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(An Autonomous Institution)

Calorific value-Gross and Net calorific value (Definition)

The efficiency of a fuel is determined by its calorific value. The calorific value of a fuel is defined as “the total amount of heat liberated by the complete combustion of an unit mass of fuel”.

Units of Calorific value

The quantity of heat can be expressed by the following units:

- (a) Calorie: Calorie is defined as the amount of heat required to raise the temperature of 1 gram of water through 1 °C .
- (b) Kilocalorie: It is defined as the amount of heat required to raise the temperature of 1 kilogram of water through 1 °C.
- (c) British Thermal Unit (BTU): BTU is defined as the amount of heat required to raise the temperature of 1 pound of water through 1°F (70 – 71 °F).
- (d) Centigrade Heat Unit (CHU): It is defined as the amount of heat required to raise the temperature of 1 pound of water through 1 °C.

The calorific value of solid and liquid fuels are expressed in cal./g or kcal./kg. The calorific values of gaseous fuels are expressed in kcal. /m³.

Gross and Net Calorific value

i) Higher (or) Gross calorific value (HCV or GCV)

When a fuel is burnt, the hydrogen is converted into steam. If the combustion products are cooled to room temperature, the steam gets condensed into water and latent heat is evolved. Thus, the latent heat of condensation of steam is also included in the calorific value determination which is called as higher calorific value or Gross Calorific value.

Gross or higher calorific value is defined as the total amount of heat produced, when a unit mass of the fuel is completely burnt and the products of combustion are cooled to room temperature.

ii) Lower or Net Calorific value (NCV or LCV)



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In actual combustion practice, the products of combustion are not cooled to room temperature and are allowed to escape. As a result, only a lower amount of heat is available. The amount of heat so available is called *lower or net calorific value* (NCV or LCV).

The net calorific value is defined as the net heat produced, when a unit mass of the fuel is completely burnt and the products of combustion are allowed to escape.

Net calorific value = Gross calorific value - Latent heat of condensation of water vapour produced

$$= \text{GCV} - \text{Mass of hydrogen per unit weight of the fuel burnt} \times 9 \times \text{Latent heat of condensation of water vapour}$$