

Thermo-syphon Water Cooling System

The thermo-syphon cooling system (Fig. 12.30) operates on the principle of natural convection caused by variation in density of water, and hence does not use a pump. The heated water expands, due to which the density decreases. When it cools down, its volume decreases and hence density increases. This variations in density sets up convection currents so that circulation of water takes place. All components of water-cooling systems except the circulating pump are used in this case.

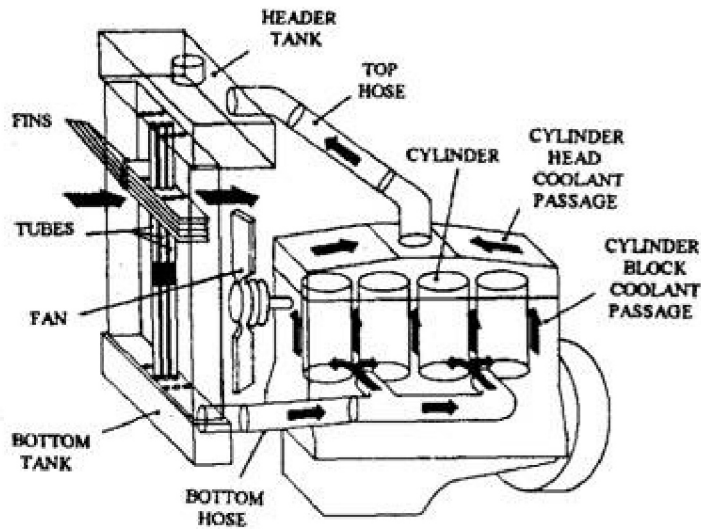


Fig. 12.30. Thermo-syphon liquid cooling system.

The advantages of thermo-syphon cooling are :

- (a) Cheap as no water pump is required.
- (b) Reliable as there are no moving parts.
- (c) Circulation of water depends solely on engine temperature. The hotter the engine, the greater is the circulation.

Disadvantages of thermo-syphon cooling are as follows (which are additional points over those provided under section 12.1.3).

- (a) In order to achieve efficient circulation, the radiator top tank must be well above the engine. This needs a high bonnet line.
- (b) Cooled water enters the engine at the bottom of the cylinder, where the engine normally runs fairly cool and it heats up to maximum as it reaches the top of the cylinders. Therefore, it has a reduced cooling effect on the hottest part of the engine.
- (c) Difficult to fit an interior heater successfully without a water pump.
- (d) Under conditions of very heavy load or in hot climates the water may not circulate as quickly as required.

Incorporation of a water pump insures positive water circulation and removes all the disadvantages of the thermo-syphon cooling process.

Advantages of water-cooling systems working on the thermo-syphon principle over air-cooling systems :

- (a) It is generally considered more suitable than air-cooling for multi-cylinder engines.
- (b) Water has very high specific heat therefore ; a small amount of water is able to absorb a large amount of heat.
- (c) Water is cheap and easily obtainable.
- (d) By means of thermostat, engine temperature can be controlled.
- (e) Engine noise is reduced because it passes through the water jacket.
- (f) Engine heated water can be used to heat the car interior and in some cases the induction manifold.