



SELECTIVE CATALYST REDUCTION (SCR)

WHAT IS SELECTIVE CATALYST REDUCTION (SCR)?

Selective Catalyst Reduction (SCR) technology has been around for decades. First introduced by the Japanese in the 1970s, this technology is often found in power plants, marine vessels, and heavy duty vehicles as one of the most cost and fuel effective ways of reducing nitrogen oxide (NO) and nitrogen dioxide (NO_x) emissions.

It is no longer the case that soot particulates are considered to be the 'worst' elements found in diesel vehicle emissions. More recently, research has identified NO_x to potentially cause or exacerbate various respiratory conditions.

Some car manufacturers, such as Mercedes and Volkswagen, have been using SCR technology since around 2004. The technology has since become more commonplace to treat emissions from diesel engines over 1.5L following the introduction of Euro 6 emissions standards in 2015, which cut permitted NO_x emissions by more than 50%.

SCR technology can reduce a vehicle's NO_x emissions by up to 90%, whilst also reducing hydrocarbons (HC), carbon monoxide (CO) and particulate matter emissions.

HOW DOES IT WORK?

SCR technology works by injecting a liquid-reductant agent through a special catalyst into the exhaust stream of the vehicle. This reductant is an automotive grade urea solution comprised of approximately 1/3 ammonia and 2/3 water. It is more commonly referred to as a diesel exhaust fluid (DEF) and it triggers a chemical reaction that converts NO_x into:

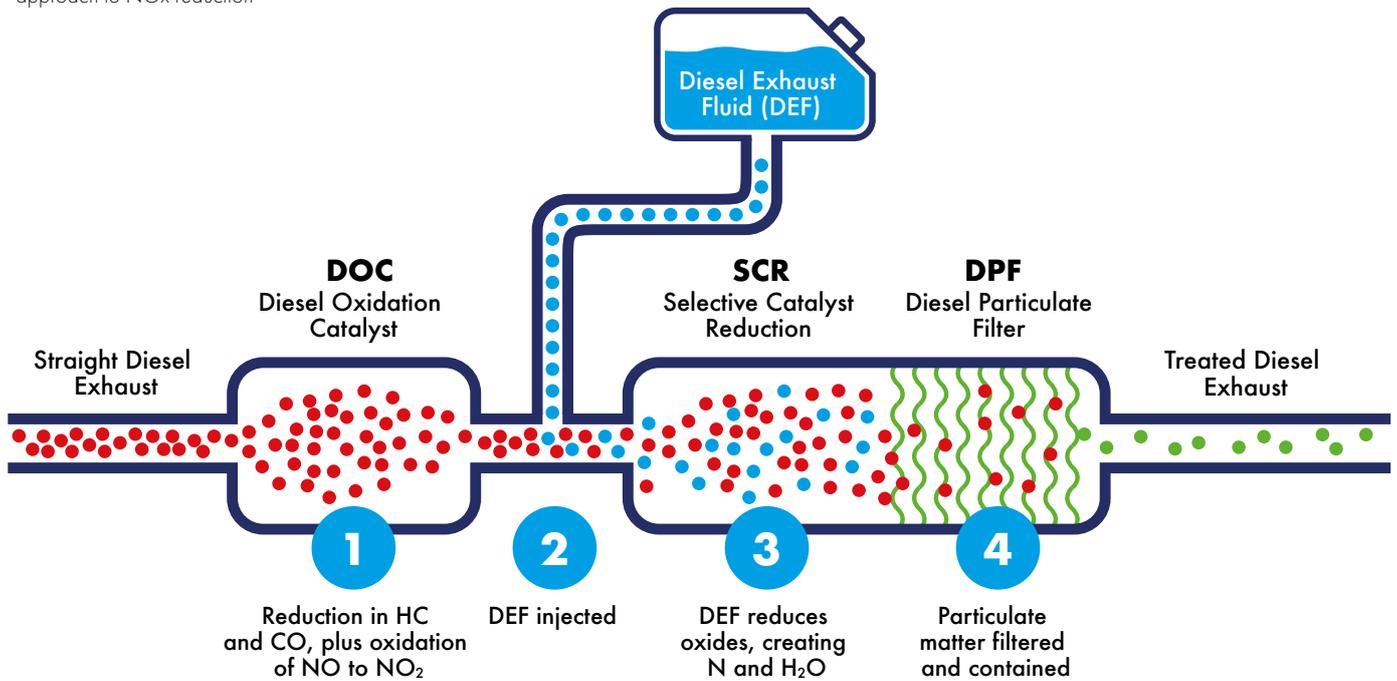
Nitrogen (N)
Carbon dioxide (CO₂)
Water vapour (H₂O)

Ammonia is highly reactive with NO_x in the oxidising atmosphere of the vehicle exhaust. This is where the 'selective' part of the name comes from. The chemical reaction itself is known as 'reduction', hence the name Selective Catalyst Reduction.

