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, 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 Grades

For Engine Oils Recommended in Relation with the Outside Temperatures (°C)

-35 -30 -25 -20 -15 -10 0 5 10 15 20 25 30 35 40 45 50

SAE 10W
SAE 20W
SAE 30
SAE 40
SAE 10W-30
SAE 10W-40
SAE 10W-60
SAE 15W-40 mineral base
SAE 15W-40 semisynthetic base
SAE 20W-60 semisynthetic base
SAE 5W-30 synthetic base
SAE 0W-30 synthetic base
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
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 camshaft.

➢ Then this oil flows to piston pin through oil holes and sprayed over piston, piston rings, cylinder valves and other parts.
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.
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