Informal document No. 8
(46th GRPE, 19-23 May 2003
agenda item 8.)

PROPOSAL FOR DRAFT AMENDMENTS TO REGULATION No. 101

TO INTRODUCE HYDROGEN (H_2) AS PROPULSION FUEL

INTRODUCTION

Within the framework of the European Integrated Hydrogen Project (EIHP) the proposed amendment to the Vehicle Regulation No 101 to introduce hydrogen as a propulsion fuel, as reproduced below, was prepared by OICA.

BACKGROUND AND JUSTIFICATION

1. Method of measuring H2 consumption:

In cause of, at present, unsolved problems in using a hydrogen balance method in analogy to the carbon balance method when measuring the H2 consumption during the test cycle there are two options suggested:

a) Hydrogen Balance Method:
In analogy to the carbon balance method it is suggested to measure the emissions of H_2 and H_20 during the test cycle and to calculate the responding H2 consumption by using the hydrogen balance method.
At present there are several unsolved problems in estimating the dilution factor in the test sequence:

- one problem is the high water condensation and the undefined amount of water remaining in the exhaust system and CVS facility
- another problem is the, in dependence of lambda, varying portion of water (for Lambda = 1 the water content according to the H_2 balance method is 34,8 %, for Lambda = 3 the water content is 15,1%)

In comparison to the hydrogen balance method for the carbon balance method a constant lambda value of 1 is based. This is reasonable as, differing from H_2 fuelled vehicles, each combustion is just at Lambda 1.

b) Data generated by the engine control module:
It is suggested to calculate the H_2 consumption by using data generated from an engine control module during the test cyle.

2. Conformity of production:

Those paragraphs are defining measures to ensure the conformity of production with regard to the CO2 emissions from vehicles. It is suggested to remain the COP part unchanged as H2 emissions are not greenhouse gases and the COP part is not applicable to electric vehicles, too. In case of bifuelled vehicles (petrol tank capacity > 15l) the conformity of production with regard to the CO2 emissions has to be conducted.
Anyway the conformity of production and the conformity of in-service vehicles has to be checked in respect to the emissions of nitrogen oxides according to ECE Regulation No. 83.

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PROPOSAL FOR DRAFT AMENDMENTS TO REGULATION No. 101
TO INTRODUCE HYDROGEN (H_2) AS PROPULSION FUEL

List of contents, annexes,

Paragraph 1., amend to read (scope):

1. This Regulation applies to the measurement of the emission of carbon dioxide (CO_2) and fuel consumption for M1 category vehicles, or to the measurement of electric energy consumption and range of categories M1 and N1 vehicles 1/ or in the case of vehicles fuelled by H_2, to the measurement of the H_2 consumption for M1 category vehicles.

Paragraph 3.1.; amend to read (application for approval):

3.1. The application for approval of a vehicle type with regard to the measurement of the emission of carbon dioxide and fuel consumption, or to the measurement of electric energy consumption, or in the case of vehicles fuelled by H_2 to the measurement of the H_2 consumption shall be submitted by the vehicle manufacturer or by his duly accredited representative.

Paragraph 3.2.1.; amend to read:

3.2.1. A description of the internal combustion engine type or the electric power train type comprising all the particulars referred to in annex 1 or annex 2. At the request of the technical service in charge of the tests or the manufacturer, complementary technical information could be considered foe specific vehicles which are particularly fuel efficient.

Paragraph 4.1.; amend to read (approval):

4.1. If the emissions of CO_2 and fuel consumption or the H_2 consumption of internal combustion engine, or the energy consumption of the vehicle type submitted for approval of that vehicle type shall be granted.

Paragraph 5.1.; amend to read (specifications and tests):

5.1. The components liable to affect the emissions of CO_2 and fuel consumption or the H_2 consumption or the electric energy consumption shall be so designed, constructed and assembled as to enable the vehicle, in normal use, despite the vibrations to which it may be subjected, to comply with the provisions of this regulation.

Paragraph 5.2.; amend to read

5.2. Description of tests for internal combustion engines using carbon-based fuels

Paragraph 5.4.; amend to read:

5.4. Description of tests for H_2 fuelled vehicles

Paragraph 5.4.1.; amend to read:

5.4.1. The vehicle shall be submitted to the test cycle simulating the urban and extra urban driving patterns as described in appendix 1 of annex 4 of Regulation No. 83 as last amended at the time of approval of the vehicle.

Paragraph 5.4.2.; amend to read:

5.4.2. The tests results will be expressed in m^3 per 100 km, and rounded to the first decimal place.

Paragraph 5.4.3.; amend to read:

5.4.3. The H_2 consumption will be measured according to annex 5 of this Regulation.

Add a new paragraph 5.4.4.; to read:

5.4.4. The reference fuel used for testing will be H_2, as defined in ISO / FDIS 14687

Paragraph 5.4. (former), renumber as paragraph 5.5.; to read:

5.5. Interpretation of results

Paragraph 5.4.1. (former), renumber as paragraph 5.5.1.; to read:

5.5.1. The CO_2 value, the value of H_2 consumption or the value of electric energy consumption, adopted as the type approval value shall be the value declared by the manufacturer if the value measured by the technical service does not exceed the declared value by more than 4%. The measured value can be lower without any limitations.

