

# Engine Lubrication System

The method of reducing the friction by introducing the substance called lubricant between the mating parts is called **lubrication.**

### **Objectives**

- Reduce friction thus increase efficiency
- Reduce wear and tear of moving parts
- Carry away heat
- Provides sealing action between cylinder and piston rings, thereby it reduce blow by.
- Provide protection against corrosion.
- Lubrication film acts as cushion and reduce vibration
- Carrying away the grit & other deposits and provide cleaning
- Reduce noise

## Types of lubricants

- Solid (e.g. Graphite molybdenum, Mica)
- Semi-Solid (e.g. Heavy greases)
- Liquid (e.g. Mineral oils, Vegetable Oils,  
Animal Oils)

## Properties of lubricates

### Viscosity

- It is measure of resistance to flow of an oil. It is measured in Saybolt Universal Seconds (SUS).

### Viscosity Index

- The variation of viscosity of an oil with change in temperature is measured by viscosity index.
- Smaller the variation of viscosity, higher the VI.
- VI of *Paraffin oil* is 100 (small change) and VI of *Naphthenic oil* VI is 0.

### Cloud Point

- The temperature at which the oil starts solidifying is called cloud point.

### Pour Point

- It is the temperature just below which oil sample will not flow under certain prescribed conditions.
- Sample is cooled until no movement of the oil occurs for 5 sec after the tube is tilted from the vertical to the horizontal.

### Flash Points

- The flash point is defined as the lowest temperature at which an oil will vaporize sufficiently to form a combustible mixture of oil vapour and air above the surface of the oil.
- It is found by heating a quantity of the oil in a special container while passing a flame above the liquid to ignite the vapour. A distinct flash of flame occurs when the flash point temperature is reached.

## Fire Points

- Fire point is obtained if the oil is heated further after flash point. Fire point is the temperature at which the oil, if once lit with flame, will burn steadily at least for 5 seconds.
- Fire point temperature is usually  $10^{\circ}\text{C}$  higher than flash point temperature.

## Oiliness

- The property of an oil to cling to the metal surface by molecular action and then to provide a very thin layer of lubricant under boundary lubrication condition is called the oiliness or lubricity or film strength. .

### Carbon residue

- It is the quantity of carbon residue which remains after evaporation of a simple oil under specified conditions.

### Detergency

- To prevent the formation of deposits, the engine oil has the property of detergency to clean the deposits.
- It has also the ability of dispersing the particles, preventing them from clotting and to keep them in a finely divided state.

### Foaming

- Any violent agitation in the crankcase engine oil to foam. It is because of the presence of air bubbles in the oil. This action accelerates oxidation and reduces the mass flow of oil to the bearing and other moving parts causing insufficient lubrication.



## **Classification based on rating**

### **SAE rating**

- Society of Automotive Engineers assigned the number for gradation of oil based on their viscosity at  $-18^{\circ}\text{C}$  (5W, 10W, 15W) &  $99^{\circ}\text{C}$  (20W, 30W, 40W, 50W).

