

*In focus...*

# Refrigerant gases

By Rhea Healy

When the freshly-revised fluorinated gas (F-gas) regulation came into force two years ago, it really put the pressure on those in the refrigerant business to switch to more environmentally-friendly alternatives – with its impact being widely felt by those in the sector today.

As detailed by the British Refrigeration Association (BRA), the modified F-Gas regulation which came into force in January 2015 across Europe signalled the beginning of a stringent ‘cap and phase down’ stage, aiming to encourage users to switch to lower global warming potential (GWP) refrigerants.

Measured in carbon dioxide (CO<sub>2</sub>) equivalent tonnes, the regulation affects the use of F-gases like hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF<sub>6</sub>). The F-Gases with the highest GWP are being tackled and phased out first before moving onto to ‘lower-risk’ refrigerants.

It continues to stifle the distribution and use of refrigerant gases in two major ways. Firstly, the amount of F-gases allowed onto the European market will continue to be significantly slashed – tumbling 79% in total by the year 2030.

Secondly, the BRA will implement a complete usage ban on new centralised refrigeration systems from 2022. This affects systems with a capacity of 40kW or more being installed using refrigerants with a GWP of 150 or more. Additionally, from 2020 a ban will be placed on servicing existing commercial refrigeration systems containing refrigerants with a GWP of 2,500 or higher.

This latest directive affects anyone that manufactures, uses or services equipment that contains F-gases, like

refrigeration and air conditioning systems, solvents or aerosols, produces or wholesales F-gas, or imports or exports F-gas, or equipment containing F-gas, to or from the EU – with the shockwaves of ongoing and further change being felt by companies across the sector.

As A-Gas Managing Director John Ormerod signified, “The F-gas regulations are changing how we work in the industry and the introduction of low GWP refrigerants are at the heart of this. The challenges ahead are significant and it’s going to have a big impact in the next few years.”

As it stands, there are currently no commercially available refrigerants below 150 GWP on the market today to act as suitable replacements. There are some CO<sub>2</sub>, hydrocarbon and ammonia (NH<sub>3</sub>) alternatives, but these come with their own consequences. R404A, which is the most commonly used refrigerant across the industry, has the highest GWP of 3922 – around 4,000 times the amount that CO<sub>2</sub> contains.

There are two medium GWP alternatives currently available – the R407A and R407F – that are cost-effective and energy efficient, in many cases. And with newer generation refrigerants coming to market, like Solstice® N40 and Opteon® XP40 that offer additional benefits of lower discharge temperatures, the market for solutions is really heating up. Ormerod reinforced, “The refrigerant quota phasedown under F-Gas will put considerable pressure on the supply chain. Shortages are a strong possibility and this will place added pressure on end-users.”

## Driving change

A-Gas’ core business is focused on refrigerants used for heat exchange in air



conditioning and chilling applications. With trading subsidiaries in the UK, South Africa, Australia, South East Asia, China, Thailand and the Americas, A-Gas is focused on refrigerants, recovery and reclamation and industrial specialty gases.

“Regulation is driving change in many of the countries we operate in and we are working with customers to support them in the transition to more environmentally-friendly fluorocarbons,” he explained.

According to Ormerod, the phasedown of HFCs driven by stricter F-Gas regulations will put ‘significant pressure’ on the supply of high GWP refrigerants in the years beyond 2018 where there will be ‘big step-downs’ in the amount of refrigerant that can be placed on the market.

“Users of refrigeration and air conditioning equipment have a variety of options to move away from high GWP refrigerants,” he continued. “These fall into three main areas – replacing the equipment, retrofitting gases with

lower GWP alternatives, or relying on reclaimed refrigerant.”

According to the European Partnership for Energy and the Environment (EPEE), roughly a quarter of the 2018 virgin refrigerant shortfall will need to come from reclaimed sources, so Ormerod believes that, “The latter is becoming an increasingly important part of the supply mix. If this doesn’t happen there simply won’t be enough gas on the market to meet demand – reclaimed refrigerants can fill the gap.”

A-Gas recently invested in an additional refrigerant separator in response to the tougher F-Gas regulations, which will operate in tandem with its existing separator at its UK headquarters and more than double its reclamation capacity. Ormerod signified that this investment will “provide the industry with the necessary capacity and infrastructure to support the F-Gas phasedown. We are already seeing changes in market patterns and as a major supplier of refrigerants we are

responding to this.”

## Historic legislation

The recent Kigali Amendment to reduce HFCs was another historic step forward in the march towards a 1.5°C world after nearly 200 countries met in Kigali, Rwanda at the 28<sup>th</sup> meeting of the parties to the Montreal Protocol on Substances that Deplete the Ozone Layer (MOP28) on 14<sup>th</sup> October (2016).

HFCs, typically used in refrigeration and air conditioning applications, are the world’s fastest growing greenhouse gases and have extremely high GWP. The implementation of this historic legislation has propelled the refrigeration industry towards finding more environmentally-friendly alternatives – which correlates into some added business opportunities for the industry.

