

## GOLD SPONSORS:



# LUNCH BREAK

8 - 9 - 10 NOVEMBER 2016 | SAN JOSÉ, COSTA RICA



# Gerhard MÜLLER

8 - 9 - 10 NOVEMBER 2016 | SAN JOSÉ, COSTA RICA

## *CITA Project: Sustainable Emission Testing*

8 - 10 NOVEMBER 2016 SAN JOSÉ, COSTA RICA

# SET STUDY

SUSTAINABLE EMISSION TESTING

CITA REGIONAL CONFERENCE

CENTRAL & SOUTH AMERICA

GERHARD MÜLLER



Estimates of the health impacts attributable to exposure to air pollution indicate that fine **particulate matter (PM<sub>2.5</sub>) concentrations in 2011 were responsible for about 458 000 premature deaths in Europe (over 40 countries (14)), and around 430 000 in the EU-28**, originating from long-term exposure.

Source: European Environment Agency, Air Quality in Europe - 2014

## CITA Public Studies: TEDDIE Study – Diesel emissions



Pollutant	EU reference value	Exposure estimate (%)	WHO AQG	Exposure estimate (%)
PM <sub>2.5</sub>	Year (25)	10-14	Year (10)	91-93
PM <sub>10</sub>	Day (50)	21-30	Year (20)	64-83
O <sub>3</sub>	8-hour (120)	14-17	8-hour (100)	95-98
BaP	Year (1 ng/m <sup>3</sup> )	24-28	Year (0.12 ng/m <sup>3</sup> )	85-89
NO <sub>2</sub>	Year (40)	8-13	Year (40)	8-13
SO <sub>2</sub>	Day (125)	< 1	Day (20)	36-43
CO	8-hour (10)	< 2	8-hour (10)	< 2
Pb	Year (0.5)	< 1	Year (0.5)	< 1
Benzene	Year (5)	< 1	Year (1.7)	10-12

Colour coding:	< 5 %	5-50 %	50-75 %	> 75 %
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### DIRECTIVE 2014/45/EU

“On the basis of an **assessment of equivalence**, Member States may authorise the use of **OBD** in accordance with the manufacturer’s recommendations and other requirements”


# REASONS




Emissions  
exceed the  
limits  
constantly



Follow-up of  
the  
TEDDIE study



Equivalence  
OBD/tailpipe  
regarding  
2014/45/EU



Tampering  
emission  
systems



IMPROVED TEST PROCEDURE TO DETECT GROSSPOLLUTERS  
SHORT TERM REDUCTION OF POLLUTANTS

# 5% of the vehicle fleet causes 25% of all pollutant emissions\*

Identification of  
additional approx.  
5% to 7%  
Grosspolluters

**Eliminates**

approx. 25% to 35% of  
all pollutants

\*European Commission: Impact Assessment SWD(2012) 206 final

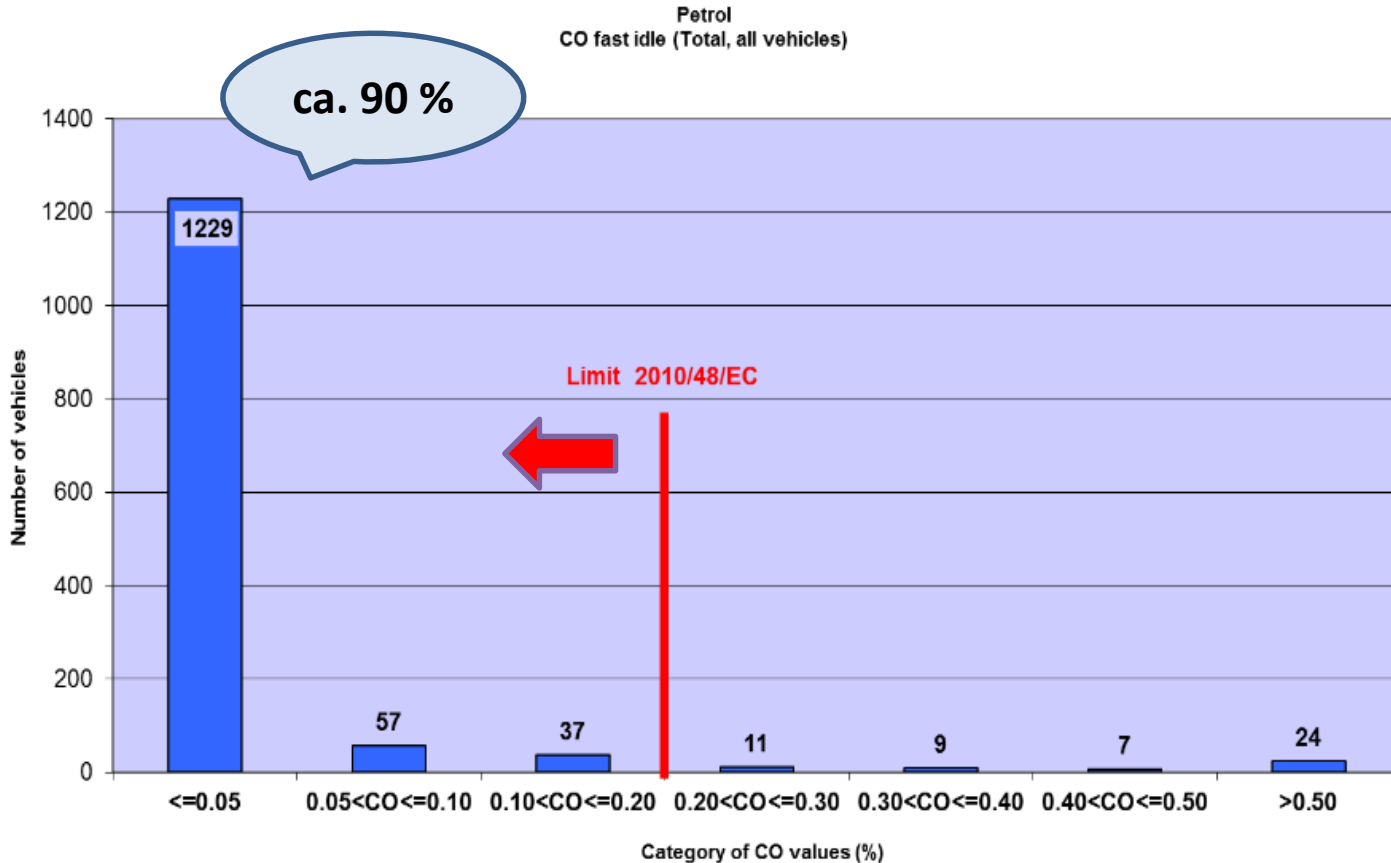


# PARTICIPATING PTI TEST CENTRES – NUMBER OF TESTS

- Belgium – GOCA
- France – Dekra
- Germany – TÜV SÜD
- Germany – TÜV Nord
- The Netherlands – RDW
- Sweden – Bilprovningen
- Sweden – Opus Bilprovning
- Spain – Applus
- Spain – Certio
- Spain – Itvelesa
- Spain – Itvasa
- Spain – SyC
- Spain – Veiasa

Number of Tests	DIESEL	PETROL
Euro 3	48	35
Euro 4	1052	818
Euro 5	464	435
Euro 6	5	7
no declaration	85	79
Total	1654	1374

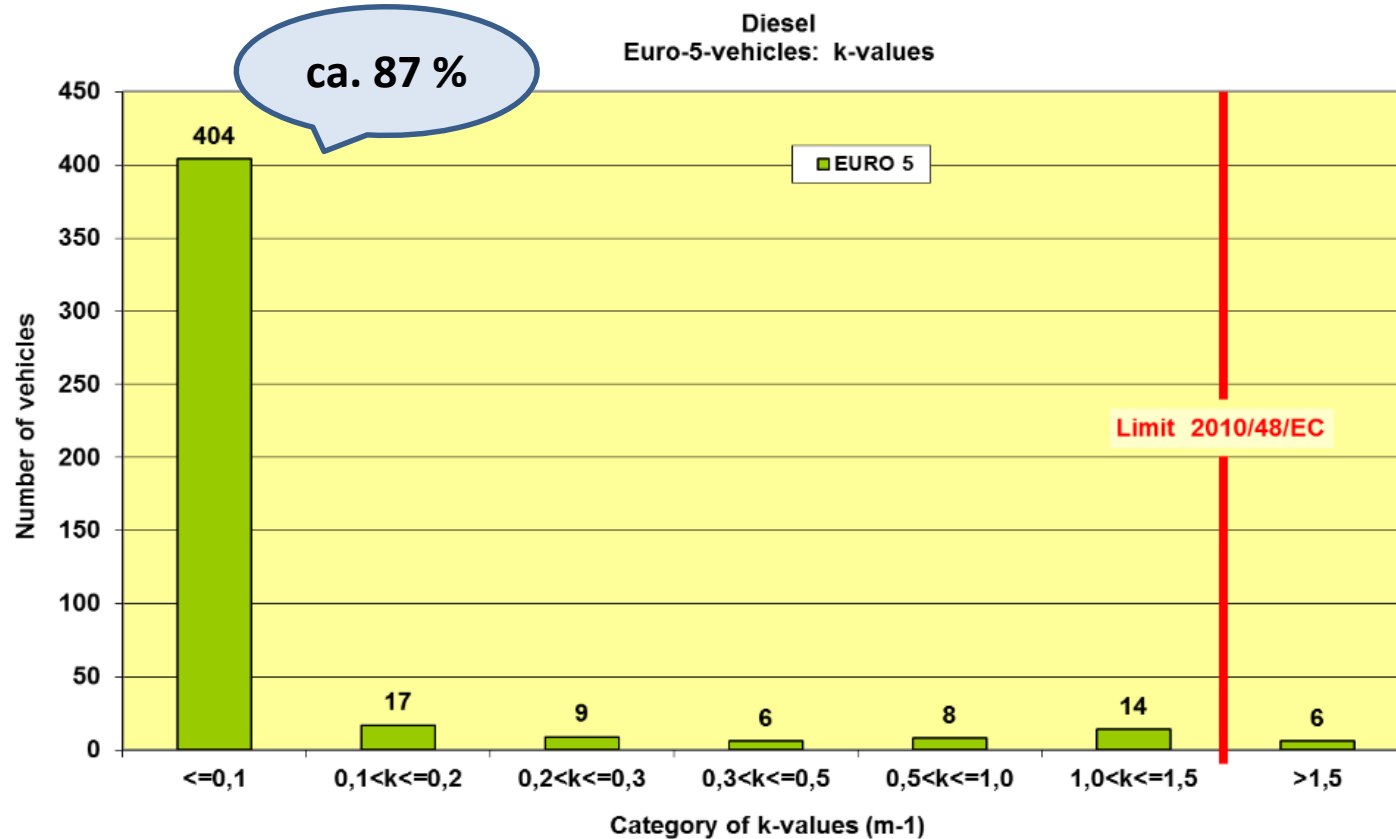
# Limits of Petrol Vehicles



Majority of vehicles have CO concentrations far below 0.05 vol.% CO, current threshold is 0.2 vol.% CO: new limits for CO might be applicable



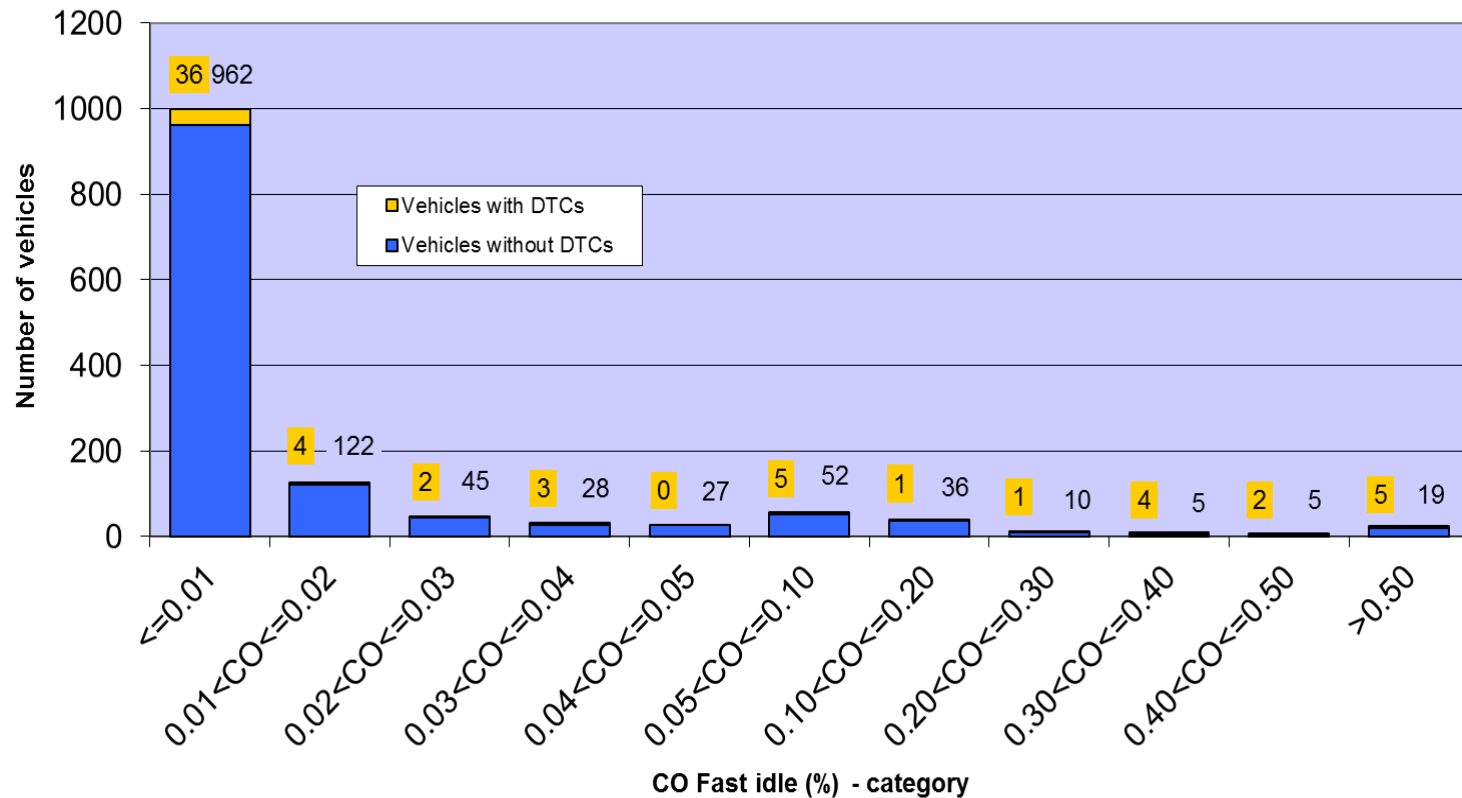
# Limits of Diesel Vehicles



Majority of vehicles have PM concentrations far below 0.1 k-value, current threshold is 1,5 k-value: new limits for PM might be applicable

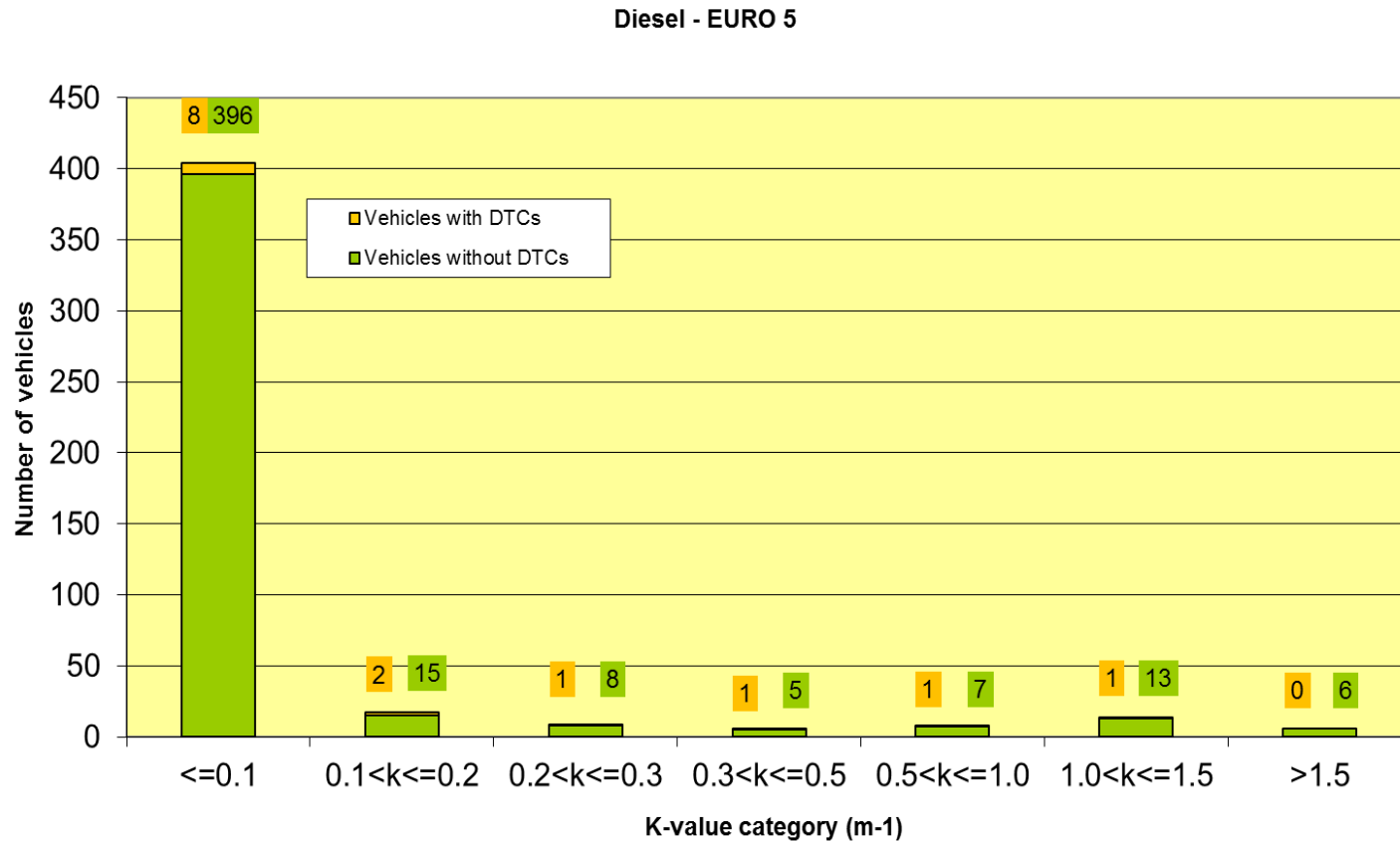
# DTC - Reading versus CO – Measurement Petrol Vehicles

