Week 5: Lecture 3

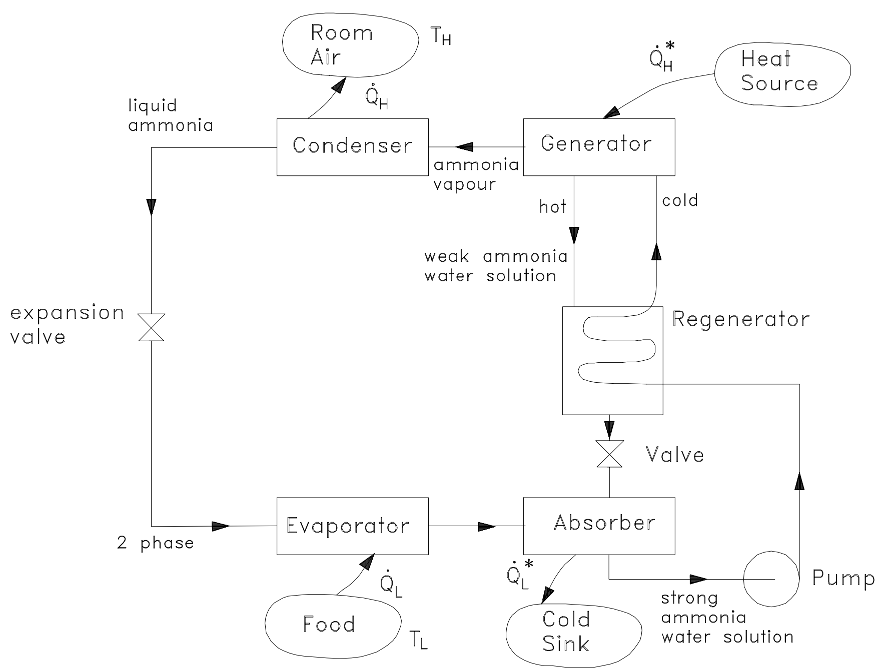
Absorption Refrigeration System

Differences with VCRC

VCRC	Absorption RS
• vapour is compressed between the evaporator and the condenser • process is driven by work	• the refrigerant is absorbed by an absorbent material to form a liquid solution • heat is added to the process to retrieve the refrigerant vapour from the liquid solution • process is driven by heat

Common Refrigerant/Absorber Combinations

Refrigerant	Absorber
ammonia	water
water	lithium bromide



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- absorption is proportional to $1/T \Rightarrow$ the cooler the better
- in the generator, ammonia is driven out of the solution by Q_H^*
- in the absorber, ammonia vapour is absorbed into the water at low T and P maintained by means of Q_L^*
- big savings in using a liquid pump as opposed to the gas compressor in a conventional refrigerator, but it must be weighed against the cost of extra components

Process

- ammonia circulates through the condenser, expansion valve and evaporator (as in the VCRC)
- compressor is replaced by an absorber, pump, generator and a valve
- in the absorber, ammonia vapour is absorbed by liquid
- the process is exothermic
- the solution is cooled - more ammonia can be dissolved in water
- pump raises solution to the pressure of the generator
- generator drives ammonia vapour out of solution (endothermic reaction)
- vapour passes to the condenser
- a weak ammonia, water solution passes back to the absorber through a valve