SNS COLLEGE OF TECHNOLOGY
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DEPARTMENT OF AGRICULTURAL ENGINEERING

COURSE CODE & NAME: 23AGT203 – THERMODYNAMICS AND HEAT TRANSFER

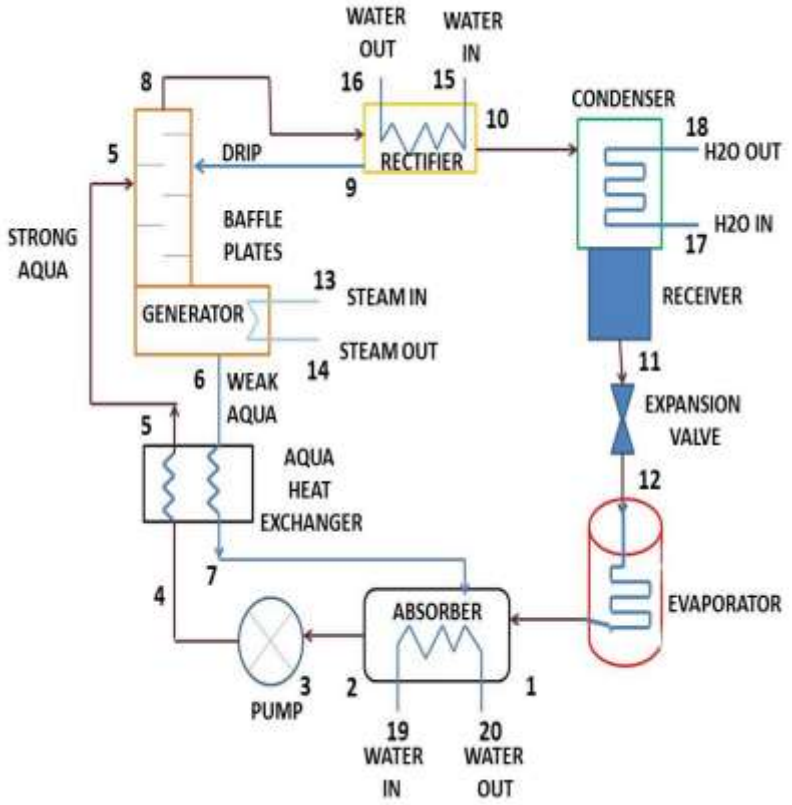
II YEAR / III SEMESTER

UNIT III – HEAT ENGINES

TOPIC : Vapor Absorption Refrigeration System

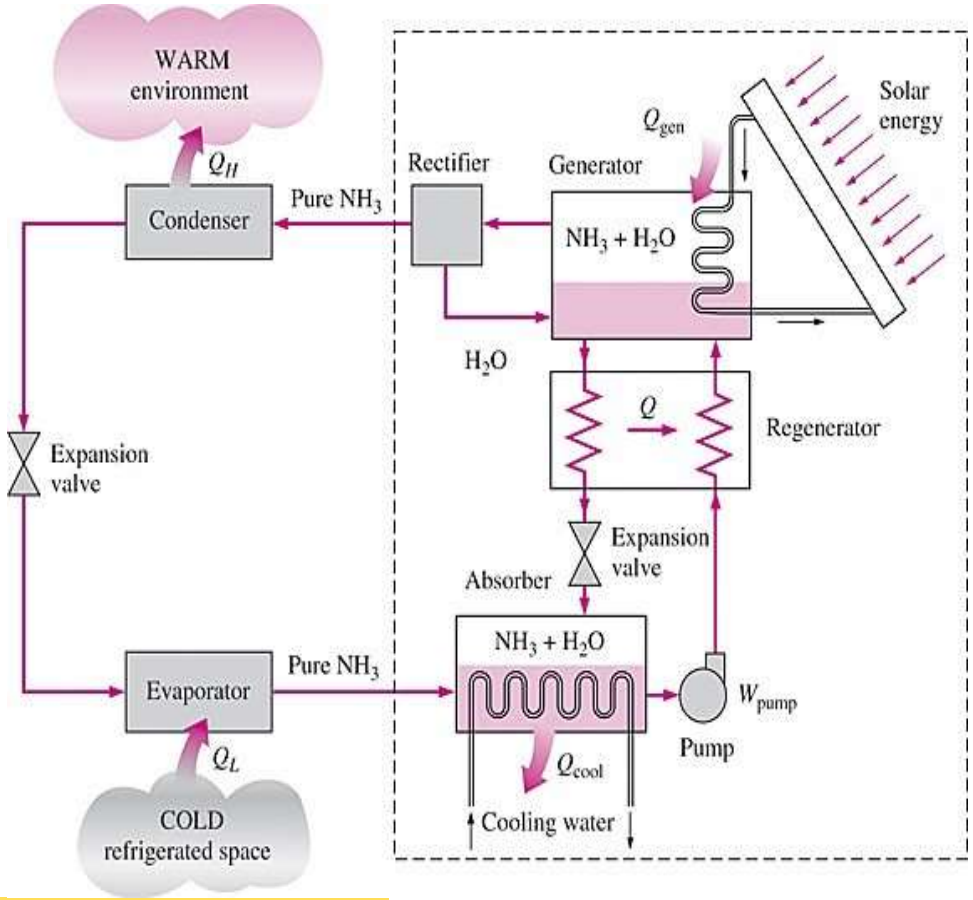
Vapour Absorption Refrigeration System

- The vapour absorption refrigeration system is one of the oldest methods of producing refrigerating effect
- The principle of vapour absorption was first discovered by Michael Faraday in 1824
- The first vapour absorption refrigeration machine was developed by French Scientist, Ferdinard Carre, in 1860.
- In this system ammonia is used as the refrigerant and water is used as the absorbent.

