Market surveillance: A new business
In the field of emission reduction
Whole Vehicle Type-Approval System (WVTA):

An update of the EU emission regulation


• The major overhaul of the EU type-approval framework for motor vehicles was adopted on 30 May 2018.


• The new regulation will make vehicle testing more independent and increase surveillance of cars already in circulation. It will:

  • raise the quality level and independence of vehicle type-approval and testing
  • increase checks of cars that are already on the EU market
  • strengthen the overall system with European oversight
  • It becomes mandatory for all new vehicle models as of 1 September 2020. The new rules go together with Commission initiatives such as the proposal for a new deal for consumers. In a Dieselgate-type scenario, this initiative allows victims of unfair commercial practices to obtain remedies collectively through a representative action.
Whole Vehicle Type-Approval System (WVTA):

Key players & responsibilities

GTAA : Granting Type Approval Authority

- Approval authorities are established or appointed by EU countries and mandated by the Commission. The approval authorities have skills for:
  - all aspects of the approval of a type of vehicle, system, component.
  - acting as the contact point for the approval authorities of other EU countries
  - ensuring that the manufacturer meets his obligations regarding the conformity of production
  - designating the technical services
  - Information gathering & risk assessment (define ISC tests constraints)

TS: Technical services

- A technical service is an organization or a body designated by the national approval authority as a:
  - testing laboratory to carry out tests
  - or as a conformity assessment body to carry out the initial assessment and other tests or inspections on behalf of the approval authority
Version layers of the market surveillance

Before production

End of production line

6 month < ... < 5 years
15,000 < ... < 100,000 Km
Whichever is sooner

Any time

Min. 4 years
+ every 2 years

TYPE APPROVAL including
DURABILITY & OBD

COP:
CONFORMITY OF PRODUCTION

ISC:
IN-SERVICE CONFORMITY

RSI:
ROAD SIDE INSPECTION

PTI:
PERIODICAL TECHNICAL INSPECTION

Emissions testing throughout vehicle useful life
ISC: In-Service Conformity definition process

- **Information gathering & Risk Assessment**
  - Main Responsibility: GTAA

- **ISC Testing**
  - Main Responsibility: TS + OEM

- **Compliance Assessment**
  - Main Responsibility: GTAA + OEM

- **Remedial Measures**
  - Main Responsibility: GTAA + OEM

- **Reporting**
  - Main Responsibility: GTAA

**As of 1 January 2020,**
5 % of the ISC families per manufacturer per year
or at least two ISC families per manufacturer per year, where available.

The requirement for testing a minimum of 5 % or at least two ISC families per manufacturer per year shall not apply to small volume manufacturers.
Selection of vehicles for ISC Testing

- Driven in the **Union** for at **least 90 %** of its driving **time**.
- Maintenance record which shows that the vehicle has been **properly maintained**
- Vehicles exhibiting indications of **abuse, improper use** that could affect its emissions performance, tampering or conditions that may lead to unsafe operation shall be **excluded**
- Vehicles shall **not** have undergone **aerodynamic modifications**
- If the information stored in the on-board computer shows that the vehicle was operated after a **fault code** was displayed and a **repair was not carried out**
- If the **fuel** from the vehicle tank does not meet the **applicable standards**
- If the vehicle is within 800 km of a scheduled **maintenance service**, **No active fault code** for the pollution control devices

<table>
<thead>
<tr>
<th>EU Registration</th>
<th>Number of sample lots</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 100.000</td>
<td>1</td>
</tr>
<tr>
<td>100.001 &lt; ... &lt; 200.000</td>
<td>2</td>
</tr>
<tr>
<td>Above 200.000</td>
<td>3</td>
</tr>
</tbody>
</table>

Each sample lot is minimum 3 vehicles, maximum 20 vehicles (according results).
In-Service Conformity: Information gathering & Risk Assessment

- GTAA shall gather all relevant information on possible emission non-compliances relevant for deciding which ISC families has to be checked in a particular year.
- GTAA shall take into account all source of information indicating vehicle types with high emissions in real driving conditions.
- That information shall be obtained through the use of appropriate methods, which may include remote sensing, simplified on-board emissions monitoring systems (SEMS) and testing with PEMS.
- The number and importance of exceedances observed during such testing may be used to prioritize ISC testing.
Key concept:
From a simple block trip to Approval cycles test results
Proposal for ISC and Market surveillance in order to manage information gathering to point out suspicious vehicles.

