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Working Party on the Transport of Perishable Foodstuffs

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Item 6 (a) of the provisional agenda
Proposals of amendments to ATP:
pending proposals

Amendment to Annex 1, Appendix 2 paragraph 3.2.6 and 4.3.4 (ii), Annex 1, Appendix 3 and the ATP Handbook

Transmitted by the Government of the United Kingdom

Introduction

1. Currently there is no airflow requirement despite the secondary coolant being vital for safe carriage of perishable cargoes in mechanically refrigerated vehicles.

2. At present the existing text appears to make airflow measurement optional. Annex 1, appendix 2, paragraph 4.3.4 (iii) reads as follows:

> "If the air circulation of a refrigeration unit's evaporator fans are to be measured, methods capable measuring the total delivery volume shall be used."

3. A UK proposal (ECE/TRANS/WP11/2012/5) was to change the wording regarding airflow tests was presented at the 68th session. This was not accepted, as verifying manufacturers' airflow figures is not mandated. A working group was proposed for an amended proposal for next year.

4. The UK submitted an informal document (INF.5) for discussion at the 69th session of WP11 and was suggested an informal working group be formed.

5. The UK then submitted a working document (ECE/TRANS/WP.11/2014/15, part A) which was adopted at the 70th session of WP11.

6. On the 17th September 2015, the Finnish Government made an objection to the proposed amendment to annex 1, appendix 2, paragraph 2.3.6 (C.N.481.2015.TREATIES-X1.B.22) (airflow requirement proposal for 60 a/c/h). This was an objection of a single proposal and did not affect the other proposals.

7. At the 75th session of WP11 an updated version of the proposal was presented and there were objections from Germany regarding the table for the ATP handbook, Czech Republic had concerns regarding small evaporators in multi temperature trailers and Finland still had concerns from the Finnish manufacturers and industry. The UK delegation took the

comments on board and has presented a modified version that will hopefully satisfy all parties.

8. The table for the handbook has been reduced and made more relevant for ATP purposes, we have provide more background with regards to smaller evaporators in multi-temperature unit which will hopefully meet with the approval of the Czech Republic and we have contacted the Finnish competent authorities for information on why there is an objection from the industry but have received no additional information at present.

Additional information for small evaporators

9. The following section is intended as a clarification regarding a comment about the possibility that smaller evaporators would be restricted by the proposed UK minimum air changes requirement. Using all of the data available to CRT from ATP test reports issued by multiple test stations, the maximum permitted compartment volumes for multi temperature evaporators were calculated. It was assumed that all such appliances would be installed into trailers to provide a constraint to facilitate calculation of the capacity requirement.

10. Initially the maximum permissible volume for each evaporator was calculated by dividing the manufacturer-declared airflow by 40 which is the proposed minimum number of air changes per hour. The internal surface area is used in part 7 of Annex 1, Appendix 2 to determine capacity requirements. With this in mind the internal length was calculated using internal width and height of 2.5m and 2.6m respectively which are typical values for the considered equipment. The following formula was used:

$$l_{int} = \frac{v_{max}}{w_{int} \cdot h_{int}}$$

11. To determine the capacity requirement the following assumptions were made:

(a) Body K value of 0.40W·m-2·K-1

(b) Fixed transverse bulkhead with GRP floor, K value of 1.5W·m-2·K-1 as per the table in Annex 1, Appendix 2 part 7.3.7

(c) Frozen compartment considered with a single neighbouring chilled compartment

Capacity was then calculated with F = 1.75:

$$Q_{min} = F \cdot \left(S_{bulk} \cdot K_{bulk} \cdot \Delta T_{bulk} + S_{body} \cdot K_{body} \cdot \Delta T_{body}\right)$$

12. This is considered to be the minimum ideal heat flow into a compartment with all real figures being greater.

13. It was found that 82% of evaporators would be limited by the capacity requirement rather than the proposed minimum airflow requirement. It was also found that, when airflow was the limiting factor, mid-sized evaporators were affected whilst smaller systems and host units were limited by the minimum capacity requirement.

14. Where capacity was the limiting factor, the average reported capacity of evaporators was 67% of the minimum capacity required by maximising the volume based on the manufacturer's declared airflow. For the majority of evaporators, the capacity required by ATP is significantly greater than the proposed minimum airflow requirement for a given volume.

Proposed amendment

15. We propose to amend the text as follows, with a footnote.

A new paragraph is added to the point 3.2.6:

"The required airflow for equipment that has an internal volume of ≤2 and ≤100m^3 is calculated using the following formula:

$$\dot{V}_L = N \cdot V$$

The air flow rate *N* is defined as the circulated volumes *V* of the empty load space each hour.

Where:

V is the volume of the load space, in m^3;

$\dot{V}_L$ is the recommended design air flow, in m^3/h;

N is the air flow rate, in h^{-1}..

with

$40 \leq N \leq 60$ for frozen mode or
$50 \leq N \leq 90$ for chilled/heating mode.

The air delivery system shall be compensated for any loss of airflow due to internal equipment such as air ducts and the frosting of the evaporator(s) and need not be continuous.

If the equipment internal volume is ≥100m^3 or ≤2 m^3, the competent authority where the equipment is registered or recorded shall determine adequate airflow based on the overall heat transfer and where they are permitted to operate."

Annex 1, Appendix 3

16. The ATP certificate will need to be amended with a new section below in Annex 1, Appendix 3.

"7.2.6 XX air changes/hour"

Where XX is the number of air changes per hour calculated by dividing the total airflow of the evaporator fans by the total internal volume of the equipment as a whole.

Impact

17. This change would modernise the ATP and a positive impact would be that food safety and quality would improve. The financial impact to industry is that there would be an additional cost for an airflow test in cases where it is not carried out already.

18. A defined flowrate for the secondary refrigerant would help ensure all products within the cargo space meet the requirements of Annex 2 and 3.

19. However, the airflow result is required in the machine test report and therefore there appears an inconsistency.

Handbook

20. The following could be added to the handbook for additional explanation:

"Air flow is an essential parameter within temperature controlled transport.

For frozen cargoes, airflow should be low to avoid desiccation but sufficient to remove heat entering through the insulated walls, supply air can deviate below the set temperature to remove heat without damaging the product. Chilled cargoes require higher airflow for good temperature distribution and also because the supply air temperature cannot be allowed to deviate significantly below from the set temperature due to freeze or chilling. Some chilled cargoes are metabolically active and therefore require higher airflow to remove that heat.

Intermittent fan operation should not be used for sensitive cargo where close temperature distribution is required. Generally, start/stop operation of the unit when the evaporator fans/unit are allowed to cycle should be used only for frozen goods transportation

Table 1
Examples of air flow requirements for temperature sensitive goods

Type of goods	*Temperature range [°C]*	*Sensitivity to humidity*	*Recommended airflow rate [times/empty volume of equipment]*
Hanging meat	-1/+1°C	Yes	50 –90
Chilled products	-1/+6°C	Yes	50 – 90
Frozen foods	< -18°C	No	40 – 60
Ice cream	< -20 °C	low	40 – 60