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**Regulation No. 110 (Specific equipment for CNG)**

**and Regulation No. 67 (Equipment for liquefied petroleum gas (LPG))**

### **Proposal for amendments to Regulations No. 110 and No. 67**

### **Submitted by the expert from the CLEPA**

The text reproduced below was produced by the expert from European Association of Automotive Suppliers (CLEPA) to introduce type approval provisions for “valve control at stop-start”. The modification to the current text of the Regulation is marked in bold or new or strikethrough or deleted characters.

**I. Proposal Regulation No. 110: “Valve control at stop-start”**

*Part I, paragraph 2., insert new paragraph 2.27 to 2.29. to read:*

- 2.27. “stop-start” means a system which shuts off the engine automatically when the vehicle comes to a halt.**
- 2.28. “hybrid-electric system” means a stop-start system which also shuts off the engine when the vehicle drives electrically.**
- 2.29. “start-stop systems with coasting” means a stop-start system which also shuts off the engine when the vehicle drives and the accelerator pedal is released.**
- 2.30. “commanded stop phase” defines the period of time during which the engine is allowed to start automatically.**

*Part I, paragraph 4.1., insert new paragraph 4.1.1 to read:*

- “4. MARKINGS
- 4.1. The sample of specific component submitted for approval shall bear the trade name or mark of the manufacturer and the type, including one concerning designation regarding operating temperatures (“M” or “C” for moderate or cold temperatures as appropriate); and for flexible hoses also the manufacturing month and year; this marking shall be clearly legible and indelible.
- 4.1.1 In addition to provisions of paragraph 4.1., one of the following additional marks shall be used for automatic cylinder valve which comply with Annex 4A paragraph 2.2.4:**
- i. “H1”**
  - ii. ”H2”**
  - iii. “H3”**

*Part II, paragraph 17.5.1., insert new paragraph 17.5.1.3 and 17.5.1.4 to read:*

- “17.5.1. Automatic valve
- 17.5.1.1. An automatic cylinder valve shall be installed directly on each container.
- 17.5.1.2. The automatic cylinder valve shall be operated such that the fuel supply is cut off when the engine is switched off, irrespective of the position of the ignition switch, and shall remain closed while the engine in not running. A delay of 2 seconds is permitted for diagnostic.

- 17.5.1.3. Notwithstanding the provisions of paragraph 17.5.1.2., the automatic cylinder valve may stay in an open position during the commanded stop phase of an automatic stop-start or hybrid-electric system.**
- 17.5.1.4. If the automatic valves are closed during commanded stop phases, one of the following provisions shall apply:**
- a) A functional check for each valve shall be carried out once per driving cycle. In the event that the functional check indicates that the valve is not closing, an indicator shall clearly inform the driver.**
  - b) The valves shall comply with Annex 4A, paragraph 2.2.4.”**

*Annex 4A, insert new paragraph 2.2.4 to read:*

- “2.2.2. The automatic valve shall be so designed as to be leak-proof at a pressure of 1.5 times the working pressure (MPa) (see Annex 5B).
- 2.2.3. The automatic valve, being in the normal position of use specified by the manufacturer, is submitted to 20,000 operations; then it is deactivated. The automatic valve shall remain leak-proof at a pressure of 1.5 times the working pressure (MPa) (see Annex 5B).
- 2.2.4. The automatic cylinder valve for use in stop-start or hybrid-electric systems according to paragraph 17.5.1.4. b) shall be submitted to the following numbers of operations during test according 2.2.3.:**
- i. 200,000 cycles (mark “H1”) for stop-start systems;**
  - ii. 500,000 cycles (mark “H2”) for hybrid-electric systems;**
  - iii. 1,000,000 cycles (mark “H3”) for stop-start systems with coasting;**

**Notwithstanding, the valves complying with (b) shall be deemed to satisfy (a), and the valves complying with (c) shall be deemed to satisfy (a) and (b).”**

- 2.2.5. ~~2.2.4.~~ The automatic valve shall be so designed to operate at temperatures as specified in Annex 5O.”**

