ENGINE TERMINOLOGY

Engine Lubrication Principles

Engine Oils

Aim

- Primary function
- Lubrication principles
- Hydrodynamic action
- Engine oils
- Ratings

Primary Function

- Separate moving components

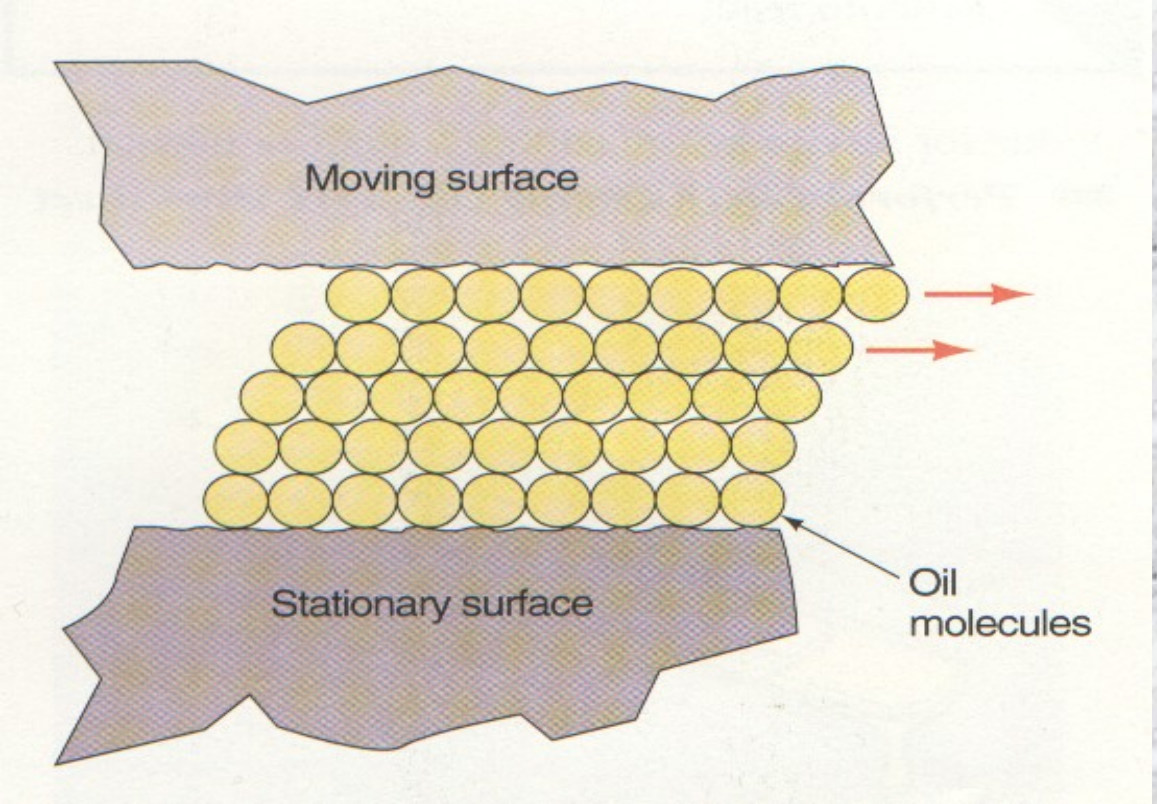
Lubrication Principles

Hydrodynamic Lubrication

Hydro - liquids - as in hydraulics - engine oil
Dynamic - motion - engine parts in relative motion

Hydrodynamic Lubrication

- is the wedge shape of oil film that completely separates two surfaces that have relative motion

