

Workshop  
“Car Emissions and Euro 5”

Brussels, 5 April 2005

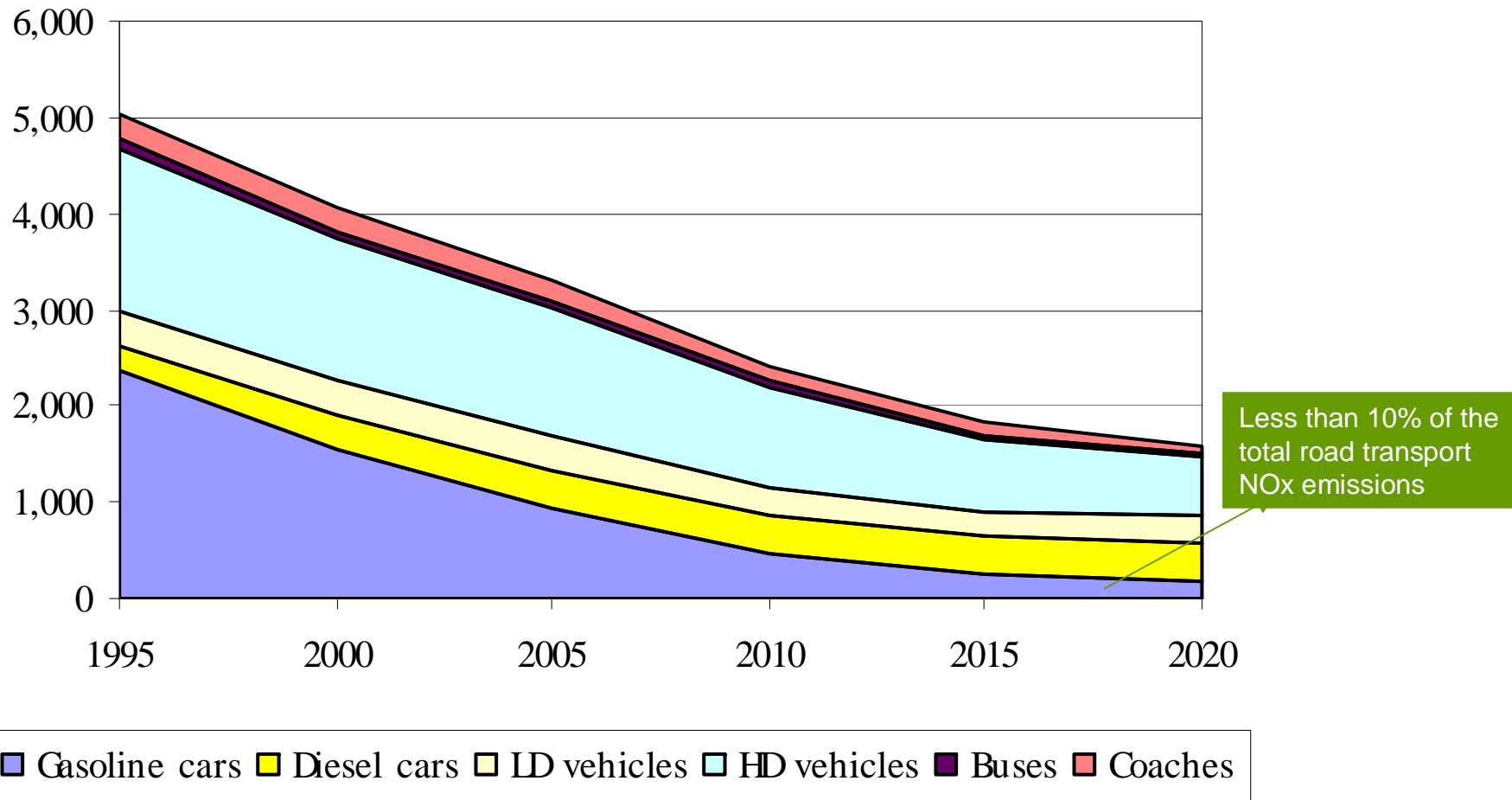


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## Car Emissions and Euro 5

- ⇒ Euro 5 is intended to be one among several measures that the Clean Air For Europe (CAFE) programme will recommend with the aim of attaining the long term objectives of the Sixth Environmental Action Programme (6EAP) in the most cost effective way.
- ⇒ ACEA has always welcomed a scientific approach, which is based on an evaluation of all sources of pollution, the reduction targets that can be technically imposed on each of them and the corresponding costs/benefits for addressing environmental concerns. ACEA effectively contributed to the previous Auto Oil I and II programmes and is today active within CAFE.
- ⇒ At the same time, a review of the TREMOVE and RAINS base cases and of the technologies available today for further controlling motor vehicle emissions can provide an overview of what could be asked for under Euro 5, ahead of the recommendations of CAFE,

