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TURBOCHARGING, SUPERCHARGING, AND NITROUS

If you feel intimidated by the technical aspects of forced induction, you're not alone. I've tried to read technical articles and books, but it seems that the more I read, the more I realize how much I don't know. But, if you keep in mind that your Neon's engine is just a fancy air pump, you're on your way to understanding how turbos and superchargers work.

In a standard intake system, air enters (or is drawn into) the engine through the intake manifold. If there's a cold-air or ram-air intake in place, the air entering the intake manifold will be cooler and have less turbulence. The effect is usually slightly increased horsepower. A forced-induction system takes this theory a lot further. Simply stated, turbocharging and supercharging are just more effective ways of getting air into the intake manifold.

So, what's the big deal about forced induction? Well, with a naturally aspirated engine, you rely on atmospheric pressure to fill your cylinders with air. With forced induction, the air is compressed and crammed into the combustion chambers at a higher rate than the atmosphere would force it in. This is measured in psi, usually called boost. In unscientific terms, you're able to fit more air in



Turbo systems are very popular additions to normally aspirated Neons. Various configurations are available, and you can use an air-to-water intercooler (shown) or an air-to-air unit (like the one that comes on the SRT-4).

the cylinder (actually it's just more dense). When you add extra fuel to go with the extra air, you get extra power.

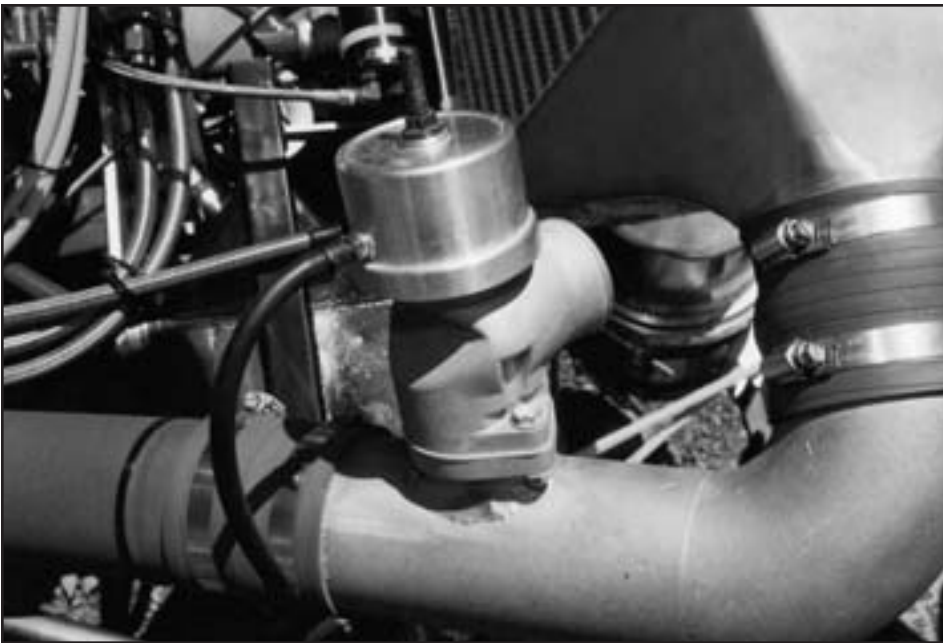
Turbocharging

So how does a turbocharger go about compressing air? In a turbocharged

engine, the turbocharger is positioned in the exhaust, just after the header or exhaust manifold. As the exhaust gasses are forced out of the engine, the hot gasses are pushed through the turbocharger. The gasses spin the turbine wheel before flowing out through the exhaust. The turbine wheel is connected



Mounting a wastegate can be a bit of a challenge. You have to make sure that it's adjusted properly so that the valve is fully closed (no leakage) when the system is under boost.



A blow-off or pop-off valve makes a distinctive noise during upshifts, which is why so many turbo enthusiasts like them. But they also serve a valuable purpose: Keeping the boost up during shifts.

to a compressor wheel, so when the turbine wheel spins, so does the compressor wheel. The spinning compressor wheel forces the air into the intake, compressing it and building boost.

The size of the turbo and the speed at which the turbo spins work together to determine how much boost is

made. Are you already worrying about how much boost is too much? Well, that depends on your engine. The more boost, the more horsepower – period. To what point? The point where your engine blows up. The more your engine can take, the higher the horsepower.

Since you don't want your engine to blow up, you have to somehow control how much boost is made. This is where the wastegate comes in. A wastegate is a relatively simple device that bypasses some exhaust flow around the turbine section of the turbocharger to limit boost. Under normal conditions, the wastegate is held shut by a spring inside the unit. It controls the amount of boost your turbo develops by opening when the turbo spools up and builds a certain amount of boost, thereby releasing the extra pressure. The basic turbos that you'll find in most kits have the wastegate built into the exhaust housing. On more advanced setups that require more exhaust to be bypassed, the wastegate is mounted to the exhaust manifold or header separate from the turbo.

Don't confuse a wastegate with a blow-off valve. When your engine is at full boost, you have a lot of compressed air traveling through the throttle body. When you shift gears or otherwise let off the gas, the throttle body snaps closed, and all that air will have no place to go. If there were no way of relieving this pressure, it would either back up in the system and damage the turbo, or blow out through the weakest link in the turbo system (hoses). The blow-off valve is located in the intercooler piping between the intercooler and the throttle body. Having a blow-off valve takes pressure off of the turbine wheel, allowing it to keep spinning as you shift through the gears, reducing turbo lag.

You can also control the amount of boost with a boost controller. By installing a boost controller, you can increase boost pressure to the threshold of your turbo's capacity, or decrease it to the threshold of your wallet. A blown engine will cost a lot of cash, so I let my wallet dictate how I set the boost controller. This is where a boost gauge comes in handy. You may have set your controller at 10 psi, but a boost gauge can tell you if you're getting more (or less) than you expect. Of course, an SRT-4 already has a gauge. Most boost controllers are fairly accurate, but it's nice to be able to check. Mechanical boost controllers are more affordable, but electronic boost controllers are easier to deal with.