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Safety, properties & use of fluorocarbons

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‘Natural’ refrigerants ?

There is no real distinction between the processing required for any refrigerant, whether it occurs naturally in any useable form or is produced by chemical synthesis. They all require an industrial scale manufacturing process to meet quality specifications for refrigeration fluids.

The vapour compression cycle accounts for well over 90% of all refrigeration, air conditioning and heat pump systems. It relies on successively compressing a fluid to a pressure where it can be condensed, with subsequent evaporation to provide the cooling, and finally recirculating it to the first step. To achieve best efficiency, not only should the physical properties of the fluid match the particular requirements of the system but the fluid must meet rigorous standards of purity. These requirements for quality assurance and reliability, coupled with the quantities involved (many hundreds of thousands of tonnes per year) mean that all refrigerant fluids are the result of industrial scale manufacturing processes, and have to pass through separation and purification processes. Typically:

- Carbon dioxide is a by-product of ammonia production and is also recovered and isolated during air separation. In both cases its quality must be brought to refrigerant specifications by further industrial processing;
- Ammonia is synthesised by catalytic methane reforming at high temperature and pressure. It is used predominantly as an intermediate to produce chemical fertilisers and must be treated to obtain refrigerant purity;
- Propane, Butane and Pentane (including their isomers) are separated from fossil fuels in an oil refinery (distillation) and purified on-site;
- Fluorocarbons basic building blocks are fluorspar rock, sulphuric acid, salt and hydrocarbons, which are chemically processed to obtain the desired refrigerant. The final production steps are separation and purification.

Conclusion: No commonly used refrigerant (except water or air) can be obtained without being subjected to industrial processing.

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