SNOW 'N' BLOW

INSTALLING SNOW METHANOL INJECTION AND MAGNUM POWERS' MPX BLOWER CASE

AN OLD SAYING TELLS US THAT THERE IS NO REPLACEMENT FOR DISPLACEMENT, AND AS WITH MOST OLD SAYINGS, THERE IS SOME TRUTH IN IT. BUT TO ACTUALLY SAY THAT IT'S TRUE—WELL, IT'S JUST NOT.

The replacement for displacement is called forced induction, and whether the induction is forced through a supercharger or turbocharger, the result is the same: lots more air entering the engine, forcing the use of much more fuel and creating much more power.

But this additional boost in power isn't free. As the Eaton M90 supercharger in our '94 Thunderbird SC compresses air, it creates heat in the process. That's not some fault of the Eaton design; it's a law of physics. But while we can't stop the supercharger from creating heat, we can dramatically reduce that heat. One method is to install a bigger intercooler, and that's something we'll do later. But first, we had another plan of attack: methanol injection.

Injecting a 50/50 mix of water and methanol into the fuel/air charge as a means of combating heat is not a new idea. Many aircraft incorporated this idea as early as World War II, and the idea has never really gone out of style. Today, Snow Performance (866/365-2762) is the leader in automotive aftermarket methanol injection, and Snow offers a direct-fit kit for the Supercoupe. The kit includes a 150-psi pump, 2-quart reservoir, digital variable controller, two nozzles and all the necessary hardware. The kit activates based on the MAF voltage signal, creating a smart system that only works when you really need it.

1. The Snow methanol injection kit includes a pump, digital controller, reservoir, corrosion-resistant tubing, nozzles and all the hardware necessary for installation.
Snow's methanol injection works in several ways. The first is that the water component of the methanol mixture has obvious cooling and vaporization properties to reduce the temperature of the air/fuel charge. This lower air-charge temp allows the air charge to be denser, allowing for more fuel and more power. The methanol also works as a chemical intercooler to fight detonation, preventing your car from pulling timing (and thus power) as boost levels rise. And finally, methanol acts as a high-octane fuel, adding yet more oxygen to the fuel mixture.

We took our car to SuperCoupes Unlimited and Supercoupe expert Dave Dalke. Many consider Dalke the nation’s premier SC tuner, and we wanted his expertise for both the installation and the tuning. Sure enough, he knew a way to install the kit while keeping it completely hidden, preserving the car’s sleeper look. And his electronic tuning paid off huge—we ended the day with 53 more horsepower than we began with.

ON THE DYNRO

BACK IN THE DECEMBER ‘06 ISSUE OF FORD BUILDER, WE DID OUR FIRST UPGRADES ON THIS CAR AND MADE 237 HP AND 313 LB-FT OF TORQUE AT THE WHEELS. AFTER DOING SO, WE SAID WE THOUGHT THE CAR HAD MORE IN IT, AND WE WERE RIGHT. THIS TIME, WE PERFORMED OUR DYNO TESTING AT TWISTED INNOVATIONS (440/474-2059) IN ASHTABULA, OHIO. SUPERCOPUES UNLIMITED’S DAVE DALKE DIALED IN SOME MORE FUEL AND PERFORMED SOME OTHER ELECTRONIC WIZARDRY, COAXING AN ADDITIONAL 41 HP FROM TUNING ALONE, REACHING 278 RWHP.

Our datalog shows that activating the Snow methanol kit instantly dropped air-charge temperatures by 30 degrees, allowing us a much denser charge of air into the engine, and preventing the computer from pulling out timing on the top end. Thus, the Snow kit rewarded us with 14 hp and 6 lb-ft of torque at the peak, but as expected, the biggest gains came at higher rpm levels. Higher rpm and higher boost levels make the Snow kit even more necessary, so we weren’t done testing it yet—we still had to install our new MPX supercharger case and test the methanol’s effect on that more potent blower combination.
Two days after we installed Snow Performance Alcohol Injection on our SuperCoupe, we returned to SuperCoupe Unlimited for another horsepower injection. This time we selected several upgrades that would work hand in hand with the Snow kit, but the highlight of this installation was Magnum Powers’ new MP Extreme (MPx) supercharger case.

