

Topic A Briefing Paper: Barriers related to standards and legislation

This briefing paper was drafted by Ricardo-AEA and Gluckman Consulting on the basis of a study currently being carried out for DG Clima. It is intended to provide some background to participants at the Consultation Forum according to Regulation (EU) No 517/2014, held in Brussels on September 10th 2015. Topic A concerns standards and legislation that affect the usage of low GWP alternatives to HFCs.

1. Context of Topic A

The phase-down of HFCs will require end users in the RACHP and foam markets to use alternative fluids with lower GWPs. In many cases this necessitates a switch from a non-flammable / non-toxic fluid to a fluid that will require some technical adaptations of the equipment. In particular, many of the low GWP alternatives being proposed might be flammable, toxic or operate at high pressure.

Various standards and pieces of legislation that affect the use of fluids in RACHP and foam blowing were written at a time when there was no restriction on the GWP of the fluids available. This often led to a conservative approach being adopted by standards committees; for example in certain specific applications the conservative approach to ban the use of any flammable fluid was adopted because a non-flammable option was widely available.

The HFC phase-down introduced in the EU F-Gas Regulation 517/2014 will make it increasingly difficult to use high GWP HFC fluids. Research has shown that the proposed HFC phase-down targets can only be achieved with the use of new fluids that require technical adaptations. In that context, a previous decision by a standards committee or a Member State legislator to ban a fluid in a certain application may now be considered overly conservative and that it creates a barrier to the uptake of low GWP HFC alternatives. Where it can be shown that safe use of a fluid is possible it may be important to modify standards and legislation to remove these barrier to the uptake of alternatives.

The standards and legislation that create these barriers exist both at EU and at Member State levels:

- At EU level there are various standards creating barriers that apply across the whole EU. For example EN 378 defines restrictions on maximum refrigerant charge, some of which are now considered too conservative.
- At Member State level there are some pieces of legislation that go beyond the EU level standards and that create extra barriers that apply in a single country or in a region of a country.

The most important barriers relate to the use of flammable fluids. For a fluid to have a low GWP it must have a short atmospheric life. In general, low GWP fluids are more chemically reactive than high GWP fluids. Whilst this is desirable from the climate change perspective, it makes it likely that low GWP fluids have some degree of flammability. Historically there was widespread availability of non-flammable high GWP HFC fluids and it was reasonable to simplify the treatment of flammable fluids. Some existing standards and pieces of legislation simply refer to fluids as being either flammable or non-flammable and they impose a ban on any flammable fluid in certain applications. This very simplistic view of flammability creates barriers to the use of some low GWP alternatives. Flammability is a complex issue and revisions to standards and legislation need to recognise this. Barriers to flammable fluids will be reduced if they properly take into account (a) the degree of flammability of different fluids and (b) the various technical measures that can be taken to mitigate flammability risks.

2. DG Clima Study on Standards / Legislation

This briefing document is based on work being carried out in a study for DG Clima that identifies barriers to low GWP alternatives created by restrictions imposed by standards and legislation. Recommendations will be provided to reduce the impact of barriers identified.

Article 11(6) of the F-Gas Regulation mandates the Commission to: *“collect, on the basis of available data from Member States, information on national codes, standards or legislation of Member States with respect to replacement technologies using alternatives to fluorinated greenhouse gases in refrigeration, air-conditioning and heat pump equipment and in foams”*.

The work carried out in relation to Topic A included a literature search, a Member State survey across the EU, analysis of the standards and legislation identified and discussions with standards experts and industry stakeholders. The scope included the refrigeration, air-conditioning and heat pump sectors (RACHP) and insulation foams.

3. Preliminary Findings

Member State Legislation

The Member States survey received a good response, with data received from 24 countries representing 95% of the EU population. The key data requested in the survey was for Member States to identify any national or regional standards or legislation that creates any barriers to low GWP alternatives that go beyond EU level requirements.