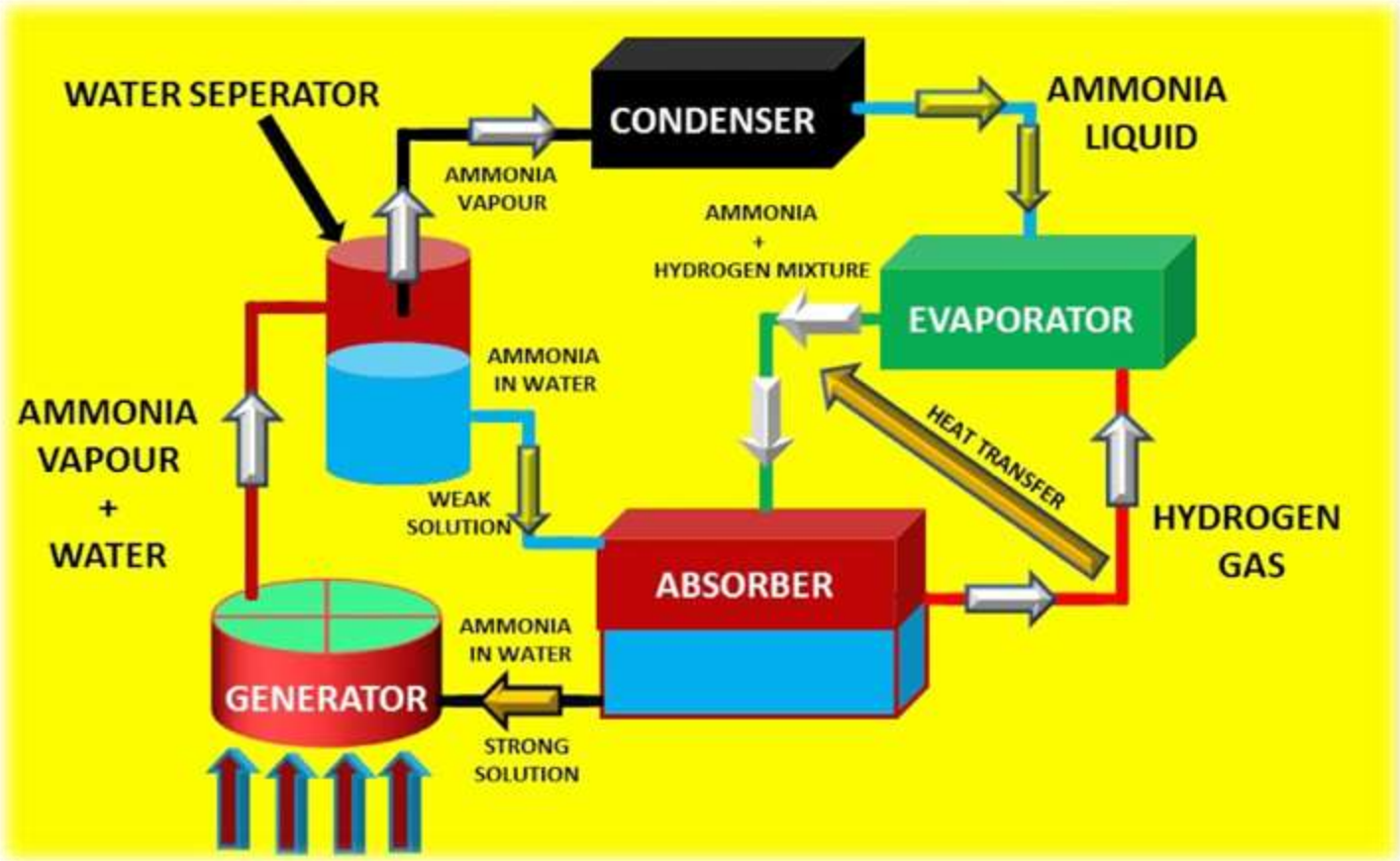


Vapour Absorption Refrigeration System

When there is a source of inexpensive thermal energy at a temperature of 100°C to 200°C is absorption refrigeration.



Vapour Absorption Refrigeration System

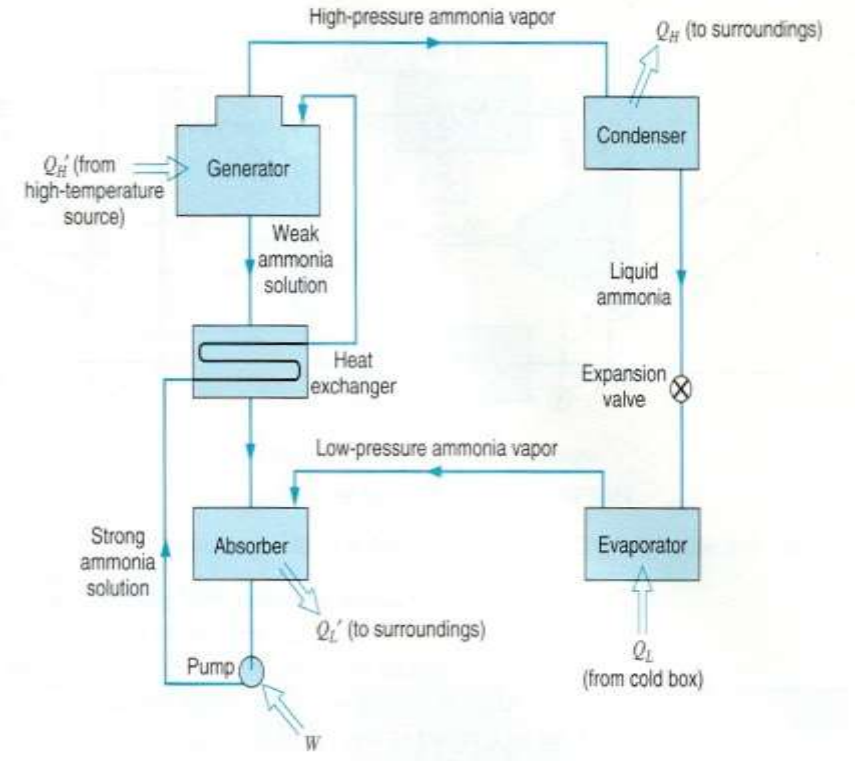


Vapour Absorption Refrigeration System

- Water–lithium bromide and water–lithium chloride systems, where water serves as the refrigerant
- A liquid is compressed instead of a vapor and as a result the work input is very small and often neglected in the cycle analysis
- ARS should be considered only when the unit cost of thermal energy is low and is projected to remain low relative to electricity

