EXPERIENCES WITH EURO 6 RDE IN AECC RDE TEST PROGRAMMES

International Conference ECT-2016 • New-Delhi • 9-11 November 2016

Dirk Bosteels

AECC
ASSOCIATION FOR EMISSIONS CONTROL BY CATALYST

AECC MEMBERS

European Emissions Control companies

Overview of AECC PEMS database

Diesel vehicles (focus on NOx) and Gasoline vehicles (focus on PN)

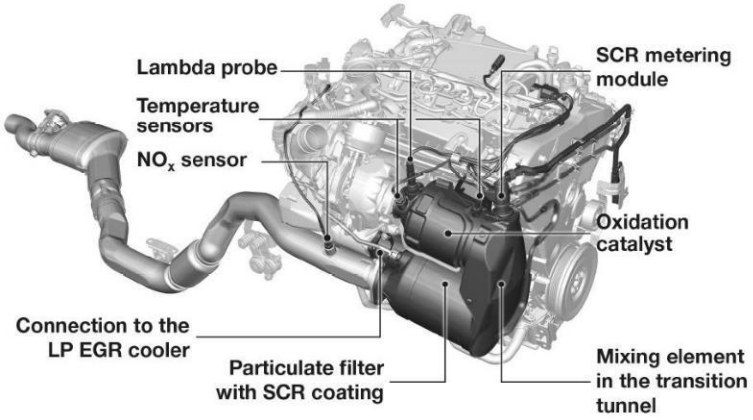
Vehicle	Year	Type	Series production/ demonstrator	Comment
1	2012	GDI-MPI	Series	Without GPF
2	2013	Diesel	Series	HP+LP EGR
3	2013	Diesel	Series	SCR
4	2013	Diesel	Series	LNT+SCR
√ 5	2014	Diesel	Demonstrator NOx CF<1.5	SCR on DPF
√ 6	2015	Diesel	Series NOx CF<1.5	SCR on DPF
√ 7	2015	GDI	Series NOx and PN CF<1	With GPF
√ 8	2016 ongoing	GDI	Series + Demonstrator	Without GPF With GPF

√ Analysis with latest version of EMROAD and CLEAR done

GDI: Gasoline Direct Injection
MPI: MultiPoint Injection
GPF: Gasoline Particulate Filter
HP: High Pressure
LP: Low Pressure
EGR: Exhaust Gas Recirculation
SCR: Selective Catalytic Reduction
LNT: Lean NOx Trap
DPF: Diesel Particulate Filter

