CHALLENGES AND SOLUTION FOR UPCOMING EMISSION NORMS IN HEAVY DUTY

GAURAV HEDA

ECT 2024, New Delhi, India

Public

AGENDA

- **EMITEC TECHNOLGIES**
- CHALLENGES IN HD FOR FUTURE LEGISLATION
- LEARNING FROM PASSENGER CAR AND NON ROAD
- DEVELOPMENT FOR HEADY DUTY AFTER-TREATMENT
- READY ADAPTIVE SOLUTION

EMITEC TECHNOLOGIES

GLOBAL FOOTPRINT

High capacity facilities for serial production and new product launches with potential for capacity expansion

Global footprint

Engineering location

Production location

Customer, Sales, and Application centre

Test Center

3
Production locations

8
Engineering / Application locations

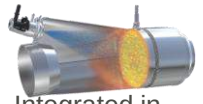
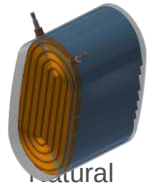
1
Test Center

35 000 000 +
Annual production capacity

EMITEC TECHNOLOGIES

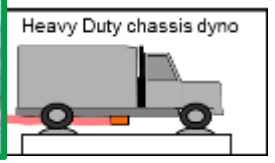
A WIDE RANGE OF INNOVATIVE PRODUCTS FOR MOBILE & STATIONARY APPLICATIONS

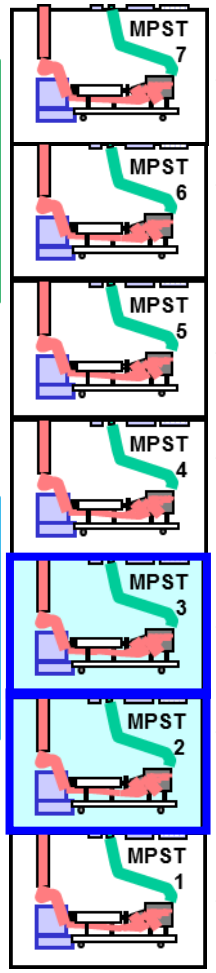
400 000 000 + produced METALIT® & EMICAT®

PRODUCT GROUP	METAL SUBSTRATES & FOILS	FILTERS	ELECTRICAL HEATED CATALYSTS
	METALIT®		EMICAT®
		 Exhaust Gas Recirculation Filter  Partial flow deep bed Particulate Filter **PM-METALIT®**	 Electrically Heated Catalyst  Integrated in compact SCR  Integrated in Universal Decomposition Pipe  Ring Shaped SCR Catalyst  Electrically Heated Disc  Natural Gas Engines
PROPULSION	PHEV 48V DIESEL GASOLINE	DIESEL	PHEV 48V DIESEL GASOLINE
APPLICATION			

