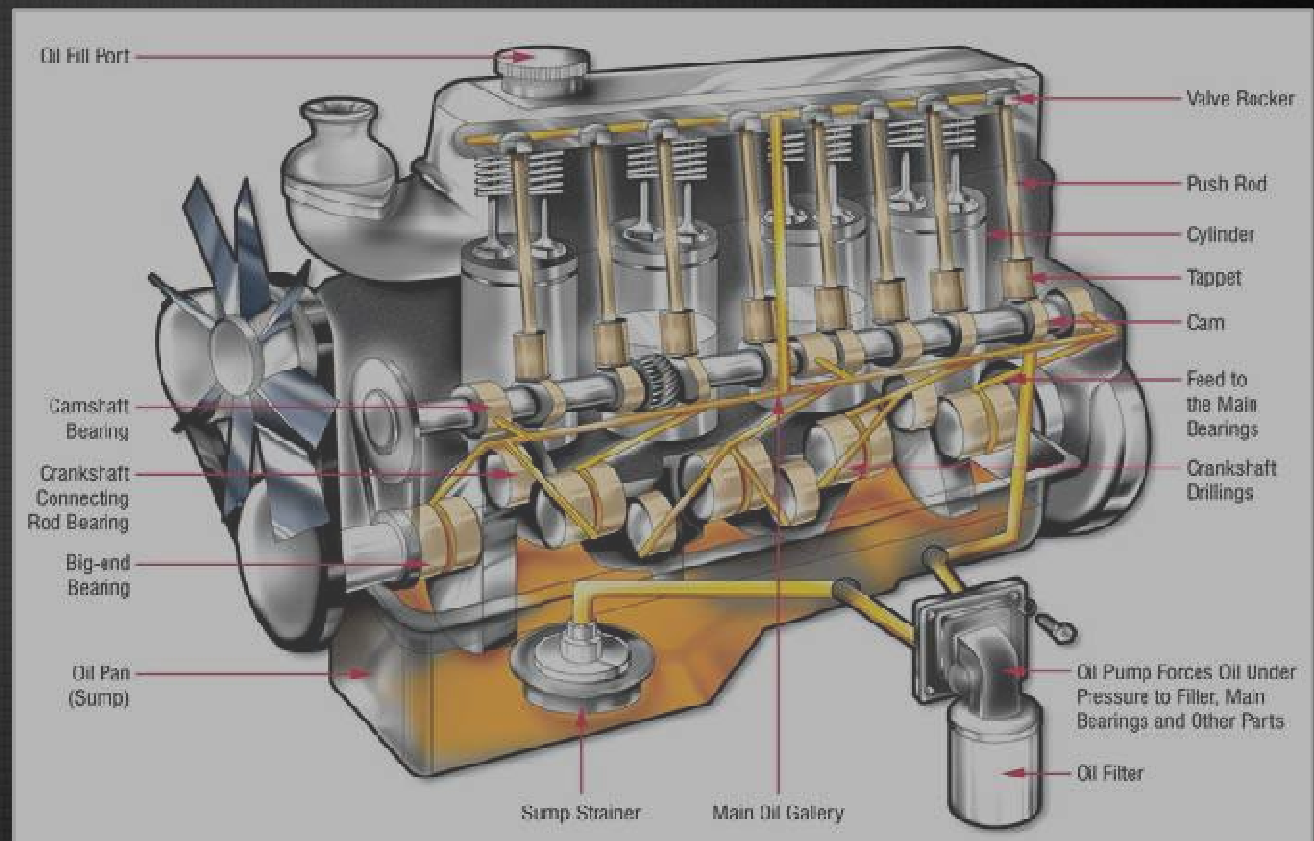


# LUBRICATION SYSTEM IN IC ENGINES



# Definition of lubrication

Lubrication is the action of applying a substance such as oil or grease to an engine or component so as to minimize friction and allow smooth movement.

