EXECUTIVE SUMMARY

If we could burn petrol or diesel perfectly in pure oxygen it would produce only carbon dioxide (CO2), water vapour (H2O), and energy. However, in reality it is never possible to burn fuels perfectly, so there are always some emissions of unburned and partially burned fuel together with oxides of nitrogen (NOx) from the nitrogen in the air.

Fuel, whether it be petrol, diesel, and natural gas is made up of hydrocarbons. These can range from small, simple molecules such as methane, the main component of natural gas, to large complex molecules. In combustion, these molecules get broken up. Ideally, they break down completely to CO2 and water vapour, but some escape unchanged or partially degraded as hydrocarbons (HC) or as carbon monoxide (CO). For diesel engines especially, but also for Gasoline Direct Injection engines, some of the fuel ends up as particulate matter (PM). PM is mainly soot particles with volatile hydrocarbons and some sulfate and metallic residues from the fuel and engine lubricant.

The other main pollutant in exhaust gas results from the fact that we burn the fuel in air, which is nearly 80% nitrogen, not in pure oxygen. At high temperatures, the nitrogen forms nitrogen oxides (NOx) in the combustion chamber. The more efficient the combustion, the higher the temperatures are likely to be and hence the higher the NOx emissions.

In Brazil motor vehicles are a significant source of air pollutant emissions. These emissions contribute to urban air quality problems, negative human health outcomes, climate change and impacts on the environment.

The vehicular emissions in Brazil are regulated by the "Programa de Controle da Poluição do Ar por Veículos Automotores" (PROCONVE). Implemented in 1986, it sets limits on the amount of air pollutants that may be emitted by new vehicles sold in the country. Both light and heavy vehicles are regulated by this program. The focus of this paper is on light vehicles, which are classified and regulated as distinct from heavy-duty vehicles

Proconve has been improving the emission performance of new vehicles sold in the country since its introduction. However, despite the progress generated, air quality in many Brazilian cities still does not meet the guidelines recommended by the World Health Organization.

With the full implementation of the current phase of PROCONVE L6 for light-vehicles completed in 2015, Brazilian regulators should consider the evolution of the program to mitigate the risks to human health and to the environment.