The MPx is a completely new case casting for the Eaton M90 supercharger, and it offers a huge leap in performance over the stock, or even a ported stock, case. Magnum Powers cast the MPx from a stronger 356-T6 aluminum alloy than Eaton uses, and it’s designed in a reinforcing rib that runs the length of the case to prevent flex. Most important, though, is that the new case design increases intake duration—think of it as a cam with larger duration, but for your blower. SuperCoupe Unlimited’s Dave Dalke elaborates:

“The MPx inlet exposes the blowers to the inlet plenum much longer than a stock blower. In a sense it increases intake duration. Then the period of time where the ‘gulp’ of air is sealed both from the inlet and the outlet (when it is being pushed up the outside of the case) is called the ‘seal time.’ While compression does not occur during this phase, it is still valid to think of this as the compression and power cycle of a motor. The longer the seal time, the greater the efficiency of the blower. Like a cam with long duration, the seal time is reduced by having the inlet duration increased, and so efficiency drops somewhat. Just as a long-duration cam will sacrifice low-rpm power, this blower design sacrifices what would be low-rpm boost for the blower. Then the outlet of the blower is enlarged also, but the MPx, by closing the sound ports, is able to get back some of that lost duration while still offering a large outlet to vent the air efficiently.”

The net result is that if you spin an MPx at the same rpm as a stock blower, you will find that it makes less boost than a stock blower. However, when driven as designed (at least 15 percent OD), the blower performs much better than stock. So it’s not necessary to have a high-rpm motor to benefit from the MPx. It can make plenty of boost at what we would consider a low engine rpm—it’s just that the blower is spinning significantly faster.”

In addition to the MPx case, Magnum Powers also supplied us with its supercharger and jackshaft pulley kit. This kit
Here's the fun part: feeding the nut through the reservoir to secure the feed fitting. So why use the windshield-washer reservoir as a methanol tank? First, it has a 2-quart capacity, just like the smaller Snow reservoir. Second, this car has a VVM that puts out a warning light when the reservoir gets low, so we'll be less likely to hurt the engine by running out of methanol. Finally, this choice keeps the kit totally hidden. Dalke wanted to install an LED in the instrument cluster to indicate when the Snow system is active. To get to the cluster, remove the piece of trim under the steering column and remove the bolts from the cluster surround trim. Removing the cluster surround trim is easiest if you remove the two bolts that mount the top of the steering column. The column won't fall far—just enough to get the trim out without breaking it. Seven Torx bolts hold the lens and top portion of the instrument cluster in place. Remove these bolts and then the plastic pieces. Dalke used a step drill to place the LED in line with the mark indicating 10 pounds of boost.

Magnum Powers also sent us its revised cold-air divider kit, an attractive sheetmetal design that seals the air filter from excessive under-hood heat. Other components included 60-pound fuel injectors (we already had a 255-LPH pump), an 80mm C&L mass air meter, Magnum Powers belt tensioner springs and a SuperCoupes Unlimited double intercooler. Combined, these items allowed us to dial the boost way up, keep the air-charge temps down and keep the engine fed with fuel.