## Lubrication System

Lubricating system is a mechanical system of lubricating internal combustion engines in which a pump forces oil into the engine bearings.

# PURPOSE OF LUBRICATION

- To reduce the friction between moving parts
- To increase the efficiency
- To minimize the vibrations
- To reduce the corrosion and carbon deposits
- To reduce the heat of moving parts
- To minimize power loss due to friction
- To reduce the noise created by moving parts
- To provide cooling to the engine

# TYPES OF LUBRICANTS

## ➤ SOLID LUBRICANTS

- ❑ e.g. graphite ,molybdenum ,mica

## ➤ SEMI-SOLID LUBRICANTS

- ❑ e.g. heavy greases

## ➤ LIQUID LUBRICANTS

- ❑ e.g. mineral oil obtained by refining petroleum.

# PROPERTIES OF LUBRICANTS

## ➤ Viscosity

- ❑ It is a measure of the resistance to flow of an oil
- ❑ It is measured in saybolt universal seconds (SUS)
- ❑ It is expressed in centistokes ,centipoises and redwood seconds

## ➤ Viscosity Index

- ❑ viscosity of oil decreases with increase in temperature

## ➤ Cloud point

- ❑ If an oil is cooled , it will start solidifying at some time .
- ❑ Temperature at which oil starts solidifying , is called cloud point

# PROPERTIES OF LUBRICANTS

## ➤ Pour point

- ❑ It is temperature just above which the oil sample will not flow under certain prescribed conditions
- ❑ this property is important for operation of engines and substances at low temperature conditions

## ➤ Flash point and Fire point

- ❑ The temperature at which vapour of an oil flash when subjected to a naked flame is called flash point
- ❑ Fire point is the temperature at which the oil ,it once lit with flame ,will burnt steadily at least for 5 seconds