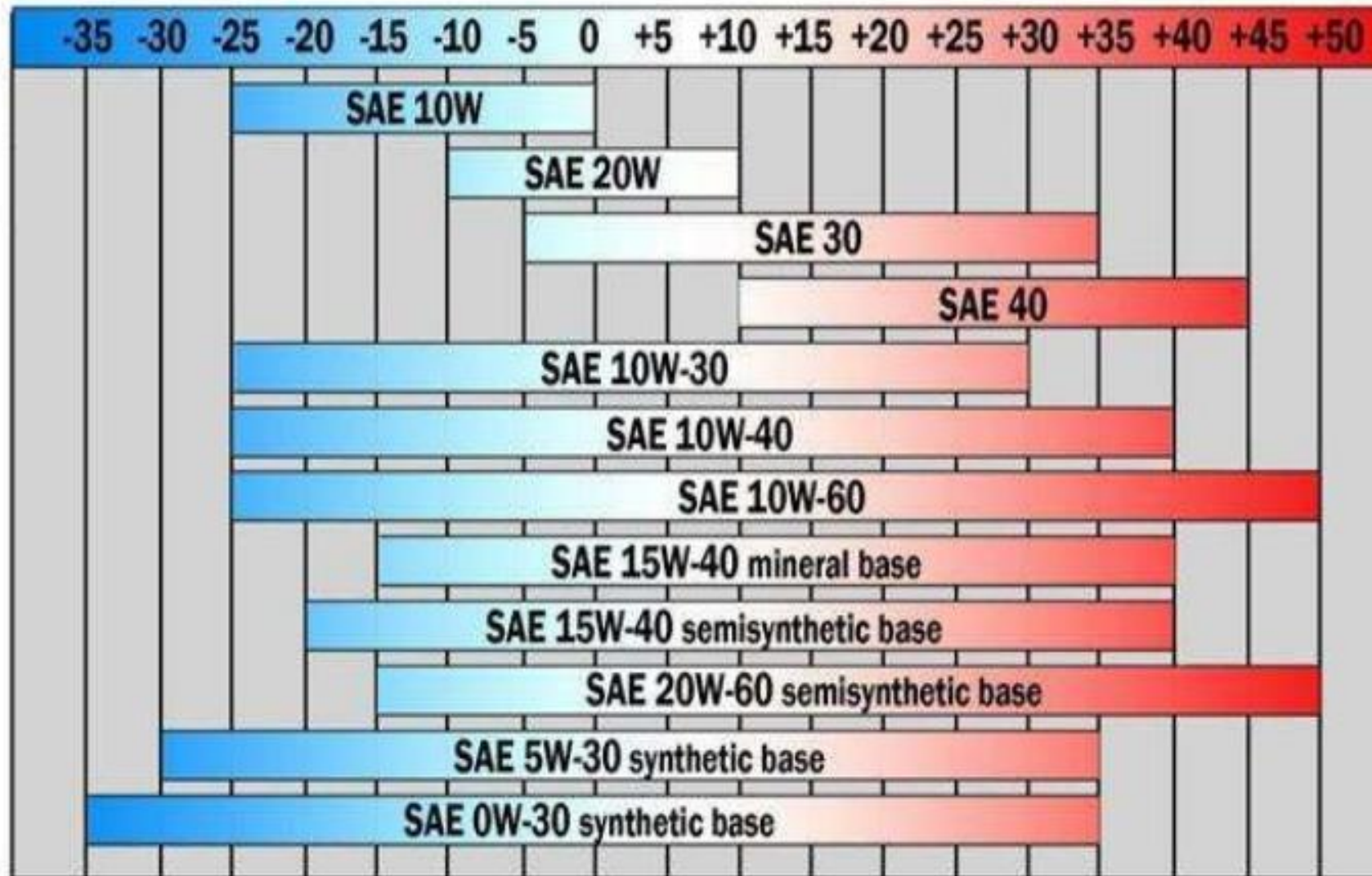
### **API Service rating**

- American Petroleum Institute classified the oil based on their property into three classes as Regular, Premium and Heavy Duty type based on quality & performance of oil.
- Petrol engine- SA, SB, SC, SD, SE
- Diesel engine- CA, CB, CC, CD, CE
- A,B stands for light duty and naturally aspirated while D,E stands for heavy duty and supercharged.



## SAE Grades

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



# Lubrication System Types

- Petroil or mist lubrication (Petrol and Oil Premix)
- Splash
- Pressure Fed or Force Feed

### **Mist Lubrication system (Petrol)**

- Employed in 2 Stroke Petrol engine
- In this system, the petrol and lubricating oil are previously mixed in fuel tank from where it is supplied to the carburettor.
- Proportion 2 to 3 %
- It provide lubrication to cylinder, piston, piston rings and connecting rod bearing via the crankcase.
- Also the separate lubrication is provided to those parts of the engines where the mixture of oil and petrol cannot reach or in case it gives unsatisfactory lubrication

