Non-exhaust emissions in the UK
Non-exhaust emissions (NEE) are an increasing concern in the UK

Research and analysis
Non-exhaust particulate matter from road transport: health effects

Committee on the Medical Effects of Air Pollutants (COMEAP) report on medical aspects of road traffic pollution other than exhaust emissions.

Published 16 September 2020
From: Public Health England

Investigating the sources and pathways of synthetic fibre and vehicle tyre wear contamination into the marine environment

Press release
First phase of research paves the way for further studies on microplastics pollution

Highways England has launched a study into whether surface water which runs off roads affects the level of microplastics in the environment.

Published 30 December 2020
From: Highways England

Ella Adoo-Kissi-Debrah: Air pollution a factor in girl's death, inquest finds

Department for Transport
UK DfT perspective on regulating brake emissions
Non-exhaust emissions (NEE) in the UK

PM2.5 from road transport

PM10 from road transport

Non-Exhaust Emissions from Road Traffic

Prepared for:
Department for Environment, Food and Rural Affairs;
Scottish Government; Welsh Government; and
Department of the Environment in Northern Ireland
UK Government initiatives on NEE
Call for evidence on brake, tyre and road surface wear (2018)

- Over 50 responses received - only qualitative data submitted

- Suggested a range of technologies and approaches to reduce emissions e.g. driving style; alternative materials for brakes, tyres and roads; regenerative braking

- Highlighted lack of internationally agreed measurement methods, and that emission factors (EFs) may have become dated as technologies evolved

- Government is addressing these emissions by funding relevant research and supporting PMP’s work in developing methods to measure NEE
New Environment Bill

• New Environment Bill currently under scrutiny in UK Parliament

• Setting new targets on air quality - including PM2.5, which will be informed by a recent call for evidence

• Sought evidence on PM2.5 under different future scenarios e.g. main future drivers; concentrations to be expected; population exposure; uncertainty in modelling.

• Proposed targets aim to:
  — reduce annual mean PM2.5 concentration
  — reduce population exposure to PM2.5
Funding research to develop methods to reduce NEE

- Ongoing funding for research on methods to reduce emissions from brake, tyre wear or road surface abrasion

- Projects include:
  - novel designs for tyres reducing environmental and air impact of wear (ENSO Tyres)
  - monitoring wheel alignment to reduce emissions from misalignment (Auto-Align)
  - validation of on-vehicle device for collection of tyre wear particles (The Tyre Collective)
UK’s commitment to decrease emissions from road transport

News story
UK becomes first major economy to pass net zero emissions law

New target will require the UK to bring all greenhouse gas emissions to net zero by 2050.

Published 27 June 2019
From: Department for Business, Energy & Industrial Strategy and The Rt Hon Chris Skidmore MP

ULEVs registered for the first time - UK

DfT Vehicle Licensing Statistics 2019
End of sale of new petrol and diesel cars and vans by 2030

- Driving uptake of zero emission vehicles by phased ban of petrol and diesel vehicles
  - Step 1: phase-out date for the sale of new petrol and diesel cars and vans brought forward to 2030.
  - Step 2: all new cars and vans to be fully zero emission at the tailpipe from 2035.

- New consultation in 2021 on the phase-out of new diesel HGVs to put the UK in the vanguard of zero emission freight.

- Growing uptake of zero emission vehicles must be supported by regulations on NEE that address all propulsion types.
UK research on NEE measurements
Research on measurement of brake and tyre wear emissions

Main goals:

• Phase 1 - Develop a device and methodology for characterising brake and tyre wear particles in real driving conditions

• Phase 2 - Fill knowledge gaps in the measurement of brake and tyre wear emissions from road vehicles, including electric and hybrid vehicles

• Phase 3 – Develop recommendations on type approval and legislation for brake and tyre wear emissions

Phase 1 - 2021  ➔ Phase 2 - 2022  ➔ Phase 3 - 2023
Research on measurement of brake and tyre wear emissions

Phase 1 – Development of tyre and brake wear in-vehicle measurement system (Jan-Dec 2021)

• Concept development
  — Identify feasibility of using on-board measurement system to characterise brake and tyre wear emissions from real world conditions
  — Assess options that allow effective sampling of particles, efficient transmission to analyser, and characterisation

• Prototype build, testing and in-vehicle validation
  — Demonstrate system can provide reliable, repeatable and reproducible results in a vehicle
  — Laboratory- and road/track-based evaluation and testing
Research on measurement of brake and tyre wear emissions

Phase 2 – Study on knowledge gaps on tyre and brake wear emissions (Jan-Dec 2022)

• Investigate influence of variables affecting particle emissions from brake/tyre wear
  — Characteristics of brake system (e.g. physicochemical composition of pad/disk materials; deterioration state)
  — Characteristics of tyres (e.g. size; chemical compositions of materials employed; deterioration state)
  — Driving characteristics (e.g. impact of violent acceleration/braking events on tyre abrasion rate; particle mass; particle number; size distribution)
  — Characteristics of vehicle (e.g. light vs. heavy duty; weight; distribution of load)

• Investigate the effect of the use of regenerative braking on brake and tyre wear emissions
  — Laboratory-based tests to estimate expected decrease in brake wear, opposed to expected increase in tyre wear from higher vehicle mass (e.g. EVs)
Research on measurement of brake and tyre wear emissions

Phase 3 – Recommendations on type approval and legislation to address brake and tyre wear emissions (Jan-Jun 2023)

- Potential amendment proposals for the PMP brake wear cycle, aimed at improving its representability with regards to real world emissions

- Assess representativeness of current emission factors for braking and tyre wear from light-duty vehicles
  — Provide recommendations on future improvements to emission factors

- Estimate future contribution of brake and tyre wear emissions to PM emission from road transport in UK

- Provide recommendations on future legislation and type approval regulation aimed at reducing tyre and brake wear emissions
UK’s perspective on regulating NEE
Considerations for brake emissions regulation

Q1. What would be the ideal scheme for regulating brake emissions from conventional ICE Light-Duty vehicles?

• Approval at vehicle level is more likely to comprehensively assess vehicle emissions
  — Type approval of aftermarket brake products at a component level will help maintain low emissions over the vehicle lifetime

• Given the wide range of particle sizes from NEE, both PM and PN limits are appropriate
  — Chemical composition of particles (i.e. toxicity) should be considered to avoid unintended consequences

• Feasibility of real world measurement should be explored to understand representativeness of laboratory testing
Considerations for brake emissions regulation

Q2. How should non-conventional Light-Duty vehicles (i.e. HEVs, EVs) be handled in a future regulatory approach?

• Propulsion types beyond ICE need to be covered

• If feasible, real world measurement could provide a uniform approach across propulsion types
  — Simulated regenerative braking on a brake dyno could potentially provide an interim solution/alternative
  — Real world measurement could potentially support the assessment of innovative technologies e.g. ADAS, car-to-car communication

Q3. How should HD vehicle brake emissions be handled?

• Need to improve understanding on the brake emissions from HD vehicles, including new propulsion types

• Wide range of truck’s load and number of axles need to be covered
Thank you

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