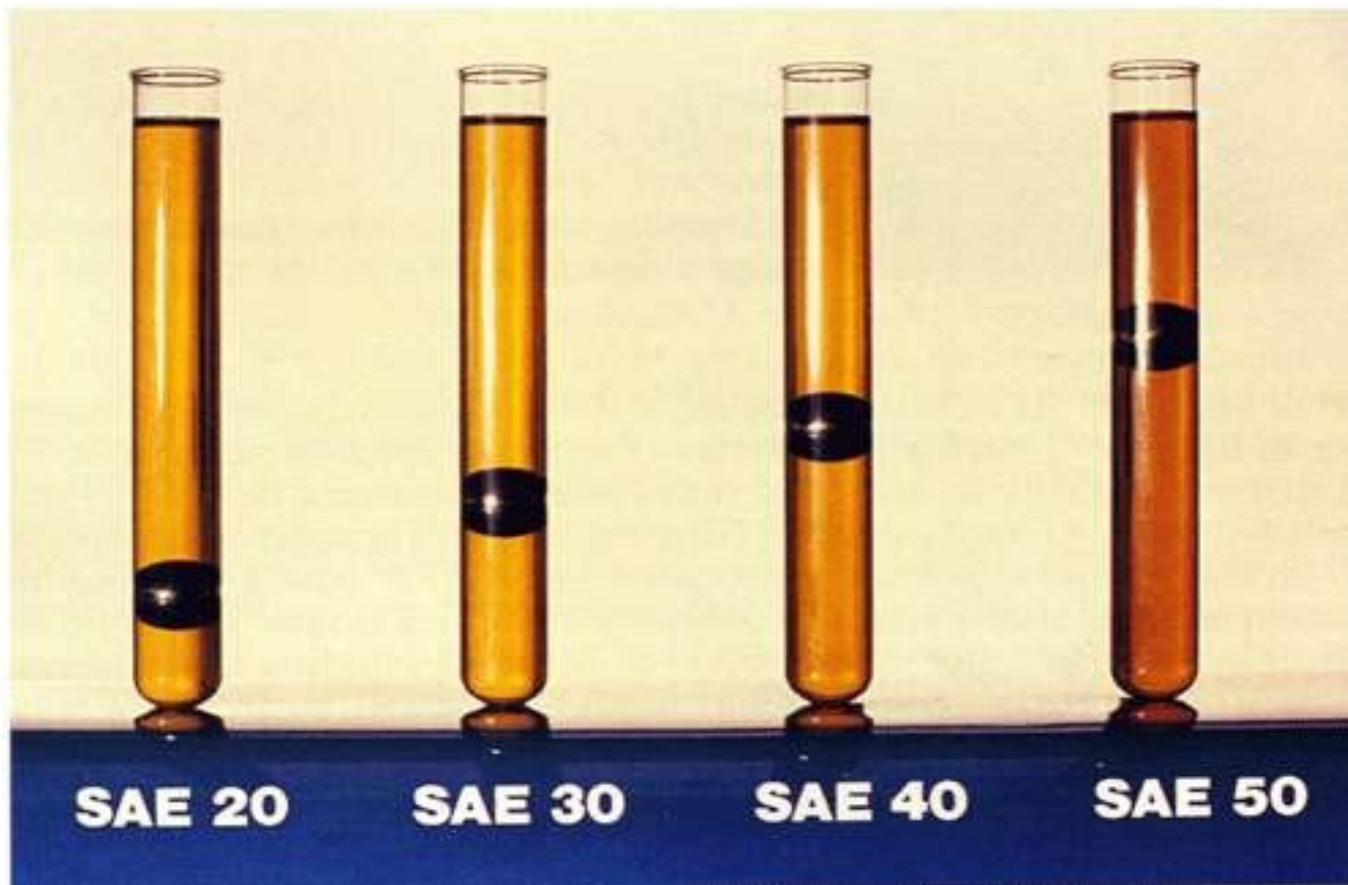
## ➤ Specific Gravity

- ❑ It varies between 0.85 to 0.96

## SAE Number

- Society of Automotive Engineer has recommended SAE viscosity number for lubricating oils.
- viscosity number is determined by the range of viscosities within it fall at the given temperature.
- For winter use 5W,10W,20W
- For normal use 20,30,40





**SAE 20**

**SAE 30**

**SAE 40**

**SAE 50**





# ENGINE PARTS THAT REQUIRE FREQUENT LUBRICATION

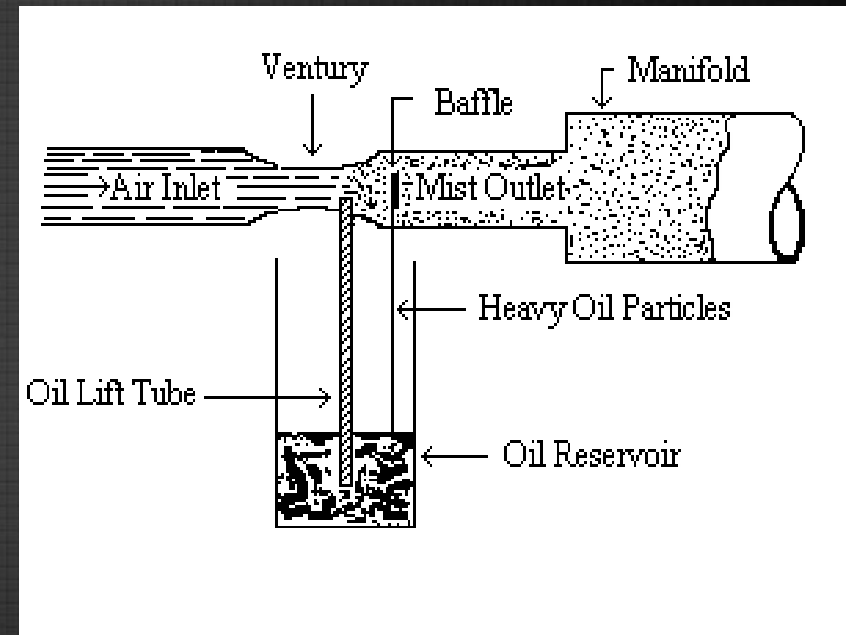
- CYLINDER PISTON AND PISTON RINGS
- MAIN BEARING
- CRANKSHAFT
- CRANK PIN AND PISTON PIN
- BIG END AND SMALL END CONNECTING ROD
- CAMSHAFT
- VALVES