## **Mist Lubrication system (Petrol)**

### **Advantages**

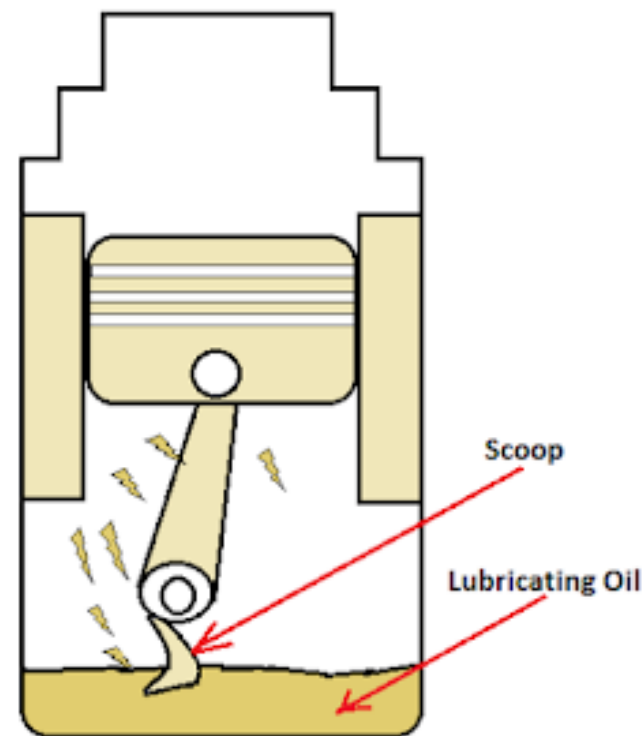
- Economical and cheap
- No oil pump, filter and oil carrying pipe needed
- Quantity of oil is automatically regulated with load and speed
- Probability of lubrication failure are the least

## **Mist Lubrication system (Petrol)**

### **Disadvantages**

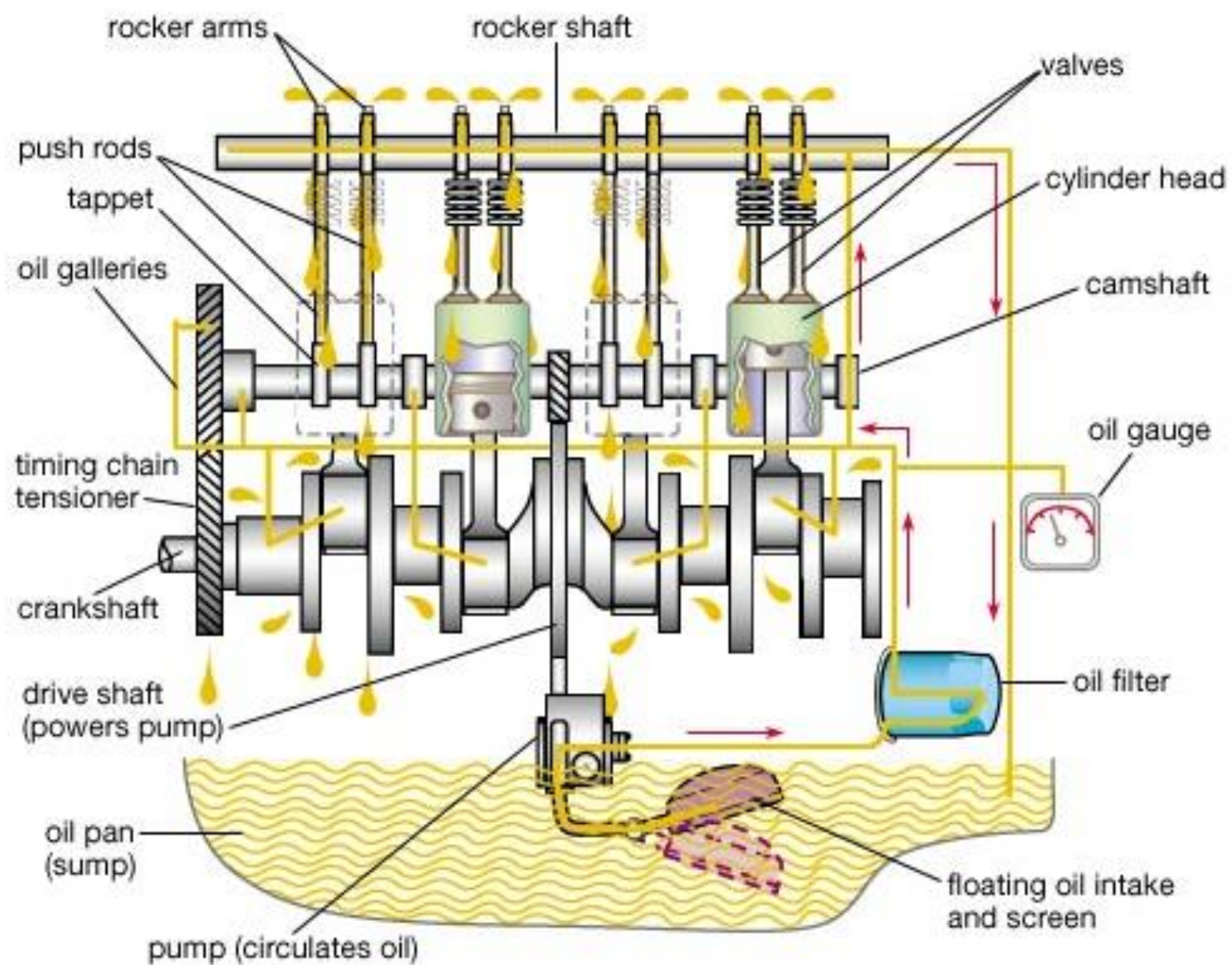
- Carbon deposits and burning of oil film
- Fouling of sparkplug, increases maintenance cost.
- Oil consumption is high, rather the engine is usually over oiled
- During long duration of no load due to almost closed throttle valve, engine mating parts may not get adequate lubricating oil.

