

**PMP Webconference
6th November 2020, 13:00-16.00**

Meeting Minutes

1. Introduction

Debriefing on 81st GRPE Session: informal documents submitted to amend GTR 15 (introduction of SPN10 option) approved by GRPE.

PN measurement procedure for HD engines is described only in UNR 49. Amending this Regulation would imply immediate regulatory effect. For this reason the test procedure for SPN 10 and direct raw exhaust sampling for HD will be presented as a technical informal document in January 2021.

Japan has announced that they might submit a request in that occasion to ask for introduction of PN measurement in GTR n.4.

At UNECE level there is no approved regulation describing the PN PEMS procedure. The circulated document based on the draft UNR RDE should not be considered a PMP's proposal for the amendment of this regulation. Any decision on how to include the procedure in a legislative document will be taken at a later stage.

RDE GTR proposal being developed within the RDE IWG includes PN PEMS for 23 nm. Once approved this procedure might be updated to include the PN10 option. (Penny D)

2. Presentations

- Update on sub-23 nm LDV ILCE / Sub-23 nm for HDE (Tero Lahde)
ILCE is now completed in ASIA. Evaluation is ongoing. DRAFT reports have been circulated to the participating labs.

- PN-PEMS 10 nm for LDV (and HDE) (Barouch Giechaskiel.)
Carried out two campaigns (BOSMAL, JRC)
Less than 30% difference the reference systems.
Testing with DPF, LPG, GDI, and PFI vehicles
Detection by particle counter and diffusion charger
Proposed efficiencies table at different particle diameters based on the campaigns
Is catalytic stripper need? Data does not show though but the participants suggested it should in order to be in agreement with the PMP systems.
Recommend for sub 23nm PN PEMS the use with CS (VW, Catalytic Instruments)
JRC: little difference from tailpipe and CVS PMP. VW (Stefan Carli.) saw difference if no CS was used.
Q: Regeneration? Only one test with regeneration was carried out for now. At larger emissions there is very good agreement of instruments (particle size maximum is at 60-70 nm)
At HD there could be volatiles at <23nm when PN is low.
No testing was done on-road. No repetition could be done, due to COVID situation, but the systems should be robust as they were only slightly modified from the 23 nm commercial systems.

RDE cycle should be used in the Lab. Dynamic cycles might have larger differences (BMW, Alexander Terres)
Is zero check possible (Hiroyuki Yamadatdu?) JRC: yes
Next steps: JRC lab will be shut down until Feb 2021
Comments received on sub 23 PN PEMS procedure will be integrated in new DRAFT (JRC)

- VETC (China) experience with the Golden instruments (VETC Sheng SU)
 PMP HDE tests with China 3- 7 engines (with and w/o DOC,DPF, or SCR)
 At CVS tunnel limit of 6×10^{11} /kWh fulfilled. Small contribution of 10-23 nm TP versus CVS: lower number at tailpipe, both for 10nm and 23 nm
 crankcase emission contribute and might add uncertainty
 Investigations if 10nm is needed for HD in China
 DPF have higher efficiency at 10 nm points towards no need.
 During regeneration there are larger particles, points towards no need for 10 nm
 Discussion: Reason for higher number at CVS could be background PN from dilution air at CVS. Or, contamination from HD CVS tunnel (check tunnel temperature). Losses at the sampling line of the tailpipe system. Better penetration efficiency of the system at CVS with evaporation tube, compared to the system at tailpipe with catalytic stripper
 Trend is seen at both, 10 nm and 23 nm instruments

- PN tailpipe sampling for HDE. (Barouch Giechaskiel)
The main open points from the circulated document:
- Should CVS results be corrected for amount tailpipe sampling?
 At GTR15 no correction, if $Q_{ext} < 0.5\%$ of Q_{exh}
 Should gas and PN probe be shared? Proposal to keep separated
 Tailpipe sampling: direct hot sampling, or cold dilution $T > 20^{\circ}C$ and description of sampling line (heated $> 140^{\circ}C$, or insulation of < 26 cm)
 sampling line losses?
 Proposal: Residence time < 1 s until PND0, or VPR under cold dilution, no length requirement (could be 3 m based on the residence time). Insulated if $L < 10$ cm, heated at $> 150^{\circ}C$ if $L > 10$ cm

- Potential topics for future research

- Total particles

AGVES Meeting: would be interested in total particles. PM also covers the total particles. Solid particle might not cover some semivolatiles eg during regeneration
 during regeneration volatiles increase to 10^{14} # /km at CVS, not at tailpipe (10^{12} #/km) => Could be artefact of transfer hose releasing deposits at elevated temperature
 Conclusion: measurements total and non-volatile in parallel to check necessity

Discussion:

Bob Anderson: US would only be interested if total number is included. Measurement at CVS likely not possible. Also, it will be a big challenge for tailpipe sampling.

Shirish Shimpi: total was not possible at PMP PN procedure (Rainer Vogt): When the PMP PN procedure was decided, both, the better measurement repeatability and the potential impact of solid particles was considered.

(Other participant): One should also investigate the health relevance and the representativeness compared to the true emitted total particles

Hua Karlsson: Best available technology (DPF) is already in place. No technology for reducing further total particle number. JRC is doing this research work. This is not under the PMP mandate. Work could be of interest if questions arise why solid particles are

counted, and not total.

- Common calibration procedures
Nothing done by JRC, yet. Next Telco to be updated by JRC.
Comment from participant: Robust procedure could be a priority work
JRC is doing research on these topics – the topic will be addressed
in the next telco.

3. Discussion (all)

PN PEMS: New experimental work may be done after Mar 2021.

Technical Report needed for exhaust sampling versus CVS sampling?

Giorgio Martini will clarify if needed.

New documents will be prepared (JRC) taking into account the received comments
and the discussion, then circulated to the group. TBD if another WEB CONFERENCE
is needed

4. Any other Business

NONE