8.VERT-Forum – 17.March 2017, EMPA-Academy Dübendorf

The VW-Scandal

VERT-Involvement

conclusions and actions in place of palavers

Andreas C.R. Mayer

Emission Fraud

is frequently detected in the USA since the authorites have the obligation by the CAA to test new cars after introduction and inspectors are free to decide how to test. In Europe …….

The most famous story - quite similar to the VW Scandal 2015 happended in Y 1998 with HDV
(when J.Lemaire was Director of MECA and underwent testimony)
reported by the EPA report «asleep at the wheel»
Sanctions are alwas high and the fines are is traditionally used for emission reserach (we got two research oders from CARB out of this)

ASLEEP AT THE WHEEL

The Environmental Protection Agency's Failure to Enforce Pollution Standards For Heavy-Duty Diesel Trucks

A Staff Report
Prepared for the Use of the

Committee on Commerce
U.S. House of Representatives
Tom Bliley, Chairman

March 2000

The problem is weak or missing controls

The Classic Control Paradigm requires four Levels of Emission Control

A. On-board Functionality and Safety

B. Homologation of New Engines

C. In Use Compliance and Manufacturing Conformity

D. 100% Periodic Control of in-use Fleet PTI with diagostics of engine and all EC-elements

These 4 objectives should never be mixed nor can any of them be abandoned for whatever political or financial reasons

A-C can be manipulated → real world emissions will be higher

D can not be manipulated and guarantees lowest possible emissions

Background and Time Table: 1

- IUC: before 2000 EU abandons «in use compliance test»
- PTI: 2014 EU abandons «periodic technical emission inspection»
  EU recommends by Directive 45/2014 that member states limit it to EPTI = check of ECU and use PTI only for safety aspects

→ Given this guarantee the manufacturers knew hat once they have passed homologation no further emission control will happen

→ Manufacturer use this «license» to limit emission reduction to test cycle conditions which reduces development costs, product costs and operating costs.

→ This strategy is in hidden in software but opens opportunities for in-use manipulation, which now seems to become common.

- July 2015: WVU reveales the existance of defeat devices in VW-cars
- Sept.2015: CARB-letter (which we received next days)

Unbelievable: EU-commission abandones periodic emission test

29.4.2014 EN Official Journal of the European Union L 127/51

DIRECTIVE 2014/45/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 3 April 2014

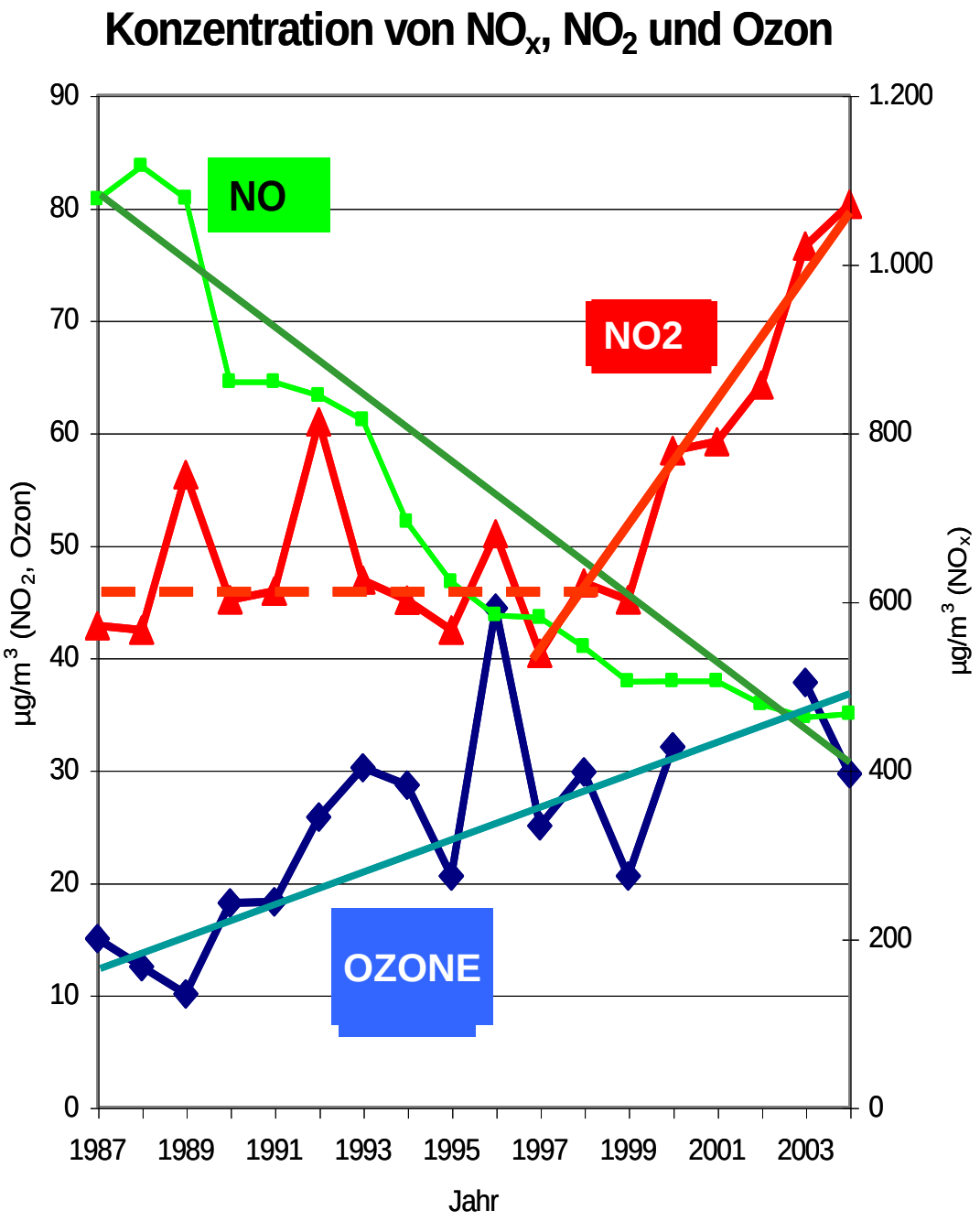
on periodic roadworthiness tests for motor vehicles and their trailers and repealing Directive 2009/40/EC

(Text with EEA relevance)

(10) For vehicles complying with emission classes Euro 6 and Euro VI, on-board diagnostics systems (OBD) are becoming more effective in assessing emissions, justifying their use as an equivalent to standard emission testing for the purpose of roadworthiness tests. With a view to providing for the use of OBD in roadworthiness tests for vehicles up to emission classes Euro 5 and Euro V, Member States should be able to allow this testing method in accordance with the manufacturer's recommendations and other requirements for such vehicles where the equivalence, taking into account any relevant type-approval legislation, where appropriate, has been independently verified.

