Honeywell

Position Paper

The EU Regulation on Certain Fluorinated Greenhouse Gases (F-Gas Regulation 842/2006).

Executive Summary

The F-Gas Regulation (Fluorinated Gas Regulation) has its origin in the first European Climate Change Program (ECCP), which took place during the early years of this past decade. The goal of this regulation: significant reduction of Fluorinated Gases that have a high Global Warming Potential (GWP).

The EU had already committed to an 8 percent reduction from 2008 to 2012 versus the 1990 baseline of GHG Emissions in the Kyoto Protocol.

F-Gases have been addressed in a dedicated working group because of the particular position of these gases:

- Fluorocarbons are manufactured on purpose to meet societal needs.
- Fluorocarbons have a number of very desirable characteristics.
- Hydro fluorocarbons (HFCs), which replaced Chlorofluorocarbons (CFCs), have already contributed significantly to the reduction of GHG emissions.

For automobile air conditioning, the EU has created the Mobile Air Conditioning Directive (MAC).

Focus of F-Gas Regulation: containment of F-Gases in closed systems, avoiding leakages, a structured approach to monitor systems, recovery of product at the end of its life and the phasing down of high GWP fluorinated materials.

F-Gas Regulation does play an important role in the EU's path forward to meet the 2020 GHG emissions targets.

Introduction

The F-Gas Regulation has its origins in the first European Climate Change Program (ECCP) that ran in the early years of this past decade. The ECCP's key objective was to identify cost-effective policies and measures that would assist the European Union in achieving its commitments under the Kyoto Protocol. In fact, the EU is committed to reducing its Greenhouse Gas emissions in the first budget period running from 2008 to 2012 by 8 percent versus the baseline of the Greenhouse Gas emissions in 1990 (EU-15).

In recognition of the particular position of F-Gases, the ECCP created a separate working group to address policies and measures affecting the emissions of Fluorinated Greenhouse Gases. There are several reasons why these F-Gases required a distinct approach:

1. Contrary to all other Greenhouse Gases listed in the Kyoto Protocol (CO2, N2O, and methane), F-Gases are not a by-product of human activities, but are manufactured on purpose to meet certain legitimate societal needs;
2. A large category of the F-Gases listed are Hydro fluorocarbons (HFCs)[1] which were designed to replace Ozone Depleting Substances that are covered by the Montreal Protocol.

[1] The other substances are Perfluorocarbons and Sulphur Hexafluoride (SF_6)

3. Although Ozone Depleting Substances are excluded from the Kyoto Protocol, they are actually quite potent Greenhouse Gases – in general the conversion from CFCs to HFCs has resulted in a 75% reduction in the GWP[2] values.
4. As a consequence, use and therefore emissions of F-Gases in 1990 were virtually non-existent, and allowances had to be made to accommodate the fact that they replaced other more potent greenhouse gases that are not included in the 1990 baseline;

The ECCP in the end concluded that for F-Gases, the focus should be on emission prevention through improved containment, better design and recovery, reclamation and re-use. Therefore the goal of the F-Gas Regulation is to achieve a 35% reduction in emissions versus projected emissions (100 million tons of CO2-equivalent, versus more than 4000 million tons overall GHG emissions in the EU-15).

For one specific sector, an exception was made. HFC-134a (GWP-1400) is used as the refrigerant in passenger car air-conditioning systems. Emissions from these systems were projected to grow substantially. As a result, a separate Mobile Air-conditioning Directive[3] was adopted which required that from 2011, all new vehicle platforms could not be fitted with air-conditioning systems that rely on a fluid with a GWP greater than 150. From 2017 onward, all new vehicles would have to meet this requirement. The projected emissions are 100 million T CO2 equivalent, and the reduction is 35 million tons CO2 equivalent or <1% in overall emissions

Late in 2003, the Commission submitted its proposals for the F-Gas Regulation and the MAC Directive. It took nearly three years to complete the legislative process (interrupted by the 2005 European Parliament elections).

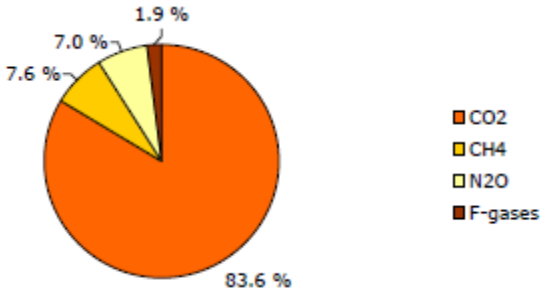
Background on Fluorocarbons

Fluorocarbons are man-made chemicals designed to meet legitimate societal needs such as cooling, heating, power generation using waste- or geothermal heat, enhanced thermal insulation, safe aerosol propellants including pharmaceutical applications, solvents, fire protection, and others. They have a number of desirable properties in common:

- chemical stability
- non-corrosiveness
- moderate operating pressures
- good energy efficiency

Because of these properties, they became the preferred choice in a wide range of applications where traditional substances caused concerns about their safe use. Moreover, because of their stability, Fluorocarbons can be safely recovered for reclamation and re-use.

