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Emission data evaluation according to Japans proposal “3-Phase WLTC at low temperature”

Low Temp Task force, F2F meeting
JRC Ispra, 16.+17. of April 2018

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Agenda

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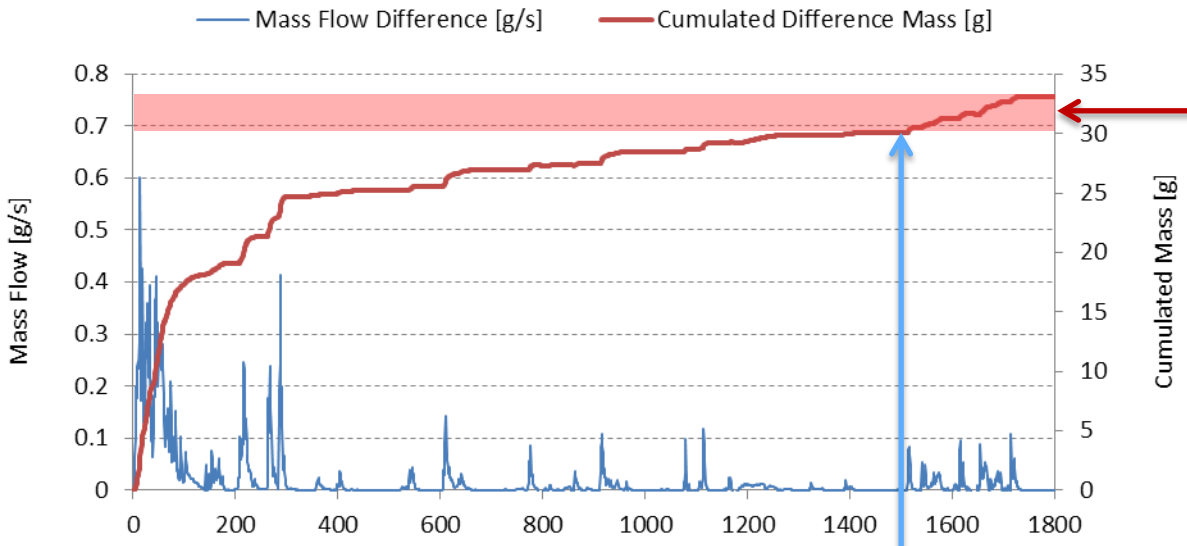
- Introduction
- Influence on emission results if 4th phase is omitted for low temperature testing
  - Gasoline, Diesel, LCV
- Summary

Introduction

Effects of phase reduction on cumulated emissions

- If the 4th cycle phase is omitted, a certain portion of the total emissions is not considered for the type 6 test



