HindPhotostat

GET IT ON Google Play

Hind Photostat & Book Store

Best Quality Classroom Topper Hand Written Notes to Crack GATE, IES, PSU's & Other Government Competitive/ Entrance Exams

MADE EASY
MECHANICAL ENGINEERING
R.A.C
By-Bansal Sir

- Theory
- Explanation
- Derivation
- Example
- Shortcuts
- Previous Years Question With Solution

Visit us:-www.hindphotostat.com

Courier Facility All Over India
(DTDC & INDIA POST)
Mob-9311989030

HindPhotostat

GET IT ON Google Play

MADE EASY , IES MASTER , ACE ACADEMY , KREATRYX

ESE , GATE, PSU BEST QUALITY TOPPER HAND WRITTEN NOTES
MINIMUM PRICE AVAILABLE @ OUR WEBSITE

1. ELECTRONICS ENGINEERING
2. ELECTRICAL ENGINEERING
3. MECHANICAL ENGINEERING
4. CIVIL ENGINEERING
5. INSTRUMENTION ENGINEERING
6. COMPUTER SCIENCE

IES ,GATE , PSU TEST SERIES AVAILABLE @ OUR WEBSITE

- IES –PRELIMS & MAINS
- GATE
- NOTE;- ALL ENGINEERING BRANCHS
- ALL PSUs PREVIOUS YEAR QUESTION PAPER @ OUR WEBSITE

PUBLICATIONS BOOKS -

MADE EASY , IES MASTER ,ACE ACADEMY ,KREATRYX ,GATE ACADEMY, ARIHANT ,GK

RAKESH YADAV, KD CAMPUS , FOUNDATION , MC –GRAW HILL (TMH) ,PEARSON...OTHERS

HEAVY DISCOUNTS BOOKS AVAILABLE @ OUR WEBSITE

F230, Lado Sarai New Delhi-110030 Phone: 9311 989 030	Shop No: 46 100 Futa M.G. Rd Near Made Easy Ghitorni, New Delhi-30 Phone:9711475393	F518 Near Kali Maa Mandir Lado Sarai New Delhi-110030 Phone: 9560 163 471	Shop No.7/8 Saidulajab Market Neb Sarai More, Saket, New Delhi-30

Website: www.hindPhotostat.com
Contact Us: 9311 989 030
Courier Facility All Over India
(DTDC & INDIA POST)

Refrigerator and Air conditioning

- Basic concept
- VCRS
- Ref
- VARS
- RBC
- Ref Equipment

- Psychrometry
- Summer & winter AC

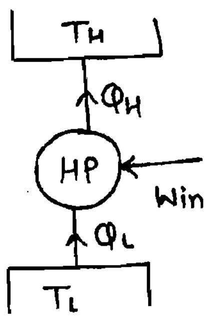
BOOKS : CP Arora
PL Ball

BASIC CONCEPTS

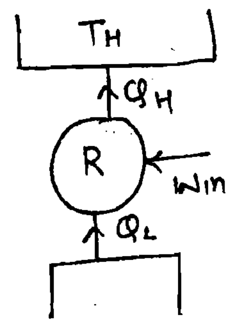
- **Refrigeration Effect** :- It is the amount of heat which is required to extract from the Storage space in order to Provide & maintain lower temperature than that of surroundings

Refrigerant → It is the working fluid or working substance which is use to extract the heat from the storage space

COP → Coefficient of Performance or Energy Performance or EPR ratio :→ $COP = \frac{DE}{W_{in}}$