TEST CENTER

VIEW CENTRAL FLOOR





600 kW
4000 Nm

400 kW
820 Nm

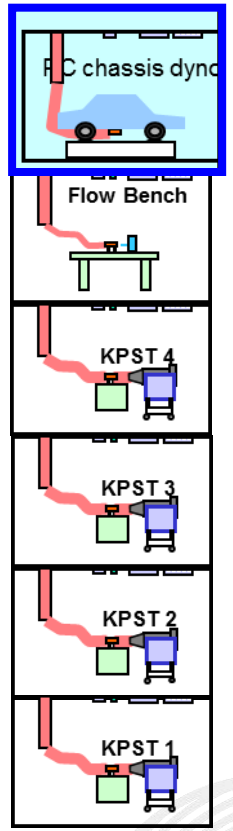
230 kW
400 Nm

400 kW
2500 Nm

230 kW
400 Nm

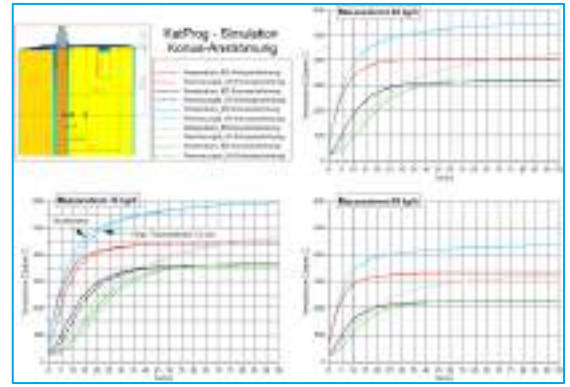
400 kW
820 Nm

230 kW
400 Nm

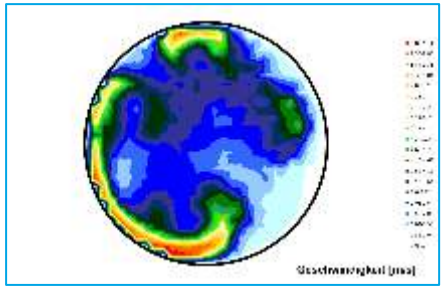


DEVELOPMENT SUPPORT BY EMITEC TECHNOLOGIES

Development Service
(CAD / CAE / Concept Development)



Rapid-Prototyping
(as plastic part for pre examinations
e. g. flow distribution)



Functional samples from metal e.g. casted, metal printed,
Complete exhaust systems für test on engine test bench
or vehicle testing)

Detailed reporting of test and analysis
results

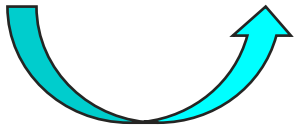
AGENDA

- EMITEC TECHNOLGIES
- **CHALLENGES IN HD FOR FUTURE LEGISLATION**
- LEARNING FROM PASSENGER CAR AND NON ROAD
- DEVELOPMENT FOR HEADY DUTY AFTER-TREATMENT
