Steam table :-

⇒ It is tedious to calculate the relation between various quantities as pressure, temperature, specific volume, enthalpy of the steam at various stages.

⇒ These properties values are various quantities given in these table for 1 kg of steam is dry saturated.

The following three main divisions present in steam tables.

Table I : Specific volume, Specific enthalpy, Specific entropy for various pressure.

If the required pressure is not directly include in a steam table, it would lying between two consecutive pressure such as data can be calculated by simple interpolation.

Table II.

It shows the various quantities for various saturation temperature since there is only one saturation temp for each saturation pressure

Table : III.

It shows the superheated steam table here, the various quantities such as specific volume, specific enthalpy and specific entropy for various pressure and temperature.

Thermodynamic Properties of Steam :-

Various properties → Various condition of steam (wet, dry & superheated)

i) Enthalpy of steam (h) :-

It is the amount of heat added to the water from freezing point to till the water.

Wet steam, $h_w = h_f + x h_g$.

Dry steam. $h_d = h_s + h_{fg}$.

Superheated steam. $h_{sup} = h_g + C_p (T_{sup} - T_{sat})$

where,

h = Enthalpy of steam KJ/kg.

$T_{sup} - T_{sat}$ = degree of superheat.

ii) Specific Volume of Steam (v).

It is defined as the volume occupied by the unit mass of steam at the given pressure and temperature.

Wet steam $V_w = x V_g$.

Dry steam $V_d = V_g$.

Superheated steam $V_{sup} = \frac{V_g T_{sup}}{T_{sat}}$.

V = specific volume (m^3/kg)

w = wet d - dry.

sup - superheated.

h - enthalpy.

s - entropy.

iii) Work done during expansions (W).

During the evapouration process, there is a considerable increases in its volume when the pressure remains constant.

Energy required for absorption of latent heat for increasing volume of the steam.

Wet steam, $W_{wet} = 100 p \times V_g$.

Dry steam $W_d = 100 p V_g k$.

Superheated steam $W_{sup} = 100 p V_{sup}$.

where,

W = work done in KJ.

P = pressure at which evapouration (bar)

iv) Internal Energy of Steam (U) :

Internal energy of steam is defined as the actual heat energy stored in the steam above the freezing point of water at the given conditions.

$$h = W + \Delta u .$$

$$\Delta u = h - W$$

Wet steam $U_w = [h_f + x h_{fg}] - [100 p x v_g]$.

Dry steam $U_d = [h_f + h_g] - [100 \cdot p v_g]$

Superheated steam $U_{sup} = h_{sup} - 100 pv_s$

v) Entropy of steam (S) .

It is the property of the steam which increases with increase in temperature and decrease with decrease in temperature.

Wet steam $S_{wet} = S_f + x S_g$.

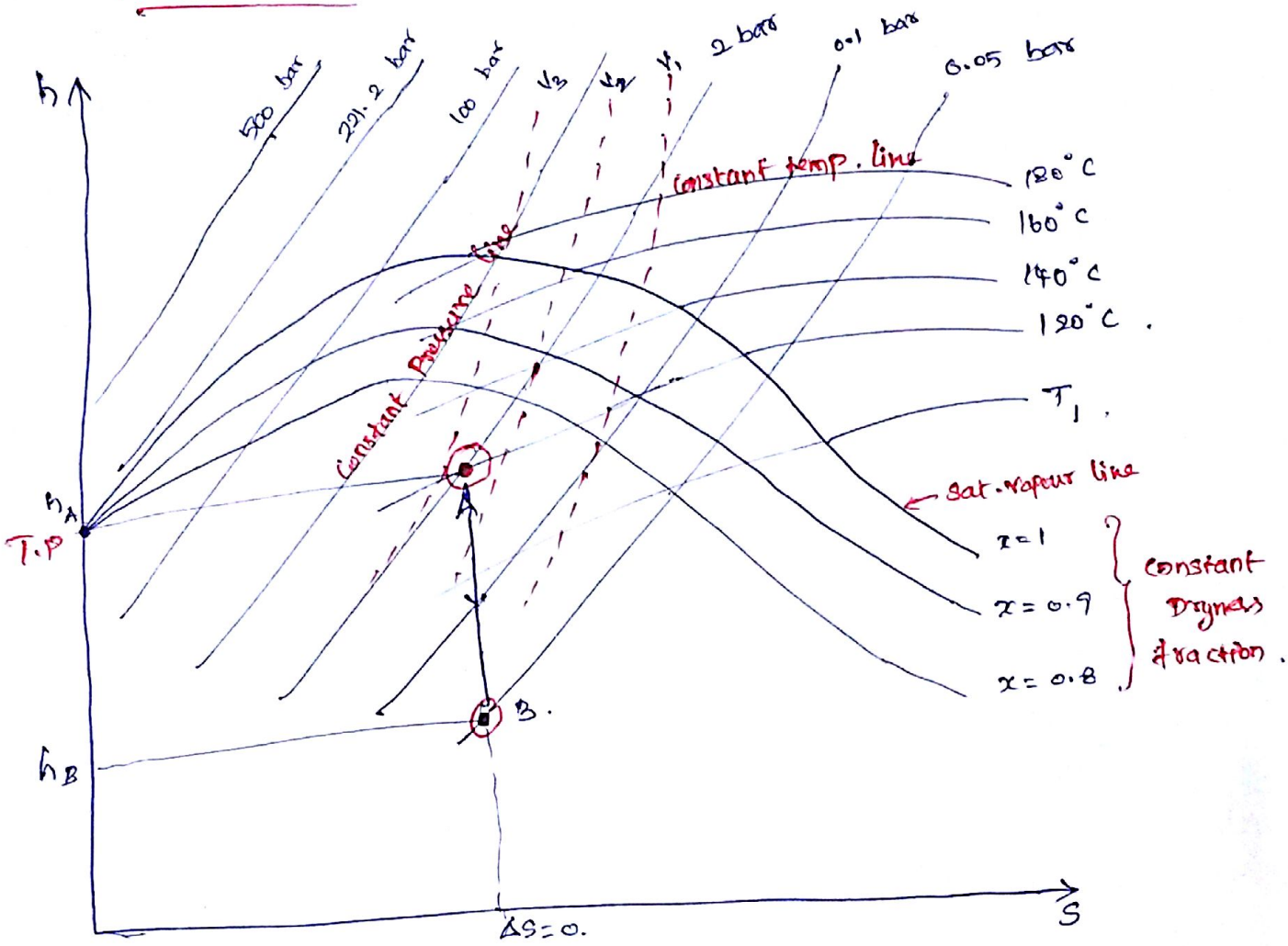
Dry steam $S_{dry} = S_f + S_g$.

Superheated steam $S_{sup} = S_g + C_{ps}$

Enthalpy - Entropy Diagram (h-s)

(or)

Mollier chart.



It is used to find out the properties of steam in various condition.

condition for steam :-

- 2bar, 120°C
- 0.05 bar, 0.8 dryness fraction

} expansion (isentropic)

$$W = h_A - h_B .$$