

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

Cooling System

NECESSITY OF COOLING SYSTEM

The cooling system is provided in the IC engine for the following reasons:

- The temperature of the burning gases in the engine cylinder reaches up to 1500 to 2000 °C, which is above the melting point of the material of the cylinder body and head of the engine.
- Therefore, if the heat is not dissipated, it would result in the failure of the cylinder material.
- Due to very high temperatures, the film of the lubricating oil will get oxidized, thus producing carbon deposits on the surface. This will result in piston seizure.
- Due to overheating, large temperature differences may lead to a distortion of the engine components due to the thermal stresses set up.
- This makes it necessary for, the temperature variation to be kept to a minimum.

Cooling System

REQUIREMENTS OF EFFICIENT COOLING SYSTEM

The two main requirements of an efficient cooling system are:

- It must be capable of removing only about 30% of the heat generated in the combustion chamber.
- Too much removal of heat lowers the thermal efficiency of the engine.
- It should remove heat at a fast rate when the engine is hot.
- During the starting of the engine, the cooling should be very slow so that the different working parts reach their operating temperatures in a short time.

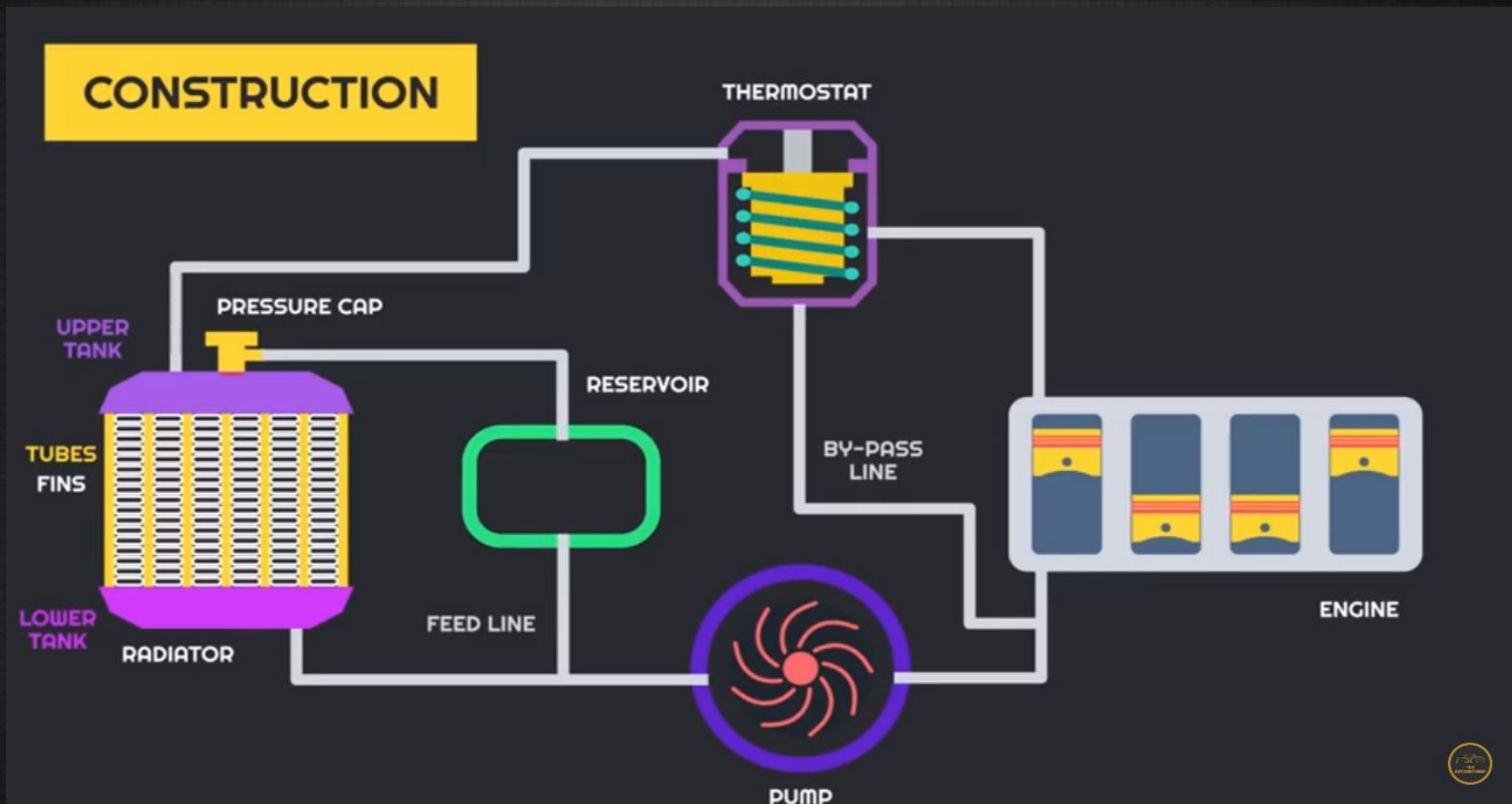
Cooling System

TYPES OF COOLING SYSTEM

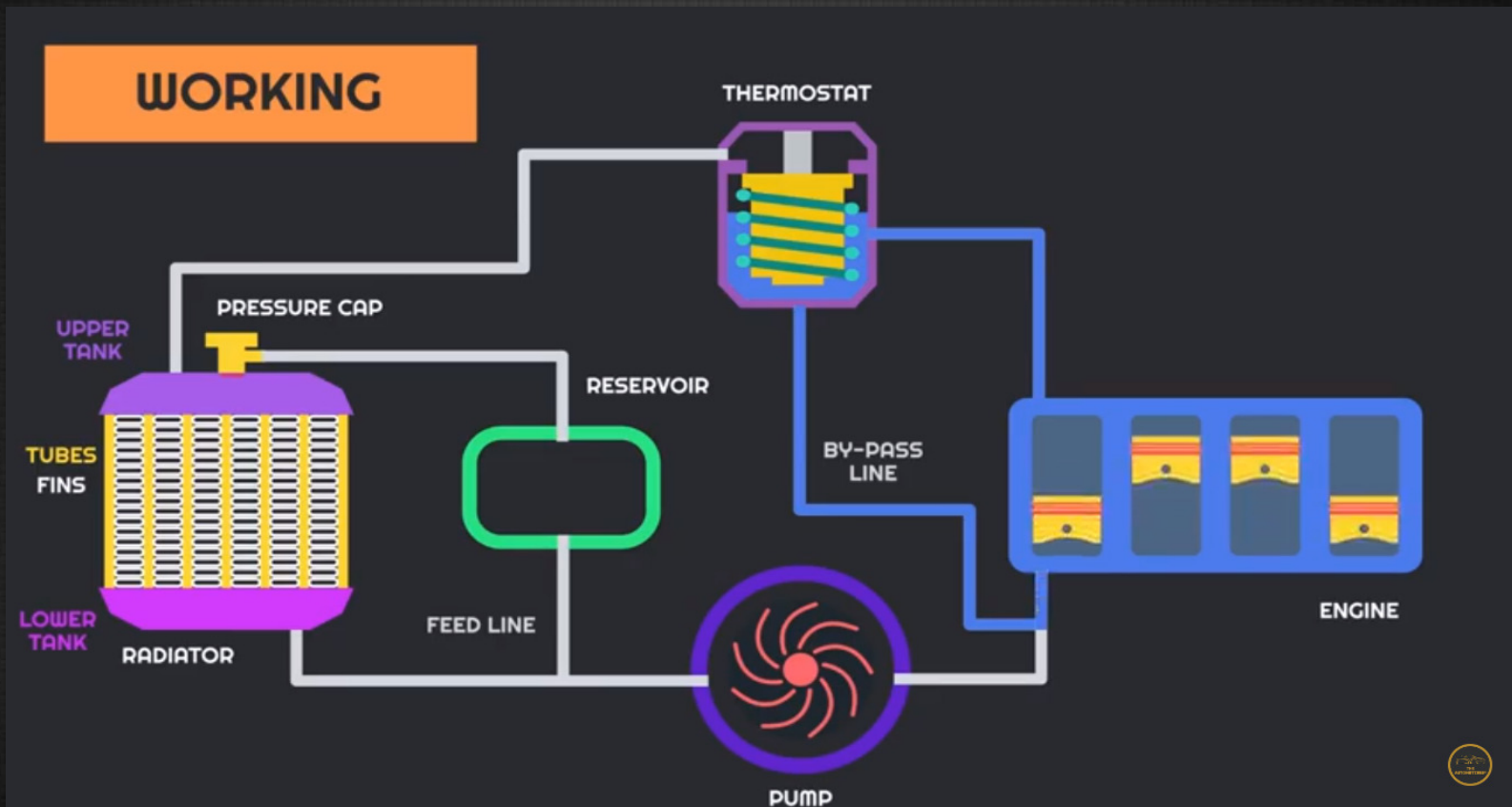
There are two types of cooling systems

- Liquid-cooling system
- Air cooling system

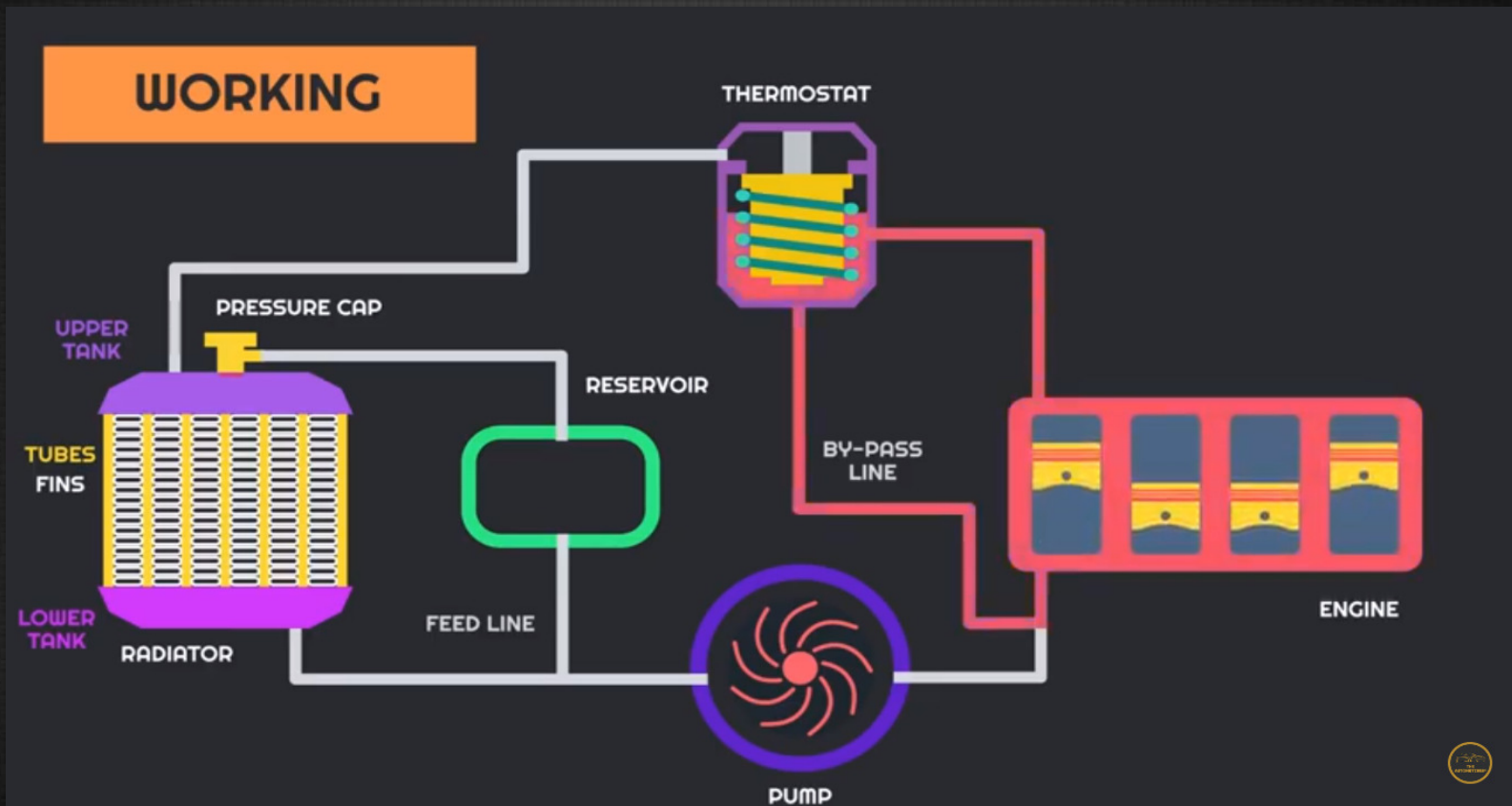
Cooling System (Liquid)