Dyno testing demonstrated that the MPx is more than enough blower for our application. On this night we raised our rear-wheel power output from 292 hp and 363 lb-ft of torque to 310 hp and an entirely respectable 418 lb-ft of torque. That's 18 hp and 55 lb-ft of torque, but it seems that our power numbers didn't rise as much as our torque numbers, because torque peaked well before the engine began pulling timing on the top end. Our stock cylinder heads are now our limiting factor, so the next phase of our build will be to install SuperCoupes Unlimited ported heads and a more aggressive cam. Dalke said a gain of 100 hp for these next mods isn't out of the question, so check back next month to see if we can reach 400 RWHP, and if so, what that number will mean to us at the dragstrip.
After installing the LED, Dalke slid the instrument cluster cover and lens back in place, replaced the Torx bolts and ran the wiring out the bottom of the instrument cluster toward the main dash harness. 15. The plan was to inject the methanol in two places: a small shot prior to the supercharger and a larger shot in the lower ducting between the intercooler and the engine. Start to remove the upper ducting by unbolting it from the intercooler. 16. A large collared nut secures the ducting to the supercharger. If you don’t have the correct tool to remove it, contact Supercoupe Performance (513/697-6501). 17. You’ll need to remove the intercooler, too, so remove the lower intercooler mounting bolt, as seen in this photo. 18. Remove the intercooler itself. Now is as good a time as any to replace it, but to test the effectiveness of the Snow kit alone, we’ll reuse the stock unit for now. 19. There’s a good chance the lower supercharger ducting won’t come out unless you loosen the alternator and power steering pump, so remove the appropriate drive belt (there are three total—no kidding). 20. The alternator, power steering pump and one tensioner are held in place on the same bracket. Loosen this bracket, or remove it if you need even more room. The bolt is hiding behind the tensioner in this photo. 21. Now you should have the necessary room to remove the supercharger-to-intercooler ducting. 22. You’ll need to be careful when selecting where to mount the methanol injection nozzle in this ducting. Make sure it’s someplace where it won’t interfere with the power steering pump. Dalke knew just where to put it to keep it hidden and away from the pump, but you’ll want to measure carefully—you don’t want to have to PATCH this hole! 23. Install the Snow injection nozzle as seen here, again using Amazing Goop as a thread sealer. 24. Reinstall the lower ducting and the alternator/power steering bracket. 25. Install the upper supercharger ducting and the intercooler by reversing the removal procedure.
26. Since this car has a Magnum Powers intake plenum, we can use one of our unused parts at the rear of the plenum to inject an initial shot of methanol. Remove the windshield wiper and cowl panel and then install another injection nozzle in the plenum. 27. This shot illustrates just how hard it is to see the methanol lines hidden behind other engine components. Before finishing, though, Dallke hid the lines even more by slipping them into black split loom. 28. Reinstall any of the drive belts you removed. 29. Space under the hood is at a premium, so the best place to install the Snow pump is inside the bumper cover ahead of the right front tire—the will also keep the pump hidden. To access that area, remove the bolts that hold the plastic fender liner in place. 30. The inner bumper makes the best place to mount the pump. Dallke drilled four mounting holes and installed the pump using sheetmetal screws. Don’t forget to use the supplied rubber grommets to isolate the pump from vibrations. 31. Running the methanol lines is easy since the Snow kit uses simple push-fit connectors. 32. Follow the kit’s instructions when it comes to wiring and running your methanol lines. In our case, the pump draws from the reservoir in front of the radiator and pumps to the twin nozzles in the supercharger inlet and intercooler ducting. 33. The installation is done, and thanks to Dallke’s stealthy installation, no one will ever know the kit is there unless we tell them.
35. Magnum Powers’ MPx case only looks like the original to the untrained eye. Those who know what to look for can spot the revised intake and exit ports as well as the large reinforcing rib that runs the length of the assembly. But when it’s installed, only a true expert will be able to spot it.

34. Baseline dyno testing showed the car produced 278 hp and 357 lb-ft of torque at the wheels. Activating the Snow alcohol injection system got us up to 292 hp and 363 lb-ft of torque at the wheels for a net gain of 14 hp and 6 lb-ft of torque. Be aware that the true value of the Snow kit, though, will really become apparent when we replace the supercharger and generate more heat and boost. 36. This is the revised intake port on the MPx case. This opening is much larger than that found on a standard M90, allowing for greater airflow and increased supercharger duration. 37. Loosen the jackshaft pulley now before you remove the drive belts. 38. Remove the crank pulleys. 39. Disconnect the upper intercooler pipe from the intercooler and remove it. 40. Since we showed you how to remove the supercharger assembly in the December '06 Ford Builder, we’ll skip that portion of this disassembly and show only those steps relevant to installing the new MPx case and other supporting parts.
Saved 62¢ Per Gallon*
Gained 115 HP

“I’ve had two Edge tuners. But their tuners wouldn’t let me tow at the highest power levels. From my research, Hypertech would with Stage 3. Hypertech offered more power and performance than the other tuning companies, and I got 4 more mpg. I’m a farmer and I tow all kinds of farm equipment. The power I get from Hypertech is awesome. I can’t do without Hypertech.”

Robert Walker
2006 Ford F250 6.0L Power Stroke

41. Unbolt the fuel rails from the intake manifold and remove the fuel injectors.
42. During our last dyno test, our stock 36-pound injectors (top) were well above 90 percent of their duty cycle. Dalke opted to replace them with 60-pound injectors (bottom) that will be more than enough to support over 400 RWHP.
43. The stock, ported M90 and Magnum Powers inlet are on the left; the MPx pieces are on the right.
44. Remove the hose barbs from the rear of the old plenum and transfer them to the new plenum. Dalke used Amazing Goop to seal the methanol injector nozzle to the plenum and liquid Teflon tape for the hose barbs.