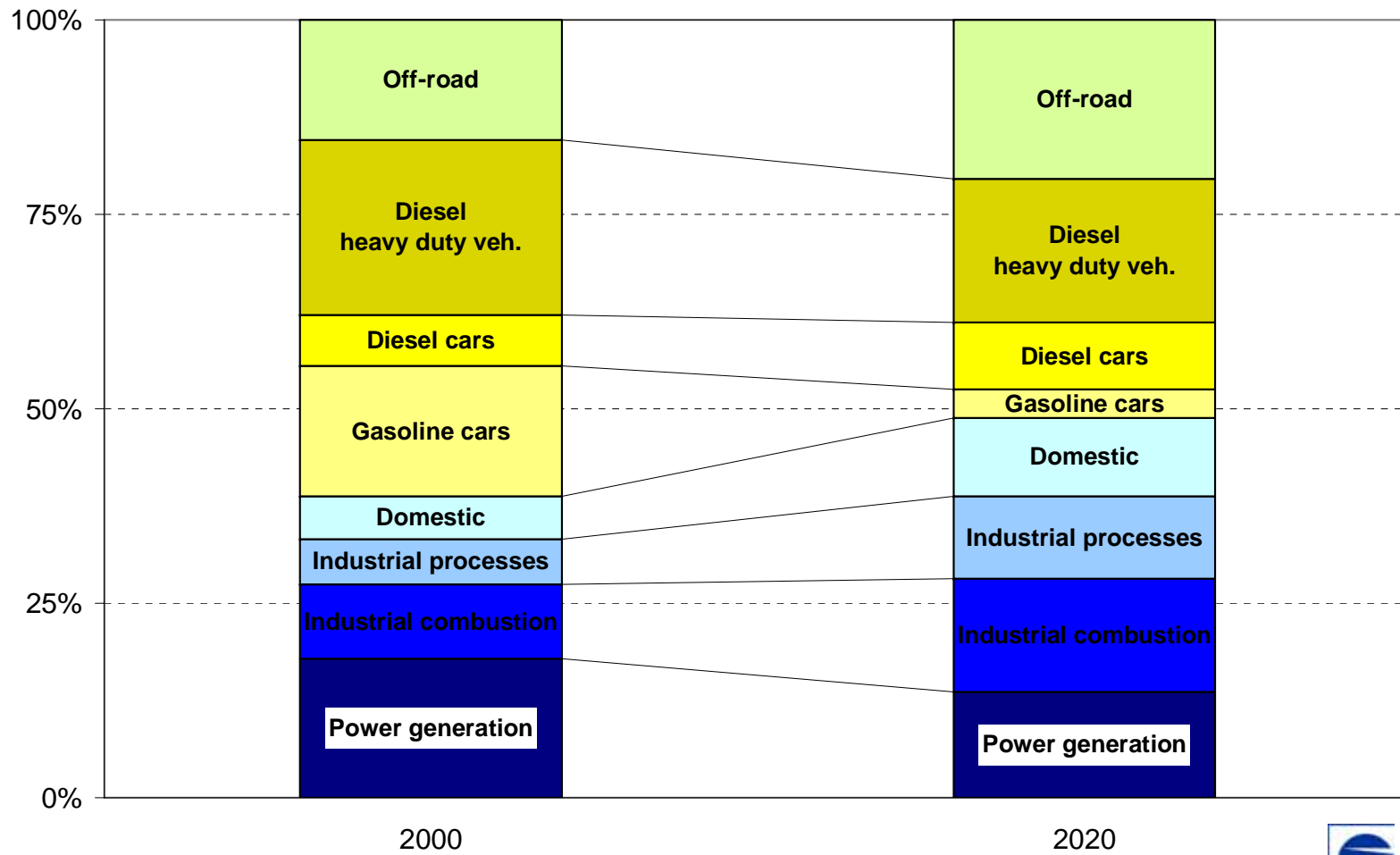
## Road transport NOx emission [k ton/year]



