost up from 6 psi to 8 psi. With a kit so thorough, installation is straightforward for a seasoned Mustang enthusiast. If turning wrenches isn't your thing, a professional

11 Once the new blower pulley is installed, the mounting bracket can be attached to the supercharger. Note the new supplied idler pulley, which replaced the original.

12 Dave Chamberlain re-installs the blower and bracket assembly on the engine.

13 Drain the coolant and remove the coolant reservoir, as it will not be re-used. Assemble the water pump to the Vortech coolant reservoir and mount under the front headlamp area using supplied hardware.

installation center can handle the task in approximately six hours. The crew at GTR High Performance allowed us to look on during the installation process and showed us the highlights.

Vortech claims their Charge Cooled intercooled 8psi supercharger kit raises the output from stock 210 hp and 240 lb-ft torque to 330 hp and 337 lb-ft torque. Remember that these are flywheel ratings and not rear-wheel ratings. GTR has a DynoJet chassis dyno,



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14 Assemble the water cooler with supplied fittings and brackets as shown.

15 The Styrofoam bumper support must be removed at this point.

16 Use the supplied bolts and spacers for the Vortech assembled water cooler. The spacers must sit between the bumper and the water cooler.

so we wanted to compare our rear wheel readings to Vortech's data.

As soon as the GTR technicians completed the project, the Mustang went directly onto the dyno for testing. Using Charley's Diablo Predator tuner, which was originally included with the base Vortech kit, GTR reflashed the computer to safely accept the higher boost level and colder air charge. When the tire smoke cleared, the mighty V-6 churned out 282 hp and 288 lb-ft! Remember, these are rear-wheel numbers, which are typically 20 percent lower than flywheel figures. Assuming a 20 percent parasitic loss through the drivetrain, wheels, etc.,

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17 Once secured, the water cooler should look like this.

18 Plumb and route the water lines as shown.

19 Assemble the surge tank reservoir to the mounting bracket and install on the passenger side strut tower. Note that

we actually made more power and torque than Vortech's advertised outputs! Using Vortech's advertised figures, we should have realized closer to 265 hp and 270 lb-ft to the wheels (again, assuming a 20 percent loss). Instead, we saw 17 hp and 18 lb-ft more than anticipated!

Now, let's analyze the dyno results before and after the Vortech Charge Cooler. Look at the peak-to-peak gains of 38 hp and 33 lb-ft torque. Although impressive, those numbers only tell part of the story. The largest gains were seen at 5,400 rpm with 40 hp and 38 lb-ft! To illustrate that the performance gains are not only seen at high revs, we saw a 17 hp and 24 lb-ft torque gain at only 3,800 rpm (the point at which the dyno

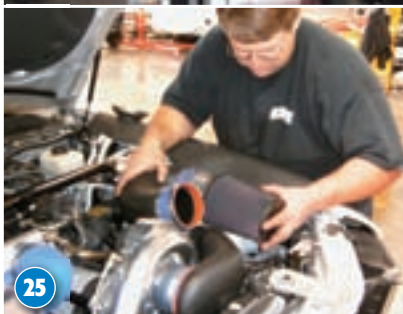
no modifications are necessary for the aftermarket strut tower brace.

20 The new engine coolant reservoir mounts adjacent to the previously installed surge tank.

21 With the coolant reservoir secured, connect the coolant line.

began recording data). This clearly shows the effects of more boost and a colder air charge. Such increases are what you feel in the seat of your pants.

We can continue dissecting the test results until we go cross-eyed. However, numbers do not describe how the Mustang performs once off the dyno and on the road. A test drive was in order. The instant the pedal is buried, the Vortech huffer spools up and pushes a generous helping of cool, dense air into the 4.0 mill. The Mustang's rearend squats and the tires dig for traction in vain. Once underway, the motor pulls to redline with authority and the automatic transmission upshifts right on cue and the fury begins all over again. To say that this is a zippy



22 The upper radiator hose must be cut in half to allow the supplied metal tube to be inserted for clearance.

23 Dave now lowers the Charge Cooler assembly into position.

24 The blue sleeves are now attached to the inlet and outlet of the Charge Cooler.

25 Dave re-installs the inlet to the supercharger.



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little V-6 would be an insult. Just to put this in perspective, a stock 2005-2007 Mustang GT V-8 lays down about 265 hp to the tires...Charley's Vortech-motivated V-6 made over 282 hp to the

tires. Charley has already embarrassed countless Mustang GTs.

In addition, GTR High Performance also informed us that shortly after this story was completed, they installed the same

Vortech Charge Cooler kit on another similarly-equipped V-6 Mustang, this time a five-speed manual transmission car, and hit 291 hp and 293 lb-ft torque at the wheels! All of these results were achieved with conservative 91 octane street tune and smog-legal parts. Even higher power gains are possible for those that have access to 93 octane fuel or even race fuel. In summary, V-6 Mustang + Vortech Charge Cooled supercharger = V-8 Mustang flattening performance. What's not to like?



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DYNO TEST RESULTS NON CHARGE-COOLED

RPM	HP	TORQUE
3800.....	177.67.....	245.56
3900.....	185.59.....	249.93
4000.....	191.68.....	251.68
4100.....	196.61.....	251.86
4200.....	202.17.....	252.81
4300.....	207.85.....	253.88
4400.....	212.41.....	253.54
4500.....	218.41.....	254.92
4600.....	222.82.....	254.41
4700.....	227.85.....	254.62
4800.....	233.31.....	255.29
4900.....	237.41.....	254.47
5000.....	237.40.....	249.38
5100.....	240.64.....	247.82
5200.....	243.93.....	246.38
5300.....	243.92.....	241.71
5400.....	242.68.....	236.04
5500.....	242.46.....	231.53
5600.....	242.63.....	227.56
5700.....	241.74.....	222.75

DYNO TEST RESULTS WITH CHARGE-COOLED

RPM	HP	TORQUE
3800.....	195.03.....	269.56
3900.....	202.51.....	272.71
4000.....	207.40.....	272.32
4100.....	215.10.....	275.54
4200.....	222.01.....	277.63
4300.....	229.77.....	280.65
4400.....	236.27.....	282.03
4500.....	243.64.....	284.36
4600.....	249.39.....	284.74
4700.....	256.17.....	286.25
4800.....	263.38.....	288.18
4900.....	267.61.....	286.83
5000.....	271.18.....	284.85
5100.....	274.25.....	282.43
5200.....	278.71.....	281.50
5300.....	280.82.....	278.28
5400.....	282.27.....	274.54
5500.....	280.43.....	267.79
5600.....	282.11.....	264.59
5700.....	281.97.....	259.81

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26 The final step is to re-install the front bumper, starting with the Styrofoam bumper support.

27 Ta-Da! Installation is now complete.

SOURCES

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