
Road traffic emissions: methodology, current situation, perspectives

Guest Editor:

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For roughly 30 years, the emissions of road vehicles have been subject to increasingly stringent regulations. The success of this process has been monitored by the environmental agencies for about 20 years. While in the early days the focus was on compliance with the certification limits, today, real-world emissions are the main interest. Knowledge of the real emissions from road traffic and its trends in the past and forecasts for the future is a major factor in environmental policy.

Emissions models are used today to derive regional, national and international inventories from test bench data and to estimate the impact of different measures to reduce traffic-based pollutants. These models link statistical driving behaviour and fleet data with emission measurement results from investigations in emissions laboratories.

The ongoing reduction of emission limits is resulting in significant progress in engine technology. However, the emissions from modern engines with spark or compression ignition depend mainly on the programming of the engine control unit. As an example, the application engineer can select the air to fuel ratio and consequently the emissions almost freely for all points on the engine map. This choice is limited however, since other engine qualities such as fuel consumption, noise, smoothness, torque curve, protection against overheating and other parameters also have to be optimised. In addition to these steady-state operating strategies, engine behaviour during transients significantly affects the real-world emission levels. The dynamic qualities of the control loops thus also play an important role, especially for engines with exhaust gas after-treatment systems.

This evolution caused an increase in the difference between emissions in type approval tests and in real-world driving. Therefore, representative real-world driving patterns are applied for those emission measurements used for emission modelling. The prediction quality of these models was further improved by additionally taking into account other parameters such as ambient temperature, vehicle load and gear-shifting behaviour. While emission inventories were used mainly on international and national levels in the past, the need for local data is increasing. Emission estimates for cities, quarters or even single streets or tunnels are used as input for dispersion models and for dimensioning ventilation systems.

At an international symposium 'Emissions of Road Traffic' at EMPA (Swiss Federal Laboratories for Material Testing and Research), first the structures, concepts and validation of the current European models were presented. Current emissions were then analysed with a focus on non-regulated pollutants such as benzene and ammonia, and finally the impact of road traffic emissions and their future trends were discussed. This special issue of the *Journal of Environment and Pollution* summarises the main contributions of the above-mentioned symposium.