SGS 2- 3

14-16 January, 2008

Hydrogen and Fuel Cell Vehicles GTR (HFCV):
2nd Meeting of the sub Group Safety (HFCV – SGS)

Answers to the Questions Raised at the 1st SGS

Transmitted by the expert from JAPAN

Q: What is the reliability/durability of the hydrogen sensors?

A: Japanese requirements for hydrogen sensors are specified as follows.

Attachment 100 TECHNICAL STANDARD FOR FUEL SYSTEMS OF MOTOR VEHICLES FUELED BY COMPRESSED HYDROGEN GAS

3–9–2 A device shall be installed, that gives a warning to the driver that hydrogen gas is leaking when the hydrogen gas leakage detector detects hydrogen gas leakage.

3–9–3 A device shall be installed, that shuts off the supply of hydrogen gas when the hydrogen gas leakage detector detects hydrogen gas leakage.

3–9–4 The warning device shall be located at a position readily recognizable by the driver.

3–9–5 When subjected to the tests according to Attached Table 3 “Test for Hydrogen Gas Leakage Detector, etc.,” the hydrogen gas leakage detector, device that gives a warning to the driver and device that shuts off the supply of hydrogen gas shall detect hydrogen gas, actuate the warning device, and shut off the supply of hydrogen gas. Moreover, if a motor vehicle is equipped with plural hydrogen systems, it shall be acceptable if the device shuts off the supply of hydrogen gas from the hydrogen system that is leaking hydrogen gas.

3–9–6 There shall be a device which gives a warning to the driver at the driver’s seat when an open wire or a short circuit takes place in the hydrogen gas leakage detector.

In addition, the “Test for Hydrogen Gas Leakage Detector, etc.,” which is mentioned in 3-9-5 above, is specified as follows. In Japan, hydrogen sensors are tested not only at the time of type approvals but also at the time of periodic vehicle inspections.

Attached Sheet 3　TEST FOR HYDROGEN GAS LEAKAGE DETECTOR, ETC.

1. Test conditions

1–1 Test vehicle

The test vehicle shall be in the condition given in Paragraphs 1–1–1 and 1–1–2 below.

1–1–1 Unless necessary for the discharge of test gas, the hood, luggage compartment lid, and doors shall be closed.

1–1–2 Components that are unlikely to affect test results need not be genuine parts.

1–2 Test gas

Mixture of air and hydrogen gas with 3.9% ± 0.1% hydrogen concentration shall be used.

1–3 Test site

The test shall be conducted where it is little affected by wind.

2. Test method

2–1 Preparation for test

2–1–1 Start the fuel cell system of the test vehicle if the vehicle is a fuel cell vehicle, and warm it up thoroughly in a stationary state. If the vehicle is not a fuel cell vehicle, warm it up and keep it idling.

2–1–2 If necessary for blowing the test gas to the hydrogen gas leakage detector without fail, the following measures of Paragraphs 2–1–2–1 through 2–1–2–3 may be taken.

2–1–2–1 Attach a test gas induction hose to the hydrogen gas leakage detector.

2–1–2–2 Take measures to make the gas stay near the hydrogen gas leakage detector.

2–1–2–3 Remove the hydrogen gas leakage detector.

2–1–3 If the fuel cell system in a fuel cell vehicle stops automatically during the test, measures shall be taken so that the fuel cell system will not stop. If the test vehicle is not a fuel cell vehicle and is constructed to stop idling automatically, measures shall be taken so as to prevent the engine from stopping.

2–1–4 In cases where the operating conditions of the device to shut off hydrogen gas supply cannot be confirmed, confirmation may be performed by monitoring the operating signal or supply power of the shut-off valve.

2–2 Test

Blow test gas to the hydrogen gas leakage detector.

Q: How does the regulation handle false positives (system shutdown for a hydrogen sensor fault)?

A: With regard to detection of a hydrogen sensor failure, there is a provision in Attachment 100: TECHNICAL STANDARD FOR FUEL SYSTEMS OF MOTOR VEHICLES FUELED BY COMPRESSED HYDROGEN GAS:

3–9–6 There shall be a device which gives a warning to the driver at the driver’s seat when an open wire or a short circuit takes place in the hydrogen gas leakage detector.

Q: High-Pressure Shut-off valve is required if a regulator cannot be attached up stream of the main stop valve – What is the reason for this? (Page 7)

A: The basic structure of the pressure regulator explains the reason. A diaphragm partitions the inside of the pressure regulator into the pressurized side and the atmosphere side. In the event a hole is made in this diaphragm, or the diaphragm seal becomes defective, the gas will leak into the atmosphere. When such failure occurs in the pressure regulator located upstream of the main stop valve, the gas leak cannot be stopped even if the main stop valve is working. This actually happened at a manufacturer's FCV while Japan was discussing the regulation.

Q: Is there a time element? This is during the bubble test, which is the same as the European test (has a three minute time limit). Japan says there is no time limit. (they will check and report back.)

A: Attachment 100 does not specify any confirmation time condition for the bubble leak test, whereas JIS Z2329, which is a Japanese industrial standard for the bubble leak test, states that the confirmation time shall be 10 seconds or longer. In Japan, bubble test agents that conform to JIS Z2329 are sold on market. It is possible that the confirmation time differs among agents being sold, depending on which standard each agent complies with. It is therefore necessary to check each agent.

Q: Are we going to mandate sensors in the GTR?

A: The United States, Canada, Europe, and Japan all require mandatory odorization of flammable gases. The gas leak detection is secured in natural gas vehicles because the gas used by these vehicles is odorized.

For fuel cell vehicles, we need a technical standard for hydrogen leak detection which can be an alternative to odorization. Based on the result of an experiment conducted in Japan 3 years ago, Japan concluded that the hydrogen sensors deliver detection performance close to that of odorization and specified the related provisions in Attachment 100.

Future discussions at HFCV-SGS may find other detection technologies, besides hydrogen sensors, that have performance equivalent to that of odorization.