- READY ADAPTIVE SOLUTION

EUROPEAN EMISSION LEGISLATION AND TEST CONDITIONS

COMPARISON OF OLD AND NEW LEGISLATION FOR HEAVY DUTY VEHICLES

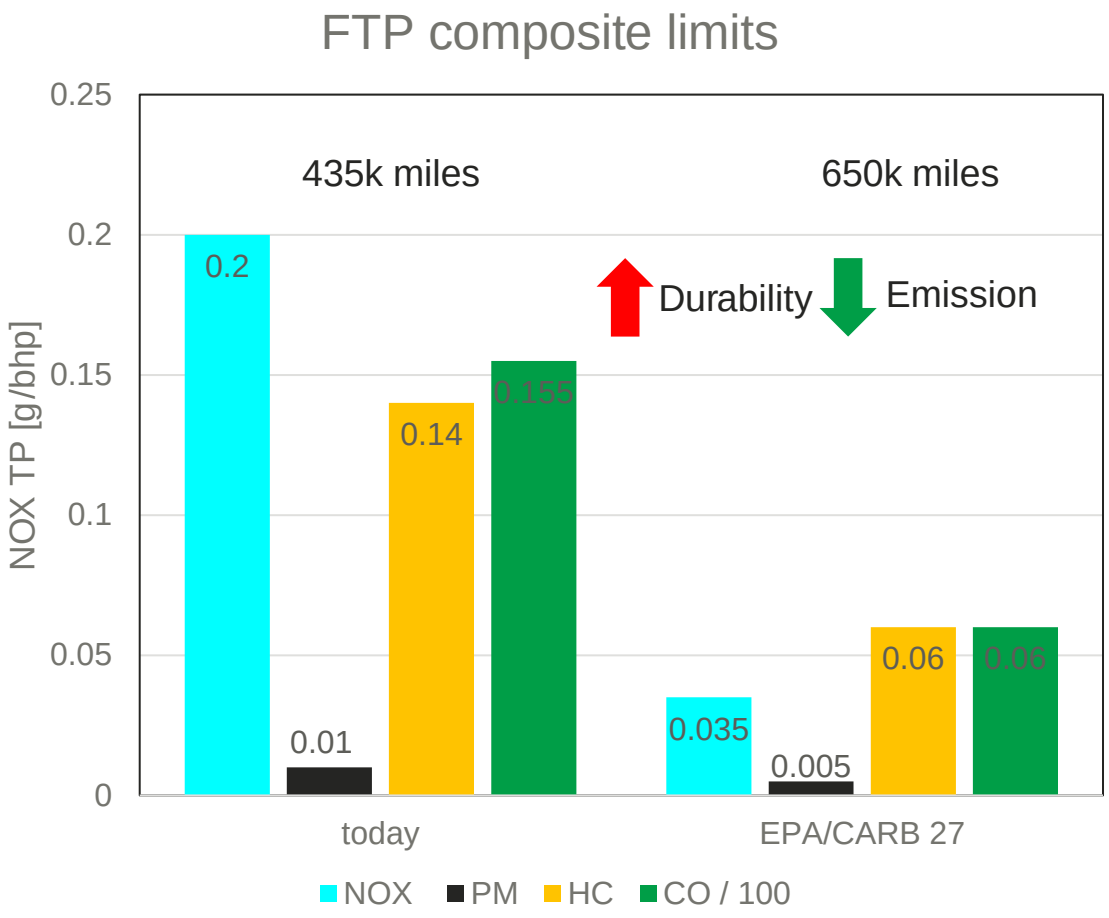
	Trucks	
	EURO VI	**Trilogue agreement Euro VII**
Limits	Weighted average MAW Cold (x0,14) / MAW Hot (x0,86)	Maintaining Euro 6 Test conditions Weighted average MAW Cold (x0,14) / MAW Hot (x0,86)
NOx	460 mg/kWh	**200 mg/kWh**
PM	10 mg/kWh	**8 mg/kWh**
PN	PN_{23} $6x10^{11}$ #/km	**PN_{10}** $6x10^{11}$ #/km
CO	4.000 mg/kWh	**1.500 mg/kWh**
THC		
NMHC		
NMOG	160 mg/kWh	**80 mg/kWh**
NH_3	10 ppm	**60 mg/kWh**
CH_4	500 mg/kWh	500 mg/kWh
N_2O	-	**200 mg/kWh**
Power Treshhold	10% of max power	**6% of max power**
RDE Conformity Factor	CF gaseous = 1,5	**CF gaseous = 1,3**
		CF NH_3 = 1,4
	CF PN =1,63	**CF PN =1,5**