### Splash Lubrication System :-

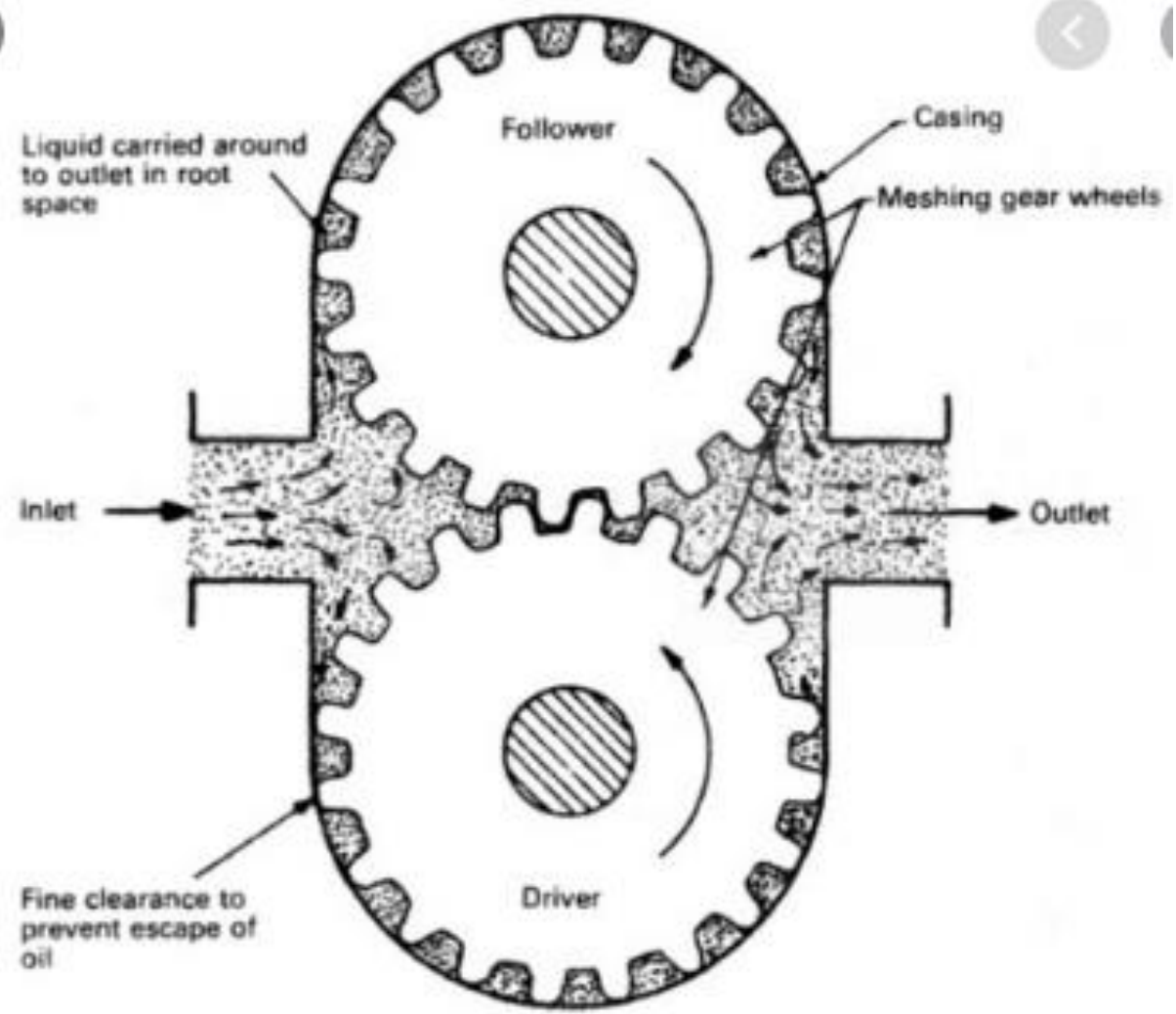


- > In this system a scoop is fitted at the bottom of connecting rod and every revolution of camshaft, scoop is dipped in the oil and filled with oil and then splashed the oil on engine component.
- > It is one of the cheapest method of engine lubrication system which is generally used in small 4- stroke engine.