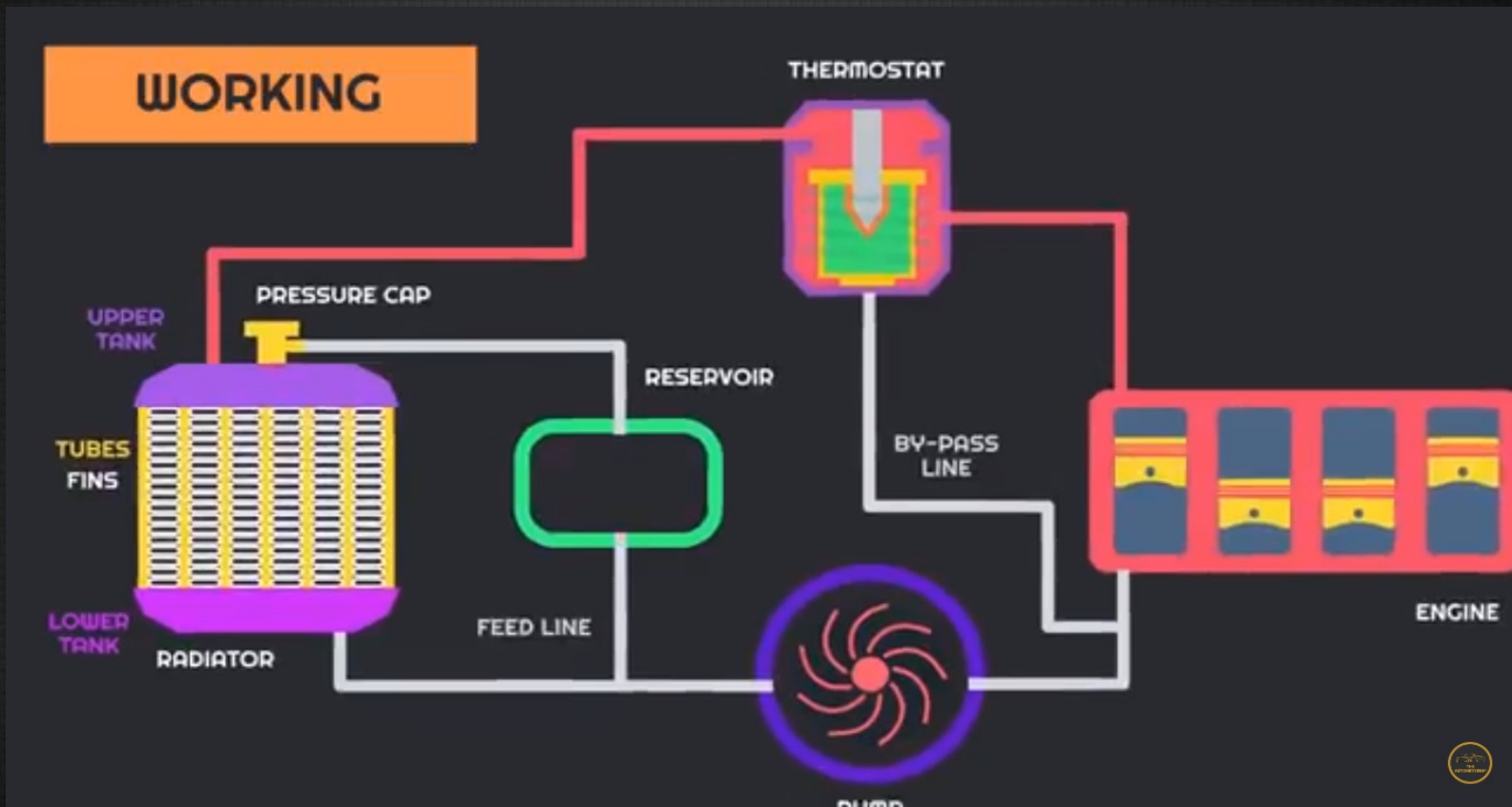
Cooling System (Liquid)



