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HBEFA - Status, Outlook

ERMES Plenary Meeting 2017 – Zurich/Duebendorf, 14 Nov.- 2017



Agenda

1. Overview HBEFA
2. ERMES-DB
3. Outlook

HBEFA – Overview

HandBook on Emission Factors for Road Transport

- A database for vehicle emission factors

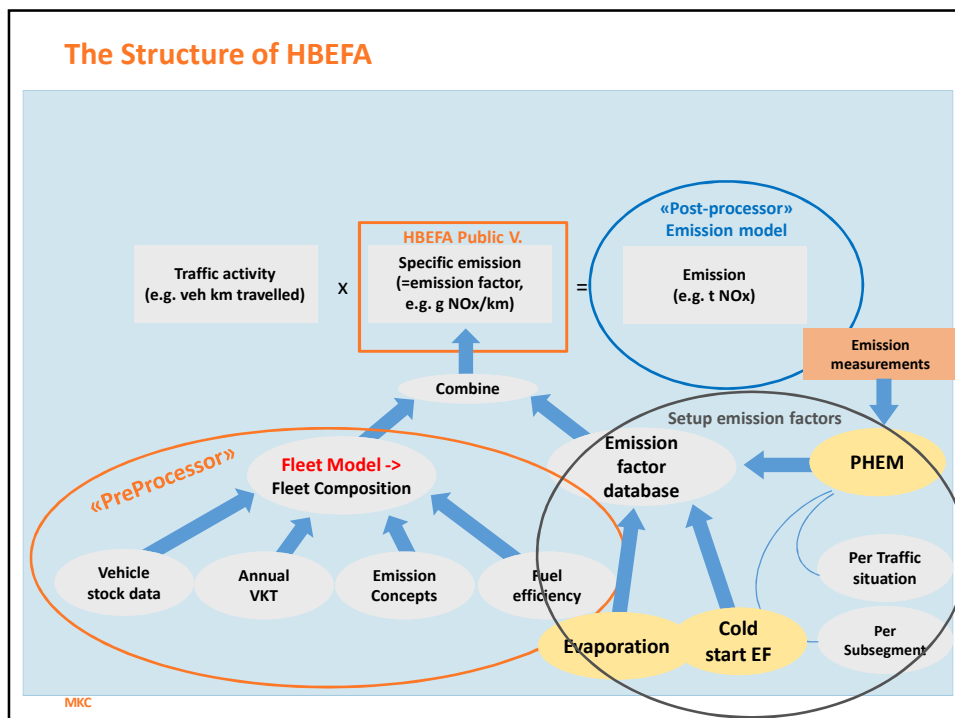
History

- First version: HBEFA 1.1 – 1995: Germany, Switzerland, Austria
- Since then: updates every 4 to 5 years (+ Sweden, Norway, France)
- Actual version: HBEFA 3.3 – 2017:
 “quick update” for EF- NOx PC Diesel (“indicative”, to be verified)

Versions

- HBEFA “public version”: a database for vehicle emission factors (EF)
 - HBEFA “public version” (download from www.hbefa.net)
 - HBEFA “online version” (simplified, aggregate EF) (www.hbefa.net)
- HBEFA “Expert version”: (scenario tool, see Plenary Meeting 2016 in Lyon)
 - Includes a pre-processor module (“fleet model” -> fleet compositions)
 - Includes a post-processor module (“emission model”-> emissions)

