

TECHNICAL TIPS – “Wench With A Wrench”

By Gail Wagner – Midstate Miata Club of NY

Hello, Miata Members,

Is spring here or not? I hope it makes up its mind soon as my poor *Scarlet* sits undriven in my driveway under cover for the past two weeks. ☺

The Catalytic Converter – What Is It and What Does It Do ?

(And Why You Should Care)

Recently, one of our members had an incident with his catalytic converter and I thought it would make an excellent topic for this month’s article. I did some research and found some fascinating information about a small piece of equipment that’s normally out of sight.

An academic definition: A catalytic converter (a “cat”) uses a chamber called a catalyst to change the harmful compounds from an engine’s emissions into safe gases, like steam. It works to split up the unsafe molecules in the gases that a car produces before they get released into the air. Got that? No quiz. ☺

I’m sure we are all old enough to remember when the Federal EPA (Environmental Protection Agency) regulations on exhaust emissions brought about the first cats on most gas or diesel-fueled vehicles to comply as a way to help reduce air pollution in 1975.

A Little History: The first cats were designed in France at the end of the 19th century. By the mid-50’s, research was developed for the gasoline engine on cars and further developed creating the first production cat in 1973, one step ahead of the EPA.

Cats were also partly responsible for the banning of leaded gasoline that damages cats. The EPA began to ban leaded gas in the 1970’s due to health and environmental concerns. By 1975, unleaded gas was universally available. Requiring the removal of lead in gasoline allowed the use of cats to meet the U.S. emissions standards.

Where is it? The cat is located on the underside of a vehicle and looks like a large metal box. There are two pipes coming out of it. (On some newer vehicles, including NC Miatas, a second

cat is located just behind the exhaust manifold). The cat utilizes these two pipes and the catalyst within it during the process of making the gases safe to be expelled.

Gases are brought in from the “input” pipe connected to the engine of a vehicle. These exhaust gases are blown over the catalyst which causes a chemical reaction that breaks apart the pollutants. The less harmful gases now travel through the second pipe, or the “output,” that is connected to a car’s tailpipe.

The catalyst inside a cat is made typically from platinum or a similar metal, such as rhodium or palladium. Gases flow through a ceramic honeycomb structure located within the cat housing design by Corning Glass right here in CNY. The housing is lined with metals that have specific jobs in reducing emissions. There are two main types of catalysts that might be featured in a car:

- **Reduction catalysts:** Help reduce nitrogen oxide pollution by removing oxygen. Nitrogen oxides are broken up into nitrogen and oxygen gases, which on their own are harmless.
- **Oxidation catalysts:** Used to change carbon monoxide into carbon dioxide through an opposite process of adding oxygen.

And Guess What? An Oxygen Sensor! Ever wonder what that was for? An oxygen (O₂) sensor works to tell a car’s electronic control unit (ECU) how much oxygen is found in the exhaust gases. This helps a vehicle run on a more efficient air/fuel ratio, allowing the engine to supply the converter with enough oxygen to complete the oxidation process.

That’s Hot! Cats require a temperature of about 800F to operate efficiently so it has to be placed closed to the engine as possible on the exhaust system beneath the vehicle or one or two smaller cats known as “pre-cats” are placed immediately after the exhaust manifold. This is a reason why you are advised not to park on dry grasses which can cause a fire.

Signs of Catalytic Converter Issues:

- **Declining fuel efficiency:** If a cat becomes clogged, it can reduce the amount of airflow through your engine. To compensate, your engine might start to burn more fuel than usual resulting in a noticeable drop in fuel efficiency.
- **The Infamous Check Warning Light:** Just to confuse things, a check engine light can indicate a range of things. However, there is a diagnostic system on cars manufactured after 1996 that will test the cat. If your converter is malfunctioning, the air-to-fuel ratio sensors might trigger the warning light to come on.
- **Smelling rotten eggs:** The cat might experience internal damage that causes it to have a hard time converting exhaust gases. The result can be a sulfuric “rotten egg” smell.
- **Issues starting the engine:** The exhaust gases in a vehicle have to escape. A clogged cat can’t prevent this from happening as effectively. This can result in increased exhaust pressure and cause your car to sputter or stall.
- **Poor acceleration:** Exhaust gases have to escape somehow. Trapped exhaust and increased pressure from a clogged cat might cause trouble accelerating. You might notice jerking or stalling when you try to do so.

- **Failed emissions test:** NYS requires regular emissions testing on vehicles and if you don't pass the culprit may be the cat. Cars less than 2 years old (2020 and 2021 currently) or older than 25 years old (1996 and older) are exempt from emission testing in yearly NYS inspection).

Theft!! With the external location and the use of valuable precious metals including platinum, palladium and rhodium (currently \$29,000 per oz.!), cats are a big target for thieves these days. The problem is especially common among late-model trucks and SUVs because of high ground clearance and easily removed bolt-on cats but that doesn't exclude our little Miatas, especially those in off-premises winter storage. (Good reason not to jack them up off their tires during storage. Ripe for the "pickins'.) ☹

Welded-on cats can be easily cut off. Pipecutters are often used to quietly remove the cat but other tools such as a portable reciprocating saws can often damage other components of the car such as the entire exhaust system, alternator, wiring or fuel lines so there are dangerous consequences.

Rising metal commodity prices boom during the 2000s led to a significant increase in cat theft and a cat can cost more than \$1,000 to replace on newer vehicles. Luckily for older Miatas 1990-2005 this isn't so much of a problem financially unless further damage was done to the vehicle in the process of removing the cat.

You can take steps to deter theft that include having the cat welded to the car so it's harder to remove, engraving the car's vehicle identification number (VIN) so it's easier to identify as stolen property, spend a few hundred dollars for a special clamp or cage that will make removal far more difficult or invest in a car alarm that is sensitive to the vibration of a cat being sawed off.

Take care of your Miata and it will take care of you!

Gail

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