The Time Table: 2

- Nov.2015: VERT proposes public comment to demonstrate the perfect nanoparticle filtration of these cars – **members refuse**
- Jan.2016: VERT publishes NPTI proposal for DUH to be used in an EU-hearing
- 22. Sept.2016: A.Mayer invited as expert in the official and public hearing of the German Parliament Berlin
- Oct. 2016: German Minister Dobrindt requires AU re-introduction – AU means for Diesel just free acceleration, which is not sufficient; but PN is already part of the new proposal
- NTO publishes 7-10 % DPF failures in LDV in July 2016
- 23.Nov 2016: VERT kicks off NPTI working group with NL, D, CH, EU-JRC to design new PTI for vehicles with DPF and SCR → new PN instruments will be required and a load step test procedure



Monitoring a German Highway

1987-2004

Clear indication for emission control (in this case just DOC) malfunctions, nobody wanted to agree to our explanations during **BUM/Bonn hearing Sept 2005**

Source: UBA, Umwelt Bundesamt

EU limits Emission of new cars and establishes Air Quality Limits

frequently exceeded → sanctioned by EU-commission

EU-Direktive 1999/30/CE für AQ

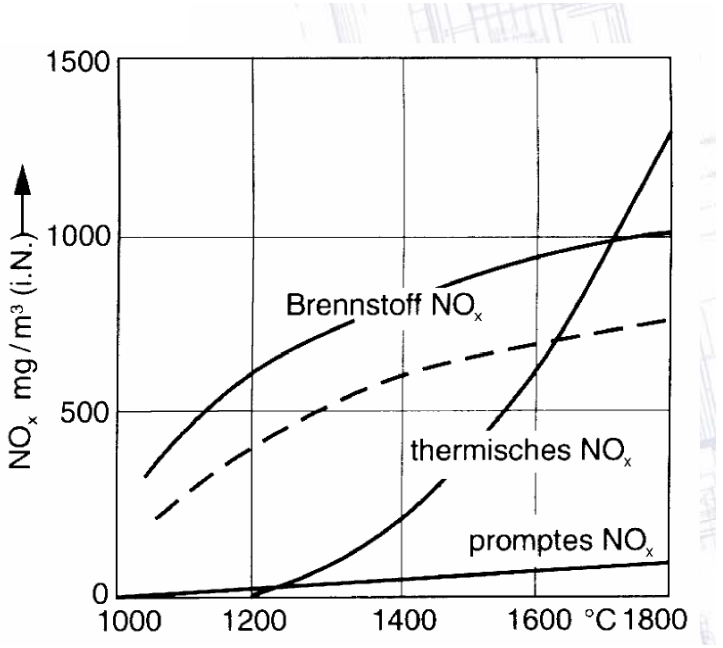
EU limit values for PM10 and NO_2

averaging period	limit value	attainment period
24 h	50 µg/m^3 PM_{10}	1 Jan. 2005
	35 exceedances/year	
1 year	40 µg/m^3 PM_{10}	1 Jan. 2005
24 h	50 µg/m^3 PM_{10}	1 Jan. 2010*
	7 exceedances/year	
1 year	20 µg/m^3 PM_{10}	1 Jan. 2010*
1 h	200 µg/m^3 NO_2	1 Jan. 2010
	18 exceedances/year	
1 year	40 µg/m^3 NO_2	1 Jan. 2010

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

Why is Formation of Nitric Oxides unavoidable

- Air contains 70% N_2
- Combustion of Fuel with Air produces much NO, some NO_2 and a little N_2O
- ***Zeldovich*** showed that this accellerates **> 1200°C**



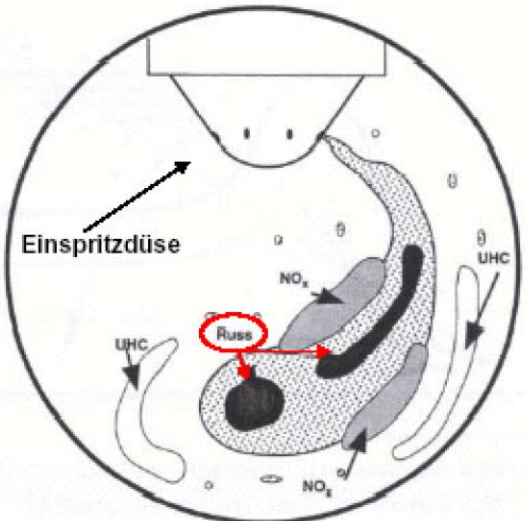
The Challenge

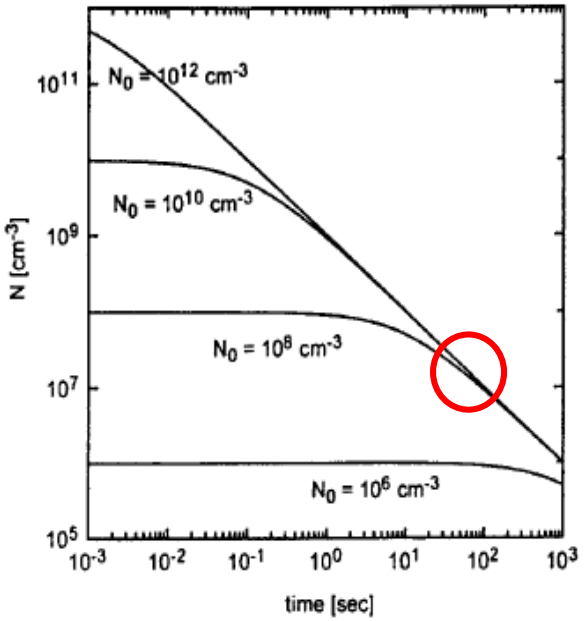
- *Improving combustion needs increased temperatures - Carnot*
- *Modern engines emit higher NOx than older ones*

→ de-coupling of combustion and emission control permits good combustion, low CO_2 and eliminating emissions

Why is Formation of UFP unavoidable

- **Source one** is the fuel injection inhomogeneity forming soot
- **Source two** is lubrication oil metal compounds
- **Source three** is friction metals, vaporized and renucleated





Primary particles have a diameter of 20 nm they agglomerate very fast

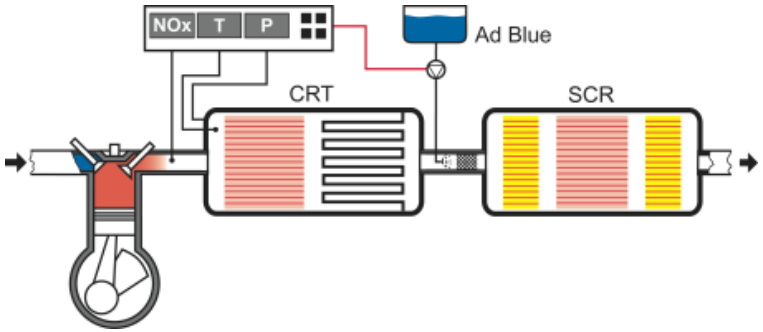
We measure about 1-10 Mio P/cc with old and with new engines in the tail pipe

The good News: we have a Toolbox of very efficient Exhaust Gas Cleaning Devices by Aftertreatment

- DOC Diesel Oxidation Catalyst
- SCR Selective Catalytic Reaction
- EGR from downstream DPF for light load DeNox
- LNT Lean NOx Trap
- DPF Diesel Particle Filter

