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Item 5 (b) of the provisional agenda

Proposals of amendments to ATP:

New proposals

Requirements for the consideration of a change of refrigerant for an approved, vapour-compression refrigeration unit (drop-in)

Transmitted by the Government of France

Background

1. In accordance with the Kyoto Protocol, Regulation (EU) No. 517/2014 of the European Parliament and of the Council on fluorinated greenhouse gases, known as F-Gases, came into effect on 1 January 2015. It aims to reduce emissions of greenhouse gases through a series of measures that includes implementing a schedule for reducing the placing on the market of HFC refrigerants and limiting the global warming potential (GWP) of refrigerants that can be used, to a certain threshold, determined according to a schedule, the purpose of the refrigerant and the work carried out.
2. This regulation will have a global impact on the availability of R404A.
3. Currently, refrigeration units based on mechanical vapour compression mainly use R404A as a refrigerant (it comprises 95% of the total amount of fluids banked in this type of equipment). In accordance with the F-Gas Regulation, R404A will be covered by the quota reduction schedule and the use of R404A in the transport sector will be restricted as of January 2020. As the allocated quotas decrease, the quantities of refrigerants produced will also decrease. The greatest reduction in the allocated quotas is scheduled to take place in 2018, which is expected to be the most critical year in the proposed schedule.

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4. Manufacturers are adopting different strategies, which range from using natural refrigerants, anticipating the appearance of refrigerants with low GWP values, and anticipating or implementing interim solutions which involve using refrigerants that respect the GWP limits established for the start of 2020. For manufacturers, interim solutions based on using blends of HFOs as refrigerants seem to be a good short-term alternative for the next few years.

5. Bearing in mind that the thermodynamic properties of replacement refrigerants are close to those of R404A, a procedure is proposed for assessing the impact of the change of refrigerant on the characteristics of refrigeration units that have already been tested in accordance with ATP.

Proposal

6. The present proposal introduces a method for restricting the number of tests carried out on vapour-compression refrigeration units when the refrigerant used in the units is replaced by another with similar properties (drop-in refrigerant).

7. Checks are carried out on these units in order to determine whether or not the change of fluid (drop-in refrigerant) has a significant impact on the refrigerating capacity.

Principle of the test

8. The test methodology involves executing the tests described in ATP, annex 1, appendix 2, section 4, entitled "PROCEDURE FOR MEASURING THE EFFECTIVE REFRIGERATING CAPACITY W_0 OF A UNIT WHEN THE EVAPORATOR IS FREE FROM FROST", in the version approved on 30 September 2015.

9. The test is based on the following points:

- No modifications, aside from the type of refrigerant, are made to the approved type;
- The thermodynamic properties of the new refrigerant must be similar to those of the previous one (making it a drop-in replacement);
- The actual impact of the change of refrigerant on the refrigerating capacity of the refrigeration unit is estimated on the basis of a restricted range of tests and a single criterion is used to test the equivalence of the refrigerating capacities.

Environmental impact

10. This proposal would make it possible to considerably reduce the number of tests and thus their environmental impact. It would also avoid penalizing the use of mechanical vapour-compression units that use new refrigerants, which are mentioned in international protocols aimed at limiting the greenhouse gas effect.

Economic impact

11. The cost of testing these materials will fall significantly once they are scheduled to be introduced into a broad range of refrigeration units. The cost for manufacturers and, in turn, their customers will be drastically reduced.

Proposed amendment to ATP

12. It is proposed that a new section 10 should be added to ATP, annex 1, appendix 2, as follows:

“10. CHANGE OF REFRIGERANT IN A VAPOUR-COMPRESSION REFRIGERATION UNIT

10.1. Testing the changes made to the unit

A unit tested in accordance with ATP, in which the refrigerant is to be changed (using a drop-in refrigerant), may be modified only as follows:

- The refrigerant may be replaced by a fluid with equivalent thermodynamic properties
- The pressure regulator(s) with which the unit is fitted may be set

No other change may be made to the design.

10.2. Test methodology

The unit containing the new refrigerant is subjected to a limited test in accordance with the description described in section 4.

The equivalence of the refrigerants is then tested by testing the following inequality:

$$\frac{Q_{mod}-Q_{Ref}}{Q_{ref}} \geq -0.035 \quad (1)$$

where:

Q_{ref} is the refrigerating capacity of the certified unit,

Q_{mod} is the refrigerating capacity of the unit with the new refrigerant,

For an approved type of refrigeration unit:

- If equation (1) is satisfied for two different class temperatures, one of which is the minimum class temperature, and for each type of drive across the range of effective refrigerating capacities generated by the refrigeration unit, then the refrigerating capacities of the reference refrigeration unit and the modified one are considered to be equivalent. In this case, the ATP test station may produce an addendum noting that the refrigerating capacities of a particular refrigeration machine are equivalent when either refrigerant is used. This is a case of strict equivalence.
- If, for all types of drive across the range of effective refrigerating capacities generated by the refrigeration unit:
 - The refrigerating capacities of the machine operating with the reference refrigerant and the machine operating with the drop-in refrigerant are shown to be equivalent for at least one temperature level, and
 - The variation in refrigerating capacities found for the additional temperature level is of the same order of magnitude,

then the ATP test station must complete its tests and check that the variation noted can be observed at all temperature levels for all types of drive. If this is the case, the

official test station may produce an addendum that records the refrigerating capacities obtained with the new constituent. This is a case of restricted equivalence.

For an approved range of refrigeration units:

If at least two refrigeration units tested with two different constituents at an ATP test station are:

(1) **Strictly equivalent**, then the official test station can produce an addendum for each of the interim machines for which the laboratory holds the test report without changing the refrigerating capacities obtained with the reference constituent.

(2) **Of restricted equivalence**, with variations in refrigerating capacity between the two refrigeration machines of the same order of magnitude for each temperature level considered, then the test laboratory can produce an addendum for each interim machine, modifying the refrigerating capacities obtained with the reference constituent by a ratio that maximizes the loss of refrigerating capacity for each temperature level considered and for all types of drive.

If, for a particular refrigerating machine, there is a significant difference in energy consumption, the addendum must state the energy consumption measured and/or estimated with the new refrigerant.”
