

76th UNECE GRPE session

PMP IWG Progress Report



UNITED NATIONS

Geneva, 10th -11th January 2018

PMP meetings in 2017

- 2017-01-11: PMP 42nd (GRPE Geneva summary)
 - 2017-03-15/16: PMP 43rd
 - 2017-05-22: PMP 44th (telco)
 - 2017-11-7/8 PMP 45th
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- NEXT F-2-F MEETING: **16th – 17th May 2018** (Location: JRC Ispra)

EXHAUST PARTICLE EMISSIONS

Main open points

- Round Robin Sub-23nm
- Raw exhaust sampling
- Round Robin PNC (Particle Number Counter)
- Horizon 2020 projects
- Particle emissions from gas engines
- WLTP low temperature PN testing (waiting for specific questions from WLTP Low Temp task force)

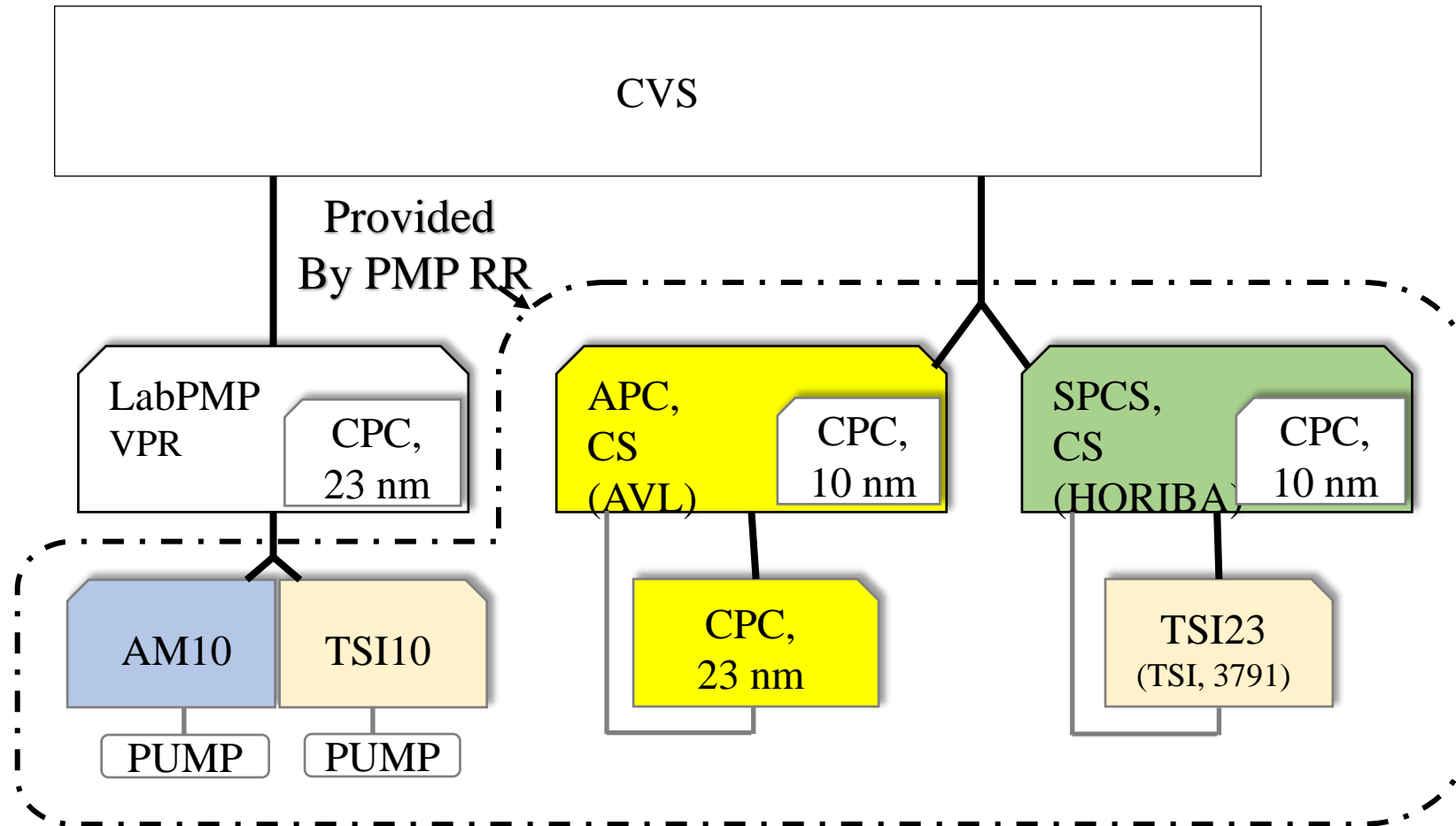
Sub23 nm particles

- Development of a sub23nm (cut-off size: ~ 10 nm) particle number measurement procedure based on the existing PMP methodology conveniently adapted.
- Main purpose: Monitoring particle emissions of new engine/after-treatment technologies.
- Assessment of the repeatability/reproducibility of the proposed particle counting methodology by means of a “round robin”.

Investigation of sub23nm protocol

- Two systems with CS and 10nm CPC to circulate
- Each lab PMP system plus a 10nm CPC (to circulate)
- One golden vehicle (Opel Astra GDI – no GPF)
 - The PMP group would have preferred 6d technology for the golden vehicle, this was not available in the program timing and will need investigation later in 2018 when it becomes available
- Different labs will test different engine technologies

RR measurement equipment



Details about the upcoming RR

- Measurements will be conducted between 11/2017-05/2018 + Japan
- 6 laboratories within EU, 1 in Switzerland and 1 in Japan

Laboratory	Month
Lab1	November
Lab2	December
Lab3	January
Lab4	February
Lab5	March
JRC	
Lab7	April

Test protocol

- Tests are aimed to be conducted within 3 measurement days
 - ✓ 3 cold WLTCs and 5 hot WLTCs
 - PM1 @ cold start WLTCs
 - ✓ 1 steady speed test
- The test results are used for
 - ✓ Evaluating PN10 measurement possibilities with existing LabPMP
 - ✓ Gathering PN23/PM10 data for vehicles
 - ✓ Compare results between the laboratories
