Fuels & Combustion

INTRODUCTION :→ Every real life system requires Energy for its performance. Energy input may be in the form of heat. from where we shall get heat. Traditionally heat for Energy input can be had from the heat released by fuel during combustion process. During combustion the Energy is released by oxidation of fuel Elements such as carbon C, hydrogen H_2 & Sulphur S i.e high temperature reaction of these Elements with oxygen O_2 (generally from air) releases Energy to produce high temperature gases. These high temperature gases act as heat source.

⇒ **Air fuel Ratio :→** It refers to the ratio of amount of air in combustion reaction with the amount of fuel. Mathematically

$$AF = \frac{\text{Mass of Air}}{\text{Mass of fuel}} = \left(\frac{\text{Molecular wt. of air} \times \text{no. of moles of air}}{\text{Molecular wt. of fuel} \times \text{no. of moles of fuel}}\right)$$

Fuel - Air Ratio :→ It is the inverse of Air fuel ratio. Theoretical air fuel ratio can be Estimated from stoichiometric combustion analysis for just complete combustion.

⇒ Equivalence Ratio :→ It is the ratio of actual fuel air ratio to the theoretical fuel air ratio for complete combustion. fuel air mixture will be called will be lean mixture when Equivalence ratio is less than unity while for Equivalence ratio value being greater than unity the mixture will be rich mixture.

⇒ Theoretical Air :→ Theoretical amount of air refers to the minimum amount of air that is providing sufficient oxygen for complete combustion of fuel. Complete combustion means complete reaction of oxygen present in Air C, H_2, S etc resulting into CO_2, H_2O SO_2, N_2 with air as combustion products. At the end of complete reaction there will be no free oxygen in the products. The Theoretical Air is also called "Stoichiometric Air"