

THE FUTURE OF FLUORINATED GASES

Not only good refrigerants, but strong greenhouse gases

Perfect refrigerant should satisfy a number of different criteria. Synthetic refrigerants have been considered to be nearly perfect for a long time, until the adverse effect of some of them on environment has been revealed. The transition towards non- ozone depleting refrigerants have been done by developing a number of strong fluorinated greenhouse gases – Hydro fluorocarbons (HFCs).

Regulation on fluorinated greenhouse gases No 842/2006 (known as F-Gas Regulation) has been introduced by the European Commission to mitigate the effect F-gases have on environment. The F-gas regulation performed good in accounting the use of F-gases, but failed in achieving their mitigation. It is estimated, that emissions from F-gases have increased by 60% since 1990. New F-gas Regulation, which will replace the current one, is the next action EU takes to address climate change by reducing of greenhouse gas emissions in the EU by 80-95% by 2050 compared to levels in 1990 [1].

F-gas Regulation covers the use of fluorinated gasses (F-gases) – powerful greenhouse gases that contribute to global warming if released into atmosphere. F-gases account for around 1-2% of the world's annual greenhouse gas emissions. This figure, if nothing will change, can reach 19% by 2050 [2]. Refrigeration industry is large F-gas consumer. European Union is responsible for more than three fifth of total F-gases use [3]. HFCs are most common F-gases, which were developed to replace chlorofluorocarbons (CFCs). HFCs are commonly used as refrigerants in air-conditioning and commercial refrigeration systems. Other F-gases - Perfluorocarbons and Sulphur Hexafluoride (SF₆) – are also strong greenhouse gases (GHGs) covered by the regulation.

New F-gas Regulation is one in a number of attempts European Union (EU) makes to limit and control F-gas usage. It contributes to achievement of EU objective to reduce greenhouse gas emissions by 80-95% by 2050 compared to 1990 levels [1]. In fact, actions to contain, prevent and reduce emissions of F gases are being taken by the EU as part of its obligations under the Kyoto Protocol; the use of F-gases in automotive air-conditioning systems is regulated by the so called MAC Directive. Many commercial, industrial and public sector organisations, including stationary refrigeration, air conditioning and heat pumps and mobile air conditioning, already have obligations under the current EU F-gas Regulation.

Six years of F-gas regulation: time to see the results

In accordance with the current F-gas Regulation, all companies producing, importing or exporting more than one tonne of F-gases must report quantities and intended applications to the European Environment Agency (EEA). The summary on the data reported by companies on the production, import and export of F-gases in the European Union is presented in the recent EEA Technical report [3]. The report summarizes the data from 120 companies and asses the data in two different ways depending on the units used: physical metric tonnes of F-gases and CO₂-equivalent emissions, related to global warming potential (GWP) of various F-gases.

As seen from the reported results, the 2012 year's production, import and intra EU-sales amounts of F-gases decreased by 5%, 6% and 12% respectively, compared to the values from 2011 year. When

speaking in terms of CO₂ emissions, the trends are somehow different, where production of F-gases seen to increase by 1%, while import and sales show almost the same trend.

The Figure 1 presents amounts of the production, imports, exports and sales of aggregated fluorinated gases within the European Union expressed in metric tonnes. It compares the values, obtained from the recent report with those presented in the F-gas reports in during 2007-2010 years.

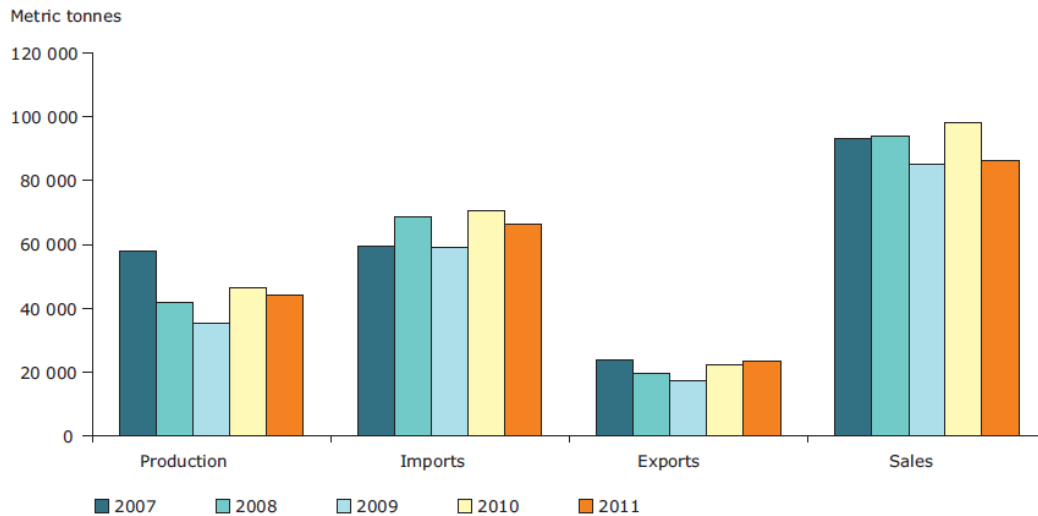


Figure 1: Production, imports, exports and sales of aggregated fluorinated gases within the European Union (metric tonnes) [3].

As it is seen from the Figure 1, the use of F-gases shows no noticeable trends over the past years. That is not a good indicator, as, considering the high GWP of some of HFCs, this figures are better to decrease with time. It is possible to conclude that current F-gas Regulation has no visible effect on mitigating F-gases consumption and thus needs to be revised in order to address climate problem properly. If no action taken, it will lead to further GHG increase. At the same time it is pointed out, that more environmentally friendly alternatives exist in many spheres, where HFCs is actively used this days, including SF₆-free insulation [4]; and feasible natural refrigerants alternatives to synthetic ones [5]).