Petrol - over all EURO classification



No direct correlation between DTC - Reading and CO - measurement

# DTC - Reading versus k – value Diesel Vehicles (EURO 5)



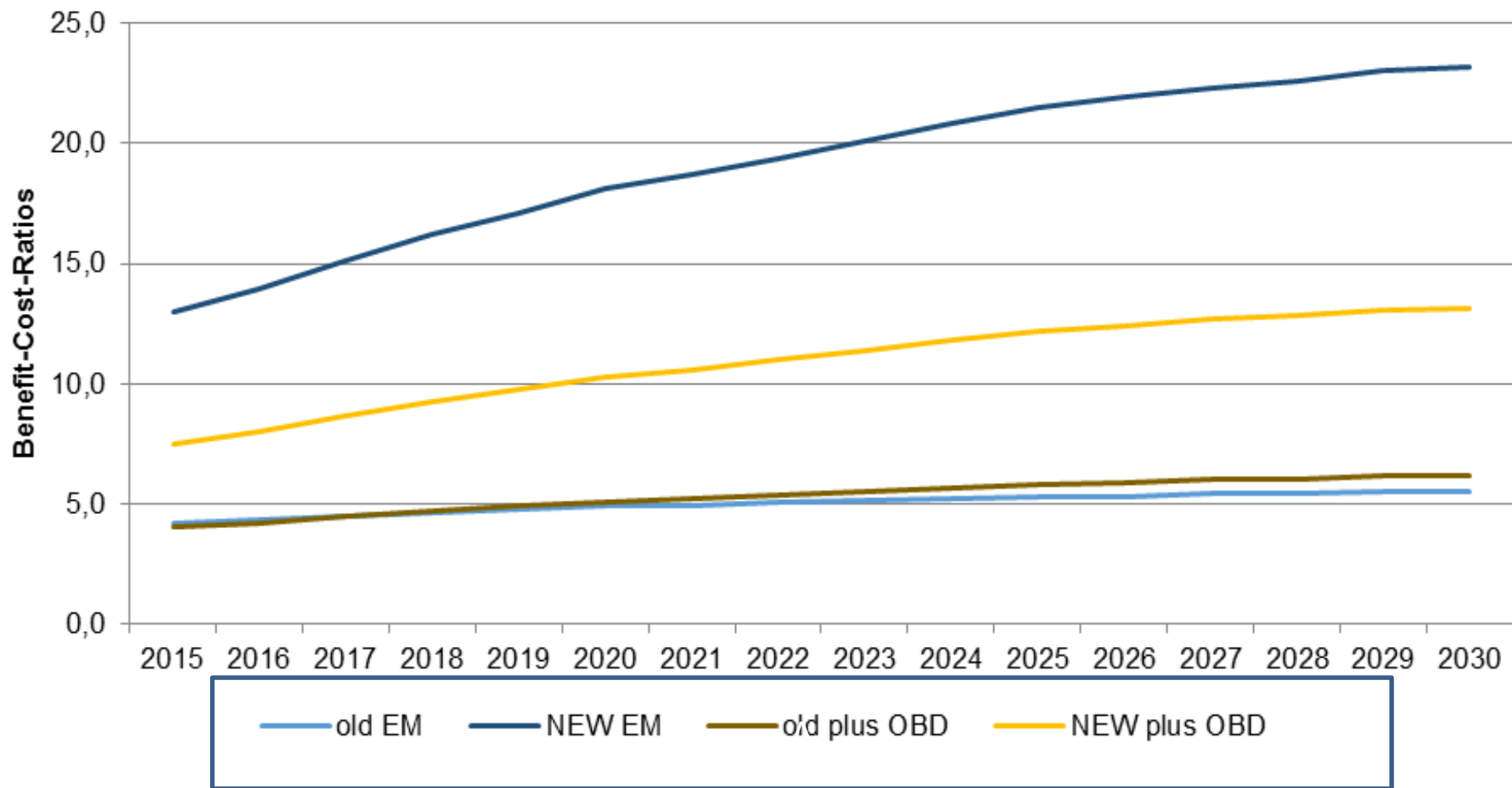
No direct correlation between DTC – Reading and k-value measurement

# Share of failed vehicles

	Total tested vehicles	State of threshold	Threshold	Share of failed vehicles (%) <i>only by exhaust emission testing</i>	share of failed vehicles (%) <i>only by OBD testing</i>	Share of failed vehicles (%)
All petrol – CO high idle (%)	1374	old	>0.2	3,7	4,6	7,4
	1374	proposed	>0.1	6,4	4,6	10,0
Diesel EURO 5 - k-value (m-1)	464	old	>1.5	1,3	3,0	4,3
	464	proposed	>0.2	9,3	3,0	11,4

**Modern emission test detects more Grosspolluters**

# High Benefit – Cost Ratio



# CONCLUSION

**Mandatory  
Combination of  
OBD and Tailpipe  
test**

**New thresholds:  
CO max. 0.1 % (EURO 4)  
Plate value or K-value max. 1.0 m<sup>-1</sup> (EURO 4)  
K-value max. 0,2 m<sup>-1</sup> (EURO 5)**

**MOST EFFECTIVE CONTRIBUTION TO AIR QUALITY AND HEALTH  
SHORT TERM REDUCTION OF POLLUTANTS (ONE TEST PERIOD)  
HIGH BENEFIT-COST RATIO**

## FURTHER ACTIVITIES



Further investigations are necessary to refresh the periodic emission test and include also NO<sub>x</sub> measurement (SET II study)

Future solutions should be developed for

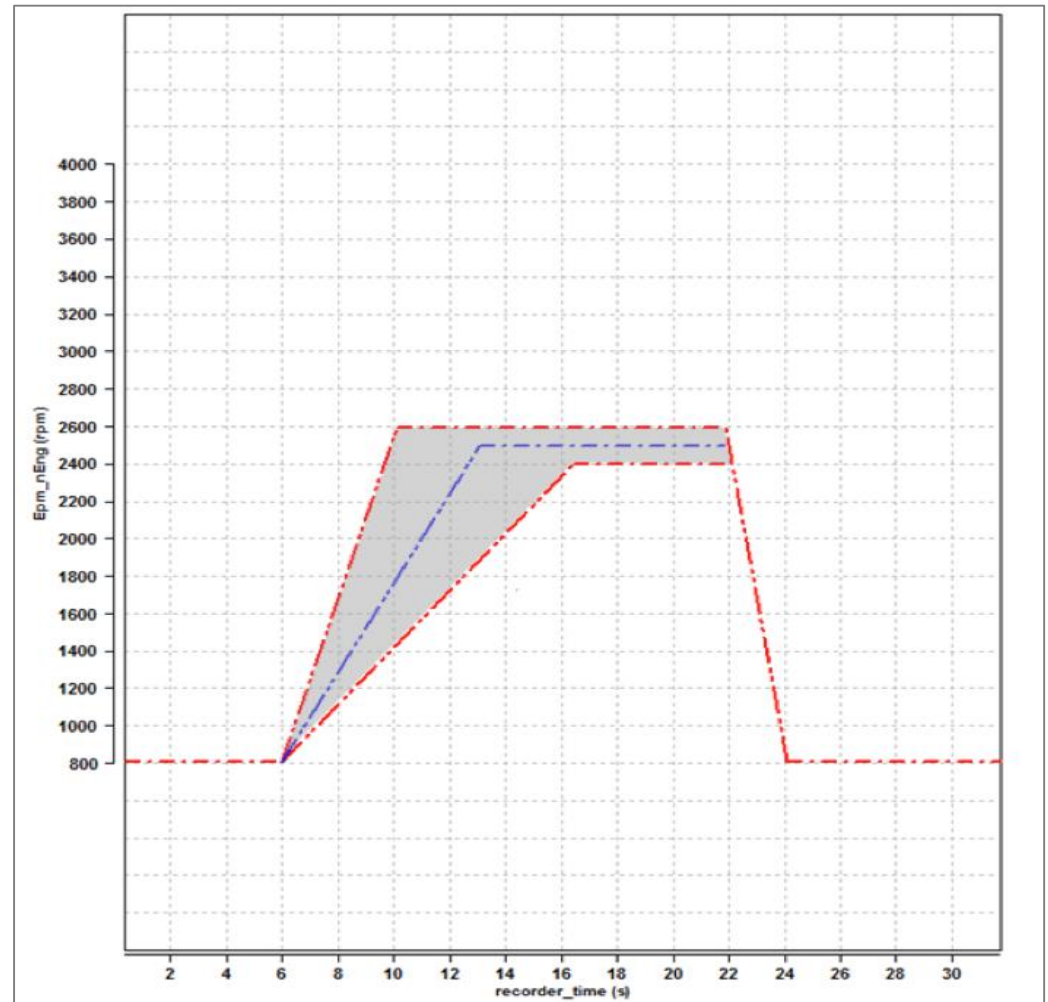
- Inexpensive test methods to measure NO<sub>x</sub>
- Applicable limit values for NO<sub>x</sub>



# Laboratory tests

## 1. AVL

- **AVL testing procedure:**
  - Acceleration up to 2500 RPM within 4 to 11 seconds
  - Keeping approx. 2500 RPM for 5 to 6 seconds
  - Installing failures
- **Open Questions:**
  - Do  $\text{NO}_x$  emission increase during the test?
  - How do  $\text{NO}_x$  emission increase with failures ?



# Laboratory tests

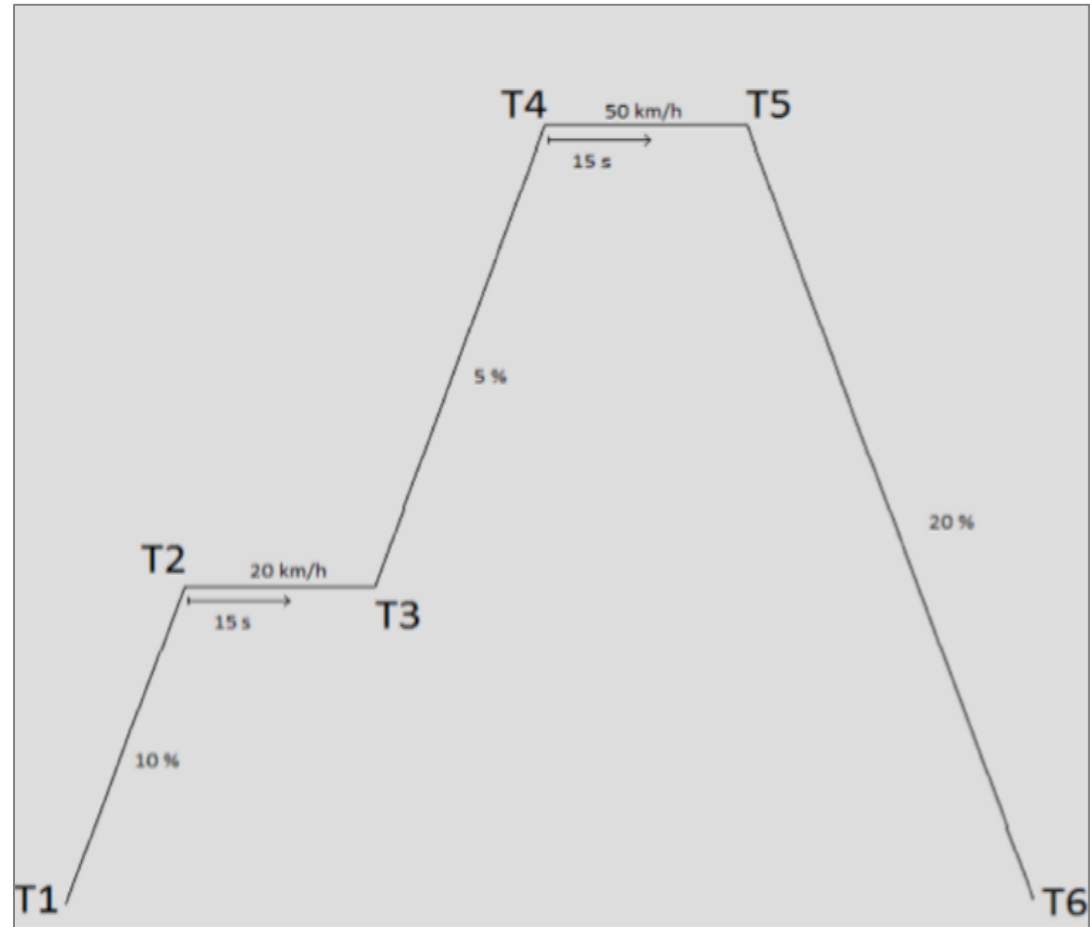
## 2. ASM 2050

### ➤ ASM 2050 testing procedure:

- 20 km/h and 50 km/h
- Variants with
  - 1./2. gear
  - 1./2./3. gear
  - Automatic in “D”
- Installing failures

### ➤ Open Questions:

- Do NO<sub>x</sub> emission increase during the test depending on the variant?
- How do the NO<sub>x</sub> emission increase with failures ?



# Summary laboratory tests

**AVL**  
**NO<sub>x</sub> ppm**

Vehicle:	Without failure	Air-mass sensor plug removed	Deterioration factor
2	101,8	229,0	2,3
Vehicle:	Without failure	EGR plug removed	
3	121,5	177,0	1,5
4	114,3	141,0	1,2

## Main findings:

Failures lead to slightly higher NO<sub>x</sub> concentration (max. 120%) on a low level between 120 ppm and 230 ppm

# Summary laboratory tests

**ASM 2050**  
**NO<sub>x</sub> ppm**

Vehicle	Without failures		Air-mass sensor plug removed		Deterioration factor	
	20 km/h	50 km/h	20 km/h	50 km/h	20 km/h	50 km/h
2	112,5	693,4	534,2	725,6	4,8	1,1
			EGR plug removed			
3	31,6	358,9	335,5	707,4	10,6	2,0
4	115,2	365,8	345,8	556,3	3,00	1,5

## Main findings:

Failures lead to higher NO<sub>x</sub> concentration (max. 1000%) already after an acceleration up to 20 km/h on a significant level between 340 ppm and 530 ppm

**THANK YOU FOR  
YOUR ATTENTION!**

**COMPLETE PROJECT INFORMATION AVAILABLE AT**  
**WWW.CITAINSP.ORG**



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# Antonio MULTARI

8 - 9 - 10 NOVEMBER 2016 | SAN JOSÉ, COSTA RICA

*Emission Experience and  
New Concept for Emission Testing*





## Emission Experience and New Concept for Emission Testing

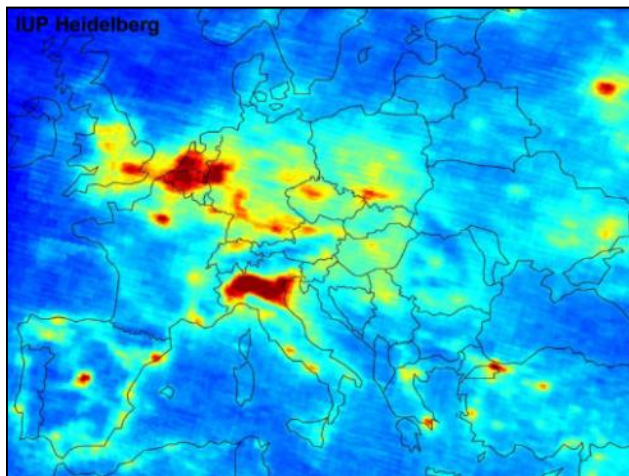
### MAHA Maschinenbau Haldenwang GmbH & Co. KG

