

Required Qualities of CI Engine fuel

1. Free from water and sediments
2. Volatile at cylinder temperature
3. Low self ignition temperature
4. Sulphur content is not more than 0.5%
5. Easily atomized (viscosity)
6. High heating value
7. Easy to handle
8. Economical viable

$P+A \rightarrow$ inlet manifold

Air fuel \rightarrow

air

liquid
 \downarrow
gas evap
==

atomized
 \downarrow
bulk liquid \rightarrow small Droplet
 \uparrow
energy

Rating of CI Engine Fuel

- Rating of SI fuel is characteristics of fuel that determine whether fuel will knock or not under given operating conditions
- There are two method adopted for fuel rating
 1. Cetane number
 2. Diesel Index

Cetane number

- Cetane number is defined as “ the percentage by volume of normal cetane in mixture of normal cetane and α -methyl naphthalene which has the same ignition characteristics as the test fuel when combustion carried out in a standard engine under specified operating conditions “

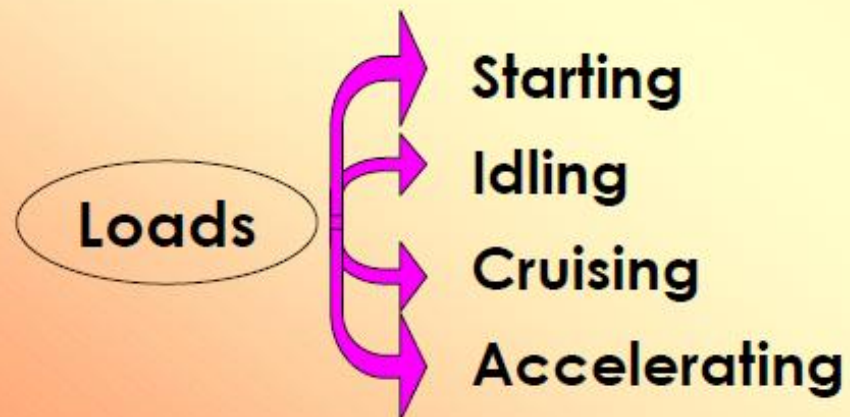
$$\text{Diesel Index} = \left[\text{Aniline Point } (^\circ\text{C}) \times \frac{9}{5} + 32 \right]$$

- Normal Cetane CN = 100
- α -methyl naphthalene CN = 0

$$\frac{\text{XAP} \pm \text{grading}}{100}$$

Carburetion

- The process of mixture preparation in an SI engine is called carburetion. This air-fuel mixture is prepared outside the cylinder in a device called CARBURETOR.
- The carburetor atomizes the fuel and mixes with air in different proportions for various LOAD conditions.



Functions

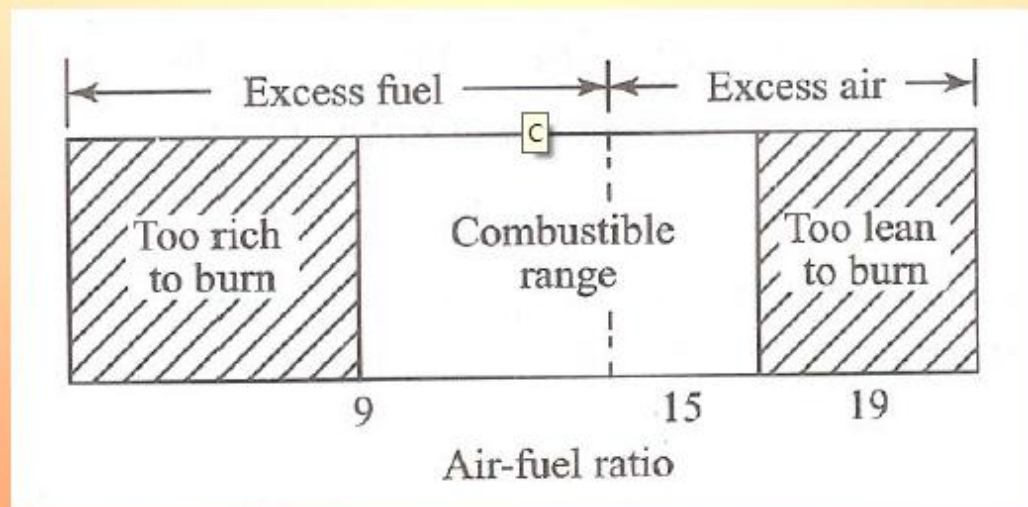
- ❑ It must atomize, vaporize and mix the fuel homogeneously with air.
- ❑ It must supply correct amount of air-fuel mixture in correct proportion under all load conditions and speed of the engine.
- ❑ It must run the engine smoothly by supplying a correct mixture strength.

