

Cracking the myths about propane



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Reducing our carbon footprint is currently on everyone's mind, but with the energy prices soaring, it's easy to get narrowly focused on kilowatt hours, and lose sight on other aspects of sustainability. For instance, there is a revolution ongoing when it comes to refrigerants, where EU regulations on synthetic refrigerants like CFC, HCFC and HFC have tightened, severely restricting or even banning their use. And a further tightening is underway with the update of the F-gas regulation which is currently under discussion. Within this scenario one of the earliest natural refrigerants ever tried – propane – has sailed up to become a smart replacement choice in many present and future HVAC applications. However, the knowledge in the business on using propane as a refrigerant is still scarce, and a number of myths emerging. Let us go through – and bust – some of them.

Myth: "Propane is not a refrigerant, it's a hydrocarbon and thus only good for burning."

This is definitely not true. Propane was one of the first candidates for refrigerants, has a long history, and is well-tested. It has excellent thermodynamic properties and can be used in a wide variety of HVAC appliances. And not to forget – it is smarted to use it in small quantity as a refrigerant in a heat pump instead of burning it in large quantity in a boiler (with 3 kg of propane you can heat a small building for a day by burning it in a boiler, or you can heat the building for 5 years if you use it as a refrigerant in a heat pump).

Myth: "The use of propane as a refrigerant is just a temporary fad pushed by the environmental movement."

In fact, Swegon now sees propane as a long-term solution that will not be displaced in the foreseeable future. Propane is already being used today as a refrigerant, for example, in supermarket display cabinets, domestic equipment and portable AC (have you ever check what is the refrigerant used in the refrigerator you have in your kitchen?). Its share is also growing fast in process and commercial comfort applications, and due to ongoing EU regulation updates, it will become widely used in the HVAC market.

Myth: "The use of propane as a refrigerant, results in low efficiency heat pumps"








Propane units' inefficiency has been one of the first myths to rise in the sector. However, associating the efficiency of a heat pump solely with the refrigerant is incorrect, it is a shortcut that can lead to mistakes. The unit's resulting efficiency derives from many factors: the product design, the available technologies and it is often a trade-off between different project targets such as compactness, silence, cost, etc. Therefore, comparing the unit overall figures, and associate the differences to the refrigerants only, is a source of gross simplifications.

That said, it is a fact that there are already propane heat pump ranges on the market with efficiencies comparable or even better than older product ranges with HFC refrigerants such as R32 and R454B.

Myth: "As natural refrigerant, CO₂ is better than propane."

CO₂ is definitely a good refrigerant with a Global Warming Potential of just 1. It is already in use for cooling in many commercial refrigeration applications where it has replaced some synthetic refrigerants. Nevertheless, if we look to heating and air conditioning appliances

Properties of refrigerants:

							
GWP	1924	1300	573	<1	467	677	3
ASHRAE class	A1	A1	A1	A2L	A2L	A2L	A3
Flammability	No	No	No	Mildly	Mildly	Mildly	Flammable
Toxicity	No	No	No	No	No	No	No
PED group	2	2	2	1	1	1	1
Composition	Blend of HFC	HFC	Blend (HFC + HFO)	HFO	Blend (HFC + HFO)	HFC	HC
Glide	Almost zero	zero	zero	zero	Low glide	zero	zero
Suitable for W/W MT HP (LwT --> 45°C)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Suitable for W/W HT HP (LwT --> 60°C)	Yes	Yes	Yes	Yes	No	No	Yes
Suitable for A/W MT HP (LwT --> 45°C)	Yes	Yes	Yes	No	Yes	Yes	Yes
Suitable for A/W HT HP (LwT --> 60°C)	Yes	No	No	No	No	Almost	Yes

(*) GWP (AR5) according to IPCC V time horizon 100 years

then it has some significant drawbacks (extremely high operating pressure with poor efficiency) that makes it suitable only in high temperature lift applications.

Myth: “Propane is too risky to use.”

To be fair, all refrigerants have drawbacks. Leaving aside the environmental effects of some synthetic refrigerants, even if we focus on natural refrigerants only, we can see that CO₂-based units need pressures of up to 90 bar, and ammonia-based units come with their own toxicity risks. In comparison to that, propane is relatively harmless. Yes, it is certainly flammable. But this can be properly addressed with guidelines and best practice instructions (think about how you properly deal with fuel pumps at a gas station for instance that is classified as an explosive area). And chances are that you already have propane in your home, happily burning it away on weekends: a cylinder for a propane-driven barbecue typically contains 5–10 times the amount of propane than what would be used in a chiller or heat pump for your residence. In HVAC applications, the propane is confined in a safe, closed system with monitoring of leakages and with component designs that prohibit fire or explosions. And as we mentioned above, you probably already have propane circulating in your refrigerator without having given it a second thought.

Myth: “The introduction of a new refrigerant in this phase could slow down the necessary transition from boilers to heat pumps.”

It is true that propane cannot be used in all heating systems, such as rooftop units or direct expansion systems such as VRF / VRV. So, for specific applications

we will still need synthetic refrigerants. But for most other heating systems propane is an excellent choice and will help support the boiler-to-heat pump transition. In particular, propane will be a key enabler in the European Commission Renovation Wave initiative, which will speed up the replacement of existing boilers with high temperature heat pumps. In newer buildings, the distribution system often works at low to medium temperatures, but radiators in older buildings often need water with higher temperature (60–75°C). In these buildings, heat pumps using propane, will be a perfect solution, thanks to their capacity to deliver water as hot as that from boilers. Heat pumps using synthetic refrigerants are not capable of this unless you choose more expensive cascade systems.

Myth: “This is just a refrigerants business. Next year there will be a new next gen refrigerant candidate in place of propane.”

Over the last few years there has been a rush in the refrigerant business, with many chemical companies investing heavily into finding “the perfect refrigerant”. So far, none have proven their worth. Furthermore, even existing synthetic refrigerants are increasingly being subjected to regulation revisions trying to mitigate their greenhouse effect. With the latest, low GWP synthetic refrigerant generation (HFO, hydrofluoroolefin), there are growing concerns about possible harmful compounds generated by decomposition in the atmosphere. The natural refrigerant propane has none of these problems. It is a mature solution, requiring no further long-running development work. It is already present in nature, and it is ready to use.

In short, propane is here to stay. ■