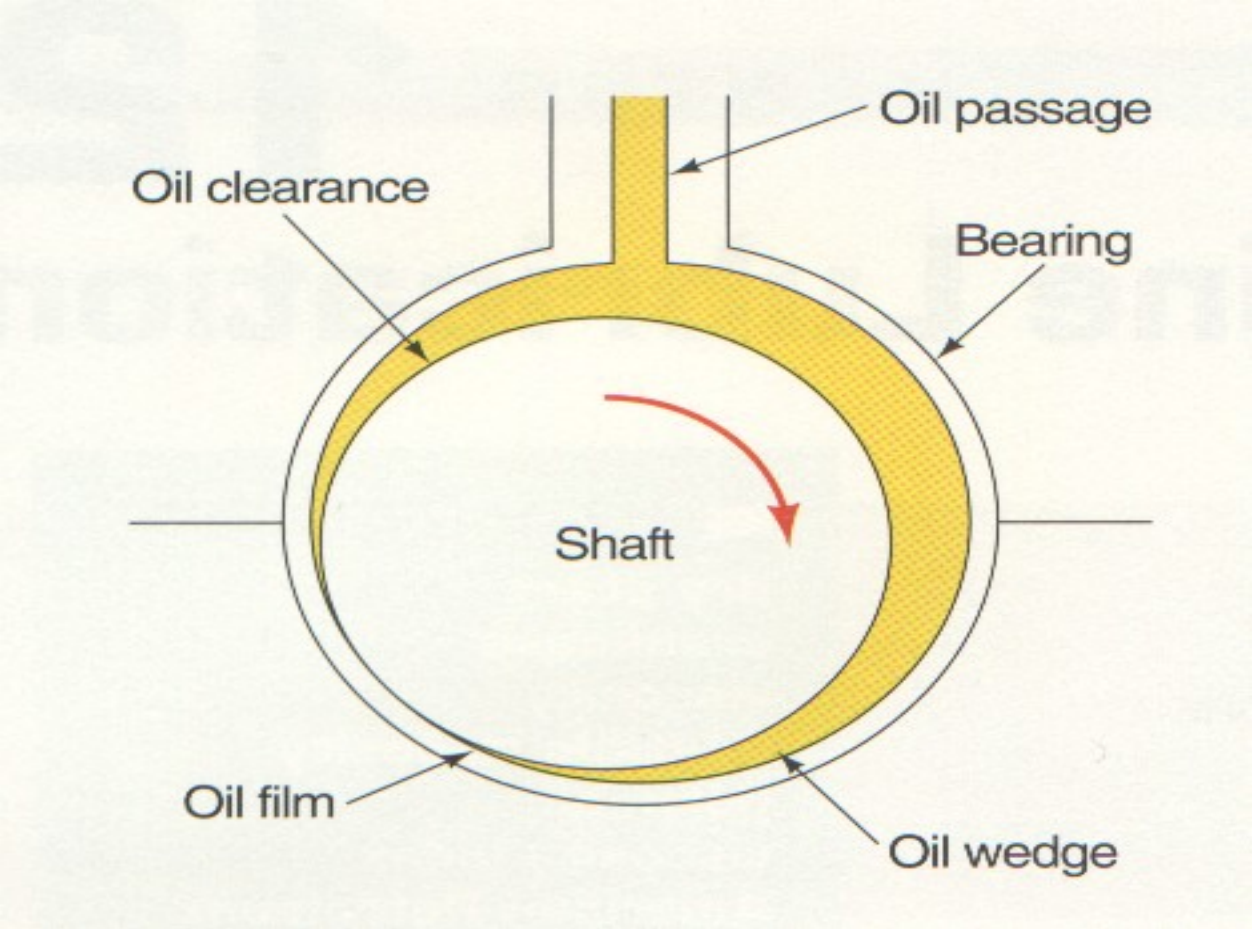


Do you remember the name for engine bearings?

Anti-Friction Bearings

Hydrodynamic Lubrication

- occurs between the shaft journals and the bearing inserts.



Hydrodynamic Lubrication

- The engine lubrication system must provide a constant supply of clean oil at a high enough pressures to force oil to the bearings to allow enough flow for cooling of the bearing surfaces
- The oil is supplied to the lightly loaded area of the bearing and then the hydrodynamic process takes over
- The hydrodynamic oil film pressures developed on the engine bearing surfaces may exceed 1000 psi.
- Loss of oil supply will result in bearing failure

Hydrodynamic Lubrication

- Normal bearing wear happens when there is a lack of hydrodynamic lubrication.
- This occurs when?

  Initial engine start up

- When the engine is off, t
  the oil from around it as
  bearings.

Boundary Lubrication

- Occurs when the oil film is extremely thin and the high spots of the surfaces touch

Engine Oils

Purpose

- Lubricate all moving parts to prevent wear
- Reduce friction
- Aid in cooling the engine
- Assist the cylinder seal at the piston rings
- Neutralize acids formed from combustion process
- Prevent rust and corrosion
- Clean the engine and hold dirt in suspension