- The steady speeds are included in the protocol to
 - ✓ Compare sub23nm fractions from the steady points at different labs.
 - ✓ Stability or setup differences can be better understood

PN Counting from Raw Exhaust via Fixed Dilution

- Interest in this approach confirmed by some engine manufacturers and some instrument manufacturers
- 01 Series of amendments to Reg. 132 already includes such possibility but the procedure is not defined
- Preliminary results generated by the JRC show 20% differences - Data presented by the industry during the 43rd meeting confirms good correlation
- A well designed experimental programme is needed to address remaining open points – availability of engine and test bench?

PNC Calibration Round Robin

- Confirm that the k factor can be included in the final counting efficiencies
- Investigate the possibility/impacts regarding changing the calibration material
- Investigate the possibility to calibrate at 10 nm

- Main results presented in the 43rd PMP meeting

- Draft final report finished - Circulated among participants for comments on 22nd of October
- Final version: End of January
- Teleconference (beginning of February?) to agree the next steps

HORIZON 2020 projects

- The group is monitoring the progress of the three projects funded by EU under the H2020 scheme
 - DownToTen
 - PEMS4nano
 - SUREAL-23
- These projects have the objective of investigating (nature, composition,...) sub23 nm emissions and to develop new test procedures to measure these particles
- Representative of the consortia provide regular updates to PMP group – Presentations available on the PMP website

Gas engine testing

- SwRI gave a presentation in the 45th PMP meeting with the results of a very interesting experimental campaign comparing a TWC equipped CNG and a SCR/DPF equipped diesel engines
- Main conclusions:
 - CNG engine produced 2-8 times higher PN emissions
 - CNG engine produced 5-10 times higher sub25 nm particles and ash
- Some results from JRC confirm these results.
- Further investigation on light duty and heavy duty required during 2018, including if possible in the sub-23nm RR

Additional topics to be addressed?