Antonio Multari

San Jose, Costa Rica, 31.08.2016

**Concept for a good way for an more realistic test for emission testing.**

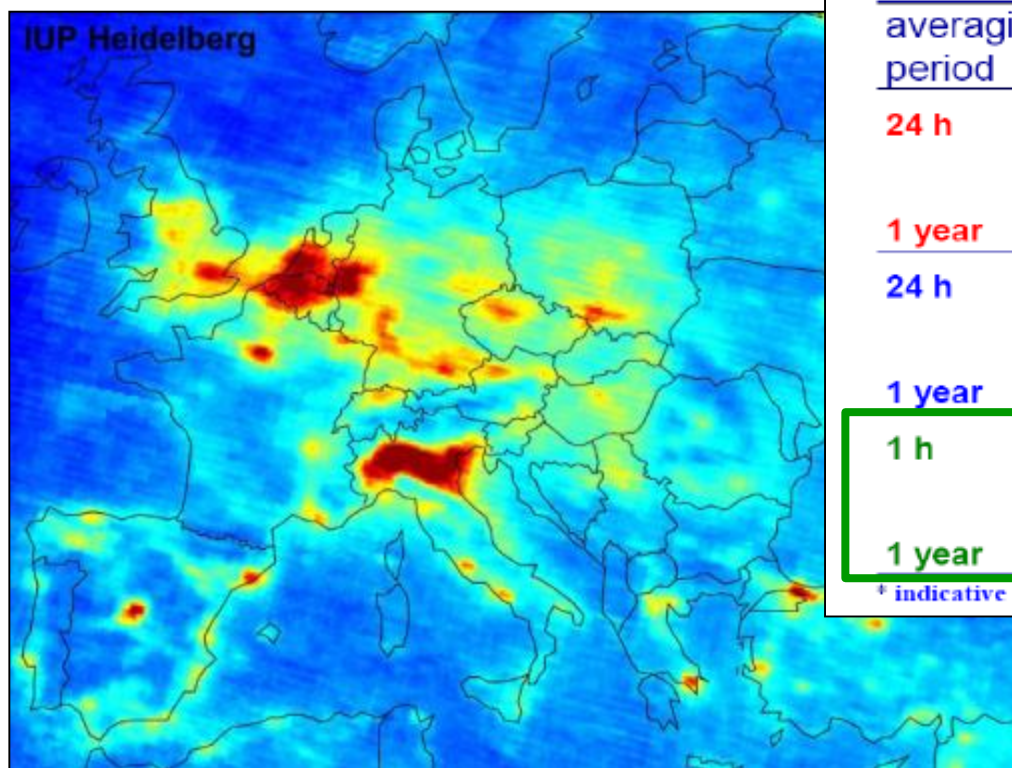
**The experiences on existing best practice and experience around the world are considered.**



## Agenda

1. EU-Air Quality Goals 1999/30/EG
2. PM and NO<sub>x</sub> Topics at WHO and Newspapers
3. PM and NO<sub>2</sub> Values in Europe
4. Chile: Introduction of the ASM Test for Petrol/Gasoline
5. Comparison between the different Methods
6. Spain: Spanish trials for measuring NO, NO<sub>2</sub> and PM under load
7. New Concept for Emission Testing

## EU-Air Quality Goals 1999/30/EG: Are exceeded around Europe.



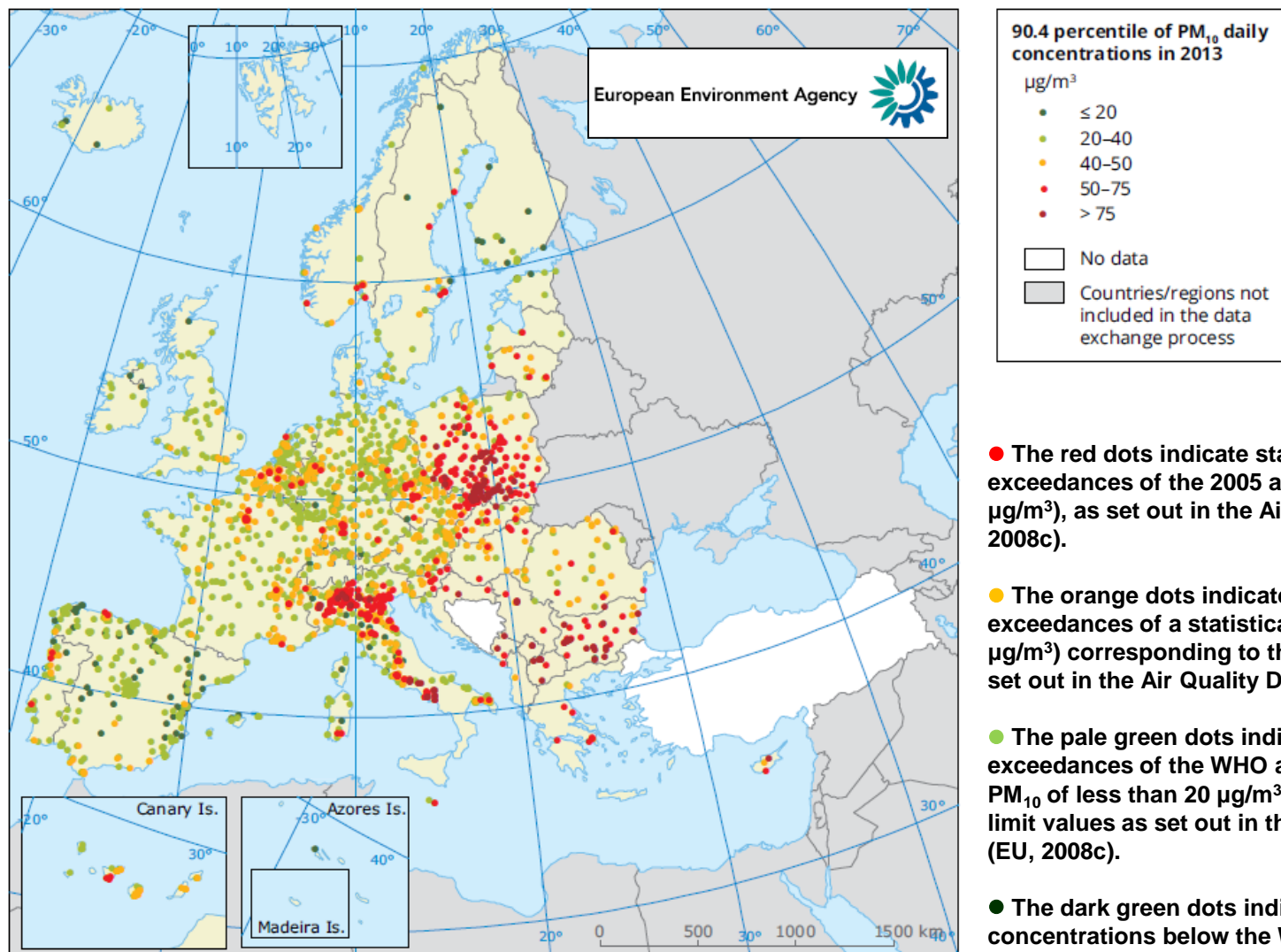
EU limit values for PM <sub>10</sub> and NO <sub>2</sub>		
averaging period	limit value	attainment period
24 h	50 µg/m <sup>3</sup> PM <sub>10</sub> 35 exceedances/year	1 Jan. 2005
1 year	40 µg/m <sup>3</sup> PM <sub>10</sub>	1 Jan. 2005
24 h	50 µg/m <sup>3</sup> PM <sub>10</sub> 7 exceedances/year	1 Jan. 2010*
1 year	20 µg/m <sup>3</sup> PM <sub>10</sub>	1 Jan. 2010*
1 h	200 µg/m <sup>3</sup> NO <sub>2</sub> 18 exceedances/year	1 Jan. 2010
1 year	40 µg/m <sup>3</sup> NO <sub>2</sub>	1 Jan. 2010

\* indicative limit values, to be reviewed by the EU Commission

Source: 2010, Dr. A. Mayer, TTM



## Exceeding PM<sub>10</sub> Limits in Europe



● The red dots indicate stations reporting exceedances of the 2005 annual limit value (40 µg/m<sup>3</sup>), as set out in the Air Quality Directive (EU, 2008c).

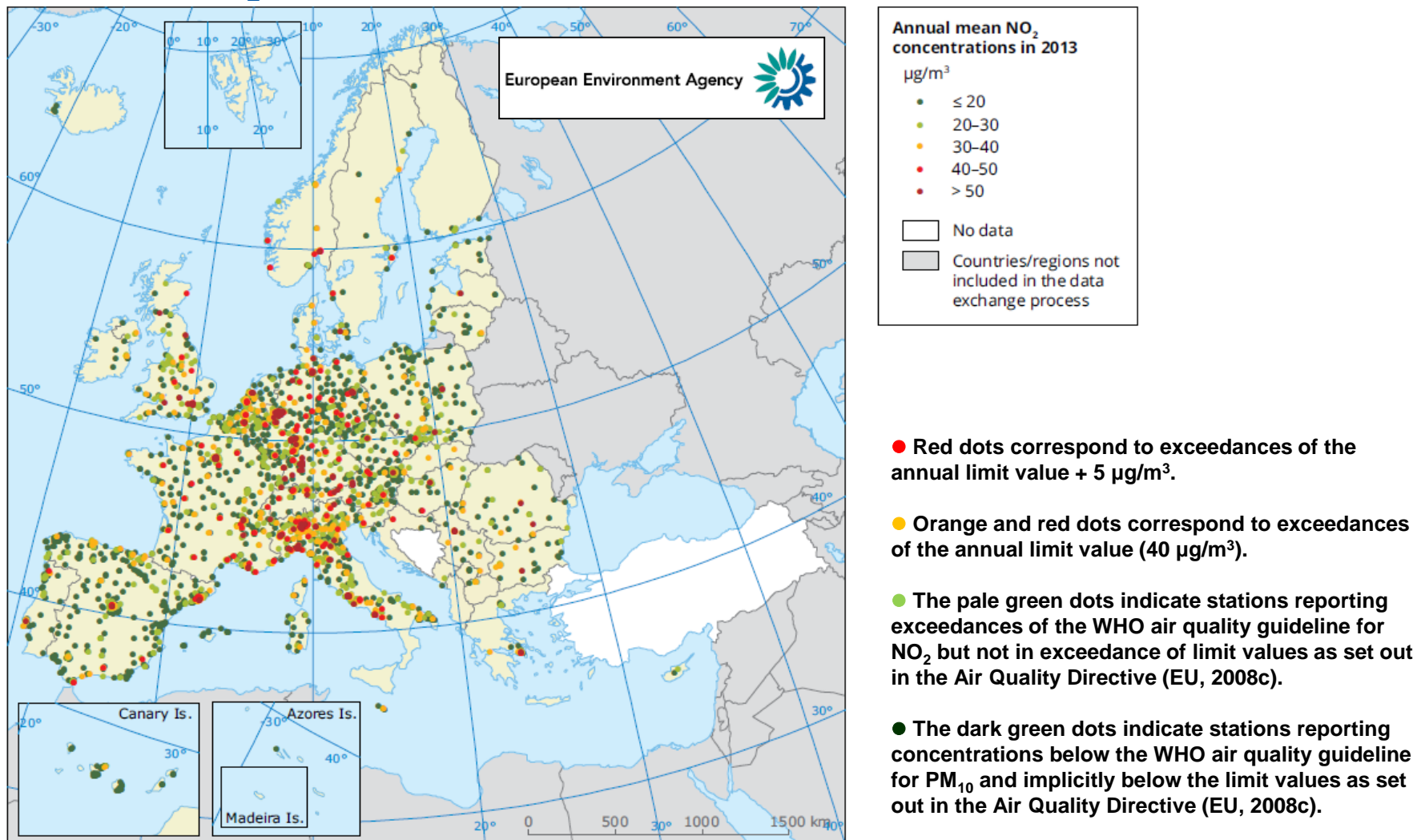
● The orange dots indicate stations reporting exceedances of a statistically derived level (31 µg/m<sup>3</sup>) corresponding to the 24-hour limit value, as set out in the Air Quality Directive (EU, 2008c).

● The pale green dots indicate stations reporting exceedances of the WHO air quality guideline for PM<sub>10</sub> of less than 20 µg/m<sup>3</sup> but not in exceedance of limit values as set out in the Air Quality Directive (EU, 2008c).

● The dark green dots indicate stations reporting concentrations below the WHO air quality guideline for PM<sub>10</sub> and implicitly below the limit values as set out in the Air Quality Directive (EU, 2008c).

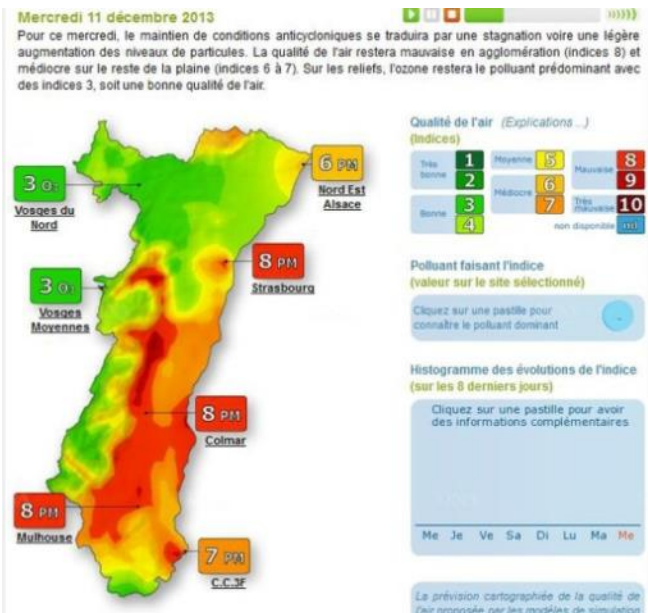
Source: Air Quality in Europe – 2015 Report from European Environment Agency

## Exceeding NO<sub>2</sub> (Nitrogen Dioxide) Limits in Europe



Source: Air Quality in Europe – 2012 Report from European Environment Agency

## France Exceeding the Air Quality Limits



Le pic de pollution aux particules présente un danger pour la santé considère le préfet du Bas-Rhin qui prend des mesures contraignantes pour les automobilistes : la vitesse sera limitée à 70 km/h demain sur les accès à l'agglomération strasbourgeoise.

### Nombre de jours de dépassement du niveau de recommandation en particules pour les 11 dernières années

This 1 of 5 days!

Localisation	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012*	2013
Région	11	1	1	2	17	16	23	18	12	70	86
Bas-Rhin	8	1	1	0	15	15	22	16	12	70	83
Haut-Rhin	4	1	0	2	12	10	9	8	0	26	36
Strasbourg	8	1	1	0	14	15	22	16	12	70	82
Colmar	0	0	0	0	12	5	8	5	0	18	30
Mulhouse	4	1	0	1	8	10	3	6	0	25	33

\* Depuis 2012, le nombre de jours de dépassements du seuil d'information et de recommandation est calculé par rapport à 50µg/m³ sur 24 heures glissantes (arrêté préfectoral du 1er février 2012). Avant cette date, le seuil pris en compte est de 80µg/m³.

<http://www.atmo-alsace.net/>

Les moteurs essence à injection directe 10 fois plus polluants que les diesels !

Publié dans Ecologie / Electrique > Santé  
par Patrick Garcia Le 28 Novembre 2013 à 12h16



Jusqu'à présent, on associe plus facilement les moteurs Diesel aux rejets de particules que les moteurs essence. Pourtant avec la généralisation de l'injection directe, il semble selon une étude récente que ces moteurs essence produisent désormais jusqu'à 10 fois plus de particules que leurs homologues modernes fonctionnant au gazole.

L'association européenne Transport & Environnement lance la polémique en expliquant que les nouvelles générations de moteur à injection directe produisent désormais beaucoup plus de particules que les diesels modernes tous équipés de filtres

dorénavant. En soumettant 3 autos de marque différente (Ford Focus, Renault Mégane et Hyundai i40) à des mesures de rejet de particules (mesures réalisées par le TÜV allemand), T&E a pu constater que si ces 3 modèles respectent la norme Euro 6b (oui, il y a apparemment plusieurs grades dans la norme Euro 6) qui entre en vigueur fin 2013, aucune ne respecte par contre la 6c qui sera effective en 2017. Une norme 6c que respectent pourtant d'ores et déjà les moteurs diesels actuels.

La technologie à injection directe qui consiste à injecter le carburant non plus dans un conduit d'admission mais directement dans la chambre de combustion serait en effet génératrice de particules en grand nombre. La solution passerait par l'adoption de filtres à particules pour moteurs essence, une modification qui coûterait selon l'association de 40 à 130 euros par voiture. D'après les constructeurs qui attendent de voir comment va évoluer la réglementation (la norme Euro 7 n'est pas encore détaillée), il existerait d'autres solutions que ces filtres.

<http://www.caradisiac.com/>

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Un épisode de forte pollution atmosphérique se développe actuellement sur le département du Bas-Rhin, note un communiqué de la préfecture diffusé ce mercredi soir qui rappelle que l'ASPA a observé un dépassement du niveau d'alerte pour les particules en suspension (80 µg / m³ en concentration sur 24 heures), "seuil au-delà duquel il existe un risque pour la santé humaine".

En vue de limiter cette pollution principalement due au trafic routier, précise le communiqué, le préfet du Bas-Rhin Stéphane Bouillon, a décidé de mettre en œuvre une mesure d'urgence portant sur la vitesse des véhicules.