# TYPES OF LUBRICATION SYSTEM

- MIST LUBRICATION SYSTEM
- WET SUMP LUBRICATION SYSTEM
- DRY LUBRICATION SYSTEM

# MIST OR PETROIL (PETROL PLUS OIL) LUBRICATION SYSTEM

- This system is used in 2 stroke cycle engines
- The lubrication oil (2% to 3%) is mixed with the petrol in the fuel tank
- The oil and the fuel mixture is inducted through carburetor
- The optimum fuel oil ratio used is 50:1
- Petrol gets evaporated and the oil lubricates the main parts of cylinder
- Fuel oil ratio used is important for the good performance of engine



## ADVANTAGES of mist lubrication System

- Separate lubricating system is not required
- No maintenance cost for lubrication system
- Weight of engine is reduced by avoiding separate lubricating system

## DISADVANTAGES of mist lubrication System

- If oil is less then there is chance of seizure of the engine
- More oil makes excess air in the exhaust

# WET SUMP LUBRICATION SYSTEM

- In this system a big oil sump is provided at the base of crank case.
- From the sump oil is pumped to different parts of the engine
- The main types of Wet sump lubrication system are:
  - ❑ Splash lubrication system
  - ❑ Pressure lubrication system
  - ❑ Splash and pressure lubrication system

# SPLASH LUBRICATION SYSTEM

- The lubricating oil is filled in the sump
- Scoop are attached to the end of connecting rod
- When system moves to Bottom Dead Centre (BDC) scoop splashes lubricating oil to the piston ,cylinder ,big end of connecting rod ,main bearing and cam shaft bearing
- The splashed oil settles on engine parts and then to sump again

