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Particulate Filter Check

by means of a

Particle test

VERT Online Focus Event
July 7th, 2021
Gerrit Kadijk

Content presentation

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1. Introduction

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- Gerrit Kadijk Bsc (1963), Delft – The Netherlands
- Internal combustion engine and emission engineer
- Researcher/scientist @ TNO (1988 – 2020)
- Owner of Emission Training Services (2021)
- Lecturer at Da Vinci College in Dordrecht (2021)

- Developer of the Dutch Particulate Filter Check (2012 – 2020)

2. What's in a name?

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- New PTI-PN emission test procedure
- Fully developed between 2015 and 2020
- Implementation in 2022 in The Netherlands and Belgium
- **A clear dedicated new name is needed for communication purposes.**

2. What's in a name?

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- PTI test procedure: **Particulate Filter Check (PFC)**
- PTI emission test: **Particle Test (PT)**
- PTI measuring device: **Particle Number Counter (PNC)**

3. Development and implementation PFC

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- 2012-2015 Investigation of improved opacity meters
- 2015-2019 Investigation and specification of particle counter and development of test procedure and limit values.
- 2019-2020 Publication of the specifications of low cost particle counters and calibration procedures
- 2020-2021 Type approvals of particle counters and implementation of PFC in PTI
- 2022 Start execution of the PFC

Scientific reports of the PFC development

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1. Roadworthiness Test Investigations of Diesel Particulate Filters. TNO 2013 R10160 v3.
2. Roadworthiness Test Investigations of Diesel Particulate Filters on vehicles. TNO 2015 R10307 v2.
3. Investigation into a Periodic Technical Inspection test method to check for presence and proper functioning of Diesel Particulate Filters in light-duty diesel vehicles. TNO 2016 R10735.
4. Investigation into a Periodic Technical Inspection test method to check for presence and proper functioning of Diesel Particulate Filters in light-duty diesel vehicles – part 2. TNO 2017 R10530.
5. Follow-up research into the PN limit value and the measurement method for checking particulate filters with a particle number counter. TNO 2020 R 10006.

Reports to be downloaded on https://www.pti-pf-test.com/publications

4. Key elements Dutch PFC

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- Road vehicles: Euro 3, 4, 5, 6, VI with a wall flow particulate filter.
- Particle test: low idle speed, measurement of particle number concentration with a **low cost particle counter.**
- Duration of the total test procedure is appr. 90 seconds.
- No preconditioning required (Expected share of vehicles without preconditioning is 90%. The residual 10% must be tested with a warm engine)
- PTI limit value is 1,000,000 #/cm^3