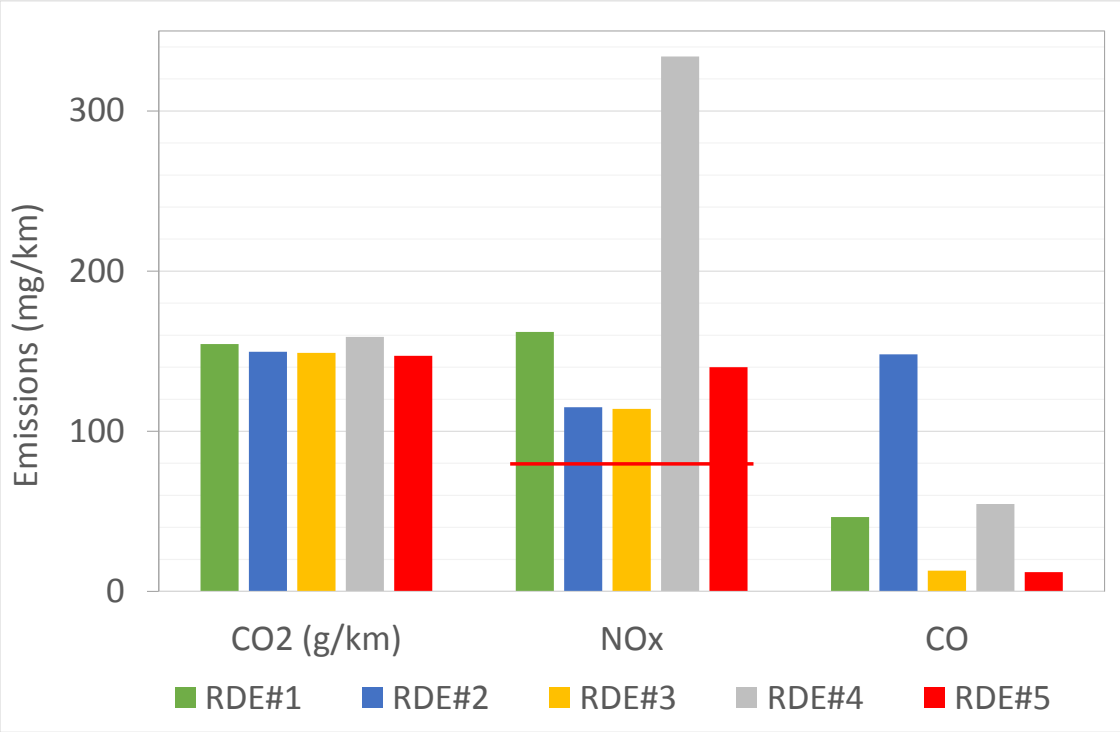
2015 Diesel Vehicle 6 programme set-up

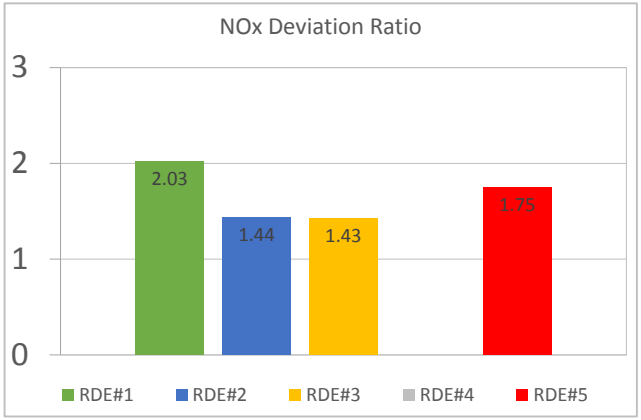
- Objective: investigate the real-world emissions performance of a commercially available Euro 6 Diesel car equipped with an advanced emissions control system.
- Vehicle
  - D-segment, 2l engine
  - High- and Low-pressure EGR
  - DOC + SCR on DPF



Diesel RDE emissions

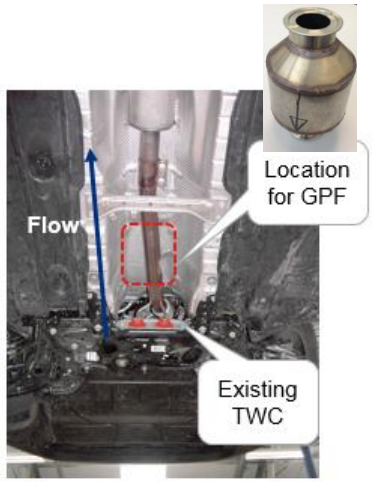
5 repeats of same RDE route





2016 GDI Vehicle 8 test programme set-up

- Objective: investigate NOx & PN RDE without and with Gasoline Particulate Filter (GPF)
- Vehicle
  - C-segment, 1.4l engine
  - Market representative GDI technology targeting Euro 6c - only Euro 6b available
  - Original configuration w/o GPF
  - Add coated GPF demonstrator underfloor
- HORIBA PEMS equipment
  - Gaseous PEMS (CO2, CO, NOx)
  - PEMS-PN demo unit



