



25th ETH-Conference on Combustion Generated Nanoparticles

Cleaner air due to vehicle approval or vehicle inspection?

June 23th, 2022

Videoconference

Limit values type-approval tests – RDE - EOBD

And afterwards in Service of the vehicle

- EOBD
- Durability 160.000 km
- Opacity plate value

limit values Type Approval M1 diesel vehicles			
Euro class	date	PM	PN
		[mg/km]	[km ⁻¹]
Euro 1	1993	140	
Euro 2	1996	80	
Euro 3	2000	50	
Euro 4	2005	25	
Euro 5a	2009	5	
Euro 5b	2011	4,5	6,0 *E11
Euro 6a	2014	4,5	6,0 *E11
Euro 6b	2017	4,5	6,0 *E11

Removal of DPF exists !!!



Just GOOGLE “Remove DPF”!

- It is cheaper and easy to cheat than to repair;
- (E)OBD is not able to detect fraud;
- Opacity Plate value is not consistent with Euro 5 and Euro 6;
- PTI was not able to detect removal of DPF.

PN-counting in Periodic Technical Inspection



Exchange opacity measurement by a PN-counting measurement in order to detect DPF malfunctioning or fraud.



Start up PN-counting during PTI in Europe

The Netherlands	01/07/2022
Belgium	01/07/2022
Germany	01/01/2023
Switzerland	01/01/2023

Need for innovative equipment because ...



A badly working diesel particulate filter (DPF) is today not detectable during traditional PTI inspection!

- The opacimeters are not adapted to measure the low concentrations emitted by vehicles with a DPF;
- The current rejection criteria for opacity values are too high;
- EOBD readings can not detect the reprogramming of the electronic units to obscure the removal of a DPF.

