The Japan Refrigeration and Air-conditioning Industry Association (JRAIA) and the Japan Business Council in Europe (JBCE) fully support the goal and purpose of the F-gas Regulation[1]: to contain, reduce and prevent emissions of F-gases. The Regulation is crucial in order to ensure that the refrigeration and air-conditioning industry remains sustainable, and in order to allow it to further improve its environmental footprint. We therefore believe that it is in our direct interest to have a Regulation that works as effectively and efficiently as possible. It is in that context that JRAIA is continuing to submit data, input, detailed comments and insights and has been doing so since the start of the Review of the Regulation.

At this stage, however, we would like to highlight five broad but nevertheless crucial issues.

1) Timing of the Review – delays in national implementation

The Regulation was adopted in 2006, and was applicable in all Member States from mid-2007. However, despite this direct applicability, it has become clear that national provisions that were needed to implement the Regulation have been significantly delayed. And in some Mediterranean Member States with a sizeable refrigeration/air-co market, the necessary requirements are still not in place (Italy, Greece).

These delays have had an unmistakable impact on the ability to determine whether the F-gas framework is effectively meeting its goals. And according to Article 6 of the Regulation, mandatory reporting obligations only kicked in in 2008. As a result of this, the draft Review Study, which is being compiled by contractors, is full of language such as: “cannot yet empirically be measured”, “cannot be verified through empirical data yet”, “reliable data are not yet available”, or “quantitative data is not yet available”.

JRAIA and JBCE are therefore of the opinion that it is too early to fundamentally overhaul the current F-gas Regulation.

2) Global Warming Potential / Indirect emissions / Eco-efficiency

The ongoing Review of the Regulation, as evidenced through the draft Study being compiled by contractors, focuses only on the Global Warming Potential (GWP) of different refrigerants. JRAIA and JBCE believe that this approach is wrong and will almost unavoidably lead to erroneous conclusions being drawn.

The first element in understanding why GWP should not be the only criterion with which different refrigerants are assessed and compared is that it indicates a potential negative climate impact (instead of an actual negative impact which has already occurred). This potential is only fulfilled if the refrigerant is effectively released or emitted. And this is obviously the reason why containment

1 Regulation 842/2006 of the European Parliament and of the Council on certain fluorinated gases; OJ L 161, 14.6.2006.

measures and preventing emissions play such a key role in this Regulation (see section 4).

But such potential, direct emissions are not the only climate change impact that can be generated. Equipment which contains refrigerants to enable it to fulfil its function (refrigeration, air-conditioning, or heating) runs on electricity. Generating electricity causes emissions of greenhouse gases, because fossil fuels are being burned in the unfortunately still vast majority of power plants. Therefore, the amount of electricity which appliances consume has a climate change impact. It is not a coincidence energy efficiency is a key element of the EU's flagship 20/20/20 strategy.

As it happens, it is widely recognised that when it comes to appliances that contain refrigerants, such indirect emissions are the biggest source of climate change impact. For instance, in air conditioning systems, between 90 to 95% of the climate impact is generated by the energy which they use. It is therefore crucial that the energy efficiency and indirect emissions of different refrigerant and appliance options are fully taken into account. A good example is an air-conditioning appliance that runs on CO2. When it is used in circumstances of high ambient air temperatures (such as in Mediterranean summers), the appliance starts to consume a lot of extra electricity and becomes very energy inefficient.

According to the Roadmap to de-carbonise the EU economy, CO2 emissions from power generation should be almost eliminated by 2050. At that point, the impact of indirect emissions will no longer really have to be taken into account. In the meantime, however, it would be very short-sighted to ignore the impact of indirect emissions and energy efficiency.

Instead of only focussing on GWP, an eco-efficiency approach looks at all the climate change impacts. The TEWI (Total Equivalent Warming Impact) concept provides a quantifiable assessment basis which gives the full picture. It should be used in the F-gas Review to enable a more realistic analysis and comparison of different refrigerant and application options. The approach which the authors of the draft F-gas Review Study use to try to incorporate indirect emissions is an inaccurate estimate which does not reflect the real impact.

3) Consumer and worker safety

When assessing different refrigerant options, one key element should not be brushed aside or minimized: safety both of consumers and workers. This concern is particularly acute with quite a few of the alternative refrigerants that are currently taken into consideration: ammonia (NH3), or hydrocarbons such as propane.

For most of these refrigerants, no overall solution or technology has been developed yet that guarantees the safety of consumers and workers under all circumstances. Nor have enough specific or customised solutions emerged that deal with all potential use conditions and risks. Without resolving this issue, one should not allow them to be widely used, let alone used under all circumstances.