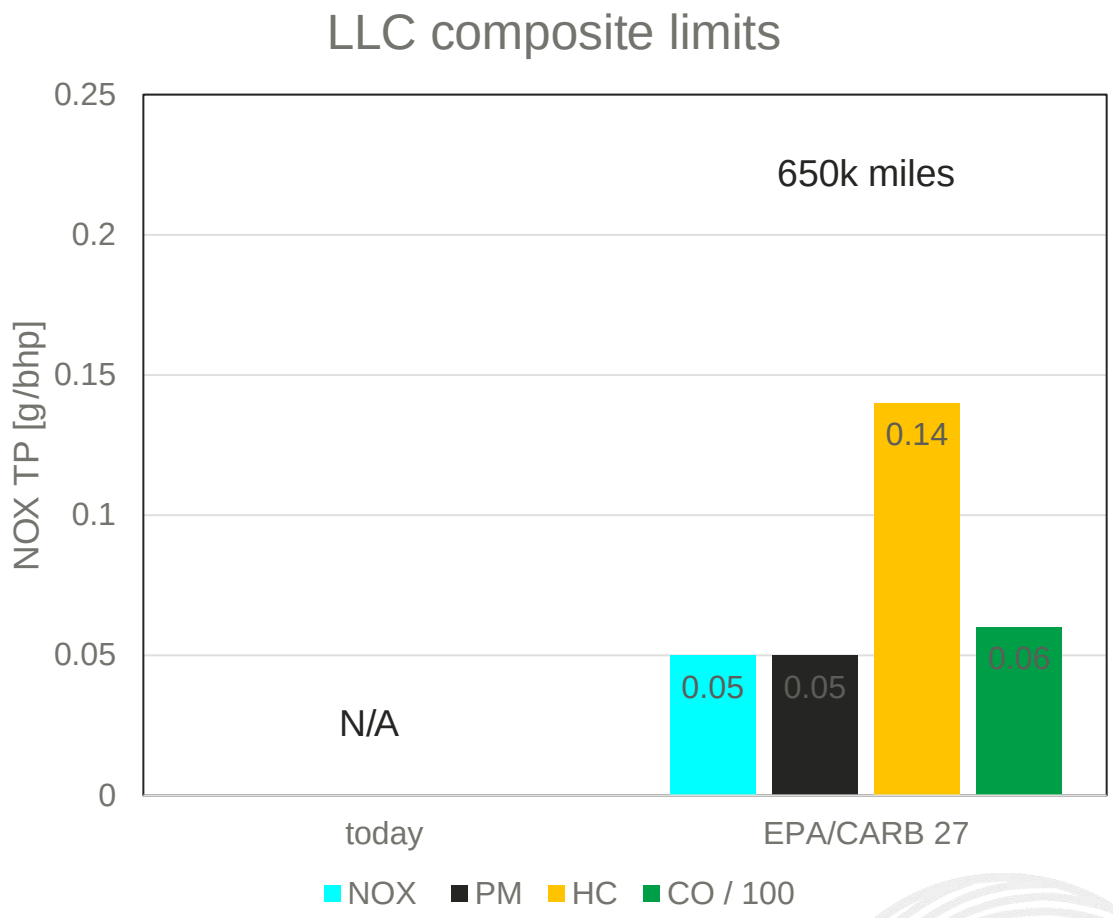


EU VII ~ 0.5⋆ EUVI

US HD ON HIGHWAY / CV REGULATORY DEVELOPMENT

EPA / CARB 2027 REQUIREMENTS





CHALLENGES

HEAVY DUTY

CO_2 Target

Cold Start

Low Load Cycle;
City Driving

In addition:

Meeting stringent CF in Real Drive (RDE) / In-Use / Off-Cycle Emissions

AGENDA

- EMITEC TECHNOLGIES
- CHALLENGES IN HD FOR FUTURE LEGISLATION
- **LEARNING FROM PASSENGER CAR AND NON ROAD**
- DEVELOPMENT FOR HEADY DUTY AFTER-TREATMENT
- READY ADAPTIVE SOLUTION

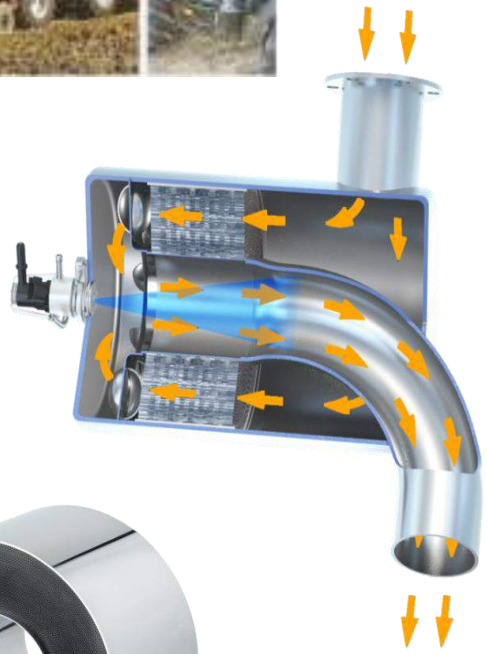
EMITEC PROVEN CONCEPT

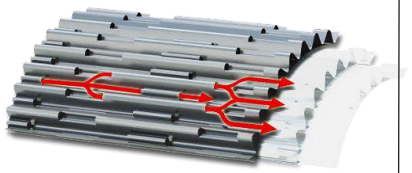
CLOSE COUPLED DOC / SDPF SYSTEMS

Gasoline EU	Gasoline US	Diesel EU
		
		

