

REASONS WHY HFO REFRIGERANTS ARE A STRONG ALTERNATIVE TO NH₃/AMMONIA

PILLAR 7 - SPACE CONSTRAINTS/ CHILLER FOOTPRINT



INTRODUCTION

When installing an industrial chiller in a food, beverage, or dairy setting, it is important to consider whether NH₃ (Ammonia) is indeed the most appropriate refrigerant solution.

In food and beverage processes, it has been a traditional approach to have the cooling process applied by an "Industrial" cooling system, typically using ammonia as refrigerant. Some reasons are based on unconscious bias, some other reasons are the "natural" aspect of ammonia.

But now companies that need a mild freezing cooling system are increasingly turning to Hydrofluoroolefin refrigerants – known as HFOs – to improve sustainability, boost performance, and significantly reduce costs.

The ideal refrigerant for these sectors needs to be non-toxic, non-flammable, non-explosive, non-corrosive, not harmful to the environment, cheap and easy to produce / work with and have good thermodynamic properties. Luckily, HFOs meet this criterion. And simply put, HFO solutions are always lower cost versus NH₃/ammonia.

HFO refrigerants are categorised as having zero ozone depletion (ODP) potential and low global warming potential (GWP) and R1234ze is a synthetic refrigerant, rather than a natural refrigerant like ammonia. Interestingly the GWP value of R1234ze is less than the GWP another natural refrigerant CO₂ (being 1) and importantly R1234ze doesn't create TFA (trifluoroacetic acid and its salts).

Here we look at the aspect of space constraints.

COMPACT DESIGN

HFOs have zero ozone depletion potential (ODP) and near-zero global warming potential (GWP). HFO systems do not need intermediate heat exchangers to isolate the toxic ammonia. The use of copper and the smart optimisation of all components as a basis for a standard product help creating a compact yet well serviceable cooling system. The compact design of HFO chillers, the ease of installation and reduced maintenance requirements makes them a flexible, sustainable and cost-saving option compared to ammonia.

HFO refrigerants can substantially reduce the Total Life Cycle Cost

of your investment and are ideal for almost every application – a perfect cooling alternative to ammonia.

FACTORY SPACE IS PREMIUM REAL ESTATE

The amount of cooling plant which contains ammonia must be kept to a minimum in workspaces and areas where many people are spending long periods of time. This comes back to safety and ammonia's risk to human health but raises important questions about where you locate an ammonia chiller, especially if your process and facilities are not geared up adequately.

Real estate on factory floors is at a premium, and although chiller plant can be situated externally depending on sizing and cooling requirements (free cooling needing an external chiller for example) there are benefits to having a chiller near the food or beverage application it is cooling, not least for observation and ease of use.

In any case, it is increasingly clear that food and beverage manufacturers are selecting cooling systems today with minimal footprint being a driving factor in their decision-making process. The ideal solution needs to be compact, self-contained, plug and play, easily accessible to carry out service and maintenance and essentially not get in the way of their main task, which is the production of milk, dairy, food products, soft drinks or alcoholic beverages.

CONSIDERATIONS FOR INSTALLING AMMONIA CHILLERS

If installing an ammonia chiller inside, provisions should be made to locate it either in a separate building or at least away from where personnel are working. When selecting an internal location, which will of course take up significant space, considerations should be made that should the ammonia chiller leak that the gas is able to pass through to different parts of the building or facilities and this can be mitigated by things like self-closing doors and ensuring the plant room is sealed adequately, all with further costs and implications.

Access to the ammonia chiller and all its components for both testing as well as planned preventative maintenance and emergency repair is critical. Even if the ammonia chiller is sited outdoors, and any leak would be vented to atmosphere, there will still need to be special pipework and infrastructure between the

chiller and the vessel, tank or bottling line it is cooling. Again, this can be problematic if space constraints are an issue, and the whole footprint, not just the chiller's footprint would need to be carefully considered, planned out and catered to.

IN PRACTICE

In a recent project, a UK based dairy opted for an 1200kW HFO chiller over their original ammonia chiller solution for several reasons, but one important factor to them was conserving as much space at their facilities as possible. The HFO cooling system we supplied, aside from it being a more cost-efficient option thanks to standard design, production and components, was also less bulky and streamlined than the ammonia alternative they had looked into. The ammonia system would have required expensive stainless-steel piping to withstand its corrosive properties, additional maintenance and special devices mounted to monitor the safety of the system, which would have got in the way and caused access issues and monopolised plant room space they had other plans for.

IN SUMMARY

Although ammonia has been used as a cost-efficient cooling medium for over 150 years in chillers and cooling applications at food, beverage, and dairy production sites, the science and modernisation behind other less toxic/safer/lower GWP refrigerants has developed hugely, not least in terms of the magnification and rise to prominence of HFO refrigerants in very recent times especially.

The door is firmly open for refrigerants like R1234ze to offer a perfect cooling alternative regardless of the process or application in question. Given that hydrofluorocarbons like R1234ze are environmentally friendly, non-toxic and with low GWP/ODP (Global Warming Potential / Ozone Depletion Potential), they make a great option for all process cooling requirements in all the aforementioned sectors and their associated industries.

Although service, maintenance and system care are important whatever type of chiller is used, with HFO plant there is not the same risk, worry, risk to health / life and need for emergency procedures should an accident occur.

7 REASONS TO CHOOSE AN ICS COOL ENERGY HFO CHILLER OVER AN AMMONIA CHILLER

- Cost effective solution
- Zero Toxicity
- Ease of maintenance and operation
- Low GWP
- Standardised range of products with fast customisation options
- Proven performance
- Compact footprint