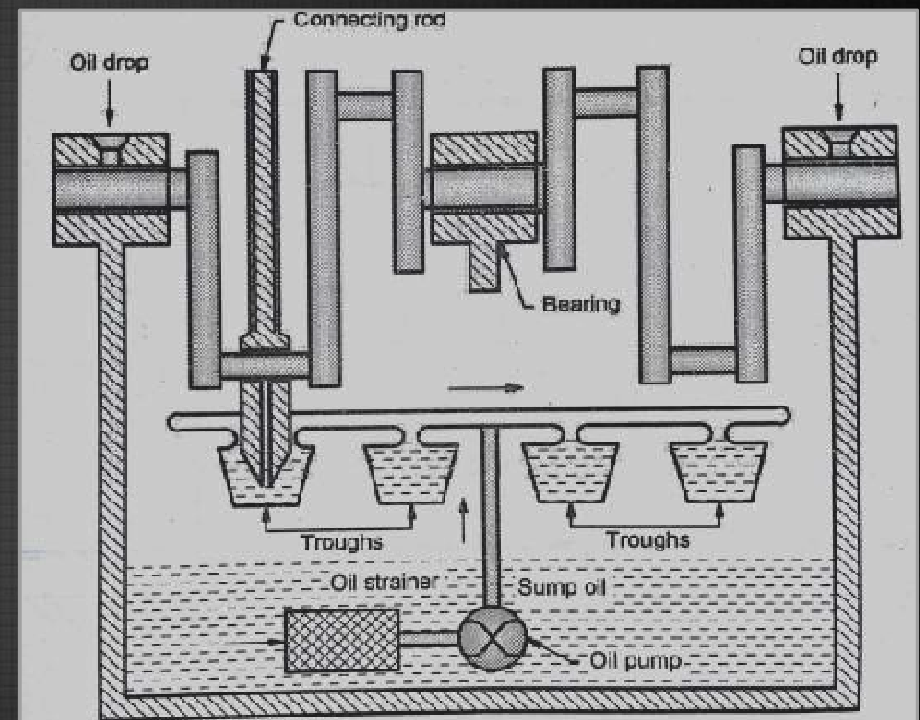
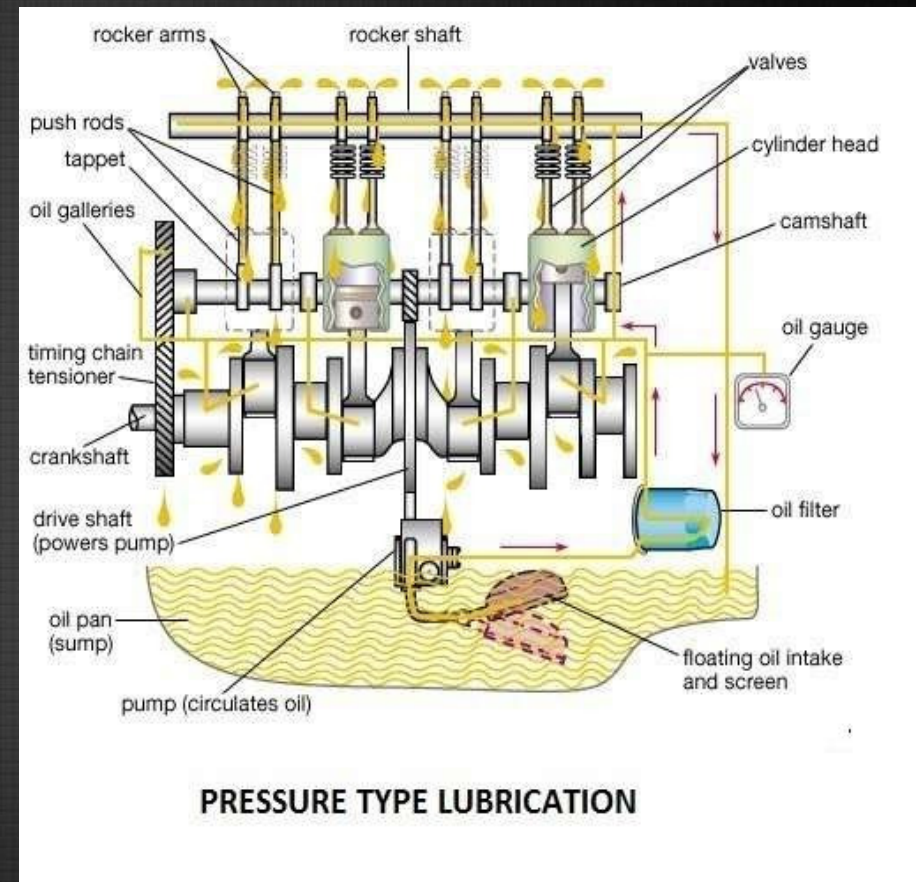


Fig. 5.6.1 : Splash system

# PRESSURE LUBRICATION SYSTEM

- In this system , lubrication is done with the help of pressure pump which is submerged in the sump
- With the help of pressure pump after filtration, oil is forced under pressure to different parts of the engine through oil tubes
- From the bearing oil floats to connecting rod through oil holes between connecting rod and cam shaft
- Then this oil flows to piston pin through oil holes and sprayed over piston , piston rings ,cylinder valves and other parts



