RAC

DATE

Refrigeration :

It is the process of maintaining lower temperature compare to surrounding. in order to maintained lower temperature continuously refrigeration system must operate on a cycle.

Refrigerants :

This are the substances which absorbs heat from storage space and produced lower temperatures.

eg : R-11, R-12, R-134a, NH_3, CO_2 etc.

Refrigeration effect: (RE)

The amount of heat that is to be removed from storage space in order to maintained lower temperature is known as refrigeration effect.

$$C.O.P_R = \frac{Q_2}{-Win} = \frac{RE}{Win}$$

Significance of C.O.P

C.O.P represents the running cost of the system

Greater the C.O.P lesser is the work input for a given refrigeration load and lesser is the lesser electrical energy consumption and lower is the running cost and hence large C.O.P is desired.

Unit of Refrigeration : (TR)

It is the amount of heat to be removed from 1 tonne of water (American tonne = 907 kg) at 0°C in order to convert it into ice at 0°C in 24 hrs. (1 day)

∴ ton of refrigeration represent heat transfer rate

In order to distinguished mass from heat transfer tonne is written for mass. and ton is written for heat transfer rate.

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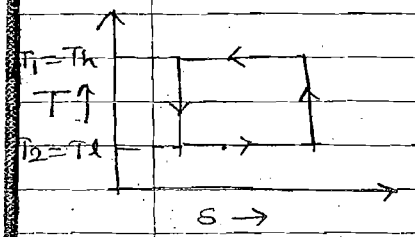
$1\,TR = m(LH) = \frac{907 \times 335}{2400 \times 3600}$

1 TR = 3.5 KJ/sec = 3.5 kw = 210 KJ/min

Ideal Refrigeration cycle (Reversed carnot cycle) or Reversible refrigeration cycle.

Reversed carnot cycle is an Ideal refrigeration cycle.



$$(C.O.P)_{ideal} = (C.O.P)_{max} = \frac{T_l}{T_h - T_l}$$

Note : lower temp is known as evaporator temp and higher temp is known as condenser temp.

if $\dot{m}$ is the mass flow rate of refrigerant then

refrigeration capacity $RC = \dot{m} RE$

power input $(pi) = \dot{m} \times w_i$

$$\therefore C.O.P = \frac{RE}{win} = \frac{RE \times \dot{m}}{win \times \dot{m}} = \frac{RC}{Pin}$$

(1) A carnot refrigerator requires 1.5 kw for ton of refrigeration to maintain a region at −30°c then the c.o.p of refrigerator.

⇒

$Pin = 1.5$ kw

$RC = 1\,TR = 3.5$ kw

$$C.O.P = \frac{3.5}{1.5} = 2.33$$