Because of their stability, these substances have relatively long atmospheric lifetimes, measured in years. Thus, they contribute to the greenhouse effect. In the chart below, the share of each of the substances in total GHG emissions in Western Europe in 2009 is shown:



Share of GHG emissions EU-15, 2008 (EEA Report No 7/2010)
Total emissions EU-15 2008: 3 970 million tonnes CO2-equivalent

[2] GWP: Global Warming Potential with reference to CO_2, where the GWP of CO_2 equals 1
[3] Directive 40/2006/EC

The F-Gas Regulation appreciates the fact that the effect of F-Gases on climate change cannot be looked at in a vacuum. Air-conditioning is a good example. F-Gases are used as refrigerants because they are safe and very energy efficient. One could remove F-Gases as an option and replace it with a substance with a lower GWP. However, if that substance created a less energy-efficient system, then the overall impact on climate would show the decreased impact from the refrigerant and at the same time the increased impact from higher CO2 emissions. The consultants have been given the task to weigh these various factors in their recommendation.

The EU F-Gas Regulation

The F-Gas regulation consists of a set of pragmatic approaches to the use categories of fluorinated greenhouse gases:

- The use of F-Gases in closed systems (air-conditioning and refrigeration systems, heat pumps, fire-protection systems, switchgear, etc.) is permitted, and the focus is on containment and emission prevention by:
    - mandatory inspections of installations by qualified personnel
    - installation and servicing by qualified staff and companies
    - mandatory record-keeping by the owner/operator
    - mandatory recovery at end of life
    - labeling of equipment containing F-Gases
- The use of F-Gases in inherently emissive applications is prohibited unless their use is justified for safety or other compelling reasons
- Mandatory reporting by producers, importers and exporters of F-Gases.
- An assessment of the effectiveness of the regulation by mid-2011.

Moreover, the regulation provides the option to individual Member States to seek additional restrictions provided they were in force at the time of adoption of the Regulation. Both Austria and Denmark have been granted such exemptions until the end of 2012.

Several of these measures took effect after a transition period, and the F-Gas regulation has been in full effect since July 2008. In particular, the establishment of national certification schemes for personnel and companies handling F-Gases has been a challenge. Some Member States (Netherlands, Sweden) have had a long experience with such systems, which have resulted in demonstrably lower emission levels.

A positive side-effect of improved containment is that the energy efficiency of the equipment is maintained at the original levels, thus reducing power consumption and the indirect CO2 emissions associated with it. Honeywell is a strong supporter of such an integrated assessment, also known as Total Equivalent Warming Impact or Life-Cycle Climate Impact.

The Way Forward

In the meantime, the European Union has adopted its 2020 targets (20% renewable energy, 20% GHG emission reduction and 20% energy efficiency improvement). F-Gases can play a vital role in achieving these goals:

- Heat pumps can make a major contribution both in terms of energy efficiency and CO2 emission reduction. They replace traditional heating through combustion with highly efficient use of renewable energy sources (water, air, geothermal). Many heat pumps rely on F-Gases as safe working fluids.
- Equally, F-Gases are specialized working fluids in Organic Rankine Cycle power generation. They are used in both decentralized biomass and geothermal installations.
- Replacements for the F-Gases with a much lower GWP are being introduced. They provide the same performance, such as energy efficiency, as the mainstream F-Gases, while at the same time reducing the Total Equivalent Warming Impact (TEWI) substantially. Consequently, it will be possible to meet the increased demand for refrigeration and cooling across the EU while reducing direct GHG emissions.
- Insulation will continue to play a vital role in retrofitting the existing building stock in the EU, especially in central Europe. Several F-Gases have excellent insulating properties in

insulation foam, which will achieve ambitious energy efficiency targets while providing the same or higher level of comfort.

- Safety remains a concern in emissive uses. Ultra-low GWP fluids can deliver a safe environment for professional and consumer uses for items such as aerosols. Alternatives such as HFO-1234ze are available today to enable a swift change.

Honeywell's Position Going Forward

Honeywell has enjoyed a leadership position in fluorocarbons and is currently developing a range of products with a reduced GWP and ultra-low GWP, while retaining the favorable properties of the previous generation of fluorocarbons.

For example, Honeywell successfully introduced HFO-1234yf (GWP 4) as a cost-effective replacement in passenger car air-conditioning, enabling the car industry to meet the MAC Directive requirements without having to resort to expensive re-engineering of their systems. In addition, Honeywell has fully commercialized HFO-1234ze used today in emissive aerosol applications to replace HFC-134a and in other applications. Honeywell is also working on energy efficient insulating foams that provide optimum insulation with minimal direct emissions.

Honeywell supports legislation that encourages the use of lower GWP fluids and avoids being technology prescriptive. While contained in finished products, F-Gases contribute to very energy efficient applications. The new generation, ultra-low GWP fluids can make a significant cost-effective contribution to achieve the 2020 GHG emissions goals.

Honeywell supports market-based instruments such as the proposed system of cap and phase down under which the total consumption of HFCs is frozen at a specific level (in tons of CO2-eq), and subsequently reduced gradually.[4]

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[4] UNEP/OzL.Pro.22/5 30 July 2010