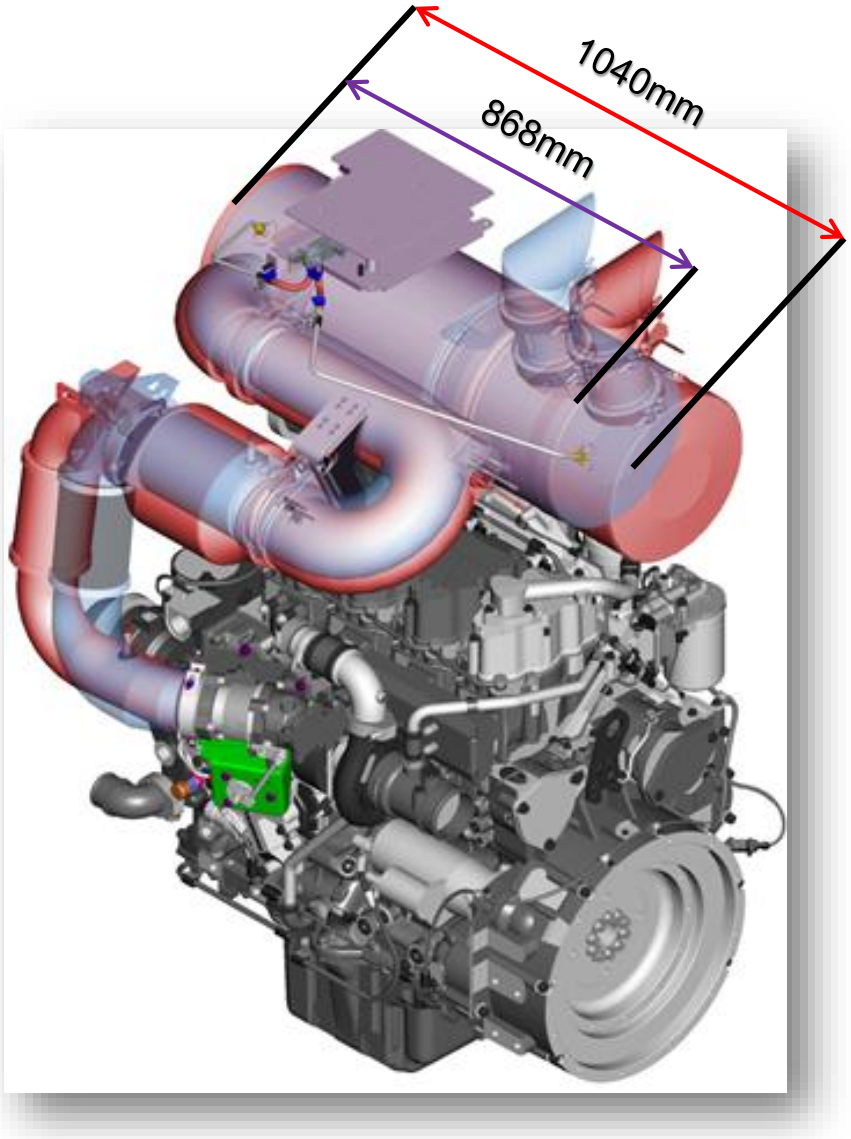
SCR + DPF

expensive and bulky



but coming

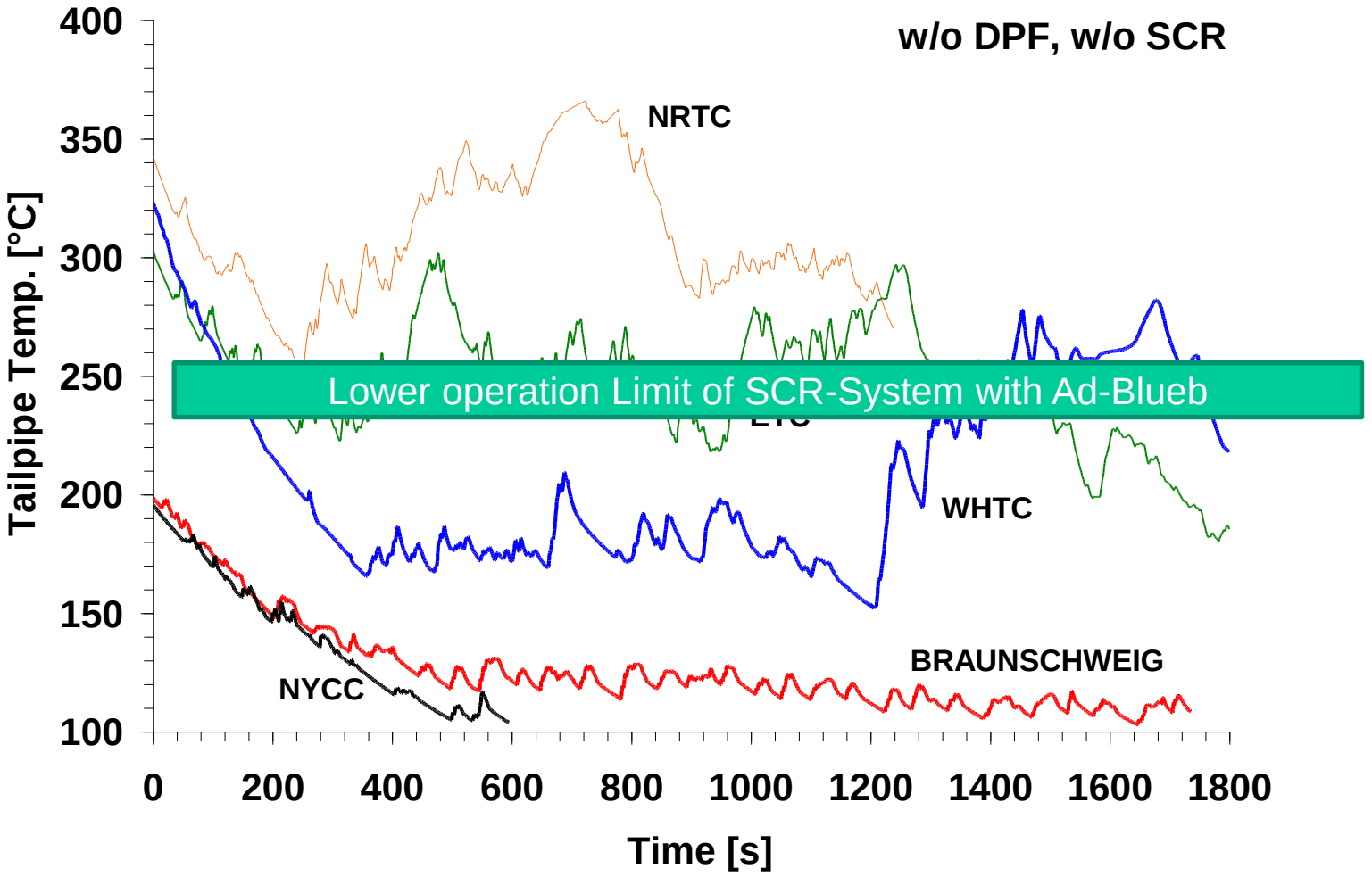
SCR on DPF → →



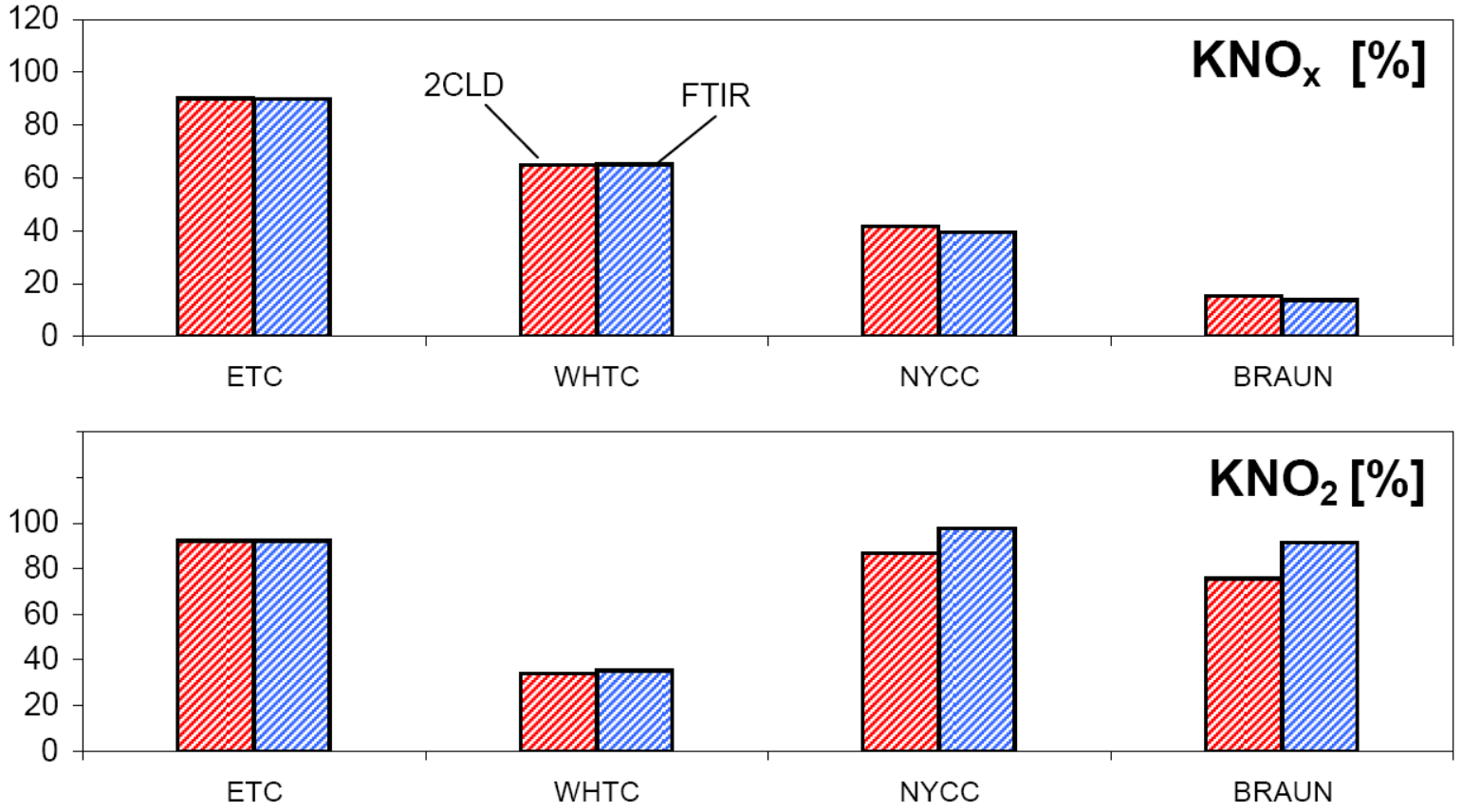
Red → SCRoF (1040mm)