4. Key elements Dutch PFC

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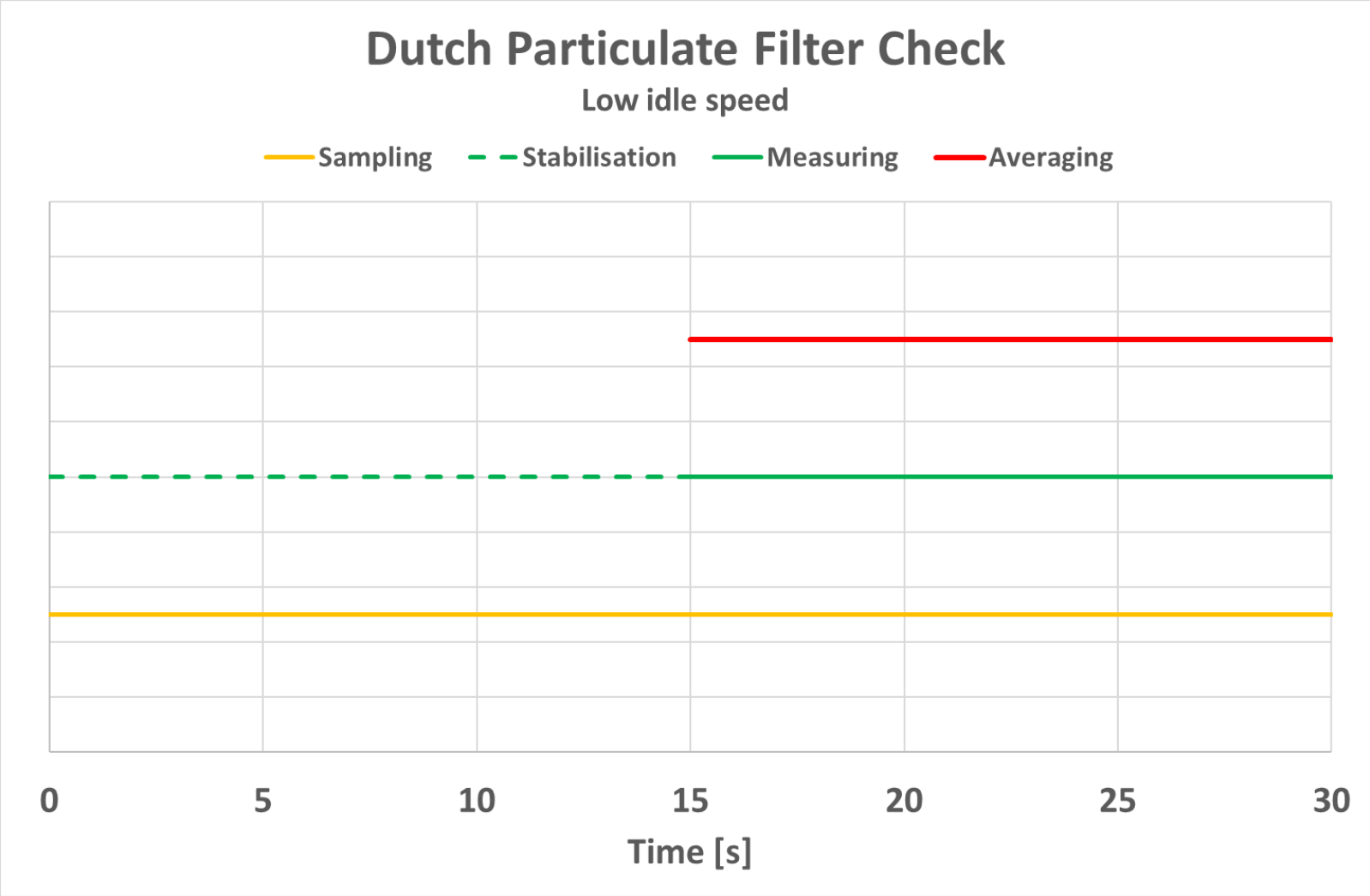

Test procedure PFC:

Data input 20 seconds

Zeroing 20 seconds

Installation probe 10 seconds

Testing 30 seconds

Printing 10 seconds

Total duration 90 seconds.

4. Preconditioning of the PFC

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- <u>No preconditioning required but you may precondition the vehicle</u>

(Expected share of vehicles without preconditioning is 90%. The residual 10% must be tested with a warm engine)

- Reference conditions:

  Warm engine, EGR valve closed (manipulation proof) , no DPF-regeneration

- Preconditioning is volontary because in reference conditions the PN emission at low idle speed is the lowest.

- When a vehicle passes the PTI under random conditions at low idle speed it certainly passes under reference conditions.