$Q_L + W_{in} = Q_H$



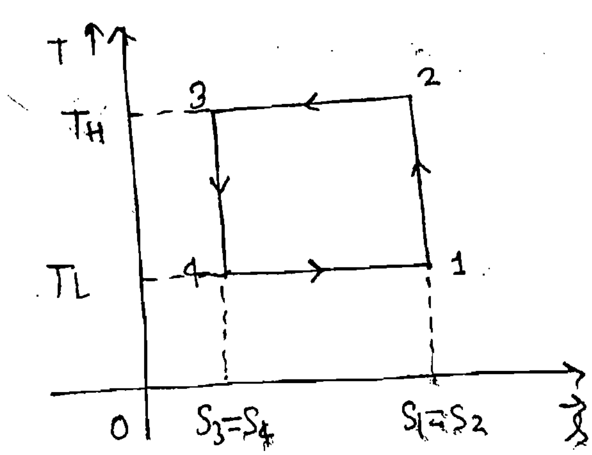
$$(COP)_{HP\,Actual} = \frac{Q_H}{Q_H - Q_L}$$

$$(COP_{HP})_{Ideal} = \frac{T_H}{T_H - T_L}$$

$$(COP)_{R\,Actual} = \frac{Q_L}{Q_H - Q_L}$$

$$(COP_R)_{Ideal} = \frac{T_L}{T_H - T_L}$$

- Ideal Refrigeration Cycle or Reversed Carnot Cycle :→



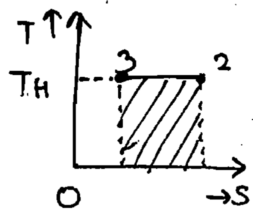
Process 1-2 Rev. adiabatic compression

Process 2-3 Isothermal Heat rejection

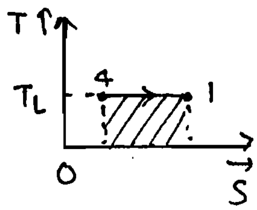
3-4 Isentropic Expansion

4-1 Isothermal heat addition

$$COP = \frac{DE}{W_{NET}} \qquad W_{NET} = Q_{Net} = \cancel{Q_{1-2}}^{\,0} + Q_{2-3} + \cancel{Q_{3-4}}^{\,0} + Q_{4-1}$$



$$dQ_{2-3} = T(S_F - S_I) = T_H(S_3 - S_2) = -T_H(S_1 - S_4) \quad \text{— (2)}$$



$$dQ_{4-1} = T_L(S_1 - S_4) \quad \text{— (3)}$$

Use eqn (2) & (3) in eqn (1)

$$W_{Net} = Q_{Net} = -T_H(S_1 - S_4) + T_L(S_1 - S_4)$$

$$\boxed{W_{Net} = Q_{Net} = (T_L - T_H)(S_1 - S_4)} \quad \text{— (4)}$$

$$\boxed{W_{Net} = -ive}$$

From eqn (4) we can say that our system under consideration is a work absorbing device.

$$W_{input} = (T_H - T_L)(S_1 - S_4)$$

$$COP = \frac{DE}{(T_H - T_L)(S_1 - S_4)} \qquad DE \rightarrow Q_{4-1} = T_L(S_1 - S_4)$$

$$\boxed{COP = \frac{T_L}{T_H - T_L}}$$

NOTE:-

1. Reversed carnot COP is a function of temp. Limits only

2. If there are 'n' number of Rev. Refrigerator are operating between same temp. limits with different working fluids, then the value of max. possible COP or Ideal COP or Reversed carnot COP are having same value.

3. Reversed Carnot COP is independent of Working fluid

4. Producing Ice at 0°C

(a) $(COP)_{sumer} > (COP)_{winter}$

~~(b)~~ $(COP)_S < (COP)_w$

(c) $(COP)_S = (COP)_w$

(d) Can't say

Summer	Winter
$T_L = 0°C$	$T_L = 0°C$
$T_H = 30°C$	$T_H = 10°C$

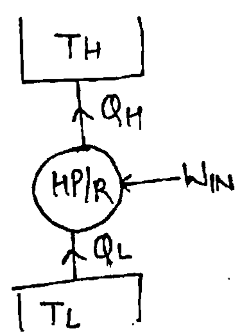
T_L = constant — $(COP)_S < (COP)_w$

$(T_H)_S > (T_H)_w$

Relationship between Heat Pump COP & COP of Refrigerator: →

$$COP_{HP} = COP_R + 1$$

$$1 + COP_R = \frac{T_L}{T_H - T_L} + 1 = COP_{HP}$$



The above expression is applicable b/w same temp. limits