Internal Combustion Engines

Lecture-5

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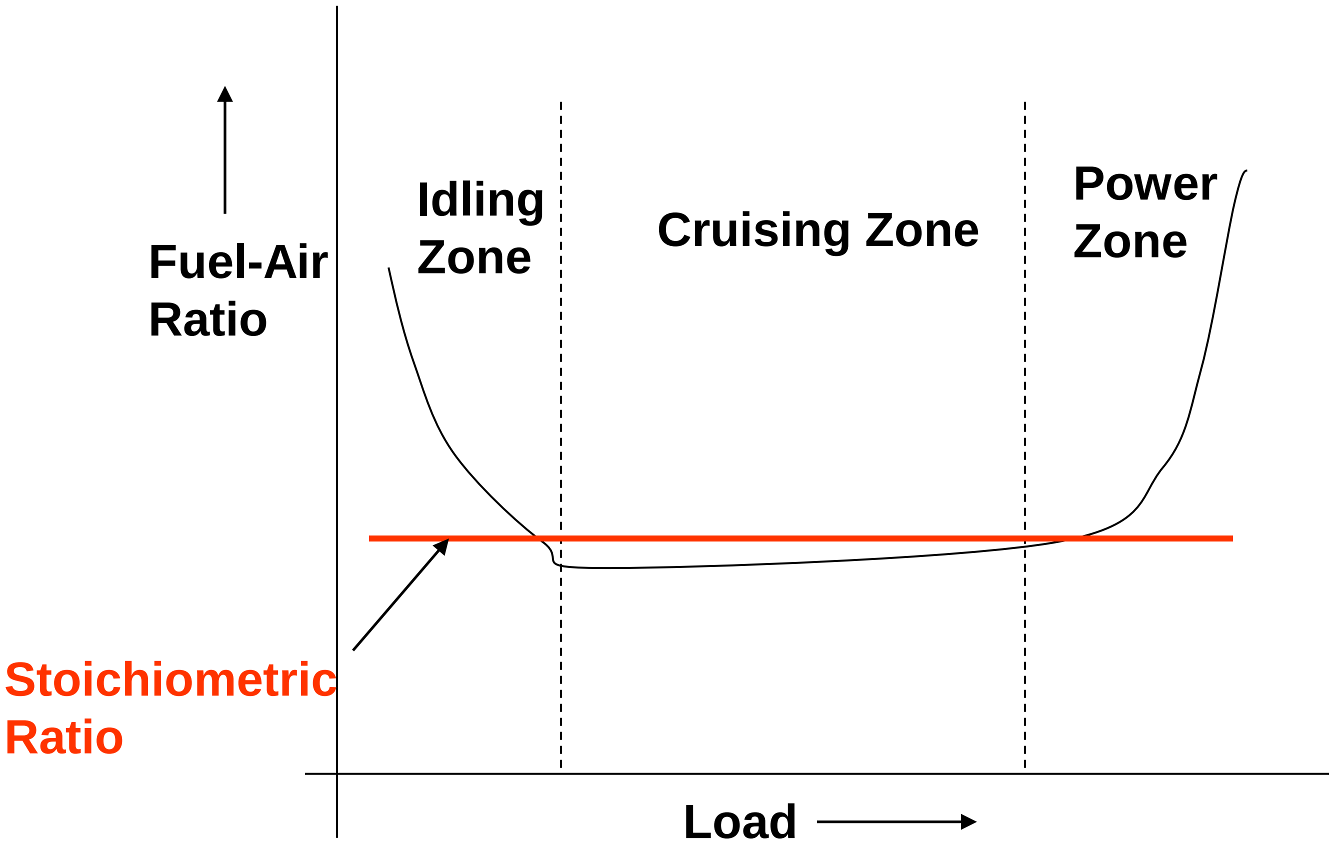
Carburetion

