FUEL

Fuel is a combustible matter which on burning with air produces a huge quantity of heat energy along with a low quantity of other by products.

Fuel + O2 → Product(s) + Heat

In other words, fuel is defined as any combustible substance which maybe burnt to supply heat for practical applications.

Characteristics of good fuel

1. Its calorific value should be high.
2. It should be cheap and readily available.
3. It should be stored for a longer period i.e. it should be non-volatile and stable.
4. It should not produce much ash.
5. Transportation should be easy.
6. It should not produce any poisonous gas.
7. It should not produce much smoke.
8. It should have low ignition temperature.
9. It should not be explosive in nature.
10. It should not contain high percentage of moisture.
11. It should contain low percentage of volatile matter.
12. It should require low storage volume.

Calorific value

Calorific value may be defined as "the net amount of heat energy produced by the complete combustion of a unit mass or unit volume of fuel in air." Units of Calorific value are: Cal/gm, Kcal/Kg, KJ/Kg, British Thermal Unit (BTU), etc.

Solid fuel: (Coal, wood, saw dust, rice bran, straw)
Liquid fuel: (Kerosene, Petrol, Diesel, Spirit, alcohol, LPG, CNG, etc.)
Gaseous fuel: (Methane, butane, water gas, producer gas, bio-gas, coal gas, acetylene, hydrogen etc.

Petrol or Gasoline

i. The fraction obtained between 40° - 120 °C, chiefly contains petrol.
ii. It consist of hydrocarbons between pentane to octane (C_5H_{12} to C_8H_{18})
iii. It is volatile and inflammable.
iv. Average Composition **C = 84%, H=15%, O+S+N =1%**
v. Calorific Value = **11,250 Kcal / Kg.**

Uses:

- It is used as a fuel in the petrol engine.

- It is used as a dry cleaning agent.
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Kerosene

- i. It is obtained between **180º – 250 ºC**
- ii. It consists of hydrocarbons between decane to hexadecane **(C10H22 to C16 H34).**
- iii. Average Composition, **C = 84 % , H = 16%, S < 0.1%**
- iv. Calorific value = **11, 100 Kcal/ Kg**

Uses:

- It is used as a fuel in the kitchen for domestic.
- It is used as a fuel in jet planes.
- It is used in making oil gas.

Diesel

i. It is obtained between **250º – 320ºC**
ii. It contains a mixture of hydrocarbons between pentadecane to octadecane **(C15H32 to C18 H38).**
iii. Average composition: **C = 85%, H = 12%, Rest = 3%**
iv. Calorific Value = **11000Kcal/kg**

Uses:

- It is used as a fuel in diesel engine.

Water Gas

- It is a mixture of combustible gases CO and H2 with a little quantity of non-combustible gases CO2 and N2.
- The average composition of water gas is
- **H2= 51 %, CO = 14 %, CO2 = 4%, N2 = 4%,**
- Its calorific value is **2800 Kcal / m3**

Uses:

It is used as:

- an illuminating gas.
- a fuel
- a source of H2 Gas

Producer Gas:

- It is a mixture of combustible gases, CO and H2 with large quantities of non-combustible gases CO2 and N2
- The average composition of producer gas is
- **CO = 22- 30%, H2 = 8 - 12 %, CO2 = 3%, N2 = 52 - 55 %**
- Its calorific value is **1300 Kcal /m3.**

Uses:

It is used:

- In heating furnace in metallurgical operations.
- As a reducing agent.

LPG (LIQUIFIED PETROLEUM GAS)

COMPOSITION:

n-butane= 27%
iso-butane= 25
butane= 43%
propene= 2.5%
propane= 2.5%
with little or no ethane

Uses:

- It is mainly used as a domestic fuel and industrial fuel.
- Now a days it is also used as a motor fuel.

CNG (COMPRESSED NATURAL GAS)

COMPOSITION:

Methane= 70-90%
Ethane= 4-9%
with traces of propane and butane.

Uses:

- It is used as a fuel for vehicle.
- It is also used as a domestic and industrial fuel.
- It is used as a source of carbon used in tyre industry.
- It is used for the production of hydrogen gas needed in fertilizer industry.

COAL GAS

It is a mixture of a number of lower hydrocarbons along with N_2, H_2, CO and CO_2.

COMPOSITION:

Methane= 32%
Ethene= 3%
Ethyne= 2%
N_2= 4%
H2=4%
CO= 7%
CO_2= 1%

Uses: It is used

- as a fuel.
- as a reducing agent in metallurgical operations.
- as an illuminant.