Vapour Absorption Refrigeration System

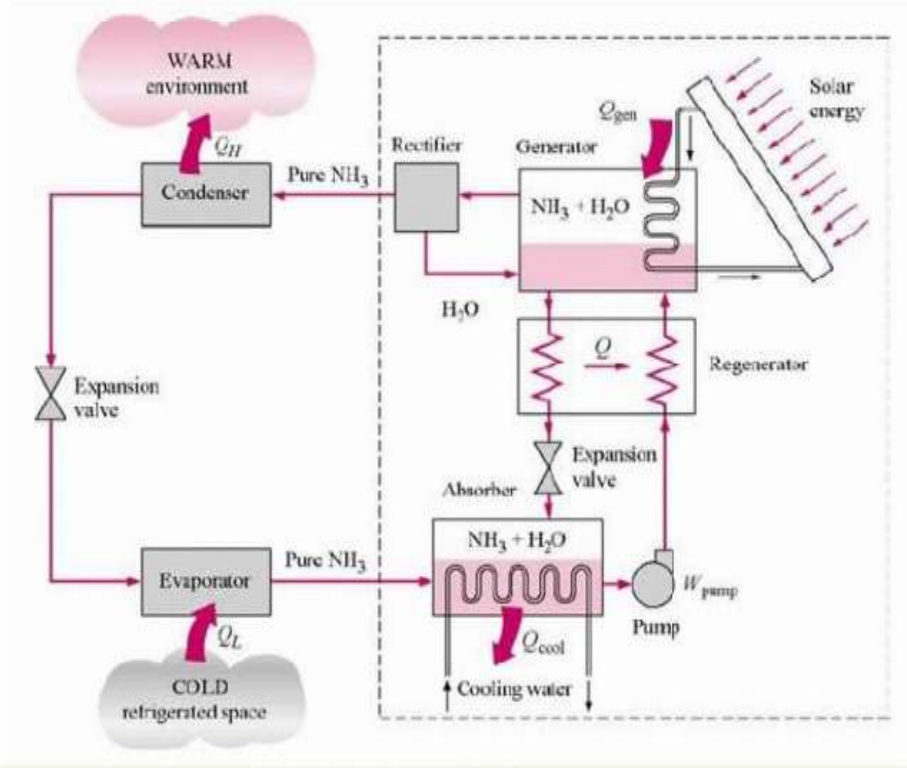
Air-conditioning systems based on absorption refrigeration, called absorption chillers, perform best when the heat source can supply heat at a high temperature with little temperature drop.



