

Turbochargers vs superchargers essay



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A turbocharger is defined as a centrifugal blower driven by exhaust gas turbines and used to supercharge an engine. (Merriam-Webster Dictionary)

Turbochargers compress the air flow into the engine. One of the advantages of the air being compressed is that more air is being squeezed into the cylinder, more air in the cylinder means that more fuel can be added. It achieves the boost by using the exhaust flow from the exhaust to spin a turbine, which spins an air pump. The turbine spins at speeds up to 150, 000 RPM, that's about 30 times faster than most engines can go.

The typical boost provided by a turbocharger is 6 to 8 psi. (<http://auto.howstuffworks.com/turbo2.htm>) A supercharger can be defined as a device such as a blower or compressor for pressurizing the cabin of an airplane or for increasing the volume air charge of an internal combustion engine over that which would normally be drawn in through the pumping action of the pistons. (Merriam-Webster's Dictionary) A supercharger is any device that pressurizes the air intake to above atmospheric pressure.

Superchargers are powered mechanically by belt or chain drive from the engine crankshaft. Most are driven by an accessory belt that wraps around a pulley that connects to a drive gear. The drive gear rotates the compressor gear. The compressor gear squeezes air into a smaller space and discharges it into the intake manifold. Supercharging adds an average of 46% more horsepower and 31% more torque. Superchargers spin at speeds as high as 50, 000 to 60, 000 RPM.

A compressor spinning at 50, 000 RPM produces a boost of about 6 to 9 psi. (<http://auto.howstuffworks.com/supercharger1.htm>) Since a turbocharger is

driven by exhaust gasses, its turbine must spool up before it begins to turn the compressor's impeller. During this time the turbo is creating no boost. Turbochargers utilize a wastegate to reduce lag while preventing it from spinning up too quickly. The wastegate is a valve that allows the exhaust to bypass the turbine blades. The wastegate sense boost pressure, if it gets too high, it can be an indicator that the turbine is spinning too fast and it will bypass the exhaust around the turbine blades, causing the blades to slow down.

A supercharger connects directly to the crank so there is no lag. It produces boost at a low RPM. A turbocharger is more economical because it is driven by the potential energy in the exhaust gasses that would usually go out the exhaust pipe. The turbo's impeller is powered only under boost conditions so there is less parasitic drag while it is not spinning. Turbochargers do create exhaust backpressure and additional exhaust flow interruption.

Superchargers are a bit more reliable than turbochargers. When an engine with a turbo is shut off, oil inside the turbo's bearings can be baked by the heat of the engine.

This problem combined with high RPM's (up to 150, 000) can cause problems with internal bearings and shorten the life of the turbocharger. Turbochargers also require aftermarket exhaust manifolds. Superchargers require few fuel and ignition upgrades and normally require little or no engine tuning which make it a better method of forced induction for street and race vehicles. They also provide a much broader powerband that has no lag. It is much easier to install and tune, so it makes it more practical for an everyday mechanic to install on their vehicle.

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