

**INFORMAL GROUP ON GASEOUS FUEL VEHICLES
Within the UN GRPE (WP29)
PROPOSED AMENDMENT**

Name of Organisation submitting Amendment/Work Item

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Regulation name and reference number

REGULATION N. 115 (retrofit)

Specific language for Amendment/Work Item

ENGLISH

Name of Amendment/Work Item

Proposed Amendment to the Total Hydrocarbon Emissions Limit Value for Natural Gas Vehicles

Amendment to Reg. ECE-ONU N.115

Amend paragraph 6.2.2.5.1.3, add the following to read:

"6.2.2.5.1.3. "..... by the deterioration factors.

The HC emissions shall be measured as NMHC and MHC (CH₄). The mean value of THC emission shall be calculated as THC_e equivalent as follows:

$$\text{THC}_e = K * \text{MHC} + \text{NMHC}$$

Where K = 0,42 (see rationale)

The value of THC_e shall be compared with HC or THC emission limits as defined in the original vehicle type approval Regulation, and the value of NMHC shall be compared with NMHC emission limits, as defined in the original vehicles type approval Regulation.

Amend paragraph 6.2.2.5.1.4.2, add the following to read:

"6.2.2.5.1.4.2 "..... by the deterioration factors.

The HC emissions shall be measured as NMHC and MHC (CH₄). The mean value of THC emission shall be calculated as THC_e equivalent as follows:

$$\text{THC}_e = K * \text{MHC} + \text{NMHC}$$

Where K = 0,42 (see rationale)

The value of THC_e shall be compared with HC or THC emission limits as defined in the original vehicle type approval Regulation, and the value of NMHC shall be compared with NMHC emission limits, as defined in the original vehicles type approval Regulation.

Rationale:

- Considering that the methane retrofit kit is normally installed on gasoline vehicles, equipped with gasoline optimized catalyst, a different method for calculating THC emissions is proposed. The HC emissions shall be measured as NMHC and MHC (CH₄). The mean value of equivalent THC emission, to be compared to the limit, is calculated considering that the original vehicle is equipped with gasoline optimized catalyst instead of a methane optimized catalyst. The THC_e equivalent shall be calculated as follows:

$$\text{THC}_e = K \cdot \text{MHC} + \text{NMHC} \quad \text{where:}$$

$$K = \frac{1 - \eta_M}{1 - \eta_G} \quad \text{where:}$$

η_M = is methane conversion efficiency of a Methane Optimized Catalyst

η_G = is methane conversion efficiency of a Gasoline Optimized Catalyst

The value of K is determined according experimental tests with internal combustion engine fuelled with methane, alternatively equipped with Methane Optimized Catalyst and with Gasoline Optimized Catalyst.

The mean values of the conversion efficiencies measured are:

$\eta_M = 0,95$ for methane optimized catalyst

$\eta_G = 0,88$ for gasoline optimized catalyst

so the value of K is = $\frac{1-0,95}{1-0,88} = \frac{0,05}{0,12} = 0,42$

- The highly stable CH₄ molecule is difficult to convert, especially for retrofit systems on a vehicle with a catalyst designed for petrol. CH₄ has very low reactivity and is not toxic or carcinogenic and not considered as an ozone precursor.
- European, U.S. and California precedents exist for an NMHC standard. An NMHC standard has been recognized in Europe for heavy duty vehicles in 1999 in an amendment (1999/96/EC) to 88/77/EEC; in the U.S. Clean Air Act Amendment of 1990; and in California (identifying separately non-methane organic gases).

Please submit comments to:

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