
**Proposal for the technical report on the development of
Amendment 2 to UN GTR No. 19 on Evaporative emission test
procedure for the Worldwide harmonised Light vehicles Test
Procedure (WLTP)**

Technical report on the development of Amendment 2 to UN GTR No. 19 on the Evaporative emission test procedure for the Worldwide harmonized Light vehicles Test Procedure (WLTP EVAP)

I. Introduction

1. During the seventy-fourth session of the Working Party on Pollution and Energy (GRPE) in January 2017, the Evaporative emission test procedure for the Worldwide harmonised Light vehicles Test Procedures (WLTP EVAP) Task Force (TF) submitted a working document and an informal document for the consideration of GRPE.
2. The working document ECE/TRANS/WP.29/GRPE/2017/3 (Proposal for a new UN Global Technical Regulation on Evaporative emission test procedure for the Worldwide harmonized Light vehicles Test Procedures), UN GTR No. 19, contained the new proposed test procedure to measure evaporative emission from non-sealed fuel tank systems.
3. Non-sealed fuel tank systems are mostly used in conventional vehicles with an internal combustion engine. Since these vehicles have a high chance of purging the fuel vapours inside the fuel tank systems and the canister(s) into the internal combustion engines, the pressure inside the fuel tank generated by fuel vapours is well maintained at low level.
4. From late 2016 to September 2017, thirteen meetings (including three face-to-face meetings and two drafting meetings) were held and the WLTP EVAP task force worked to include a test procedure covering the sealed fuel tank systems in UN GTR No. 19. These systems are expected to be used in the hybrid electric vehicles driven mainly by electric engines and in the future conventional vehicles.
5. Amendment 1 to UN GTR No. 19 complements the text of the UN GTR not only by adding descriptions of the test procedure for sealed fuel tank systems but also by adding other provisions related to non-sealed fuel tank systems which were raised along the discussions on sealed fuel tank systems.
6. From April to September 2018, four meetings (including one drafting meeting) were held and the WLTP EVAP task force worked to include the calibration requirements and intervals for test equipment, and the equation for the variable-volume enclosures in UN GTR No. 19. Also, improvements to clarify the requirements were made.
7. The discussions of Amendment 2 were led by experts from Japan (Ms. Mayumi "Sophie" Morimoto) and the European Commission's Joint Research Centre (Giorgio Martini). The drafting of the text was led by the experts from the European Commission (Serge Dubuc and Rob Gardner).

II. Text improvements

A. Objectives

8. After the issuance of the original UN GTR No. 19 and Amendment 1 to it, certification tests started in Europe. During those certification tests using this new GTR-based procedures, several issues which needed improvements of the GTR text were

identified. These issues were mostly caused by misinterpretation from missing equation and explanations in the text.

9. Therefore, WLTP IWG decided to keep EVAP task force active to solve those issues.

B. Topics discussed

10. The following points were discussed during WLTP EVAP task force meetings:

- (a) Calibration requirements and intervals for test equipment
- (b) Equation for the variable-volume enclosures
- (c) Improvements of the texts
 - (i) Clarification of aged carbon canister and when to install
 - (ii) Clarification and review of test equipment
 - (iii) Clarification and review of requirements of an evaporative emission family
 - (iv) Clarification of "carbon canister"
 - (v) Change the term "carbon canister" used to catch depressurisation puff loss overflow

C. Amendments introduced in UN GTR No. 19

1. Calibration requirements and intervals for test equipment

11. During the 22nd WLTP IWG, one of the manufacturers mentioned that the calibration requirement is missing from UN GTR No. 19. The task force members confirmed that the requirement should be included in GTR.

12. Japan made a text proposal to include the calibration requirements and its intervals into the paragraph on test equipment. In that proposal, the texts mostly referred to the requirements written in UN Regulation No. 83, the same as the requirements for test equipment. Some members proposed to change the reference to UN GTR No. 15 instead. After discussion within members, they decided to keep references to UN Regulation No. 83 because some equipment does not require the same severity as required for the Type 1 test.

13. For equipment not written in both UN Regulation No. 83 or UN GTR No. 19, the task force members decided to calibrate the equipment before its initial use and at the appropriate service intervals thereafter.

2. Equation for the variable-volume enclosures

14. During the 22nd WLTP IWG, one of the manufacturers requested to add the alternative equation for the variable-volume enclosures. This equation is already used in US EPA and CARB regulations.

15. The variable volume enclosure is the enclosure which adjusts the volume by moving the roof or internal/external bags during temperature changes. With this feature, the pressure and the number of molecules inside the enclosure remains the same even during temperature changes. The alternative equation reflects this feature, assuming no gas is removed during the diurnal test.

16. The task force members discussed if this alternative equation should be added to UN GTR No. 19. After extensive discussions on understanding the feature of the variable volume enclosure, the task force decided to add the equation as an alternative option.

17. During the 23rd WLTP IWG, India asked to clarify where the fixed value of 1.42 m³, which is subtracted from enclosure volume in the equation, comes from, and review the value. It is the assumed volume of the vehicle exteriors, the volume of the vehicle with the windows and the luggage compartment open. The manufacturer may choose to use this fixed value or the actual measured volume. This fixed value originally came from US EPA/CARB regulation and existed from original text of UN GTR No.19. EPA tracked down where this number came from and clarified this value was decided a few decades ago with good engineer judgement when evaporative emission tests were introduced. EPA also mentioned that no manufacturer requested to use measured value. Therefore, task force members decided to keep it as it is.