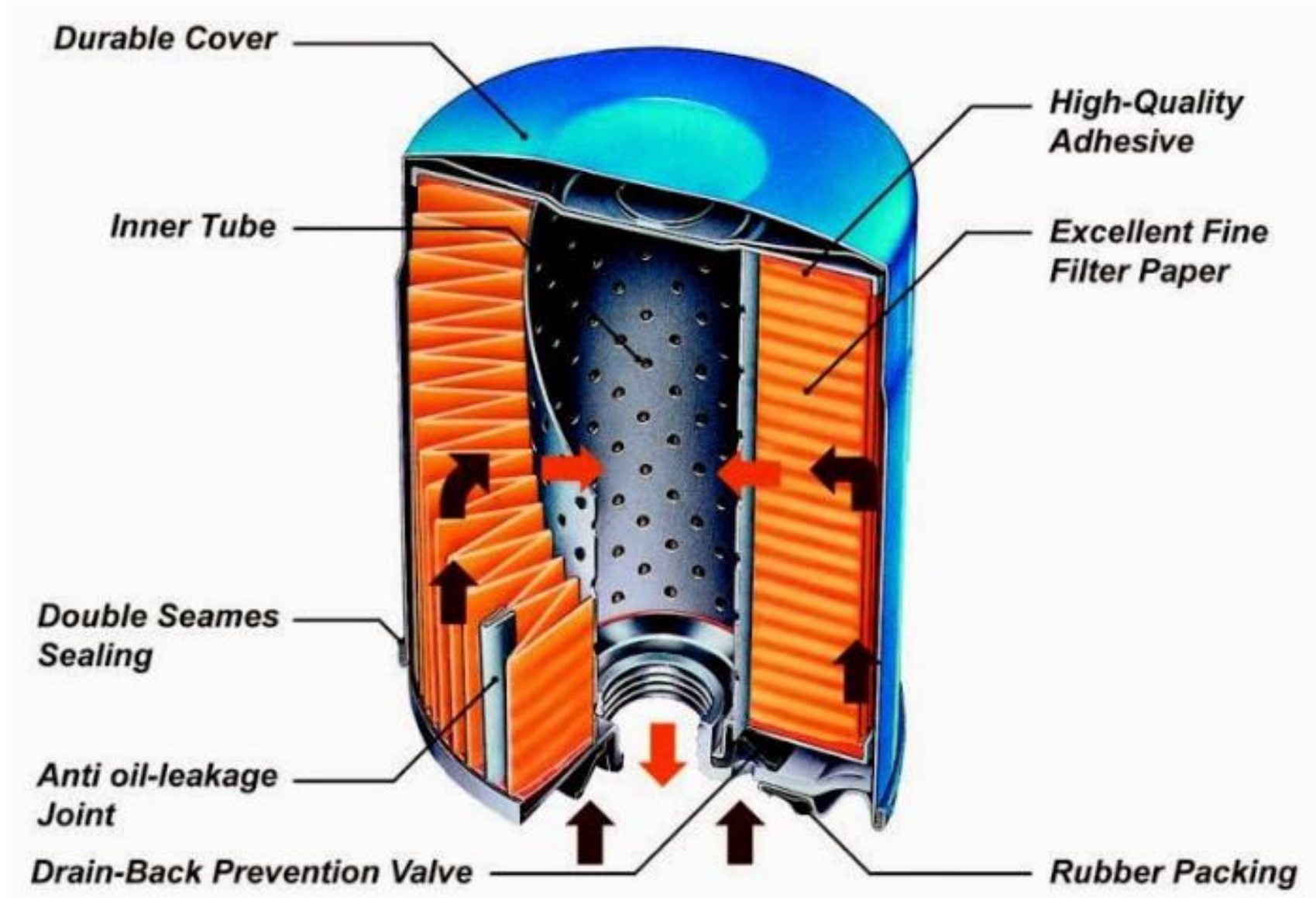


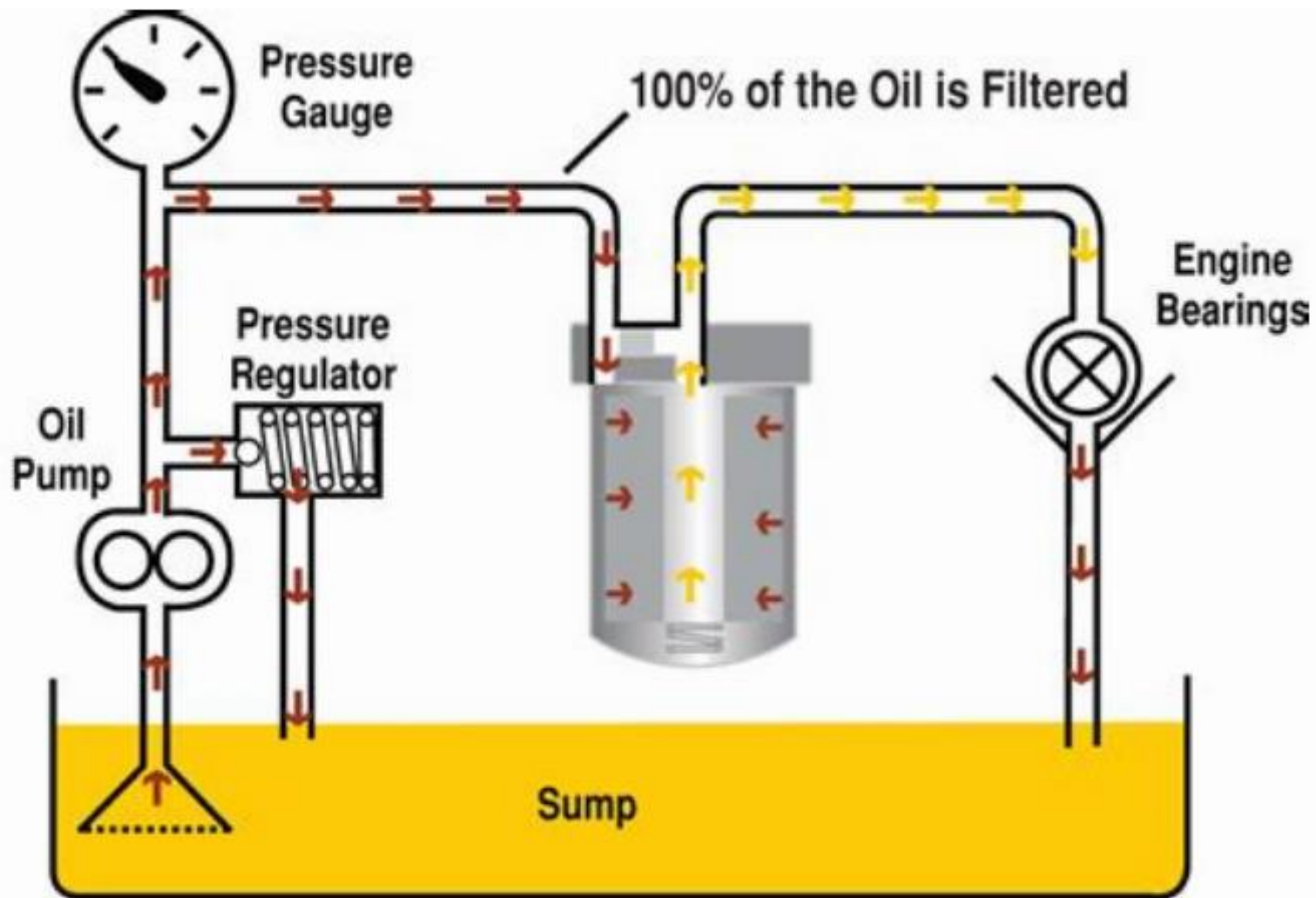






*Simple gear pump*





**Full-Flow**