

Appendices

Appendix 9 Nitrogen Emissions from Vehicles

The aim of this appendix is to review the mechanisms that are believed to be responsible for the emissions of oxides of nitrogen (NO_x) and nitrous oxide (N₂O) from motor vehicles so as to demonstrate that they are independent. One depends primarily on the air/fuel mixture, the other depends on the nature of the catalyst (if any) on the vehicle. It is not possible to estimate N₂O emissions on the basis of known NO_x emissions.

A9.1 *NO_x Emissions*

The presence of CO, NO and SO are evidence of incomplete combustion. The carbon, nitrogen and sulfur (if any) in the fuel combine with atmospheric oxygen. Complete combustion produces CO₂, NO₂, and SO₂. Automobile exhaust consists of a mixture of all these six gases. In particular, the amount of NO emitted from the exhaust depends on the peak temperature reached within the combustion system, and on the air/fuel ratio, as depicted in Figure 10.1 of Part 2. Once NO has been released into the atmosphere, it reacts with oxygen and ultraviolet light, and is slowly converted to NO₂ and ozone.

A9.2 *N₂O Emissions*

Workbook 3.1 of the Australian National Greenhouse Gas Inventory (1996: p.32) notes that there is considerable evidence to suggest that the use of catalysts to control pollutants actually increases the amount of N₂O emitted. There is also evidence that the amount of N₂O that is emitted increases as the catalyst ages.

A9.3 *Conclusion*

One may expect a vehicle without a catalyst to emit *higher* values of NO_x than a vehicle equipped with a catalyst. However, one expects a vehicle without a catalyst to emit *lower* values of N₂O than a vehicle that is equipped with a catalyst. Thus, although there is probably an inverse relationship between NO_x emissions and N₂O emissions, the complexity of the interaction between combustion temperature, air/fuel ratio, and the properties of the catalyst are such that it is not possible, at this stage, reasonably to approximate N₂O emissions from NO_x levels.