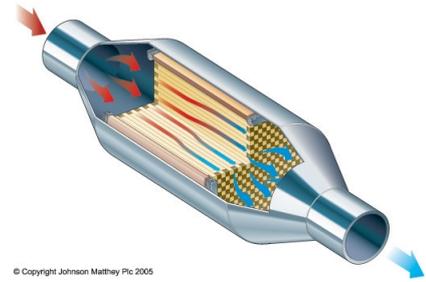


Diesel Particulate Filters



What is a Diesel Particulate filter?

A diesel particulate filter (DPF) is a device fitted to a diesel vehicle which filters particulate matter (PM) from exhaust gases. It does this by trapping solid particles while letting gaseous components escape. This type of filter has been in use for over 20 years, and many variants exist. These filters enable reductions in emissions which help meet European emission standards, improving air quality and thereby health standards.

What is PM?

PM is made up of a complex mixture of solid and liquid particles, including carbon, complex organic chemicals, sulphate, nitrates, ammonium, sodium chloride, mineral dust, water and a series of metals, which is suspended in the air. PM₁₀ refers to particles with a diameter smaller than 10µm and PM_{2.5} to particles with a diameter smaller than 2.5µm. They may be produced directly from a source such as an engine – or formed from reactions between other pollutants (e.g. NO₂, SO₂, NH₃) in the air (secondary PM)

Regeneration

DPFs need to be emptied of trapped particulate matter regularly. This is done by a process called regeneration, which involves burning the soot to gas at a very high temperature, leaving behind only a very small residue. Regeneration, if not carried out properly, can lead to a build up of soot which can affect performance and ultimately lead to expensive repair costs. This has led to some diesel vehicle owners removing their DPFS. However, DPF removal has both legal and social implications.

Legal requirements

It is an offence under the Road vehicles (Construction and Use) Regulations (Regulation 61a(3))¹ to use a vehicle which has been modified in such a way that it no longer complies with the air pollutant emissions standards it was designed to meet. Removal of a DPF will almost invariably contravene these requirements, making the vehicle illegal for road use.

A vehicle might still pass the MoT visible smoke emissions test, which is primarily intended to identify vehicles that are in a very poor state of repair, whilst emitting illegal and harmful levels of fine exhaust particulate.

¹ <http://www.legislation.gov.uk/ukxi/1986/1078/contents/made>

Social Implications

Air pollution causes an estimated 29,000 early deaths in the UK, and has annual health costs of roughly £15 billion². The health effects of PM are more significant than those of other air pollutants. Chronic exposure contributes to the risk of developing cardiovascular diseases and lung cancer. Current evidence suggests that there is no “safe” limit for exposure to fine particulate matter. The Report of the Committee on the Medical Effects of Air Pollutants (COMEAP) from 2008 concluded that, although there had been improvements in pollutant levels, the average reduction in life expectancy as a result of airborne particulate matter across the population was 6 months³.

The Comeap report⁴

The defra funded Comeap Report looked at the mortality effects of long-term exposure to PM air pollution in the UK.

The report came to 4 major conclusions:

- a) Removing all anthropogenic (‘human-made’) particulate matter air pollution (measured as PM_{2.5}) could save the UK population approximately 36.5 million life years over the next 100 years and would be associated with an increase in UK life expectancy from birth, i.e. on average across new births, of six months. This shows the public health importance of taking measures to reduce air pollution.
- b) A policy which aimed to reduce the annual average concentration of PM_{2.5} by 1 µg/m³ would result in a saving of approximately 4 million life years or an increase in life expectancy of 20 days in people born in 2008.
- c) The burden of anthropogenic particulate matter air pollution is, with some simplifying assumptions, an effect on mortality in 2008 equivalent to nearly 29,000 deaths in the UK at typical ages and an associated loss of total population life of 340,000 life-years. The burden can also be represented as a loss of life expectancy from birth of approximately six months.
- d) The uncertainties in these estimates need to be recognised: they could vary from about a sixth to double the figures shown.

These figures underline the importance of diesel particulate filters in reducing particulate matter emissions, and improving air quality.

Furthermore, PM has negative environmental impacts. It comprises nitrates, sulphates and ammonium which are the main drivers for acidification and eutrophication – two extremely damaging processes to natural ecosystems, which

² https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69340/pb13378-air-pollution.pdf

^{3,4} The Comeap Report, 2010

can cause habitat loss and affect biodiversity. PM also contains black carbon, a known contributor to global warming. DPFs are essential in reducing current PM emissions in order to prevent these processes occurring.