

UNIT-1

FAS ASSIGNMENT

1. Classify types of fuel feed system and explain it.

- The main purpose of the fuel feed system is to control the fuel supply to the engine. To supply the fuel from the fuel tank to the engine cylinders, manufacturers use the following methods in case of a petrol engine.

Types of Fuel Feed systems of a petrol engine:

- ✓ Gravity Feed
- ✓ Pressurized Feed
- ✓ Vacuum system
- ✓ Pump Feed
- ✓ Fuel injection system

Gravity Feed System:

- The 'gravity system' is confined to smaller vehicles such as entry-level two-wheelers, bikes, and quads only. In this design, the engineers mount the fuel tank at the highest position. It feeds the fuel into the carburetor float chamber by gravity. This system has a very simple design and hence, cheaper to produce and maintain. However, the disadvantage is that you need to place the fuel tank over the carburetor for this system to work correctly.

Pressure Feed system:

- The pressure feed system uses a hermetically sealed (airtight) fuel tank. In this design, a separate air pump or engine exhaust creates pressure in the tank. However, for starting the engine; you need to hand prime the pump. Thus, it creates pressure and forces the fuel to flow to the carburetor. Although there are chances of leaking of pressure, you can place the fuel tank at any suitable location in the vehicle which is an advantage.

Vacuum System:

- This system uses engine suction pressure to suck the fuel from the main tank to an auxiliary tank. From there, the fuel flows to the carburetor float chamber by gravity. This system is now obsolete.

Pump Feed System:

- Most present-day cars use this system. This system uses a steel pipe to supply the petrol to the fuel pump which then pumps it into the carburetor float chamber thru' flexible pipe. If it is a mechanical fuel pump, then it gets the drive from the engine camshaft. Hence, it is attached to the engine. On the other hand, electrically operated

fuel pumps can be placed anywhere. So, manufacturers place it inside the fuel tank to reduce the chance of vapor-l

Fuel Feed System – Pump Type

Fuel Injection System:

- Modern/present-day vehicles use petrol injection system which replaced the carburetor. The injector nozzle atomizes the fuel and forces it into the air stream. Newer generation engines use separate injector for each cylinder. The air-fuel mixture for different load and speed conditions is controlled either mechanically or electronically. Hence, this makes the fuel system more accurate. For more information, read about the EFI, MPFI & GDi .

2. **Give the classification of carburetor and explain any one.**

- A carburetor is a mechanical device that forms part of the ancillary superstructure of an internal combustion engine. The specific function of the carburetor provides fuel to the combustion chamber where an explosion occurs. Carburetors mix raw fuel with air to produce a more volatile and highly combustible blend of fuel. The downward stroke of an engine's piston creates a natural vacuum, pulling the mixture from the carburetor into the cylinder walls. A separate process initiates a spark at the right moment and ignites the newly mixed fuel, causing it to ignite. The explosion forces the piston downward and produces power.

- Technological advancements in automobile manufacturing and electronics led to the development of fuel injection. Fuel injection is the primary alternative to the carburetor in cars today. The function of a fuel injector system is based on the same principle as the carburetor. While fuel injection produces faster response and fuel efficiency, the carburetor still exists in classic cars as well as an extensive range of gas-powered machines and transportation alternatives. These include airplanes, generators, tractors, lawn and garden equipment and motorcycles

1. According to the direction of flow.

- a. Uplift carburetors or updraft carburetor
- b. Down draft carburetor
- c. Horizontal carburetor.

2. According to the arrangement of the float chamber

- a. Eccentric carburetor
 - b. Concentric carburetor
3. According to the number of units
- a. Single carburetor
 - b. Double carburetor.

4. According to the type of venture :

- a. Plain venturi carburetor
- b. Double venturi carburetor
- c. Vane venturi carburetor
- d. Nozzle bar venturi carburetor
- e. Triple venturi carburetor.

5. According to the type of power system

- a. Manually operated carburetor

b. Vacuum controlled carburetor.

