











The opinions expressed in the studies are those of the consultant and do not necessarily represent the position of the Commission.

## PARTICULATES

### Characterisation of Exhaust Particulate Emissions from Road Vehicles

Project details	
Domain	Vehicle Technology: Vehicle Emissions
Duration	from 01/04/2000 until 01/10/2003
Website	<a href="http://lat.eng.auth.gr/particulates/">http://lat.eng.auth.gr/particulates/</a>
Other sources	 <a href="#">Inception Report</a> (2,86 kB)  <a href="#">Vehicle exhaust particulates characterisation, properties, instrumentation and sampling requirements</a> (871 kB)  <a href="#">Investigations for the definition of sampling conditions for the selected instrumentation</a> (2,3 MB)  <a href="#">Relevant protocol for particulate characterisation</a> (232 kB)  <a href="#">Dilution sampling system</a> (1,28 MB)  <a href="#">Roadside measurements of particle size distribution</a> (0,98 MB)  <a href="#">Measurement of non-exhaust particulate matter</a> (1,65 MB)  <a href="#">Comparison of particle exhaust emissions measured at a chassis dynamometer and on-road chasing on a test track</a> (960 kB)  <a href="#">Particulate and PM characterization in non-legislative conditions (sub-zero ambient temperatures)</a> (895 kB)  <a href="#">Final Report</a> (1,93 MB)

To assess the impacts of different emissions abatement measures, accurate air quality models based on proper understanding of the relative contributions from the various emissions sources are required, together with knowledge on the health effects of those emissions. Recognising the need for further work in these areas, two new projects, **PARTICULATES** and [ARTEMIS](#) were initiated by the European Commission in 2000, sponsored under the Fifth Framework Programme on Research and Technological Development.

**ARTEMIS** is a 4 year programme, which commenced in January 2000, with objectives to update the emissions factors for all transport sources, including passenger cars, heavy duty vehicles, two-wheel vehicles, rail, sea and air transport. ARTEMIS should provide improved models for transport emissions leading to more consistent emissions inventories at both National and International levels.

**PARTICULATES** is 3.5 year project launched in April 2000, part of a common project cluster with ARTEMIS, recognising the need to further characterise automotive particulate emissions. Although mass emissions of automotive particulate matter (PM) are well documented, health and environmental concerns are shifting towards number, size and composition of particles. However, much has still to be learnt about the relative importance of particulate properties - mass, size, number and composition - to health

effects and also about measurement methodologies and particulate reduction technologies, especially for the smallest, nucleation mode particles.

The **PARTICULATES** project aims at collecting and analysing particles emitted from motor vehicles in a scientifically and technically sound manner. It contains the following basic work tasks:

- **Definition of the exhaust aerosol properties for both accumulation and nucleation mode particles and evaluation of the available measurement instruments and techniques.** The properties which will be measured are expected to include: opacity, mass concentration, number concentration, size, nature (liquid or solid particles), microstructure (porosity, surface area, density) and chemical composition. Several instruments will be used comparatively for size classification and number concentration recording (e.g., electrostatic classifiers, impactors, diffusion batteries) and established techniques will be employed for chemical characterisation, microstructure definition and opacity measurements. Sampling techniques will be critical, especially for nucleation mode particles.
- **Development of a harmonised protocol for the measurement of exhaust aerosol.** The protocol should set guidelines for temperature and velocity conditions along the sampling line, aerosol residence time in the components of the sampling system, sampling system materials, sampling dilution ratio and conditions and secondary devices characteristics.
- **Examination of the particulate emissions of current light duty vehicles and heavy duty engines** in order to identify the current vehicle emission performance.
- **Investigation of the influence of engine technology, fuel quality and after-treatment on particulate emissions.** The effect of measures taken so far to reduce PM emissions in mass terms will be examined in the light of the particulate properties under investigation. The tests will investigate the effect of engine and combustion system characteristics (such as commercially available advanced diesel combustion systems with high pressure fuel injection, common-rail, etc.), fuels (gasoline and diesel, as well as some alternative fuels) and currently available after-treatment devices (particulate trap, oxidation catalyst, etc.).

Overall, the expected products of PARTICULATES will include a detailed framework for a future vehicle particulate sampling and measurement methodology, basis for emissions modelling tools, assessment of the effectiveness of technical measures for reducing particulate emissions and input to studies of health effects.

**Coordinator**

- [Applied Thermodynamics Laboratory of the Aristotle University of Thessaloniki](#) (GR)

## Partners

- [AEA Technology plc](#) (UK)
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- [Joint Research Centre, European Commission](#) (EU)
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- Renault Research Innovation (FR)
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