

WLTP DTP PM-PN Subgroup Activities, Progress & Future Plans

7th DTP Meeting

Bern

12th – 14th September 2011

Chris Parkin

Outline

- Meetings
- Closed Issues
- Data To Gather During Validation 2
- Amendments to GTR Text
- Future Plans
- Administrative Issues

Outline

- Meetings
- Closed Issues
- Data To Gather During Validation 2
- Amendments to GTR Text
- Future Plans
- Administrative Issues

Subgroup Meeting

- 10th Meeting – 8th July
 - The following Open Issues were reviewed;
 - Dilution air background correction,
 - Filter media specification,
 - Filter conditioning,
 - PM Microbalance precision,
 - Reference filter weighing,
 - PM calculations,
 - PN during regeneration investigative measurements,
 - VPR minimum penetration efficiency
 - PNC calibration frequency
 - PNC calibration aerosol

Subgroup Meeting

- The draft GTR text was reviewed. Updated text reflecting status following the meeting was circulated as document PMPN-10-08 (and now rev.1).

Outline

- Meetings
- **Closed Issues**
- Data To Gather During Validation 2
- Amendments to GTR Text
- Future Plans
- Administrative Issues

Closed Issues

PM Sampling

- **A9 Dilution air background correction:** Dilution air background correction should be made on the basis of a rolling average background measurement. This contrasts with tunnel background correction where the background measured on day of test, following any tunnel pre-conditioning, should be applied.
- **A38 Filter media:** References for filter media collection efficiency measurement have been added

PM weighing

- **B2 Microbalance precision:** 1 μ g as per GTR 4 agreed
- **B6 Reference filter weighing:** Reg 83 provisions on maximum time between sample and reference filter weighing (8 hours) and reference filter weighing acceptance criteria. These are more demanding than GTR 4 provisions.

Issues for Further Work Following 10th Meeting

- **A38 Filter Media specification:** Chairman to seek clarification of flow rate for filter efficiency check
- **B7 PM Calculation:** PM small group to provide updated/corrected text and equations
- **C1 Regeneration Experimental Measurements:** ACEA and JRC to discuss scope of experimental measurements
- **D4 PNC calibration frequency:** TSI to provide text implementing 13 month interval with a requirement to either monitor PNC counting efficiency versus a reference or change PNC wick every 6 months
- **D5 PNC calibration aerosol:** clarify whether D_{50} requirements should be met before or after k factor is applied

Closed subject to review e.g. due to Validation 2 or DHC conclusions

- **B3 Filter conditioning:** minimum of 1 hour conditioning time, unless validation experience suggests longer is necessary
- **D1 VPR solid particle penetration efficiency:** 70% minimum penetration requirement at 100nm to supplement existing 50:100nm and 30:100nm pcrf ratio requirements, subject to review based on data from PMP VPR Round Robin

Outline

- Meetings
- Closed Issues
- **Data To Gather During Validation 2**
- Amendments to GTR Text
- Future Plans
- Administrative Issues

Data To Gather During Validation 2

- Experience on PN during DPF regeneration;
 - To confirm PN measurement system is capable of excluding worst case volatile material during DPF regenerations
 - CVS and filter face temperatures during regenerations?
- Dilution tunnel pre-conditioning and background
 - Is 20 minutes pre-conditioning at 120kph sufficient?
 - Tunnel PN background levels
- PM filter conditioning
 - Minimum conditioning time required

PN During Regeneration

Experiments to be conducted during Validation 2 to investigate feasibility of specifying PN measurement during regen

- Vehicles
 - Will need regen indicator and inhibitor switch
- Measure PN before, during and after regeneration
- Different PN measurement systems
 - Two systems per lab sampling in parallel
- Impact of VPR pcrf
 - Test over range from 100-3000 (one system at high, one at low setting each test)
- Two tests at each pcrf setting
- Impact of CVS dilution on nucleation mode particles
 - Test at max and min CVS dilution
- DPF fill procedure
 - Either fast loading on engine dyno or on vehicle loading
 - Follow R83 advice on fill state stabilisation for pre-regen tests
- VPR sulphate removal capability
 - Test with highest sulphur lube oil permitted by OEM and fuel at maximum (10/15mg/kg) sulphur limit

Outline

- Meetings
- Closed Issues
- Open Issues
- Data To Gather During Validation 2
- **Amendments to GTR Text**
- Future Plans
- Administrative Issues

Amendments to GTR Text

Document: WLTP-DTP-PMPN-10-08 rev.1 changes since 09-06 rev.3 are;

- **List of Symbols & Acronyms** - updated to reflect latest changes
- **PM & PN dilution air background** –dilution air background measurements should be based on 20 day rolling average measurements. Maximum permissible corrections (in $\mu\text{g}/\text{m}^3$ or $\#/\text{m}^3$) should be equivalent to 1mg/km or 2×10^9 #/km at flow rate of test
- **PM & PN dilution tunnel background** – dilution tunnel background measurements must be made on day of test following any tunnel pre-conditioning. Maximum permissible correction of 1mg/km and 2×10^9 #/km. Tunnel background measurements must be on day of test after any tunnel pre-conditioning
- **PNC Monitoring** – requirement to monitor PNC counting efficiency v reference PNC or ≥ 2 measurement PNCs added. Alternatively PNC wick may be changed every 6 months
- **PM Calculation** – parameter names and subscripts aligned with GTR 4
- **PM Temperature control** – clarified that components may be heated to achieve $\leq 52^\circ\text{C}$ sample temperature

Amendments to GTR Text

- **PM sample probe** – minimum internal diameter reduced to 8mm in line with GTR 4
- **PM sampling Particle Transfer Tube** – minimum bend radius of 100mm added
- **PM Secondary dilution requirements** – secondary air HEPA filtered, injected into transfer tube as close to sample extraction as possible, 0.25-5 seconds residence time from point of secondary air injection to filter face, proportionality of sample flow must be maintained, returned flow should not interfere with other samples. PM sampling diagrams updated
- **PM filter spec** – test procedure reference and test aerosol added, filter face velocity clarified
- **PN Sampling diagram** – corrected to show LEPA filter in correct place

Outline

- Meetings
- Closed Issues
- Open Issues
- Data To Gather During Validation 2
- Amendments to GTR Text
- **Future Plans**
- Administrative Issues

Future Plans

- Confirm latest changes to GTR text
- Commence updating PN calibration guidance documents
- Review data from Validation 2 on;
 - tunnel background,
 - tunnel pre-conditioning,
 - Minimum filter conditioning time,
 - Measurement of PN during regeneration
- Review data from PMP VPR Round Robin on;
 - Repeatability of VPR solid particle penetration measurement and implications for VPR solid particle penetration efficiency specification

Outline

- Meetings
- Closed Issues
- Data To Gather During Validation 2
- Amendments to GTR Text
- Future Plans
- **Administrative Issues**

Administrative Issues

- Next meeting scheduled for 23rd September
- Following this meeting Chairmanship will be taken over by Caro Hosier, Ford Motor Company
- Co-chairmanship to be confirmed at next meeting