For insulation foam there were no barriers identified by any Member State.

For RACHP, the majority of Member States (17 out of 24) indicated that they do not have any standards or legislation that create extra barriers at either a national or regional level.

In a small number of countries there are significant national barriers, especially to the use of flammable refrigerants in buildings with public access. For example:

- a) In Italy there are a number of Ministerial Decrees affecting various public access buildings including: hotels, shopping malls, hospitals, schools, offices and airports. These ban the use of any flammable refrigerant in split air-conditioning applications. This includes both higher flammability (A3) and lower flammability (A2L¹) refrigerants. Ammonia is permitted for water chillers but other flammable refrigerants are banned for chillers.
- b) In France there is a decree that addresses the risks of fire and panic in public buildings. This applies to buildings such as hotels, restaurants and bars, shops and shopping malls, hospitals, schools, offices and museums. It applies to all RACHP applications and bans the use of flammable refrigerants.

Further details are provided in Appendix B.

EU Level Standards and Legislation

The literature search identified numerous relevant standards and Directives related to the safe use of refrigerants that apply at EU level. Some of these are listed in Appendix A.

¹ A2L is a new category of flammability introduced in the international standard ISO 5149 on safety and environmental requirements for refrigeration systems and heat pumps

Various EU Directives set an appropriate framework for the safe use of refrigerants and foam blowing agents. For example the ATEX Directives set rules for the use of flammable fluids and the Pressure Equipment Directive deals with pressurised systems. None of the experts consulted in the study indicated that these Directives would require modification to enable greater uptake of low GWP alternatives. However, the Directives address numerous end use applications, not just RACHP. Using these Directives to assess RACHP safety takes significant expertise and can be very time consuming (and hence costly) for an individual application.

To address this situation various standards specifically address the RACHP markets. EN 378 applies to all stationary RACHP applications. Three different parts of EN 60335 address small parts of the RACHP market. The advantage of these standards is that they simplify the assessment of RACHP applications by providing simple rules for maximum refrigerant charge in a range of different applications. However, a potential disadvantage is that they over-simplify the situation and create barriers to low GWP alternatives.

EN 378 is being revised, with a new version expected in 2016. The revised version will address some of the current barriers. It is expected that the new 2L flammability category will be introduced, to harmonise EN 378 with ISO 5149. Some parts of EN 60335 are also being revised, with a new version expected either in 2016 or 2017. The progress is quite slow and it seems unlikely that the next versions will address all the barriers. Some specific criticisms received from industry experts include:

- a) That the rules for higher flammability (A3) refrigerants are too conservative in certain applications e.g. for commercial hermetic systems in EN 60335-2-89 which has a charge limit of 150 grammes.
- b) That risk management techniques (such as ventilation and shut-off valves in conjunction with refrigerant detection) are not being considered for A3 refrigerants in the revision to EN 378.
- c) That some standards treat all flammable refrigerants in the same way, without recognising the different degrees of flammability.
- d) That the extra charge allowed for lower flammability (A2L) refrigerants being proposed in the revision to EN 378 is too conservative.

These are crucial issues to resolve as safety is such an important issue. There also may be a lack of good data to help standards committees justify changes to current standards

Preliminary Conclusions

A review of both the Member State legislation and the most relevant EU level standards and Directives showed that in the RACHP sector:

- For **ammonia** there are no unreasonable barriers. The requirements set for ammonia in EN 378 and other relevant standards and Directives are considered appropriate and are well respected by many industry experts. They allow the use of ammonia, which is toxic and has lower flammability (2L), in a wide range of industrial applications and for most water chiller applications, providing the relevant safety requirements are adhered to.
- For **CO₂** there are no unreasonable barriers. CO₂ is being adopted in a wide range of different applications and the current standards provide a reasonable and appropriate set of constraints to ensure safe operation of this high pressure fluid.
- For **hydrocarbons** (HCs, and other A3 higher flammability fluids) the current standards create significant barriers. Some national legislation (e.g. an Italian Decree) simply ban the use of HCs

whilst others limit the amount of HC charge to a conservatively low level (e.g. a 150 grammes limit in EN 60335-2-89 for small commercial refrigeration systems).