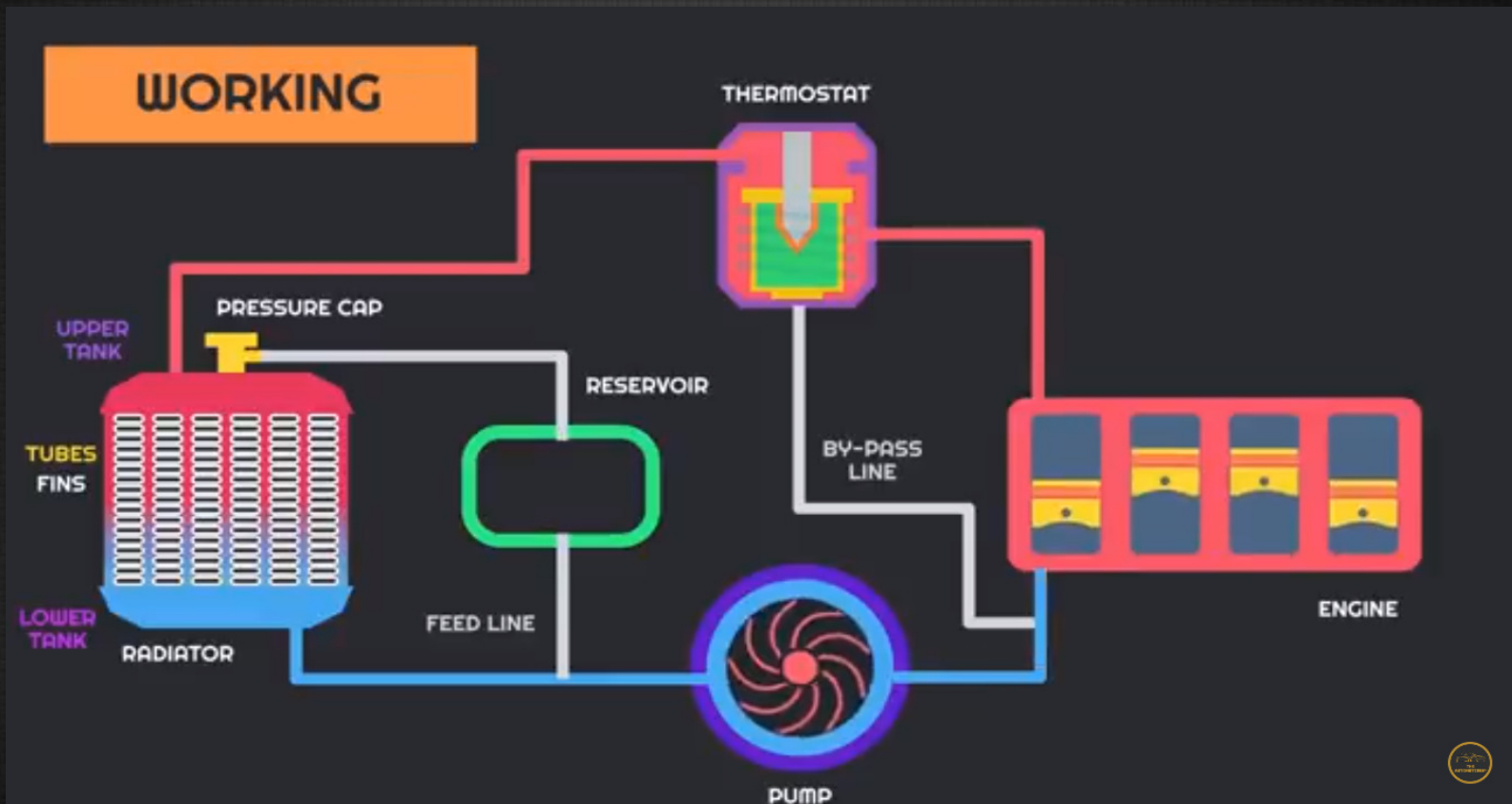
Cooling System (Liquid)