*Annex 4H, insert new paragraphs 2.1.1. and 2.1.2. to read:*

- “2.           Electronic control unit
- 2.1.           The electronic control unit can be any device which controls the CNG demand of the engine and establishes the cut-off of the automatic valve in case of a broken fuel supply pipe or in case of stalling of the engine, or during a crash.
- 2.1.1.       **Notwithstanding the provisions of paragraph 2.1, the automatic cylinder valve may stay in an open position during the commanded stop phase of an automatic stop-start or hybrid-electric system.**
- 2.1.2.       **If the automatic cylinder valve is closed during commanded stop phases and they do not comply respectively with Annex 4A, paragraph 2.2.4., a functional check of each valve shall be done once per each driving cycle. In the event that the functional check indicates that the valve is not closing, an indicator shall clearly inform the driver.**
- 2.2.       The switch-~~offing off~~ delay of the automatic valve after stalling of the engine may not be more than 5 seconds.”

## **II.     Justification Regulation No. 110: “Valve control at stop-start”**

Reference paragraph, 17.5.1.3., 17.5.1.4., Annex 4A and Annex 4H

The Start-Stop or hybrid-electric functionality of the engine will also be used in CNG vehicle systems to reduce CO<sub>2</sub> emissions. Thereby the number of opening/closing cycles of the CNG tank valves will be increased by a factor of up to fifty. The current regulation requires the valve to be closed when the engine is switched off. It is proposed to let the tank valves stay open in a commanded stop-start phase as it is the case for the idling phase of non stop-start vehicles. Thereby the same durability requirement as regards opening/closing cycles of the valves as for non-stop-start systems is preserved. The automatic cylinder valve may stay in an open position to assure a correct and save operation of the valve over life of the vehicle. If the automatic valves are closed during commanded stop phases then a functional check of each valve can be done once in each driving cycle to monitor that the valve is closing when commanded to do so over the life time of the vehicle. In the event that the functional check indicates that the valve is not closing, a visible or audible indicator shall clearly inform the driver. Thereby different durability requirements as regards opening/closing cycles for the type approval can be avoided.

If the automatic valves are closed during commanded stop phases and no functional check of each valve will be done once in each driving cycle the cylinder valves shall be type approved according the expected cycle number of the applied stop-start or hybrid-electric system.

If the functional check is used and is detected a valve which does not close the system is still protected by the excess flow device.

### III. Proposal Regulation No. 67: “Valve control at stop-start”

*Part I, paragraph 2., insert new paragraph 2.20 to 2.23. to read:*

- 2.20. “stop-start” means a system which shuts off the engine automatically when the vehicle comes to a halt.
- 2.21. “hybrid-electric system” means a stop-start system which also shuts off the engine when the vehicle drives electrically.
- 2.22. “start-stop systems with coasting” means a stop-start system which also shuts off the engine when the vehicle drives and the accelerator pedal is released.
- 2.23. “commanded stop phase” defines the period of time during which the engine is allowed to start automatically.

*Part I, insert new paragraph 4.4. to read:*

“4.4. In addition to provisions of paragraphs 4.1. and 4.2., one of the following additional mark shall be used for remotely controlled service valves and remotely controlled shut-off valves which comply respectively with Annex 3, paragraph 4.7, or Annex 7, paragraph 1.7:

- i. “H1”
- ii. ”H2”
- iii. “H3”

*Part II, insert new paragraph 17.6.1.3 to read:*

- “17.6.1.2. The remotely controlled service valve with excess flow valve shall be controlled such that it is automatically closed when the engine is not running, irrespective of the position of the ignition switch, and shall remain closed as long as the engine is not running.
- 17.6.1.3. **Notwithstanding the provisions of paragraph 17.6.1.2 the remotely controlled service valve may stay in an open position during the commanded stop phase of an automatic stop-start or hybrid-electric system.**
- 17.6.1.4 **If the remotely controlled service valve is closed during commanded stop phases one of the following provision shall apply:**
  - a) **A functional check of the valve shall be carried out once in a driving cycle. In the event that the functional check indicates that the valve is not closing, an indicator shall clearly inform the driver.**
  - b) **The valve shall comply with Annex 3, paragraph 4.7.”**

