HIGH SPEED DIESEL

- Diesel is also a mixture of hydrocarbon compounds, boiling in

the range of 250°C–360°C.

- Unlike MS, diesel oil is not vaporizable at ambient condition but requires heating.
- Diesel is burnt in a CI engine where the fuel is atomized and sprayed in the hot compressed air. Since the temperature for utoignition (the method of ignition without the aid of fire or spark) for diesel oil is much lower than MS, the temperature during compression of air causes this ignition.

Cetane Number

- ***Knocking quality*** of diesel oil is measured by cetane number, which is defined as the percentage of normal cetane (a straight chain hydrocarbon) in a mixture of n-cetane and α-methyl naphthalene (an aromatic hydrocarbon), which gives the same performance as that of the diesel sample.
- This is tested in a standard diesel engine of CFR.

Diesel Index

- The presence of paraffinic hydrocarbons in diesel may be related by the aniline point, which is the temperature at which aniline solubilizes the fuel in equal amounts and a homogeneous mixture results. The greater the paraffin content, the higher the aniline point.
- Also, the API gravity of oil increases as the paraffin content rises.
- With the help of these properties, the diesel index (DI) is given as

$$\text{DI} = \text{API} \times \text{aniline point in } ^\circ\text{F} / 100.$$

DI and Cetane Number

- DI has been correlated with the cetane number and it has been found that DI is directly proportional to the cetane number.
- The cetane number is thus obtained from the DI.
- The value of the DI should be at least 45.

Sulfur

- In order to reduce pollution, the sulfur content of diesel should not be large.
- In refineries, catalytic desulfurization is carried out to remove sulfur from diesel oil.
- The sulfur content should not be more than 0.25% by weight of the oil.

Corrosion

- A corrosion test of diesel is also carried out using the copper strip method at 100°C for 3 h.

Flash Point

- The flash point of diesel is a minimum of 33°C for automobiles. However, depending on the ambient temperature, it may be higher.
- The lower the flash point, the greater the chance of autoignition. During winter a low flash point is preferable while in summer it should be more (around 35°C).
- Too high a flash point may cause knocking in the engine.

Flame Length

- In the combustion chamber of an engine, a long flame length may damage the chamber.
- Hence, a short flame length is desirable.
- Diesel oil should not produce a flame length of more than 18 mm.
- In the refinery, sometimes kerosene and other hydrocarbons, like heavy naphtha, are also blended in diesel with the result that the flame length may increase.
- Hence, reduced crude oil (RCO) is injected to adjust the flame length to the desired value.

Pour Point

- The pour point is defined as the temperature at which oil will cease to flow due to the formation of wax crystals.
- In India, the pour point of diesel has been fixed at a value less than 6°C. However, in colder places, a lower pour point is advisable.

Viscosity

- In a flow process, fluid experiences a kind of friction opposing the fl ow. This friction is known as fluid friction, which is defined as the resistive force (shear) exerted between two parallel sliding layers of fluid moving in the direction of flow.
- This shear force is proportional to the rate of change of velocity (shear rate) of the sliding layers.
- Viscosity is the proportionality constant between the shear force and the

shear rate.

- The higher the viscosity, the greater the friction and the fluid is termed

more viscous.

- Most hydrocarbon liquids follow this rule (Newton's law of viscosity).
- Low viscosity is preferred for diesel oil at ambient temperature. It should be between

2.5 and 7 centistoke (cSt) at 38°C.