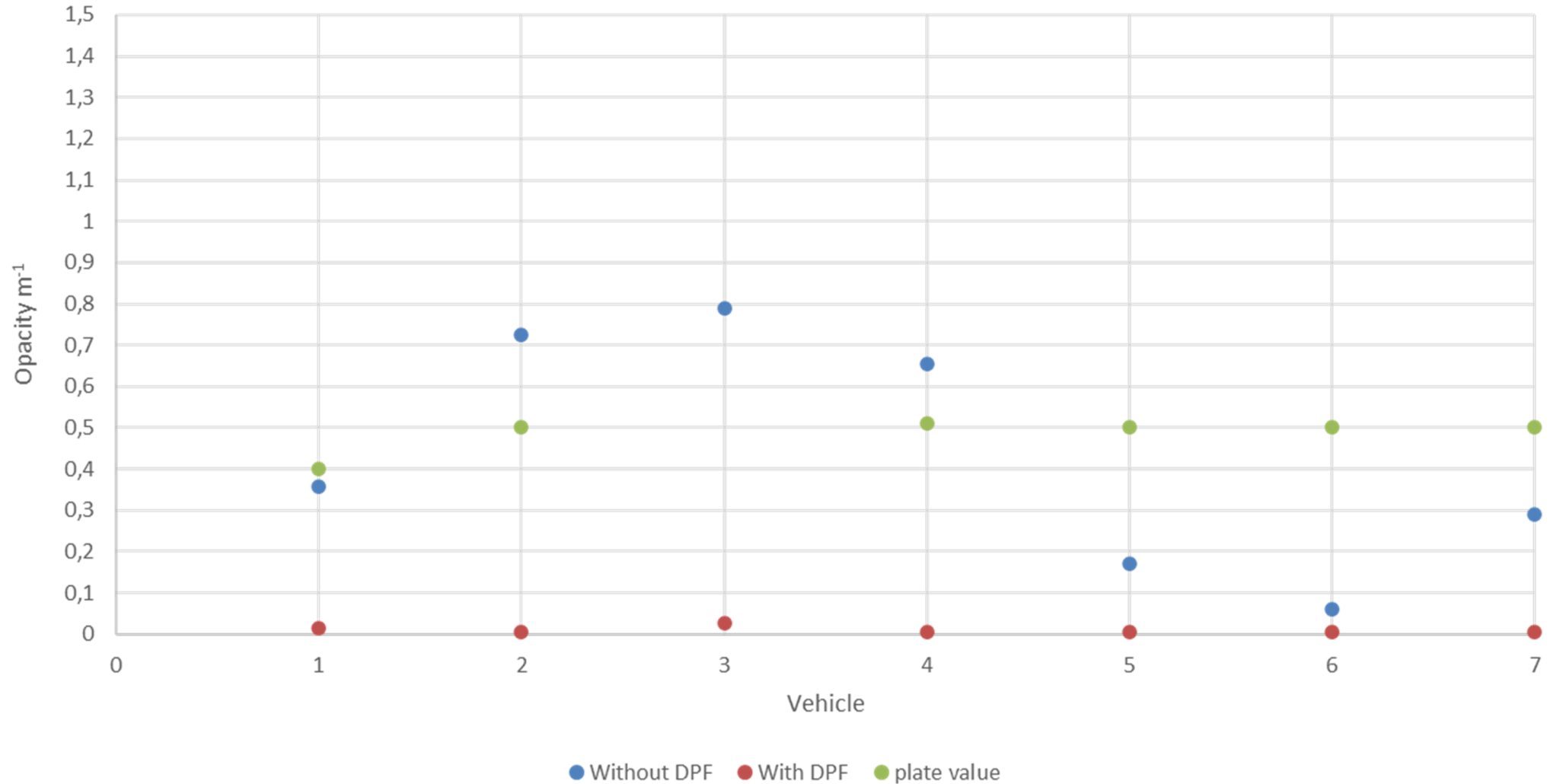
Current rejection limits are too high



Date	Euro	Gasoline			Diesel	EOBD
		Idle	High idle		Free acceleration	
			+ 2000 tr/min			
		CO (vol%)	CO (vol%)	λ	$K (m^{-1})$	
before 1980		4,5	/	/	2,5 (d) en 3 (TD)	
01/01/1980						
01/10/1986		3,5	/	/		
01/07/1992	Euro 1					
01/01/1996	Euro 2					
01/01/1998	Euro 2	0,5	0,3	1 ± 0,03		
01/01/2000	Euro 3					
01/01/2002	Euro 3	0,3	0,2	1 ± 0,03		
01/01/2005	Euro 4					
01/01/2007	Euro 4					
01/06/2008	Euro 4					
01/09/2009	Euro 5					
01/09/2014	Euro 6				1,5	EOBD if assesement of equivalence
					0,7	Tailpipe test or EOBD