Factors affecting Carburetion

- ❑ the time available for mixture preparation
- ❑ the temperature of the incoming air
- ❑ the quality of the fuel supplied
- ❑ the engine speed
- ❑ the design of the carburetor



- ❑ Chemically Correct (15:1)
- ❑ Rich Mixture (10:1)
- ❑ Lean Mixture (17:1)

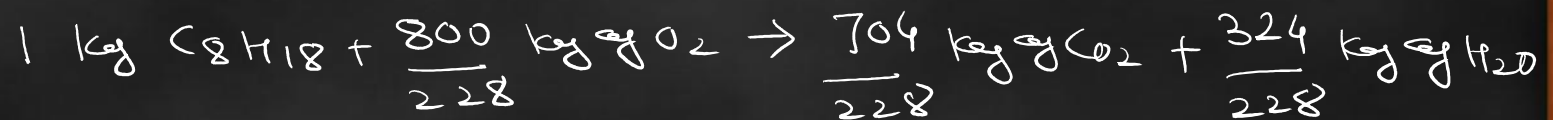
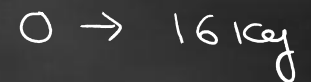
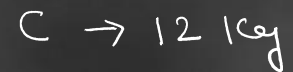
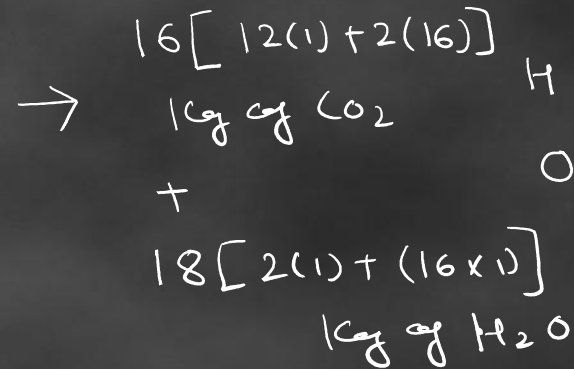
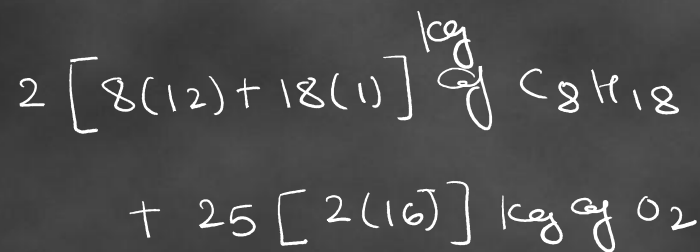


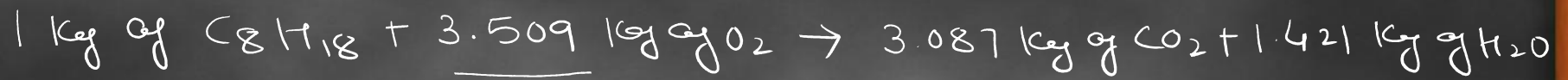
Stoichiometric mixture

chemical formula of Petrol C_8H_{18}



molecular weight





↓

Air (mass)

Air \rightarrow 23:1 O_2 (mass)

1 kg of air \rightarrow 0.230 kg of O_2

$$3.509 \times \frac{100}{23} = 15.25 \text{ kg of air}$$

A:F

15:1 \rightarrow petrol

Rich mixture \rightarrow more fuel

Lean mixture \rightarrow more Air

A:F

15:1

ϕ



$\phi > 1$

$\phi = 1$

$\rightarrow \phi < 1$