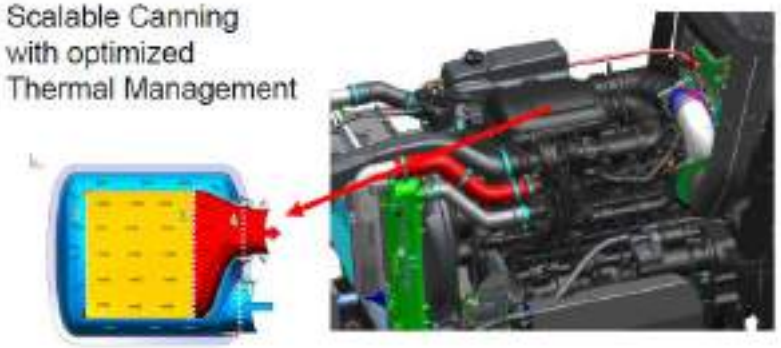
EMITEC PROVEN CONCEPT

SCR-SYSTEM WITH RING METALIT® CATALYST AND ADBLUE® INJECTION





Scalable Canning
with optimized
Thermal Management



AGENDA

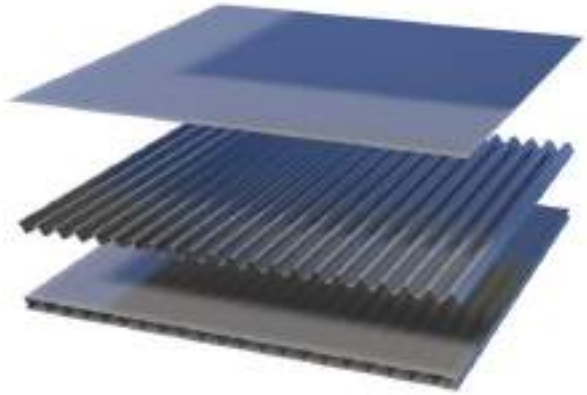
- EMITEC TECHNOLGIES
- CHALLENGES IN HD FOR FUTURE LEGISLATION
- LEARNING FROM PASSENGER CAR AND NON ROAD
- **DEVELOPMENT FOR HEADY DUTY AFTER-TREATMENT**
- READY ADAPTIVE SOLUTION

CHALLENGE HIGHER EFFICIENCY, LOWER COST

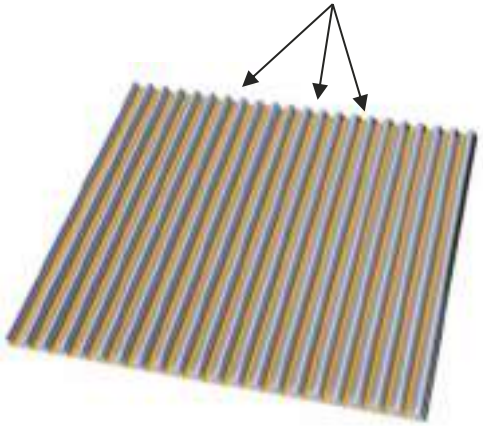
CS-DESIGN FOR DOC AND SCR

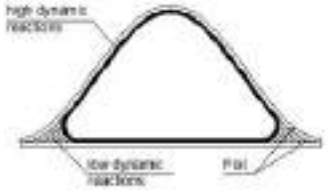
Standard design

Stacking of flat and corrugated layers to create a honeycomb body



Contact lines between corrugated and flat foil





CS-design

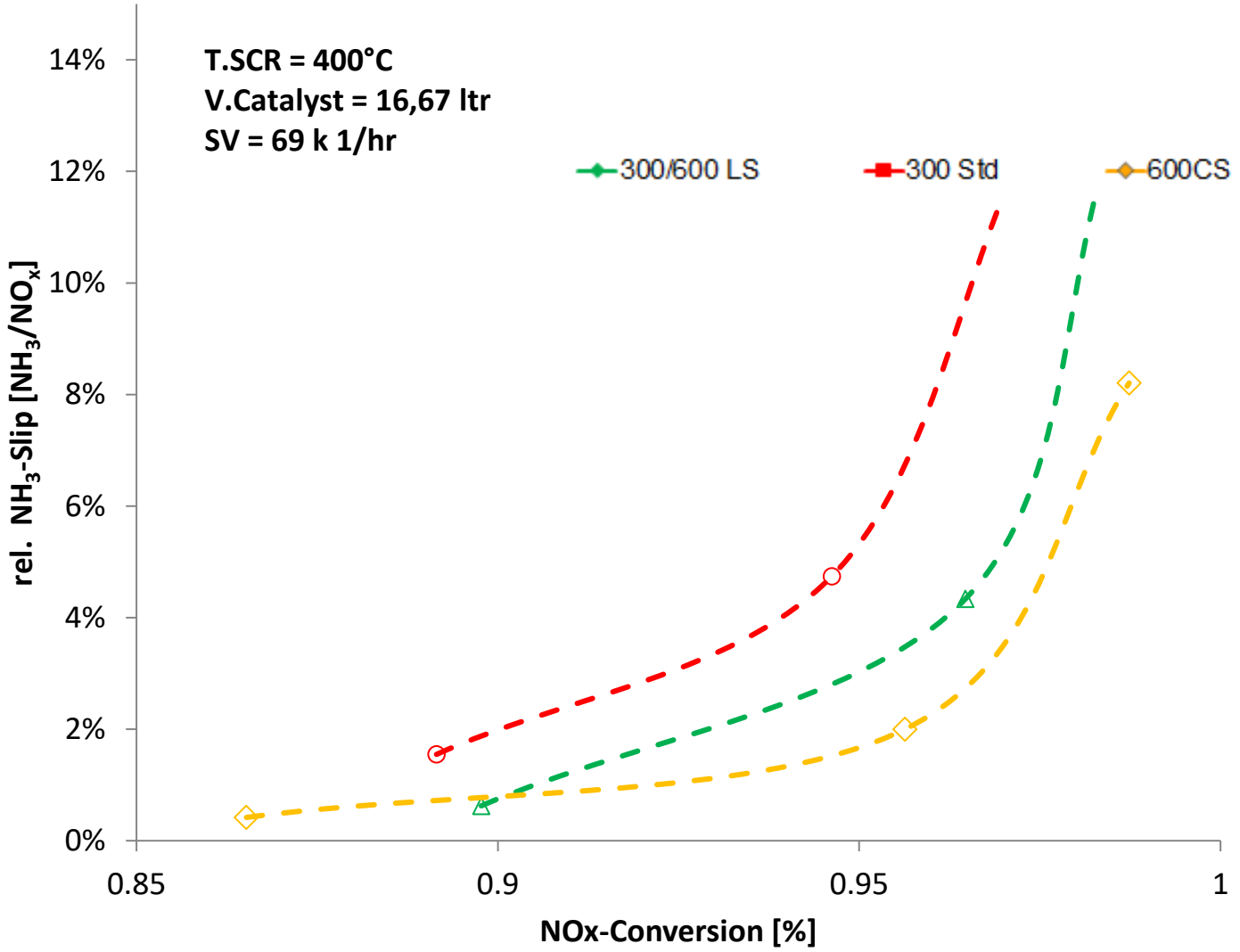
- Removal of the flat foils
- Alternating stacking of the diagonally corrugated layers