Purple → SCR-only (868mm)

Source: LIEBHERR Dr Regis VONARB

Exhaust Temp.in different Test Cycles

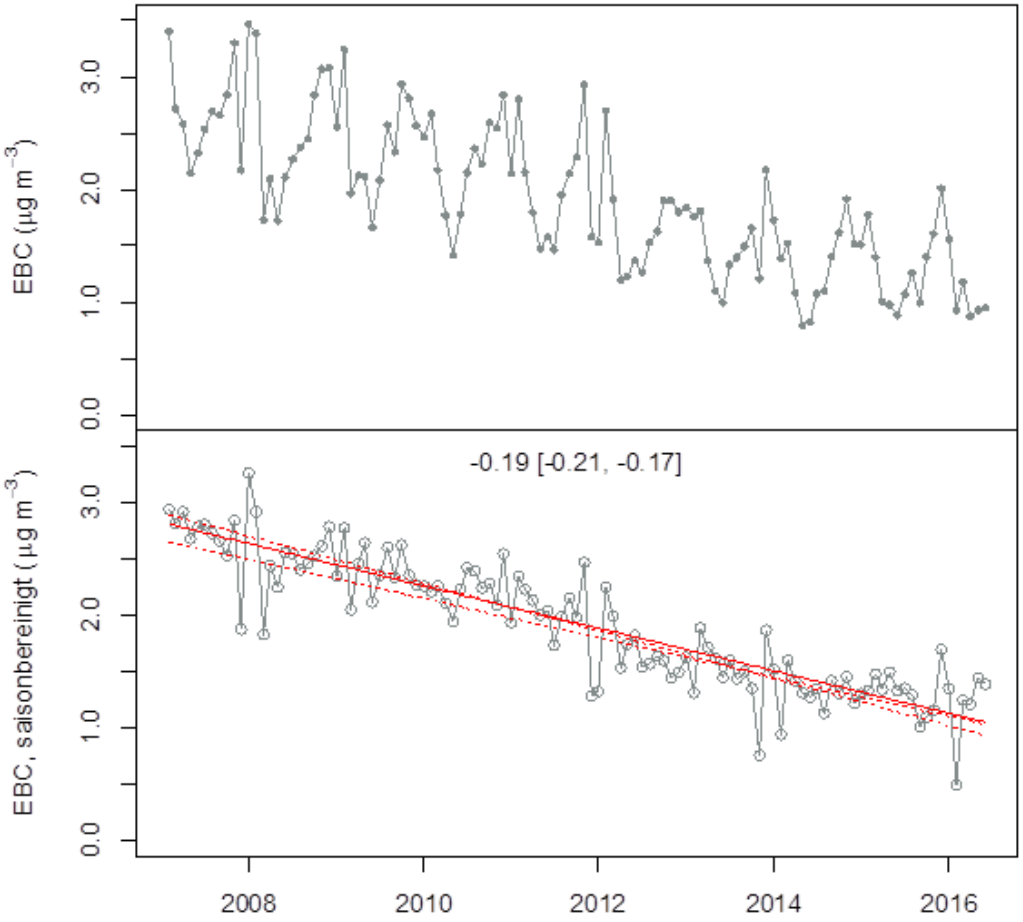


NOx Reduction Efficiencies in Dynamic Cycles and Real World can be very high, if …