* Based on $1.20 per gallon. Actual savings depend on fuel cost, total vehicle weight, and terrain.
45. When bolting the supercharger top to the supercharger, it’s important to use an anaerobic sealer instead of regular RTV silicone. The anaerobic stuff forms a thinner, more durable seal that actually strengthens the assembly of the individual pieces. 46. Bolt your throttle body (ours is an 85mm Magnum Powers piece) to the MPX inlet. As with the supercharger top, use an anaerobic gasket maker. 47. The MPX will bolt in place just like the stock unit, but be sure to use the two longer side bolts supplied with the kit. 48. Magnum Powers’ cold-air kit bolts in place of the stock airbox and draws air from inside the hood. Made from three steel plates cut and bent to shape, the kit effectively isolates the air filter from engine heat once the hood is closed. 49. The stock mass airflow meter (left) would never be able to keep up with the MPX, so Dalke selected a C+L 80mm piece (right). It’s larger in diameter, and it lacks the bridge present in the stock piece, giving it even more flow. 50. We were able to reuse our air filter, and Dalke reassembled the intake tract, including the new C+L MAF. 51. Dalke removed the intercooler as he did for the alcohol install, but this time the stock piece is gone for good. 52. He also pulled the rubber boot that seals to the intercooler, removing the plastic push fasteners. 53. The best time to replace the pulleys is while the intercooler is out of the car. At top are the new silver crankshaft and jackshaft pulleys from Magnum Powers, and a stock water pump pulley. Below are the stock crank and jackshaft pulleys and an under-drive water pump pulley that won’t work with our new setup. 54. The new pulleys install surprisingly easily, and you won’t need to remove the radiator from the car to get them in, or to get an air ratchet on them. 55. Given the amount of boost we planned to run, belt slippage is a concern. Fortunately, Magnum Powers makes stronger tensioner springs. To install them, first remove the belt tensioners. 56. Place the tensioner in a vise as shown and remove the pulley.
To install the new tensioner springs, Dalke pried the tensioner’s top plate off. Popping the top plate off will cause the tensioner’s internals to fall, as seen here. You’ll need to reuse everything except the original spring, so don’t lose anything. The stock spring is on the right and the new spring is on the left. Each has about the same number of winds, but the new spring’s winds are closer together and the spring is stiffer than the original. The new spring wire is slightly larger in diameter than the original, so Dalke used a rotary tool to enlarge the tensioner’s slot for the spring’s end. Dalke also removed some material from the tensioner to increase its range of travel in order to better fit the pulleys and belts. Hammer the tensioner’s top plate flat again. Assemble the tensioner as shown, placing the spring and through the hole in the bottom of the tensioner assembly. You’ll need a friend to help you assemble the tensioner. You have to fully compress the spring by prying on the tensioner and then hammer the top plate back in place. Dalke says it’s possible to do it alone, but that it’s much more difficult. In addition to all the other new parts, Dalke installed a set of Autolite 3993 spark plugs. Seen here in a spare head, the 3993 is one heat range cooler than the stock plugs and utilizes a gasket-type seat (SC heads can accommodate gasket or tapered-seat plugs). With everything else done, it was time to install the new intercooler (top). There’s just no comparison between this new unit and the original (bottom). It’s twice as thick, and with a puller fan for cooling, but it’s not any wider and won’t block air going to the radiator. Use a copper gasket maker to seal the intercooler tubes to the intercooler and reinstall the upper intercooler tube. The installation is now complete. Aside from the bigger intercooler, new cold-air divider and a few very subtle clues on the MPX case, this engine bay still looks very stock.
Back at Twisted Innovations (440/474-2059), the new MPx kit, its support components and the double intercooler raised our numbers from 292 hp and 363 lb-ft of torque to 310 hp and 418 lb-ft of torque at the wheels. Those numbers translate to increases of 18 hp and 55 lb-ft of torque at their respective peaks, but the MPx also lowered the rpm at which peak horsepower occurs, making it more useful. Furthermore, our power increases under the curve (that is, at all areas below the peaks) were even more impressive; we gained 43 hp and 67 lb-ft of torque at 3,100 rpm. As Dalke predicted, our power was down a bit below 2,600 rpm, but after that the MPx really started to shine.

After testing the effect of the MPx system, we decided to revisit our Snow methanol injection kit by testing its effect on the MPx. Without the methanol, the SC could only throw down 292 hp and 405 lb-ft of torque, so the methanol was good for 19 peak hp and 13 peak lb-ft of torque. However, the dyno again indicated more impressive numbers under the curve—at 5,000 rpm, the methanol gave us 40 hp and 40 lb-ft of torque.