- Supply fuel and air to SI Engines



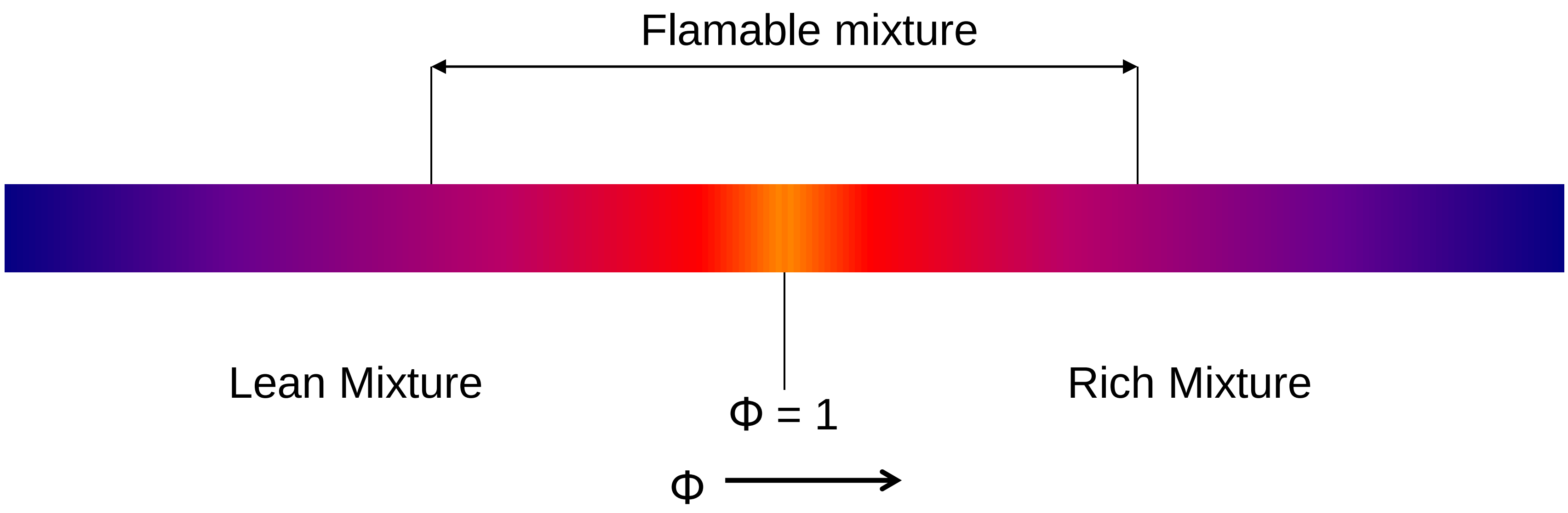
Carburetion Curve

Purpose

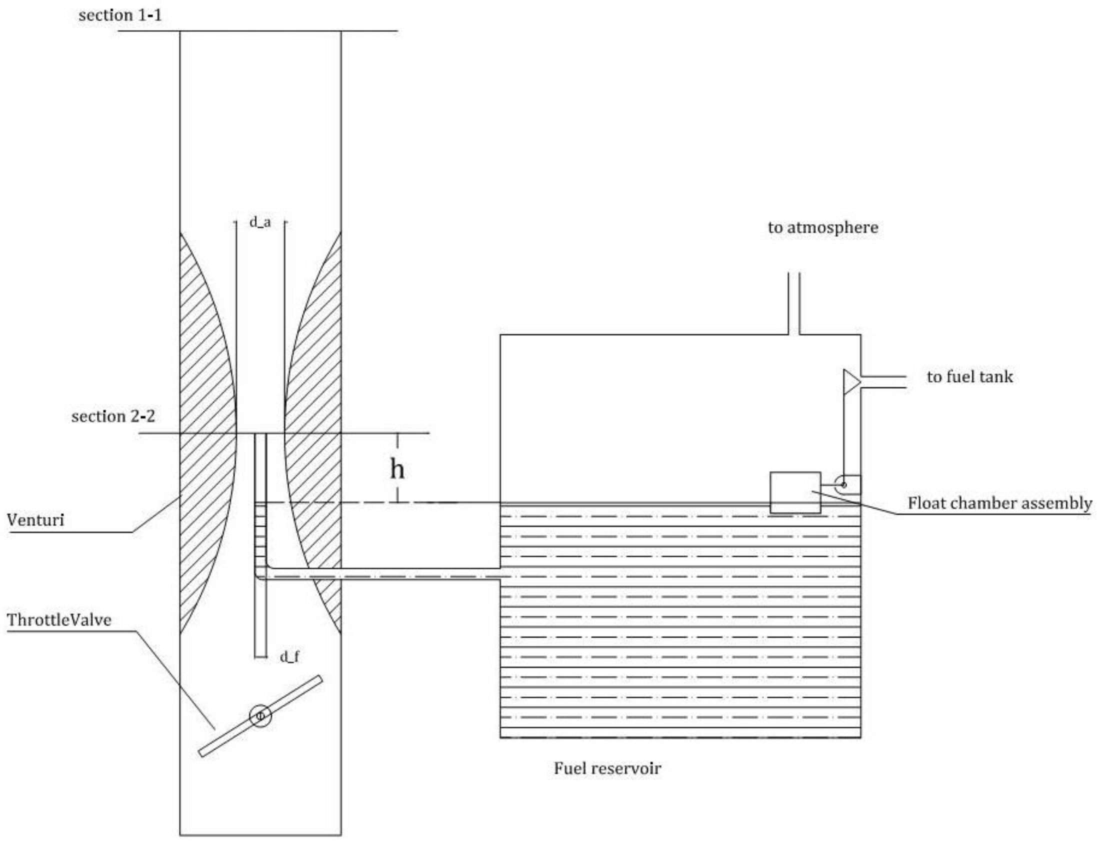
- **To meter fuel**
- **To create a homogeneous mixture**