Cooling System (Liquid)

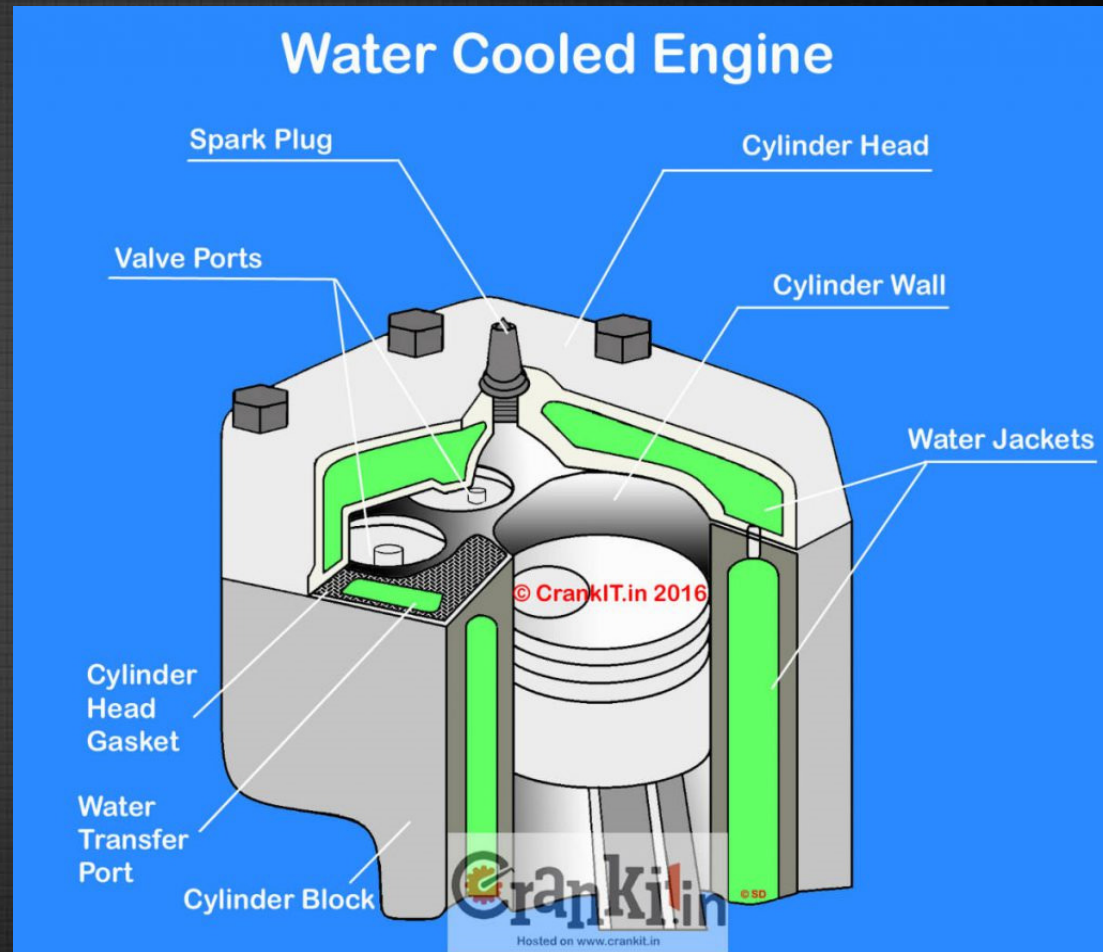


Cooling System (Liquid)



