Measurement Campaign in Runeberg Street in Helsinki and Influence of Speed and Driving Pattern on Exhaust Emissions

- Part of the EU/OSCAR project (2002-2005)

- Actions in Runeberg Street:
  - air quality, traffic, and meteorological monitoring campaigns
  - driving cycle measurements: emissions – influence of speed and driving pattern
  - evaluation of the dispersion models with new emission data
  - analyse the influence of buildings on air quality in the street canyon

- Similar work in four cities: Athens, Helsinki, London, and Madrid
## Runeberg Street – Monitoring Campaigns

<table>
<thead>
<tr>
<th>Location</th>
<th>Time period</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Street canyon</td>
<td>19.2.2003 – 31.12.2004</td>
<td>PM$<em>{2.5}$*, PM$</em>{10}$*, NO$_2$/NO</td>
</tr>
<tr>
<td>Street canyon</td>
<td>20.3.2003 – 31.12.2004</td>
<td>Time, speed, length and type** of each vehicle passing the station – the two directions separately</td>
</tr>
<tr>
<td>Roof top</td>
<td>3.9.2003 – 2.5.2004</td>
<td>WS, WD</td>
</tr>
</tbody>
</table>

* Method of PM monitoring: β-attenuation  
** i) passenger cars and vans, ii) buses, iii) lorries, iv) lorries with a semi-trailer, v) juggernauts, vi) passenger cars and vans with a trailer, and vii) passenger cars and vans with a caravan

This data, together with data from several other air quality and meteorological stations is available in the NORDIC database.
OSCAR – Influence of Speed and Driving Pattern on Emissions

Coordination and development of the new practices to estimate EFs:
• TRL (UK) and TNO (the Netherlands)

Background:
• for newer vehicles speed is less important descriptor of the exhaust emissions, especially in urban traffic

Aim:
• To develop the best practices for estimation of EFs for congested flow:
  • a traffic situation model: correlate average emission rates with a number of test cycle parameters (not just speed), which are referenced to specific ‘traffic situations’ (e.g. motorway with 120 km/h limit)
Driving cycle measurements in Helsinki

- carried out by FMI
- with one passenger car, in real-world traffic
- 1 week

GPS Antenna
EOBD Interface
Data logger (time, vehicle speed, rpm, % load, % throttle position)
Diary
Driving cycle measurements – analysis of data

• Characterisation of the driving pattern database for each city, e.g.
  • mean speed
  • engine speed and load
  • % of time by gear
  • speed range

• Characterisation of each link using a number of parameters, e.g.
  • traffic flow per lane per unit time (traffic counts)
  • vehicle composition (traffic counts)
  • speed limit
  • traffic management

• Identification of links between driving pattern descriptors and link descriptors
Links between driving pattern and link descriptors

Links with <70 km/h speed limit

- A01 - Athens 50 km/h
- A02 - Athens 60 km/h
- A03 - Athens 60 km/h
- H03 - Helsinki 70 km/h
- H04 - Helsinki 70 km/h
- H05 - Helsinki 50 km/h
- H06 - Helsinki 50 km/h
- H07 - Helsinki 40 km/h
- H08 - Helsinki 40 km/h
- L01 - London 48 km/h
- L02 - London 64 km/h
- L03 - London 48 km/h
- L04 - London 48 km/h
- L05 - London 48 km/h
- M50 - Madrid 50 km/h
Dynamometer Emission Tests

• conducted by TNO

• 20 light duty vehicles including e.g. EURO III, EURO IV

• 10 OSCAR driving cycles per vehicle, plus legislative cycle, ARTEMIS cycles, and other TNO cycles

• regulated pollutants: CO, NOx, VOC, CO2, SO2, PM10
Some results: PM$_{10}$ Emission Rates for Diesel Vehicles

![Graph showing PM$_{10}$ emission rates for different diesel vehicles. The graph includes data for various models such as Peugeot 306 1.9D, Toyota Picnic 2.2TD, Opel Astra 1.7 DTi, Volvo V70 D5, Volkswagen Passat 1.9 TDi, and Renault Megane 1.5DCi. The graph is labeled with PM emission rate (g/km) on the y-axis and Oscar C, Oscar D1, Oscar D2, Oscar E, Oscar F, Oscar G1, Oscar G2, Oscar H1, Oscar H2, and Oscar H3 on the x-axis.]}
Some results: Measured PM$_{10}$ Emission Rates for Diesel Vehicles

• the driving mode: idle
The Best Practices for Estimation of EFs for Congested Flow

• integration of OSCAR emission data with existing databases (COPERT/ARTEMIS)

• adoption of traffic situation modelling approach

• reporting the final results:

www.eu-oscar.org