In Japan, the number of appliances or systems that use ammonia as refrigerant is small compared to those that rely on fluorocarbons. Nevertheless, the number of accidents with ammonia systems is higher than with fluorocarbon systems. And this is the case even though these applications are strictly controlled and handled by qualified people. The cause of harm is the toxicity of ammonia.

Hydrocarbons, on the other hand, are very flammable. An argument which is often used in an effort to claim they are nevertheless safe to use as a refrigerant, is that they are being widely and commonly used as fuel gases (in cooking for instance). Both circumstances of use could not be more different however. Hydrocarbons that are used as fuel gas are consumed in the process. And therefore, a cooking stove that reaches the end of its useful product life will no longer contain hydrocarbon gases. Applications that use hydrocarbons as refrigerant should still contain them at end of life. This makes handling the product, and treating it for recovery or recycling a task which is full of risk.

JRAIA and JBCE are of the opinion that in the absence of appropriate safety solutions, these alternative refrigerants will simply not be able to be used widely. Doing so would create uncontrollable risks, in particular at end of life. And in the instances where such solutions might be available, they will inevitably come at a cost, and this should be taken into account in their assessment.

4) Containment and recovery

In the sections above on global warming potential and on safety, it has become clear that preventing releases or leaks of refrigerants from the appliances in which they are used are more than crucial. Only when refrigerants with a GWP are not recovered at end of life, and either re-used or destroyed, will their potential be fulfilled.

And preventing leaks or releases of hydrocarbons is even more acute. For instance, when propane is used as a refrigerant, this is under circumstances of high pressure (more than 100 times higher than in cooking for instance). This means that when a leak does occur, the hydrocarbon will emerge much quicker, and create a much more immediately acute risk of explosion. Similar risks have to be faced when hydrocarbons are recovered at end of life. Such recovery process requires a lot of manipulations such as pipe connections and disconnections. The occurrence of malfunction in the tools that are used for that, or an operating mistake, will result in a major sudden release of hydrocarbon refrigerant.

JRAIA and JBCE are therefore of the opinion that the containment and recovery requirements in the current Regulation should be applied, controlled and enforced in the strictest possible sense. When enough factual data are available to quantify or determine the actual decrease in emissions of F-gases which these provisions have resulted in, an assessment of how they should be strengthened can be envisioned.

5) HFO 1234yf, HFC 32 and other low flammability refrigerants

In the draft study which is currently being compiled by external contractors, relatively new refrigerants such as HFO1234yf are also being assessed. JRAIA and JBCE are of the opinion that it is premature to reach definitive conclusions on these refrigerants and believe most other market

participants have the same opinion.

Several projects and assessments are under way that should result in a very comprehensive, full, and hopefully definitive assessment of all the aspects surrounding HFO1234yf, HFO1234ze, HFC32 and their blends. For instance, a global project has recently been started under the initiative of the ICARHMA[2], in which the JRAIA is actively taking a part. But JRAIA, with the support of METI (Japanese Ministry of Economy, Trade and Industry), is also involved in another independent study in Japan. And the US DoE (Department of Energy) is carrying out a full risk assessment of these low flammability refrigerants.

The indications are that HFO1234yf on its own could be used in certain applications where R134a is used, but has drawbacks in performance where R410A is used.

In addition, safety of these refrigerants has to be assessed carefully. Until now, only non flammable-lower toxicity refrigerants (class A1)[3] have been used for mass produced air conditioning equipment. HFO1234yf and HFC32 also have low toxicity, but they have minor flammability (class A2L). So, even though the flammability is low, the risk of fire or explosion increases. Thorough quantitative analysis is therefore necessary to judge whether this increased risk is acceptable or not.

Other refrigerants in the same class as HFO1234yf are HFO1234ze and HFC32. Preliminary performance evaluations show better TEWI (total equivalent warming impact) values for a blend of HFO1234yf with HFC32 than for HFO1234yf on its own in air-cooled systems.

JRAIA and JBCE believe HFO1234yf, ze, HFC32, and their blends have good potential to reduce the global warming impact of refrigerants, and we are therefore actively evaluating them. However, we suggest to avoid reaching policy conclusions on these new refrigerants until the results of global research and assessment projects are available. It is currently expected that this will take 1 to 2 years.

