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Museum of London Docklands

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Emissions Analytics

Ecodriving & Air Quality Emissions: Results of On-Road PEMS Testing

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Emissions Analytics' credentials



- Founded in 2011
- Headquartered in UK, with operations in London, Los Angeles and Stuttgart
- Specialist in PEMS testing and data analysis
- 1600+ vehicles tested
- Largest commercially available database of real-world emissions data
- Works with OEMs, Tier 1/2 suppliers, fuel and chemical companies, regulators, consultancies, consumer media

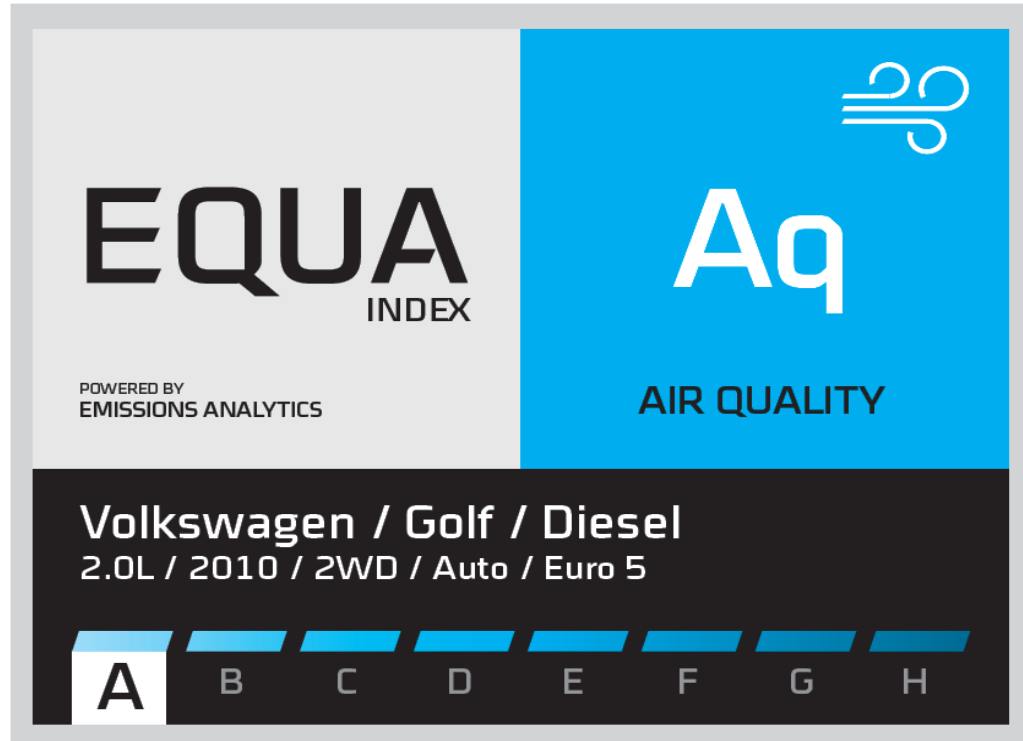
Equipment

- SEMTECH-LDV
- Portable Emissions Measurement System connects to tailpipe
 - Captures emissions for CO₂, CO, NO, NO₂, total hydrocarbons
 - At 1 Hertz
- Air temperature, pressure, humidity
- GPS for speed and altitude
- Engine data via CANBUS
- Fuel economy derived via carbon balance
- Weight addition 100kg





