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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

Definition of the independence of equipment taking into account mixed energy source technologies

Transmitted by the Government of France

Revision

Summary

Executive summary:	The purpose of this proposal is to put forward a definition of the concept of the independence of equipment from the refrigeration source.
Action to be taken:	Amend the relevant part (annex I) of the ATP Agreement.
Related documents:	None

Introduction

1. Non-self-contained refrigeration units operated by mechanical vapour compression are driven by an external source of energy – electrical or mechanical – resulting from an energy conversion with an internal combustion engine operating.

2. Self-contained compression units have an indirect, finite source of energy traditionally represented by the contents of the tank of fossil fuel to which they are connected. The tank is not part of the self-contained thermal unit but actually comprises a variable external component and is tested by the official testing station.

3. In both cases, the refrigeration process depends on tank capacity, the difference being whether the vehicle engine needs to be running or not.

4. It is now no longer possible for ATP to ignore the pressure from new technologies, and in particular equipment powered by electric storage batteries, dedicated or otherwise. Such batteries can even be charged while the vehicle engine is running and the refrigeration equipment is operating. There is no denying that electric storage batteries make for greater independence, but how are we to classify equipment of this kind, powered by mixed energy sources, which lies somewhere between the two traditional types of equipment that have shaped ATP? It is thus proposed that such equipment be called “hybrid equipment”.

5. The fact is that it is difficult to discuss the degree of independence of a refrigeration unit without considering the equipment where it is to be fitted, how it is to be used and the vehicle that is to carry the whole arrangement.

I. Proposal

6. Definition of the independence of equipment

“Equipment is self-contained if:

Case 1

- The charge time for the energy reservoir is deemed negligible,
- The refrigeration or heating process relies on an energy source that:
  - Is always available;
  - Cannot be interrupted except where essential for the safety of property or persons;
  - Is not shared except for fuel used in heat engines.
- The refrigeration or heating process can run for 12 hours without recharging of the power source in accordance with the class temperature of the equipment.

The equipment must satisfy the following requirement:

$$\frac{E_{nominal.tank}}{Q_{P_{nominal}}} * \frac{P_{nominal}}{3600 * 1{,}75 * K_{body} * S_{body} * \Delta T} \geq 12$$

Where:

$E_{nominal.tank}$ is the maximum energy that can normally be stored in the energy source [Wh] or unit [X];

$QP_{nominal}$ is the energy flow rate extracted by the cooling or heating system operating at full power [Wh/s] or [X/s];

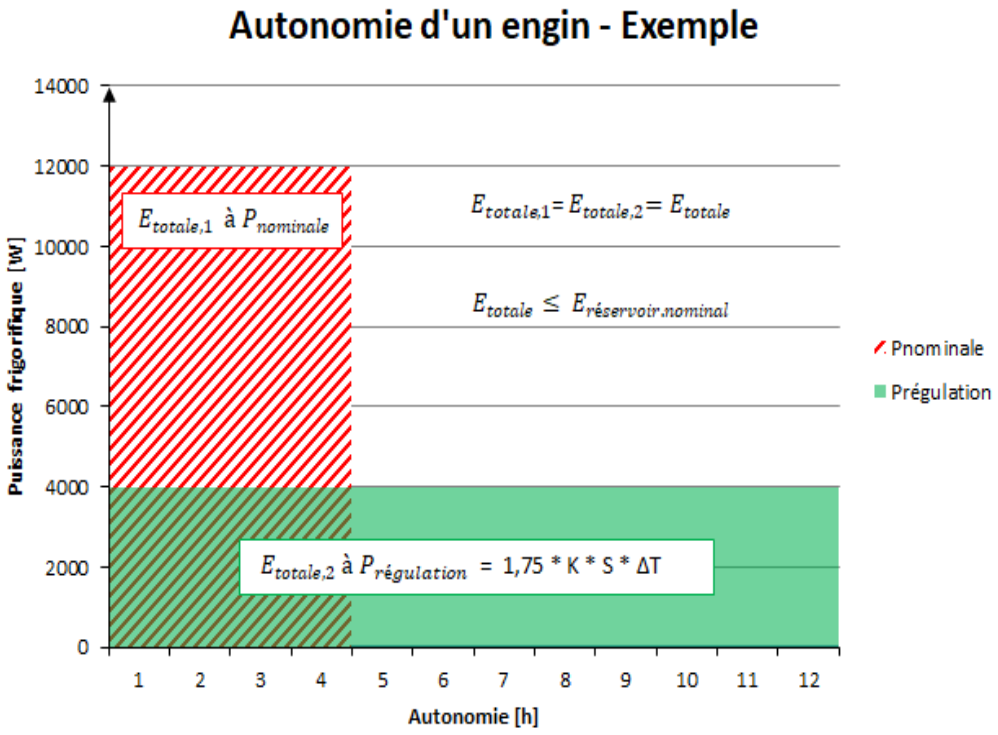
K_{body} is the K value of the outer body [W/(m².K)];

S_{body} is the geometric mean of the surface area of the body [m²];

ΔT is the temperature difference between the outside and inside of the body in mono-temperature operation [K];

$P_{nominal}$ is the nominal refrigerating capacity of the refrigeration unit [W];

Entry in the ATP handbook:



Negligible recharging time is deemed to be any operation lasting less than 20 minutes that allows for the recharging of the energy reservoir to its maximum starting with no more than one quarter of its nominal capacity.

