Investigation Of SCR Tampering With Remote Sensing Device

Roadworthiness Committee June 24, 2019
Remote Sensing Device

- Speed/acceleration measurement
- Driving direction
- Deflection mirror
- Road
- Detection unit
- Camera
- Measurement system
- Laptop

Investigation Of SCR Tampering With Remote Sensing Device
Purpose of RSD Measurements

- Utility for preselection of vehicles for roadside inspections (RSI)
- Overview over the entire fleet emissions
Results RSD Measurements – Preselection for RSI

- **27,025 vehicles** measured by RSD
- **32 vehicles** were selected of those
  - **3 vehicles**: manipulations by emulators and missing fuses (only Euro V vehicles)
  - **5 vehicles**: defects in the emission aftertreatment system
  - **6 vehicles**: without SCR system
  - **18 vehicles**: no verifiable modification
Results RSD Measurements – Preselection for RSI

Findings

- Most efficient initial inspection by all-purpose OBD tester; favourably with automatic test procedure

- Open national legal issues
  - Competence for dismantling limited
  - Confiscation of emulators
  - Consequences for vehicle owner/driver
Results RSD Measurements – Fleet Emissions

4.279 valid measurements of those 645 assignable to emission class:
- 8 Euro III
- 8 Euro IV
- 217 Euro V
- 412 Euro VI

Attention: distribution of Euro classes not representative for entire fleet
Results RSD Measurements – Fleet Emissions
Results RSD Measurements – Fleet Emissions

Objective of measurements:

Estimation of a manipulation rate: How many vehicles are potentially manipulated?
Interpretation of RSD Measurements

1. Reference measurements with manipulated Euro VI vehicle
   - Reference value for operation with and without SCR system

2. Comparison of the measured values with the limit values of the respective emission classes
Interpretation of RSD Measurements
Reference measurement with Euro VI vehicle

IVECO Stralis Euro VI
SCR
no EGR
Interpretation of RSD Measurements
Reference measurement WITHOUT emulator

Investigation Of SCR Tampering With Remote Sensing Device
Interpretation of RSD Measurements
Reference measurement WITH emulator

![Graph showing NOx/CO2 ratio, speed, CO2, and slope index over distance.]

Mean NO\textsubscript{x} value of the 3 slope sections
Interpretation of RSD Measurements
Reference measurement with Euro VI vehicle

• Without emulator (SCR system active)

3.0 g NO\textsubscript{x}/kg fuel

• With emulator (SCR system inactive)

37.1 g NO\textsubscript{x}/kg Kraftstoff
Interpretation of RSD Measurements
Comparison with Limit Values

Conversion of specific emission limits [g/kWh] in mass fraction [g/kg fuel]

<table>
<thead>
<tr>
<th>Emissions-klasse</th>
<th>Grenzwert [g/kWh]</th>
<th>Grenzwert [g/kg Kraftstoff]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Euro III</td>
<td>5,0</td>
<td>25,3</td>
</tr>
<tr>
<td>Euro IV</td>
<td>3,5</td>
<td>17,7</td>
</tr>
<tr>
<td>Euro V</td>
<td>2,0</td>
<td>10,1</td>
</tr>
<tr>
<td>Euro VI</td>
<td>0,4</td>
<td>2,0</td>
</tr>
</tbody>
</table>

Explanatory note: for the above conversion an assumption with a significant uncertainty for the value for the thermodynamic efficiency in the particular operating points has to be made. In combination with the unfavourable conditions at the measurements (< 5 °C) a safety factor has been introduced.

⇒ „safety factor“ 2
Results RSD Measurements
Vehicle Percentage Euro III Related to Total Fleet

Investigation Of SCR Tampering With Remote Sensing Device
Results RSD Measurements
Vehicle Percentage Euro IV Related to Total Fleet

Investigation Of SCR Tampering With Remote Sensing Device
Results RSD Measurements
Vehicle Percentage Euro V Related to Total Fleet

Investigation Of SCR Tampering With Remote Sensing Device

20.2 g/kg fuel
10.1 g/kg fuel
Results RSD Measurements
Vehicle Percentage Euro VI Related to Total Fleet

Investigation Of SCR Tampering With Remote Sensing Device
Results RSD Measurements – Euro V vehicles only

Investigation Of SCR Tampering With Remote Sensing Device
Results RSD Measurements – Euro VI vehicles only

- 37.1 g/kg fuel (reference measurement with emulator)
- 4.0 g/kg fuel
- 2.0 g/kg fuel

12 of 412, 3%
90 of 412, 21%
135 of 412, 33%

Investigation Of SCR Tampering With Remote Sensing Device
Amendment of the Austrian Motor Vehicles Act

Paragraph on Modifications of Registered Vehicles

Old:

• Modifications of vehicles have to be notified to the Governor if they potentially influence the roadworthiness or the operational safety

• Governor has to approve the modifications if all relevant regulations are met

New:

• Modifications of vehicles have to be notified to the Governor if they potentially influence the roadworthiness or the operational safety or the environmental performance

• Governor has to approve the modifications if all relevant regulations are met
Amendment of the Austrian Motor Vehicles Act

Paragraph on Modifications of Registered Vehicles

- **Modifications on emission related parts** of the powertrain system, including engine, exhaust system and emission control system of vehicles which are able to decrease their characteristics or performance on emissions are prohibited.

- **Defeat devices** as defined in Regulations (EU) No 715/2007 or (EU) No 168/2013 or defeat strategies as defined in Regulations (EU) No 595/2009 or (EU) 2016/1628 as well as deactivation or removal of emission reducing devices or their modifications potentially decreasing the performance are prohibited in particular.

- Modifications of the engine control unit to change the engine power (Chip-Tuning) are permitted only and can be approved only if a test report issued by a technical service notified for the regulatory acts referred above demonstrates that all relevant emission legislation is met.
Amendment of the Austrian Motor Vehicles Act

Paragraph on Modifications of Registered Vehicles

• Making available on the market and placing on the market, offering and advertising of defeat devices, defeat strategies or items for deactivation or tampering of pollution control devices as well as for deactivation or removal or any other modification of pollution control devices decreasing their performance is prohibited.

• Offering or advertising of execution of such modifications, their making available on the market and placing on the market of such illegal chip tuning is prohibited too.

§ 33 Abs. 6a KFG 1967

(https://ris.bka.gv.at/Dokumente/Bundesnormen/NOR40213174/NOR40213174.pdf)
Thank you for your attention!

Friedrich Forsthuber
friedrich.forsthuber@bmvit.gv.at