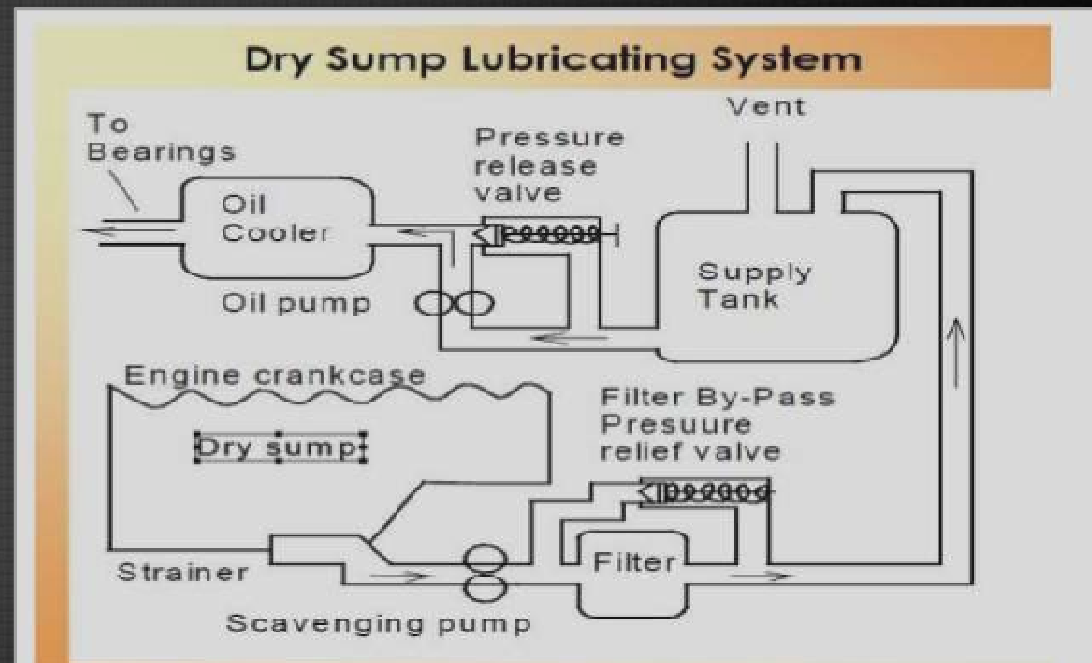


# SPLASH AND PRESSURE LUBRICATION SYSTEM

- Splash system is not sufficient when bearing loads are higher hence lubricating oil under pressure is supplied by oil pump to main and crankshaft bearings
- Oil pump also supplies oil under pressure to pipes which directs a stream of oil against the dippers (scoop) on the connecting rod bearing cups
- Other parts are lubricated by splash of oil by scoop

# DRY SUMP LUBRICATION SYSTEM

- In dry sump , extra oil is stored in a tank outside the engine rather than oil pan
- In this system ,the lubrication oil is passed through the pipes using scavenging pumps
- After lubrication ,the oil is again collected by special connecting sections and passed to heat exchanger for cooling
- Scavenging pump has greater capacity than oil feed pump and it is placed externally to sump



# ADVANTAGES OF DRY SUMP LUBRICATION SYSTEM

- Improvements to vehicle handling and stability. The vehicle's center of gravity can be lowered by mounting the engine lower in the chassis due to a shallow sump profile. A vehicle's overall weight distribution can be modified by locating the external oil reservoir away from the engine
- Improved engine reliability due to consistent oil pressure. This is the reason why dry-sumps were invented
- Increased oil capacity, by using a larger external reservoir than would be practical in a wet-sump system
- Having the pumps external to the engine makes them easier to maintain or replace

# DISADVANTAGES OF DRY SUMP LUBRICATION SYSTEM

- Dry-sump systems add cost, complexity, and weight
- The extra pumps and lines in dry-sump engines require additional oil and maintenance
- The large external reservoir and pumps can be tricky to position around the engine and within the engine bay due to their size
- Inadequate upper valvetrain lubrication can also become an issue if too much oil vapor is being pulled out from the area, especially with multi-staged pumps