

+ Wastegates and Blow Off Valves + Explained Correctly and in Detail

What a Wastegate Does

A turbocharger is driven by exhaust gas. The more exhaust energy you send through the turbine, the faster the turbo spins. The wastegate controls this by diverting exhaust flow away from the turbine once a target boost pressure is reached.

In simple terms:

More exhaust sent to the turbine = more boost

Less exhaust to the turbine = less boost

When the wastegate opens and “bleeds off” excess exhaust energy, it lowers the boost.

Main Benefits of a Wastegate and Why You Need It - Boost Control

This is the primary purpose. The wastegate limits maximum boost pressure, stabilizes boost and prevents dangerous over boost conditions. Without it, boost would climb uncontrollably with RPM and load.

Engine Protection

A properly functioning wastegate protects the engine from detonation, excessive cylinder pressure, lean conditions, overheating and catastrophic failure. Too much boost can destroy an engine very quickly.

Turbocharger Protection

The wastegate also prevents turbo overspeed. Turbochargers can spin upwards of 100,000–200,000+ RPM. Exceeding safe shaft speed can damage bearings, crack turbine wheels and destroy compressor wheels.

Improved Power Management

A wastegate allows tuners to precisely control boost curves, shape torque delivery, improve traction and improve drivability. This becomes extremely important in drag racing, road racing and high-horsepower street cars.

Better Efficiency

A properly sized wastegate is an efficient wastegate. This setup helps reduce pumping losses, stabilizes turbine speed and improves thermal management. That translates into more repeatable power, better reliability as well as lower stress on components.

Internal vs External Wastegates

The Internal Wastegate Design

Built into the turbocharger housing.

Benefits: Compact, less expensive (in some cases), quieter and OEM friendly.

Drawbacks: Limited flow capacity and less precise control at higher power levels.

Commonly found on: Factory turbocharged cars and entry level low to moderate horsepower builds.

The External Wastegate Design

Separate valve mounted on exhaust manifold or turbo piping.

Benefits: Far superior boost control, higher flow capability, better high-RPM control and ideal for big horsepower.

Drawbacks: Louder. There really are no drawbacks short of packaging and a bit more sound. It's just the price we pay for more power 😊.

These are common in: Racing, high-performance forced induction systems and serious aftermarket builds.

Why External Wastegates Matter on Big Builds

As horsepower increases, exhaust flow increases dramatically. A small internal gate may not bypass enough exhaust gas, causing boost creep, unstable boost and the danger of over boost. An external wastegate solves this with greater bypass capacity.

The “Wastegate Sound”

The screaming sound people hear on race cars often comes from an external wastegate dumping exhaust directly into the atmosphere through a screamer pipe. That sound is basically: “Excess exhaust energy being bypassed.”

Here is a simple analogy. Think of the turbocharger as a water wheel, while the exhaust gases would be a river current. The wastegate is like the floodgate controlling how much water hits the wheel. Too much water and the wheel over speeds and breaks. The wastegate keeps everything under control. A properly designed wastegate system is one of the biggest differences between a reliable turbo setup and a hand grenade with spark plugs.

What is a Blow Off Valve (BOV) and What Does it Do?

A blow-off valve (BOV) is one of the most important supporting components on any forced induction engine. Its main job is simple: Protect the turbocharger/supercharger and maintain responsiveness when you suddenly lift off the throttle.

Here's what actually happens. Under boost, the turbocharger/supercharger is compressing air and forcing it into the engine. The moment you let off the gas, to shift or slow down, the throttle blade closes instantly. However, the turbocharger/supercharger is still spinning at extremely high RPM and still trying to push air forward. Without a BOV, that compressed air has nowhere to go. The pressure wave slams backward against the compressor wheel of the forced induction device. This is called compressor surge. A BOV, like the Granatelli Motor Sports 50mm Viper or 64mm Anaconda opens during throttle lift and vents that excess pressure either into the atmosphere (“pssssh” sound), or back into the intake system (recirculating/diverter valve/bypass style). The main benefit is Turbocharger/Supercharger (blower) impeller protection. It is also the biggest reason why you must have a properly sized BOV.

A BOV reduces compressor surge, which decreases stress on the turbo/blower bearings, reduces shaft shock on all forced induction devices and helps prevent premature turbo/blower wear or damage. In the case of a turbo spinning 100,000+ RPM, it does not like pressure reversing direction against it. The same can be said for the centrifugal style supercharger because it is belt driven, meaning when you lift off the peddle at high RPMs, the supercharger impeller is still spinning at near maximum speed and has no way to slow down until the engine slows down and that creates compressor surge without the use of a BOV.

