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QUIZ NO. 02

ANSWERS TO THE TOPIC.:

1. The boiler efficiency is defined as

$$\zeta = \text{Output} / \text{Input}$$

$$\text{Output} = \text{Input} - \text{Losses}$$

Therefore,

$$\zeta = (\text{Input} - \text{Losses}) / \text{Input}$$

$$= 1 - (\text{Losses}/\text{Input})$$

As the losses is always a positive term, the ratio of losses / Input is a positive term and therefore when subtracted from one, the result is less than one. Therefore ζ is less than 1 (100 %).

As per the law of conservation of Energy, the energy input in terms of Fuel, manifests itself in the form of energy in the steam and energy lost with various streams like flue gas, fly ash, ash pit, blowdown, radiation loss, water vapours, hydrogen loss etc. As all these losses are positive terms, the output in the form of heat in steam is less than heat supplied by fuel. Therefore the ratio of energy content in steam to the energy input in the form of fuel is less than one.

2. The statement saying "CO₂ produced by burning 1 Kg of gasoline is more than that produced by burning one Kg of LPG" is **TRUE**.

The LPG consists of 50% v/v C₃ (Propane) and 50% v/v C₄ (Butane). Therefore one Kg of LPG will contain 0.431 kgs of propane and 0.568 kgs of butane. One kg of propane when burnt will give 3 kgs of CO₂ and one kg of butane will give 3.03 kgs of CO₂. Therefore one kg of LPG when burnt will give 3.01 kgs of CO₂.

Whereas, the gasoline consists of higher hydrocarbons (C₈). As the carbon content is more, obviously the CO₂ produced after combustion is more. One mole of C₈ will give 8 moles of CO₂. i.e. 112 Kgs of gasoline will give 352 Kgs of CO₂. Therefore one Kg of gasoline will give 3.08 Kgs of CO₂. This is higher than that of LPG.

To estimate CO₂ produced after combustion, we have to know the carbon content of the fuel. Specifically, fixed carbon has to be known for this purpose.