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

PILLAR 2 - TOXICITY

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 toxicity.

RISK TO HUMAN HEALTH

Ammonia (NH3) is extremely toxic, corrosive and at room temperature is a highly irritating, colourless gas with a strong and suffocating odour.

Leaks can occur at any time if equipment is worn or damaged. Ammonia requires specialist cooling systems that are built to rigorous specifications, with operation governed by stringent safety standards. High hazard levels and demanding maintenance schedules – and the need for specially trained staff and elaborate contingency plans - all create higher costs for plant operators. Even with the best precautions, still accidents can happen, with a risk for dramatic impact to the surroundings.

Ammonia is extremely toxic, explosive, flammable, and corrosive. Leaks are a serious hazard with ammonia causing skin problems, breathing difficulties or even death. Inhalation can be fatal within minutes at higher concentrations.

As a result of its highly toxic nature, it is imperative that cooling systems designed to run on ammonia are installed, monitored, and carefully maintained to avoid leaks. Members of staff must be adequately trained to prevent/respond in the safest and most appropriate way should a problem occur, whereby an immediate evacuation of the area/site needs to take place.

Again, due to its toxic properties and potential dangers when not handled properly, suppliers of chillers running ammonia refrigerant need to provide information on the hazards it poses, offer safety data sheets, and ensure the product is packaged safely.

Despite causing irritation and some health complications at relatively low parts per million, ammonia poses a real risk to life and at 300 parts per million upwards. Thankfully, due to its prominent smell, it can be noticed at just 5 parts per million, meaning emergency response to the situation and efforts made to make safe can be deployed rapidly.

Immediate Effects on Health Following Exposure to ammonia (NH3)

- It can rapidly penetrate the eye and cause permanent injury
- It can cause irritation and burns on contact with skin
- Its ingestion causes rapid onset of both serious and life-threatening symptoms
- Its inhalation can be fatal in minutes at high concentrations

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
- Standardized range of products with fast customisation options
- Proven performance
- Compact footprint