New proposal – new actions

European Commission has agreed to take further actions in reducing F-gas emissions by recently revealing the final version of the F-gas Regulation proposal [1]. The proposal is a result of broad consultations with stakeholders and is based on the outcomes of the evaluation of the current F-gas Directive. It is somehow modified version of the draft proposal, which has been available earlier for EC Member States.

The new proposal is not only strengthening existing legal requirements (such as the control of leaks, proper servicing of equipment and recovery of the gases), but also propose the phase-down mechanism, similar to that used by the Montreal protocol to phase-down ozone depleting substances. It intends to

freeze HFC consumption in 2015 and gradually reduce it to 21% per cent of current level (defined as an annual average of the levels sold in 2008-2011) by 2030, with a first cut in 2016 [1]. HFCs, imported in pre-charged equipment will be also counted under the phase-down mechanism as, according to estimations, in 2030 almost 20% of HFCs will come within imported equipment. Hence, non-hermetically sealed HFC appliances would have to be filled at the place of installation.

In addition to the phase-down, HFCs proposed to be completely banned in a number of applications. Starting from year 2015 the use of HFCs with GWP greater than 150 will be banned in the domestic refrigeration sector. Similar ban is affecting hermetically-sealed movable room air conditioning appliances from 2020. The summary overview over the new equipment restrictions is given in the Table 1.

Table 1 - Summary overview over the new equipment restrictions is given in the Table 1 [1].

Products and equipment	Date of prohibition
Use of HFC-23 in fire protection systems and fire extinguishers	1 January 2015
Domestic refrigerators and freezers with HFCs with GWP of 150 or more	1 January 2015
Refrigerators and freezers for commercial use (hermetically sealed systems)	1 January 2017 for HFCs with GWP of 2500 or more 1 January 2020 for HFCs with GWP of 150 or more
Movable room air-conditioning appliances (hermetically sealed) with HFCs with GWP of 150 or more	1 January 2020

Additionally, from year 2020 HFCs with GWP greater than 2500 will be banned for recharging of existing refrigeration equipment with a charge size over 5 tonnes of CO₂ equivalent, as more adequate and energy efficient drop-in refrigerants of lower GWP are already widely available on the market. This GWP limit will basically affect R-404A (refrigerant mostly used in supermarket systems) and can be considered as an incentive to accept the use of R-410A and other refrigerants with lower GWP.

Commercial and industrial applications, which were affected the most by the first proposal measures, are excluded from the final proposal. Initially it was proposed to ban all HFCs from 2020 in the aforementioned applications with intermediate bans taking place prior to it for all the HFCs with GWP of greater than 2150. As for now, not only these sectors are excluded, but also the figure of GWP limit value is increased. That is to account for possible GWP estimation value change of refrigerants, which are also updated in the current proposal to the recent values based on the Fourth Assessment Report adopted by the Intergovernmental Panel on Climate Change.

Positions to new proposal vary

A lot of parties take an opportunity to comment on both the draft and, since recently, the final proposal. While most stakeholders agree on the phase-out mechanism, NGOs and stakeholders from “green” industry regard a phase-down as a complement to bans.

Environmental Investigation Agency (EIA), which welcomed the initial proposal and considered it as an opportunity to move away from HFCs and transition to low-global warming potential alternatives, now reacts with disappointment. According to the Clare Perry, EIA Senior Campaigner, the current proposal "...is a missed opportunity and shows all the hallmarks of heavy industry lobbying. More ambitious draft proposals that were leaked previously have been watered down, bans have been removed and what have left is lacking in ambition [6]." Interesting to note, that EIA, when commenting the draft proposal, foresaw this by pointing out that "it clearly doesn't go far enough and could easily be seriously diluted if the lobbyists currently working behind the scenes for the HFC industry get their way" [7]. In support to this statement, it is pointed out that most sectors are ready to go HFC-free by 2020, or even earlier, and, therefore, it is no reason to not to propose bans in those sectors.

The European Partnership for Energy and the Environment (EPEE), which represents the European air conditioning and refrigeration industry at parliamentary level, in reaction to the draft proposal has showed opposition to any bans and support to follow the gradual phase-down, with less severe, that proposed by draft, reductions (30% by 2010 and 65% by 2030) [8]. In the recent press release regarding the final proposal, EPEE "shows fully support to the Commission's intention to gradually phase-down HFCs" and calls upon all stakeholders to remain realistic and to make sure that health and safety, energy efficiency and cost-effectiveness will not be jeopardized by the new rules [9]. Considering the current proposal it is safe to say that the position of manufacturers has been given priority to the requests from the environmentalists, what led to removing a number of bans in the final proposal.

The European Fluorocarbon Technical Committee (EFCTC), among other, when commenting the draft proposal was questioning the reasoning for the GWP ceiling of 2150 and asks to increase it up to 3000 value. Additionally, it is pointed that the prohibition of the HFCs use in virtually all new commercial and industrial refrigeration equipment will discourage the early adoption of, and transition to, lower GWP HFC-based blends. The latter might force users to use less energy efficient solutions [10]. We can see now that these suggestions were largely accounted for in the final proposal.

It is clear that new regulation will bring a change into refrigeration industry, which is barely stabilised after the transition from ozone depleting refrigerants. What is not completely clear, though, is whether the industry is ready for a new change. We have seen examples of industries working hard to adjust to new requirements. For instance, the transition from R-134a to R-1234yf, which seemed to be unavoidable, now is questioned again by such manufacturing leaders as Daimler AG and Volkswagen Group. But this is a topic for another article, which will be available in the next issue of Kyla+.

Citations

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