- For **A2L** lower flammability fluids (e.g. HFOs and HFC-32) the current standards create significant barriers. There is insufficient recognition of the lower flammability status in some national legislation and the charge limits set by some EU standards may be unnecessarily conservative.
- Most of the barriers are at an EU level with at least 16 Member States indicating no national level issues that go beyond EU level issues.
- For this reason, at Member State level there are a few countries that could consider whether their current national legislation can be updated to bring them in line with the less stringent constraints in most Member States while fully safeguarding safety issues.
- To maximise the uptake of lower GWP alternatives to HFCs the research has shown that the key barriers relate to the various flammable refrigerants including both A3 and A2L fluids. To overcome these barriers it might be necessary to also consider changes to certain EU standards.
- Important standards such as EN 378, EN 60335-2-40 and EN 60335-2-89 are currently being reviewed. It is expected that these revisions will lead to some reductions to the current barriers. However, there are strong concerns that the changes being proposed will not maximise the safe operating envelope for A3 or A2L refrigerants.
- A key constraint for standards committees is a lack of strong evidence to support increased charge sizes in some applications. If such data could be collected it may support a less conservative approach to the next generation of these standards.

4. Stakeholder Input Required

Topic A will be discussed during the morning session of the Workshop on September 10th. Feedback from stakeholders will be a crucial input into the development of the final project report and recommendations. DG Clima are very keen for attendees to provide input into the discussion. Please take the opportunity to provide feedback. Some of the questions that will be debated during the discussion period include:

1. Are there any examples of limiting Member State legislation/codes/standards that have not been identified during the Member States Survey? (Only 7 countries said they had constraints: Austria, Belgium, France, Germany, Italy, Spain and Sweden)
2. Are there any other EU standards that are not listed in Appendix A that should be considered to identify barriers to the uptake of low GWP alternatives?
3. Do you agree that the current standards for ammonia and CO₂ are reasonable: at EU level? At national level? - Do you agree that the key issue to be addressed are standards limiting the use of flammable substances?
4. For flammable refrigerants, what are the key changes required to allow safe use in a wider range of applications? Which are the most important standards to change (at EU level)(at national level)?
5. What steps must be taken to ensure the relevant standards committees do not apply overly conservative restrictions on the use of new low GWP HCF replacements? What improved data is required to support less conservative standards?
6. What future work in the area of standards by European standardization organisations is necessary?

Appendix A

There are numerous EU Directives, Regulations and safety standards that affect manufacturers and users of RACHP equipment. The most important of these are summarised in the table below.

Summary of EU Level Directives	
EU Directives	Purpose
ATEX 95 (94/9/EC)	ATEX addresses risks related to potentially explosive atmosphere. These Regulations set rules for how flammable refrigerants can be safely used. Directive 14/34/EU replaces 94/9/EC from April 2016.
ATEX 137 (99/92/EC)	
PED 97/23/EC	Pressure Equipment Directive: rules for use of refrigerants operating under pressure.
LVD 14/35/EU	Low Voltage Directive: rules for use of electrical equipment (50 to 1000 volts).
Related Codes and Standards	
Standard	Purpose
EN 378: 2008	Refrigerating systems and heat pumps – safety and environmental requirements. EN 378 provides practical rules to define important parameters such as maximum refrigerant charge. It is harmonised with some of the above EU Regulations. EN 378 is currently under revision. A new flammability category (2L, low flammability) will be introduced, to harmonise with international standards including ISO 817.
IEC EN 60335-2-24	Safety requirements for household and similar electrical appliances
IEC EN 60335-2-40	Safety requirements for electrical heat pumps, air conditioners, and dehumidifiers
IEC EN 60335-2-89	Safety requirements for commercial refrigerating appliances
EN 1127-1	Explosive atmospheres — explosion prevention and protection
EN 60079	Requirements for electrical systems used in potentially explosive atmospheres
EN 13463	Non-electrical equipment for use in potentially explosive atmospheres
EN 13313:2009	Refrigerating systems and heat pumps - Competence of personnel

Appendix B

The table below provides information from Member States about national legislation that could create barriers to the uptake of low GWP alternatives.