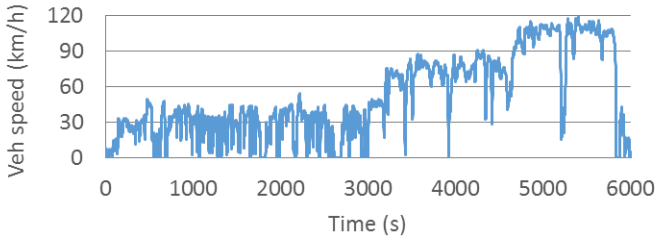
Underfloor view

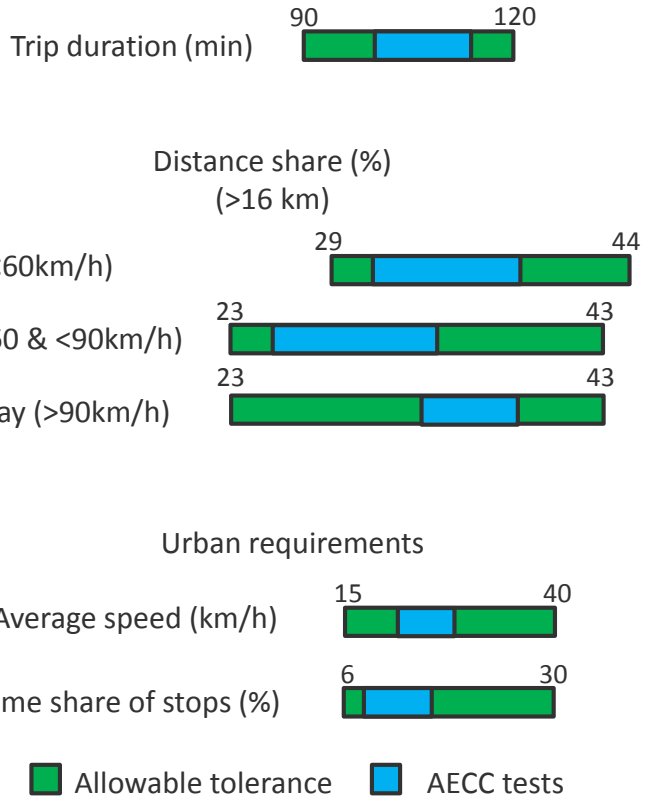
2016 GDI Vehicle 8 test programme set-up

- Identified parameters to evaluate
  - fuel type & quality
  - cold-start PN
  - driving dynamics (RDE on dyno)
  - cold ambient temperature
  - <23nm PN
- Test matrix

Exhaust	Fuel	NEDC + WLTC	RDE on road	RDE on dyno
Original (without GPF)	Ref E5	1x	-	-
	Ref E10	1x	3x	-
	Market E5	1x	3x	6x
With coated GPF	Ref E10	1x	3x	-
	Market E5	1x	3x	6x

RDE route is within the requirements





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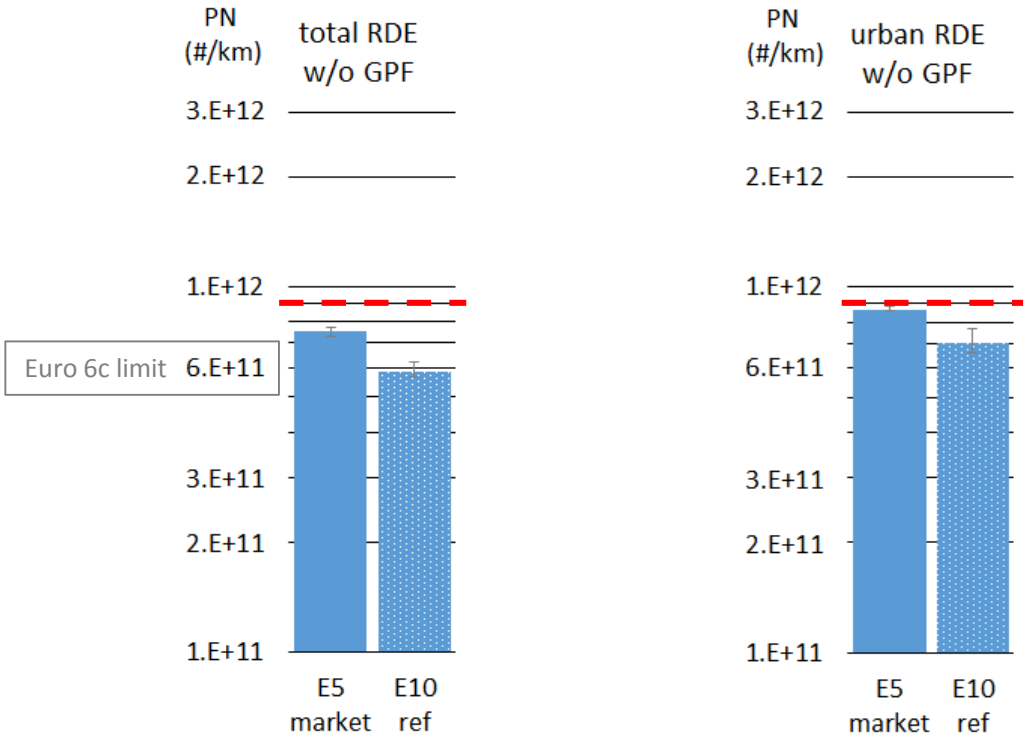
GDI PN results w/o GPF reach Euro 6d NTE limit on the road