#### Tags

- Actualité
- A la Une
- Faits divers
- Edition de Strasbourg
- Strasbourg

#### Notez l'article





## PM and NO<sub>x</sub> Topics in European Newspapers :

O.J.D.: 95855  
E.G.M.: 588000  
Tarifa (€): 4900

**La Voz de Galicia**

Fecha: 24/03/2011  
Sección: SOCIEDAD  
Páginas: 39

### Las ITV aceptarían endurecer el control de gases en los vehículos

El 15% de los turismos inspeccionados incumplen la normativa actual

R. ROMAR  
REDACCIÓN / LA VOZ

El 15% de los turismos de España que pasan la revisión en las estaciones de ITV tienen que volver a realizarla porque presentan defectos graves en la emisión de gases contaminantes. O, lo que es lo mismo, un total de 451.000 vehículos de este tipo sobre 3.064.000 inspeccionados en el último año han registrado esta deficiencia, que es la cuarta en importancia en cuanto a los fallos detectados por los técnicos en los turismos que pasan el examen. La primera causa son fallos en los frenos.

La cifra es alta, e indicativa también de la elevada antigüedad del parque móvil español, pero lo será aún más si prospera la propuesta, lanzada por el Ayuntamiento de Barcelona y que el Ministerio de Medio Ambiente tiene ya en estudio, de reforzar las exigencias en la inspección para el control de emisiones procedentes de los vehículos. Actualmente, los técnicos miden los niveles de monóxido de carbono en los coches de gasolina y la opacidad de los humos de escape en los diésel. Las partículas en suspensión y el dióxido de nitrógeno, cuya alta concentración está directamente asociada con problemas de salud, no se tienen en cuenta. La propuesta, lejos de incomodar al sector de las ITV, les

#### La contaminación automovilística

##### CONSECUENCIAS

**Medio ambiente**  
Aceleran el efecto invernadero y el cambio climático. Destruyen la capa de ozono, provocan lluvia ácida.

**Salud**  
La polución agudiza las enfermedades respiratorias, como la bronquitis, y las del corazón. Causa trastornos nerviosos, alergias, irritación de los ojos y tiene efectos cancerígenos.

##### El parque de vehículos en España



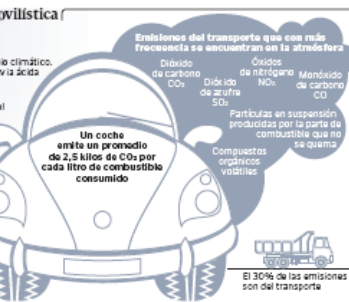
Fuente: DGT, Federación Española de Vehículos, Confederación de Medio Ambiente, Ural y elaboración propia.

##### EL DATO

**3.064.000**

**Vehículos inspeccionados**  
De ellos, los inspectores de la ITV han detectado 451.000 con fallos en la emisión de gases.

parece correcta y están dispuestas a apoyarla si así lo decide el Gobierno. «Nosotros cumplimos la ley española, que deriva de una directiva europea, pero si se cambia, nosotros también vamos de cabeza, estamos a la orden de lo que nos digan», explica Luis Rivas, secretario general de Aeca-ITV, la asociación



que agrupa a las 334 entidades del área de España y que realiza al año algo más de 15 millones de inspecciones de vehículos. Rivas admite que para adaptarse a una normativa más exigente quizás sea necesario cambiar los aparatos para incorporar la medición de óxidos de nitrógeno y de partículas más pequeñas, aunque subraya que «técnicamente es posible y no supondría un gran problema». «Lo importante —añade Rivas— es que ha llegado la hora de ser más exigentes y de atacar otras emisiones que ahora no atacan las ITV porque no están recogidas en la ley».

El portavoz del sector, que insistió en que «estamos capacitados para implementar los nuevos controles en tiempos razonables», también se mostró partidario, si así se considerara oportuno, de practicar revisiones específicas para los gases contaminantes al margen de las de seguridad y de que los coches potencialmente más perjudiciales para la salud y el medio ambiente sean inspeccionados con una mayor regularidad. «Creemos y defendemos», destacó Luis Rivas, «que son las ITV las que deben realizar los controles de emisiones que se establezcan como novedosos».

O.J.D.: 240675  
E.G.M.: 756000  
Tarifa (€): 6439

**ABC**

Fecha: 23/03/2011  
Sección: SOCIEDAD  
Páginas: 47

### Veto a los coches de más de diez años

► Barcelona pide una ITV que saque de la calle a los vehículos más contaminantes

ALEX GUBERN  
BARCELONA

El Ayuntamiento de Barcelona quiere prohibir la circulación de los coches de más de diez años con objeto de reducir la contaminación. La capital catalana, cuyo pleno municipal aprobará el viernes su Plan de Energía 2011-2020, instará al Gobierno a sacar adelante una nueva regulación de la Inspección Técnica de Vehículos (ITV) que incorpore un filtro adicional de carácter ambiental: si ahora solo se tienen en cuenta las emisiones de CO<sub>2</sub> (efecto invernadero), Barcelona quiere que se fije también un límite para los óxidos de nitrógeno (NO<sub>x</sub>) y para las partículas de menos de 10 micras (PM10), perjudiciales para la salud y con unas tasas en el caso de Barcelona y Madrid por encima de lo que fija la UE. Según el Ayuntamiento, la edad media del parque móvil de la ciudad es de cinco años, diez en el caso de las llamadas flotas cautivas (transporte de mercancías y pasajeros), y se estima que sólo un 3% de estos úl-

timos generan el 12% del total de emisiones contaminantes. El objetivo es pues sacar de la calle a los más contaminantes.

Aunque por la mañana la responsable de Medio Ambiente de Barcelona, Imma Mayol (ICV), dio a entender que el municipio consideraba vetar la circulación de estos vehículos, por aproximación aquellos de más de diez años, por la tarde el Ayuntamiento matizó, recordando que una prohibición así sólo puede aprobarse con carácter estatal, y que el criterio no puede ser el de la edad sino el nivel de las emisiones. El Consistorio reclamará, en paralelo al endurecimiento de la ITV, un plan E-Renove de ayuda a la sustitución de coches contaminantes. En el punto de mira, los actuales vehículos diésel, de menor consumo pero los principales emisores de partículas. La oposición municipal descalificó ayer la medida por su carácter «antisocial».

El Plan de Energía de Barcelona —108 medidas y un coste estimado de 688 millones—, propone actuaciones previsibles, como avanzar en la generación de energía solar en cada edificio, y otras que no lo son tanto, como obligar a los taxis vacíos a permanecer inmovilizados en las paradas, o la instalación de mini parques eólicos en las azoteas.

Source: 24.03.2011,  
Newspaper: Spain, La Voz de Galicia

Source: 23.03.2011,  
Newspaper: Spain, ABC

## PM and NO<sub>x</sub> Topics in European Newspapers :



A measuring hose for emissions inspections in diesel engines sticks in the exhaust tube of a Volkswagen Golf 2.0. Photograph: Patrick Pleul/AFP/Getty Images

theguardian

### Diesel cars emit up to four times more toxic pollution than a bus, data reveals

Failure to use available technology to cut dangerous nitrogen oxides in new cars is a 'disgrace', says MEP

Damian Carrington

Wednesday 21 October 2015 12.09 BST

A modern diesel car pumps out more toxic pollution than a bus or heavy truck, according to new data, a situation described as a "disgrace" by one MEP.

The revelation shows that effective technology to cut nitrogen oxides (NOx) pollution exists, but that car manufacturers are not implementing it in realistic driving conditions.

theguardian

### Wide range of cars emit more pollution in realistic driving tests, data shows

Source: UK, The Guardian Website

## PM and NO<sub>x</sub> Topics in European Newspapers :



Title:

« Překročení limitu NO<sub>x</sub> nebylo žádným tajemstvím »

*An exceeding of NO<sub>x</sub> limits wasn't secret*

« Ke konci roku 2014 byla v Berlíně předložena studie nezávislé organizace ICCT... »

*At the end of 2014 in Berlin, independent organization ICCT (International Council in Clean Transportation) submitted a study that provides interesting findings. It proves the car diesel engines has considerable difficulties with NO<sub>x</sub> emissions because 15 cars under test exceed up to 7 times the limit of EU6 (80 mg/km) ...*

Source: Technical weekly newspaper in Czech Republic.



## PM and NO<sub>x</sub> Topics in European Newspapers :


**Pollution**

### The great diesel scandal: how cheap fuel is choking our cities


Diesel's popularity with motorists has surged, but its green image was an illusion. Now concern is growing over the damage caused by emissions, with children particularly vulnerable


Fiona Harvey


Wednesday 6 August 2014 16:55 BST



Comments  
505

 Save for later



 Particulates are one of the worst offenders in air pollution because they damage the lungs when inhaled.  
Photograph: Peter Macdiarmid/Getty Images

Stand at a busy road junction on a bright day and chances are you will see it: a Wacky Races cloud of black smoke left hanging in the air after a car pulls away. These clouds are actually particles of soot - partially burnt fuel from diesel engines - and they are arguably the worst environmental menace facing city-living Britons - and children in particular.

Diesel vehicles have enjoyed a surge in popularity on our roads, rising from less than a quarter to more than half of all cars sold in the last five years. In the recent past, they were even touted as more environmentally friendly than petrol vehicles, because they burn less fuel and so can produce, overall, less CO<sub>2</sub>. This green image, however, was always an illusion: diesel engines burn fuel less cleanly than petrol-driven models, resulting in a large excess of particulates - the visible clumps of soot left behind in the exhaust fumes.

Source: 06.08.2014, Newspaper: UK, The Guardian;  
<http://www.theguardian.com/environment/2014/aug/06/diesel-scandal-cheap-fuel-choking-cities>

22. September 2015, 18:48 Uhr Abgase und Feinstaub

### Wie gefährlich sind Dieselmotoren?



- Moderne Motoren sind ein wesentlicher Quell für Stickoxide (NO<sub>x</sub>).
- Dieselmotoren von VW setzten in Tests teilweise das 40-fache des erlaubten Grenzwerts frei.
- Stickoxide können auf Dauer die Gesundheit der Anwohner großer Straßen schädigen, das Risiko für Herz-Kreislauf-Erkrankungen steigt.

Von *Christopher Schrader*

Die Nummer eins der Luftschadstoffe zu sein, das ist ein zweifelhafter Titel. Das Umweltbundesamt hat ihn dieses Jahr dem Stickstoffdioxid (NO<sub>2</sub>) verliehen. Seit Langem scheitern alle Versuche, den Gehalt des Gases in der Atmosphäre zu begrenzen, was Deutschland schon reichlich Ärger mit der Europäischen Kommission eingetragen hat. Noch immer meldet mehr als die Hälfte der Messstationen in Deutschland überhöhte Jahresmittelwerte für NO<sub>2</sub>; in Stuttgart, Darmstadt und München lagen 2014 wieder einmal die Spitzenwerte an Hauptverkehrsstraßen häufiger über dem Limit als per EU-Verordnung erlaubt.

Source: 22.09.2015, Newspaper: Germany, Süddeutsche Zeitung; <http://www.sueddeutsche.de/wissen/abgase-und-feinstaub-wie-gefaehrlich-sind-dieselmotoren-1.2658978>

## Websites for OBD/DPF Manipulation:

### Cheat OBD Emissions Test

<https://forum.efilive.com/showthread.php?11344-Emission-Testing-Ways-to-Cheat>

<http://www.chargerforums.com/forums/archive/index.php/t-186834.html>

### Cheat OBD Test

[http://www.obdclearinghouse.com/index.php?body=get\\_file&id=1645](http://www.obdclearinghouse.com/index.php?body=get_file&id=1645)

### Cheat OBD Codes

[http://www.cesenatico5stelle.it/wiki5st/index.php?title=Obd\\_2\\_code\\_cheats\\_download\\_fast\\_TKwS](http://www.cesenatico5stelle.it/wiki5st/index.php?title=Obd_2_code_cheats_download_fast_TKwS)

[http://www.deichcamp.de/index.php/Obd\\_2\\_cheats\\_download\\_free\\_fast\\_KYqu](http://www.deichcamp.de/index.php/Obd_2_cheats_download_free_fast_KYqu)

<http://hackaday.com/2009/05/12/obd-ii-automotive-data-logging/>

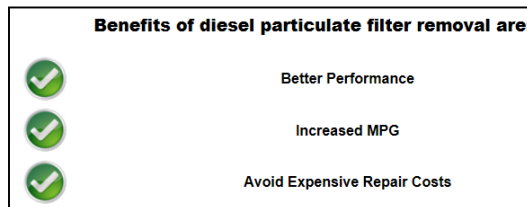
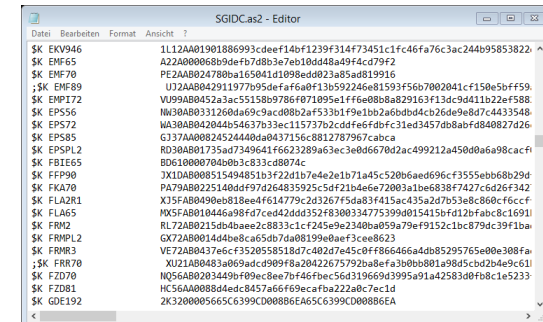
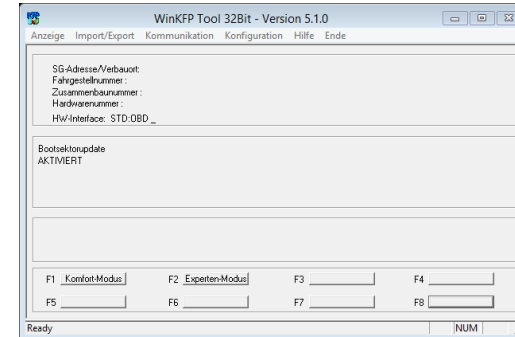
## Diesel Particulate Filter Removal

<http://www.ecuflash.co/dpf-removal/>

<http://www.tdperformance.co.uk/dpf-removal/>

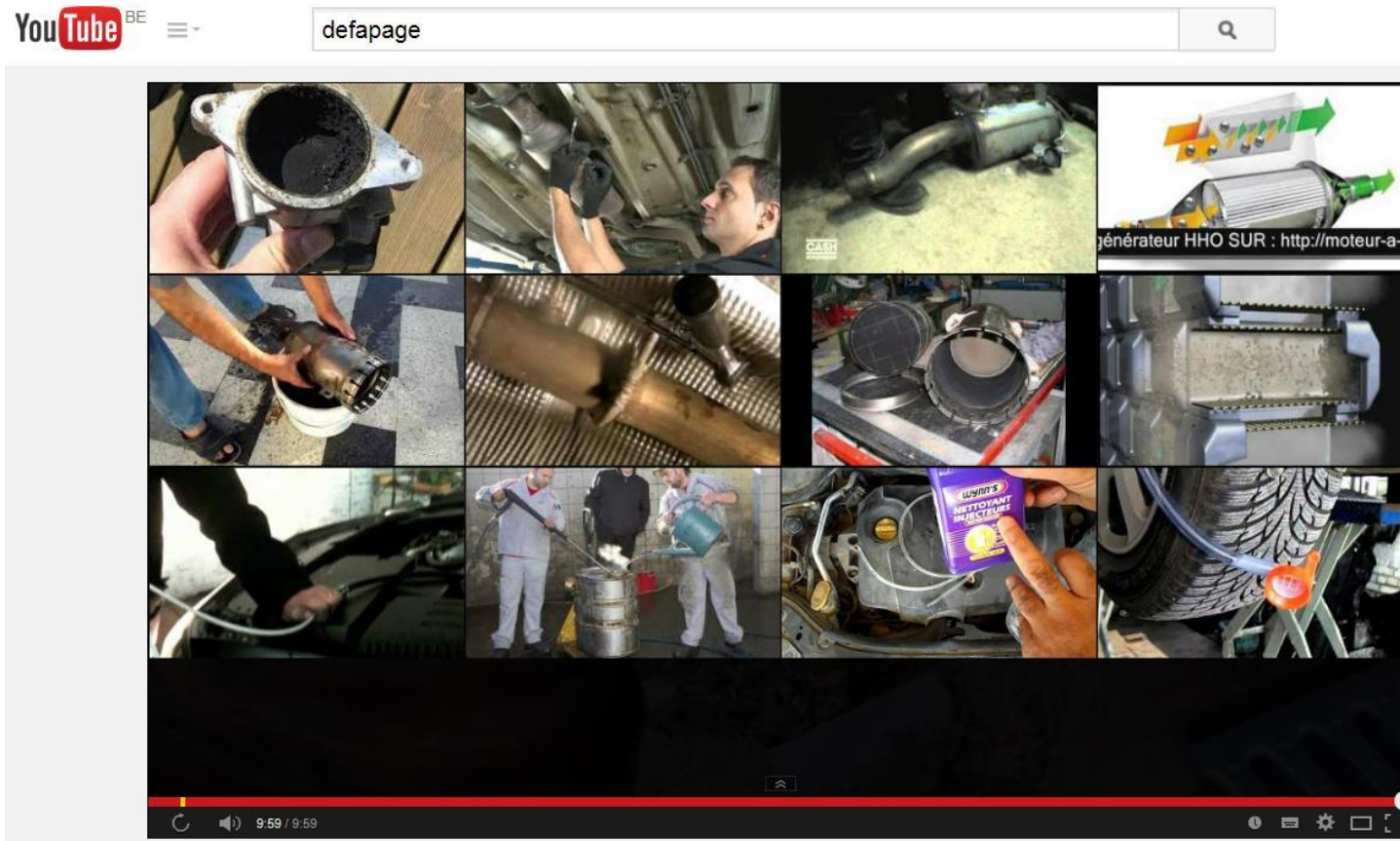
[http://www.evolutionchips.co.uk/Diesel\\_Particate\\_Filter\\_Removal\\_DPF.html](http://www.evolutionchips.co.uk/Diesel_Particate_Filter_Removal_DPF.html)

