



UPDATE PTI PROCEDURE FOR DPF TESTING & EMISSION PERFORMANCE OF OLDER GASOLINE VEHICLES

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TNO innovation
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**DUTCH DPF-PTI RESEARCH AND IN USE COMPLIANCE PROGRAM
RESULTS 2018-2019**

STATUS OF DUTCH PTI DPF PROGRAM

- › The new PTI DPF test protocol (Periodic Technical Inspection) will be finalised and published in September 2019 in the Dutch “Staatscourant”.
 1. Low idle speed test.
 2. Specification of a PTI-PN-tester developed by Dutch NMi.
 3. PN limit value of 250.000 #/cm³.

- › **The new PTI PN emission test procedure will be implemented in the Dutch PTI as soon as sufficient new PN-tester are on the market (2021).**

2018 - 2019 PROGRESS VERT-NPTI GROUP



Potential suppliers of PTI-PN testers:

- TSI
- Testo
- Naneos
- Sensors
- AVL
- Dekati
- TEN
- MAHA
- Premier Diagnostics
- Pegasor
- Continental
- Mahle

Potential PTI market needs high numbers of instruments

DUTCH NMI: SPECIFICATION OF NEW PTI PN TESTER

- › Solid Particles.
- › Particle sizes: 23, 50 and 80 nm.
- › Measuring range: 0 – 5.000.000 #/cm³.

- › Part 1: Specification of the tester
- › Part 2: Calibration procedures
 - › Type approval, Initial & in-field calibration.

- › Certification is already possible in 2019. Contact details: pkok@nmi.nl



WORLD WIDE HARMONISATION OF THE PN TESTER

- › Minutes 53rd CIML Meeting (OIML workgroup), Hamburg, Germany 9–12 October 2018
- › *Resolution no. 2018/27 (agenda item 12.1.2.5) The Committee, Noting the comments made by its members on the details of the terms of reference included in Addendum 12.1.2.5, Approves as a new project, under the responsibility of TC 16/SC 1, the development of a new Recommendation on Instruments for measuring the vehicle exhaust soot particle number (PN), to be conducted as specified in the project proposal provided in the addendum 12.1.2.5 to the working document of this meeting.*
- › Germany (PTB, Prof. Volker Ebert) and Netherlands (NMI, Mr. Paul Kok) are leaders of this new OIML project.

GASOLINE VEHICLES WITH HIGH MILEAGES

- › 12 vehicles
 - › Emission classes: Euro 2,3,4,5
 - › Mileages: 155.000 – 254.000 km
 - › Age 6 – 20 years.
-
- › Chassis dynamometer
 - › Common Artemis Driving Cycle (CADC)



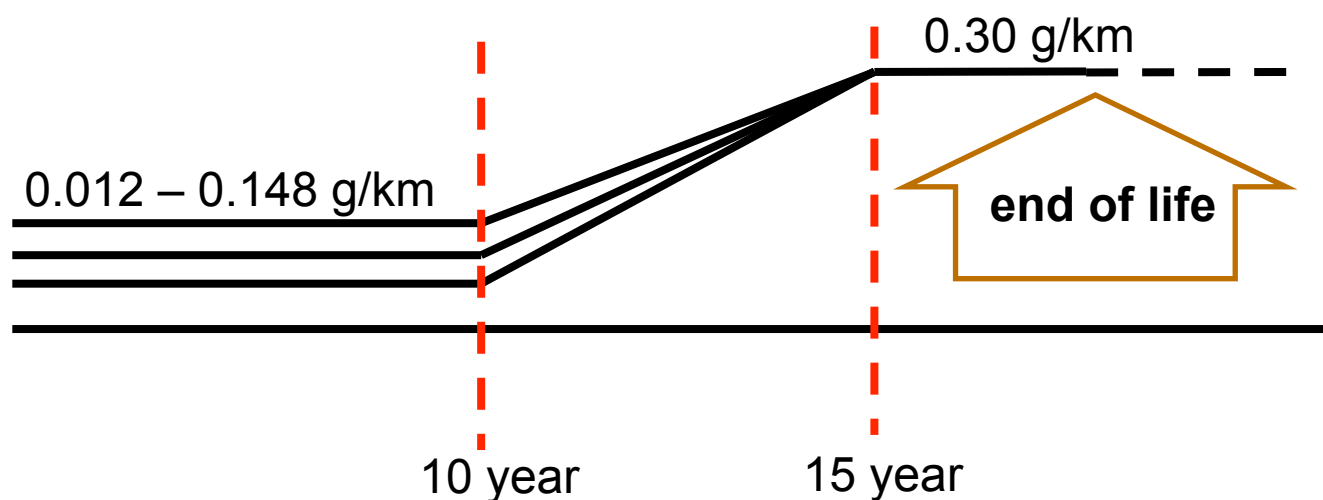
WHEN NEW VEHICLES ARE CLEAN *WILL THEY REMAIN SO*