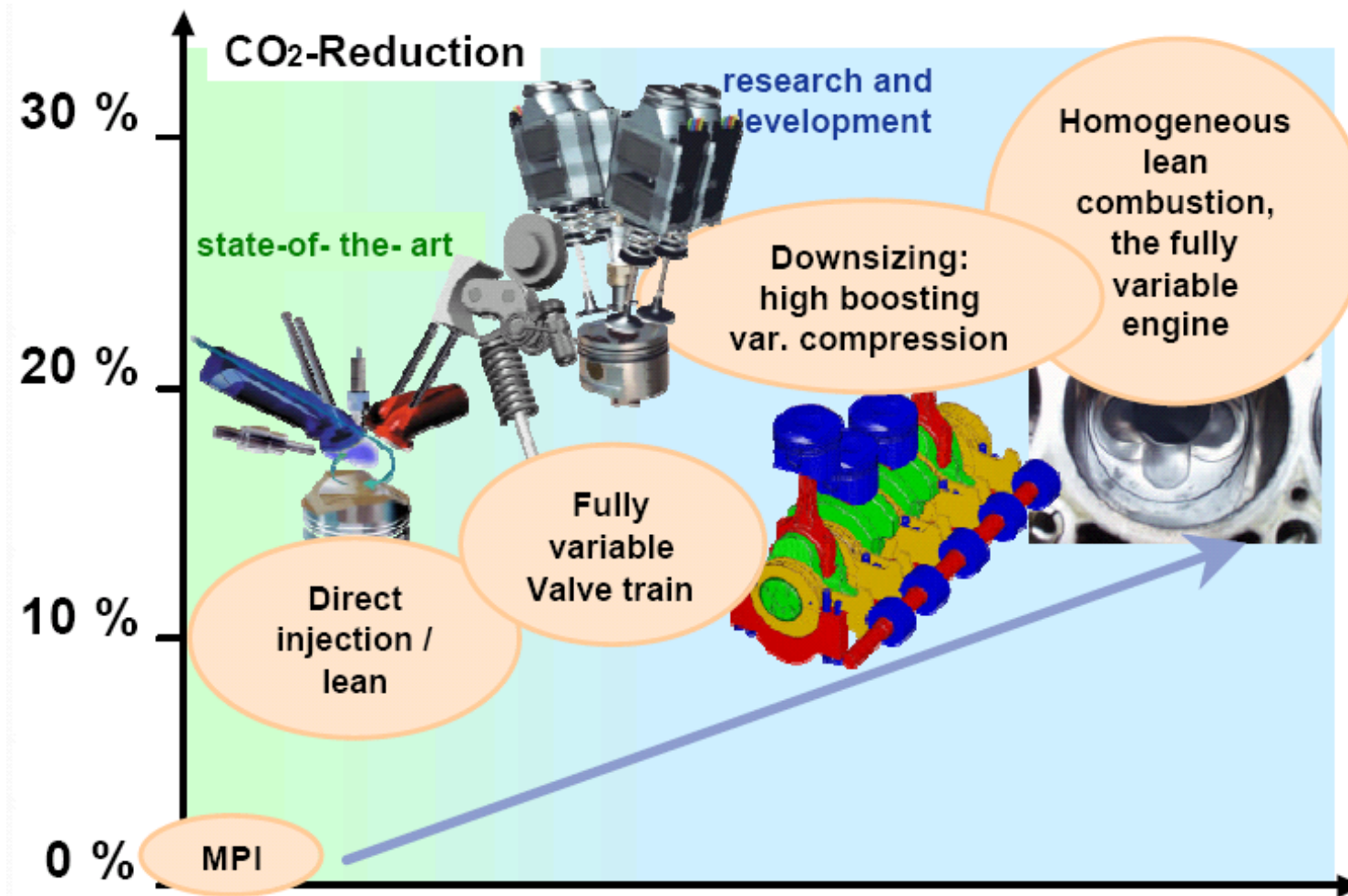
Source: TREMOVE 2.31 – base line

# NO<sub>x</sub> emissions

## “With climate measures” scenario, EU-25



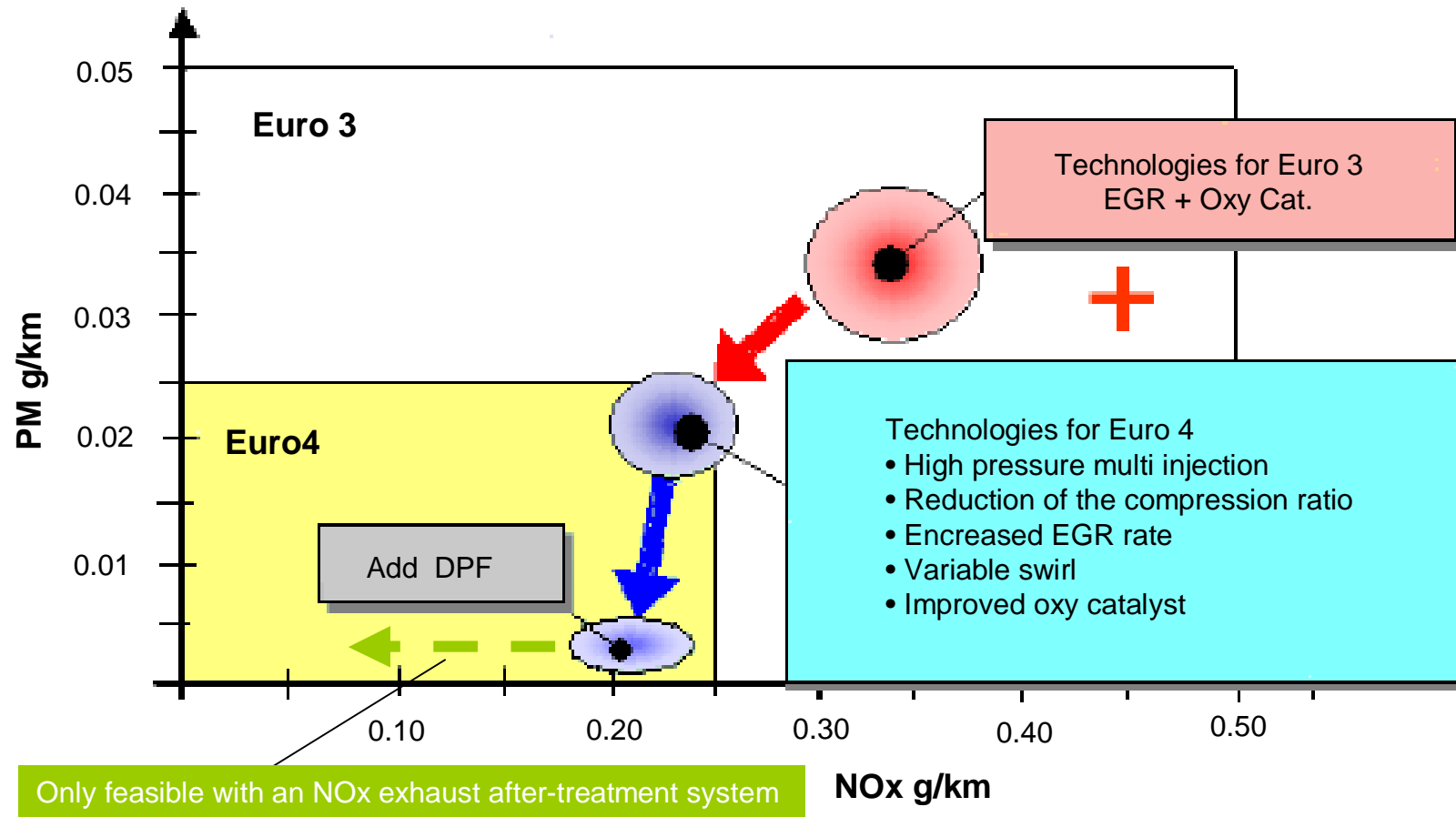
Gasoline passenger cars  
Main target – CO2 emissions and fuel consumption



Source: The Future of Vehicle Propulsion – Combustion Engines and Alternatives;  
Stefan Pischinger, RWTH Aachen, FEV Motorentchnik; CAPoC6 – Brussels 10/2003

