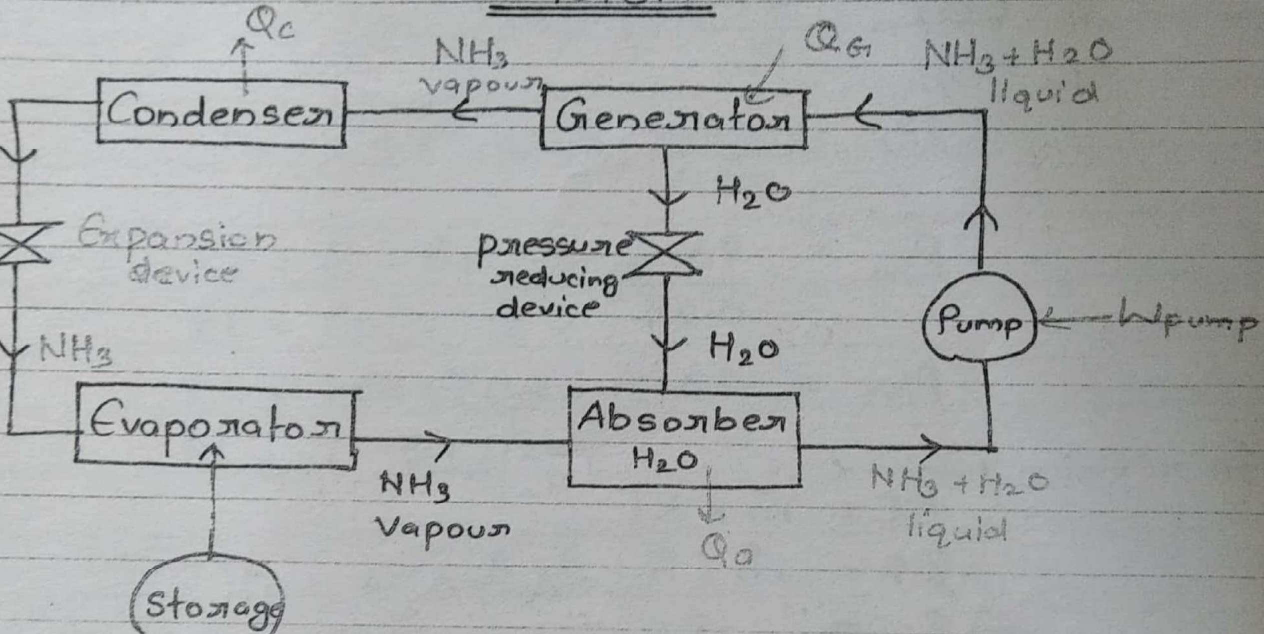
"VAPOUR ABSORPTION REFRIGERATION SYSTEM"



Compressor is replaced with generator, pump & absorber. 'V-A' system is heat operated device. Solar refrigerators are based on 'V-A' cycle. 'V-A' system is used where the cost of electricity is very high. The most popular 'V-A' system is $NH_3 - H_2O$ system in which NH_3 is refrigerant & water is absorbant.

COP of 'V-A' cycle :- In 'V-A' cycle, the refrigerant absorbs heat in generator & evaporator & it rejects in condenser & absorber.

$$COP = \frac{RE}{Energy\ I/p}$$

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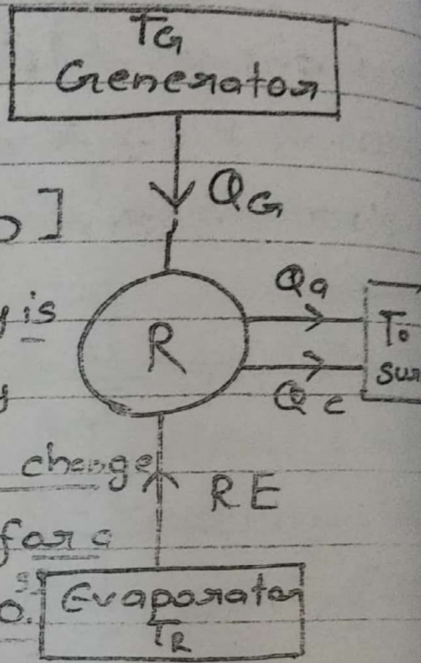
$$COP = \frac{RE}{Q_G + W_{pump}}$$

As pump work W_{pump} is very small, it can be neglected. Therefore, COP is given by-

$$\left\{ COP = \frac{RE}{Q_G} \right\}$$



$Q_G + RE = Q_c + Q_a$ [from Ist law]

"As entropy is a property therefore change in entropy for a cycle will be 0."

$(\Delta S)_{univ} \geq 0$ [IInd law]

$(\Delta S)_{sys} + (\Delta S)_{surr} \geq 0$

$(\Delta S)_{sys} \to 0$

$(\Delta S)_{surr} \geq 0$

$$-\frac{Q_G}{T_G} - \frac{RE}{T_R} + \frac{Q_c + Q_a}{T_o} \geq 0$$

$$-\frac{Q_G}{T_G} - \frac{RE}{T_R} + \frac{Q_G + RE}{T_o} \geq 0$$

$$-\frac{Q_G}{T_G} - \frac{RE}{T_R} + \frac{Q_G}{T_o} + \frac{RE}{T_o} \geq 0$$

$$Q_G\left(\frac{1}{T_o} - \frac{1}{T_G}\right) \geq RE\left(\frac{1}{T_R} - \frac{1}{T_o}\right)$$

$$Q_G\left(\frac{T_G - T_o}{T_o T_G}\right) \geq RE\left(\frac{T_o - T_R}{T_o T_R}\right)$$

$$\left(\frac{T_G - T_o}{T_o T_G}\right)\cdot\left(\frac{T_R}{T_o - T_R}\right) \geq COP$$

$$COP \leq \left(\frac{T_G - T_o}{T_o T_G}\right)\left(\frac{T_R}{T_o - T_R}\right)$$

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$$\left\{ COP_{max.} = \left(\frac{T_G - T_O}{T_G}\right)\left(\frac{T_R}{T_O - T_R}\right) \right\}$$

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