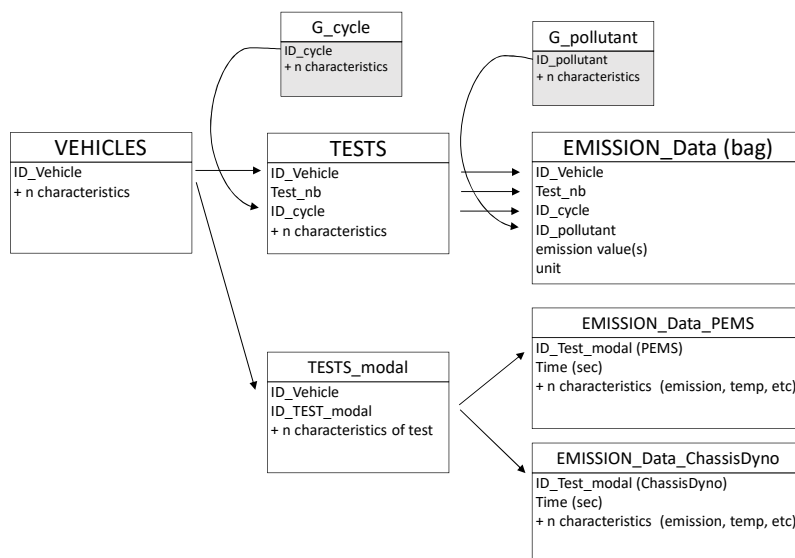
The Structure of HBEFA



ERMES (LDV) DB

- Content: emission measurements light duty vehicles (PC, LCV) of n labs
- Use: for calibration and validation purposes at aggregate level
- Origin: ARTEMIS (WP 300) - "A300DB", designed by Infrac/Inrets
- Software: MS Access DB
- Since 2007 Continuously updated within HBEFA-context
Renamed to "ERMES LDV DB" ca. 2012
- Extensions 2017
 1. include modal (instantaneous) data (ChassisDyno, PEMS)
 2. include motorcycles

ERMES (LDV) DB - data structure



ERMES – content of DB – autumn 2017

Number of vehicles measured

VehCat	Technology	SumNrOfVeh	pre-EURO-1	EURO-1	EURO-2	EURO-3	EURO-4	EURO-5	EURO-6
pass. car	petrol (4S)	2'876	878	1'191	164	156	315	146	26
pass. car	diesel	1'156	207	48	54	141	194	306	206
pass. car	CNG	5					4	1	
pass. car	bifuel CNG/petrol	31				1	25	5	
pass. car	LPG	12		7	3	2			
pass. car	bifuel LPG/petrol	1						1	
pass. car	flex-fuel E85	32					27	5	
pass. car	Hybrid petrol/electri	12					10	2	
pass. car	Plug-in Hybrid petrol	1							1
pass. car	Plug-in Hybrid diesel	2							2
Sum		4'128	1'085	1'246	221	300	575	469	232

LCV	petrol (4S)	64	23	36	5				
LCV	diesel	117	24	20	30	7	7	28	1
Sum		181	47	56	35	7	7	28	1

motorcycle	petrol (4S)	16			1	14	1		
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ERMES – content of DB – autumn 2017

Nr of vehicles tested in cycle groups

VehCat	Technology	EU_em_std	Legislative cycles			Real world cycles			
			NEDC	FTP	WLTC	CADC	ERMES	BAB	TNO Dyna
pass. car	petrol (4S)	pre-EURO-1	834	310	-	7	-	241	-
pass. car	petrol (4S)	EURO-1	695	842	-	9	-	90	-
pass. car	petrol (4S)	EURO-2	114	110	-	33	-	59	-
pass. car	petrol (4S)	EURO-3	154	101	-	87	-	56	-
pass. car	petrol (4S)	EURO-4	313	77	-	229	-	29	-
pass. car	petrol (4S)	EURO-5	144	-	40	54	31	10	-
pass. car	petrol (4S)	EURO-6	20	-	17	8	16	1	-
pass. car	diesel	pre-EURO-1	177	82	-	2	-	35	-
pass. car	diesel	EURO-1	17	8	-	5	-	10	-
pass. car	diesel	EURO-2	48	26	-	31	-	17	-
pass. car	diesel	EURO-3	137	69	-	66	-	31	-
pass. car	diesel	EURO-4	187	45	-	129	-	16	-
pass. car	diesel	EURO-5	195	-	55	71	44	12	21
pass. car	diesel	EURO-6	84	-	32	47	18	7	10
LCV	petrol (4S)	pre-EURO-1	23	19	-	-	-	19	-
LCV	petrol (4S)	EURO-1	24	19	-	-	-	20	-
LCV	petrol (4S)	EURO-2	5	5	-	-	-	5	-
LCV	diesel	pre-EURO-1	24	7	-	-	-	7	-
LCV	diesel	EURO-1	6	5	-	-	-	15	-
LCV	diesel	EURO-2	14	9	-	8	-	7	-
LCV	diesel	EURO-3	5	3	-	4	-	-	-
LCV	diesel	EURO-4	7	6	-	7	-	6	-
LCV	diesel	EURO-5	21	-	-	13	3	6	2