Example graph: T.HC of a gasoline vehicle

Emission portion not considered

Cut off point

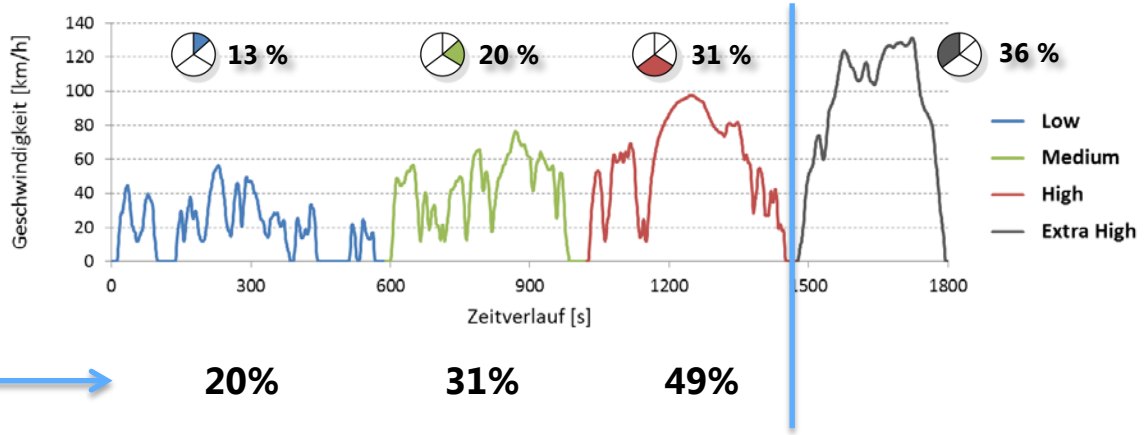
Introduction

Effects of phase reduction on emission factors

- Reduction in overall driving distance shifts the weighting of the remaining phases for the calculation of the total emission factors

WLTC (4-Phase)

d_{tot}	23.25 km
v_{max}	131 km/h
a_{max}	1.7 m/s²
v_{mittel}	46.6 km/h



WLTC (3-Phase) → **20%** **31%** **49%**

Introduction

Test parameters used for Empa dyno measurements

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- Vehicle selection
  - Vehicle selection according to Swiss market composition
  - All vehicles type approved according to Euro 6b
- Chassis Dyno settings
  - Dyno coefficients (F0, F1, F2) according to manufacturer
  - Weight setting according actual vehicle weight
  - Same dyno settings (mass, F0, F1, F2) for all temperatures (-7°C)
- Ambient conditions
  - Temperature: -7°C
  - Humidity: below 12°C no humidity control available
- Post processing
  - No NOx correction factors applied

Influence on emission results if 4th phase is omitted for low temperature

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- Influence on emission factor (in g/km, mg/km or #/km)
  - Comparing the 3-phase result to the 4-phase result
  - Impact on total result calculated from sub cycle results in %
  - Values in brackets represent the standard deviation

	CO2	CO	T.HC	NOx	PN
passenger car, gasoline (6 veh.)	3.9 (±3.0)	19.1 (±25.5)	10.5 (±24.9)	22.5 (±18.2)	35.7 (±8.0)
passenger car, diesel (9 veh.)	5.1 (±4.8)	42.9 (±9.5)	54.8 (±18.8)	-6.9 (±9.7)	27.7 (±22.8)
light commercial, diesel (6 veh.)	-0.3 (±4.1)	38.8 (±10.3)	40.4 (±17.1)	-2.2 (±13.1)	29.2 (±36.4)

Influence on emission results if 4th phase is omitted for low temperature

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- Influence on total absolute emissions (in g, mg or #)
  - Comparing the 3-phase result to the 4-phase result
  - Impact on integrated result over complete cycle in %
  - Values in brackets represent the standard deviation

	CO2	CO	T.HC	NOx	PN
passenger car, gasoline (6 veh.)	-33.0 (±1.9)	-23.2 (±16.5)	-28.7 (±16.0)	-21.0 (±11.7)	-12.5 (±5.1)
passenger car, diesel (9 veh.)	-32.3 (±3.1)	-7.9 (±6.2)	-0.2 (±12.1)	-40.0 (±6.3)	-17.6 (±14.7)
light commercial, diesel (6 veh.)	-35.7 (±2.7)	-10.5 (±6.7)	-9.5 (±11.0)	-36.9 (±8.4)	-16.7 (±23.5)

Summary

- CO2 / CO / T.HC / PN: Higher influence of cold start urban driving leads to higher overall emission factors
- NOx
  - Reduction of NOx emissions for Diesel vehicles due to elimination of high load section (makes up 35-40% of total absolute emissions)
  - Hypothesis: Future developments due to legislation (WLTP/RDE) will lead to NOx behaviour like the other emissions (broad introduction of SCR)

Thank you for your attention!

With a sincere vote of thanks to:

Swiss Federal Office for the Environment FOEN, Air Pollution Control and Chemicals Division, Traffic Section

Dr. Brigitte Buchmann, Head of Department Mobility Energy and Environment, Empa

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