Performance Exhaust Systems

This article discusses the benefits of installing a performance exhaust system.

CorkSport Mazdaspeed 3 Exhaust

Performance Exhausts

The purpose of the exhaust system on your car is to get the exhaust gases away from the engine and discharge them away from the car. Stock exhaust systems are engineered to be quiet. As a result, they usually restrict exhaust flow enough to cause a loss in power. The primary benefit of a performance exhaust is to recover this lost power but there are several other benefits.

Power

The improved flow from a well designed performance exhaust system allows exhaust to exit the engine faster and with less restriction. The restrictions that develop in the stock exhaust cause pressure build-up in the exhaust piping. This is referred to as 'back pressure'.

It is important to recognize that exhaust requirements are different depending if your car is turbo charged or naturally aspirated. On a turbocharged engine you want minimal back pressure. Generally, this means the larger piping and less exhaust restriction the better.

However, some back pressure is desired on a non-turbo engine. This is because of the scavenging effect. Scavenging is utilizing the momentum of the exhaust gas from the combustion chamber to help expel the exhaust gas and draw in fresh air. So by reducing backpressure, some amounts of raw fuel (and fresh air) will be "scavenged" into the exhaust system.

A turbocharged vehicle is relatively quiet because the turbo helps to muffle the sound. A non-turbo engine is usually much louder and thus requires more muffling.

What this all boils down to is that the muffler size and pipe diameters will be different between a turbo and non-turbo engine.

For example, consider the turbocharged Mazdaspeed 3.

2007 Mazdaspeed 3

A performance exhaust allows the turbocharger to spin easier because of the reduction in back pressure. This in turn allows the turbo to build boost faster and generate more boost. This produces a performance increase you can really feel. The CorkSport Mazdaspeed 3 exhaust system shows a peak gain of 19 hp at the wheels.

Even a non-turbo car will get a power boost from a well designed exhaust system. For instance, Mazda 3 showed an average gain of 7.5 hp and a peak gain of 12.2 hp at the wheels from installation of a CorkSport exhaust system.

Sound

You might have heard the term 'tuned' exhaust. This term is sometimes used for an exhaust tuned for power and other times for an exhaust tuned for sound. The trade-off between sound level and exhaust flow has been discussed but you must also consider resonation. A tuned exhaust has been built to minimize resonation.

Performance Exhaust Systems

Resonation can occur even when the exhaust is not very loud. In most cars it happens at lower engine speeds with heavy load. For instance, cruising up a steep hill in fourth gear can produce a mind-bending vibration in some cars if not accounted for.

Stock exhausts have very little resonation, if any, because the manufacturer has tuned the exhaust to eliminate it. However, this usually comes at the expense of some power.

A properly tuned exhaust system will give you an acceptable sound level, minimal resonation and it should be quiet enough that you can hold a conversation while driving down the road!

Style

The exhaust system has a big impact on the style of your car. Polished stainless steel piping looks awesome and lets people know you only buy the best for your ride.

The exhaust tip is the most visible part of the exhaust system. This is all most people see, so it should be great looking.

Exhaust Design

So, you've decided a performance exhaust might be a good fit for you. What should you look for in a quality exhaust?

Mufflers

The first thing that comes to mind when most people think exhaust is the muffler. Stock exhaust systems usually use at least one diversion type muffler. These mufflers use fiberglass packing and make the exhaust flow through bends inside the muffler. These bends cause the exhaust to slow and spend more time in the muffler. This is effective to quiet the sound of the exhaust but it doesn't help performance. A diversion type muffler is pictured below.

Reconsider our example car, the stock Mazdaspeed 3, its' exhaust system has 3 mufflers. Two of the mufflers are a diversion type muffler and the other is a bullet shaped resonator.

One style of performance muffler uses a straight through design with a perforated core that allows exhaust gas to pass through easily and does a decent job of muffling. Straight through mufflers are usually louder than diversion mufflers. Sometimes several straight through mufflers are used to achieve desired sound levels. The picture below shows a straight through muffler.

Materials

Believe it or not, the materials used to construct an exhaust system play a factor in determining how well the system performs.

Stock exhaust systems on newer cars often use a low-grade stainless steel (T202). This metal is cost effective for the OEM (in this case, Mazda) but does not come without compromise. A higher grade metal will last longer and sound different.

Performance Exhaust Systems

T304 stainless steel has become popular choice for performance exhausts. Its ability to retain heat, offer superior strength and improved corrosion resistance make it an obvious upgrade over a stock exhaust.

Pipe Bends

The type of bender used to construct the exhaust is also very important. Stock exhaust systems use piping that is put though a pipe bender, which "crushes" the pipe at the bend and restricts exhaust flow.

Pinch Bent Piping

Better flow is obtained with mandrel bent piping. This gives the pipe a smooth bend.

Mandrel Bent Piping

Quality performance exhausts use only mandrel bent piping.

Welds

Good strong welds are very important in your exhaust system. There are various types of welds used for exhaust systems. TIG (Tungsten inert gas) welding is high quality because impurities are minimized during the welding process. MIG (Metal inert gas) welding is used by the OEM and some aftermarket companies since it is a faster (cheaper) method for welding but it does not look as good and is not as strong (more impurities in weld).

TIG welded Exhaust

Fitment

It is important that the exhaust system fit your car right. Factory exhaust mounts should be retained whenever possible. A quality aftermarket exhaust will "bolt-in". It is important to purchase an exhaust system made by a manufacturer that knows your car (Mazda) to ensure a proper fitment.

Installation Instructions

A quality product is more than just the product itself. A performance exhaust should come with complete installation instructions specific to your car. All additional hardware necessary for installation should come with the exhaust. And lastly, technical support should be available should you need it.

Summary

This article explained the benefits of installing a quality performance exhaust system. Key features were identified to help the reader make an educated choice for their next performance exhaust purchase.

Happy Motoring!

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