Oil Viscosity

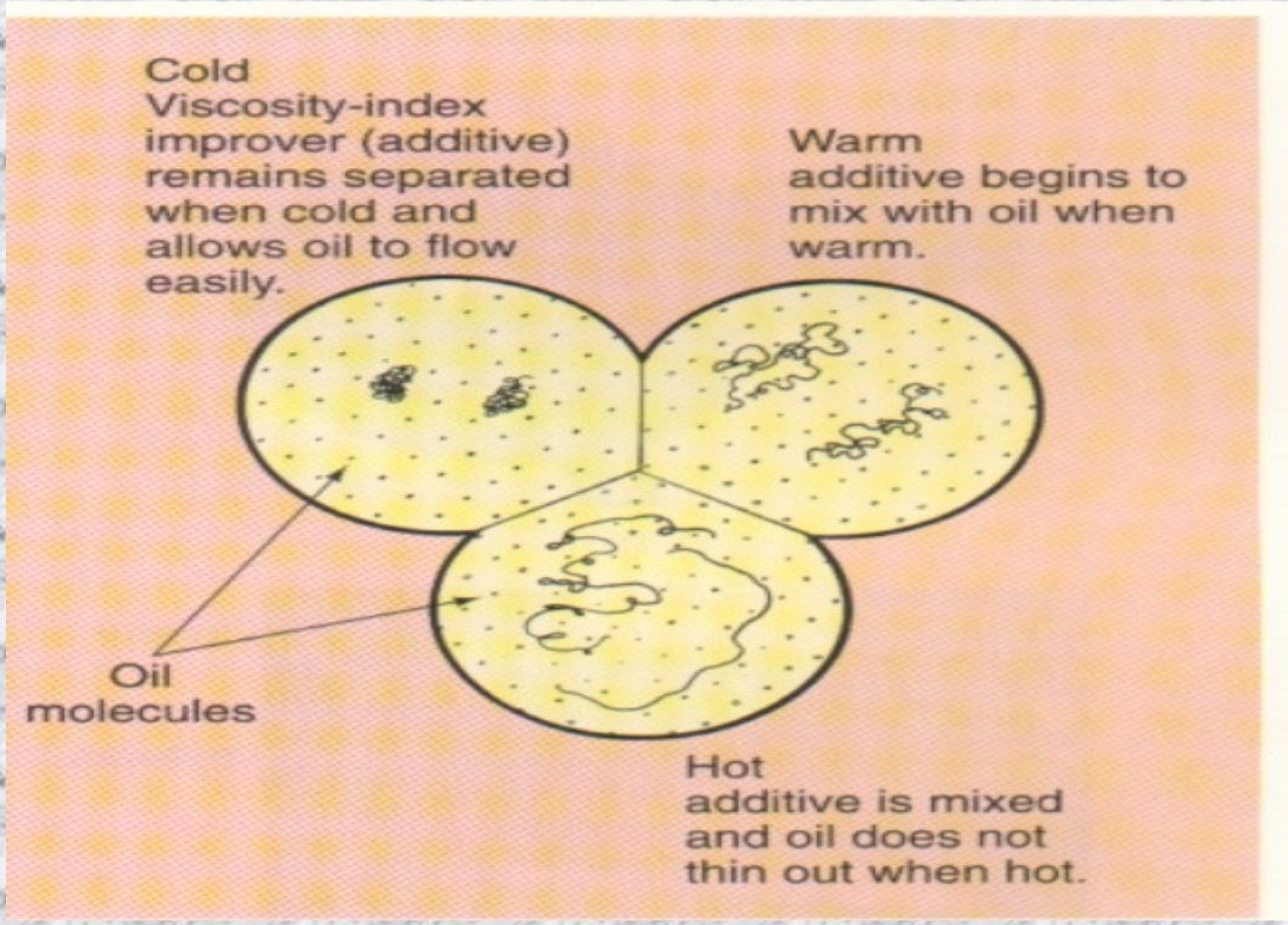
- Viscosity is the resistance to flow of an oil
- A high viscosity oil has a greater resistance to flow and is said to be thicker than a lower viscosity oil
- As an oil cools it thickens and as it heats up it thins out.
- Viscosity changes with temperature

Oil Viscosity

- Oil must not be too thick at low temperatures or cranking speeds will be low, and hard or no starts will result, due to the increased co-efficient of friction.
- Oil must not be too thin at high temperatures or the oil film will not support the loads placed on it and boundary lubrication will occur and increase the co-efficient of friction.
- Viscosity is measured by the Say bolt Universal Viscosity Test which measures the number of seconds for a definite quantity of oil to flow through a fixed orifice into a measured container at a specified temperature.

Viscosity Index Improver

- Polymer additive that induces thickening of a thin base oil at high temperatures
- 10W30 oil starts as a 10W oil and viscosity index improvers are added in sufficient quantity to bring the high temperature viscosity rating up to the S.A.E. 30 standard.
- VI improvers make up between 6 and 15% of the oil
- VI improvers breakdown with use
- Oil oxidizes and thickens forming sludge


Cold
Viscosity-index improver (additive) remains separated when cold and allows oil to flow easily.
Warm
additive begins to mix with oil when warm.
Oil molecules
Hot
additive is mixed and oil does not thin out when hot.

S.A.E. Oil Viscosity Ratings

- Grade number represents the viscosity range of an oil
- A grade number with no letter following means that oil was tested only at 100C (212F) eg. SAE 10, 20 30
- The higher the number the higher the viscosity

- Grade numbers that are followed by a the letter "W" indicate that the oil was tested at -18C (0F) and are given a viscosity rating at that temperature. eg. 10W, 20W

- Multigrade oils like 10W30 are tested at -18C and 100C and meet the S.A.E. specifications for those temperatures
  (VI improvers are added to meet these specifications)

Synthetic Oils

Base Stocks not from crude oil

- Polyalphaolefins - Mobil 1
- Organic esters - alcohol and acid - Castrol Syntec
- Polygycols - polyalkaline gylcol (PAG oil for 134a A/C)

Advantages

- remains fluid at very low temperatures
- lower internal friction - fuel economy and cooler engine
- resists oxidation

Disadvantages

- $ cost $ - 4 to 5 times more money
- may not be compatible - gaskets, seals = oil leaks