# Diesel passenger cars

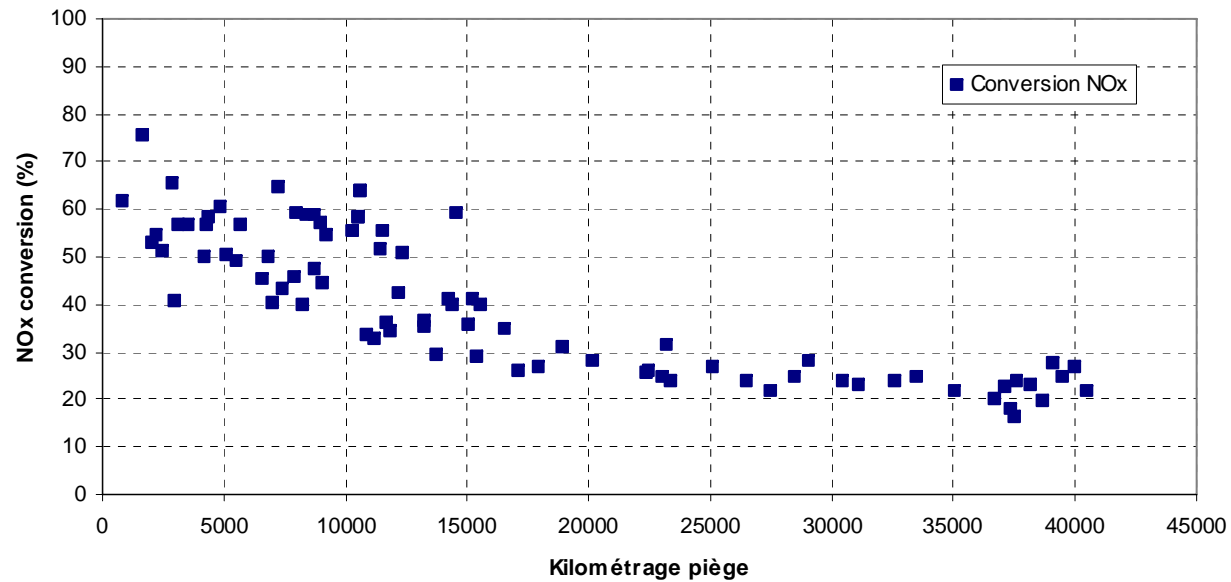
## Technology to meet the Euro 4 and future emissions standards



## NOx trap : risks and limitations

The present status is as follows :

- Durability
  - Immature technology
  - Inevitable and irreversible damage due to thermal stress and sulphur poisoning  
(even with 10 ppm sulphur in Diesel fuel)