› Euro-5/6 restricted to:

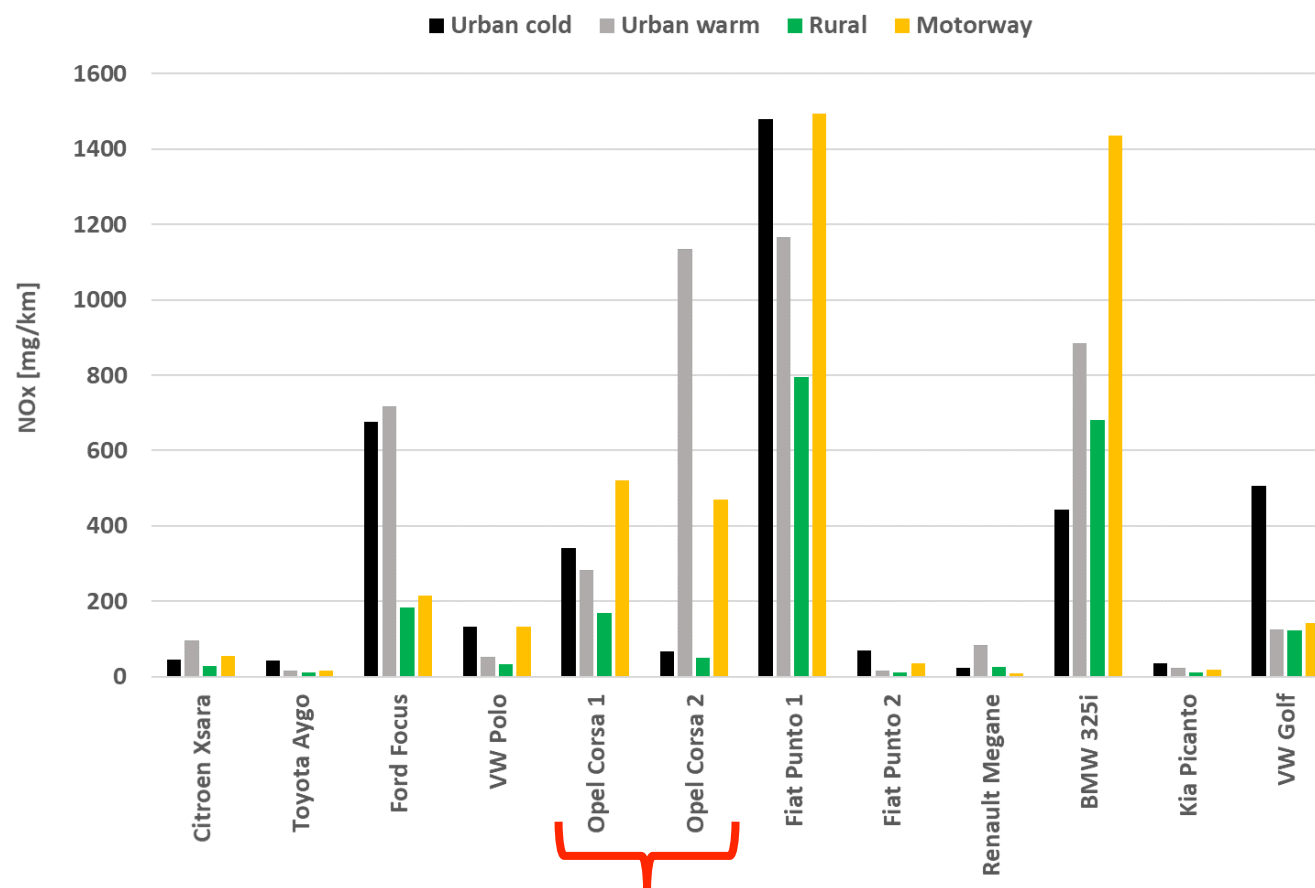
- › In-service conformity: 100,000 km or 5 years, whichever is sooner
- › Durability requirements of emission control parts: 160,000 km on the bench
- › Vehicles with good service and usage records, proper replacements parts
- › Controlled according to Reg. 83: 40% of the vehicles may develop faults without consequences.
- › In all other situations high emissions may go unnoticed and unchecked.
 - › up to very levels, or fault codes, caught Periodic Technical Inspection
- › Long remote sensing campaigns already showed growing emissions over the lifetime, without limit. (See, e.g., TNO Report 2015 R11043, with IIASA, and Harald Jenk presentation at ERMES meeting 2019)
- ›