Faster Turbo Response Between Shifts

When the valve vents pressure, in turbo applications, the turbo can keep spinning more freely. That means quicker spool time after gear changes, less lag and smoother power delivery. On performance focused cars, especially manual transmissions, it is crucial and the most noticeable.

Improved Drivability

Without a BOV, some forced induction cars can feel jerky or unstable during throttle transitions. A properly sized BOV smooths lite-throttle behavior, part-throttle drivability and shift recovery.

Reduced Compressor Surge Noise

Compressor surge sounds like fluttering or chirping. Some even call it “turkey gobble.” Some people think that sound is desirable, but excessive surge is mechanically abusive over time.

Helps Maintain Turbocharger & Supercharger Efficiency

Keeping airflow controlled helps the turbo/blower remain in a more stable operating range instead of repeatedly stalling airflow. Now here’s the important nuance many people miss, not all “flutter” is catastrophic. A mild amount on certain setups may not immediately hurt anything. Some racers intentionally tune for aggressive sounds. However, sustained compressor surge absolutely increases stress and reduces long-term reliability.

There are generally two main types of valves. An Atmospheric BOV, like the Granatelli Motor Sports 50mm Viper and 64mm Anaconda BOVs. They vent air to the atmosphere. They’re famous for the loud “whoosh” sound they make. Popular in aftermarket performance builds, it can cause a rich condition on (MAF) Mass Airflow-based cars if not tuned correctly. That is why, in most cases, MAF cars require a Recirculating (Diverter) Valve. This design routes air back into intake of the forced induction device. They are quieter as well and OEM preferred. In MAF cars they offer far better drivability and emissions compliance. There are many aftermarket companies that make retrofit atmospheric BOVs to convert factory diverter style BOVs to open air, all in the search of the “whoosh”.

For modern street cars, especially MAF-based systems, recirculating valves are usually the smarter engineering solution unless the tune is designed around atmospheric venting. A properly engineered BOV setup is less about noise and more about blower longevity, transient response, airflow stability and overall efficiency. The sound is just a cool side effect everybody recognizes.

Is there a benefit to running a Cold Side Pressure Relief Valve like the Granatelli Motor Sports Anaconda on a Centrifugal Supercharger application?

Yes — There can absolutely be benefits to using the Granatelli Motor Sport Anaconda, Cold Side Pressure Relief Valve to ramp boost sooner, especially in Centrifugal Supercharger applications. However, the answer depends heavily on how the system is engineered. This is where a lot of people can get confused by terminology:

Turbo wastegates, bypass valves, blow-off valves (BOVs) and boost control on belt-driven superchargers explained.

Now we are going to talk more tech. A centrifugal supercharger behaves very differently than a turbocharger. A turbo is exhaust-driven, so a wastegate controls turbine speed by diverting exhaust energy, whereas a centrifugal supercharger is mechanically driven by the crankshaft traditionally through a belt. That means the impeller speed is tied directly to engine RPM, producing a very linier boost curve. Low RPM equals low boost and high RPM equals peak boost. But what if there was a way to make a centrifugal supercharger act more like a turbo? Read on! You cannot “slow down” a centrifugal supercharger impeller like a wastegate can control a turbocharger impeller. The blower is going to spin because the crankshaft is physically forcing it to spin. That means in the past you could only get maximum boost at maximum shift RPM. The Granatelli Anaconda allows you to speed up the pulley ratio of your centrifugal supercharger to make peak boost much lower in the engine RPM range yet still limit over boost to the engine for safety. This is the major benefit to the Anaconda; it controls over boosting.

Most lower boost centrifugal supercharger systems using factory Mass Airflow Sensors (MAF) use bypass valves, compressor bypass systems, or boost relief valves. These function similarly to a BOV in some ways.

They allow excessive compressed air to bypass the engine under certain conditions while still being monitored by the MAF. The main benefit of Bypass Control on a Centrifugal Supercharger includes reducing airflow sound at cruise and diminished parasitic load during at a single constant engine RPM. This is one of the biggest advantages in “low boost”, “street applications”. When you’re cruising or under light throttle, the blower is still spinning, still compressing air and still consuming horsepower. A BOV or bypass valve allows the compressed air to vent or recirculate instead of stacking pressure against a closed throttle.

More Benefits of an Atmospheric Venting BOV:

Lower intake temps,
Reduced blower load,
Improved fuel economy,
Smoother drivability.