The Success Story is true for PM/PN/BC: Cleaning the Air by DPF in Switzerland

Monitoring BC at the motorway crossing Härkingen

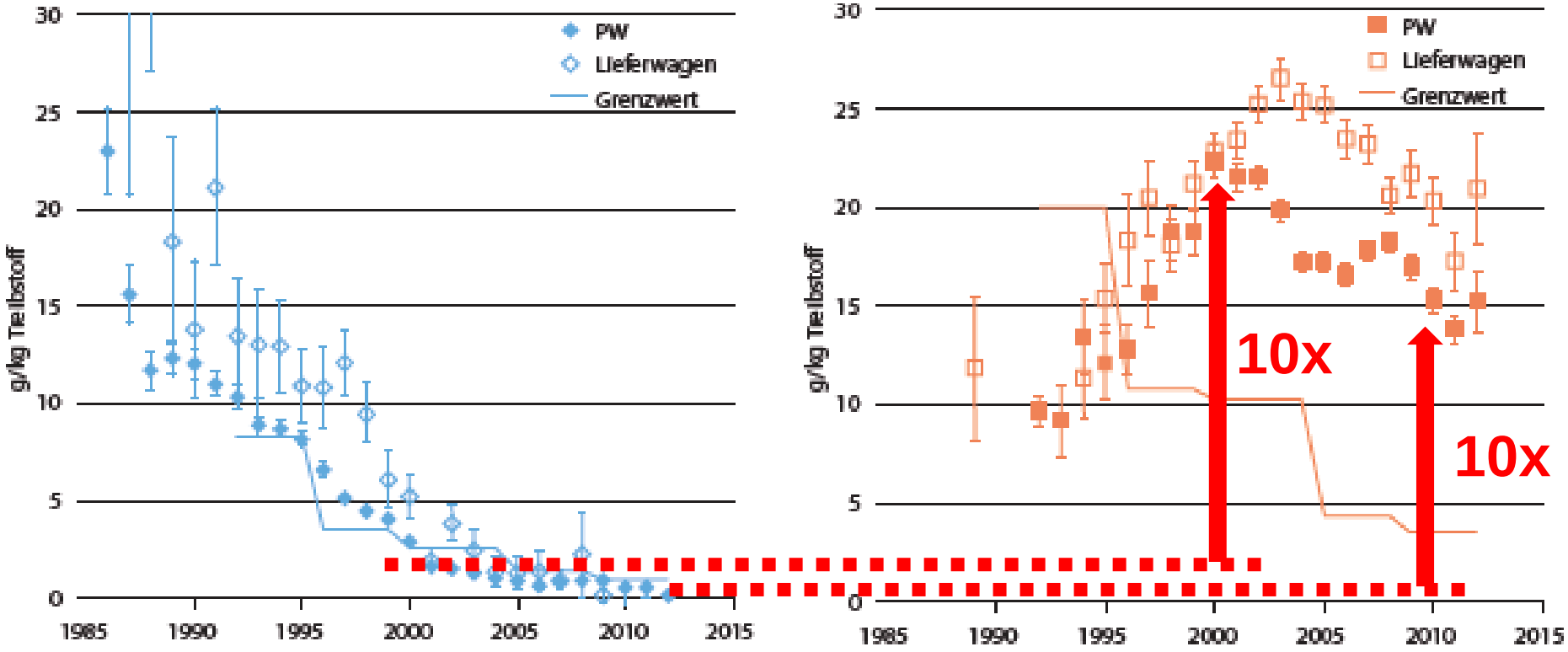


From chassis dynamometers to on-road measurements

Appearance and reality are far apart! Diesel NO_x 10x higher than gasoline vehicles

NO_x emissions of gasoline & diesel vehicles

The NO_x problem of diesel PCs & LDVs is 20 years old – that's the scandal



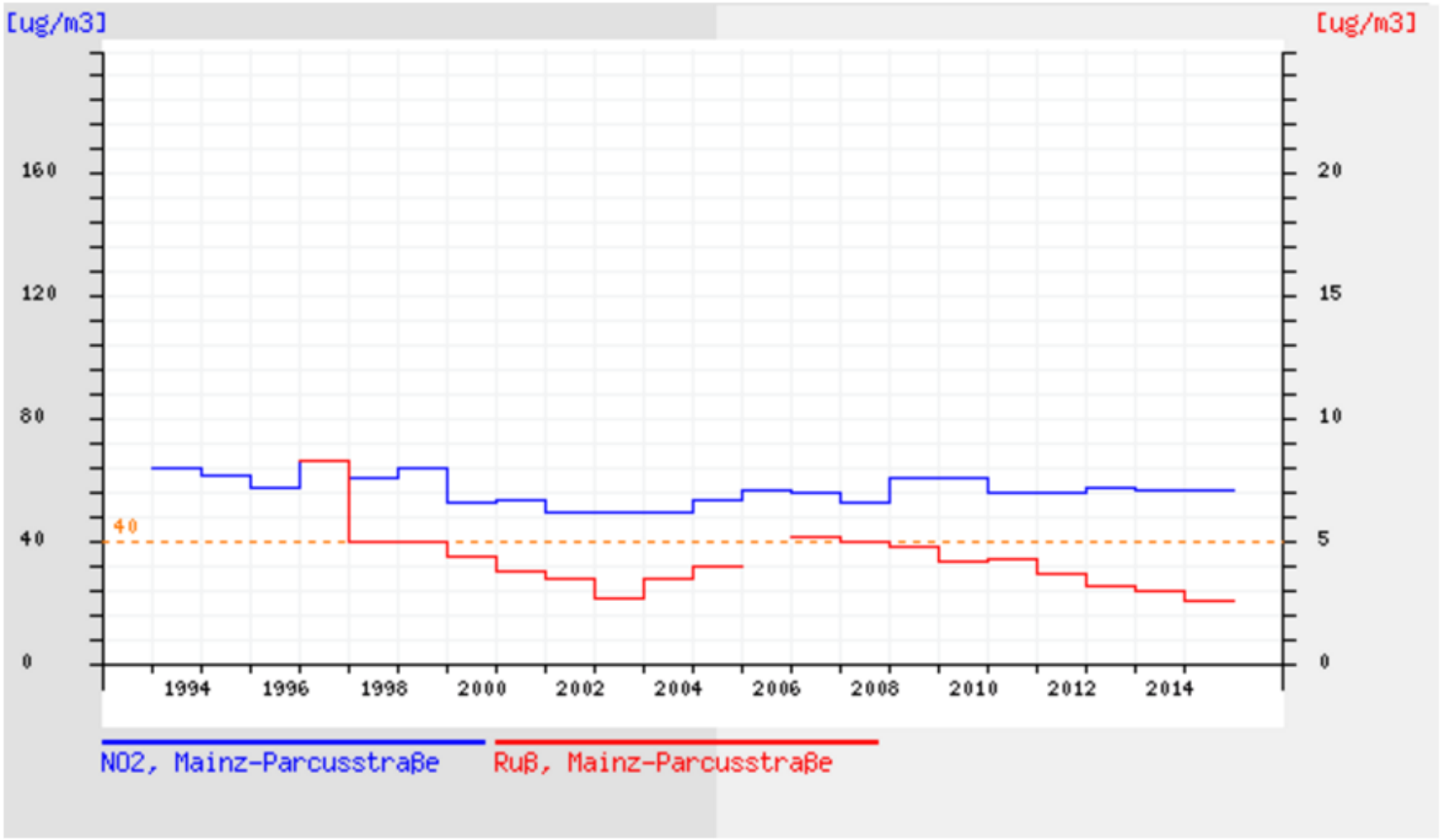
Chen & Borken-Kleefeld Atm. Env. **2014**, 88, 157-164

PM OK but **NO2 ?**

Messwertverlauf: Stickstoffdioxid,Ruß

Wertebasis: Jahresmittel

RheinlandPfalz
LANDESAMT FÜR UMWELT



The famous WVU-Report

M.C.Besch is Prof.Czerwinski's student A.Thiruvengadam also frequent ETH-NPC speaker

published May 2014

This investigation was commissioned by ICCT not by the authorities

West Virginia University. Where Greatness is Learned

CAFEE

Center for Alternative Fuels, Engines & Emissions

West Virginia University

Final Report

In-Use Emissions Testing of Light-Duty Diesel Vehicles in the United States

Prepared by:

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Dr. Arvind Thiruvengadam, an assistant professor, at the Center for Alternative Fuels Engines and Emissions at West Virginia University. As a graduate student, he helped test emissions using a mobile lab.CreditTom M. Johnson for The New York TimesMORGANTOWN, W.Va. — The scientific detective work that forced Volkswagen into a $15 billion settlement began with a handful of researchers armed with just $70,000.