Updraft Carburetor

- In this type of Carburetor, the air enters at the bottom and leaves at the top. So the flow of air is an upward direction. In this Carburetor, the injected fuel from the main jet supposed to be lifted by the upward air friction/velocity. This is the main disadvantage of this Updraft Carburetor. The Lifting of the fuel can be done when it is used for the small mixing tubes only.
- Due to the small mixing tube, this cannot provide enough mixture when the engine is running at high speeds. That is why they build the downdraught Carburetor

3. Give the classification of fuel injection system and explain any one.

- The basic types of fuel injection systems are single-point fuel injection, multi-point fuel injection, sequential fuel injection, and direct injection.
- The combustion engine in our cars would not function without fuel. Supplying this essential fuel into the combustion chambers are the fuel injection systems. Many attributes of your car are highly influenced by the type of fuel injection system its engine has, mileage, ride quality, engine life, etc. A fuel injection system is a mechatronic circuit that is the combination of mechanical and electronic circuits to supply fuel of ideal volume into the engine.
- Since the fuel injection system is such a vital component, engineers around the globe have evolved it to its most efficient and effective version. In this day and age, while there are various types of fuel injection systems available, the broad categorization brings them down to four

main types: Single point fuel injection, Multi-point fuel injection, Sequential fuel injection, and Direct fuel injection

1.A single-point injection

- A single-point injection system features a common fuel injector for all the cylinders in the combustion chamber of the engine. This is the oldest and simplest form of the fuel injection system. In place of the carburettor, the single-point injection uses one or two fuel injector nozzles in the throttle body which is why it's called Throttle body injection (TBI) as well.
- The fuel is sprayed in all cylinders at the same time, however, as opposed to the carburetor jet, it comes from an injector and can be monitored by an electronic control unit (ECU). While it has an edge over the carburetor, it has a slight disadvantage that since it uses a single injector it disturbs the performance of an engine at high RPMs and causes rough ride

quality as the required fuel supply isn't fulfilled. Moreover, a small fraction of fuel gets condensed outside the intake manifold of the cylinders and this causes fuel wastage.

4. Give various methods that are deployed in engine cooling

- There are mainly two types of cooling systems : (a) Air cooled system, and (b) Water cooled system. Air cooled system is generally used in small engines say up to 15-20 kW and in aero plane engines. In this system fins or extended surfaces are provided on the cylinder walls, cylinder head, etc.
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- **Water Cooling System**

Methods of water cooling:

1. Open jacket method There is a hopper or jacket containing water which surrounds the engine cylinder. So long as the hopper contains water the engine continues to operate satisfactorily.
2. Thermo siphon method It consists of a radiator, water jacket, fan, temperature gauge and hose connections. The system is based on the principle that heated water which surrounds the cylinder becomes lighter and it rises upwards in liquid column. Hot water goes to the radiator where it passes through tubes surrounded by air.
3. Forced Circulation system in this method, a water pump is used to force water from radiator to the water jacket of the engine. After circulating the entire run of water jacket, water comes back to the radiator where it loses its heat by the process of radiation.

5. Write a note on air cooled system.

- In this type of cooling system, the heat, which is conducted to the outer parts of the engine, is radiated and conducted away by the stream of air, which is obtained from the atmosphere. In order

to have efficient cooling by means of air, providing fins around the cylinder and cylinder head increases the contact area. The fins are metallic ridges, which are formed during the casting of the cylinder and cylinder head. The amount of heat carried off by the air-cooling depends upon the following factors:

- (i) The total area of the fin surfaces,
- (ii) The velocity and amount of the cooling air and
- (iii) The temperature of the fins and of the cooling air.

- Air-cooling is mostly tractors of less horsepower, motorcycles, scooters, small cars and small aircraft engines where the forward motion of the machine gives good velocity to cool the engine. Air-cooling is also provided in some small industrial engines. In this system, individual cylinders are generally employed to provide ample cooling area by providing fins. A blower is used to provide air.

1. Its design of air-cooled engine is simple.
2. It is lighter in weight than water-cooled engines due to the absence of water jackets, radiator,

circulating pump and the weight of the cooling water.

3. It is cheaper to manufacture.
4. It needs less care and maintenance.
5. This system of cooling is particularly advantageous where there are extreme climatic conditions in the arctic or where there is scarcity of water as in deserts.
6. No risk of damage from frost, such as cracking of cylinder jackets or radiator water tubes.

6. Discuss in detail water cool system.

It serves two purposes in the working of an engine:

- a) It takes away the excessive heat generated in the engine and saves it from over heating.
- b) It keeps the engine at working temperature for efficient and economical working.

This cooling system has four types of systems:

- (i) Direct or non-return system,

- (ii) Thermo-Syphone system,
- (iii) Hopper system and
- (iv) Pump/forced circulation system

- **Non-Return Water Cooling System**

This is suitable for large installations and where plenty of water is available. The water from a storage tank is directly supplied to the engine cylinder. The hot water is not cooled for reuse but simply discharges. The low H.P. engine, coupled with the irrigation pump is an example.