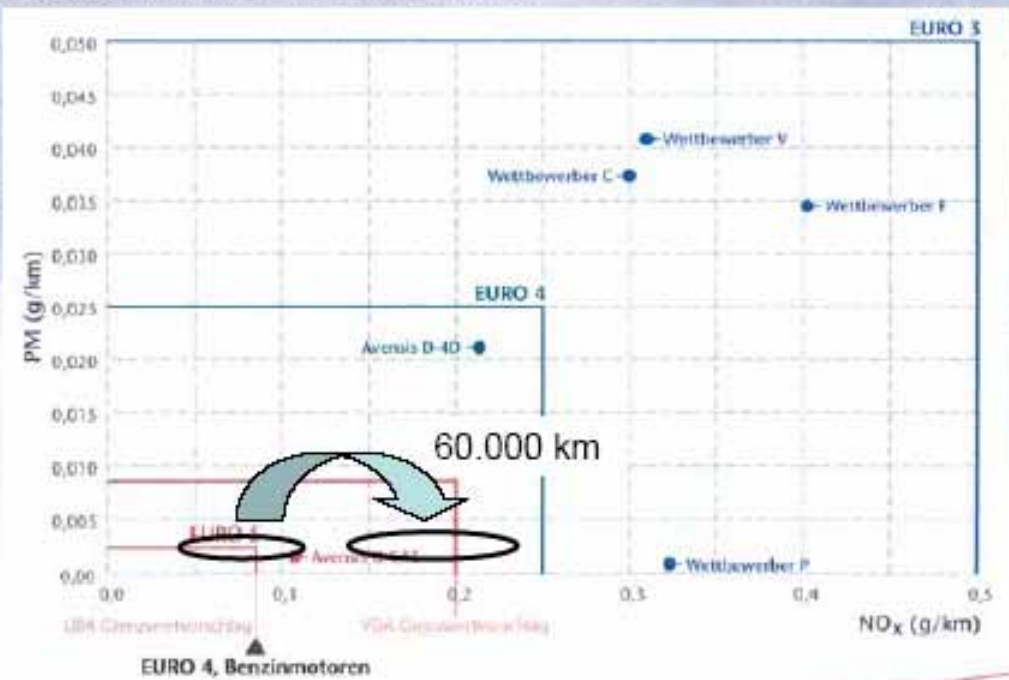


Source: PSA

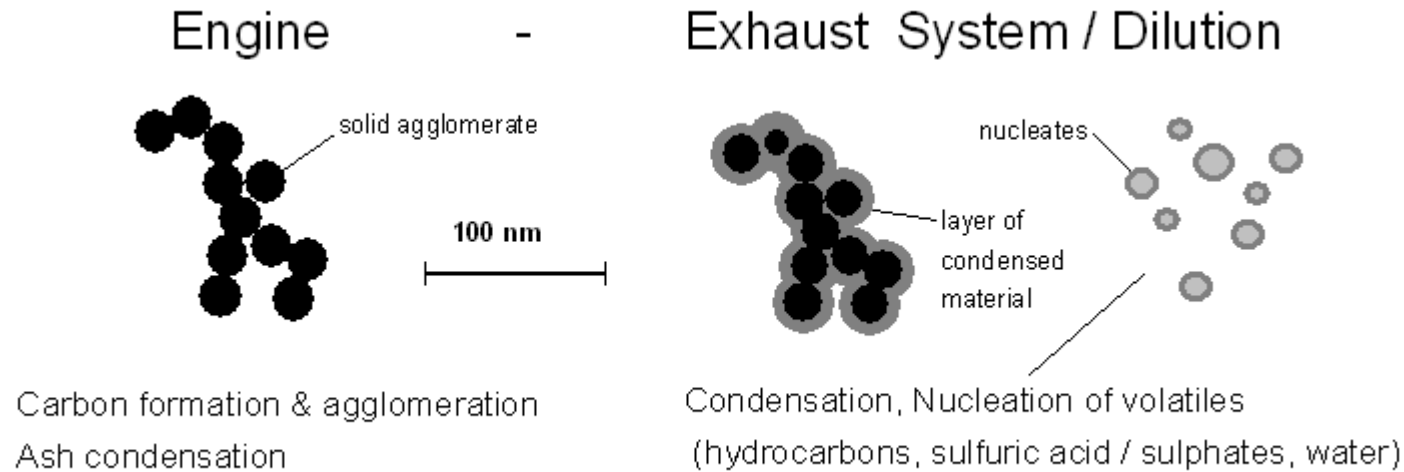
Toyota Avensis

## Toyota D-CAT

Abgasgrenzwerte für Dieselmotoren



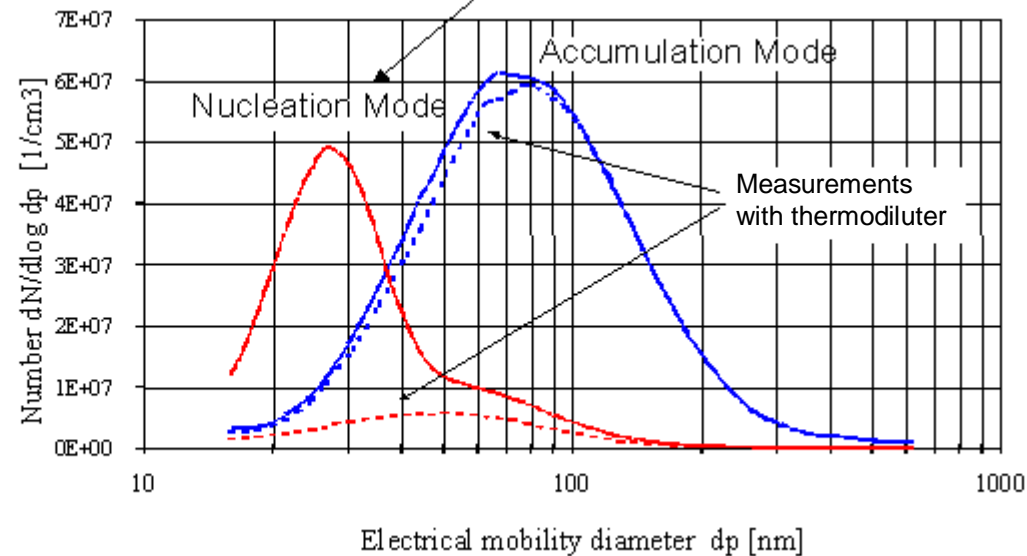
## PM emissions from diesel vehicles



- **Particles emitted by a diesel vehicle are only fine particles < PM<sub>2,5</sub>.**