<http://www.youtube.com/watch?v=7bXxXn3nL60>



Source: Internet and DREW Technologies

## OBD and DPF Tampering OBD Tampering and DPF Removal:



Source: YouTube

## OBD and DPF Tampering OBD Tampering and DPF Removal:

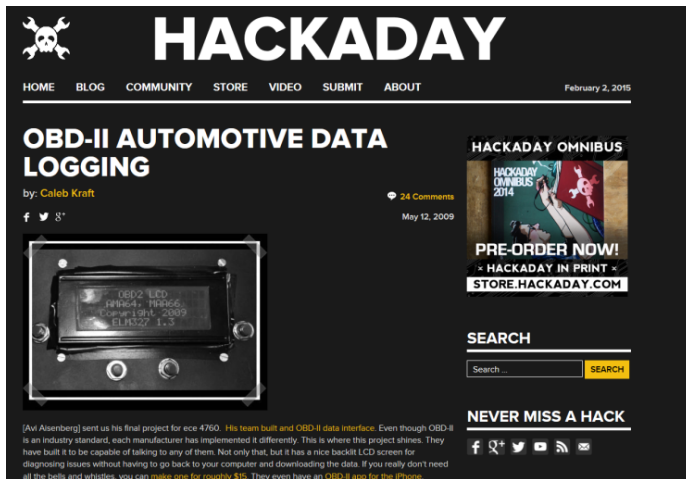
<https://www.youtube.com/watch?v=7bXxXn3nL60>



Source: YouTube

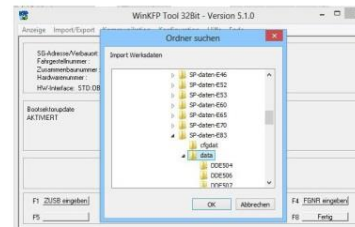


## OBD and DPF Tampering OBD Tampering and DPF Removal:

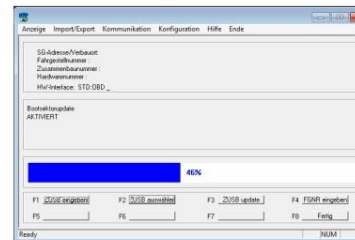


Nun werden die Steuergeräte-Daten (Werkdaten) importiert.

Klickt hierfür auf Import/Export > Import > Werkdaten



Dort navigiert man nun zum Ordner „SP-Daten-ESB\data“ und markiert eben diesen Ordner „data“, Danach OK klicken



Jetzt werden die Steuergeräte-Daten importiert (dauert einen Moment).

Wenn man nach dem Import WinkFP beendet und neu startet, sollte man eine Fehlermeldung bekommen welche im nächsten Schritt behoben wird.

Übersicht, basierend auf SP-Daten v49 (empfohlen):

Date:	ZB-Nummer:	Version:
<b>T7808376.0da</b>	<b>7808375</b>	<b>E90 manuell 120kW</b>
T7808898.0da	7808882	E90 manuell 120kW + DPF (SA200)
<b>T7808903.0da</b>	<b>7808887</b>	<b>E90 automa. 120kW</b>
<b>T7808384.0da</b>	<b>7808383</b>	<b>E91 manuell 120kW</b>
T7808874.0da	7808861	E91 automa. 120kW + DPF (SA200)
T7808873.0da	7808860	E91 manuell 110kW Fleet + DPF (SA200 + SA843)
T7808879.0da	7808866	E91 automa. 110kW Fleet + DPF (SA200 + SA843)
T7809460.0da	7809448	E90 manuell 120kW + DPF (SA200)
T7809464.0da	7809452	E90 manuell 110kW Fleet + DPF (SA200 + SA843)
T7809466.0da	7809454	E90 automa. 120kW + DPF (SA200)
T7809470.0da	7809458	E90 automa. 110kW Fleet + DPF (SA200 + SA843)
T7809495.0da	7809483	E91 manuell 120kW + DPF (SA200)
T7809499.0da	7809487	E91 manuell 110kW Fleet + DPF (SA200 + SA843)
T7809501.0da	7809489	E91 automa. 120kW + DPF (SA200)
T7809505.0da	7809493	E91 automa. 110kW Fleet + DPF (SA200 + SA843)
<b>T7808910.0da</b>	<b>7808894</b>	<b>E90 manuell 90kW MHI</b>
T7809479.0da	7809475	E90 manuell 90kW MHI + DPF (SA200)
<b>T7809510.0da</b>	<b>7809507</b>	<b>E91 manuell 90kW MHI</b>
<b>T7808338.0da</b>	<b>7808331</b>	<b>E87 manuell 120kW MHI</b>
<b>T7808824.0da</b>	<b>7808786</b>	<b>E87 manuell 120kW Garrett</b>
<b>T7808836.0da</b>	<b>7808798</b>	<b>E87 automa. 120kW MHI</b>
<b>T7808835.0da</b>	<b>7808797</b>	<b>E87 automa. 120kW Garrett</b>
T7809406.0da	7809381	E87 manuell 120kW MHI + DPF (SA200)
T7809407.0da	7809382	E87 manuell 120kW Garrett + DPF (SA200)
T7809414.0da	7809389	E87 manuell 110kW MHI Fleet + DPF (SA200 + SA843)
T7809415.0da	7809390	E87 manuell 110kW Garrett Fleet + DPF (SA200 + SA843)
T7809418.0da	7809393	E87 automa. 120kW MHI + DPF (SA200)
T7809419.0da	7809394	E87 automa. 120kW Garrett + DPF (SA200)
T7809426.0da	7809401	E87 automa. 110kW MHI Fleet + DPF (SA200 + SA843)
T7809427.0da	7809402	E87 automa. 110kW Garrett Fleet + DPF (SA200 + SA843)
<b>T7808349.0da</b>	<b>7808347</b>	<b>E87 manuell 90kW MHI</b>
<b>T7808848.0da</b>	<b>7808810</b>	<b>E87 manuell 90kW Garrett</b>
T7809440.0da	7809431	E87 manuell 90kW MHI + DPF (SA200)
T7809441.0da	7809432	E87 manuell 90kW Garrett + DPF (SA200)

Fett markierte Versionen sind DPF-frei – diese werden für DPF off benötigt!

Die fehlerhaft bezeichneten BMW-Datenbestände wurden nach bestem Wissen und Gewissen korrigiert, aber dennoch sind die Angaben zur VDI mit Vorsicht zu genießen, da die Datenrevisions nicht 100% verifiziert ist. Die fett markierten Softwarebestände wurden bereits getestet und stimmen 100%ig!

Sollte die falsche Software gefahren werden, ist das kein Problem. Einfach die richtige Version erneut flashen.

## OBD and DPF Tampering OBD Tampering and DPF Removal:



Since cars are connected to the Internet, there is the fear of hackers. If a user can start his car via a smartphone app and off - can there possibly others butt in? Or it may even happen that someone takes control over braking or steering?...

## Die Angst vor Hackern im Auto

**Sicherheitslücke** Eingriff in die Elektronik ist möglich. Beispiel BMW

**München** Seit Autos mit dem Internet verbunden werden, gibt es die Angst vor Hacker-Angriffen. Wenn ein Nutzer sein Auto per Smartphone-App starten und abschalten kann – können da vielleicht auch andere dazwischenfunken? Oder kann es sogar passieren, dass jemand die Kontrolle über Bremsen oder Lenkung übernimmt?

Die Autoindustrie sagt, die Systeme seien sicher. Doch jetzt wirft ein Schnitzer von BMW Fragen auf. Rund 2,2 Millionen Autos der mit Internet-Anschlüssen ausgestatteten Serie ConnectedDrive konnten wegen eines Verschlüsselungs-Fehlers mit etwas technischem Geschick per Funk aufgeschlossen werden.

Der ADAC entdeckte die Schwachstelle und warnte den Hersteller – der rüstete rasch nach, bevor der Autoklub an die Öffentlichkeit ging. Zur Behebung des Problems sei kein Werkstattaufenthalt nötig. Die Aktualisierung der Software laufe automatisch im Hintergrund, sobald sich

das Fahrzeug mit dem BMW-Server verbinde – zum Beispiel dann, wenn das Navigationssystem eingeschaltet wird.

Das Problem ist bekannt: Die Stars der Autohacking-Szene, Chris Valasek und Charlie Miller, demonstrierten 2013, wie man über ein angeschlossenes Notebook die Bremsen bei einem Auto abschalten oder während der Fahrt auslösen kann. Ebenso konnten sie den Lenkverstärker lahmlegen und die Anzeigen durcheinanderbringen. Inzwischen erforschen sie die Möglichkeiten eines Zugriffs per Funk. Ihre Erkenntnis: Es ist äußerst schwierig, aber bei sehr gezielten Attacken theoretisch machbar. (dpa)



**Einbruch ins Computersystem des Autos.** Archivfoto: Thomas Enderle, dpa

<https://www.youtube.com/watch?v=3jstaBeXgAs>

<https://www.youtube.com/user/ADAC>

Source: Allgäuer Zeitung, You Tube, Internet

## Why other countries are using measurement systems under load

The advantage of using this method is widely proofed and validated in the following countries: USA, Canada, Mexico, Ecuador, Chile (adding lanes in 2015/2016), Argentina (starting in 2016), Singapore, Korea, Vietnam, Hong Kong, China, Australia (in Queensland for Trucks).

Further benefits are using an wider range of RPM, producing of NO<sub>x</sub> (NO plus NO<sub>2</sub>) because it is close to road driving conditions, repeatability, stable process, closer to real emissions, stability, short test, detections of DPF and catalytic converter defects, detection of EGR problems, tacho control, comparison possible with OBD values to detect defeat software. The system is according to metrology calibration standards.



## Chile: Introduction of the ASM Test in September 2008

Norm: «El D.S. 149/2007 of the Ministry of Transportation and Telecommunication»

- For Gasoline Vehicles from beginning of MY 1992 at the metropolitan region of Santiago de Chile
- Measurement according to the ASM Modus (Acceleration Simulation Mode)<sup>1)</sup>
- Verification started at September 2008
- Duration of the ASM test approx. 4 minutes

### <sup>1)</sup> ASM Modus

a) Modus 5015: Under load at 24 km/h (15 Miles/h)

b) Modus 2525: Under load at 40 km/h (25 Miles/h)

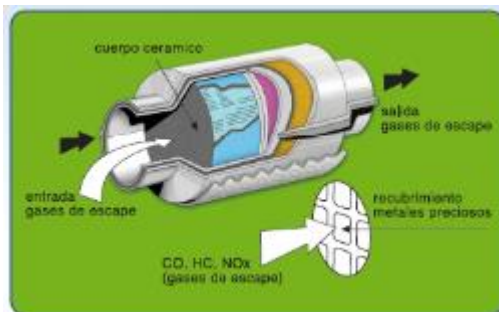
Source: MTT, Chile





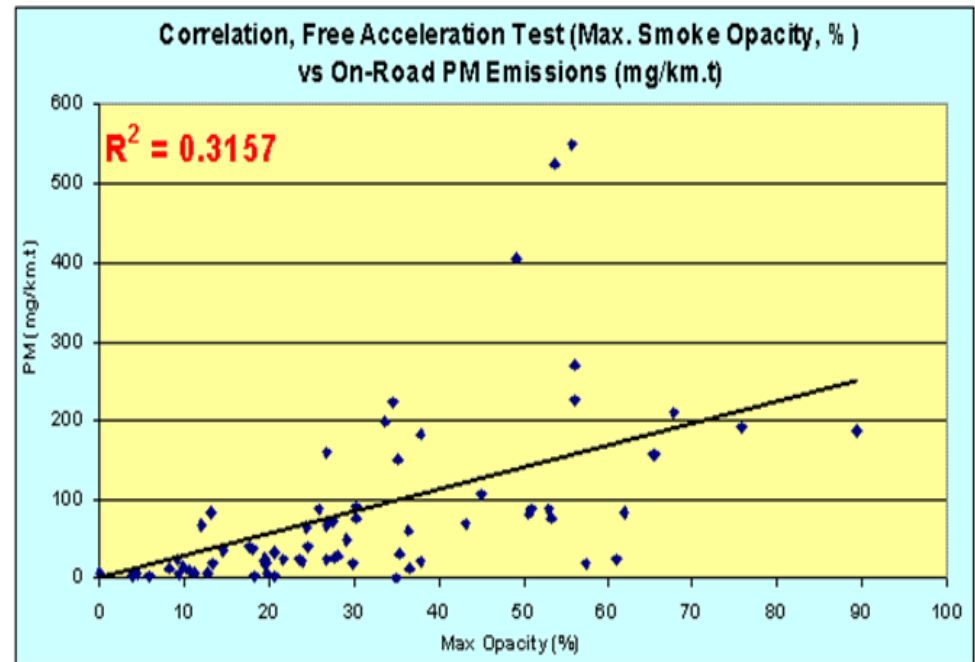
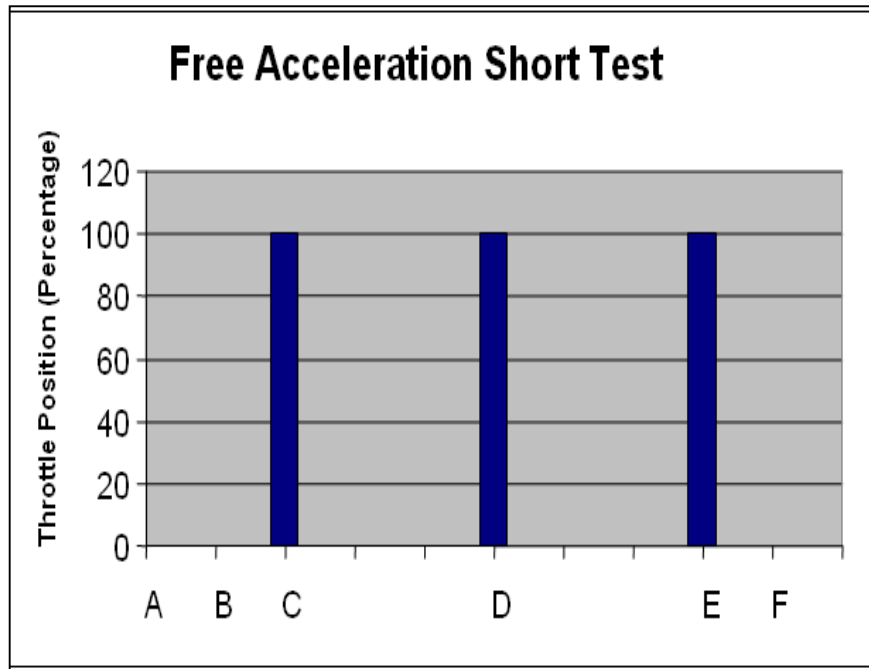
## Chile: Introduction of the ASM Test in September 2008

- The test vehicle accelerate 2 WD or 4 WD at two testing points at 24 km/h and 40 km/h.
- This measurement method allows to measure under load accurate  $\text{NO}_x$ .
- The test will be extended from the metropolitan region of Santiago de Chile to whole country.
- Test of the catalytic converter at real conditions.
- Measurement also of CO,  $\text{CO}_2$ , HC,  $\text{O}_2$  and Lambda.
- Limit values are automatically calculated by the software according the latest BAR standard or Chile standard.