Contact Points between corrugated layers

5° inclination

LOWER NH_3 SLIP WITH NEW CS-DESIGN

NOx-CONVERSION RATE @ 400°C (M = 1500 KG/H) VERSUS NH_3 SLIP



CHALLENGE COLD START AND LOW LOAD CYCLE

EMICAT® „EHC“ AND HEATING DISC „EHD“

Electrically Heated Catalyst EHC

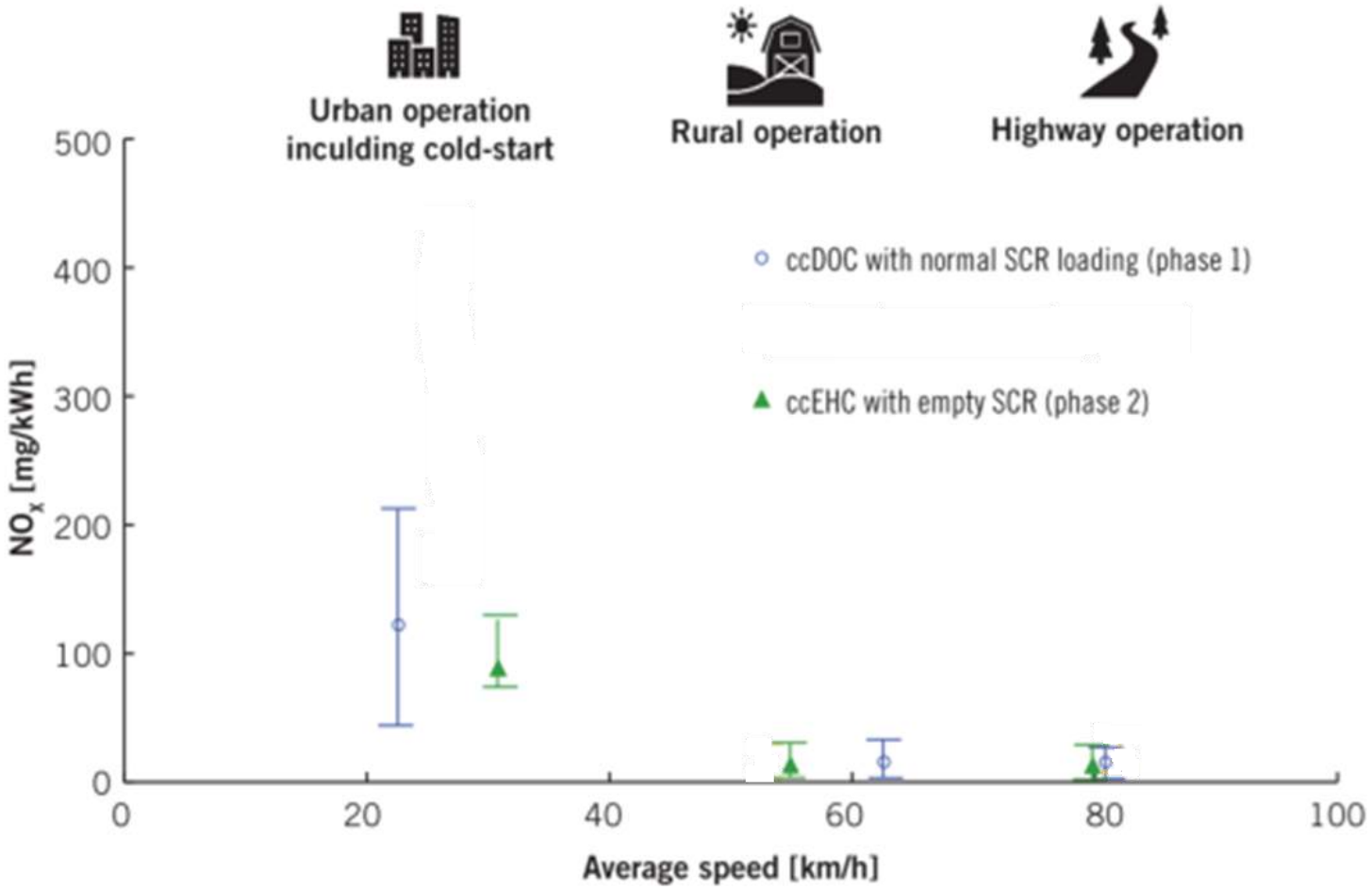
- **Proven design**
- **more than 160.000 pcs in the field since 2014**

