DRAFT Minutes

PMP 54th session (hybrid meeting)

9th Jan 2024, 14:30-17:30 CET

Palais des Nations (Room E XXII)

0. Introduction & Welcome

Barouch Giechaskiel (BG, JRC, PMP Chairman) and Rainer Vogt (RV,OICA/Ford/Technical Secretary PMP) welcomed about 140 participants.

1. Review Meeting Minutes last PMP meeting 22.Nov.2023

RV reviewed the meeting minutes of the last PMP Meeting, 22.Nov.2023 which are available at the UNECE website. Comments may be sent to RV/BG within the next two weeks.

2. Exhaust PN calibration topics

a.) CPCs Round Robin 2 status

BG reported that a Round Robin started at the end of 2023 with the aim to determine one material for calibration or correlation curves. CAST, PAO, silver generator and other generators will be tested with two 23 nm CPCs and one 10 nm CPC.

3. Tyre emission measurements

a.) Drum method - O. Hidenori (OH, JASIC)

OH, presented the indoor drum method and described the degree of impact affecting tyre abrasion. The indoor drum method controls most influencing factors. One test cycle of 250 km is repeated 20 times. Vehicle drive cycle is converted to longitudinal and lateral forces during drum testing. Ambient temperature is 25±5°C
Test program: Reference and candidate tire may be tested at the same time, if 2 position drum is available. Abrasion rate of reference tire is 50 – 190 mg/km/t
11 candidate tires were tested with 4 repetitions that gave various abrasion rate indices. First correlation data of indoor and vehicle test methods was presented (see presentation).

b.) On-road method

BG summarized the convoy method which has been submitted as Annex 10 to UNECE Reg. 117 (see presentation). Further refinements in the method are being prepared to be submitted as informal document. Tyre preparation is described. Convoy including reference tyre is run for a total of 8000 km measurement. The abrasion rate is the tyre mass lost per distance and load on tires. The Abrasion Index of Candidate Tyre is the ratio of abrasion rate of candidate tyre divided by the reference tyre abrasion rate.

Bill Coleman (BC, OICA/VW): the method was not seen at GRPE. It is for approval by GRBP.
BG: Method for approval to GRBP. OICA and all stakeholders are invited to comment. The TFTA chairs requested for GRPE's feedback due to 31.01.2024 during the GRPE session.
Theo Grigoratos (TG/JRC and chair TFTA): The technical work is carried out at TFTA – reporting to GRBP. Elodie (Chair TFTA, UTAC) will report to GRPE. The formal commenting and discussion takes place in GRBP. The technical elements are addressed at the TFTA.
BC gave further examples, i.e. GPS 10Hz sampling rate is not realistic and the option to have a valid test even if [1500] km of the GPS data is missing is too relaxed.
TG: The opinion from vehicle manufacturer is largely lacking. An OICA position/response until 25.1.24 (update after GRPE session – deadline for comments is set to 31.01.24) would be welcome.

c.) Literature study on tyres emission factors (Leon-T)

BG presented the objectives and structure of LEON-T. BG presented the release and transport of tyre wear particles in the environment. Mitigation measures, i.e. reduction of particle generation, collecting of particles in ambient by asphalt surfaces, and reduction of exposure by planting vegetation, street cleaning and treating road runoff were stated.
Abrasion rates studies are very limited. From (9) measurement studies (4) were from 1970s, one in 2004 and only two recent studies (2019-2021, ADAC). Leon-T collected data from recent studies (not summarised in other papers and reports). Abrasion rates plotted as mg/km and mg/km/t are shown in the presentation. For C1 tyres the abrasion rate was observed as 110 mg/km or 68 mg/km/t.
Imak Khalek (IK, SWRI): Is the report available? BG: yes presentation will uploaded (DONE) and paper is available via link in the presentation.

4. Overview of amendments to Brakes GTR 24

a.) JRC

TG presented PMP work on work for first amendment (see presentation). It includes the addition of requirement for testing replacement parts, an updated table 5.3 of brake friction share coefficients, summary of Annex C on determination of vehicle specific brake friction coefficients, provisions for carbon ceramic discs with updated lower temperature bounds. Provision for testing brake particle filters are included and shall be further amended in the next amendment to GTR-24. Finally, other minor updates have been summarized.

b.) OICA

RV, Jürgen von Wild (JvW, OICA/BMW), David Hesse (DH, OICA/VW), Dimitris Tsokolis (DT, OICA/Toyota) presented slides on equivalency of Method B and Method D (CAN), a Statement to Brake Particle filters testing, Vehicle selection / Family building, and Fuel Cell vehicles (see presentation)
TG: if more data is available a revision of the correlation criterion of the methods could be considered. Refinement to the testing of brake particle filter can be dealt with and the improvement of the procedure in the next amendment. Definitions for FCEVs need to be refined with other stakeholders. Friction share of FCEVs could be dealt in future amendment and depending on data availability.

