WHAT IS F GAS AND WHY SHOULD YOU CARE?

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Hydrofluorocarbons (HFCs), one type of F gas, are very powerful greenhouse gases used in our everyday lives and have a global warming potential of between 1,000 and 4,000 times higher than CO_2. Just one very good reason to care!

These man-made gases have a wide range of applications in our everyday lives and are used in such things as refrigeration, air conditioning, heat pump equipment, fire suppression systems and electrical switch gear. F-gas should be of significant focus in Net Zero plans for any organisation using these technologies and particularly supermarkets, retailers, the NHS and data centre operators.

THERE ARE THREE MAIN TYPES OF F-GASES:

- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs)
- Sulphurhexafluoride (SF6)

The most common F-gases are hydrofluorocarbons (HFCs), which contain hydrogen, fluorine, and carbon. They were developed in the 1990s following the 1987 Montreal Protocol agreement on Substances that Deplete the Ozone Layer (the Montreal Protocol). This was an international agreement which set out to stop the production and import of ozone depleting substances and reduce their concentration in the atmosphere to help protect the earth's ozone layer. HFCs were developed to substitute for substances such as chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs), both of which are responsible for depleting the ozone layer and warming the planet.

WHY SHOULD YOU CARE?

Whilst awareness of carbon emissions and the need to reduce them has grown substantially over the last decade, awareness of the contribution of F-gases to GHG emissions has not. These are the facts:

- The total atmospheric concentration of F-gases, CFCs, and HCFCs has grown rapidly since the mid-twentieth century.
- F-gases currently account for around 2.5% of all EU greenhouse gas emissions. Reaching net climate neutrality by 2050 requires us to all but eliminate F-gas emissions by then because of their potent global warming properties.
- By 2019, these unnatural man-made gases were responsible for about 10% of the direct 'radiative forcing' from all long-lived anthropogenic greenhouse gases.
- F-gases are ozone-friendly, enable energy efficiency, and are relatively safe for use by the public due to their low levels of toxicity and flammability, BUT most F-gases have a high global warming potential (GWP)[1]
- If released, HFCs stay in the atmosphere for decades and both perfluorinated compounds (PFCs) and SF6 can stay in the atmosphere for millennia.
- HFCs are very powerful greenhouse gases and have a GWP between 1,000 and 4,000 times higher than CO_2. SF6 has a GWP of 23,900.
- Up to 20% of the global warming impact of refrigerant systems can be attributed to direct emissions of F-gases.
- Approximately 80% of the emissions result from energy consumption and the associated indirect emissions.

WHAT ARE THE OPTIONS?

There are already lower GWP options available now, with others under development.

Hydrofluoroolefins (HFOs) are the fourth generation of fluorine-based gases and offer a more environmentally friendly option to all other fluorine-based gases. These are unsaturated organic compounds composed of hydrogen, fluorine and carbon.

Natural refrigerants such as carbon dioxide and ammonia do not deplete the ozone layer and have very low GWP. Unfortunately, retrofit to natural refrigerants is not possible due to flammability, toxicity and/or high operating pressures relative to other refrigerants. This will require full system refit.

Ammonia was used as a refrigerant prior to the 1950s, before "safer" fluorocarbon refrigerants became commonplace. They are now being used more extensively because of their low impact on the environment although caution is required as it is highly poisonous to humans.

Free cooling is an economical method of using low external air temperatures to assist in chilling water or air, which can then be used for industrial processes, or air conditioning systems. When outdoor temperatures are lower relative to indoor temperatures, this system uses the cool outdoor air as a free cooling source. The system fully, or partly replaces the chiller in traditional air conditioning systems while achieving the same cooling result. Such systems can be made for single buildings or district cooling networks.

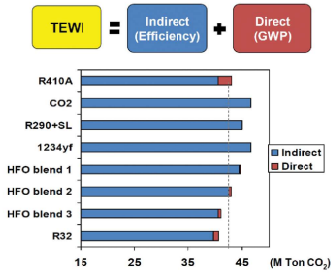
BUT, A SINGULAR FOCUS ON LOW-GWP REFRIGERANTS MAY BE MISGUIDED

To understand the true environmental (and cost) impact of using low GWP gases, the total equivalent warming impact (TEWI) must be calculated. TEWI is the sum of the direct global warming potential of refrigerants emitted into the atmosphere throughout the life cycle of the refrigeration system PLUS the indirect global warming potential caused as a consequence of transforming fossil fuels into electrical energy to operate the system.

TEWI is calculated as defined by using the following equation:
$TEWI = GWP \times L \times n + [GWP \times m \times (1-\alpha R)] + n \times Ea \times \beta$ where:

- GWP is the global warming potential of the refrigerant in kg CO_2 equivalent per kg refrigerant
- L is leaks in kg per year
- n is the number of operating years in a life cycle
- m is the refrigerant charge in kg
- αR is the recovery rate
- Ea is the energy demand required to operate the refrigeration system in kWh per year
- β is the conversion factor for converting energy into kg CO_2 per kWh

1 Global warming potential (GWP) is the heat absorbed by any greenhouse gas in the atmosphere, as a multiple of the heat that would be absorbed by the same mass of carbon dioxide (CO_2). GWP is 1 for CO_2.



SOME FURTHER CONSIDERATIONS:

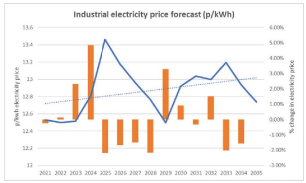
- The average price of electricity, across all sectors, in the UK is forecast to increase by circa 7% by 2025.
- The price of electricity in the UK has risen by an average of 2% annually and is predicted be as much as 33% higher by 2030.
- Green policy costs are set to account for over a quarter of electricity bills.
- Payments to low carbon technologies are predicted to double by 2025 to £15 billion per year.

FUTURE TRENDS

The HFC phase down is being introduced to drive the market towards use of lower GWP alternatives.

Implemented on January 1, 2015, the regulation put in place an HFC phase-down from 2015 to 2030 by means of a quota system and sectorial bans on high GWP refrigerants. This means urgent attention is needed by users of HFC to explore alternatives because:

- On January 1st, 2020, regulations were introduced to put legal obligations on users of F-gases for commercial refrigeration and air conditioning equipment. The EU Fluorinated Greenhouse Gases Regulation (also known as the EU F-Gas Regulation) banned the use of refrigerants with a global warming potential (GWP) of 2,500 or more in certain refrigeration units.



- The shortage of gas is happening now.
- Some gases not available at any price.
- Service costs will rise.
- There is no guarantee that your organisation will be able to obtain sufficient gas for equipment.
- A sustainable refrigerant management plan is needed to mitigate this.

Understanding the impact of F-gases, what the alternatives are, the role of indirect emissions /costs and what the regulations say is an important element in the Net Zero journey of any organisation that uses F-gases and is essential to the wider objectives of halting global warming.

For more information on any of the above, or to talk to one of our consultants about your GHG emissions, please email **George.richards@jrpsolutions.com** or call **0800 6127567**.