Vapour Absorption Refrigeration System

$$COP_{absorption} = \frac{\text{Desired output}}{\text{Required input}}$$

$$= \frac{Q_L}{Q_{gen} + W_{pump,in}} \cong \frac{Q_L}{Q_{gen}}$$

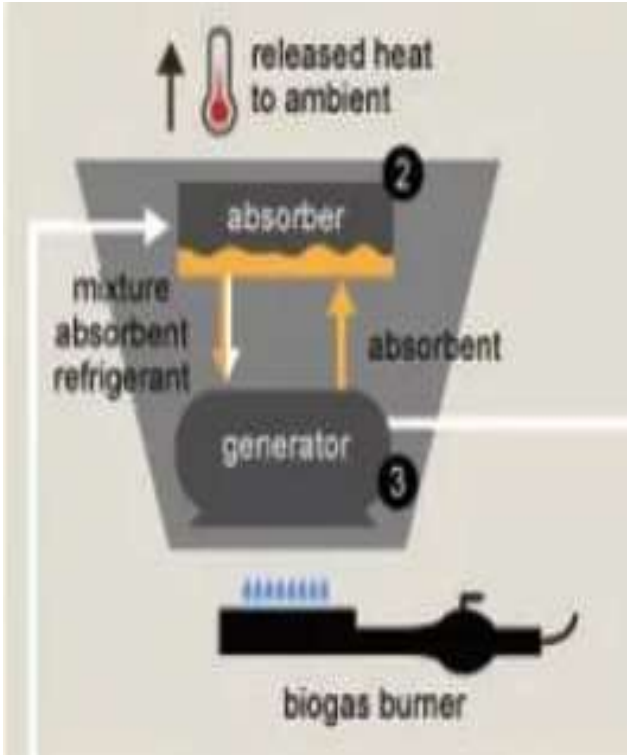


Vapour Absorption Refrigeration System

ANALYZER

The ammonia vapours leaving the generator may contain certain moisture

The function of the analyzer is to remove the moisture as far as possible

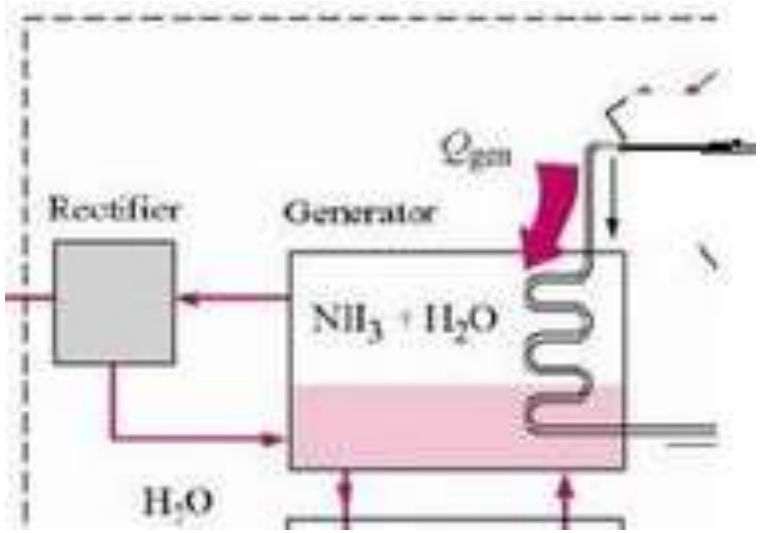


Vapour Absorption Refrigeration System

RECTIFIER

It is a closed type of cooler and is actually a miniature condenser where any traces of water vapour left in the ammonia vapour, are removed by condensation

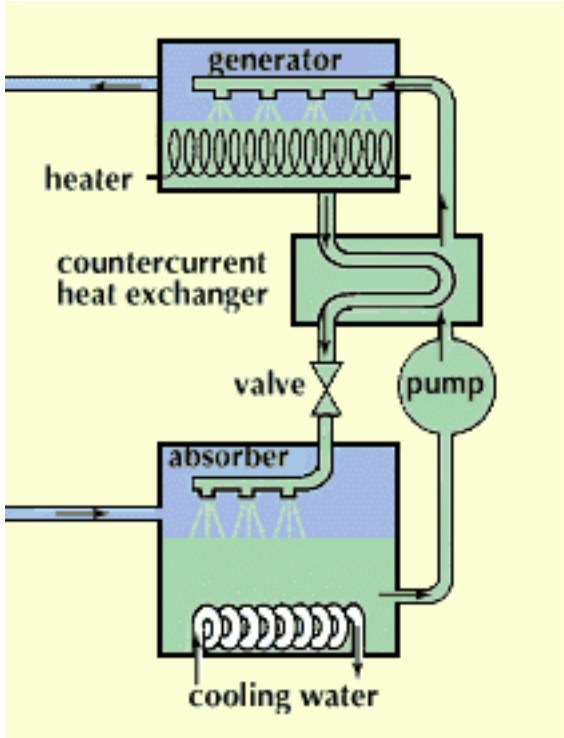
The cooling is achieved by circulating water as is done in an ordinary condenser



Vapour Absorption Refrigeration System

Heat Exchangers

Two heat exchangers are provided to internally exchange heat from the higher temperature fluid to the lower temperature fluid so that one is cooled and the other is heated.



Vapour Absorption Refrigeration System

Advantages:

- The whole system will operated at huge temperature range
- Circulation volume of refrigerant is low which reduces the running cost
- Evaporator size is also small when compared with others
- Coefficient of performance will be very high here
- Load variation does not affect performance
- More will be the capacity i.e.,> 1000 T, 30TR 91% electricity saves.

Vapour Absorption Refrigeration System

Disadvantages:

- Efficiency of absorption system will be very low when compared with others
- Time to quotient will be high so as to produce cooling effect
- As it uses kerosene/oil/gas flame it emits bad smell.
- Initial cost will be very high in the case of vapor absorption refrigeration system
- Leakage will also affects the vapor absorption refrigeration system
- Lithium bromide which will be used in VARS will is corrosive in nature which may affect the overall life of the system

Vapour Absorption Refrigeration System

Single Effect Cycle

Double Effect Cycle

Vapour Absorption Refrigeration System

Single Effect Cycle

A simple and practical absorption system using ammonia as refrigerant and water as absorbent described in the previous articles is an example of single-effect cycle system for vapour absorption refrigeration system.

Double Effect Cycle

If the heat is supplied in two stages then the system is called two stage or double effect cycle of operation.

Assessment

1. The mechanical work required to run vapour absorption system

a. Is more than the mechanical work required to run vapour compression system
b. Is less than the mechanical work required to run vapour compression system
c. Is similar to the mechanical work required to run vapour compression system
d. Cannot say

2. The compressor in the vapour compression system id replaced by

a. An absorber

b. A generator

c. An absorber-generator

d. None of the above

THANK YOU...