3. Improvements of the texts

3.1. Clarification of aged carbon canister and when to install

18. During the 23rd WLTP IWG, Japan requested to clarify what is an aged carbon canister and when it should be installed. Japan said Paragraph 3 of Annex 1 to UN GTR No. 19 might lead to misunderstanding that the measurement of Butane Working Capacity (BWC) 300 is considered to be part of the process to age the carbon canister. This paragraph is also unclear if the aged carbon canister should be installed during the run-in.

19. The task force members confirmed that the aged carbon canister shall not be installed to vehicle during the run-in period in order to keep the condition of aged carbon canister the same as before every test. Therefore, task force members decided to add the text to avoid the aged carbon canister to be installed during the run-in period. For more clarification, members decided to add another text that the aged carbon canister shall not be installed until the start of the first fuel drain and refill procedure.

20. The task force members also confirmed that the measurement of BWC300 is not part of process to age the carbon canister. Therefore, members decided to add paragraph numbers to clarify what is the process of ageing the carbon canister.

3.2. Clarification and review of test equipment

21. During the 23rd WLTP IWG, Japan mentioned that there is a corrigendum to the requirement of a variable volume enclosure, which is the limit of the difference between the enclosure internal and the barometric pressures.

22. UN GTR No. 19 refers to UN Regulation No. 83 for the requirement of variable volume enclosure and this requirement was originally based on US EPA regulation. In the EPA regulation, the limit is a maximum value of ± 2.0 inches of water, which equals to around ± 0.5 kPa. However, in UN Regulation No. 83, the limit is ± 5 hPa.

23. At first, the task force members decided to correct the value in UN GTR No. 19. However, to avoid separate requirements to test equipment among UN GTR No. 19 and UN Regulation No. 83, OICA (Organisation Internationale des Constructeurs d'Automobiles) requested to change UN Regulation No. 83. Other requirements of test equipment in the latest UN GTR No. 19, correcting UN Regulation No. 83 requirements, were deleted from UN GTR No. 19 and will be expected to be reflected in UN Regulation No. 83 in the 78th GRPE.

24. During the review of test equipment, one of member mentioned that the requirements in former paragraph 4.8. in Annex 1 to Amendment 1, additional equipment

and former paragraph 4.9. in Annex 1 to Amendment 1 (new paragraph 4.8. in Amendment 2) carbon canister weighing scales in Annex 1 is unclear.

25. In former paragraph 4.8. in Annex 1 to Amendment 1, additional equipment, the accuracy of absolute humidity is required. Since the humidity is not measured during the evaporative emission test, the task force members decided to delete the whole paragraph.

26. In former paragraph 4.9. in Annex 1 to Amendment 1, (new paragraph 4.8. in Amendment 2), carbon canister weighing scale, it was unclear what this scale is used for. This requirement was added in Amendment 1 to clarify the requirement for scale weighing the carbon canister with depressurisation puff loss overflow. Since this carbon canister weight shall be no change in the weight within the tolerance of ± 0.5 gram, the accuracy of the weighing scale was clarified. However, the text can be interpreted that this accuracy applies to all weighing scale, such as a scale used to a measure 2-gram breakthrough. The task force members decided to clarify the text.

3.3. *Clarification and review of requirements of evaporative emission family*

27. During the 23rd WLTP IWG, Japan mentioned that it is difficult to understand the requirement in paragraph 5.5.1. (b). It said "vapour hose material, fuel line material and connection technique" should be identical to categorise different vehicles in same evaporative emission family. However, it was difficult to differentiate if the connection techniques of both the vapour hose and fuel line should be identical or only if the connection technique of fuel line should be identical.

28. The task force members discussed and because of high pressure in fuel line but not with vapour hose, they confirmed that the connection technique only refers to the fuel line. To clarify the text, the bullet point on "vapour hose material, fuel line material and connection technique" was expanded to 2 bullet points.

29. Along with this discussion, one of the members mentioned that the evaporative emission family was slightly modified in EU-WLTP and this would cause disharmonisation. In the EU-WLTP discussion, it was confirmed that the vapour hose material among the family and the fuel line material among the family can be different but technically equivalent. This was also discussed with the task force members and as a result, members decided to reflect EU-WLTP requirement in UN GTR No. 19.

30. During the 24th WLTP IWG, India requested to clarify that the technical equivalency shall be demonstrated by the manufacturer to the responsible authority. Therefore, during the drafting meeting, text to clarify it is added to reflect this.

3.4. *Clarification of "carbon canister"*

31. During the review of UN GTR No. 19, it was found that the words "carbon canister", "canister", and "vapour storage unit" were used for describing the same component. Therefore, the task force members decided to harmonise on using "carbon canister".

3.5. *Change the term "carbon canister" used to catch depressurisation puff loss overflow*

32. In Amendment 1 to UN GTR No. 19, the carbon canister used to catch depressurisation puff loss overflow was referred to as an "auxiliary canister." The explanation of this carbon canister was included in paragraph 4. Test equipment to Annex 1 of this GTR. Along with the discussion, this wording might mislead to understand as a different canister and therefore this term was deleted from that paragraph. The explanation of this carbon canister was moved to paragraph 6.6.1.8.1. to Annex 1, which describes the procedure to measure the depressurisation puff loss overflow.