PFC has a very good correlation with NEDC chassis dynamometer test

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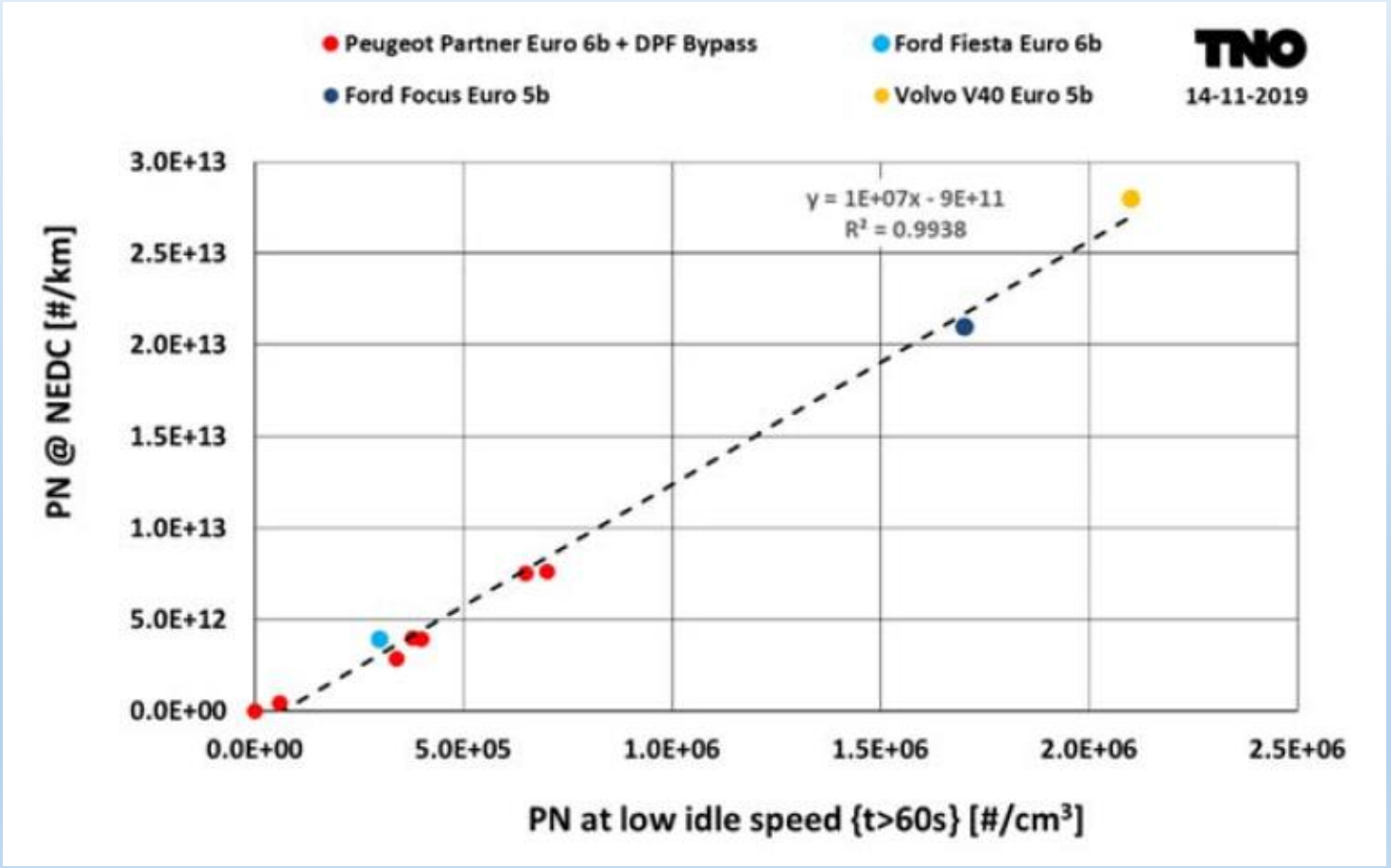

Why is this correlation so good?

A wall flow filter has a very constant filtration efficiency over the flow range.