- **Thermo-Syphone Water Cooling System**

This system works on the principle that hot water being lighter rises up and the cold water being heavier goes down. In this system the radiator is placed at a higher level than the engine for the easy flow of water towards the engine. Heat is conducted to the water jackets from where it is taken away due to convection by the circulating water.

- **Disadvantages of Thermo-Syphone System**

- 1 Rate of circulation is too slow.

2. Circulation commences only when there is a marked difference in temperature.
3. Circulation stops as the level of water falls below the top of the delivery pipe of the radiator

- **Hopper Water Cooling System**

This also works on the same principle as the thermo-syphone system. In this there is a hopper on a jacket containing water, which surrounds the engine cylinder. In this system, as soon as water starts boiling, it is replaced by cold water. An engine fitted with this system cannot run for several hours without it being refilled with water.

- **Force Circulation Water Cooling System**

This system is similar in construction to the thermo-syphone system except that it makes use of a centrifugal pump to circulate the water throughout the water jackets and radiator

The water flows from the lower portion of the radiator to the water jacket of the engine through the centrifugal pump. After the circulation water comes back to the radiator, it loses its heat by the process of

radiation. This system is employed in cars, trucks, tractors, etc.

7. Write a note on engine lubrication and explain any one type

- The lubricating system of an engine is an arrangement of mechanism and devices which maintains supply
- of lubricating oil to the rubbing surface of an engine at correct pressure and temperature.

- **The parts which require lubrication are:**

cylinder walls and piston (ii) piston pin (iii) crankshaft and connecting rod bearings (iv) camshaft bearings (v) valves and valve operating mechanism (vi) cooling fan (vii) water pump and (viii) ignition mechanism.

- **There are three common systems of lubrication used on stationary engines, tractor engines and automobiles:**

Splash system (ii) Forced feed system and (iii) Combination of splash and forced feed system.

SPLASH SYSTEM

- In this system, there is an oil trough, provided below the connecting rod. Oil is maintained at a uniform
- level in the oil trough. This is obtained by maintaining a continuous flow of oil from the oil sump or
- reservoir into a splash pan, which has a depression or a trough like arrangement under each connecting rod.
- This pan receives its oil supply from the oil sump either by means of a gear pump or by gravity. A dipper is
- provided at the lower end of the connecting rod. This dipper dips into to oil trough and splashes oil out of
- the pan. The splashing action of oil maintains a fog or mist of oil that drenches the inner parts of the engine
- such as bearings, cylinder walls, pistons, piston pins, timing gears etc.

Splash lubrication system

- This system is usually used on single cylinder engine with closes crankcase. For effective functioning of
- the engine, proper level of oil maintained in the oil pan.
- Lubrication depends largely upon the size of oil holes and clearances. This system is very effective if the
- oil is clean and undiluted. Its disadvantages are that lubrication is not very uniform and when the rings are
- worn, the oil passes the piston into combustion chamber, causing carbon deposition, blue smoke and
- spoiling the plugs. There is every possibility that oil may become very thin through crankcase dilution.

8.What are the various property that desire in lubricants(lubricating oil)

- The main properties of lubricants, which are usually indicated in the technical characteristics of the product, are:
 Viscosity.
 Viscosity index.
 Pour point.
 Flash point.
- **Viscosity**
 Viscosity is defined as the fluid's internal resistance to flow. The higher the viscosity of the fluid, the slower it

flows. If you want your film to stay put at lower speeds, you need higher viscosity.

1. Thermal Stability

Thermal stability refers to the ability of lubricants to resist breakdown at high temperatures. Poor thermal stability can result in sludge, deposits and increased viscosity

2. Oxidation Stability

Oxidation stability refers to the ability of a lubricant to resist the chemical combination with oxygen. It can result in the creation of sludge deposits and increased viscosity.

- **Pour Point**

Pour point is the lowest temperature at which an oil will flow under prescribed test conditions. It is affected by the amount of wax particles removed during the processing of crude.

The more wax particles there are, the higher the pour point. The fewer wax particles there are, the lower the pour point.

Oxidation stability is accelerated by heat, light, metal catalysts, acids formed by water contamination and other contaminants.

- **Demulsibility**

Demulsibility is another important property of lubricating oils. It is the ability of an oil to separate from water.

- **Flash Point**

Flash point is determined by heating the oil until vapours form; a flame is then passed across the oil. The flash point is the temperature at which the oil sparks, but a flame is not sustained.

- **Fire Point**

Fire point is determined in a manner similar to flash point. Oil is heated until vapours form; a flame is then passed over the oil. The fire point is the temperature at which the oil sparks and the flame is sustained.

