



Economic Commission for Europe**Inland Transport Committee****Working Party on the Transport of Perishable Foodstuffs****Seventy-ninth session**

Geneva, 25–28 October 2022

Item 5 (a) of the provisional agenda

Proposals of amendments to ATP:**Pending proposals****Definition of the independence and autonomy of equipment****Transmitted by the Government of France****Reconsideration***Summary*

Executive summary:	The purpose of this proposal is to define the independence and autonomy of equipment.
Action to be taken:	Amend the relevant part (annex 1) of the ATP Agreement.
Related documents:	None

Introduction

1. Non-independent refrigeration units operated by mechanical vapour compression are supplied by an external power source – electrical or mechanical – resulting from an energy conversion with an operating internal combustion engine.
2. Independent compression units have an indirect, finite power source typically represented by the contents of the energy storage capacity of the available fossil fuel to which they are connected. The tank is not part of the self-contained internal combustion unit but actually comprises a variable external component and is tested by the official testing station.
3. In both cases, the refrigeration process is dependent on the energy storage capacity of the available fuel, the difference being whether the vehicle's internal combustion engine needs to be running or not.
4. It is now no longer possible for ATP to ignore the pressure from new technologies, in particular equipment powered by electric storage batteries, dedicated or otherwise. Such batteries may even be charged while the vehicle's internal combustion engine is running and the refrigeration equipment is operating. There is no denying that electric storage batteries



make for greater flexibility, but where does equipment of this kind, powered by mixed power sources, fit in with the conventional equipment of the kind addressed by ATP?

5. It is in fact difficult to discuss the degree of independence and autonomy 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 configuration.

I. Proposal

6. Definition of the independence of equipment:

“Equipment is independent if:

The refrigeration or heating process relies on a power 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 internal combustion engines or fuel cells

Equipment is not independent in other cases.”

7. Definition of the autonomy of equipment:

The equipment is autonomous if:

- It is possible to make it operate for a minimum amount of time
- The time required to charge its energy storage capacity is negligible

Definition of the minimum running time

The refrigeration or heating process can operate for a minimum of four hours without charging of the power source while respecting the class temperature of the equipment.

General equation to verify the ability of the equipment to operate for a minimum time:

$$\frac{E_{nominal.storage}}{Q_{Pnominal}} * \frac{P_{nominal}}{3600 * 1,75 * K_{body} * S_{body} * \Delta T} \geq \text{Minimum running time}$$

where:

Enominal.storage is the maximum energy that can normally be stored in the power source [Wh] or unit [X];

QPnominal is the energy flow rate extracted by the cooling or heating system operating at full power [Wh/s] or [X/s];

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

Sbody 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];

Pnominal is the nominal refrigerating capacity of the refrigeration unit [W].

Definition of the charging time for the energy storage unit

Charging conditions for eutectic groups:

By definition, the charging time of the power source of these groups is negligible.

Charging conditions for electric accumulators supplying electrically operated units:

The charging time of the batteries should be negligible.

Negligible charging 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 batteries connected to the unit.

The equipment must satisfy the following requirement:

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

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

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

where:

Estorage.nominal is the maximum energy that can normally be stored in the power source [Wh] or unit [X];

t0 and *t1* represent, respectively, the start and end times for charging the power source [mn];

Estorage,tx is the energy actually stored in the power source at time tx [Wh] or unit [X];

Δt is the charging time of the power source [mn].

Charging conditions for units operating with other forms of energy:

The charging time of the power sources should be negligible.

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

The equipment must satisfy the following requirement:

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

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

$$\Delta t = t_1 - t_0 < 20$$

where:

Enominal.storage is the maximum energy that can normally be stored in the power source [Wh] or unit [X];

t0 and *t1* represent, respectively, the start and end times for charging the power source [mn];

Estorage,tx is the energy actually stored in the power source at time tx [Wh] or unit [X];

Δt is the charging time of the power source [mn].

If the equipment does not meet these conditions, it is not autonomous.”

II. Justification

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

III. Costs

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

IV. Feasibility

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

V. Enforceability

11. No problems are foreseen in implementing the proposal.

VI. Introduction of the proposed amendment to ATP

12. Part of ATP concerned: Annex 1.

Addition of a definition of the autonomy of a unit in accordance with section I – Proposal.