2 International Council of Air Conditioning, Refrigeration and Heating Manufacturers Associations http://www.icarhma.org/

3 Non-flammable, low toxicity refrigerants are referred to as class A1. Refrigerants that have low toxicity and lower flammability are referred to as class A2. Class 2L is a subclass of 2 which indicates very minor flammability. Hydrocarbons are referred as A3 (lower toxicity with higher flammability). If a refrigerant has high toxicity, it belongs to class B (B1 if it is not flammable, B2 if it has low flammability). This classification is set by a standard developed by the American Society of Heating, Refrigeration and Air-conditioning Engineers ASHREA, namely ASHREA 34, and by an ISO standard, namely ISO DIS817. Ammonia, for instance, is classified as B2L, which means high toxicity and low flammability.

The JRAIA/JBCE approach

JRAIA and JBCE recognize the very positive and promising aspects of several of the low GWP alternative refrigerants that are being considered. For instance, we realize that many hydrocarbons have a slightly better performance than quite a few HFCs. In addition, they are in most cases even cheaper. We would really like to use these hydrocarbon refrigerants in as many applications and circumstances as possible. Unfortunately, we simply cannot do that.

Consumer and worker safety concerns cannot and should not be ignored. Moreover, we feel it would be highly irresponsible, in times when product safety considerations dominate many policy agendas and when regulatory checks and frameworks are strengthened, to start marketing products with significant inherent safety risks.

JRAIA and JBCE have always been prepared to consider any kind of alternative refrigerant. And if all the circumstances are right, and the risks can be properly controlled, we do market products with new refrigerants. In Japan, JRAIA member companies supply vending machines with CO2 or hydrocarbon refrigerants to companies such as Coca Cola or Asahi. These vending machines have actually already reached an almost 50% market share in their specific product sector. Our contracts with these companies contain very strict use conditions. But these strict conditions are able to guarantee that all the concerns and risks are and will be properly dealt with.

Another example that we don't hold any kind of bias or inflexible views against alternative refrigerants and that we use them whenever we can is the Eco-Cute heat pump. This heat pump works on CO2, and more than 2 million of them have already been sold in Japan. 'EcoCute' is not a brand name but a generalised product name. Almost every large Japanese manufacturer produces an EcoCute heat pump (see its Wikipedia entry http://en.wikipedia.org/wiki/Ecocute).

Conclusion

The Japan Refrigeration and Air-conditioning Industry Association and the Japan Business Council in Europe are committed to an effective and successful F-gas Regulation. It would therefore be a pity if the ongoing Review would be based on limited data, erroneous assumptions, or flawed methodologies. Even worse is if issues such as safety are ignored or not properly evaluated.

Fundamentally overhauling the F-gas Regulation at this stage is likely to lead to premature conclusions being drawn. JRAIA and JBCE would like to argue that a bit more time is needed to allow the measures enshrined in the Regulation to do their work, and reveal how effective they are, and how they can be improved. We also need a bit more time to assess risks associated with lower GWP refrigerants with minor flammability.

The increased marketing of products with significant inherent safety risks cannot and should not be the practical outcome of the F-gas Review. JRAIA and JBCE are therefore looking forward to developing, together with other stakeholders, technical and procedural solutions that would allow as many lower GWP alternative refrigerants as possible to be used in circumstances that don't threaten consumer and worker safety.

Overall, JRAIA and JBCE would like to take a positive role in a gradual phase-down of HFCs and the mitigation of global warming impacts whilst maintaining the safety of our products.

ABOUT JBCE

The Japan Business Council in Europe (JBCE) was established in 1999 as the representative organization of Japanese companies operating in the European Union. Our membership consists of more than 60 leading multinational corporations that are active across a wide range of sectors, including electronics, automotive, and chemical manufacturing. The key goal of JBCE is to contribute to EU public policy in a positive and constructive way. In doing this, we can draw upon the expertise and experience of our member companies.

ABOUT JRAIA

The Japan Refrigeration and Air conditioning Industry Association (JRAIA) represents all the major Japanese manufacturers of refrigeration and air conditioning equipment. A significant majority of all air conditioning and refrigeration products sold in Europe are produced and marketed by member companies of JRAIA. Air conditioning and refrigeration technology was developed primarily in Japan. This know-how and expertise has been transferred to the EU and improves working and living conditions. The European investments and commitments of JRAIA companies are significant[4].

4 A JRAIA member company is actually the only company that still produces room air conditioners in Europe (namely in the Czech Republic). All European manufactuers have shifted production to Asia (Thailand, Malaysia, etc). This is recognised in the European Commission's preparatory study on eco-design of room air-conditioners (Lot 10).