For years, the research team at West Virginia University, which first noticed big discrepancies in Volkswagen's diesel emissions, has scrounged for grants and research funding to survive. Only a fraction of its $1.5 million annual budget comes from the university, and that is being cut.

"I still have sleepless nights trying to figure out how I'm going to pay the guys the next pay cycle," said Dan Carder, director of the university's Center for Alternative Fuels Engines and Emissions.

The success of Mr. Carder's David against Volkswagen's Goliath illustrates the huge disparity in resources between carmakers and oversight groups. The road testing technology that exposed Volkswagen to a raft of criminal investigations and lawsuits never attracted much interest — or money — from regulators or carmakers until recently, and that is still not certain to relieve the group's financial pressure.

The famous CARB Letter

signed by Annette Hebert

frequent ETH-NPC-speaker

which we received few days later thru J.Lemaire's network

Air Resources Board

Mary D. Nichols, Chair
9480 Telstar Avenue, Suite 4
El Monte, California 91731 • www.arb.ca.gov

Matthew Rodriquez
Secretary for Environmental Protection

Edmund G. Brown Jr.
Governor

Reference No. IUC-2015-007

September 18, 2015

Volkswagen AG
Audi AG
Volkswagen Group of America, Inc.
Through:

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Volkswagen Group of America
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Herndon, VA 20171

Stuart Johnson
General Manager
Engineering and Environmental Office
Volkswagen Group of America
3800 Hamlin Road
Auburn Hills, MI 48326

Re: Admission of Defeat Device and California Air Resources Board's Requests

Dear Mr. Geanacopoulos and Mr. Johnson:

In order to protect public health and the environment from harmful pollutants, the California Air Resources Board (CARB) rigorously implements its vehicle regulations through its certification, in use compliance, and enforcement programs. In addition to the new vehicle certification process, CARB regularly tests automobiles to ensure their emissions performance is as expected throughout their useful life, and performs investigative testing if warranted. CARB was engaged in dialogue with our European counterparts concerning high in use emissions from light duty diesels. CARB deployed a number of efforts using portable measurement systems and other approaches to increase our understanding for the California fleet. In 2014, the International Council for Clean Transportation (ICCT) and West Virginia University (WVU) identified through their

NPTI

VERT-Response

January 2016

VERT Inspection & Maintenance

Periodic Test of Diesel Vehicles for Emission Stability if equipped with DPF, DOC, SCR-Emission Control Devices

Motivation

Emission stability of modern emission controlled Diesel powertrains cannot be guaranteed by the OEM for the lifetime of the vehicle; however, this is essential for public health. Apart from wear, poisoning, aging, fuel and lube influences and damage of both, emission control hardware and software elements, various kinds of tampering and manipulation have been observed, even being publically offered on the market. Legally required electronic onboard OBD control clearly are not sufficient. Independent 100% periodic inspection ought to be mandatory to guarantee functionality of **Particle Filters (DPF), Oxidation Catalysts (DOC, ASC), Selective Catalytic NOx-Reduction (SCR)** and other emission control systems, also called exhaust after-treatment systems of modern combustion engines.

Testing Procedures

VERT has developed inspection methods for emission-control devices, which are so efficient, reliable and cost effective that they are herewith recommended for new legal procedures covering all engines and applications:

DPF, Filtration Efficiency: Solid particle number concentration PN is measured upstream and downstream of the DPF, following the ECE-PMP protocol. Measuring being done with available handheld instruments, measurements can be performed at any load or speed, even low idling is sufficient for very accurately determining the filtration efficiency; failure for this relative value is below 1%; detection limit is $<10^3$ P/cc. Small filter substrate damage of less than 2% of the overall cell number is detectable and easily repairable at low cost. This procedure can be simplified by doing only one measurement downstream at tail pipe, however, at cost of accuracy. Since filtration of solid nanoparticles mainly depends on particle size and space velocity the measuring instrumentation must be highly sensitive for particles in the size range of 20-500 nm.

DOC, Conversion Efficiency: A DOC may be part either of a DPF-system or of an SCR-system or even standing alone. It may be inhibited by thermal or chemical poisoning or contamination or PGM-coating might be too low from beginning. DOC-conversion efficiency depends primarily on temperature: In oxygen rich Diesel exhaust, conversion of CO to CO_2 starts at about 130°C (light-off) and it reaches its full conversion level at about 250°C. By means of a load step at constant rpm, conversion capability of a DOC is determined very accurately and in very short time. Test procedure is heating the exhaust gas up to 300°C on a simple roller-dyno or similar and measuring the CO→CO_2 conversion curve during cooling down at the tail pipe – or inverse. This procedure reveals the exact status of the DOC conversion activity within a few minutes. And if it is active for CO it will also be active for HC and NO conversion.

SCR, Functionality of Selective Catalytic NOx-Reduction: Functionality requires both, proper catalytic conversion of the SCR-catalyst system and the accurate injection of the urea-water solution "Adblue" to be done at the minimum permissible temperature. Again a simple load step at constant engine rpm enables to check all functions in one single run. Either heating the exhaust gas from idling temperature 150°C to 300°C, or following the cooling curve from 300°C to idle with a NOx sensor at the tail pipe reveals, whether urea is injected, whether the right amount is injected, whether it is injected at the right temperature and whether the catalyst conversion is on the expected level. After this simple test all required information for a fail/pass decision is available. An even more precise control test is available by an additional NOx-measurement upstream of the SCR. NH_3-measurement at the tail-pipe may be complementary.

Instrumentation

The instrumentation of handheld PN measurement has been specified by the Swiss VAMV-regulation, first published 8/2012 by the Swiss Federal office for metrology METAS http://www.admin.ch/ch/d/as/2012/5371.pdf and it includes the EU-PMP protocol to focus on non-volatile particles. Instruments meeting these specs are already on the marked by TSI, TESTO and AVL. Sensors for measurement of CO, NO, NO_2 and NH_3 are available by many manufacturers. A guideline for instruments for field measurement of gaseous emissions with handheld instruments is also available by the Swiss Federal Office of Metrology METAS. Test data are to be stored electronically and fail/pass criteria are evaluated automatically, protected against falsification or manipulation.

Application

This inspection method applies in principle to any vehicle or engine, HDV as well as LDV, on-road as well as off-road and is not limited to Diesel engines. Prerequisite is that engine control electronics must permit load step testing at standstill axles with emission control functions fully operative.

Available Experience, Operation Time and Cost

VERT experience dates back for 2 years in applying this testing method in a small scale. Required time for a complete test-run is about 10 minutes; cost for instruments will be in the range of opacity meters as used in the past.