RSD as a massive solution to spot faulty vehicles / categories

REAL-e to evaluate Single vehicle on a block trip

Raw pollutant analysis

Vehicle emission modeling

If necessary: Evaluation with PEMS on a RDE trip

• Learning from Measurement
• Conformity factor estimation

1 second
30 mn
1 day
**use case : Test campaign**

**Vehicle**
- Peugeot 308SW
- Diesel 1.6L Hdi 115, 1300kg
- 2014 (Euro 5)

**8 trips**
- 3 RDE type:
  - 80 km, 1h30min
- 5 « go around the neighborhood » type:
  - 7 km, 15min
use case: Initial Finding / Raw data

- **Findings:**
  - Laboratory PEMS and REAL-E provide similar raw results
  - The events are well represented by the model but the quantification can be improved
  - **Data fusion** between model and measure opens up opportunities for improvement
use case: Exemple of Re calibration

- **Findings:**
  - **Road law is** unknown in real conditions (vehicle load, vehicle condition...)
  - **Gearbox ratios from database** are not accurate
  - **Driver behaviour is difficult** to estimate

- **Teachings:**
  - **Engine speed needs to be calibrated**
  - Clustering method give accurate results
  - A reference driver model will be kept to project vehicle reference scores
**Use Case: After Recalibration**

- **Findings:**
  - The CO2 estimation is correct, once the regime is fitted.
  - For NOx, calibration improves significantly the result.

- **Teachings:**
  - AFR is sometimes incorrectly estimated, which can lead to an error in the exhaust flow rate.
  - Euro 6 equipped vehicles present additional difficulties due to their complexity but the measurement reduces uncertainties.
use case: Projection on Approval cycle

Measurements over 8 trips

<table>
<thead>
<tr>
<th></th>
<th>NEDC</th>
<th>WLTC</th>
<th>RDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO₂</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO₂ [g/km] Simu / Measure</td>
<td>99</td>
<td>111</td>
<td>116</td>
</tr>
<tr>
<td>Conso. [L/100km]</td>
<td>3.7</td>
<td>4.2</td>
<td>4.4</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>NEDC</th>
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<th>RDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOx</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NOx [mg/km] Simu / Measure</td>
<td>550</td>
<td>600</td>
<td>630</td>
</tr>
<tr>
<td>CF Euro 5</td>
<td>3</td>
<td>3.3</td>
<td>3.5</td>
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</tbody>
</table>

→ The thresholds are known, tolerance are EU defined with ISC specification...

→ This methodology is allowing to identify “Hight emitters” quicker and easier
### Cost Benefit Analysis

<table>
<thead>
<tr>
<th>Test Type</th>
<th>Cost</th>
<th>Setting</th>
<th>Performing</th>
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</thead>
<tbody>
<tr>
<td>Laboratory PEMS</td>
<td>150-200 k€</td>
<td>3 h</td>
<td>3 h (need to repeat test)</td>
</tr>
<tr>
<td>Laboratory Chassis Dyno</td>
<td>&gt;2000 k€</td>
<td>24h (soaking)</td>
<td>1 h</td>
</tr>
<tr>
<td>PTI Chassis Dyno</td>
<td>30 k€ + civil works</td>
<td>10 mn</td>
<td>5 /10 mn</td>
</tr>
<tr>
<td>PTI Gas analyser/Smokemeter</td>
<td>4-6 k€</td>
<td>1 mn</td>
<td>3 mn</td>
</tr>
</tbody>
</table>

*40 cheaper or 40 more efficient than RDE Cycles*