During the yesterday PMP meeting a few points were raised:

- Impact of fuel quality on PN emissions
- Effect of biofuels of different nature blended with conventional fuels on PN emissions

These topics are not included in the current mandate of PMP.

Proposed approach: The PMP IWG will discuss in the next f-2-f meeting what can be done and present in the June session a proposal to be taken into consideration by GRPE for a possible extension of the mandate

NON-EXHAUST PARTICLE EMISSIONS

STEP 1 - DEVELOPMENT OF A BRAKING TEST CYCLE

- WLTP Database Analysis and Presentation of basic statistics related to braking conditions (Concluded)
- Comparison of WLTP data with Existing Industrial Cycles (Concluded)
 - Reports with detailed analyses are available on the PMP website
- Creation of a dedicated Task Force – TF1 to accelerate the work (Work Currently on-going)

BRAKING TEST CYCLE – CURRENT STATUS

- Development of a new (WLTP based) and backup (LACT based) cycle
(Concluded)
 - ✓ FORD has developed the WLTP based profile in collaboration with Mr. Heinz Steven. The profile is being validated by FORD both on-road and on the dyno
 - ✓ A short LACT based schedule has been developed in the framework of the H2020 LOWBRASYS Project and will serve as a back-up cycle

BRAKING TEST CYCLE – CURRENT STATUS

- Validation of the cycles (repeatability assessment between dyno and real-world) and Round robin (reproducibility assessment on different dynos) (Initial deadline: March – April 2018)
- ✓ A round robin has been scheduled for the next months with the purpose of validating both braking schedules in terms of temperature. 8 labs will participate and the RR is expected to finish in mid 2018

STEP 2 - BRAKE DUST SAMPLING AND MEASUREMENT

- Comparison of available sampling methodologies and selection of the appropriate one (Concluded)
 - Rig testing selected - the details of the rig set up are still under discussion with a number of different proposals under evaluation
- Creation of a dedicated Task Force – TF2 to accelerate the work (Work Currently on-going)
- During the yesterday meeting several questions led to the conclusion that a document summarizing/explaining the rationale of the decision taken is needed

STEP 2 - BRAKE DUST SAMPLING AND MEASUREMENT

TASK FORCE 2 – On-going Activities

- Comparison of existing systems/test rig configurations (Deadline: January 2018)
- Selection/definition of testing parameters (Deadline: March 2018)
- Validation of the selected configuration(s) & measurement methodologies (Deadline: To be defined depending on the progress)

SAMPLING AND MEASUREMENT – Challenges

- There is a common understanding that both PM_{10} and $PM_{2.5}$ as well as PN emissions should be investigated
- Challenge: Optimal layout and sampling conditions might be different for mass and PN measurement!
- A compromise could be needed

How to take into consideration other technologies capable of reducing brake wear emissions?

- The test rig approach clearly focuses only on the brake system
- Other technologies (e.g. regenerative braking, v-2-v communication,...) may have the potential to reduce brake wear PN emissions
- How to assess these technologies?
- Proposed approach: The topic will be discussed in the next f-2-f meeting and a proposal will be presented in June

Particles from tyre and road wear

- Due to the complexity of the matter, it was decided to continue only with an information gathering and knowledge monitoring activity
- No dedicated session in the last 3 PMP meetings
- In the 45th PMP meeting it was decided to dedicate a session to this subject in one of the next f-2-f meeting (either in May or November)
- Main purpose: Present an overview of the latest studies available



Any questions?

You can find us at

giorgio.martini@ec.europa.eu - Chairman of UNECE PMP IWG

chosier@ford.com - Technical Secretary of UNECE PMP IWG