This is why Vortech, Paxton, ProCharger and OEM supercharged applications use bypass style systems. Without an improved throttle transition with a bypass system or BOV, pressure stacks instantly when the throttle closes, airflow becomes turbulent and drivability suffers. Bypass systems and BOVs smooth out shifts, throttle modulation and deceleration behavior. The general rule in centrifugal boosted street applications under 12psi, while using a factory MAF system is, use a Bypass system BOV that vents the air back into the “feed” side airstream. It is emissions complaint. Otherwise, larger, more efficient atmospheric style BOVs are king

Compressor Surge Protection

Yes — centrifugal blowers can experience compressor surge as well. Especially high-boost applications combined with large impeller units, then a sudden throttle closure and that is why a properly sized BOV is essential. Better belt life is an underrated benefit as well. When boost pressure has nowhere to go compressor load spikes, impeller resistance increases and belt shock increases. A BOV of any configuration can reduce belt slip, belt whip and tensioner spikes.

Can you use a TRUE turbocharger style wastegate instead of the Anaconda?

Technically yes — but usually not in the traditional turbo sense. In today’s racing world, some advanced race systems now use boost dump valves, manifold relief valves, electronically controlled bypass systems or air-bleed strategies. The Anaconda 64mm BOV also offers the ability to vent cold side pressure by way of its pressure port on the piston side of the diaphragm. This feature now allows you to “cap boost”, flatten boost curves, improve traction and reduce top-end boost runaway.

Many high-performance street cars and racers intentionally want to bleed off boost in upper RPM ranges to stabilize power, improve ET consistency and reduce engine stress.

Why This Isn’t Common on Street Cars

Entry level streetcars configured with centrifugal kits are generally designed around pulley ratios, impeller sizing, closed loop BOVs and tuning. That’s usually sufficient. Adding true active boost control increases complexity, adds tuning challenges and can create airflow instability if poorly engineered. The Granatelli Motor Sports Anaconda makes that a thing of the past. Said again, the base can be boost referenced to blow open at your desired peak boost and stay there. This feature allows the end user to speed up the centrifugal supercharger impeller speed to make peak boost much sooner in the engine RPM curve while still preventing undesired over pressurization.

Real-World Example

On a 1,200+ HP centrifugal drag setup, boost may climb uncontrollably at high RPM, traction may disappear, belt efficiency changes and intake temps skyrocket. A controlled boost dump from the Anaconda can flatten the curve, improve consistency and save the engine.

Bottom Line

A traditional turbo-style wastegate does not directly control centrifugal supercharger shaft speed because the blower is mechanically linked to the engine. The Anaconda allows for the venting of over boost via the cold side pressure relief valve system and advanced air-control strategy. This absolutely provides a major benefit in overall horsepower and high-horsepower boost control.

On serious centrifugal race combinations, intelligent boost management can be the difference between: usable power and a dyno queen that annihilates belts and tires.

A wastegate is absolutely critical to a turbocharged engine because it controls boost pressure. Combined with a blow-off valve it protects the turbo during throttle lift, the wastegate controls the turbo while you're in the throttle and the BOV controls it when you are out of the throttle. Without a wastegate, a turbocharger would continue accelerating as exhaust flow increases until boost skyrockets, detonation occurs, head gaskets fail, pistons melt, or the turbo over speeds and destroys itself. The wastegate is essentially the turbo system's pressure regulator, While the Anaconda is now the pressure (boost) regulator for the centrifugal when you want to exploit its maximum potential.

Granatelli Motor Sports offers a complete line of high performance Wastegates, in both Piston Style and Diaphragm as well as Blow Off Valves.

Part #540261: **Granatelli Motor Sports, 44mm Wastegate – Piston Actuated**

Part #540203: **Granatelli Motor Sports, 50mm Wastegate – Piston Actuated**

Part #540260: **Granatelli Motor Sports, 60mm Wastegate – Piston Actuated**

Part #540244: **Granatelli Motor Sports, 44mm Wastegate – Diaphragm Design, Water Cooled**

Part #540202: **Granatelli Motor Sports, 50mm Wastegate – Diaphragm Design, Water Cooled**

Part #540259: **Granatelli Motor Sports, 60mm Wastegate – Diaphragm Design, Water Cooled**

Part #540198: **Granatelli Motor Sports, 50mm “Viper”** Ultra High Flow Blow Off Valve, Atmospheric Discharge

Part #540199: **Granatelli Motor Sports, 64mm “Anaconda”** Blow Off Valve, Atmospheric Discharge

Part #540200: **Granatelli Motor Sports, 50mm Mini Flow,** Blow Off Valve, Atmospheric Discharge

Part #540201: **Granatelli Motor Sports, 50mm High Flow,** Blow Off Valve, Atmospheric Discharge