Country	Legislation
Austria	<p>StF: BGBl. Nr. 305/1969 Regulation of the Federal Minister for Social Administration and of Commerce, Trade and Industry dated 21 July 1969 on the protection of employees and the neighbourhood in the operation of refrigeration systems (refrigeration system regulation)</p> <p>This legislation regulates as a priority the safety of RAC equipment, and measures necessary to protect personnel and users of equipment. Main focus is on prevention of accidents. It affects in principle all refrigeration and AC applications.</p> <p>Standard: ÖNORM M 7770 (Refrigeration equipment and heat pumps with flammable refrigerants (group L3); safety requirements.</p>
Belgium	<p>Flanders: VLAREM II, Artikel 5.16.3.3 Refrigeration</p> <p>Orders of the Walloon Government, July 2007:</p> <ul style="list-style-type: none"> • aimed at preventing atmospheric pollution during the installation and commissioning of fixed refrigerating equipment containing fluorinated refrigerant and in the event of alteration to this equipment, and to ensure the energy efficiency of air conditioning systems (MB 28.09.2007) • laying down full and sectoral conditions on fixed cooling or heating installations production implementing a refrigeration cycle (MB 28.09.2007) <p>For each refrigeration system it is necessary to possess an environmental permit which is issued by municipal authorities.</p>
France	<p>Decree of 25 June 1980 approving the general provisions of the safety regulation against the risks of fire and panic in public buildings</p>
Germany	<ol style="list-style-type: none"> 1. BGR 500, Kap 2.35 Refers L1, L2 and L3 class of EN 378-2000. 2. TRBS 2152, part 1, section 3.4.1. (2): declaration of explosive atmosphere if more than 10 l of possible connected explosive atmosphere independent of the room size 3. Länder regional building codes: due to the flammability of many refrigerants, the systems will need to be evaluated within the fire concept of special buildings (§2.4 Musterbauordnung) e.g. skyscraper law 4. Ordinance on Industrial Safety and Working Environment Act
Italy	<p>R.D. 09/01/1927 n°147 (ammonia chillers)</p> <p>D.M. 10/06/1980 (ammonia in industrial applications)</p> <p>D.M. 9/04/1994 (flammable refrigerants in hotels)</p> <p>D.M. 27/07/2010 (flammable refrigerants in Malls)</p> <p>D.M. 19/08/1996 (flammable refrigerants in Buildings for Public Shows)</p>

	<p>D.M. 18/09/2012 (flammable refrigerants in Hospitals)</p> <p>D.M. 26/08/1992 (flammable refrigerants in Schools)</p> <p>D.M. 22/02/2006 (flammable refrigerants in Offices)</p> <p>D.M. 16/07/2014 (flammable refrigerants in Kindergartens)</p> <p>D.M. 7/07/2014 (flammable refrigerants in Airports)</p> <p>D.M. 18/07/2014 (flammable refrigerants for Freight)</p>
Spain	<p>Royal Decree 138/2011, approving the Safety Regulations for refrigeration installations and their complementary technical instructions</p> <p>This Royal Decree establishes important restrictions to the use of these technologies like the maximum charge in installations of public audience premises.</p> <p>Municipal regulations: Some municipal regulation in Spain establish limitations to refrigeration installations. These municipal regulations are important in Spain because many supermarkets are located in the ground floor of buildings</p>
Sweden	<p>Swedish Work Environment Authority AFS:ar affecting all flammable refrigerants. A2L refrigerants still are treated as A2.</p>