

STATEMENT

Last update: July 2012



Hydrocarbon (HC) Refrigerants in Refrigerating Systems

1 General

Hydrocarbons have proven to be suitable refrigerants in several applications - regarding thermodynamics and reliability. *ASERCOM* member companies have collected experience with their use in different fields and are engaged in standardization work to enable appliance and system manufacturers to use HCs as refrigerants in a safe but restricted way (see below). The flammability of the materials adds significantly to the safety responsibility compared to non flammable refrigerants.

This statement focuses on applications in European countries where uniform standards are used to a wide extent. But with reference to hydrocarbons as refrigerants even the European market is fragmented. Ecological groups in some of the EU Member States promote flammable refrigerants with the support of the governments concerned, whereas in other European Member States governmental regulations restrict their use.

It should be noted that some countries are insisting on the phase out HFCs and/or have heavily taxed these refrigerants, and careful consideration of product liability is necessary before specifying flammable alternatives.

2 Product Liability

As a result of the EU Product Liability Directive, product liability law in Europe has been harmonized, however, in view of certain discretion granted by the Directive to the Member States in connection with its implementation and due to the fact that such implementing legislation is embedded in the traditional and widely different tort law in existence in the various countries, there is no uniform product liability law even throughout the EU Member States. Consequently, it is inevitable that, despite EU efforts, even within the EU product liability claims would be treated and decided upon differently depending on where they are brought forward.

For this reason it must be pointed out that even compliance with the applicable regulations and standards (like ATEX 100) does not necessarily release the system manufacturer from liability. This is especially an issue with flammable refrigerants because alternate non-flammable refrigerants are available on the market for the same applications. This may also be a fact to be considered with reference to criminal laws in case of accidents.

Safety Standards (IEC 60335-2-24 / 40 / 89 and EN 378) currently restrict the charge of HC refrigerant depending on the location of the system, its design and its accessibility to the public, which in some cases could allow up to 4.94 kg of charge.

In designing such systems, the following precautions need to be taken into consideration as well:

- Close attention to leakage rate with relevant improvements of design and installation of systems as well as manufacturing and testing facilities
- Use of components suitable for flammable refrigerants and meeting appropriate safety requirements (including potential PED requirement)

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- Push for 3rd party approval for manufacturing, testing and charging even when it might not be mandatory at a country level.
- Focus on training at all stages of manufacturing and commissioning of the appliances

The points mentioned above are a prerequisite to consider HC as an alternative in Commercial Refrigeration as it is the case today in household refrigeration where HC and HFC coexist.

3 Limited warranty

The level of experience with HCs is presently very limited in commercial refrigerating systems, and for air conditioning and heat pump applications. This is why *ASERCOM* members may see the need to limit their warranty obligations.

4 Major applications – *ASERCOM* position

4.1 Hydrocarbons (HCs) in household and similar appliances (refrigerators, freezers, bottle coolers etc.):

- extremely small leakage rate due to the hermetically sealed system
- factory assembly (adaptations for HC technology)
- small refrigerant charge (<150 g)

resulting in **acceptable safety. Approved compressors are available, therefore both technologies (HC and HFC) coexist.**

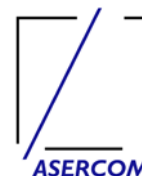
4.2 Hydrocarbons (HCs) in commercial refrigeration, air conditioning and heat pump systems:

- potentially higher leakage rates necessitate improvements of system design/installation regardless of refrigerant
- significant product liability issues exist due to the safety risk associated with the flammability of hydrocarbons
- clear and complete safety regulations still have to be established on a legally binding and preferably harmonized basis
- components approved by the manufacturer have to be available for use with HCs (*NOTE*: the possibility for higher PED category must be recognized !)
- intensive training of personnel (for design, engineering, manufacturing, installation, operation, maintenance and disposal) must become compulsory to achieve the necessary qualification in handling flammable refrigerants

Only if the above-mentioned requirements are fulfilled can hydrocarbons be seen as an alternative to the HFCs presently used. However, the electric energy efficiency should be calculated as in some cases the environmental benefits of HCs are lost or

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partly lost due to lower efficiency of systems caused by the necessity of secondary circuits for safety reasons.

4.3 Hydrocarbons (HCs) in transport refrigeration and transport air conditioning systems:

- The transport segment is a complex topic due to European directives and local regulations across Europe.
- This is particularly true for transport vehicles equipped with hydrocarbons refrigeration and/or Air conditioning systems crossing Europe where application of regulations may differ from one state to another one.
- We therefore need further detailed study and assessment prior to publish this statement including this transport segment.

4.4 Hydrocarbons (HCs) in large commercial and industrial applications:

- Only units designed and approved for HCs must be used.
- Outdoor installation of units is preferred.
- Engineering, installation and service must be carried out by competent (certified) personnel.
- Equipment/tooling suitable for HCs must be used for installation and service.

HCs may be used in large commercial and industrial applications **if all safety aspects are considered and relevant regulations and standards are applied.**

ASERCOM will continue to monitor the scientific and technical developments relevant in connection with the subject matter of this summary. *ASERCOM* will endeavour to provide - without assuming an obligation to this effect - updates whenever, due to changing criteria and/or new aspects have to be considered, *ASERCOM* might change its position with respect to the recommendations contained herein.

These recommendations are addressed to professionals, industrial, commercial and domestic refrigeration system manufacturers/installers. They have been drafted on the basis of what *ASERCOM* believes to be the state of scientific and technical knowledge at the time of drafting, however, *ASERCOM* and its member companies cannot accept any responsibility for and, in particular, cannot assume any reliability with respect to any measures - acts or omissions - taken on the basis of these recommendations.