PETROL CARS: NOX INCREASE TILL 2025 *NO INDICATION EURO-6 WILL BE BETTER*

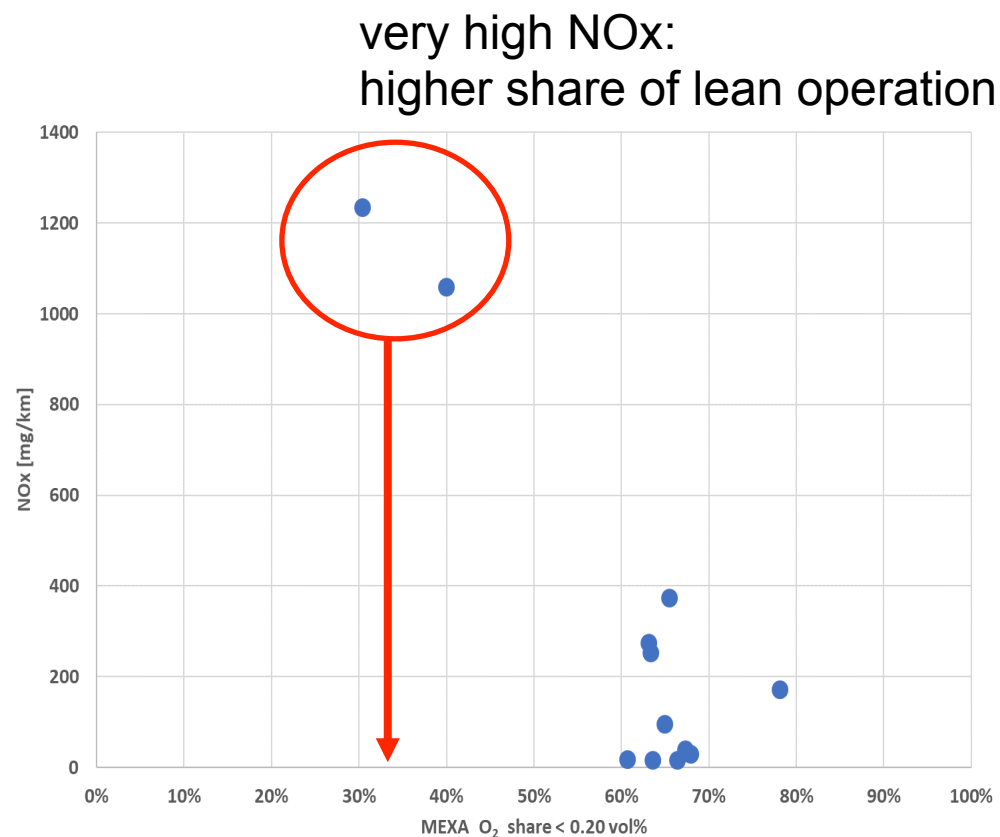
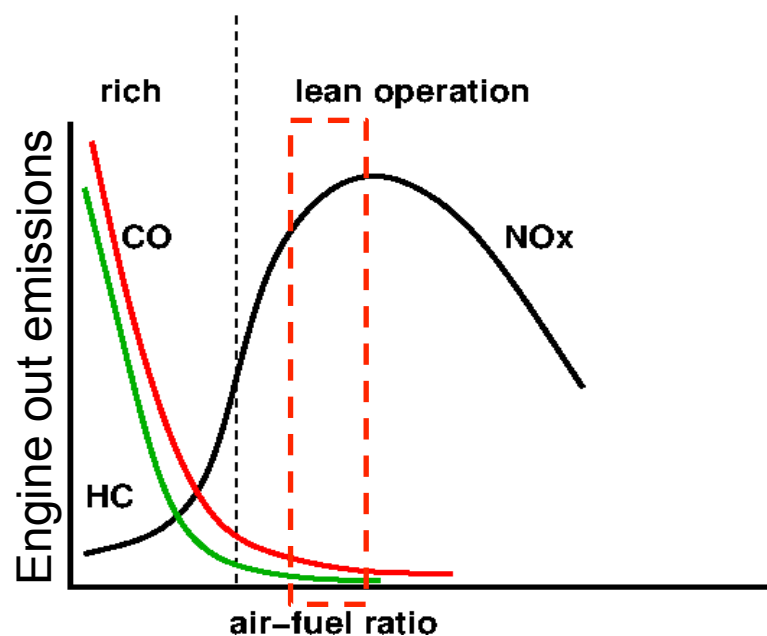
- › For modern petrol cars (Euro-3 tot Euro-5):
 - › From 10 years till 16 years linear increase of NOx emissions of petrol cars from the initial level to 300 mg/km on all roads.
 - › trend:



HIGH PETROL NOx EMISSIONS *NOT RELATED TO SPECIAL CONDITIONS*



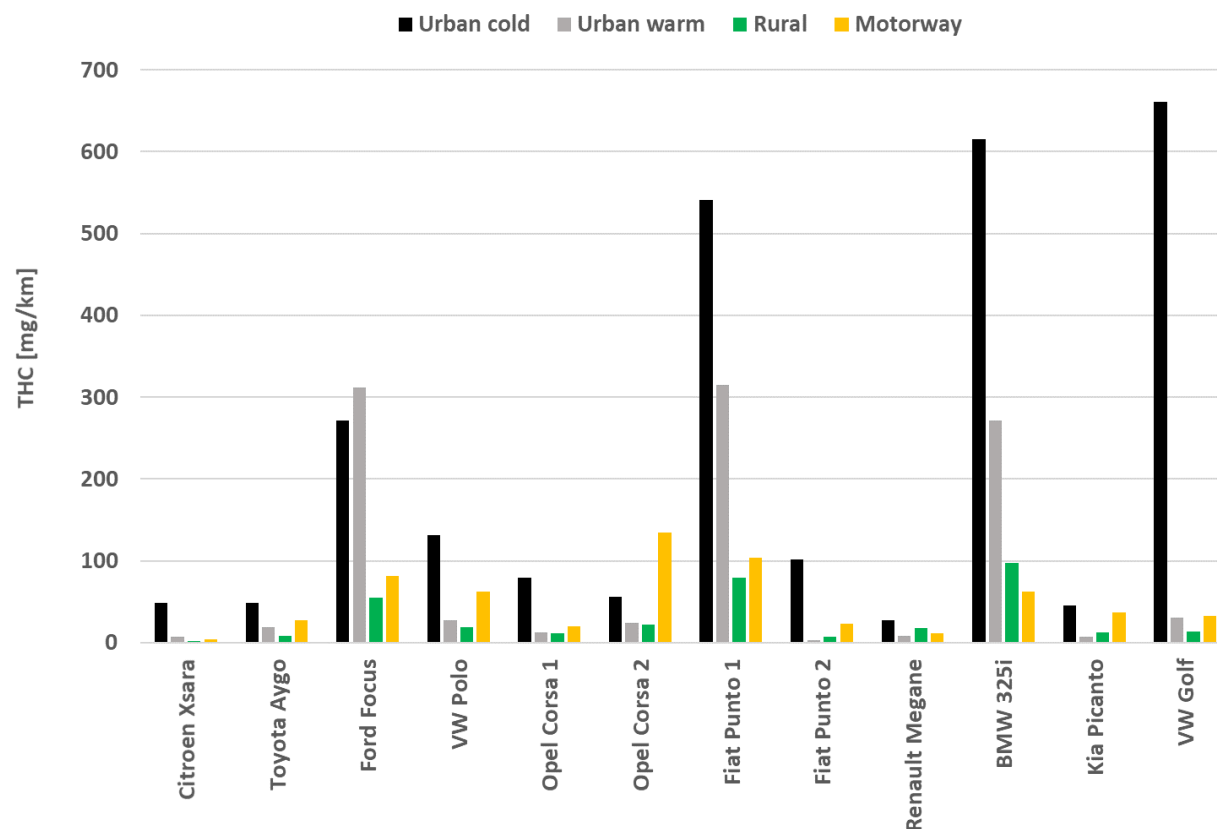
POSSIBLE LAMBDA SENSOR PROBLEM



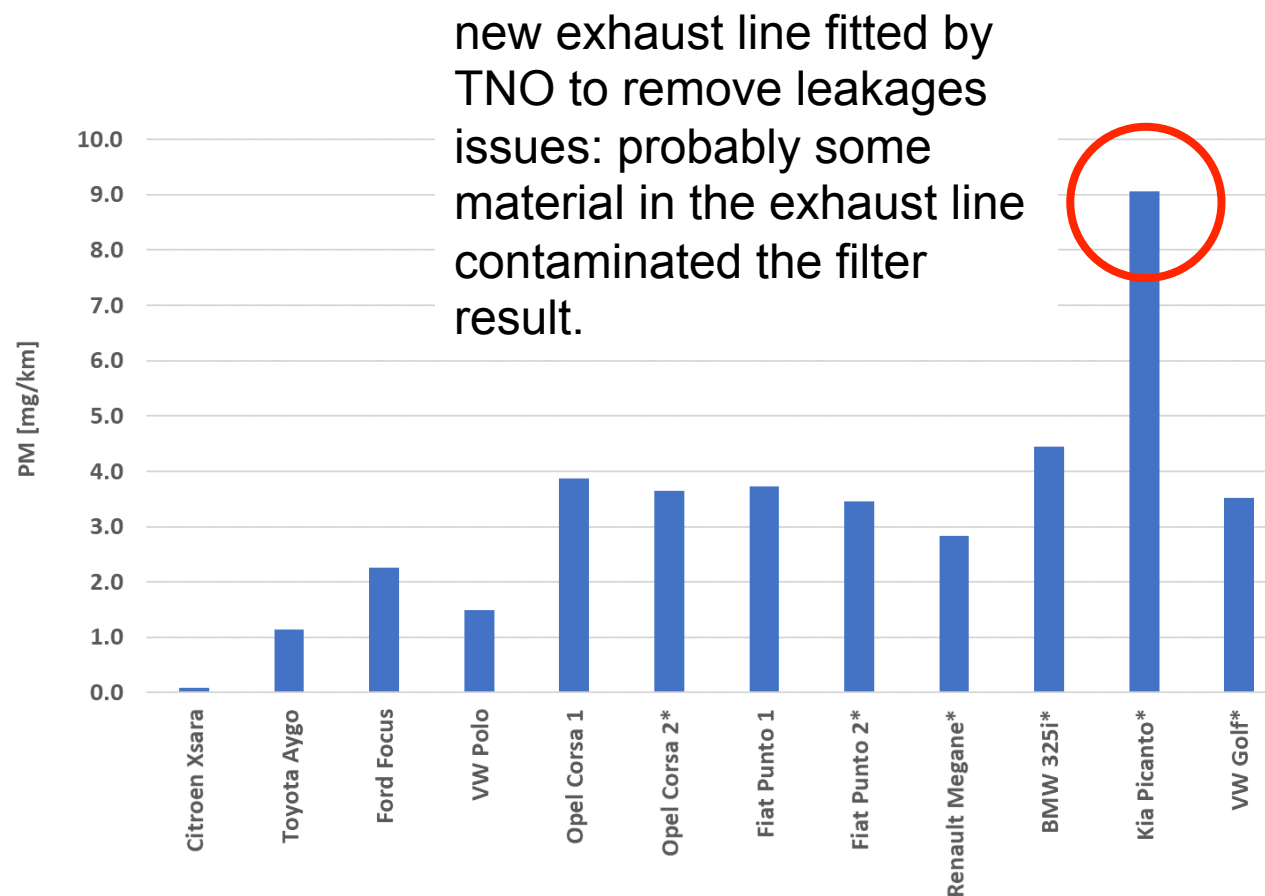
THC RELATED TO COLD START

NO CORRELATION WITH NOX:

THEREFORE, MINOR CATALYST AGING PROBLEMS OBSERVED



DESPITE SUBSTANTIAL OIL CONSUMPTION PM EMISSIONS ARE LOW



OFFERING SOLUTIONS FOR PROBLEMS, NOT MORE PROBLEMS

- › **The cause(s) and solution(s) of high NOx emissions in older petrol cars need to be identified: (more testing needed)**
 - › development of a “screening test in a day”, with escalation for high emitters
 - › finding the malfunction and the repair/solutions for high emitters
 - › developing a method to quickly and simply identify these malfunctions

Finding high emitters is not the end, but the start of the problems.

In 2019 – 2020 another 60 gasoline vehicles with high mileages will be screened. In case of malfunctions detailed research will be performed in order to find the causes of high emissions and technical solutions to recover the right emission performance.

TNO'S NEXT STEP

› *Monitoring vehicles for years, remote with SEMS*



NOx & NH3 in mg/km
CO2 in g/km
Logging frequency 1 Hz

Processed data direct
available on internet.

› *SEMS Poster 88 of this ETH conference.*

› *SEMS demonstration today @ 10.30 hrs downstairs in the ETH parking lot.*



› **THANK YOU VERY MUCH FOR YOUR
ATTENTION**

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- › <https://www.tno.nl/en/focus-area/urbanisation/mobility-logistics/clean-mobility/emissions-of-particulate-matter-from-diesel-cars/>
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