Paragraph 5.4.2. (former), renumber as paragraph 5.5.2.; to read:

5.5.2. If the measured value of CO_2 or the value of H_2 consumption or the electric energy consumption exceeds the manufacturer's declared CO_2 or H_2 or electric energy consumption value by more than 4% then another test is run on the same vehicle.
When the average of the two test results does not exceed the manufacturer's declared value by more than 4%, then the value declared by the manufacturer is taken as the type approval value.

Paragraph 5.4.3. (former), renumber as paragraph 5.5.3.

Paragraph 6.1.1.; amend to read (modification and extension of approval):

6.1.1. Consider that the modifications made are unlikely to have an appreciable adverse effect on the values of CO_2 and fuel consumption or H_2 consumption or electric energy consumption and that, in this case the original approval will be valid for the modified vehicle type; or

Paragraph 7.1.; amend to read (conditions of extension of the approval):

7.1. Vehicles powered by an internal combustion engine:
The type approval can be extended to vehicles from the same type or from different types differing with regard to the following characteristics of annex 2 if the CO2 emissions or the H2 consumption measured by the technical service do not exceed by more than 4% the type approved value:

Annex 1,

Add a new item 1.2.4.7.; to read:

1.2.4.7. By H_2 fuelling system: yes / no 3/

Add a new item 1.2.4.7.1.; to read:

1.2.4.7.1. Approval number according to Regulation No. 67

Add a new item 1.2.4.7.2.; to read:

1.2.4.7.2. Electronic Engine management Control Unit for H_2 fuelling:

Add a new item 1.2.4.7.2.1.; to read:

1.2.4.7.2.1. Make(s):

Add a new item 1.2.4.7.2.2.; to read:

1.2.4.7.2.2. Type:

Add a new item 1.2.4.7.2.3.; to read:

1.2.4.7.2.3. Emission related adjustment possibilities:

Add a new item 1.2.4.7.3.; to read:

1.2.4.7.3. Further documentation:

Add a new item 1.2.4.7.3.1.; to read:

1.2.4.7.3.1. Description of the safeguarding of the catalyst at switchover from petrol to H_2 or back:

Add a new item 1.2.4.7.3.2.; to read:

1.2.4.7.3.2. System lay-out (electrical connections, vacuum connections, compensation hoses, etc.):

Add a new item 1.2.4.7.3.3.; to read:

1.2.4.7.3.3. Drawing of the symbol:

Annex 3,

Item 6.5.4.; amend to read:

6.5.4. In the case of LPG/NG/H_2 1/ the reference fuel used for the test:

Item 7.1.2.; amend to read:

7.1.2. Fuel consumption. 3/ 4/

Add a new footnote 4/, to read:

4/ For vehicles fuelled with NG or H_2 the unit l/100km is replaced by m^3/km

Annex 4,

Below „Model A“; amend to read:

The above approval mark affixed to a vehicle shows that the vehicle type concerned has been approved in the Netherlands (E4) with regard to the measurement of emissions of CO_2 and fuel consumption, or to the measurement of H_2 consumption, or to the measurement of electric energy consumption and range pursuant to Regulation No. 101 and under approval number 002492. The first two digits of the approval number indicate that the approval was granted according to the requirements of Regulation No. 101 in its original form.

Annex 5,

Headline, amend to read:

METHOD OF MEASURING EMISSIONS OF CARBON DIOXIDE AND FUEL CONSUMPTION AND MEASURING OF H2 CONSUMPTION OF INTERNAL COMBUSTION ENGINES

Add a new item 1.6.; to read:

1.6. Measurement of H_2 consumption

Add a new item 1.6.1.; to read:

1.6.1. The H_2 consumption will be measured in tests simulating the urban and extra urban driving patterns as described in appendix 1 of annex 4 of Regulation No. 83 as last amended at the time of approval of the vehicle.

Add a new item 1.6.2.; to read:

1.6.2. The test bench will be adjusted according to Regulation No. 83 as described in appendix 1 of annex 4 of Regulation No. 83 in force at the time of the approval of the vehicle.

Add a new item 1.6.3.; to read:

1.6.3. The H_2 consumption will be measured by using one of the following methods:
Calculation of the H_2 consumption by using data generated from the engine control module during the test cyle.
Calculation of the H_2 consumption by the hydrogen balance method using measured emissions of H_2 and H_20 during the test cycle.
The technical service responsible for conducting the tests must agree to one of these methods.
The test results will be expressed in m^3 / 100 km, and rounded to the first decimal place.