So, what exactly might the Kigali Amendment mean for those in the refrigerants sector? Ormerod believes, “The Kigali Amendment brings certainty and a phasedown timetable for

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most countries around the world. We were expecting the inclusion of HFCs and as a business have worked towards this change for many years.”

Another company that views the historic Kigali Amendment as a giant leap forward for the refrigerants industry is Texas-based, high-purity hydrocarbon provider Gas Innovations.

The company’s owner Ashley Madray explained that whilst the immediate impact might be slow burning, there are definite long-term advantages. He stated, “The Kigali Amendment’s impact on our industry and demand for pure hydrocarbons as replacements for fluorine-based chemicals as refrigerants will not be immediate, but in our opinion, it’s another example of our culture moving away from the most egregious environmental impacting compounds.”

Whilst the company is currently working towards the packaging of small and disposable packages for use in the field, as well as developmental opportunities for pure hydrocarbon refrigerants, Madray pointed out that although the term ‘hydrocarbon’ is typically associated with environmental damage, they are actually a lot less detrimental than the fluorine-based compounds that Gas Innovations is offering to replace in the market.

“Generally, the EU F-Gas regulation will support our move to the pure hydrocarbons as a replacement to fluorine-based chemicals,” Madray explained. “While the new fluorine-based chemicals are more efficient than their predecessors and are non-flammable, they are classified as

▶ having GWP well in excess of the pure hydrocarbons.”

“This GWP difference will support the demand and growth of the pure hydrocarbons where possible.”

So, what will continue to drive growth for Gas Innovations? “In the recent past, virtually all of the common refrigerants have been inert, or non-flammable,” he said. “With the advent of pure hydrocarbons, we must offer packages, valves and labels that address the flammable nature of the new era of refrigerants.”

“In addition to the changes in valves, safety and cylinders, training is becoming a real issue. Cylinder packaging is critical to so much of the refrigerant market because of the varying volumes used in different applications. Bulk installations in manufacturing complexes and cylinder applications, including very small cylinders for field maintenance, must be available.” As a result of this new market dynamic, Madray revealed that Gas Innovations is currently working to develop and supply cylinders of all sizes and valves to meet demand in this evolving market.

“While most of the CFCs and HFCs were not flammable in retail and domestic applications, the hydrocarbon refrigerants are – so the technology must accommodate this change,” he reflected.

#### Demand and growth

Whilst hydrocarbons are the ‘hot’ topic at **Gas Innovations, Madray** said that everything is ‘cool’ at the company, as the surge for traditional refrigerants to be replaced by hydrocarbons is speeding up. “The replacement refrigerants are driving a good part of Gas Innovations’ growth,” he revealed.

“The volume of refrigerant hydrocarbons replacing traditional fluorinated hydrocarbons will grow much faster than the economy over the next few years. The product availability with our plans for distribution, packaging, labelling, and safety will drive our growth.”



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Other options for the refrigerants industry include the brands of newer generation of refrigerants such as Freon™ and Opteon™, two solutions offered by industry-leading refrigerant solutions specialist Chemours. Whilst the name Chemours might be new to many in the industrial gases industry, its experience with refrigerants is anything but, as it holds more than 85 years in the sector.

Andrew Abloeser, Global Marketing Communications Consultant at Chemours, reinforced, “It’s an interesting and challenging time in the HVAC industry; in the last 25 years, it has been through multiple transitions in refrigerant technology.”

“Each time one new solution was in place, it was soon time to start working to develop and adopt another one,” he stressed. “These days, the big trend and transition driving growth in the refrigerant market is the F-Gas regulation.”

Chemours Freon and Opteon products were specifically developed to help its customers address the growing regulatory challenges for lower GWP products and the restricted use of certain HFCs. The Freon brand represents Chemours’

hydrochlorofluorocarbon (HCFC) and HFC refrigerants, whereas its Opteon brand represents its products based on hydrofluoro-olefin (HFO) technology.

Chemours will invest hundreds of millions of dollars over the next three years to construct a new facility at the Chemours Corpus Christi site in Texas which will triple its capacity of Opteon products. “We anticipate that the Opteon family of products will reduce the greenhouse gas content of refrigerants by some 325 million tonnes in CO<sub>2</sub> equivalent worldwide by 2025,” Abloeser underlined.

But he cautioned that the industry still has a lot of work to do to meet astringent regulations. “It must meet the objective of maintaining and operating the growing installed base of equipment, and at the same time, reduce the average GWP of the total refrigerant mix to meet the declining HFC-carbon dioxide cap over time.”

“Many new refrigerant and equipment technologies are being developed and introduced to the EU market, and because of the wide variety of current refrigerants and equipment technologies, these will all be required to enable the EU market to meet these parallel objectives,” he concluded. 