Andreas Mayer, J.Czerwinski, Th.Lutz
VERT Scientific Committee
1.September 2016

PUA 5/18

Berlin 22.9.2016

VW-Scandal

Parliament

Hearing

A.M.invited expert

σκανδαλον = Stolperstein, Falle, Verbrechen

Ulrich Lange
Mitglied des Deutschen Bundestag
Obmann
der CDU/CSU-Fraktion
im 5. Untersuchungsausschuss/18. WP

Deutscher Bundestag
5. Untersuchungsausschuss
der 18. Wahlperiode
Ausschussdrucksache
18(31)34

Kirsten Lühmann
Mitglied des Deutschen Bundestages
Obfrau
der SPD-Fraktion
im 5. Untersuchungsausschuss/18. WP

Herbert Behrens
Mitglied des Deutschen Bundestages
Obmann
der Fraktion Die Linke
im 5. Untersuchungsausschuss/18. WP

Oliver Krischer
Mitglied des Deutschen Bundestages
Obmann
der Fraktion Bündnis ´90/Die Grünen
im 5. Untersuchungsausschuss/18. WP

An den
Vorsitzenden des 5. Untersuchungsausschusses
der 18. Wahlperiode des Deutschen Bundestages
Herrn Herbert Behrens MdB

- im Hause -

7. Juli 2016

Antrag

Der 5. Untersuchungsausschuss möge beschließen:
Es wird Beweis erhoben zum gesamten Untersuchungsauftrag (Drucksachen 18/8273 und 18/8932) durch

Anhörung von Sachverständigen

zum Thema „Funktionsweisen und Möglichkeiten von Abschalteinrichtungen und sonstigen Manipulationen einer NOx-Abgasreinigung“ in der Sitzung des Ausschusses am 22. September 2016.

Zu Sachverständigen werden

Herr Felix Domke
Programmierer, Lübeck
Herr Andreas Mayer
TTM, Prüflabor Schweiz
Herr Dipl. Ing. Jürgen Bönninger
Geschäftsführer FSD Fahrzeugsystemdaten GmbH
Herr Martin Weilenmann
Paul-Scherrer-Institut, Villigen (Schweiz)
Herr Prof. Dr. Stefan Pischinger,
Lehrstuhl für Verbrennungskraftmaschinen, RWTH Aachen
Prof. Dr. Ing. Hans-Christian Reuss
Lehrstuhl Kraftfahrzeugmechatronik Universität Stuttgart

PUA 5/18

Berlin 22.9.16

VW-Scandal

Text submitted

Deutscher Bundestag
5. Untersuchungsausschuss der 18. Wahlperiode
Ausschussdrucksache 18(31)38

Beitrag zur Sachverständigenanhörung des 5.PUA (18/8273, 8932)

zur Frage erhöhter Schadstoffemissionen und Verbräuche von Fahrzeugmotoren durch Manipulation der elektronischen Motorsteuerung durch Hersteller und Betreiber, ungeeigneter Emissionsmessung, unzureichender Gesetzgebung und mangelhaften Vollzugs am 22.9.2016 in Berlin, Paul-Löbe-Haus, Sitzungssaal E 700

Emissionsstabilität von Fahrzeugmotoren

Der einzig sichere Weg zur Emissionsstabilität bestverfügbarer Abgastechnologie ist die flächendeckende unabhängige periodische Kontrolle nach einem neuen Testprotokoll

Zusammenfassung: Die EU-Abgasgesetzgebung bis Euro V/5, im Stakeholder-Verfahren mit der Industrie erarbeitet, hat durch sehr bescheidene Grenzwertsetzung, falsche Definitionen (PN, NO_2), unrealistische Messprozeduren und stetigen Abbau der Kontrollen (im Gegensatz zu USA) für die Luftqualität wenig gebracht, sehr viel mehr wäre technisch möglich gewesen. Der Autor hat das immer wieder untersucht und weltweit über die Society of Automotive Engineers SAE und in 8 deutschen HdT-Seminaren (3 Bücher) publiziert und auf die enormen Folgekosten für die Gesellschaft hingewiesen. Die Abgasnachbehandlung bei neuen Motoren ab Euro VI/6 durch Partikelfilter und Katalysatoren in Kombination mit der elektronischen Motorensteuerung bietet nun aber in einem Riesenschritt die Möglichkeit der fast vollständigen Eliminierung der Diesel-typischen Schadstoffe, vor allem der krebserzeugenden Nanopartikel (99.9%) und PAH (90%) sowie der Stickoxide (95%) bei gleichzeitiger Absenkung des Treibstoffverbrauchs resp. der CO_2-Emission. Allerdings sind diese neuen Systeme auf einfache Weise und kaum nachweisbar manipulierbar durch den Hersteller, Werkstätten und Kunden, was schon ab 1998 an vielen Betrugsfällen in USA nachgewiesen, aber in der bisherigen EU Gesetzgebung nicht berücksichtigt wurde. Dabei stehen immer Kosten und Betriebskosten im Vordergrund und nicht Umweltethik -

- **5. Unabhängige Periodische Kontrolle jedes Fahrzeugs im Jahresrhythmus (AU):** Die Überprüfung aller Fahrzeuge auf Sicherheitsmängel und Emissionsmängel ist unverzichtbar. Nur damit wird der Staat seiner Aufgabe zum Gewährleistung von Sicherheit im Verkehr, Schutz von Umwelt und Gesundheit gerecht. Es handelt sich dabei um eine Hoheitsaufgabe, die grundsätzlich nicht delegiert werden darf. Nur auf diese Weise lassen sich Manipulationen aufdecken, deren Umfang wir jetzt gerade erst erahnen und die durch Appelle nicht eingedämmt werden können. Gleichzeitig dient diese Massnahme dazu, Informationen zu Alterung und Verschleiss bei diesen neuen Technologien ermitteln, um vorbeugende Wartung auszulösen und somit die Emissionsstabilität zu erhalten. Dies ist unser Preis für saubere Atemluft.

Dieser Praxistest muss für jede Werkstatt geeignet sein, nicht länger als 10 Minuten und finanziell vertretbar. **Wichtig ist dabei vor allem**, dass wir nicht wieder versuchen, „krampfhaft“ Emissionsprüfwerte zu definieren, die letztlich keinen Bezug zum realen Betrieb haben, sondern dass wir die perfekte Funktionalität der Emissionskomponenten prüfen, nämlich (dimensionslos) Abscheidegrad des Filter und Konversion der Katalysatoren. Damit werden wir der Forderung gerecht, dass Komponenten bestverfügbarer Technologie eingesetzt sind, wie das das Umweltgesetz für krebserzeugende Schadstoffe generell postuliert. Technisch sind wir heute in der Lage, mit diesem Test individuelle Fehler einzelner Komponenten zu diagnostizieren.

My «Pladoyer»: Emphasis on 6 Points

PUA Berlin 22.Sept.2016

Kurzfassung der 6 wichtigen Punkte

1. **Euro 6/VI für PKW und Nutzfahrzeuge ist mit Abstand beste Emissionsqualität**
   Es ist festzuhalten, dass Dieselmotoren nach Euro VI/6 heute mit Abstand die saubersten und besten Motoren sind. (Kompliment an die EU-Kommission). Bezüglich UFP 100-1000 mal besser als die Vorgänger-Emissionsstufen und bezüglich NOx 2-5 mal. Vor allem der Riesenschritt bei UFP ist zu begrüssen, weil diese zu > 95% für die vorzeitigen Todesfälle durch Herzinfarkte, Hirnschläge und Krebs verantwortlich sind.