The equipment must satisfy the following requirement:

$$t_0 : E_{tank,t0} \leq \frac{1}{4} * E_{nominal.tank}$$

$$t_1 : E_{tank,t_1} = E_{nominal.tank}$$

$$\Delta t = t1 - t0 < 20$$

Where:

$E_{nominal.tank}$ is the maximum energy that can normally be stored in the energy source [Wh] or unit [X];

$t0$ and $t1$ represent, respectively, the start and end times for recharging the energy source [mn] ;

E_{tank}, tx is the energy actually stored in the energy source at time tx [Wh] or unit [X];

Δt is the charging time of the energy source [mn];

Case 2

- Refrigeration or heating relies on an energy source that is permanently available, not shared and not interruptible;

- Refrigeration or heating can maintain the class temperature of the equipment without recharging of the power source for at least 12 hours. To be tested in accordance with annex 1, appendix 2, section 3 of ATP.

Equipment is self-contained if:

- The charge time for the energy reservoir is deemed negligible,

- The refrigeration or heating process relies on at least two power sources, at least one of which:

  • Is always available;

- Cannot be interrupted except where essential for the safety of property or persons;

- The refrigeration or heating process can run for 4 hours at full power with its power source in accordance with the class temperature of the equipment without having to recharge in accordance with the class temperature of the equipment.

The equipment must satisfy the following requirement:

$$\frac{E_{nominal.small\ tank}}{Q_{P_{nominal}}} * \frac{P_{nominal}}{3600 * 1{,}75 * K_{body} * S_{body} * \Delta T} \geq 4$$

Where:

$E_{nominal.tank}$ is the maximum energy that can normally be stored in the energy source [Wh] or unit [X];

$QP_{nominal}$ is the energy flow rate extracted by the cooling or heating system operating at full power [Wh/s] or [X/s];

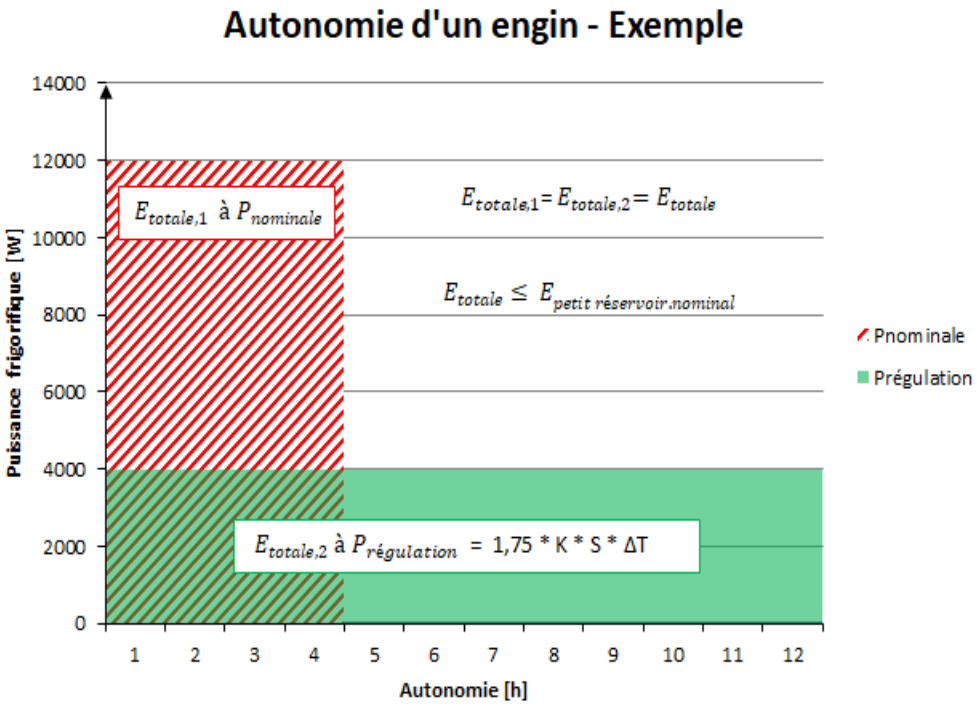
K_{body} is the K value of the outer body [W/(m².K)];

S_{body} is the geometric mean of the surface area of the body [m²];

ΔT is the temperature difference between the outside and inside of the body in mono-temperature operation [K];

$P_{nominal}$ is the nominal refrigerating capacity of the refrigeration unit [W];

Entry in the ATP Handbook:



Negligible recharging time is considered to be any operation that makes it possible, in less than three quarters of an hour, to increase the energy equal to at least half of the maximum energy capacity that can be stored in the energy reservoir in question.

The equipment must satisfy the following requirement:

$$t_0 : 0 \leq E_{tank,t_0} \leq \frac{1}{2} * E_{nominal.tank}$$

$$t_1 : E_{tank,t_1} \geq E_{tank,t_0} + \frac{1}{2} * E_{nominal.tank}$$

$$\Delta t = t_1 - t_0 < 45$$

Where:

$E_{nominal.tank}$ is the maximum energy that can normally be stored in the energy source [Wh] or unit [X];

$t0$ and $t1$ represent, respectively, the start and end times for recharging the energy source [mn];

E_{tank}, tx is the energy actually stored in the energy source at time tx [Wh] or unit [X];

Δt is the charging time of the energy source [mn];

Equipment is non-self-contained in other cases."

II. Justification

7. Technological developments in refrigeration equipment make it necessary to revise the concept of the independence of units in ATP.

III. Costs

8. No additional costs are expected for official ATP test stations, or even for manufacturers who will need to have available the additional parameters required by this proposal as part of their production management.

IV. Feasibility

9. There are no additional requirements for official ATP test stations.

V. Applicability

10. No problems are foreseen in implementing the proposals.

VI. Introduction of the proposed amendment to ATP

11. Part of ATP concerned: annex 1.

Addition of a definition of the independence of a unit in accordance with I. Proposal.