AECC project results on Euro VI HDV real-world emissions

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Exhaust emissions control technologies for original equipment, retrofit and aftermarket for all new cars, commercial vehicles, motorcycles, and non-road mobile machinery

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Content

Introduction

- AECC Position Paper on Euro 7/VII Emissions Standards
- Technologies available to handle real-world operation emissions

Heavy-duty Diesel - Real-world operation data of Euro VI vehicles

Summary
Further focus on real-world emissions

Further improve air quality and ensure the health and well-being of everyone

Represent actual mobile source usage in the European region

Legislate actual tailpipe emissions

Be fuel- and technology-neutral

Same limits and procedures for each type of powertrain within an application

Aim for application-neutral stringency

A complete set of limits for important harmful pollutants and GHGs is welcomed to provide a design guideline for emissions control systems

Legislate according to a ‘total system approach’ using a ‘whole vehicle’ basis
Technologies available to handle real-world operation emissions
For light- and heavy-duty applications

- Emissions control technologies significantly reduce pollutant emissions as part of an integrated approach
- Euro 7/VII will drive further innovation in
  - Catalyst and filter technology design
  - Emissions control system layout
  - System control
- Common system layout characteristics to handle real-world operation emissions
  - Close coupled and underfloor components to tackle emissions in all driving conditions
  - Total catalyst and filter volume to cope with peak engine pollutant flow
Technologies available to handle real-world operation emissions

For heavy-duty applications

Examples of available systems

Example of announced system with close-coupled components

Source: DAF

Source: Daimler

Source: Cummins
Objective & scope of Heavy-duty test programmes

- Identify real-world emissions of Euro VI vehicles for broad range of applications
- Investigate
  - Impact of Euro VI-D/E data post processing
  - Actual real-world operation vs. Euro VI In-Service Conformity
  - Actual real-world value (=raw data integrated over test) vs. ISC data evaluation
- Available data for the study
  - Existing real-world operation database of 23 vehicles (Euro VI-A to VI-C)
  - Real-world operation data measured on 3 vehicles (Euro VI-D)
  - Detailed testing on 1 vehicle (N3 Euro VI-C distribution truck)
    - Euro VI ISC route
    - Actual real-world operation
Data confirms low emissions of Euro VI vehicles on average

- Most vehicles in database have low emissions in real-world operation according to:
  - Average of all data
  - ISC data post-processing
Data confirms low emissions of Euro VI vehicles on average

- Several vehicles stay below Euro VI NTE limit during most of real-world operation
  - Euro VI-A regional bus
  - Euro VI-C national distribution truck

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Most vehicles in database have low emissions in real-world operation according to
- Average of all data
- ISC data post-processing

Highest Moving Average Window in real-world operation can be factor of 5-10 higher

Investigated next
- Effect of data exclusions
- Frequency of high emissions

ISC post-processing has significant impact
Data exclusions affect urban report value for Euro VI-A to VI-C

- Euro VI-A N3 vocational truck
  - Urban operation: 75% or the total trip, maximum averaged emissions 11 times the current NOx limit

- 91% of MAW above Euro VI NTE limit

Data excluded: cold start, 20%PT, 90th cumulative percentile.
Data exclusions affect urban report value for Euro VI-A to VI-C

- Euro VI-C N3 long-haul truck
  - Urban operation: 37% or the total trip, maximum averaged emissions 6 times the current NOx limit
  - 32% of MAW above Euro VI NTE limit

Data excluded: cold start, 20%PT, 90th cumulative percentile.
Data exclusions affect urban report value for Euro VI-A to VI-C

Example of Euro VI-C distribution truck

- ISC route
  - Stringency increases from Euro VI-D to VI-E
  - Truck would comply up to Euro VI-D

- Actual real-world operation
  - 100% of time below 10% power threshold
    → Not covered by ISC up to Euro VI-E
  - Raw data integrated over test is factor 4-5 higher
Data exclusions affect urban report value for Euro VI-A to VI-C

Example of Euro VI-C distribution truck

Urban part of the ISC route reflects actual real-world emissions
Improvements for Euro VI-D, but high emission events still occur

- Euro VI-D N2 rigid truck
  - Urban operation: 46% or the total trip, maximum averaged emissions 3 times the current NOx limit

- 21% of MAW above Euro VI NTE limit

Data excluded: as per Step D or E exclusions.
Improvements for Euro VI-D, but high emission events still occur

- Euro VI-D N3 tractor tanker semi-trailer
  - Urban operation: 31% or the total trip, maximum averaged emissions 5 times the current NOx limit

19% of MAW above Euro VI NTE limit

Data excluded: as per Step D or E exclusions.
Summary

- Heavy-duty vehicle real-world operation data was presented
  - All vehicles compliant to the type-approval emission level (Euro VI A-C and D) under ISC testing
  - High emission events are still occurring
    - Highest MAWs reach 5-10 times the NTE limits
    - These events mainly occur in the 0-50 km/h speed bin (mainly urban operation)
    - Data from 28 vehicles shows up to 91% of MAWs can be above the NTE limit
  - Heavy-duty ISC post-processing has significant impact on the report value for urban operation
  - HD Euro VI Step D and Step E post processing boundary conditions still exclude critical data
- Technologies are available today to appropriately handle real-world operation emissions
- AECC will continue to demonstrate that technologies are available today to effectively control emissions from ICE under real-world operation towards near zero-impact on air quality
THANK YOU!

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