

# **E-Course on Internal Combustion Engine**

## **Subject code : 3171923**

**Chapter : Fuels and its supply system  
for SI and CI engine**

## Important Qualities of IC Engine fuel

1. High Energy Density (  $kWh/m^3$  /  $kg$  ) CV
2. Good combustion Qualities
3. High thermal stability
4. Low deposit forming stability
5. Compatibility with engine hardware
6. Good fire safety
7. Low pollution
8. Easy transferability and on board vehicle storage

# Required Qualities of SI Engine fuel

(P+A) → Carburetor

- ✓ 1. Easily mix with the air flow in the inlet manifold and quickly evaporate
- ✓ 2. High heating value
- ✓ 3. Knock resistant ⇒ ?
- ✓ 4. Burn clean
- ✓ 5. Not easily pre-ignite
- ✓ 6. Easy to handle
- ✓ 7. Economical viable

CPO →

gasoline

↓  
fuel →  $\left. \begin{matrix} C \\ H \end{matrix} \right\}$

→ Paraffins  
→ Olefins  
→ Naphthenes  
→ Aromatics

30 to 200°C  
0.7 to 0.78  
44,000 kcal/kg

## Antiknock Quality

- In the SI engine gasoline and oxygen ignited and burn → heat → mechanical work
- Under certain conditions , extreme heating of the unburned part of mixture may cause it to ignite spontaneously and explode this result in pressure rise. This rapid, uncontrolled burning in the final stage of combustion is called detonation.
- Detonation in the combustion chamber setup vibration of the gases , cylinder wall and other metallic surface giving distinct noise or knock.
- The characteristics of gasoline that it resist the tendency to produce detonation is called antiknock property of fuel.

## Rating of SI Engine Fuel

- Rating of SI fuel is characteristics of fuel that determine whether fuel will knock or not under given operating conditions
- There are different method adopted for fuel rating
  1. Octane number
  2. Performance number
  3. Highest useful compression ration (HUCR)



# Octane number

- Octane number is defined as “the percentage of iso-octane by volume in the mixture of iso-octane and n-heptane which gives the same anti-knock characteristics as the fuel under standard test conditions”



- Iso-octane assigned ON = 100
- n-heptane assigned ON = 0

ON-80  $\left[ \begin{array}{l} 80\% \text{ iso octane} \\ 20\% \text{ n-heptane} \end{array} \right.$

# Octane number

- CFT committee has standardized two method of finding octane rating of fuel
  1. Research Octane Number
  2. Motor Octane Number

$$\text{Road ON} = \frac{\text{RON} + \text{MON}}{2}$$

$$\text{fuel sensitivity} = \text{RON} - \text{MON}$$

## Performance number

- Performance Number is Defined as “ ratio of knock limited indicated mean effective pressure of the tested fuel to the knock limited indicated mean effective pressure of iso-octane”

$$PN = \frac{P_{\text{mean iep of test}}}{P_{\text{mean iep of iso-octane}}}$$



# Highest useful compression ratio (HUCR)

- HUCR is defined as the highest compression ratio at which a fuel can be used without detonation in specific test engine under specified operating conditions.

CR

HUCR

ISO-Octane	10.96
n-heptane	3.75

Thank You