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## **MINUTES OF 24TH PMP INFORMAL GROUP MEETING**

1. The 24<sup>th</sup> meeting of the PMP informal group was held at JRC in Ispra on 14<sup>th</sup> & 15<sup>th</sup> December 2009. Attendees included representatives from the UK, the European Commission, Japan, JRC, JAMA, Volvo, Daimler, Iveco, VW, UTAC, EMPA, AVL-MTC, Horiba, AVL, TSI and Matter Engineering.

### **Heavy Duty Validation Exercise Results**

2. The meeting commenced with a presentation of results from the Heavy Duty Validation exercise by JRC. This included a presentation of the results of investigative experiments conducted at JRC.
3. Correlation between Golden and alternative measurement systems was good except at very low particle concentrations where alternative systems over-read due to higher background levels.
4. Horiba questioned the source of the higher background levels in the alternative measurement systems and CVS dilution systems. JRC noted that for alternative measurement system this appeared to be due to poorer dilution air filtration efficiencies. For CVS dilution systems it was noted that Ricardo's CVS had been used for extended testing of high emission engines and EMPA had been unable to prepare their CVS to minimise tunnel background levels for the testing.
5. VW asked what acceptable tunnel background levels were. JRC responded that this depended on the objectives of the testing. Higher tunnel background levels could be accepted where testing was solely to demonstrate compliance with limit values, compared to testing to accurately establish actual emissions levels (in particular on hot start test cycles). Daimler noted that in WHDC procedures 'background' denoted dilution air background only and that the onus was on labs to minimize tunnel background contributions.
6. The value of improved dilution air filtration was questioned given that tunnel background contributions appeared to be dominant.
7. Matter queried what actions were intended following on from the results on fixed dilution ratio sampling. The chairman noted that this was investigative work only. Given the limited number of results, and the fact that this approach is inconsistent with the existing regulatory approach for sampling of other emissions, it was not intended that the group would make any recommendations on this subject. Nevertheless the results may be of interest for future research on emissions sampling so would be reported for information.

## **Golden Engineer's Observations**

8. Ricardo gave a presentation on the Golden Engineer's observations from the validation exercise.
9. They noted that the sampling point from the partial flow system in most labs had been a sharp edged sampling point perpendicular to the tunnel flow, which appeared to have worked fine. Split ratios and flows through PM filters were similar at all labs. However, dilution air filtration upgrades and temperature and relative humidity measurements had had to be added to partial flow systems at many labs.
10. Daily validation checks on the Golden systems had shown no failures in the full 2 years of the programme, suggesting that less frequent checks might be acceptable. However there had been one incidence of one system overheating which was readily corrected. In response to a question from VW, Ricardo explained that this had been detected by electrical tripping and traced to an overheating pump.
11. Ricardo suggested that tunnel pre-condition or cleaning may be required where tunnel background contributions exceeded certain levels. Where tunnel background subtraction was to be allowed it might be sensible to specify maximum permissible levels.

## **Draft Heavy Duty Validation Exercise Report**

12. The draft report of the heavy duty validation exercise was discussed section by section noting that certain elements were not yet complete. A large number of clarifications, corrections and revisions were agreed. In particular it was agreed that;
  - i. It should be clarified that the exercise was not intended to propose amendments to the already agreed WHDC regulatory PM measurement technique and that comments on PM measurements relate solely to the observations of this exercise rather than more generally.
  - ii. Recommendations should be added regarding compensation for PN sample flow extracted in controlling partial flow dilution system proportionality and (in the case of total sampling type partial flow systems) in calculating PM emissions.
  - iii. Terminology used when referring to partial flow dilution systems, tunnel background contributions and alternative measurement systems will be clarified and made consistent throughout the report.