EQUA Aq: equaindex.com



Background & objectives

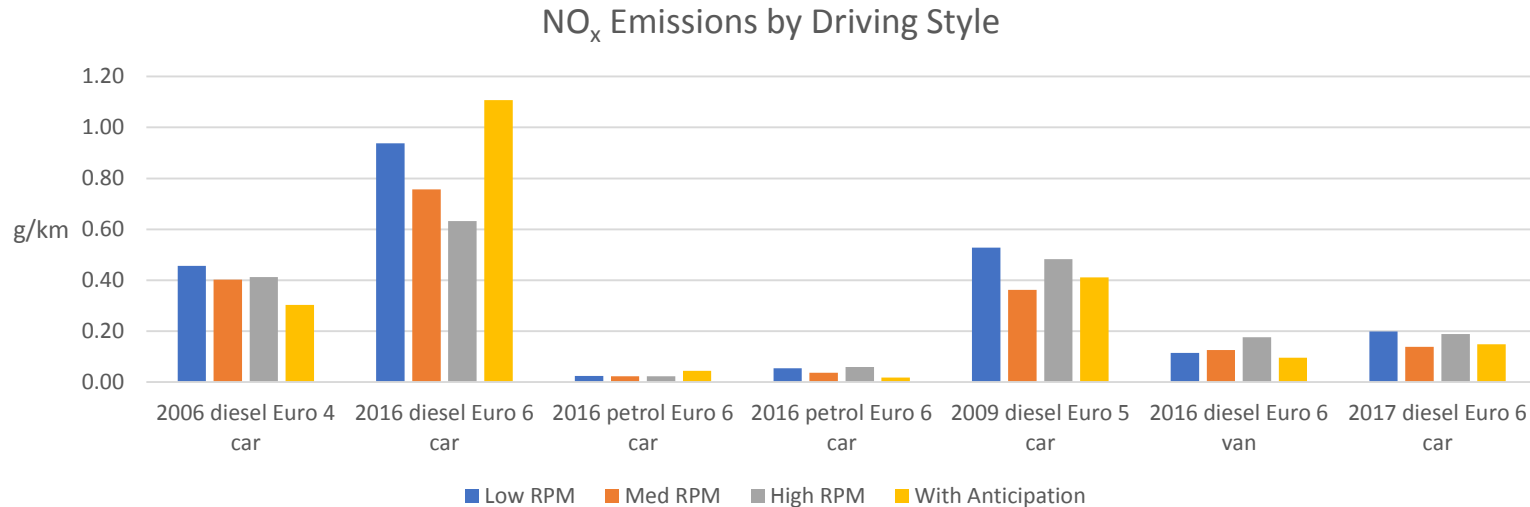
- Previous ecodriving research has concentrated on fuel & CO₂ savings
- The key previous reference (TNO, 2006) found the very low RPM gear changes advocated for ecodriving increased NO_x for Euro 3 & Euro 4 cars
- Given the strong current focus on air quality emissions, especially NO_x there is a strong case to understand how driving style affects NO_x from current vehicles
- Objective of EST/EA research: Assess the effect on NO_x emissions of gear change RPM, especially low RPM vs typical RPM, for Euro 5 and Euro 6 petrol and diesel cars and vans

Rationale for Methodology



- Use portable emissions measurement (PEMS) equipment to measure real-life on-road emissions for an urban cycle
- Test a variety of vehicles but main focus on modern (Euro 6) diesel cars
- Carefully design study & conduct sufficient repeats to identify small changes
- Control for external factors as much as possible
 - Match climatic conditions between tests as much as possible
 - No testing in rain or on wet roads
 - Vehicles warmed up before each test

Absolute NO_x Emissions



- Diesel engines produce significantly more NO_x compared to gasoline engines

Emissions for Low RPM vs. Normal RPM gear changes

- NO_x
 - All (7) geared vehicles: +24%
 - All (6) geared vehicles excl. one outlier that exhibited unusual behaviour: +27%
 - All (5) diesel vehicles: +23%
 - All (3) diesels with statistically significant results at 90% confidence: +28%
- CO_2
 - All (7) geared vehicles: -3%
 - All (6) geared vehicles excl. one outlier that exhibited unusual behaviour: 0%

Conclusions

- Low RPM gear changes (cf. normal RPM) significantly increased NO_x & had little or no significant effect on CO₂
- High RPM gear changes (cf. Normal RPM) significantly increased NO_x & CO₂
- Greater anticipation decreased CO₂, had little effect on diesel NO_x & gave a small decrease in NO_x overall
- Future testing of NO_x emissions should focus on diesels
- These results are not definitive but provide good evidence for the conclusions above for a short urban journey. Further testing is required to build the evidence including the impact of driving style on longer journeys
- Emissions varied greatly between models and age – a more fundamental understanding of emissions behaviour would be useful



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