*Part II, insert new paragraphs 17.9.6. and 17.9.7. to read:*

- “17.9.4. The remotely controlled shut-off valve shall be installed such that the fuel supply is cut off when the engine is not running or, if the vehicle is also equipped with another fuel system, when the other fuel is selected. A delay of 2 seconds is permitted for diagnostic purposes.
- 17.9.6. Notwithstanding the provisions of paragraph 17.9.4., the remotely controlled shut-off valve may stay in an open position during the commanded stop phase of an automatic stop-start or hybrid-electric system.**
- 17.9.7. If the remotely controlled shut-off valve is closed during commanded stop phases one of the following provision shall apply:**
- a) **A functional check of the valve shall be carried out once in a driving cycle. In the event that the functional check indicates that the valve is not closing, an indicator shall clearly inform the driver.**
  - b) **The valve shall comply with Annex 7, paragraph 1.7.”**

*Annex 3, insert new paragraph 4.7 to read:*

- “4.7 The remotely controlled service valves for use in according with paragraph 17.6.1.4. b) shall be submitted to the following numbers of cycles during the endurance test of annex 15, paragraph 9:
- i. **200,000** cycles (mark “H1”) for stop-start systems;
  - ii. **500,000** cycles (mark “H2”) for hybrid-electric systems;
  - iii. **1,000,000** cycles (mark “H3”) for stop-start systems with coasting;”

*Annex 7, insert new paragraph 1.7 to read:*

- “1.7 The remotely controlled shut-off valve for use according paragraph 17.9.7. b) shall be submitted to the following numbers of cycles during the endurance test of annex 15, paragraph 9:
- i. **200,000** cycles (mark “H1”) for stop-start systems;
  - ii. **500,000** cycles (mark “H2”) for hybrid-electric systems;
  - iii. **1,000,000** cycles (mark “H3”) for stop-start systems with coasting;”

Annex 14, insert new paragraph 2.1 and 2.2 to read:

- “1. The electronic control unit can be any device which controls the LPG demand of the engine and establishes the cut-off of the remotely-controlled service valve(s), cut-off valves and fuel pump of the LPG-system in case of a broken fuel supply pipe or/and in case of stalling of the engine.
2. The switching off delay of the service cut-off valves after stalling of the engine may not be more than 5 seconds.
- 2.1 Notwithstanding the provisions of paragraph 1. and 2., the remotely controlled service valve and shut-off valves may stay in an open position during the commanded stop phase of an automatic stop-start system.**
- 2.2 If the remotely controlled service valve and shut-off valve are closed during commanded stop phases and they do not comply respectively with Annex 7, paragraph 4.7, or Annex 1, paragraph 1.7, a functional check of each valve shall be carried out once in each driving cycle. In the event that the functional check indicates that a valve is not closing, an indicator shall clearly inform the driver.”**

#### **IV. Justification Regulation No. 67: “Valve control at stop-start”**

1. Reference, paragraph 17.6.1.3 and Annex 14

The Start-Stop or hybrid-electric functionality of the engine will also be used in CNG vehicle systems to reduce CO<sub>2</sub> emissions. Thereby the number of opening/closing cycles of the CNG tank valves will be increased by a factor of up to fifty. The current regulation requires the valve to be closed when the engine is switched off. It is proposed to let the tank valves stay open in a commanded stop-start phase as it is the case for the idling phase of non stop-start vehicles. Thereby the same durability requirement as regards opening/closing cycles of the valves as for non-stop-start systems is preserved. The remotely controlled service valve may stay in an open position to assure a correct and save operation of the valve over life of the vehicle. If the automatic valves are closed during commanded stop phases then a functional check of each valve can be done once in each driving cycle to monitor that the valve is closing when commanded to do so over the life time of the vehicle. In the event that the functional check indicates that the valve is not closing, a visible or audible indicator shall clearly inform the driver. Thereby different durability requirements as regards opening/closing cycles for the type approval can be avoided.

If the automatic valves are closed during commanded stop phases and no functional check of each valve will be done once in a driving cycle the cylinder valves shall be type approved according the expected cycle number of the applied stop-start or hybrid-electric system.

If the functional check is used and is detected a valve which does not close the system is still protected by the excess flow device.