Overview of RDE in China

May 2019

Geneva

China 6 LDV

■China 6 was published in 2016 (GB18362.6-2016)

- Refer to the European regulatory system, and driving cycle adopted WLTC 4 phase.
- China 6 performs fuel neutrality, no longer distinguishes gasoline and diesel limits.

Limit (Class 1)	NOx (mg/km)	PN (#/km)	CO (mg/km)	THC (mg/km)	NMHC (mg/km)	N2O (mg/km)	PM (mg/km)
6a	60	6.0E11	700	100	68	20	4.5
6b	35	6.0E11	500	50	35	20	3.0

■RDE was introduced in China 6 as type II test

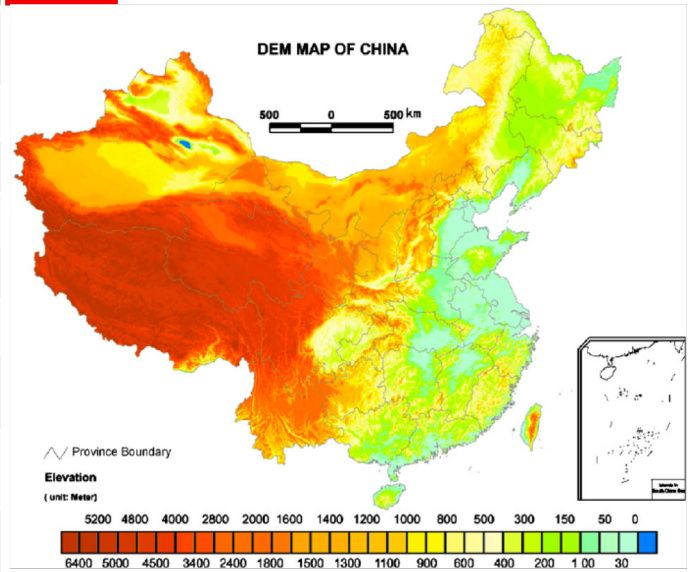
- Control the real driving emissions. Focus on: NOx and PN
- Compliance inspection tools: COP and ISC
- Screen unreliable emission control strategies.

■Mandatory introduction of Conformity Factors in July 2023 (PN-CF: 2.1; NOx-CF: 2.1, confirmed before 2022-7-1)

China 6 RDE brief introduction

- China RDE reference to EU RDE ,but make some changes according to own conditions.

Items		Requirements
Test procedure & PEMS requirements		Package1,2
Boundary Condition	Altitude	Moderate: [0m, 700m]
		Extended: (700m, 1300m]
		Enhance extended: (1300m~2400m]
	Temperature	Moderate: [0℃, 30℃]
		Extended: [-7℃, 0℃) or (30℃, 35℃]
Data post-process	ICE, NOVC-HEV	Package 2 Moving Average Window Method
	OVC-HEV	Package 3
Conformity Factors	NOx, PN	2.1



* Extended factor: 1.6 Enhanced extended factor: 1.8

China 6 RDE brief introduction

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China 6 RDE	Chapter		GTR RDE draft
General requirements	Appendix D	Real Driving Emissions testin RDE (Type II)	General article
Test Procedure	Annex DA	Test procedure for vehicle emissions testing with PEMS	Appendix 1
PEMS requirements	Annex DB	Specifications and calibration of PEMS components and signals	Appendix 2
	Annex DC	Validation of PEMS and non-traceable exhaust mass flow rate	Appendix 3
Data process	Annex DD	Determination of emissions	Appendix 4+6
	Annex DE	Moving average widow method	Appendix 5*
	Annex DF	Data exchange and reporting requirements	Appendix 8
	Annex DG	Verification of trip dynamics	Appendix 7a
	Annex DH	Procedure to determine the cumulative positive elevation gain of a PEMS trip	Appendix 7b
OVC-HEV requirements	Annex DI	Verification of trip dynamics and calculation of RDE emission results for OVC-HEV	---

Open for further evaluation

- Further review
  - Confirmatory Factor
  - CO
  - Introducing cold start
- Quality assurance of the RDE test
  - PEMS uncertainty evaluation
  - Detailed operation procedures (Back pressure, connection, PEMS operating condition…)

➢ An environmental standard (HJ) will be developed as a supplemental standard for China 6 RDE.

Research works

■ Since 2016, VECC-MEE has organized three RDE fleet-research programs.

- Over 390 RDE tests were conducted on 55 different vehicles, including gasoline , diesel and NOVC-HEV
- AVL, Horiba and Sensors PEMS were utilized for fleet tests
- City altitude up to 2300m

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Year	OEM	Vehicles	Cities	Focus
2016	8	11	4	1. Evaluate test procedure 2. Extended altitude 3. PEMS correlations
2017	21	22	6	1. Boundary condition impact: altitude and temperature 2. Drive behavior and trip dynamics 3. Fuel impact
2018	18	20	7	1. CF evaluation 2. Calculation comparisons 3. Cold start 4. PEMS uncertainty

Main findings

- Boundary conditions
  - Due to the combined effects of test route, driving behavior, meteorological conditions, the RDE test results have no obvious regularity at different altitudes.
  - The RDE test are not repetitive, as long as the experimental boundary conditions are met and the validity checks are met, the experimental results are valid.

- Driving behavior
  - Driving behavior test results show that most vehicles have a strong correlation between RPA and PN emissions.
  - The driver may consciously modify the driving behavior during RDE test, resulting in the problem of not reflecting the real driving characteristics.

- Fuel
  The PM index of gasoline may seriously affects the PN emissions of gasoline vehicles, especially without GPF.

Main findings

- Cold start
  Cold start significantly affects urban emissions. Soak time and temperature have greater impact on the cold start emissions compare to the pretreatment running.
  The MAW method does not directly reflect the cold start emission characteristics on RDE results. Need further discussion.

- CF evaluation
  Preliminary evaluation of CF factor **based on RDE fleet test**: NOx within 95% of the confidence interval is less than 1.53 and PN is less than 2.00, which needs further evaluation.

Next step

- Further assess CF value by type-testing and in-use test data, as well as PEMS uncertainty evaluation
- Proper introducing the cold start requirement
- Evaluate the impact of CO_2 emissions to MAW method at high altitude
- Evaluate the emission deterioration on RDE at in-use compliance inspection
- Develop RDE supplemental legislation

Work with IWG-RDE

■ Cooperate with IWG-RDE

- Invited JRC experts to participate in the RDE research program.
- Submitted the research data to IWG-RDE for GTR development

■ Consider Chinese real driving conditions in GTR

- Geography condition: altitude, temperature, humidity
- Heavy traffic in major cities

Thank you !

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