5. Health effects of brake wear particle emissions (Q. Vroom, TNO)

G.Q. Room (GR, TNO) stated literature on critical temperature to produce ultrafine particles. On-road simulated temperatures following the WLTP Brake could be 65°C higher than defined for the brake dyno test. TNO found over 0.30 kwh/km during own driving as compared to WLTP Brake Trip (0.18 kWh/km) (see presentation).
Health effect of particles would be related to PM size, material, oxidative potential.
In assays brake wear PM (per ug of particle matter) showed 3-27 higher oxidative potential compared to Diesel generator, or petrol two-wheeler PM.

RV commented that the observed temperatures during WLTP appear to be unusual high. The WLTP brake temperatures were compared to on-road vehicle WLTP brake tests and compared well with the temperatures at the brake dyno (see Mathissen et al Wear 2018).
GR: Cooling adjustment was done at dyno. Vehicle brake temperature were not measured, but simulated.
TG: The PMP used real-world data from 8 vehicles to derive the cooling adjustment parameters. The temperature presented seem not to be realistic unless a very small brake is considered. Does the calculation account for the parasitic losses and the brake force distribution? Additionally, deceleration data is questionable. Where and how was the driving performed?
GR: Regarding the calculation, we need to check the various parameters before replying. Driving was done in NL.
TG: The oxidative potential studies the influence of transitional metals (e.g. Cu, Fe, etc.); therefore, it is expected to see higher effects for brake particles compared to other types of particles. The oxidative potential is per mass of PM. The actual PM emission factor should also be considered.

Via Chat (Raquel Cordeiro, OICA / Volvo Cars):
Do you have any correlation or estimation about brake particle emissions relative to DALYs? DALYs for a disease or health condition are the sum of the years of life lost to due to premature mortality (YLLs) and the years lived with a disability (YLDs) due to prevalent cases of the disease or health condition in a population.
QR: Unfortunately, I don't have an answer on the correlation between brake emissions and DALY.

Via Chat (Martin Petersson): Directive 2000/53/EC of the European Parliament and of the Council of 18 September 2000 on end-of life vehicles has limits on other materials aside from asbestos.

6. TFs updates

TG: TF-3 participants need to send interest to participate to TG by Jan 20 (see presentation). The next TF-3 meeting will take place online on 18.1. The next F2F meeting will be on 15.02 at BMW in Munich. Please send interest to TG and JvW by email until 20.1.2024.
TF-5 will kick-off on 25.01. OICA has provided a presentation on issues for HDVs during last PMP meeting. Caltrans/ERG/Link (Carlos Agudelo) presented data collected in the framework of a CARB project in this PMP meeting (see Agenda point 7.). The progress from TF-5 will be shared in PMP forum.

7. Brake Emissions from Heavy Truck Vocations based on State of California Report # CA21-3232 (C. Agudelo, Caltrans/ERG/Link)

Carlos Agudelo (CA, Link) reported on the project (see presentation). CA described the vehicles, activities and emission aspects. The range of vocations and braking systems were analysed.
Brake wear index function represents the fleet emission per vehicle category.
The brake temperature range was around 60-180°C. A brake temperature model was developed by the University of Michigan and the emission test matrix was described.
Link upgraded a GTR-24 test stand for testing HD brakes.
Example test data and correlation for TPN was shown (see presentation). The particle size distribution was similar to LD brake size distribution.
Some comments from the Aersosolfd project are included, i.e. drive cycle design. Testing is carried out without the use of retarders which is prohibited within city limits (US).

RV: Which road load data was used? Was it for constant as LD, and do you expect an impact?
CA: Realistic road load was taken into account. It is an important topic to be further investigated.

8. Introduction to Brake technology (J M Gomez, BRL)

J M Gomez (JG, BRL) presented on rotating brake pad with fixed and cooled disk. (see presentation). Cooling could be liquid, or air cooling. Brake particles could be filtered by passive filter. No emissions data was presented.

9. Any other Business

CA: How will COP be handled?

TG: This is no topic for the GTR-24. It would rather be handled during EURO-7.