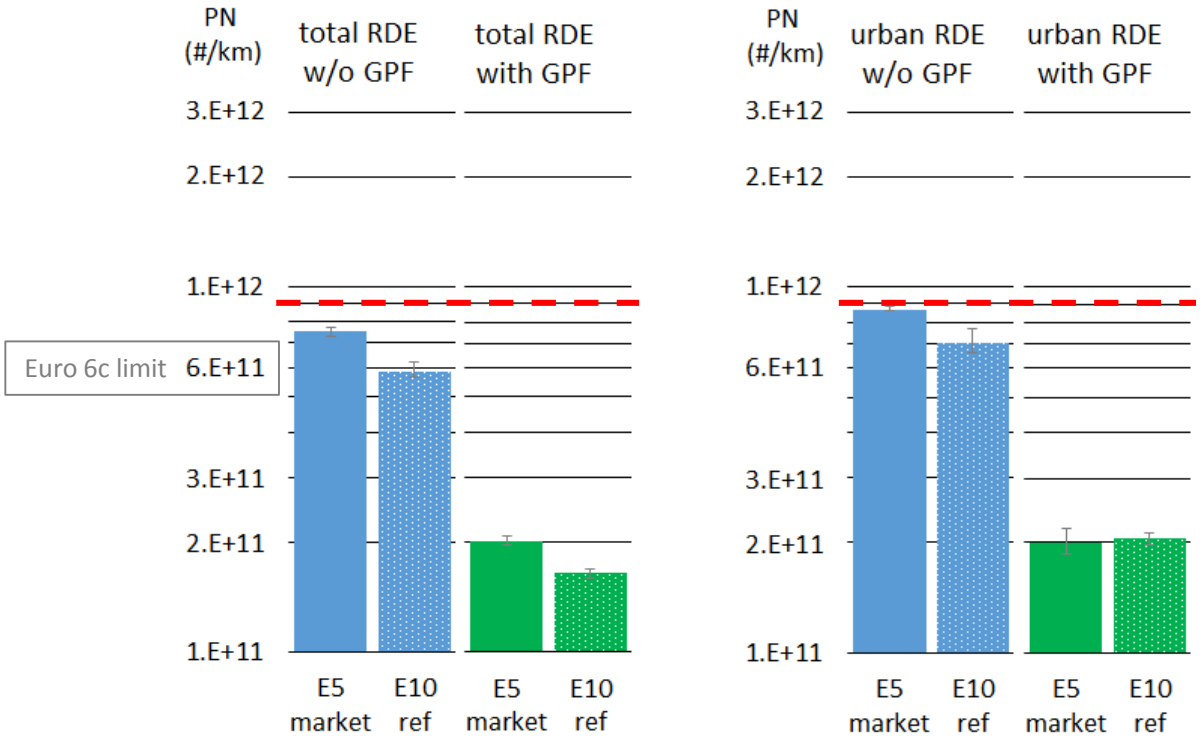


* Raw data, no exclusion/ normalisation

Euro 6d NTE limit (EC proposal Sept 16)

Measurement range 3x RDE

GDI PN results with GPF are well below Euro 6d NTE limit



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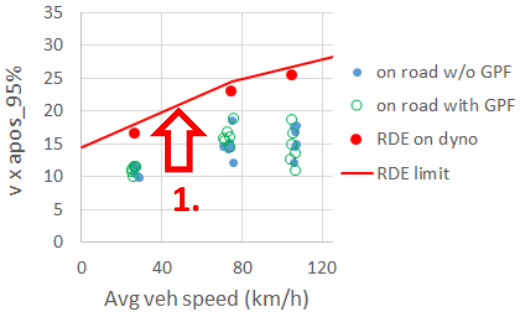
Euro 6d NTE limit (EC proposal Sept 16)