Source: MTT, Chile

General there is better correlation between by testing under load compared to free acceleration

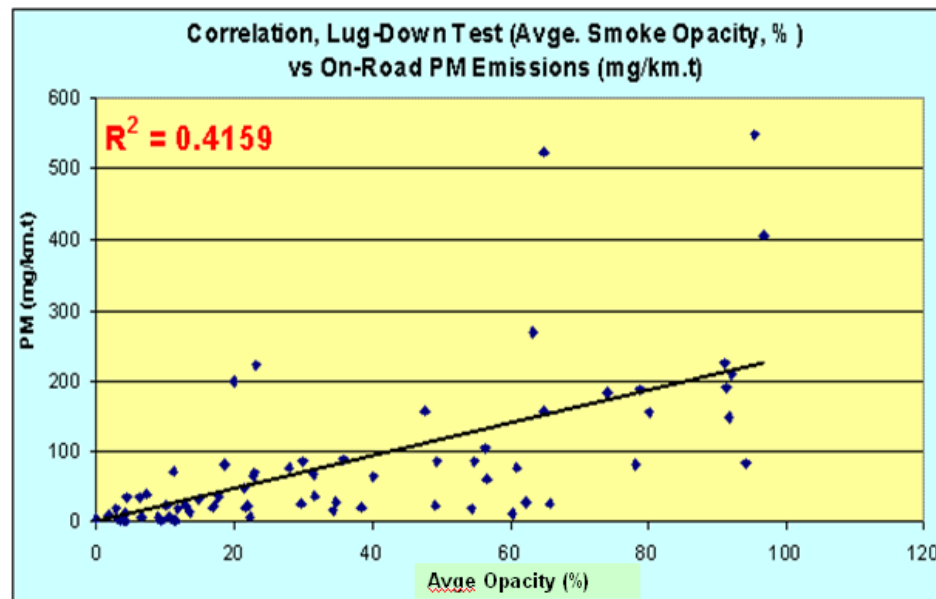
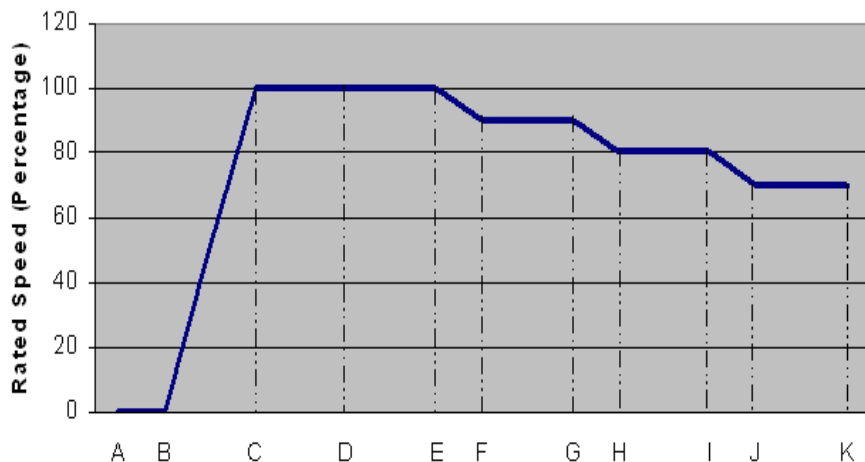


- Free Acceleration (ie SAE J1667) test is fast and convenient
- Correlation with on-road driving is generally quite low



## Better correlation by testing with Lug Down Test

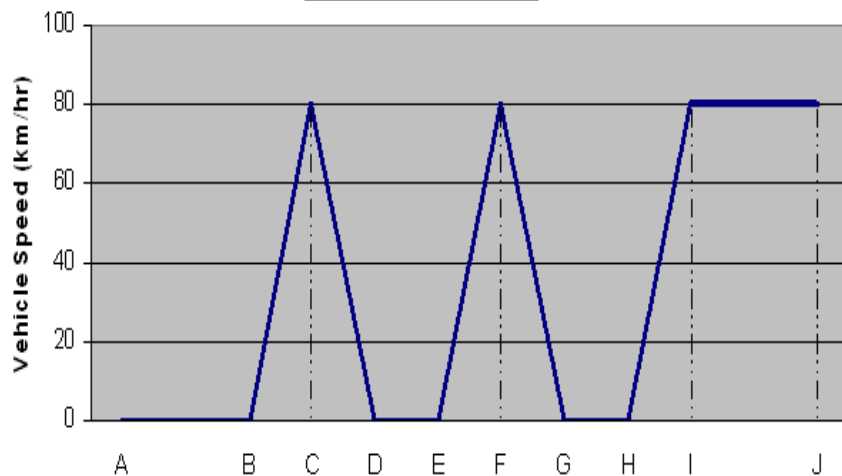
Lug Down Short Test



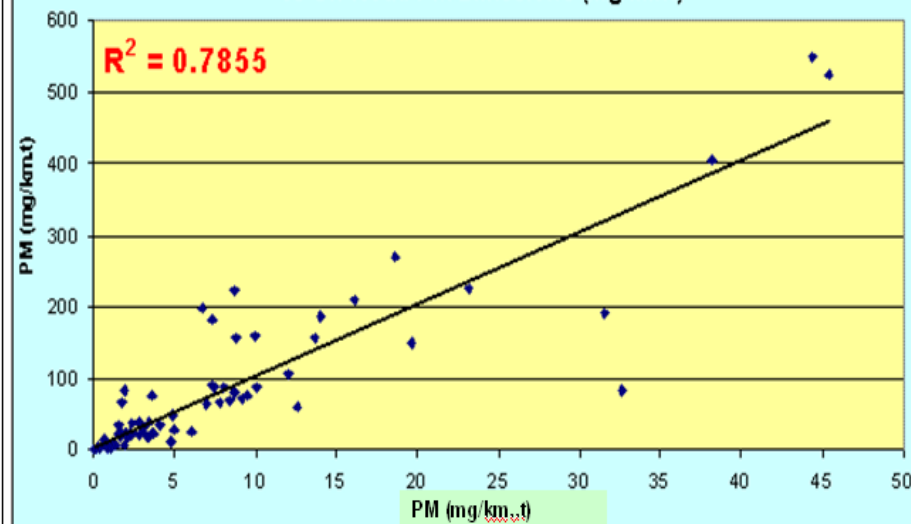
- Lug-Down test also has relatively poor correlation with on-road emission levels
- Gives a poor outcome for a relatively high investment
- Places high stress on engine and transmission
- Generally unpopular with vehicle owners

## Even better correlation by testing with DT 80 Test

DT80 Short Test

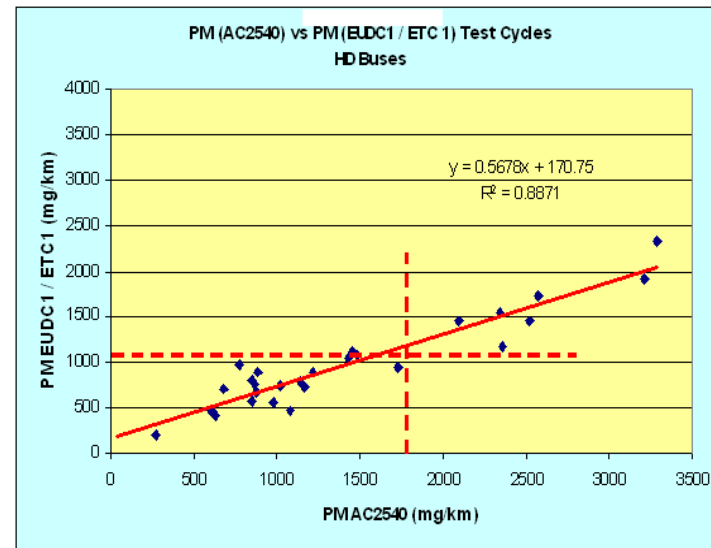
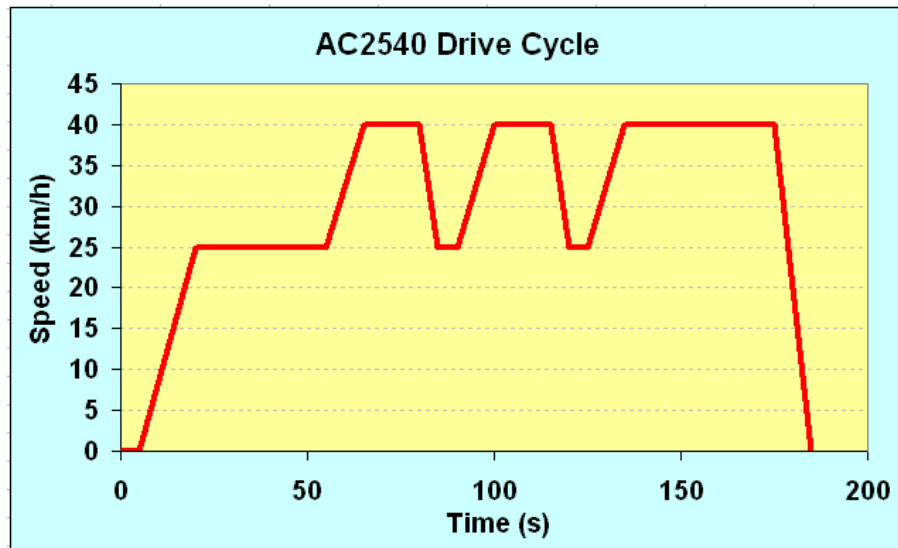


Correlation, DT80 Test (PM, mg/km.t)  
vs On-Road PM Emissions (mg/km.t)



- DT80 transient test (with exhaust mass flow) has better correlation with on-road emissions
- Selected in 2003 by Australian authorities as the national diesel emission test.
- But high dyno speed (80 km/h) and lack of acceleration phase timing has received criticism.

## Best correlation by testing with Canada's AC 2540 Test



AC2540 has good to very good correlation with European light and heavy duty certification tests at both high and low PM concentrations

This test includes exhaust flow measurement (it represent absolute values), real-time PM plus NO<sub>x</sub> (plus other gases for spark-ignition vehicles).

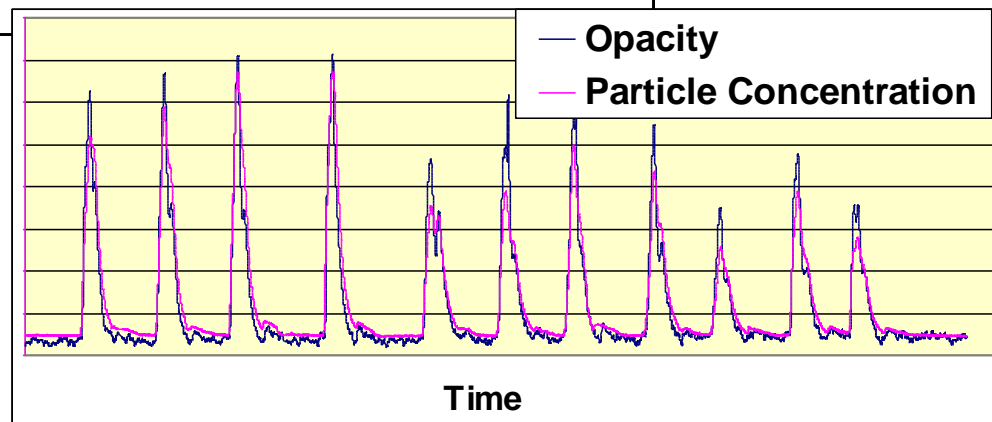
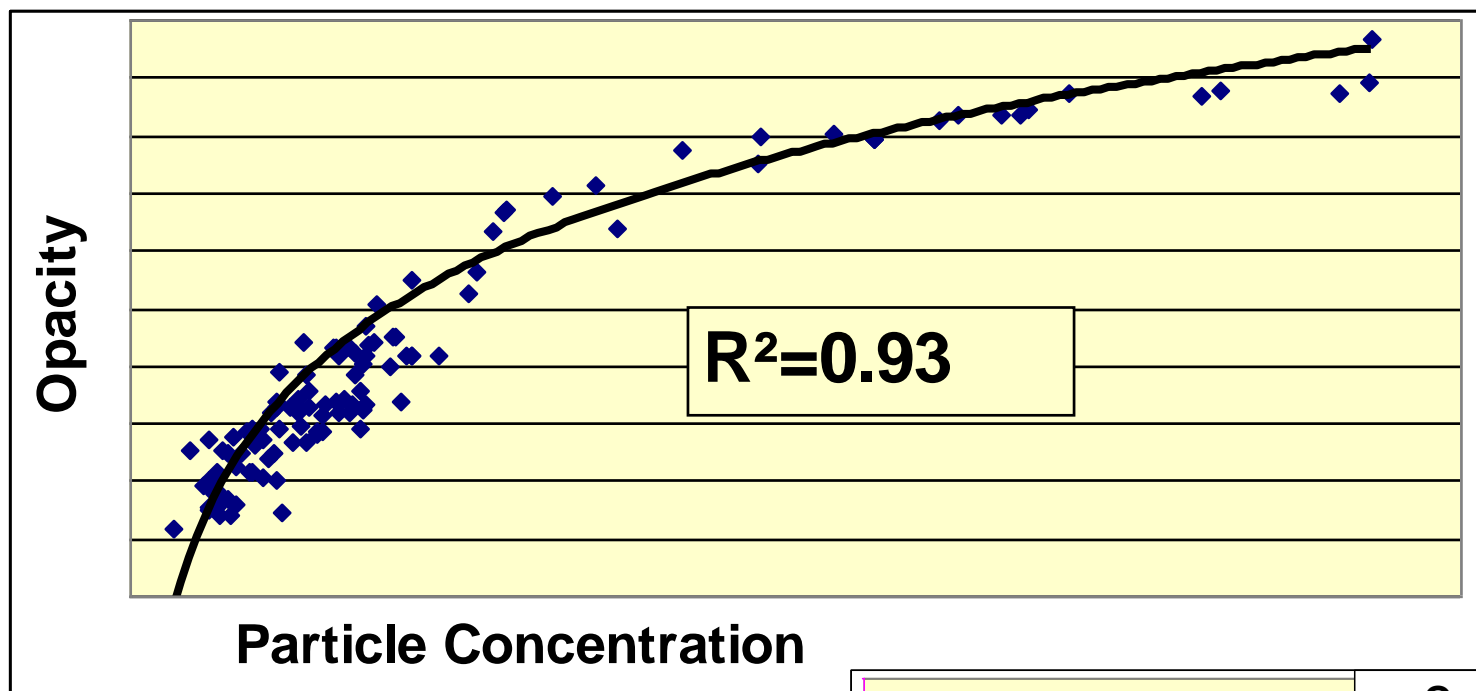
## Summary of Comparison between the different Methods

1. Free acceleration has an  $R^2 = 0.3157$
2. Lug Down Test has an  $R^2 = 0.4159$
3. DT 80 Test has an  $R^2 = 0.7855$
4. AC 2540 Test has an  $R^2 = 0.8871$

