

# PTI Emission tests



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Periodic Technical Inspection.  
A means of monitoring the  
emissions performance of  
vehicles over the life time.

CASANZ Air Talks  
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# ETS and Gerrit Kadijk



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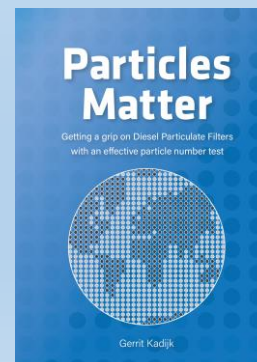
- Gerrit Kadijk Bsc (1963), Delft – The Netherlands
- Researcher/scientist @ TNO (1988 – 2020) 
- Developer of the Dutch Particulate Filter Check (2012 – 2020)
- Owner of Emission Training Services (> 2020 )
- Lecturer at Da Vinci College in Dordrecht (> 2020 )



- Author and publisher of



and



# Content presentation



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1. Vehicle emissions over the lifetime
2. Emission reduction technologies
3. PTI in Europe
4. Particulate Filter Check test method
5. Book 'Particles Matter'





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# 1. Vehicle emissions over the lifetime

Reasons for elevated real world emissions (reference is type approval):

1. Real world driving
2. Climate and altitude
3. Emission control strategy deviations (i.e. Dieselgate)
4. Manipulation (deactivation EGR / SCR / DPF)
5. Technical failures in relation to user profile
6. Deterioration of engine, catalysts and filters
7. Lack of or inadequate maintenance

Conclusion 1: There are many causes for elevated emissions over the lifetime of a vehicle.

## 2. Emission reduction technologies

- Exhaust Gas Recirculation (EGR)
- Oxidation Catalyst (OC)
- Threeway catalyst (TWC)
- Particulate Filter (DPF or GPF)
- Lean NO<sub>x</sub> Trap (LNT)
- Selective Catalytic Reduction (SCR)



Conclusion 2: These technologies are needed to reduce emissions and some conversion rates are very high (up to 99%). However they can be manipulated or fail!

## 2. Diesel Particulate Filter (DPF)

- Particulate Filter (DPF) is applied in all Euro 5 & 6 diesel vehicles
- Filtration efficiency is on average 95 to 99% and very valuable!
- Euro 4 vehicle PM = 25 mg/km, Euro 5 vehicle PM = 1 mg/km
- DPF technology is not suitable for all users (i.e. city driving) because the regeneration conditions cannot be met. Some DPF's are removed.
- Some DPF technologies are not robust, filters crack.



Conclusion 3:

Modern technologies are successful as long as their performance is monitored.

# 3. Periodic Technical Inspections in Europe



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EC Regulation 2014/45: All EU member states must perform PTI.  
A minimum set of requirements is applicable.

Objective 1: Keep vehicles safe.	Brakes, steering, tyres, lighting.
Objective 2: Keep vehicles clean.	Exhaust emissions.

PTI in the EU is a national responsibility.

Several operating models are allowed (centralised or decentralised).

Interval (years): 4-2-2-1-1... / 3-1-1-..... / 1-1-1-.....

### 3. PTI Emission Tests in Europe



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Gasoline: four gas test at low and high idle speed (CO, THC, CO<sub>2</sub> and O<sub>2</sub>)



Diesel without (and with) DPF:  
Free acceleration test with a smoke meter



**New:**

Diesel with DPF: Particulate Filter Check (PFC).  
Low idle speed test with a particle number counter.





### 3. Particulate Filter Check in NL, B, D, S



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#### National Particulate Filter Checks (PFC) in the PTI

<b>Country</b>	<b>Start date</b>	<b>PFC method</b>	<b>Euro Class</b>
Netherlands	01-07-2022	NL	3,4,5,6 and VI
Belgium	01-07-2022	NL	5b and 6
Germany	01-01-2023	D	6 and VI
Switzerland	01-01-2023	S	5b, 6 and VI

Video demonstration NL PFC: [www.particlesmatter.com/particulate-filter-check](http://www.particlesmatter.com/particulate-filter-check)

## 4. Particle counters, status March 2022



Measuring range: 5,000 to 5,000,000 #/cm<sup>3</sup>

18 suppliers

4 CPC and 14 DC types

6 Dutch type approvals

Price range: € 4,000 to € 5,250

Arex, Assemblad, AVL-Ditest, Bosch, Brainbee, Capelec, Continental, Dekati, Hella Gutmann, Maha, Mahle, Pegasor, Saarloos, Saxon-Junkalor, Sensors, TEN, TEXA, VLT, WOW!

More information: [www.particlesmatter.com/particle-counters](http://www.particlesmatter.com/particle-counters)

# 4. Requirements for a PFC



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What does a member state/country need for a PFC in the PTI?

Definition of the particle counter (type approval, calibration standards)

National metrology institute with dedicated knowledge

Definition of the particulate filter check test method

Definition of the PN limit values

Definition of the vehicles to be tested

Organisation for execution of the Particulate Filter Check in the PTI

## 4. Other initiatives / developments



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UNECE IWG-PTI prepares a Resolution for a PTI-PN test method.



EU (DG MOVE) prepares a Guidance paper with minimum requirements for a PTI-PN test method.



# 5. 'Particles Matter' for sale!



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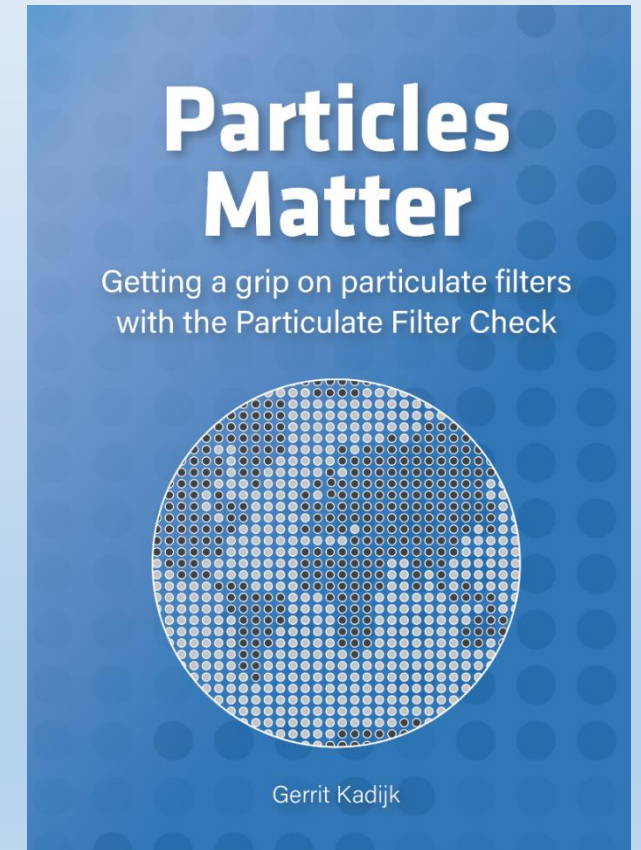
Detailed description of the Particulate Filter Check  
126 pages, 12 chapters, 92 questions & answers

Unmissable for

- Policymakers
- PN counter suppliers
- PTI operators & inspectors

[www.particlesmatter.com/book](http://www.particlesmatter.com/book)

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Your effort matters!  
Are you in?

Let's take care of our health!  
Let's keep the particulate filters in good condition !

# Thank you for your attention



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## Particles Matter

Getting a grip on particulate filters  
with the Particulate Filter Check



Gerrit Kadijk