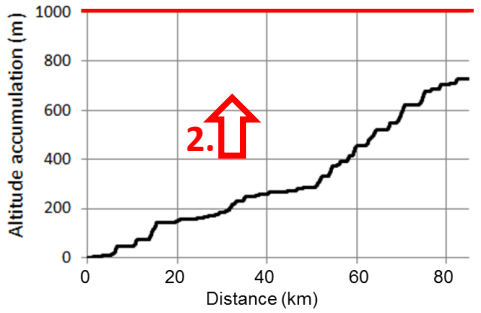
Measurement range 3x RDE

GDI RDE on dyno to investigate impact of going towards RDE boundary

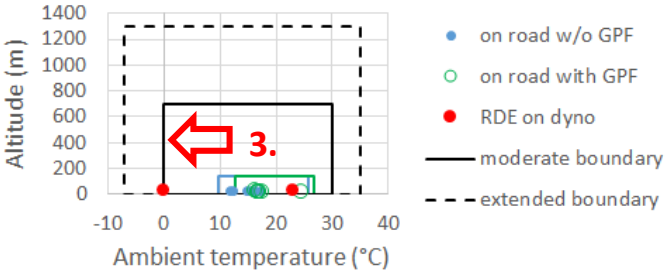
1. Change accelerations

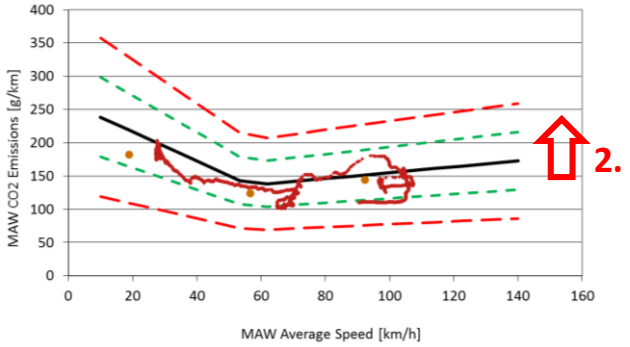


2. Change dyno load

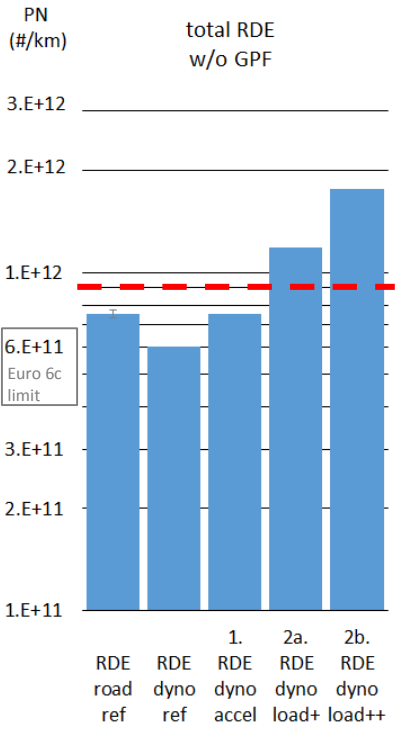


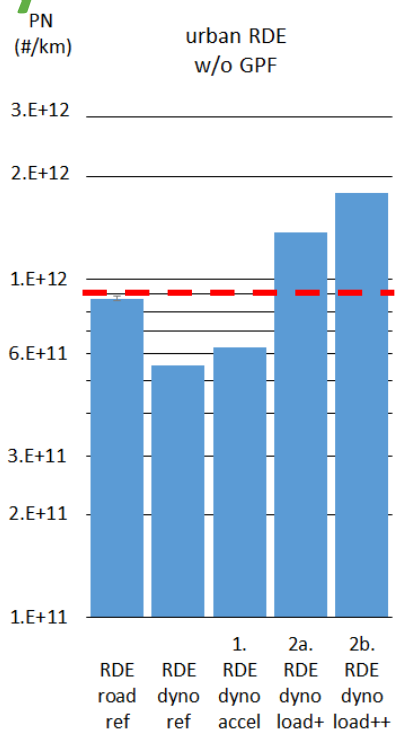
3. Change ambient temperature





GDI PN results w/o GPF increase above Euro 6d NTE limit towards RDE boundary