## **Draft Proposal To Insert PN Measurement Into Regulation 49**

13. The draft proposal to insert PN measurement procedures was also discussed section by section. A number of areas requiring clarification were identified and the following amendments in particular were agreed;
  - i. Particle sampling probe/point and transfer tube inner diameter requirements would be deleted.
  - ii. Procedures would be inserted for compensating for PN sample flow extraction in controlling proportionality of sampling of partial flow dilution systems and calculating PM (total sampling type partial flow systems only).

- iii. Time alignment should be performed based on the system 'transformation' (t50) time as per other WHDC requirements for other emissions.
  - iv. Additive regenerative adjustment should be permitted for consistency with WHDC emissions measurements.
  - v. WHTC cold start weighting factor should be 14% in line with the latest agreement on WHDC
14. VW were of the view that measurement of particle number emissions during periodic regeneration, as proposed in section 5.4.2, was not appropriate. In their view the particle number measurement system was not suitable for measuring emissions in these conditions due to the large quantity of volatile material released during regeneration. They felt that a significant quantity of this material would penetrate the VPR. NTSEL felt that more data was needed on the suitability of particle number measurement systems for measuring regeneration emissions before this was included in the Regulation.
15. The chairman noted that 'solid' particles were effectively defined by what was measured by the PN measurement system and that investigative work in the light duty validation exercise suggested that the measurement system was suitable for these measurements. In addition to which, it had been agreed in EU discussions that particle number emissions during regeneration should be accounted in the measurement and Euro VI limit values. The Commission and Daimler supported the inclusion of regeneration measurements in the Regulation adding that this had been discussed and length in the context of Euro VI and strongly supported by other engine manufacturers. Matter queried what data there was to demonstrate that volatile material did break through the VPR.
16. The chairman concluded that, although there was not complete consensus on this issue, the majority were in favour of inclusion of regeneration measurements in the Regulation.

#### **Calibration Round Robin & Workshop**

17. JRC presented the proposed content of a VPR calibration workshop. They offered to provide a Dekati dual ejector system as a reference VPR for the round robin. No alternative instruments were offered. JRC proposed to commence exploratory work in January/February prior to the start of a round robin and to host the workshop after completion of the round robin.
18. Matter, AVL and Horiba all supported the proposal to circulate an aerosol generator between labs also to compare results with those achieved using labs own aerosol generators/techniques.
19. It was suggested that comparison of removal efficiency of 100nm C40 particles with 30nm C40 particles might be a useful addition to the Workshop investigations. However AVL noted that this issue had already been investigated at JRC and further testing was not of value.
20. Horiba, AVL and Matter all confirmed they were available and willing to participate in a round robin programme after February 2010. It was estimated that 2 weeks testing per lab would be required.

### **Any Other Business**

21. Scania requested an update to the Heavy Duty Round Robin schedule noting that they were unable to test in the June-July 2010 test slot allocated to them.
22. Submission of Round Robin results was discussed. Participating labs should submit their results to Daimler and to JRC, at present data had only been received from NTSEL and not from JARI, NIER or Volvo. Volvo requested more guidance on data analysis and reporting. The chairman noted that his understanding of the purpose of the round robin (as requested by industry) was for blind testing. However, the chairman asked labs to submit any questions they may have and co-ordinate responses to them.
23. VW asked for an update on ISO's work on PNC calibration. TSI responded that a working draft, basic standard had been developed which includes both electrometer and reference PNC calibration methods. The chairman requested that TSI present progress on this activity at a future PMP meeting (when the VPR calibration Workshop results would be discussed).

### **Actions**

- I. JRC, Ricardo and chairman to revise Heavy Duty Validation report
- II. Chairman to revise Regulation 49 proposal and circulate by 18<sup>th</sup> December for consideration as an informal by GRPE 59
- III. JRC to issue invitation to participate in VPR round robin and calibration workshop to instrument manufacturers
- IV. Round Robin labs to submit test results to Daimler and JRC
- V. Remaining Round Robin labs to submit any questions

**Chris Parkin**  
**PMP Chairman**