GARVIT SHAH
F-24

EXPERIMENT : No. 4

Page No.
Date

- **Aim :** To study the various parts of vapour compression cycle refrigeration unit & carry out the performance analysis on the same.

- **Experimental Procedure :**

1. Add measured quantity of water in the evaporator tank.
2. Switch on the main board. Check voltage : It should not be less than 190V.
3. Open hand shut-off valves.
4. Switch on the unit.
5. Note down the initial water temperature & initial energy meter reading.
6. Run the unit for heat and note down following readings -
   (i) Suction Pressure i.e. Compressor ~~exit~~ inlet.
   (ii) Discharge Pressure i.e Compressor outlet.
   (iii) Compressor inlet temperature
   (iv) Compressor outlet temperature
   (v) Expansion valve outlet temperature
   (vi) Final temp. of water placed in the evaporator tank
   (vii) Mass flow rate at refrigerant.
   (viii) Final energy meter reading.
7. Switch off compressor & then switch off the main board.

Sundaram

Teacher's Sign. : _____

Calculations :

1) Actual COP & refrigerating effect

Actual refrigeration effect = Amt. of heat removed from water by refrigerant

$= (m_{water} \times C_p \times \Delta T)$ KJ

$= 15 \times 4.186 \times (26-7)$

$= \underline{1193.01 \text{ KJ}}$

Work Done = Energy consumed by the compressor

$= (E_1 - E_2)\,3600$ KJ

$= (65.50 - 65.18)\,3600 = \underline{1152 \text{ KJ}}$

$(COP)_{act} = \dfrac{RE \text{ actual}}{\text{Work Done}} = \dfrac{1193.01}{1152}$

$(COP)_{act} = 1.035$

2) Theoretical COP & refrigerating effect

$(COP)_{theoretical} = \dfrac{(h_1 - h_4)}{(h_2 - h_1)}$

$h_1 = 385$ KJ
$h_2 = 430$ KJ
$h_4 = 230$ KJ

$(COP)_{theoretical} = \dfrac{385 - 230}{430 - 385} = \dfrac{115}{45} = \underline{3.44}$

Theoretical Refrigeration Effect $= m_{ref}(h_1 - h_4)$ KJ

$= 36\,(115) = \underline{4140 \text{ KJ}}$

EXPERIMENT : No. _____ Page No. _____ Date _____

- **Observations :**

1. Mass of water (m) = 15 kg
2. Initial temp. of water = 26°C
3. Final temp. of water = 7°C
4. Initial ~~temp~~ energy meter reading = 65.18 kWh
5. Final energy meter reading = 65.50 kWh
6. Temp. before compression T_1 = 12°C
7. Temp. after compression T_2 = 33°C
8. Temp. after condensor T_3 = 28°C
9. Temp. after expansion valve T_4 = -12°C
10. Gauge pressure before compression P_1 = 1 kg/cm²
11. Gauge pressure after compression P_2 = 7.5 kg/cm²
12. Duration of experiment = 41 min
13. Mass flow rate of R-134a refrigerant = .60 kg/min = 36 kg/sec

- **Results :**

	Actual	Theoretical
COP	1.035	3.44
Refrigeration Effect	1193.01 KJ	4140 KJ

- **Conclusion :**

Actual COP is 1.035 & theoretical COP 3.44. There is a large difference in both due to the variation in surrounding, human errors & system errors.

Sundaram

Teacher's Sign. : _____