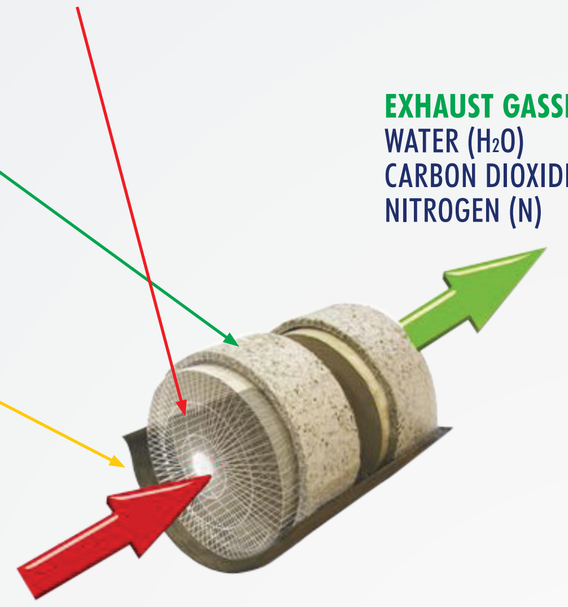
CATALYTIC CONVERTERS (CATS)

WHAT ARE THEY AND HOW DO THEY WORK?

A **Catalytic Converter (Cat)** is an emissions control device that reduces the level of harmful exhaust gasses that enter the atmosphere. It works by converting the harmful exhaust emissions into less harmful ones when the gasses pass through it.

- **Ceramic Monolith** made of a honeycomb structure to allow free air flow and maximum surface area; coated with precious metals to enable the conversion of gasses that pass through it.
- **Interam Matting** to hold the monolith in place. The matting expands when exposed to heat to supply the pressure needed to keep the monolith secure.
- Grade 409 **Stainless Steel can** (or housing) to provide protection and enable the Cat to be built into the exhaust system.



Exhaust gasses containing Carbon Monoxide, Hydrocarbons and Nitrogen Oxides enter the Cat

The gasses pass through the monolith which is coated with a combination of precious metals

A chemical reaction takes place when the Cat is at operating temperature (around 300°C)

Less harmful exhaust gasses leave the Cat – Carbon Dioxide, Nitrogen and Water

EURO EMISSIONS

The table below contains the European Emission Standards for passenger cars; defining the acceptable limits for exhaust emissions of new vehicles sold in EU member states.

Euro Standard	Implementation Date	CO (g/km)	THC (g/km)	NMHC (g/km)	NOx (g/km)	HC+NOx (g/km)	PM (g/km)
Diesel							
Euro I	Jul - 92	2.72 (3.16)	-	-	-	0.97 (1.13)	0.14 (0.18)
Euro II	Jan - 96	1	-	-	-	0.7	0.08
Euro III	Jan - 00	0.64	-	-	0.5	0.56	0.05
Euro IV	Jan - 05	0.5	-	-	0.3	0.3	0.03
Euro V	Sep - 09	0.5	-	-	0.2	0.23	0.01
Euro VI	Sep -14	0.5	-	-	0.1	0.17	0.01
Petrol					-		
Euro I	Jul - 92	2.72 (3.16)	-	-	-	0.97 (1.13)	-
Euro II	Jan - 96	2.2	-	-	-	0.5	-
Euro III	Jan - 00	2.3	0.2	-	0.2	-	-
Euro IV	Jan - 05	1	0.1	-	0.1	-	-
Euro V	Sep - 09	1	0.1	0.068	0.1	-	0.01
Euro VI	Sep - 14	1	0.1	0.068	0.1	-	0.01

UNDERSTANDING EMISSIONS REPORTS

A vehicle will fail an emissions test on either, or all, of the following:

Carbon Monoxide (CO) Levels **Hydrocarbons (HC – unburned fuel)** **Lambda Reading**

CO Failure can mean several things, but is most likely caused by a poorly running vehicle. If a Cat becomes contaminated with unburned fuel, it will become unable to convert the gasses that pass through it. A new Cat running at full capacity will almost certainly lead to an MOT pass, but unless the fault is rectified, the customer will return the next year complaining of the same problem.