Electrically Heated Disk EHD

- **Based on proven EHC design and production machines and process for PC, Trucks and NRMM**

EHC TESTING DATA

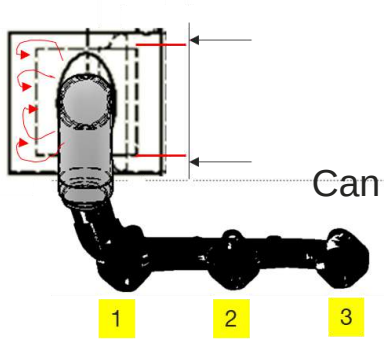
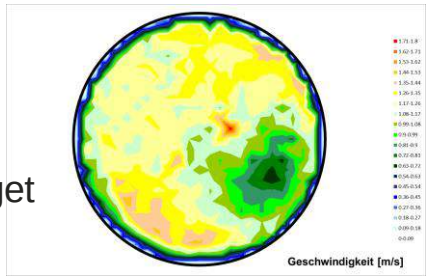
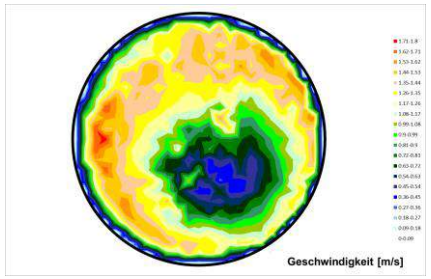
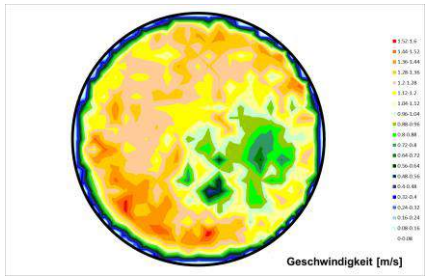
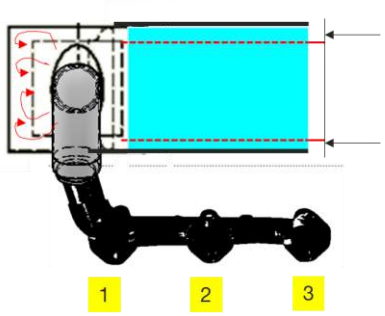
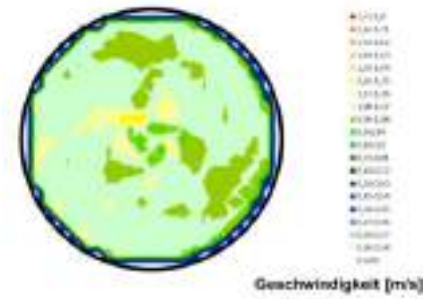
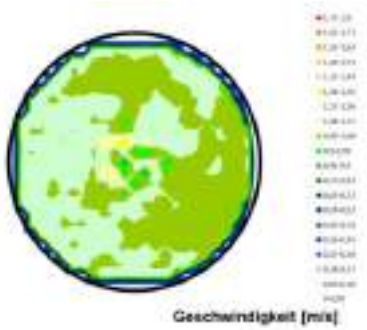
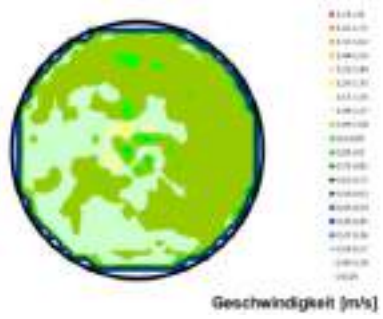
IMPROVEMENT OF SYSTEM PERFORMANCE



