

Atmospheric pollution from vehicle exhaust

This report has been prepared for the Neighbourhood Plan team by

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Introduction

The UK government has policies to reduce air pollution, particularly Nitrogen dioxide (NO₂) from vehicle exhaust. Taunton Deane Borough Council has monitored the levels of NO₂ at strategic points along the A358 through the Parishes of Ruishton and Thornfalcon and provided the Neighbourhood Plan team with a sample of readings from 2014, 2016 and 2017. A considerable proportion of the readings we have been given are above the *acceptable limit* of 40 micrograms/m⁻³, the highest of which was 72.16 in January 2017. Understandably, anything over this limit is unacceptable and as a result of the government's Air Quality Strategy, the local authority is under an obligation to take measures to put things right.

Some of the scientific points relating to the various pollutants in vehicle exhaust emissions are outlined below.

The Nitrogen dioxide in vehicle exhaust gases contributes to the formation of the following atmospheric pollutants:-

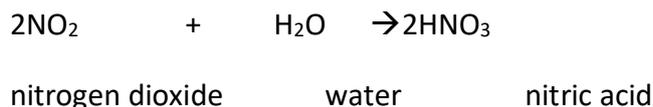
- Acid rain
- Tropospheric (ground level) ozone
- PANs – peroxyacetyl nitrates

There are, however, a number of other pollutants in vehicle exhaust. The main ones are:-

- Carbon dioxide
- Carbon monoxide
- Particulates

Acid rain

Acid rain is formed when Nitrogen dioxide dissolves in rainwater to form nitric acid.



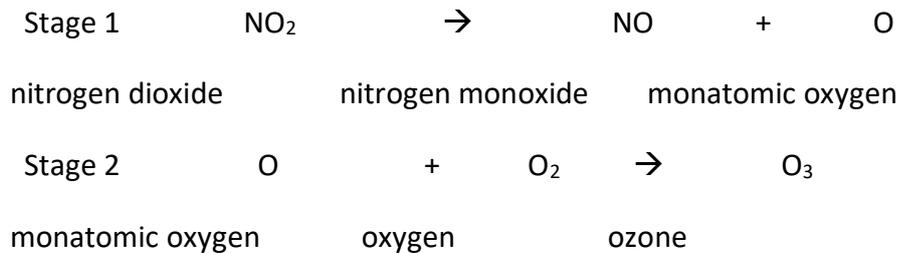
The effects of acid rain on humans are:-

- increased susceptibility to respiratory infections and asthma
- irritation of the nose and throat

Tropospheric (ground level) ozone

Formed when Nitrogen dioxide is broken down in the presence of UVA (in sunlight), to form Nitrogen monoxide and monatomic oxygen (Stage 1). Monatomic oxygen then combines with oxygen in the atmosphere, to form ground level ozone which acts as a secondary pollutant (Stage 2).

UVA in sunlight



The effects of ground level ozone on humans are:-

- an increase in respiratory problems
- eye, nose and throat irritation

PANs – peroxyacetyl nitrates

PANs are formed from vehicle exhaust emissions during hot, sunny conditions. At high temperatures and when hydrocarbon vapours are present from unburnt fuel (eg in slow moving traffic), Nitrogen dioxide in the vehicle exhaust is converted into PANs. The mechanism of their formation is quite complex!

PANs are much more toxic than Nitrogen dioxide and the effects on humans occur at relatively low concentrations:-

- breathing difficulties
- eye irritation
- increased risk of heart attack

Carbon dioxide is an important greenhouse gas which is contributing to global warming and climate change

Carbon monoxide is emitted when there is incomplete fuel combustion (in slow moving traffic). This gas has a direct effect on humans when it is breathed in as it forms carboxyhaemoglobin in the blood. The blood becomes less efficient at carrying oxygen and the immediate effects on humans may be impairment of visual acuity as well as decreased concentration. Effects are more serious during pregnancy as carriage of oxygen to the foetus may be impaired.

Particulates are tiny airborne particles of Carbon formed during incomplete fuel combustion (when not enough Oxygen is available). Poorly tuned or worn diesel engines, in particular, produce blacksmoke which contains lots of Carbon. Diesel Particulate Filters(DPFs) filter out the many particulates but any remaining in the atmosphere are inhaled and are likely to lodge permanently in the alveoli of the lungs. As the particulates build up in the lung tissue, breathing difficulties will inevitably develop.