## Testing under load

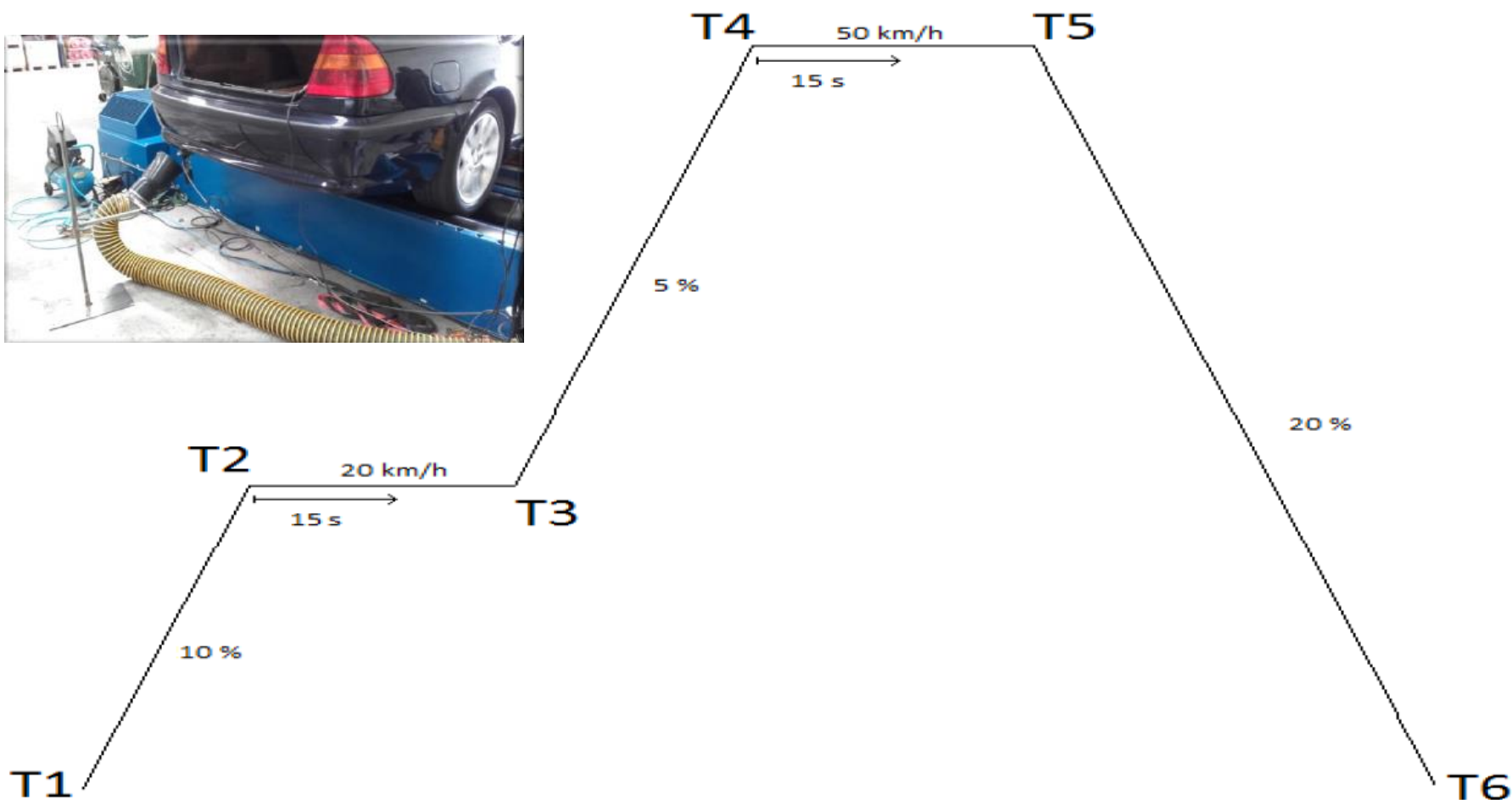


## Correlation between Opacity (m-1) and PM (mg/m3)



Source: DEKRA, Germany

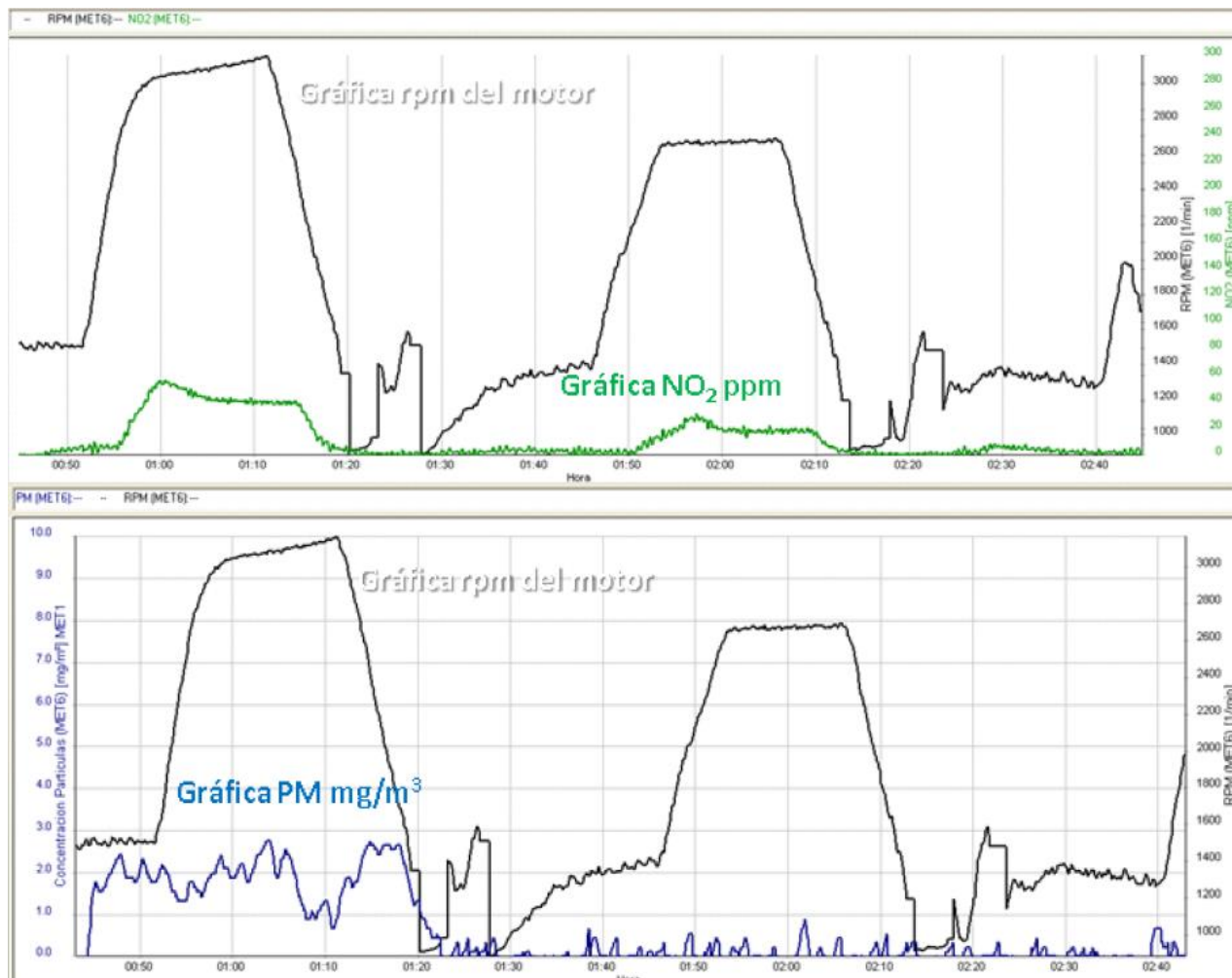
## Spanish trials for measuring NO, NO<sub>2</sub> and PM under load



Source: AECA, Spain



## Spanish trials for measuring NO, NO<sub>2</sub> and PM under load



Source: AECA, Spain

## Spanish trials for measuring NO, NO<sub>2</sub> and PM under load

### at test bench

CICLO	ETAPA	Máximos		Media	
		NOx	Partículas	NOx	Partículas
1	T1-T2	159	17,12	155	16,27
1	T2-T3	184	35,58	147	23,34
1	T3-T4	446	181,43	185	54,59
1	T4-T5	359	19,66	207	16,79
1	T5-T6	150	36,02	63	4,83
2	T1-T2	136	43,53	107	39,81
2	T2-T3	306	73,14	186	41,47
2	T3-T4	359	170,27	170	33,34
2	T4-T5	192	17,45	138	6,70
2	T5-T6	40	0,11	29	0,00
3	T1-T2	131	24,86	128	23,33
3	T2-T3	434	180,55	233	41,35
3	T3-T4	423	255,13	215	50,81
3	T4-T5	238	20,88	187	11,40
3	T5-T6	87	0,55	46	0,06

### on the road

CICLO	ETAPA	Máximos		Media	
		NOx	Partículas	NOx	Partículas
1	T1-T2	152	31,16	147	28,25
1	T2-T3	191	160,22	136	42,76
1	T3-T4	519	176,35	260	54,63
1	T4-T5	406	20,33	263	15,41
1	T5-T6	209	11,82	91	0,93
2	T1-T2	107	26,07	103	25,08
2	T2-T3	202	66,96	120	25,36
2	T3-T4	393	166,51	181	35,77
2	T4-T5	224	20,66	193	10,71
2	T5-T6	83	0,55	47	0,09
3	T1-T2	29	0,33	27	0,10
3	T2-T3	155	44,97	80	18,40
3	T3-T4	576	207,95	158	37,10
3	T4-T5	578	25,85	266	19,83
3	T5-T6	151	15,91	91	1,23

Source: AECA, Spain

## Concept for an New Emission Tailpipe Testing for Europe

1. Using in the 1st phase an ASM test bench according to California's BAR standard for passenger cars.
2. Measuring tail pipe emissions under loaded mode by using for petrol/gasoline powered vehicles the ASM 5015 and ASM 2525. For diesel powered vehicles using either the lug down test which was designed in California by CARB or the AC 2540 test which shows the best correlation.
3. For beginning the pass/fail criteria's from Chile and Korea could be used. Specific pass/fail limits could be elaborated in absolute values together with e.g. CITA for later.
4. The following emissions should be considered for petrol/gasoline powered vehicles: CO, CO<sub>2</sub>, HC, Lambda, NO, NO<sub>2</sub> and PM. For diesel powered vehicles the following emissions should be considered: CO, CO<sub>2</sub>, HC, NO, NO<sub>2</sub> and Opacity and PM.

### Concept for an New Emission Tailpipe Testing for Europe

5. The advantage of using ASM test bench is widely proofed and validated in the following countries: USA, Canada, Mexico, Ecuador, Chile, Argentina (starting in 2016), Singapore, Korea, Vietnam, China, Australia (in Queensland for Trucks). Further benefits are test under load, using an wider range of RPM, producing of NOx (NO plus NO2), repeatability, stable process, closer to real emissions, stability, short test, detections of DPF and catalytic converter defects, detection of EGR problems, tachometer control, comparison possible with OBD values to detect defeat software,...
6. The ASM test bench are available for two and four wheel powered vehicles.
7. AirCare from Canada have shown the increase of opacity during the D147 test, instead of free accelerations as performed now in most European countries.

## Concept for an New Emission Tailpipe Testing for Europe

8. The values could be displayed in concentrations or in total mass. This allows some correlations to air quality standards or vehicle type approval standards. An deterioration factor can be applied to detect the so called polluters and gross polluters.
9. Independence of OBD
10. Real measurement, not assumptions and algorithms are the characteristic of tail pipe measurement plus dyno
11. Metrology proofed test equipment, opposite to single proofed OBD systems should be used and calibrated yearly to avoid wrong measurements contrarily to OBD
12. Using in the 2<sup>nd</sup> phase an Lug-Down test bench for trucks e.g. used in China and Vietnam.

## List of abbreviations:

ASM - Acceleration Simulation Mode – <https://www.tceq.texas.gov/airquality/mobilesource/vim/testing.html>

CARB - California Air Resources Board – <http://www.arb.ca.gov>

BAR 97 - Bureau of Automotive Repair 1997 – <http://www.bar.ca.gov/>

OBD - On Board Diagnostic System – [https://en.wikipedia.org/wiki/On-board\\_diagnostics](https://en.wikipedia.org/wiki/On-board_diagnostics)

D147 - (Canada) Diesel Test Cycle 147 Seconds – [http://www.ccme.ca/files/Resources/air/mobile\\_sources/jia\\_trnsprt\\_emiss\\_reduct\\_e.pdf](http://www.ccme.ca/files/Resources/air/mobile_sources/jia_trnsprt_emiss_reduct_e.pdf)

KD147 – Korea Diesel Test Cycle 147 Seconds – [http://portal.koreascience.kr/article/articlereultdetail.jsp?no=DGHGBJ\\_2014\\_v30n4\\_327](http://portal.koreascience.kr/article/articlereultdetail.jsp?no=DGHGBJ_2014_v30n4_327)

L-Category - Motorcycles, Quads, Trikes, etc. – [http://ec.europa.eu/transport/road\\_safety/topics/vehicles/vehicle\\_categories/index\\_en.htm](http://ec.europa.eu/transport/road_safety/topics/vehicles/vehicle_categories/index_en.htm)

DPF - Diesel Particulate Filter – [https://en.wikipedia.org/wiki/Diesel\\_particulate\\_filter](https://en.wikipedia.org/wiki/Diesel_particulate_filter)

EGR - Exhaust Gas Recirculation – [https://en.wikipedia.org/wiki/Exhaust\\_gas\\_recirculation](https://en.wikipedia.org/wiki/Exhaust_gas_recirculation)

RPM - Revolutions per Minutes – [https://en.wikipedia.org/wiki/Revolutions\\_per\\_minute](https://en.wikipedia.org/wiki/Revolutions_per_minute)

CO - Carbon Monoxide – [https://en.wikipedia.org/wiki/Carbon\\_monoxide](https://en.wikipedia.org/wiki/Carbon_monoxide)

CO<sub>2</sub> - Carbon Dioxide – [https://en.wikipedia.org/wiki/Carbon\\_dioxide](https://en.wikipedia.org/wiki/Carbon_dioxide)

HC – Hydrocarbon – <https://en.wikipedia.org/wiki/Hydrocarbon>

Lambda – <https://en.wikipedia.org/wiki/Lambda>

PM - Particulate Matter (in mass concentration) – <https://en.wikipedia.org/wiki/Particulates>

NO - Nitrogen Monoxide – [https://en.wikipedia.org/wiki/Nitric\\_oxide](https://en.wikipedia.org/wiki/Nitric_oxide)

NO<sub>2</sub> - Nitrogen Dioxide – [https://en.wikipedia.org/wiki/Nitrogen\\_dioxide](https://en.wikipedia.org/wiki/Nitrogen_dioxide)

NO<sub>x</sub> - Nitrogen Oxides – [https://en.wikipedia.org/wiki/Nitrogen\\_oxide](https://en.wikipedia.org/wiki/Nitrogen_oxide)



**Thank you for your attention!**



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# Georges PETELET

8 - 9 - 10 NOVEMBER 2016 | SAN JOSÉ, COSTA RICA

*Two major items led by the  
New European Directive:  
Emission Measurement &  
Data Collection and Security*

# EMISSION MEASUREMENTS

Actual state of art regarding regulations, CITA recommendations and new studies



# EMISSION TESTING: EUROPE ROAD MAP



CO Fast Idle

0.2% :  
2010/48/EC

**SET STUDY**  
0.1% : > Euro 4  
CITA recommandation



Opacity

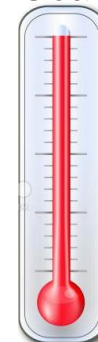
1.5m-1 :  
2010/48/EC

**SET STUDY**  
1m-1: Euro 4  
CITA recommandation  
Default value

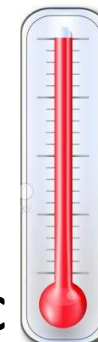
0.7m-1 : 2014/45/EC

**SET STUDY**  
0.2m-1: > Euro 5 & 6  
CITA recommandation

## TEDDIE Study



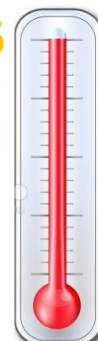
Particulates



NO/ NO2  
ratio



**2  
SET STUDY**



French  
Study

NOx  
???

## EMISSION TESTING: SET 2 NO<sub>x</sub> STUDY



### 2 SET STUDY

**Develop applicable test methods for after treatment systems (based on NO<sub>x</sub> measurement) during periodic emission tests (petrol and diesel vehicles)**

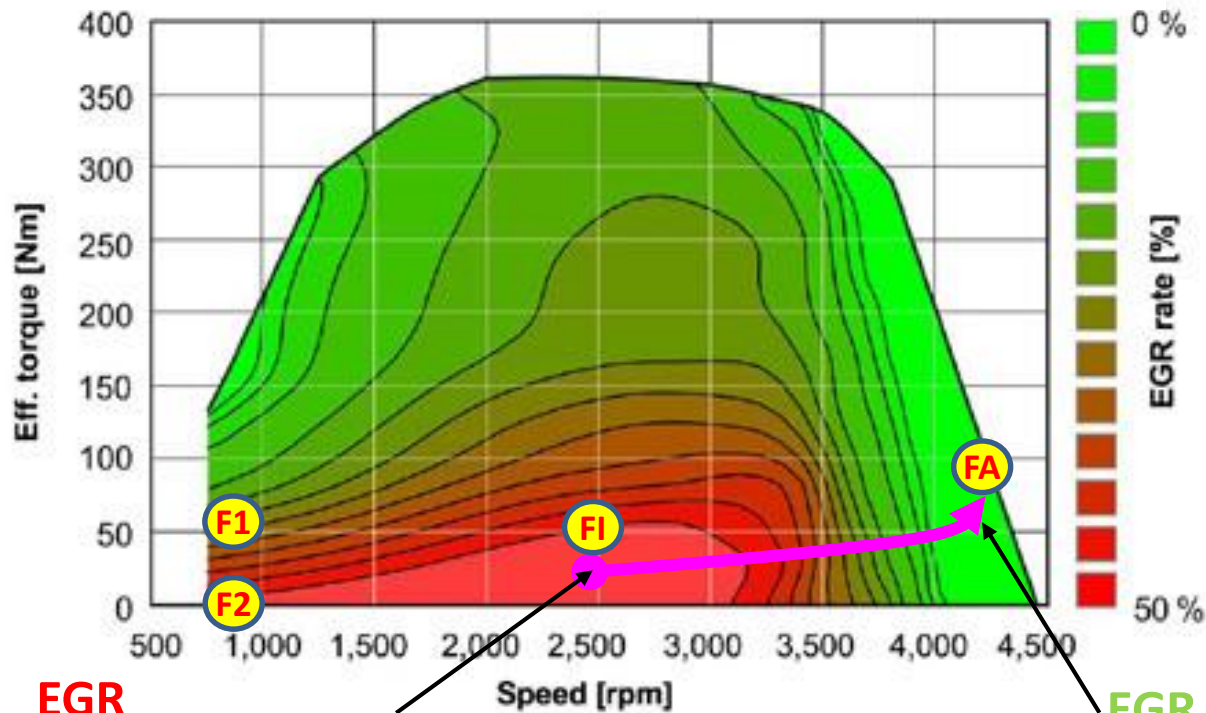
- Lab tests for “Reference values” & “Reference vehicle behavior”
- Identify possible test methods including test equipment
- Select the 3 most promising methods
- Identify defective NO<sub>x</sub> after treatment systems including EURO 6
- Evaluate these methods