Current rejection criteria are too high

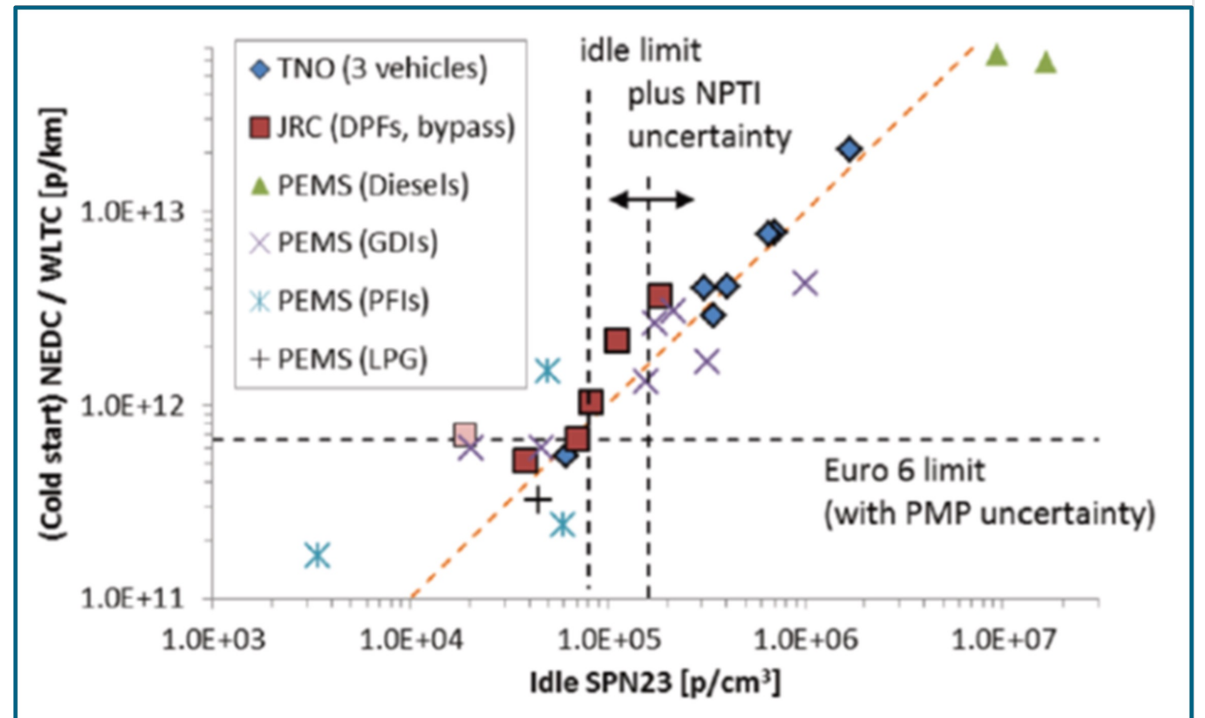
2nd generation of Opacity Equipment



PN-counting in Periodic Technical Inspection

Necessary instruments are in place

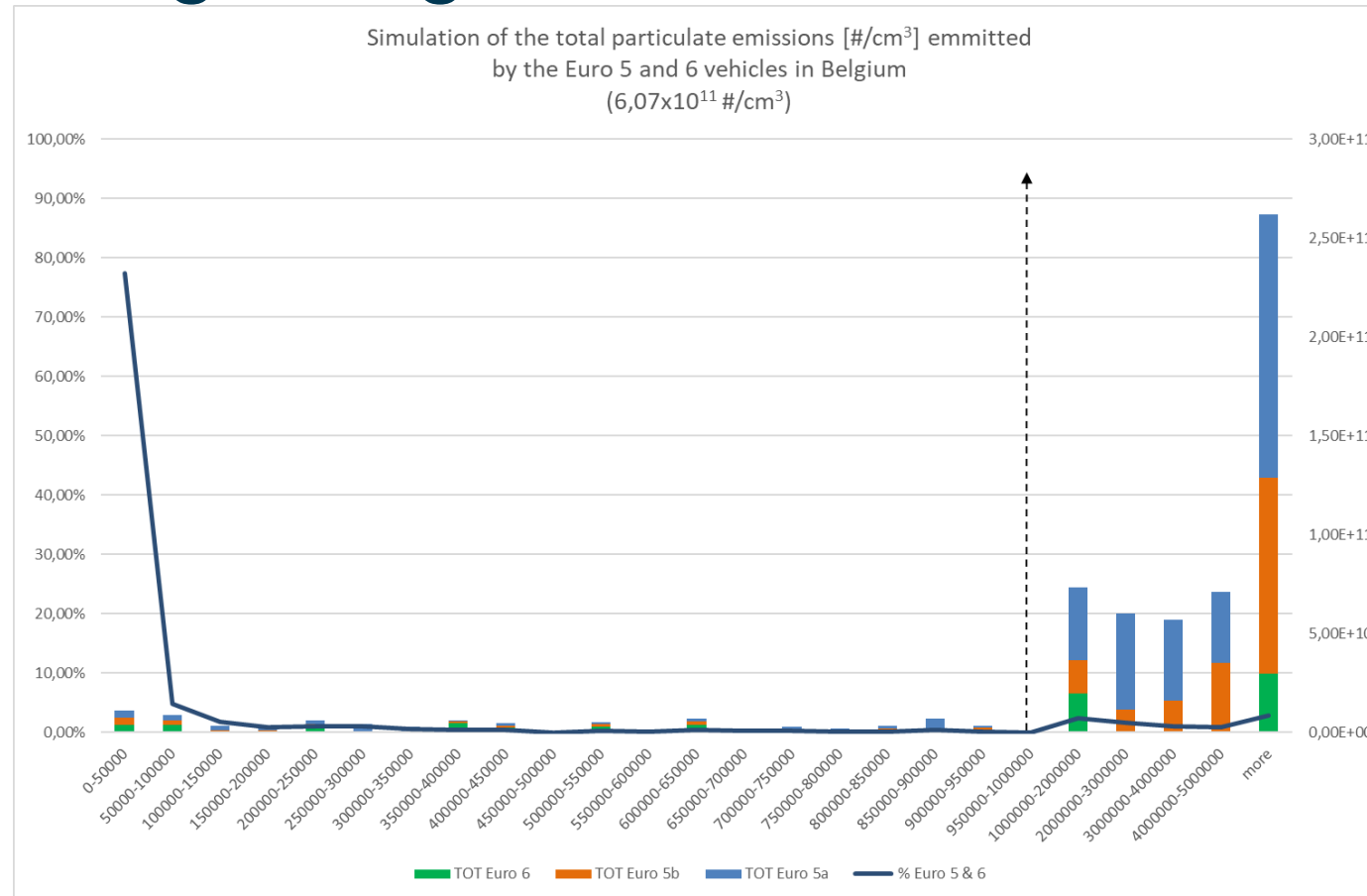
- Equipment is homologated by METAS, PTB or NMI;
- Idle test with rejection criteria.



PN-counting in Periodic Technical Inspection



Benefit PN-counting during PTI



Introducing PN-measurement for Diesel vehicles in EU Directive PTI and roadside inspection.

- Uniform European homologated equipment;
- Uniform measurement procedure;
- Uniform rejection criteria.

Afterwards introducing PN-measurement for Gasoline vehicles!

Type approval and PTI should both better integrated in each other in order to fulfill vehicle continuous compliance !

- Cheating should be made more difficult to introduce and easier to detect;
- EOBD should detect fraud;
- Measurement procedure and rejection criteria of type approval and PTI should be fixed together;



Thank you for your attention!

www.citainsp.org

Rue du Commerce 123 - 1000 Brussels, Belgium

+32 (0)2 469 06 70

secretariat@citainsp.org