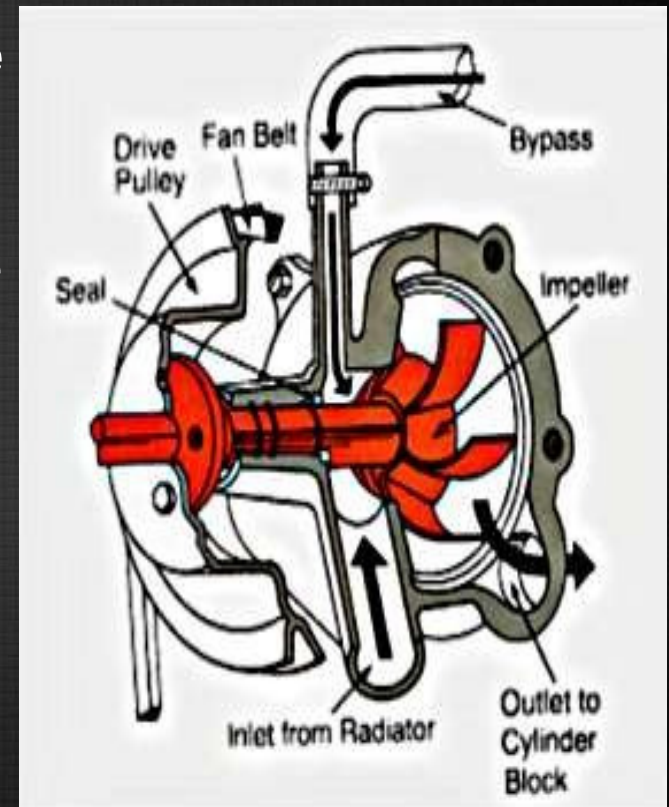
Water Cooled Engine

- Designed to keep engine block and cylinder head cool.
- Open spaces between the outside of cylinder and inside of cylinder block and head.
- When engine is running at normal operating temperature, the coolant is forced through the water jackets in the engine block, through the head gasket, into the head, and back to the radiator.



Water Pump

- Draws the coolant from the radiator, through the lower radiator hose, and then forces it through the water jackets, back into the radiator.
- If the clutch fan can be wiggled up and down, most likely the water pump needs to be replaced.
- Water pumps gasket is placed between the water pump and the engine block to prevent leakage 9if left loose it



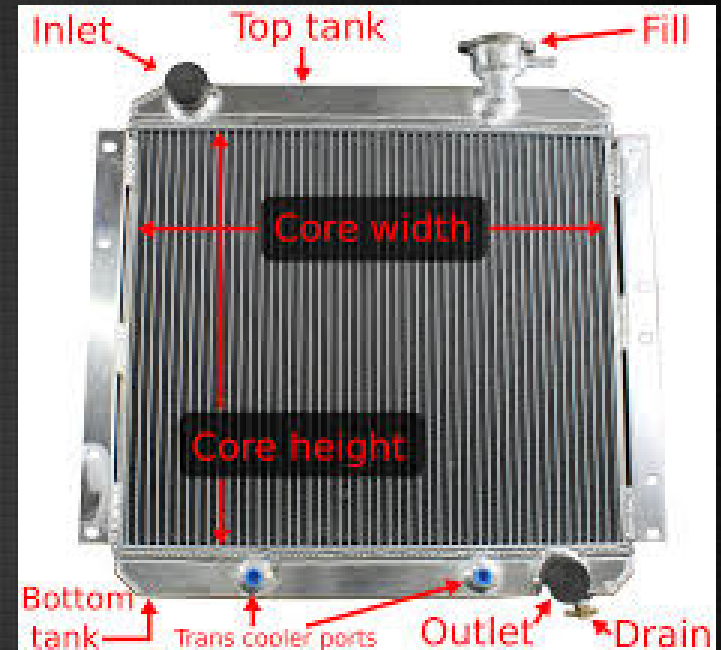
Thermostat

- **Thermostat** placed between the cylinder head and top radiator hose.
- The temperature that the thermostat opens is called *thermostat rating*.
- The thermostat's main job is to allow the engine to heat up quickly, and then to keep the engine at a constant temperature



