

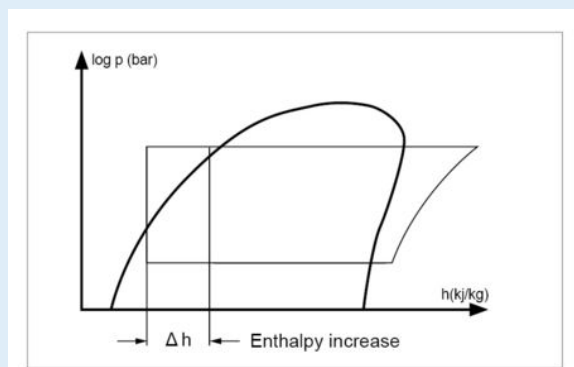
Refrigerant subcooling and system efficiency

The influence of refrigerant subcooling on system efficiency

To date, much has been written on the topic of subcooling in trade journals and other publications. It has also been the subject of (at times controversial) debate among experts. This situation has motivated Güntner to embrace the topic in order to improve the operation of cooling systems. Here, fundamental considerations are explained, which will later be expanded on in a detailed feature article.

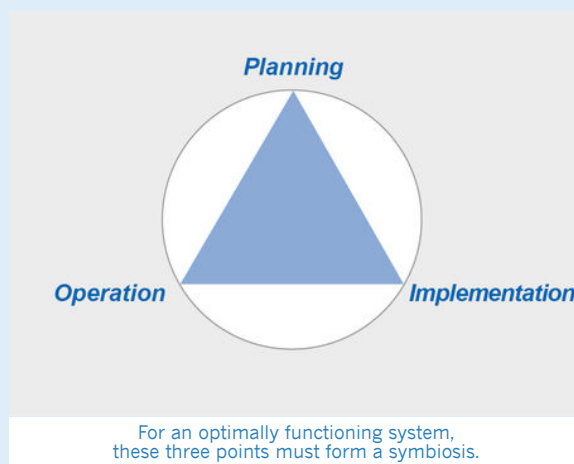
Subcooling – what is it?

In refrigeration engineering, to subcool a fluid means to reduce its temperature below the condensation point at the corresponding vapour pressure. What influence does this have on system efficiency and on the interplay of components in the refrigerant circuit?



Enthalpy increase caused by subcooling

Systematic use of subcooling should increase the operational reliability of cooling systems and bring economic benefits. Improvement of the system's COP is of importance in this context. The commercial cooling systems to be looked at in detail in this article are often unique. This means that for an optimally functioning system, the following three points must form a symbiosis:



- Planning skills and expertise (Planning)
- Professional implementation in practice (Implementation)
- Operators trained in the use of the system technology (Operation)

Subcooling of liquid refrigerant in compression refrigeration systems is a MUST!

The reasons for this are known to specialists and are briefly summarised here:

- To ensure bubble-free refrigerant upstream of the expansion valve:
 - Guarantees higher operational reliability
 - Prevents cavitation
 - Guarantees valve performance
- To increase the utilisable vaporisation enthalpy

So this is not about saying „YES“ or „NO“ to subcooling, but rather „WHERE does it come from?“ and „HOW MUCH is possible or necessary?“

WHERE does subcooling come from?

Important! Subcooling can generally only be generated if a gas seal (receiver / siphon) is realised in a system component or pipe.

Possible types of subcooling:

Uncontrolled

- In an air-cooled condenser
- In an air-cooled condenser with refrigerant accumulation
- In an air-cooled condenser with separate subcooler coil in the air inlet (the sequence of components is important: condenser -> receiver / siphon -> condenser's subcooler coil)
- In a standing receiver
- In the fluid line or pipe components
- In an internal heat exchanger (technically correct term: liquid suction heat exchanger)

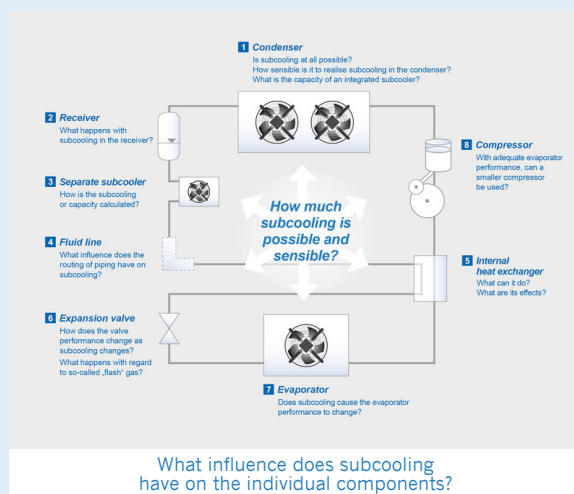
Controlled

- In a separate air-cooled subcooler
- In a separate water-cooled subcooler

Partially or indirectly controlled (for compressor efficiency)

- Economiser operation at compressors
- Subcooling in a two-stage compression process

HOW MUCH subcooling is possible? Economic limits and the limits of components



Many questions! In the afore-mentioned detailed feature article, the answers will be provided, along with suggestions and practical tips for sensible use of subcooling. The feature article is available on the Güntner website www.guentner.eu in German and English.