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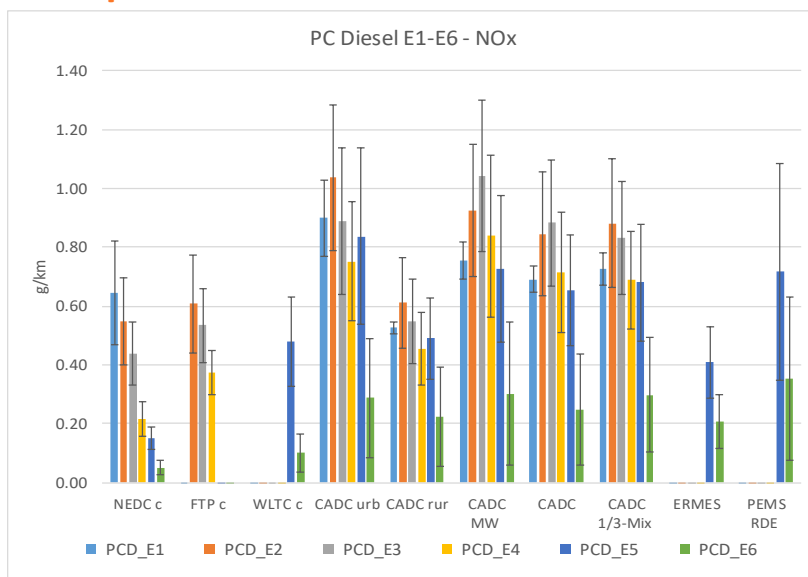
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ERMES – content of DB – autumn 2017

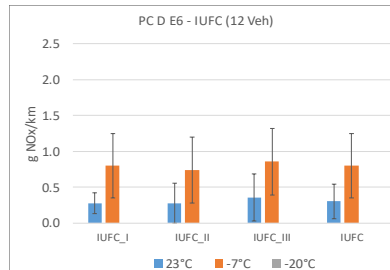
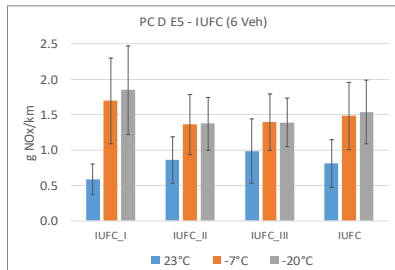
Number of vehicles tested with PEMS in different cycle groups

VehCat	Technology	EU_em_std	Modified NEDC	Real world cycles	
			NEDC-Variations	RDE	RWC
pass. car	petrol (4S)	EURO-6			3
pass. car	diesel	EURO-5	40	40	39
pass. car	diesel	EURO-6	49	48	52
LCV	diesel	EURO-5	5	5	
LCV	diesel	EURO-6			1
Total Veh.			94	93	95

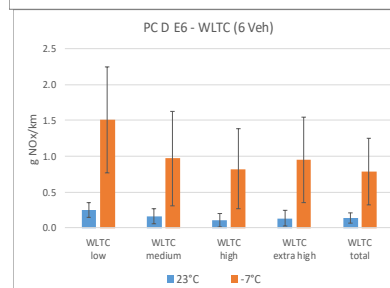
Examples: PC D Euro-1 to Euro-6



Examples: PC D Euro-5, Euro-6



- *IUFC: Inrets Urbain Fluide Courte*



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ERMES DB: Acces to the data

Principles

- Sign an NDA (non-disclosure agreement), available from the ERMES secretariat at JRC in Ispra
- Principle «data for data»: the data are available to those who provide substantial input data, i.e. their own data to the ERMES DB
- In case of publication of results the data have to be made anonymous
- Use standardized input data sheet (Excel)

Output Format

- So far: no direct access to the DB, but standardized output as Excel-file
 - vehicle + relevant attributes (lab, make, model, techn., Euro-Cl., prov.)
 - test attributes (cycle, cold/hot start, temperature, test fuel, (+ road driv. resistance, mileage, gearshift, repeat, regener. ...))
 - pollutants (+ units) [original, "harmonized"]

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HBEFA – Outlook: “Version 4.1” – per 2018

Main topics

- Verify EF of Euro 6 / VI -> update emission factors PC, HDV
 - Temperature effects for hot EF (-> Verify results of HBEFA 3.3)
 - Improve / extend empirical basis -> measurement programs
 - Verify influence of RDE (real world driving emissions)
- Methodological issues due to new data sources
 - PEMS (portable emission measurement system) -> as new source for EF
 - RSD (remote sensing data)
 - For validation of EF
 - For particular influencing factors: 1. Ambient temperature, 2. deterioration, pot. 3: make's
 - New concept of CO2 emission calculation
- New technologies
 - Electric vehicles (Hybrids, BEV, PHEV)
 - Measurement programs
 - Methodological issues (utility factors, driving patterns)
 - Upstream emissions

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HBEFA – Outlook: “Version 4.1” – per 2018

Additional topics

- EF of other vehicle categories
 - LCV
 - MC
- Particularities (special emission factors / influencing factors)
 - BC
 - Review Benzene, NO₂, N₂O, NH₃
 - PM Non-exhaust
- Traffic activity / national data (fleet model/ compositions)
 - Establish common approach/data structure
 - New data sources about %vehkm among traffic situations (“big data” level of service)
- HBEFA operational issues (under discussion)
 - Make “Expert version” publicly available?

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