ENGINE LUBRICATION SYSTEMS

Introduction

Friction, and therefore wear and tear, is created when components move against each other. Engines are lubricated to keep friction and wear to a minimum. Other tasks performed by lubrication are: cooling, sealing, cleaning and sound dampening.

Important components in a lubricating system are the crankcase, oil pump, oil filter and the excess pressure release valve or pressure regulator.

The oil is stored in the crankcase. The oil pump pumps the oil from the crankcase to the various components requiring lubrication. This includes the crankshaft, the camshafts and the cylinder walls. When the oil has completed its task, it flows back into the crankcase. The oil is cooled in the crankcase. If the crankcase has insufficient capacity for cooling the oil, an oil cooler is used. The oil filter removes contaminants from the oil. The oil and the oil filter require regular replacement.

Because an insufficient amount of oil destroys the engine, there are systems that provide warnings when the oil pressure or the oil level is too low. The oil is subject to high quality criteria. These criteria are documented as specifications. These specifications provide the minimum requirements to be met by the lubricating oil.

In Europe the European Automobile Manufacturers' Association (ACEA) specifications are the most important ones. Individual manufacturers may also specify their own criteria for lubricating oil

a) . **FRICTION**: is the opposition to relative movement between two surfaces in contact.

b). **VISCOSITY:** This is the property of fluid by which they resist flow.

c) **VISCOSITY INDEX**: Is the extent of change of lubricant viscosity when exposed to temperature e.g a high index indicates a relatively small change in viscosity and vice versa.

d) **MULT-GRADE OILS**: Are also called cross grade oils and have special additives that reduce the change in an oils viscosity with temperature performance better both in winter or summer.

e) **OILINESS**: Is the ability of an oil to cling or be attracted to metal surface. This varies with the type of oil, with vegetable based oil being the best.

f) OIL: This is the lubricant used for motor vehicle engines and most other components and are obtained either from animal vegetables or minerals. The latter (minerals oil) from the best lubricants after addition of chemicals additives.

g) Additives: Is a chemical added to oil (lubricant)to improve its performance through inhibiting oxidation (oxidation inhibitors)keeping oxidation product in suspension in the oil and removed when the dirty oil is changed (detergents)viscosity index improve, Antifoam agents.

METHODS OF LUBRICATONS

- **Boundary lubrication** (used for all sliding engine components.
- **Hydrodynamic lubrication** (used on highly loaded bearing e.g. shapes bearing.

(i) Oil as a coolant: The cooling is achieved by positioning the oil reservoir on the winding way for most engines whereas in high performance cars and some commercial vehicle. They fit an oil cooler.

- The oil is carried in the sump in which the level must be high to cover the pump inlet but not high that crankshaft dip into the oil.

-A dipstick is a simple means of checking oil level in the sump through other means e.g float indicator or an electrical gauge may be used.

-Mechanically driven pump(s) draws oil from the sump and delivers it via the main filter (18) to the main oil galley (7) A coarse strainer (17) is fitted over the pump inlet to protect the pump from strangle sediments which may cause damage.