4. Particulate Filter Check demonstration

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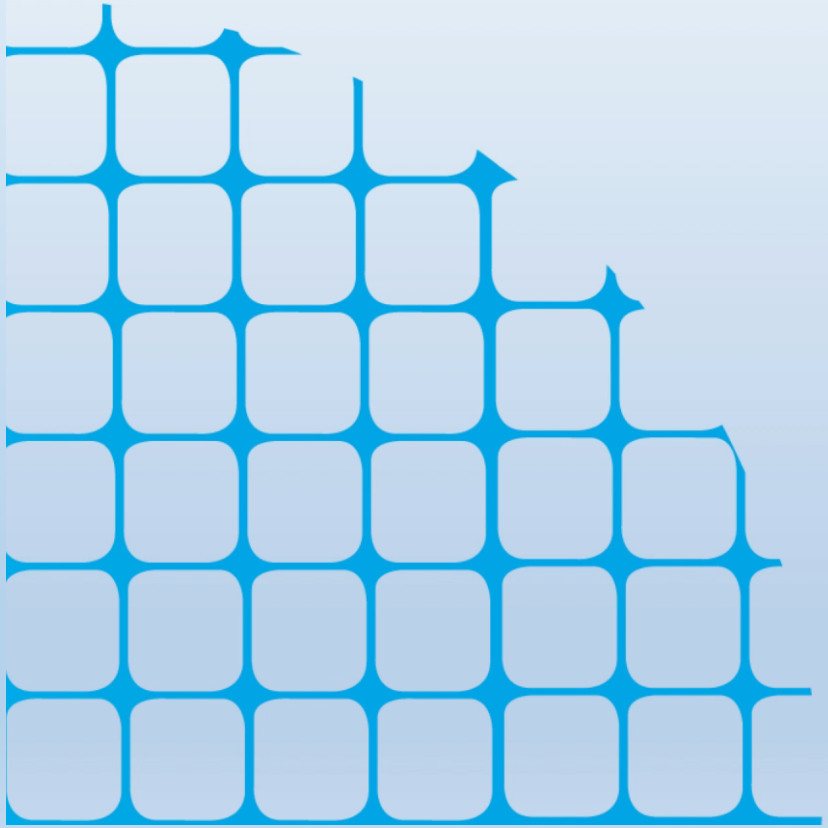

5. Low cost particle counters

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CPC and DC types

10 potential suppliers

3 particle counters are already type approved by the Dutch metrological institute.

Price range:
€ 4,750 to € 7,000

6. New books

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Language Dutch

‘Roet in beeld’ Launch 15-06-2021

Website ETS: www.deeltjestest.nl

6. New books

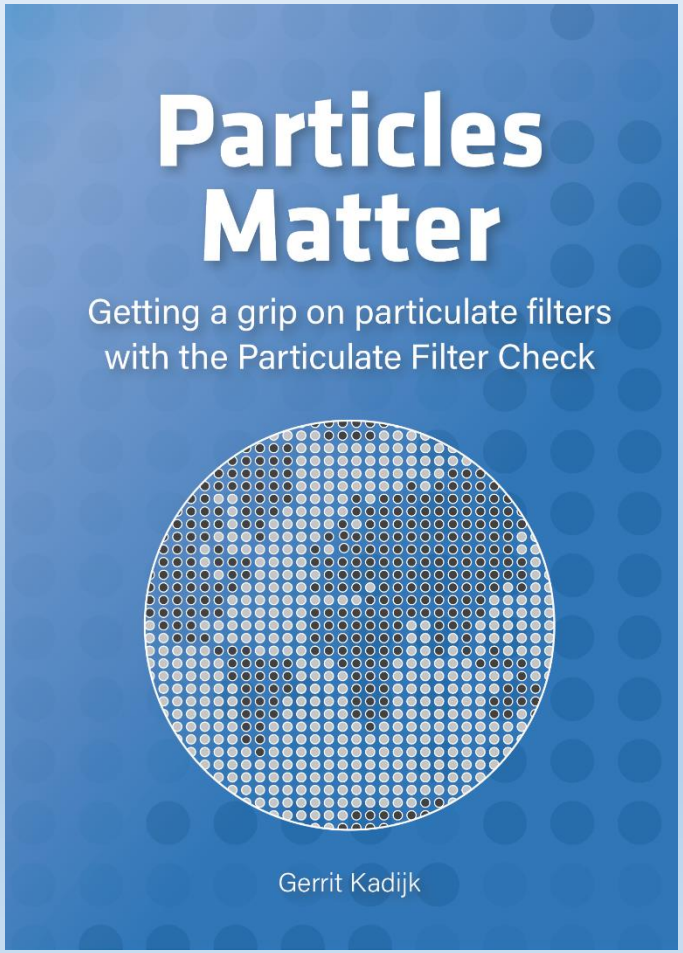
www.deeltjestest.nl

Language English

‘Particles Matter’

Launch December 2021

Website: https://www.pti-pf-test.com/book



7. News

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Thank you very much for your attention

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