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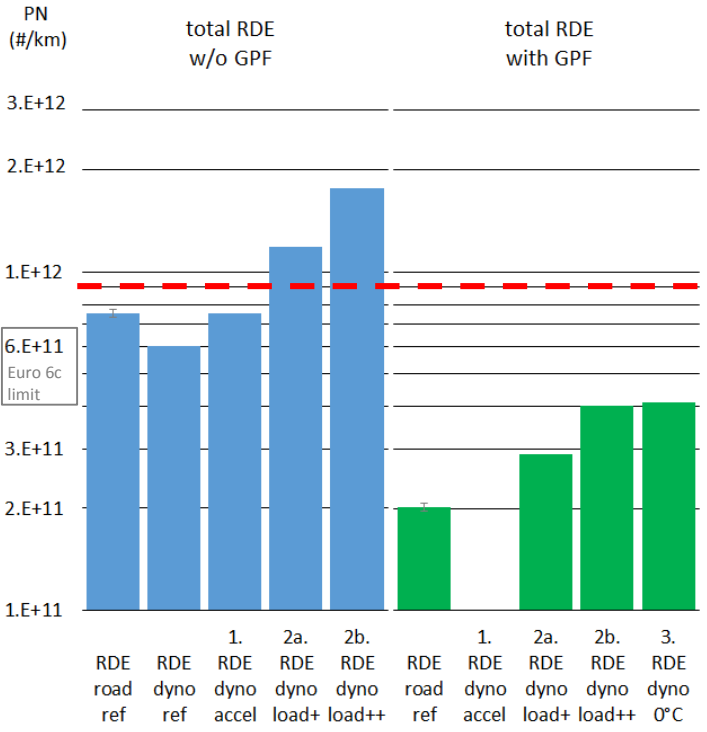
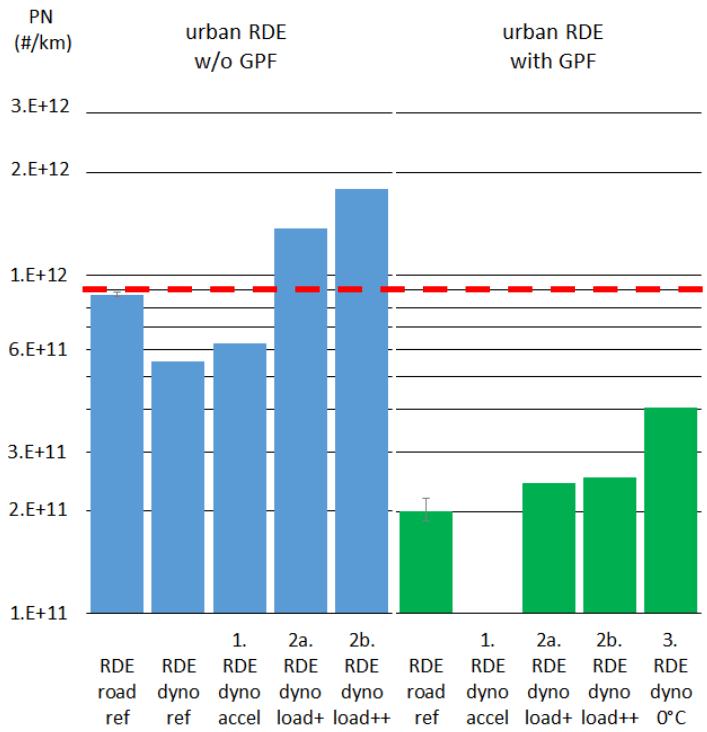
Euro 6d NTE limit
(EC proposal Sept 16)

Measurement range 3x RDE

GDI PN results with GPF remain below Euro 6d NTE limit on all RDE tests





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Euro 6d NTE limit (EC proposal Sept 16)

Measurement range 3x RDE

THANK YOU!

Dirk Bosteels
dirk.Bosteels@aecc.eu

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