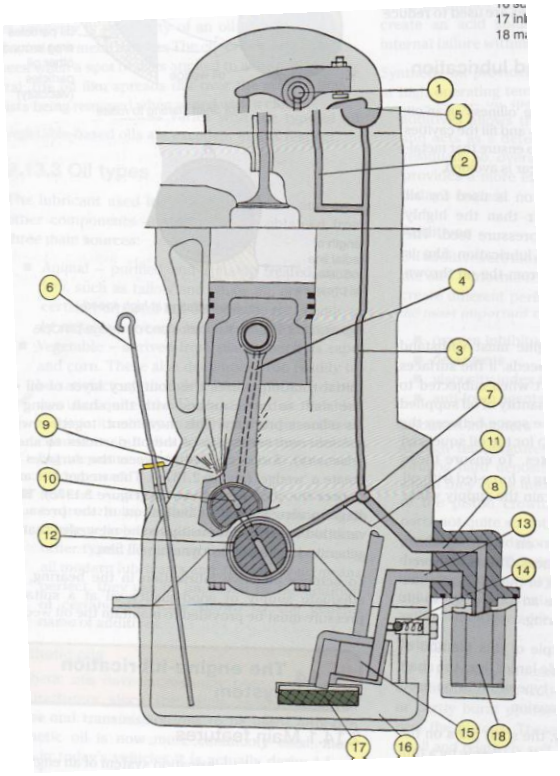
- From the main oil gallery oil is supplied to the main crankshaft bearing through passage drilled in the crankcase walls A feed is also taken through an external pipe(3) and drilled oil way(2) to hallow rocker shaft on the cylinder head radial holes in the rocker shaft carrying oil to the rocker bearing and oil seeping through bearing is splashed about the valve chamber to lubricate the valve stems pushrods etc..

- This oil eventually drain back to the sump via the pushrod enclosure lubricating the tappets on its way oil seal are generally fitted to inlet valve system to prevent oil being drawn into the combustion chambers through the inlet port.

- Holes (10) drilled through the crankshaft carry oil from a groove (12) round the main bearings to the big and groove is supplied from the main gallery (7) via the oil way (11) so that there is an interrupted supply to each.

- A small hole (9) drilled in suitable position in the big-end bearings allows intermittent jet oil to oil to spray onto the cylinder and in some engines a hole shown in dotted linear (i) drilled through the shank of the con rod to take an intermittent supply to the small end bearing.

-Oil splashed off the crankshaft lubricate the remaining parts and eventually drains back to the sump the gly of oil delivered into the system by the pump depends upon the pump capacity and at it's driven. The pressure in the system is by using a pressure relief valve.



1. Rocker spindle
2. Oil way to rocker spindle
3. Pipe to rocker spindle
4. Oil way to gudgeon pin
5. Camshaft bearing
6. Dipstick
7. Main oil gallery
8. Outlet from pressure filter
9. Oil jet to cylinder
10. Oil way to big end
11. Oil way to main bearing
12. Groove round main bearing
13. Passage from pump to filter
14. Pressure relief valve
15. Pump
16. Sump
17. Inlet strainer
18. Main Filter

OIL PUMPS

GEAR TYPE-spur-external gear pump

Bi-rotor Eccentric bi-rotor type

Sliding Eccentric vane type

(I) G Crescent-Internal-External type(plunger type)

1. **GEAR TYPE**

- Consist of a pair of gear wheel meshing together is a casing (1) fits closely around the tips of the teeth the end of the gear one gear(2) is fixed to the driving spindle (3) driven the other gear rotates idly on a fixed spindle inlet outlet (5) part are cut in the casing on when the gear rotate they carry oil from inlet to outlet in the spaces 1:1 the teeth as a tooth one gear moves out of mesh special 1:1 2 teeth of the other gear oil flow is through the inlet to fill the void spaces left on the out let side oil is displaced through the outlet on a tooth of one gear moves into space 1:1 teeth of the other note the directions shown by arrow.

2**. ECCENTRIC ROTOR TYPE:**

-The casing (1) has a cylindrical bore in which is fitted the outer rotor (2) the outer surface of this is cylindrical but a no of lobes are formed on its inner surface. The inner rotor (3) has robes formed on its outer surface, one fewer than the no formed on its outer rotor. It is fixed on the driving spindle (4) and mounted eccentrically in the casing so that each of its lobes makes contact with the inner.

- Surface of the outer rotor, dividing the space 1:1 the rotors into a number of separate compartments varying as the rotors turns.

- Inlet and outlet parts are cut in the end plate of the positioned so that the pumping compartment sweep over the inlet ports (3) as they decrease. The pump is shown assembled at sketch (b) shown the rotors removed to reveal the parts more clearly..