2. **Automobilindustrie kennt keine Umwelt-Ethik**
   Emissionstechnik verursacht Entwicklungskosten, Produktkosten und Betriebskosten, steckt voller Elektronik und ist daher jeder Art von Manipulation zugänglich. Die Automobil-industrie versucht diese Kosten zu Lasten der Emissionen zu sparen, wo immer sie kann und wo sie glaubt, nicht ertappt zu werden. Emissionsbetrug ist seit dem Clean Air Act 1970 an der Tagesordnung und je weiter die elektronische Motorkontrolle fortgeschritten ist, umso mehr – schon damals hiess die ECU die „*electronic cheating unit*".

3. **Umweltschäden werden bei uns nicht in Geldwert beziffert,**
   sind nicht monetär bewertet und daher fehlt jeder Masstab für die Sanktionierung – im Gegensatz zu USA. Man beachte, dass durch verkehrsbedingte Emissionen laut OECD derzeit in Deutschland externe Gesundheitskosten von ca. 150 Mia entstehen, die Hälfte des Budgets dieses hohen Hauses. Umweltschäden müssen auf die gleiche Ebene wie Sicherheitsschäden oder Unfallschäden gestellt werden. Das Prinzip heisst „*polluter pays*", aber das Gesetz muss den Preis fixieren. Ein kg Russ verursacht einen Schaden von > 1000 €, die Schäden durch ein Fahrzeug ohne Filter liegen der Grössenordnung der Investition. Diese Tatsache muss für die Sanktionierung und die Besteuerung berücksichtigt werden.

My «Pladoyer»: Emphasis on 6 Points

PUA Berlin 22.Sept.2016

Kurzfassung der 6 wichtigen Punkte

4. **Verantwortung für Schäden durch Abgasgifte ist nicht geregelt**
   Die Autoindustrie übernimmt diese Verantwortung nicht, sie erfüllt nur – wenn überhaupt - die Grenzwerte für das neue Fahrzeug. Und dann? Für jede Änderung lehnt sie die Verantwortung ab. Wer aber hat die Verantwortung dann, wenn nicht der Betreiber? Auch hier klafft eine folgenschwere gesetzliche Lücke.

5. **Periodisch Abgaskontrolle** (100% AU)
   Es gibt nur eine Lösung: Die periodische (jährliche) Emissionskontrolle aller Fahrzeuge, also die gute alte AU, die durch die EU 2014 abgeschafft und der OBD übertragen wurde.Das ist der einzig sichere Weg weiteren kreativen Lösungen der Branche auf die Schliche zu kommen und Manipulation in Kundenhand zu unterbinden. Eine neue Kontrolltechnik dazu ist bereit, selbst für Kontrollen durch die Polizei am Strassenrand (innerhalb von 60 Sekunden) haben wir heute Instrumente und bei Baumaschinen macht das die Schweiz schon, bei Bussen Chile. Komplettkontrolle bei der AU wird etwa 10 Minuten dauern. **Eigentlich muss man nur das einführen und das kann jedes Land selbst und zwar sofort.**

6. **Und die Emissionen der Gesamtflotte ?**
   Das darf nicht übersehen werden und auch diese Aufgabe ist lösbar - durch Nachrüstung der gleichen Technologie. Das sollte eigentlich den Autofirmen übertragen werden, als upgrade ihrer eigenen Technologie, die bisher weit hinter „best available technology“ zurückbleibt.

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Success faster than expected:

Oct. 2016:
German Minister Dobrindt requires AU re-introduction
AU means PTI emission check, for Diesel free acceleration, which is not sufficient – NPTI

ABGASUNTERSUCHUNG

Endrohrmessung kommt zurück

UPDATE Die Abgase von allen Kraftfahrzeugen sollen ab 1. Juli 2017 wieder direkt am Endrohr gemessen werden. Das geht aus dem Entwurf zur Änderung der AU-Richtlinie aus dem Bundesverkehrsministerium hervor.

January 2017
EU-introduces market surveillance which includes in-use compliance

EUROPEAN COMMISSION

Brussels, 27.1.2016
COM(2016) 31 final

2016/0014 (COD)

Proposal for a

REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

on the approval and market surveillance of motor vehicles and their trailers, and of systems, components and separate technical units intended for such vehicles

Before Closing
we should leave the style
of witch-hunters

and try to get things in perspective
of technical objectives
with respect to health effects

NO2/PM10 in Urban Air

NO2 (1 hour)

Health Threshold 400 µg/m3
EPA 2016 (asthmatics)

Actual Data and Exceedances up to 300 µg/m3

Limit EU, USA: 200 µg/m3
Limit CH: 100 µg/m3

PM10 (annual)

Actual Data and Exceedances up to 1000 µg/m3 during several days in Beijing

Limit EU: 50 µg/m3
Limit CH: 20 µg/m3

Health Threshold < 10 µg/m3
WHO 2012: carcinogen class 1

Health Impact Worldwide → Priority for PN

newest numbers by WHO 2012, Max Planck and Harvard 2015

ALRI: acute lower respiratory illness
IHD: ischaemic heart desease
CEV: cerebrovascular desease
COPD: obstructive pulmonary desease
LC: : lung cancer

10'000 killed per day - 20'000 by 2050 **(> 50 per day in Mexico City);**

WHO region	Year	Population ($\times 10^6$)	Mortality attributable to air pollution (deaths $\times 10^3$)						
			$PM_{2.5}$					O_3	Total
			ALRI < 5 yr	IHD ≥ 30 yr	CEV ≥ 30 yr	COPD ≥ 30 yr	LC ≥ 30 yr	COPD ≥ 30 yr	
Africa	2010	809	90	55	77	11	2	2	237
	2050	1,807	158	185	262	38	5	12	660
Americas	2010	930	0	44	8	4	7	5	68
	2050	1,191	0	75	15	7	11	11	119
Eastern Mediterranean	2010	602	56	115	86	12	5	12	286
	2050	1,021	66	321	246	37	13	40	723
Europe	2010	867	1	239	95	13	27	8	381
	2050	886	1	307	156	18	37	11	530
Southeast Asia	2010	1,762	64	327	250	124	15	82	862
	2050	2,332	104	865	807	419	48	227	2,470
Western Pacific	2010	1,812	19	299	794	209	107	35	1,463
	2050	1,861	16	413	1,120	309	155	57	2,070
World	2010	6,783	230	1,079	1,311	374	161	142	3,297
	2050	9,098	346	2,166	2,604	828	270	358	6,572

PN

NOx

NOx/PN at the Endpipe

NOx - raw >1000 mg/km

With defeat devices up to 20 x limit

Limit Value Euro 6: 80 mg/km

Proper Technology

PN – raw >10^{14} P/km

No defeat devices

Limit Euro 6: 0.6 x 10^{11} P/km
5 mg/km

BAT < 10^{10} P/km

Summary

- Automotive Industry is not guided by ethics principles in emission reduction but by commercial objectives

  →BAT and «polluter pays» must be enforced by law

- Problem will be solved very soon be new EU-legislation

  → Real-Driving-Emissions RDE; in force for HDV

  → In-Use-Compliance = Market Surveillance

  → Periodic Emission control during PTI → **VERT NPTI**

- Focussing on NOx-effects only and underestimating PN-effects has driven public debate out of control

  → C40 incl.mayors of Paris, Madrid, Athens, Mexico will ban Diesel by 2015 from their Diesel /2.12.2016

  → ETH-NPC Focus event on «will Diesel survive?» to put engineering facts against unprofessionalism →**VERT**

NPTI working Group (VERT, TNO, UBA, JRC et al) will provide technical details on instruments and procedures for new PTI