EXCEEDING EXPECTATIONS



Not representative of all manufacturers' approach to NOx reduction



WHAT IS IT MADE FROM?

SCR catalyst substrates are typically made from the same ceramic honeycomb material as standard automotive catalysts. They are generally coated with either oxides of base metals such as vanadium, or zeolites of copper or iron.

The advantage of zeolite SCR catalysts is that they have greater thermal durability and can operate at both lower temperatures during start up, and the higher temperatures that typically occur during regeneration. Vanadium can work well in automotive applications but is more commonly found in industrial settings.

Early SCR systems tended to place the urea/DEF injector and SCR catalyst downstream of other emissions control devices. It is now becoming increasingly common to see parts containing both SCR and DPF substrates, or even in some cases a single DPF substrate coated as an SCR catalyst.

It is also quite common to see a final catalyst installed after the SCR catalyst in the exhaust system to remove any

remaining ammonia. This is called an ammonia slip catalyst. Ammonia slip can occur when:

- Excess urea/DEF is injected
- Temperatures are too low for the ammonia to react
- The SCR catalyst has degraded

WHAT IS DEF/ADBLUE?

The most common brand of DEF is AdBlue. DEF is non-hazardous to people and the environment, although it can have a slightly corrosive effect on paintwork, so spillages when filling the DEF tank should be avoided if possible.

The average car will have a relatively small DEF tank of 5-20 litres, and will likely use a litre of fluid every 500-600 miles. This varies according to the vehicle and driving pattern.

It is important to note that DEF must be present at all times for the vehicle to continue to operate. When the fluid level is getting low, the driver will be informed by a series of lights and sounds displayed on the dashboard. Upon empty, or very close to empty, the vehicle will refuse to start again once the engine has been turned off until the DEF is topped-up.

SCR systems can be sensitive to contamination and plugging. Crystallised urea/DEF deposits have been known to build up on the surface of pipework or on the substrates themselves. The fact that the substrates are porous is essential to their operation, but this does mean the pores are easily plugged. This is likely to mean the SCR catalyst will require replacement.

DEF CRYSTALLISATION

- Too much DEF (over-dosing) may not fully hydrolyse, leading to crystallised urea deposits in the exhaust or in the injector nozzle, which will prevent DEF being injected
- Over-dosing can be the result of a partially open DEF injector nozzle, plugged DEF lines or DEF pump issues
- Low temperatures are likely to cause crystallisation as the water in the DEF evaporates, while temperatures over 400°C may also cause crystallisation as the by-products of urea formed after the reaction decompose



EXCEEDING EXPECTATIONS IN EVERYTHING WE DO

As Europe's largest independent manufacturer of catalytic converters, diesel particulate filters (DPFs) and front pipes for the aftermarket, you would expect us to deliver a wide range of quality focussed parts that are easy to order. What you may not expect is a company that has an ethos of continual investment and improvement to deliver the best possible working partnerships.

When you work with us, you will find that our approach is focussed on exceeding the aftermarket's expectations on quality. However, we also believe in working in partnership, helping you to increase your profits, offer a wider range and reduce your stock holdings so that you can ensure your customers have the very best choice available.

By aligning our business to suit your needs, we can offer bespoke solutions that are specific to your customers. We know that details matter so we invest in quality with our own world-class manufacturing processes.

We lead the way in providing practical and fitting support as well as cataloguing assistance, so can help you every step of the way.

BM Catalysts bring precision engineering and partner-first service to your business. Everything we do is dedicated to exceeding your expectations.

THOSE WHO ASK FOR PRECISION, ASK FOR BM.

Europe's leading manufacturer of
aftermarket Catalytic Converters,
DPFs and Front Pipes



Reed Mill, Sheepbridge Lane,
Mansfield, Nottinghamshire,
NG18 5DL, United Kingdom

T. +44 (0) 1623 663800
F. +44 (0) 1623 663801
E. enquiries@bmcatalysts.com

bmcatalysts.com