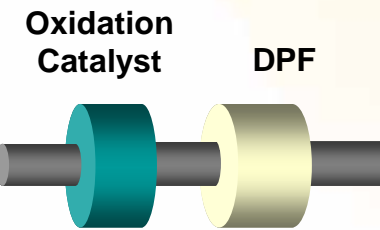
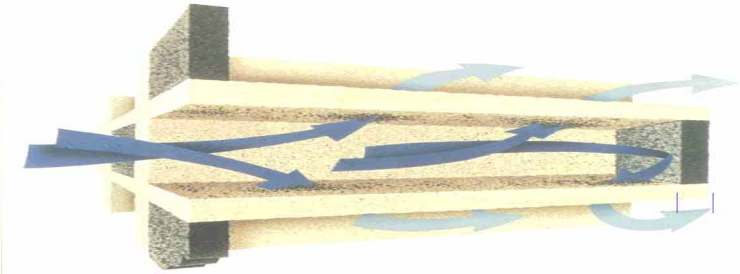
- Both the gravimetric method and the proposed number counting method measure the particle generated during the accumulation mode.

- The number of particles generated during the accumulation mode correlates with the total particle mass.

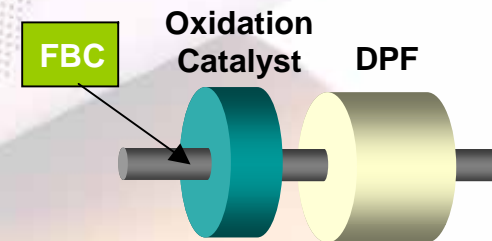
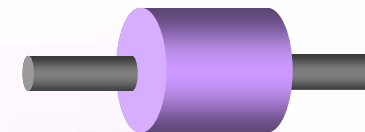


## Diesel Particulate Filter (DPF) regeneration technologies

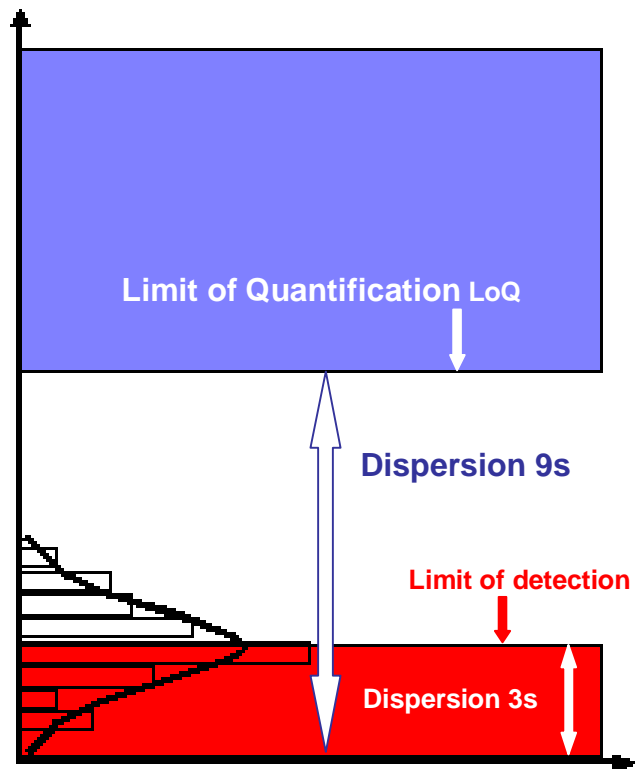
- Engine control
  - To increase exhaust gas temperature
- Continuously Regenerating CR-DPF
- Catalysed C-DPF
- DPF + Fuel Borne Additive



