

**PROPOSAL TO DEVELOP A ROAD MAP TO A GLOBAL TECHNICAL  
REGULATION ON WORLDWIDE HARMONIZED LIGHT-DUTY TEST  
PROCEDURES (WLTP)**

**A. Objective of the proposal**

The objective of this proposal is to establish a road map for a global technical regulation (gtr) for light duty vehicle emissions including:

- (a) a common test procedure reflecting the actual driving conditions in real world
- (b) consideration regarding further items like On Board Diagnostic (OBD) detection capabilities and off-cycle emission.

Regulations governing the exhaust-emissions from light duty vehicles exist for many years but the test procedures vary significantly.

The gtr No. 2, World-wide harmonized Motorcycle emission Test Cycle (WMTC), for motor cycle emissions and the gtr No. 4, World-wide harmonized Heavy-Duty Certification procedure (WHDC), for heavy-duty vehicle emissions have been successfully established.

WP29 endorsed the creation of a WLTP working group to look into the feasibility and roadmap of WLTP over an initial 2-year period. OICA wishes to contribute actively to the work.

**B. OICA position**

**Worldwide harmonization – What does it mean?**

One product sold anywhere in the world:

- One test procedure.
- One set of type approval documentation.
- Maximum possible commonisation of certification processes.
- Uniform measurement requirements.
- Limited sets of limit values for emission standards.

## **Worldwide harmonization – What must be considered?**

- Real driving patterns under urban, extra urban and highway traffic conditions.
- One test procedure for emissions and energy consumption testing.
- Broad scope including e.g. OBD, durability, off-cycle behaviour, .....
- Appropriate fuel quality for the advanced powertrain systems.
- Use of alternative fuels.
- Future requirements based on air quality objectives for emission control.
- Technological and economic feasibility.

### **C. Scope of harmonization**

- Vehicle category & Engine Family concepts
- Tailpipe emission and energy consumption test procedure (driving pattern, gear shift, preconditioning, ...)
- Test conditions (incl. load, test weight, tyre selection, ...)
- Measurement techniques
- Defeat device assessment rules
- Off-cycle concept (extra cycle, NTE, PEMS, ...)
- Other devices (e.g. MAC, heaters, electric load)
- Reference fuel specifications incl. alternative fuels
- Need for durability requirements, COP and in-service conformity programs?
- OBD (test conditions and threshold values)
- Evaporative emission test procedure (incl. ORVR and Running losses?)
- Low temperature test procedure
- Need for Diesel smoke test?
- Test at high altitude / low ambient pressure
- Limited sets of emission limit values

### **D. Approach for harmonization**

Based on the experience with WHDC and WMTC projects, the following tasks to optimize the development of WLTP are proposed:

1. Vehicle classification, scope
  - The objective is to develop a worldwide harmonised emissions test procedure for passenger cars and light duty vehicles. These classifications need to be clearly established.

2. Collection of statistics about vehicle parc and use
  - The data about vehicle use (mileage) and driving behaviour (vehicle and engine speed/load pattern) has to include all relevant real life vehicle operations.
  - A classification matrix will be derived from the data about vehicle use in order to take into account all relevant influencing parameter. This matrix should consider different regions, vehicle classes and road categories.
  - Weighting factors of the matrix are combined with the in-use data in order to create a reference database
3. Collection and analysis of in-use driving behaviour data, bearing in mind OBD
4. Cycle development, [and weighting factors]
  - The test procedure needs to be
    - representative of world-wide on-road vehicle operation,
    - able to provide the highest practical level of efficiency in representing on-road emissions,
    - corresponding to state-of-the-art testing, sampling and measurement technology,
    - applicable in practice to existing and foreseeable future exhaust emissions abatement technologies,
    - capable of providing a reliable ranking of exhaust emission levels from different engine types,
    - consistent with the development of appropriate emission factors,
    - inclusive of testing off-cycle emissions.
  - The first step is to compact the reference cycles into a first draft test cycle of a desired length.
  - This cycle should have the same key parameter values as the reference database (vehicle speed distribution, idle time distribution, acc. dec. and cruise modes).
  - It has to be foreseen that this first draft will need to be modified on the basis of an evaluation concerning driveability and practical points concerning the measurement procedure.
  - Since this process is iterative by nature, several adaptation rounds including the driveability tests have to be carried out.
  - OBD requirements must be considered.

5. Gearshift prescription development

- The development of the gearshift procedure should be based on an analysis of the gearshift points in the in-use data.
- In order to get generalized relations between technical specifications of the vehicles and gearshift speeds the engine speeds should be normalized to the utilizable band between rated speed and idling speed.
- In a second step the end speeds (vehicle speed as well as normalized engine speed) for up shifts and downshifts should be determined. The averages of these speeds for each gear and vehicle should be calculated and correlated with technical specifications of the vehicles.

6. Update of measurement procedure

- The update of the measurement procedure should include the vehicle preparation as well as the test bench settings and emission calculations, such as
  - Road load resistance,
  - Definition of inertia mass,
  - Cooling requirements,
  - Exhaust gas sampling procedure,
  - Tolerance criteria,
  - Emission calculation
- This work might be performed by ISO.

7. OBD tests

8. Driveability tests with candidate cycle

9. It is recommended to perform validation tests in two steps:

1. Test bench measurements with priority for driveability,
2. Test bench measurements in order to compare emissions.

Both steps should be performed in all relevant regions.

- Depending on the outcome of step 1 further modifications of the cycle and/or the gearshift prescriptions might be necessary.
- For step 2 the new cycle as well as the regional certification cycles should be used.

10. Emissions validation tests
  - An additional round robin test should be performed.
11. Final measurement procedure
12. Off cycle emission provisions
13. Other provisions, e.g. evaporation, durability (COP, ISC), low temp....
14. Reference fuels
15. Develop limited sets of limit values for emission limit values
16. Development of GTR text

**E. Organization**

The target should be to develop a single GTR text to cover all aspects of WLTP. Therefore we propose the development is handled by one informal group which may be assisted by specialist sub-groups reporting to it.

**F. Budget**

A budget needs to be developed during the investigation stage to clearly establish the anticipated costs of the GTR development and the burden sharing between the involved parties

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