Flamability Limit

- Equivalence Ratio (Φ) – ratio of actual fuel-air ratio to stoichiometric fuel-air ratio



Simple Float Type Carburetor



- To supply cruising zone need
- Depression created at throat
- Fuel flows due to the suction at throat
- Throttle regulates the flow in the duct
- For higher flow, change in kinetic energy is higher for air at throat. So, the depression is.
- Fuel flow increases

Air Flow Calculation

For air flow: Using SSSF equation

$$q - w = (h_2 - h_1) + \frac{1}{2}(c_2^2 - c_1^2)$$

$$c_2 = \sqrt{2(h_1 - h_2)} = \sqrt{2C_p(T_1 - T_2)} = \sqrt{2C_pT_1[1 - (p_2/p_1)^{\frac{\gamma-1}{\gamma}}]}$$

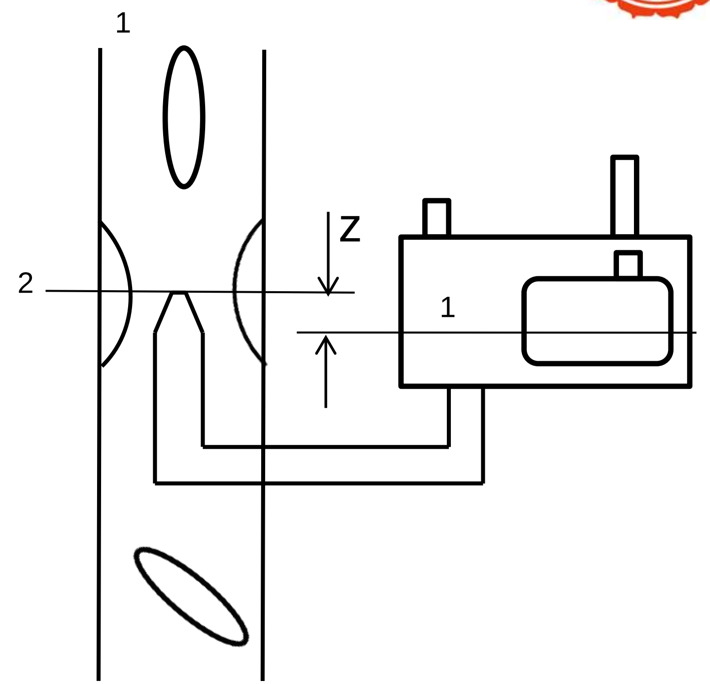
$$\frac{T_2}{T_1} = \left(\frac{p_2}{p_1}\right)^{\frac{\gamma-1}{\gamma}}$$

$$\dot{m}_a = \rho_1 A_1 c_1 = \rho_2 A_2 c_2$$

$$\rho_2 = \left(\frac{p_2}{p_1}\right)^{\frac{1}{\gamma}} \rho_1$$

$$\dot{m}_{a_{th}} = \left(\frac{p_2}{p_1}\right)^{\frac{1}{\gamma}} \rho_1 A_2 \sqrt{2C_pT_1[1 - (p_2/p_1)^{\frac{\gamma-1}{\gamma}}]} = \left(\frac{p_2}{p_1}\right)^{\frac{1}{\gamma}} \frac{p_1}{RT_1} A_2 \sqrt{2C_pT_1[1 - (p_2/p_1)^{\frac{\gamma-1}{\gamma}}]}$$

$$\dot{m}_{a_{ac}} = C_{da} \frac{A_2 p_1}{R\sqrt{T_1}} \sqrt{2C_p\left[\left(\frac{p_2}{p_1}\right)^{\frac{2}{\gamma}} - (p_2/p_1)^{\frac{\gamma+1}{\gamma}}\right]}$$



Air Properties:
C_p=1005 J/kgK,
γ=1.4,
R=287J/kgK

Fuel Flow Calculation

For Fuel: using Bernoulli's equation

$$\frac{p_1}{\rho_f} - \frac{p_2}{\rho_f} = \frac{c_f^2}{2} + gz$$

$$\dot{m}_{f_{ac}} = C_{df} A_f \sqrt{2\rho_f (p_1 - p_2 - gz\rho_f)}$$

For further reading: Book by V Ganesan

Thank You