Catalysed DPF



## PM – Lowest acceptable TA limit value



Standard deviation of the gravimetric method = 0,3 to 0,5 mg/km

LoD = 0,9 to 1,5 mg/km



LoQ = 2,7 to 4,5 mg/km



Margin for test repeatability/ reproducibility (M1) = 2 mg/km



Margin for CoP & in-use compliance (M2) = 3 mg/km



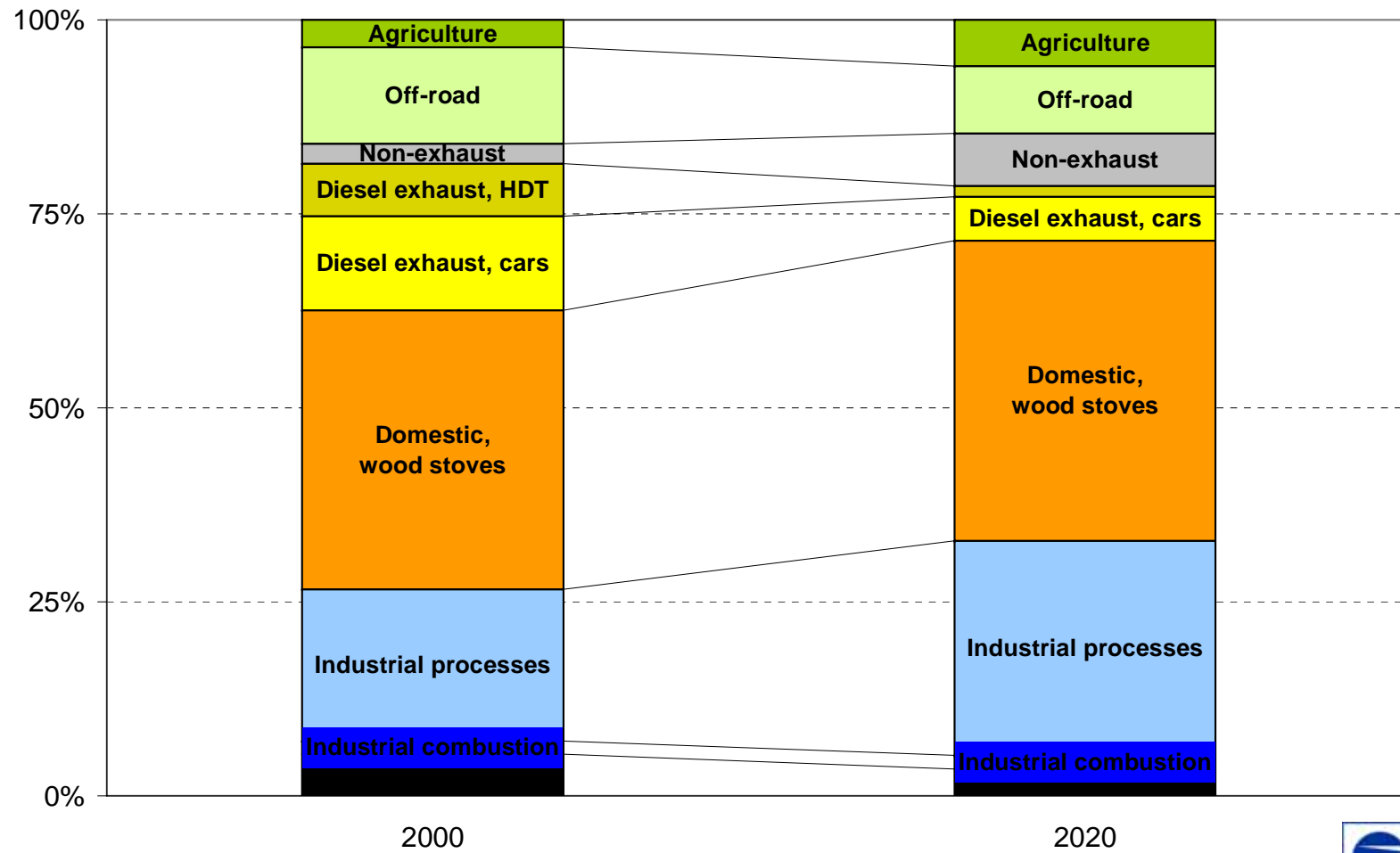
Deterioration Factor = 1



Lowest acceptable TA limit value =  $(\text{LoQ} + \text{M1} + \text{M2}) \times \text{DF} = 7,7 \text{ to } 9,5 \text{ mg/km}$

**PM = 5 mg/km enclosed in the Commission working paper imposes an engineering target lower than the Limit of Quantification**

## Contribution to primary PM2.5 emissions “With climate measures” scenario, EU-15



## Diesel fuel quality

- **Sulphur-free (less than 10ppm) diesel fuel is a prerequisite**
- **Additional requests:**
  - ⇒ Low ash content – DPF are sensitive to the ash content in fuels and lubricants.
  - ⇒ Improved lubricity – it is questionable if present test method and limits adequately protect modern injection systems.
  - ⇒ Impurities – the presence of impurities is to be strictly limited since small inorganic particles (< 1 micron) will increase wear in injection systems.
  - ⇒ cleanliness, stability – is to be controlled to avoid deposit formation. The use of appropriate detergent additives is recommended