## EGR VALVE: TEST CONDITION

EGR rate over characteristic map of 120 Kw engine



**EGR  
OPEN**

Fast Idle speed

High RPM  
maintained

**EGR  
CLOSED**



**Fast idle** speed is about 2000/2500 RPM: **EGR OPEN** in order to drop Nox value

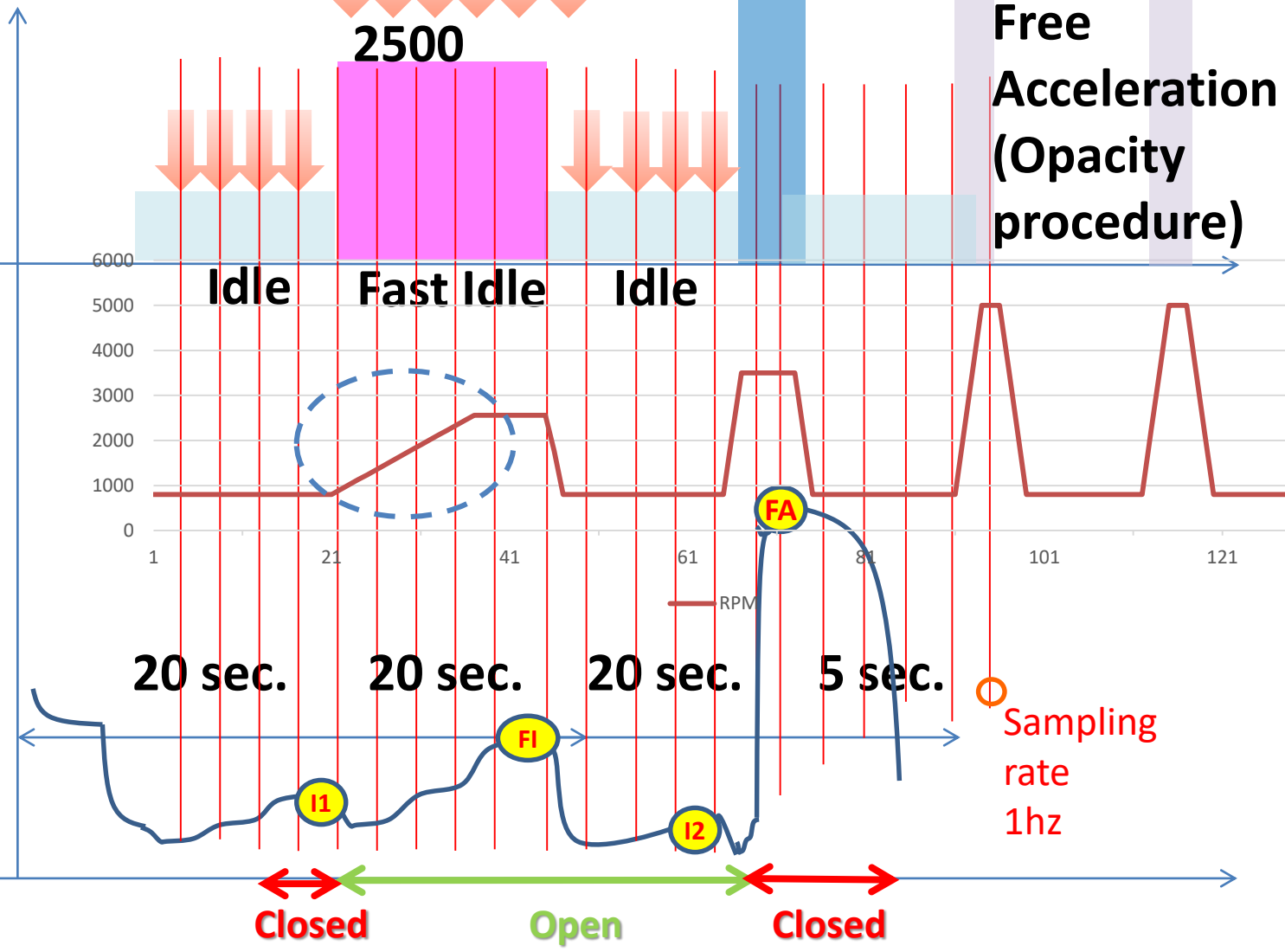
**High RPM maintained** is about 4000 RPM, with the load of the engine only: **EGR CLOSED** in order to provide torque & power

# Test sequence : EGR Activity + EOBD coherency

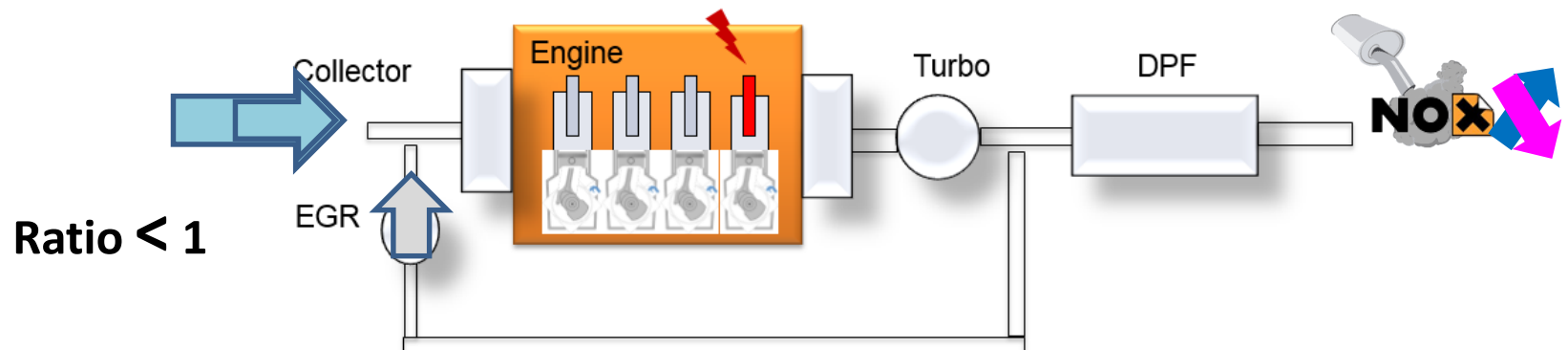
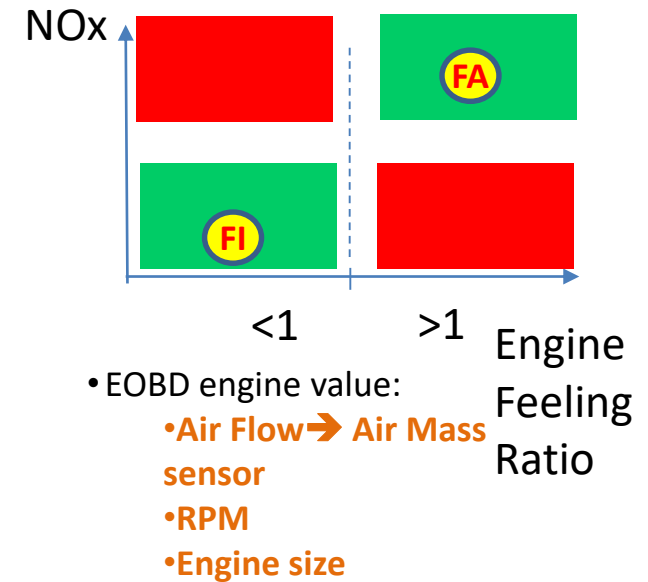
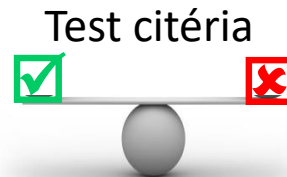


RPM

NOx



# EGR VALVE/ENGINE BEHAVIOUR



# ANTI-TAMPERING

Organisational and software anti-tampering mechanisms throughout PTI process

2014 vs 1





CORRUPTION

FRAUD





**PASS**



Vehicle n° **XXX**

**CO=0,2%**

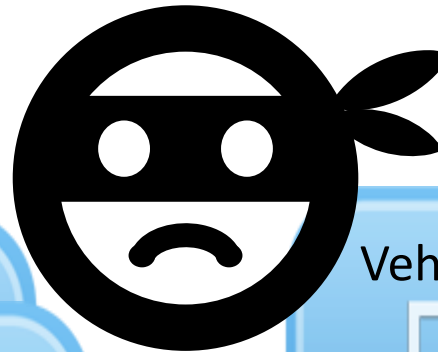
EUROsystem

Vehicle n° **XXX**

**CO=4,2%**







Vehicle n° **xx1**

Vehicle n° **xx2**

Vehicle n° **xx3**

Vehicle n° **xx4**

CO=0,2%

Vehicle n° **xxx**

CO=0,2%

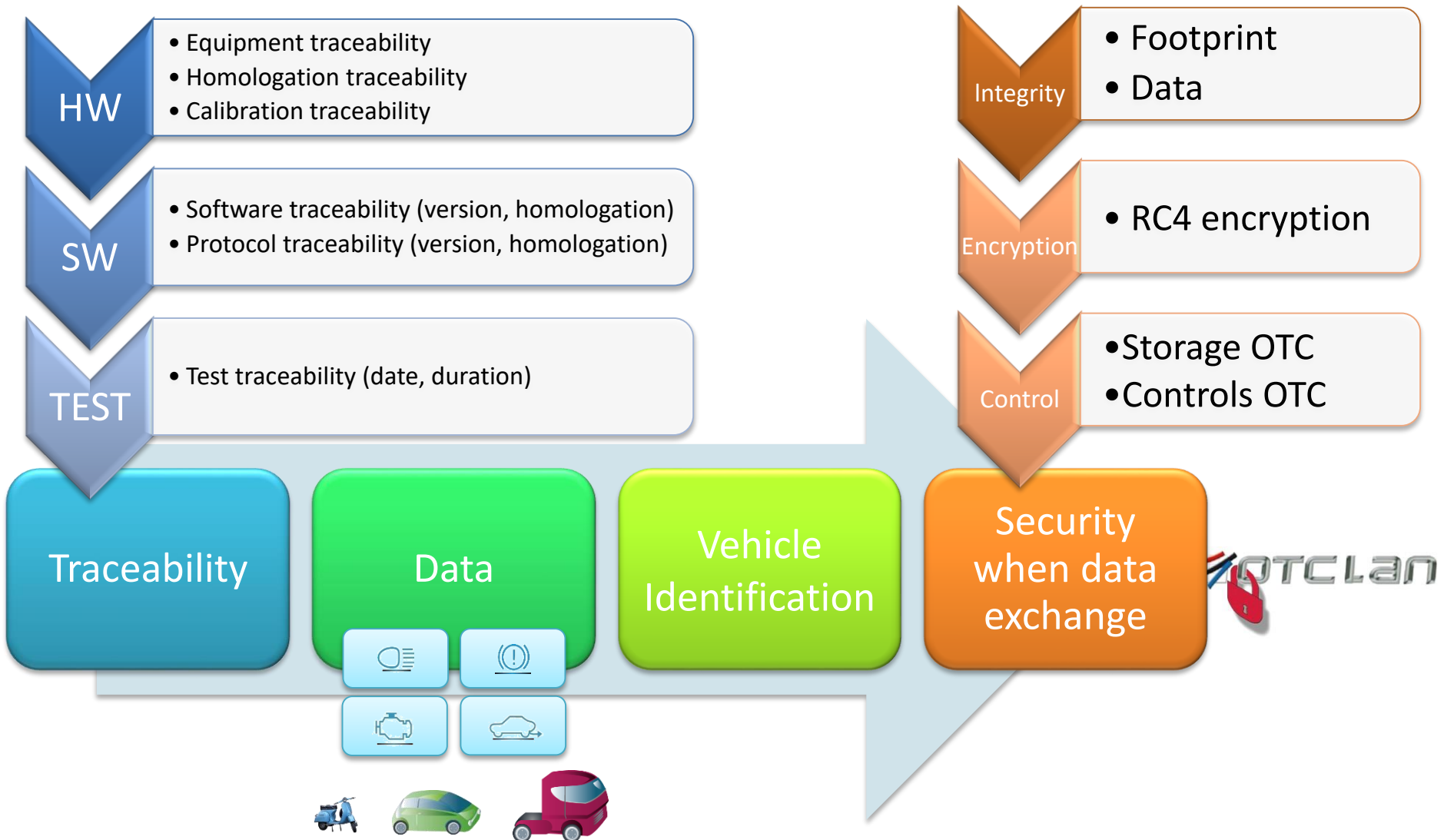
system





- Vehicle have to be handle in the testing area by a controller
- Test result have to be send by mail or email not directly from the controller
- Owner do not have to enter in the testing area
- Owner have to wait in a dedicated room
- No money movement needs to take place in the PTI centre
- Payment have to be done in advance (on-line, on separate organisation)
- National inspection fees/ no price competition

## OTCLAN : TRACEABILITY AND SECURITY IN EACH FILES EXCHANGED



## OTCLAN : TRACEABILITY AND SECURITY / OFFICIAL APPROVAL



G	Gas Analyser
O	Opacimeter
F	Brake tester
S	Suspension tester
R	Side-slip tester
P	Headlight tester
A	Play detector
E	EOBD reader
D	Decelerometer

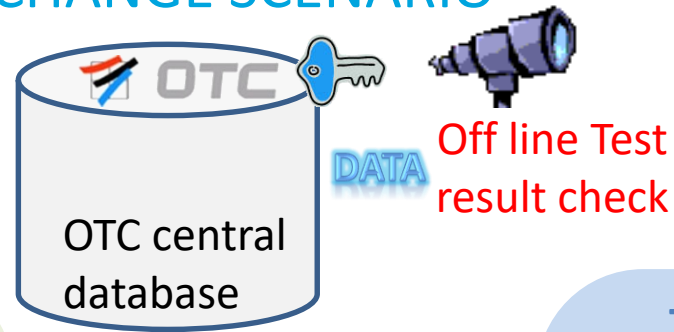
Specification  
SRV

Homologation:

- ✓ Security
- ✓ Exhaustiveness
- ✓ Compliance
- ✓ Interoperability



# TEST RESULTS DATA EXCHANGE SCENARIO

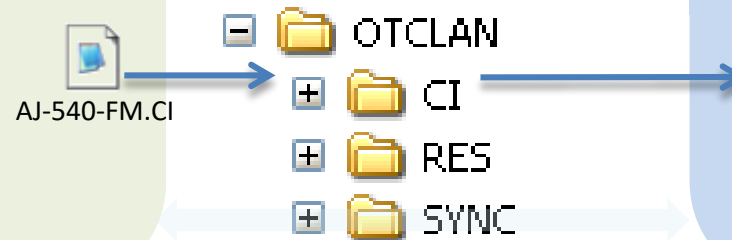


## PTI SATION SOFTWARE MGT



Files flushing

DATA



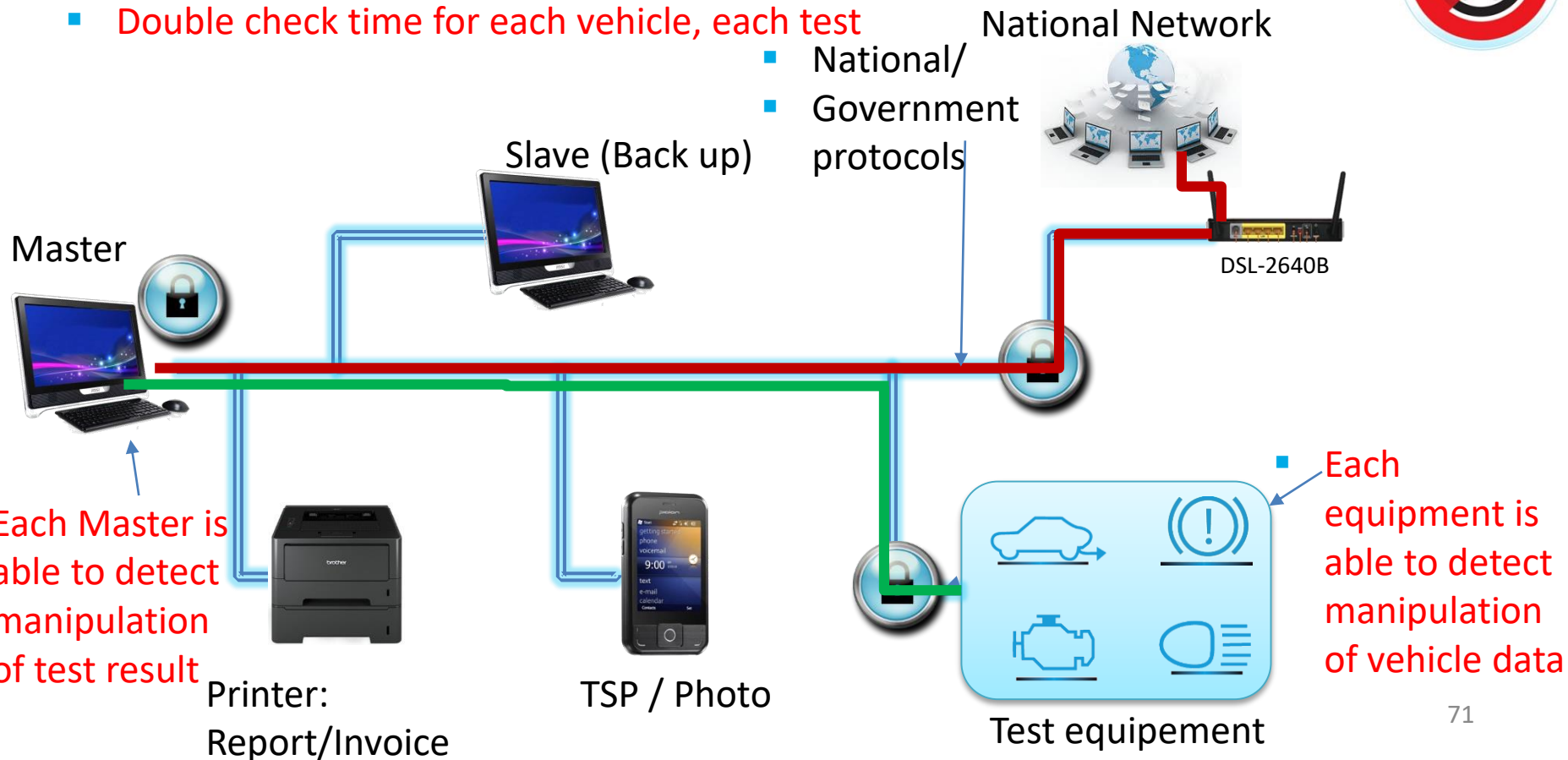
## TEST EQUIPMENT



DATA

# Test Equipment / Automatic data collection

- For each Report, Government is able to
  - Double check report vs test result (with clue for black list registration)
  - Double check equipment approval
  - Double check software version regarding regulation
  - Double check calibration status
  - Double check time for each vehicle, each test





## GOLD SPONSORS:



# COFFEE BREAK

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