AGENDA

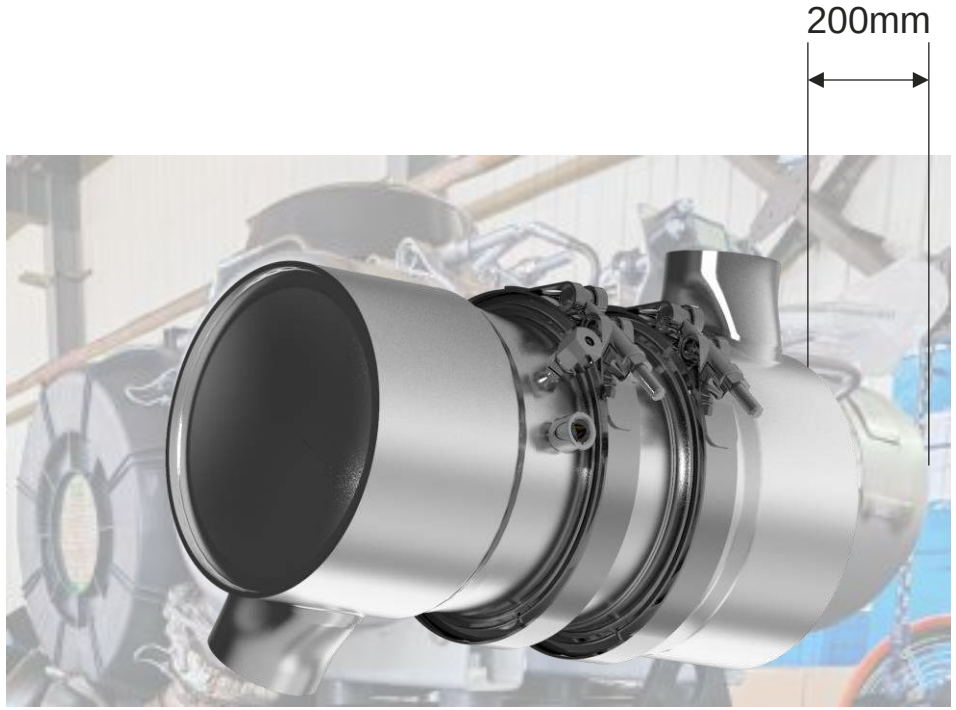
- EMITEC TECHNOLGIES
- CHALLENGES IN HD FOR FUTURE LEGISLATION
- LEARNING FROM PASSENGER CAR AND NON ROAD
- DEVELOPMENT FOR HEADY DUTY AFTER-TREATMENT
- **READY ADAPTIVE SOLUTION**

ASSESSMENT OF DOC FLOW DISTRIBUTION AS FUNCTION OF DPF BACK PRESSURE

System	Port 1	Port 2	Port 3
DOC only 	0,929 Can we get 	0,876 	0,918 
DOC with DPF 2mm gap 	0.979 	0,978 	0,979 

ACTUAL EXAMPLE

IMPROVEMENT IN SPACE



200mm reduction in space due to compact system

EMITEC ELECTRICALLY HEATED DISK (EHD)

INTEGRATION IN FRONT OF PREBOX

Integrated in given Canning

EHC Position…

EHD Position…

Easy to integrate EHD / EHC with existing ATS

SUMMARY

- Cost Effective solutions to meet Future Emission legislation,
  - Higher mass transfer with CS design provides additional benefits of Nox reduction
  - Better thermal efficiency with Belt mantle design provides ideal solution for low load operation
  - Easy adaptability of EHC / EHD in the existing system design for improved cold start performance
  - Compact exhaust system solutions with Emitec METALIT

WE SHAPE FUTURE!