Radiator

- Radiator is a heat exchanger that removes heat from the coolant passing through it.
- Vehicles equipped with automatic transmission have transmission cooler build into the radiator.
- The purpose of radiator is to provide a large amount of cooling surface area so that water passing downward through it in thin stream is cooled efficiently



Advantages and Disadvantages of liquid Cooling System

Advantages:-

- (a) Uniform cooling of cylinder, cylinder head and valves.
- (b) Specific fuel consumption of engine improves by using water cooling system.
- (c) If we employ water cooling system, then engine need not be provided at the front end of moving vehicle.
- (d) Engine is less noisy as compared with aircooled engines, as it has water for damping

Disadvantages:-

- (a) It depends upon the supply of water.
- (b) The water pump which circulates water absorbs considerable power.
- (c) If the water cooling system fails then it will result in severe damage of engine.
- (d) The water cooling system is costlier as it has more number of parts. Also it requires more maintenance and care for its parts.

Air Cooled System

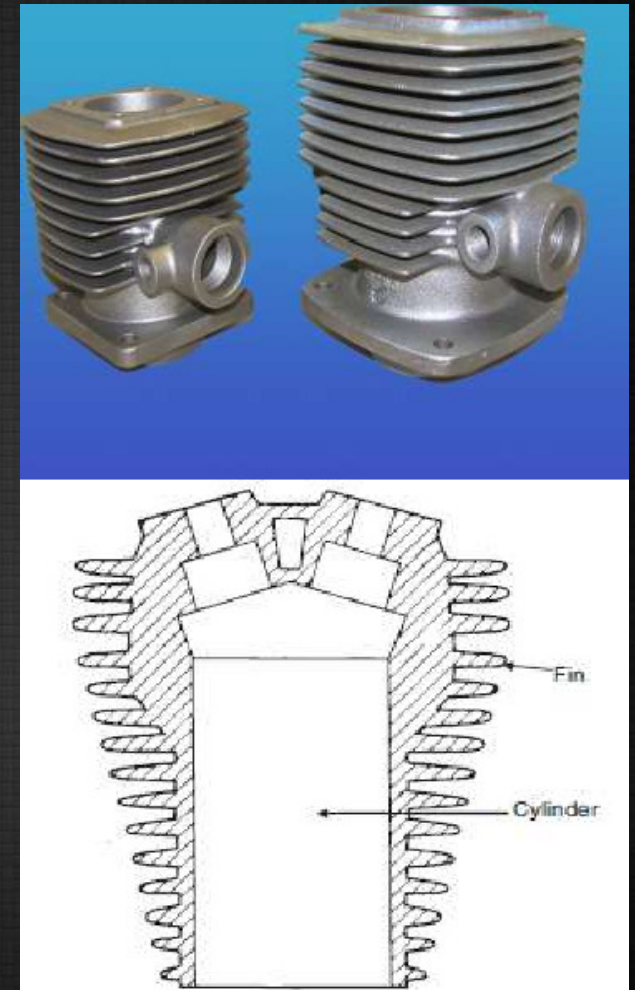
In air cooled system a current of air made to flow past the outside of the cylinder barrel ,outer surface area which has been considerably increased by providing cooling fins.

The amount of heat dissipated to air depends upon :

- (a) Amount of air flowing through the fins.
- (b) Fin surface area.
- (c) Thermal conductivity of metal used for fins.

Cooling Fins

- In the study of heat transfer, a fin is a surface that extends from an object to increase the rate of heat transfer to or from the environment by increasing convection.
- The amount of conduction, convection, or radiation of an object determines the amount of heat it transfers.
- Increasing the temperature difference between the object and the environment, increasing the convection heat transfer coefficient, or increasing



Advantages:-

- (a) Radiator/pump is absent hence the system is light.
- (b) In case of water cooling system there are leakages, but in this case here are no leakages.
- (c) Coolant and antifreeze solutions are not required.
- (d) This system can be used in cold climates, where if water is used it may freeze.

Disadvantages:-

- (a) Comparatively it is less efficient.
- (b) It is used in aero planes and motorcycle engines where the engines are exposed to air directly.