HC Failure is an indicator that the vehicle is over-fuelling. A vehicle will fail on this reading if it has HCs in excess of 200ppm. HCs in excess of 60ppm indicates a vehicle problem that needs rectifying as soon as possible.

Lambda Failure means there is a problem with the air:fuel ratio on the vehicle. If the lambda reading is less than 0.97 the vehicle is running too rich. If the lambda reading is greater than 1.03 the vehicle is running too lean.

TOP TIPS ON CARING FOR YOUR CATALYTIC CONVERTER

- Always use the correct fuel, oil and additives for your car.
- Take care when parking on grass – the extreme heat from the Cat could set fire to long grass!
- Take care when driving through deep puddles, fords and when parking on snow – in extreme circumstances the steel can crush the monolith as the Cat cools too rapidly.
- Try to fit a Cat whilst the vehicle is on the ramp, rather than on axle stands.
- When fitting a Cat, hold the part in position and loosely fix it up to the vehicle. If you tighten up one end you may not get the Cat to line up correctly.
- Ensure your vehicle is serviced according to the manufacturer's specifications.

WHAT CAN GO WRONG – WARRANTY PROBLEMS

Catalytic Converters fail for many reasons. In many cases, the failure has little to do with the Cat itself, but instead is the result of another fault within the vehicle. It is important to rectify any problems before a new Cat is fitted. Below is a list of problems related to a vehicle fault, and therefore not covered under a manufacturer's warranty.

EMISSIONS FAILURE

When a vehicle fails an MOT emissions test, the blame is usually placed on the Cat.

The Cat can only convert what gasses pass through it. If the vehicle is running poorly, the Cat will become contaminated with unburned fuel and become unable to convert the gasses efficiently.

If the Cat is replaced without fixing the vehicle fault, it is highly likely it will pass the MOT test; the new Cat is working at its full capacity and will mask any fault.

A telltale sign of a vehicle that has not been repaired is that they will return a year after failing the original MOT having failed the test again.

ENGINE MANAGEMENT LIGHT/FAULT CODES

The Engine Management Light will be triggered on the dashboard if the vehicle's emissions values fall outside the set parameters. The most common fault code relating to the Cat is the "Cat inefficient" code; P0420. It is important to investigate the following faults before condemning the Cat:

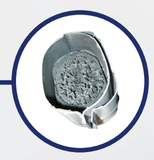
Lambda fault

Air leak in the exhaust system

Retarded spark timing

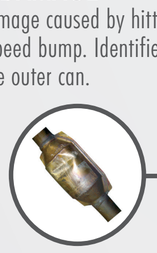
IMPACT DAMAGE

External damage caused by hitting a solid object such as a speed bump. Identified by scratches or dents on the outer can.



MELTED/BROKEN MONOLITH

A monolith is usually broken when it is impacted by an object, or when it suffers a sudden change in temperature. This is identified by blue/purple colourisation of the outer can, or rattling; indicating the monolith has broken up.



POOR FITTING

Over-tightening can cause flanges to crack. Non-usage of spring bolts can cause excessive vibrations, causing the monolith to break up; as can worn gaskets.

OVERHEATING

Overheating is caused mostly by unburned fuel entering the Cat due to an engine misfire. Possible vehicle faults causing this are:
Faulty Spark Plugs
Distributor timing is out
Faulty Lambda Sensor
Faulty fuel injection system
Faulty Map sensor

USE OF EXHAUST PASTE

The use of paste in front of a Cat is an automatic warranty failure. Exhaust paste becomes brittle when dry, and can break off. If the dry paste hits the monolith, it can cause breakages and fractures.

NOISY

Although a Cat does have some silencing qualities, it should not be considered to be a silencer.
Noise can be caused by excessive fuel getting into the Cat.

PLUGGED AND CONTAMINATED

If a Cat becomes 'clogged' or 'contaminated' it will no longer be able to convert any gasses.
This is usually caused by one of the following reasons:
Incorrect fuel Unsuitable fuel additives Engine problems
If the Cat becomes totally blocked, the engine will fail due to the increased back pressure.
Poor engine performance could be an indicator of this.

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