

AI 3401 TRACTORS AND ENGINE SYSTEMS

UNIT II NOTES





Further to remove the fine particles and abrasive material in the fuel, secondary filter is used which is made of fine pores and it is placed after the fuel feed pump. These smallest impurities are retained to protect the extremely sensitive parts like fuel pump and injectors to get damaged. These filters are generally made of two sections/stages in which first stage is made of cloth and second is of paper through which the fuel passes to leave impurities behind in the fuel line.

Superchargers:

The device (compressor) powered by crankshaft used to compress incoming air of the engine is called supercharger. Supercharger is used to increase the volumetric efficiency of an engine by feeding both air and fuel at high pressure. The supercharger is driven directly by the engine through belts, the response of the same is instantaneous and a sudden increase in power can be obtained

Centrifugal supercharger

This is one of the most commonly used supercharger which is driven by belt and pulley. The air fuel mixture enters into the impeller of the supercharger where this mixture is supercharged with pressure using the kinetic energy

- **Fuel Delivery & Injection**

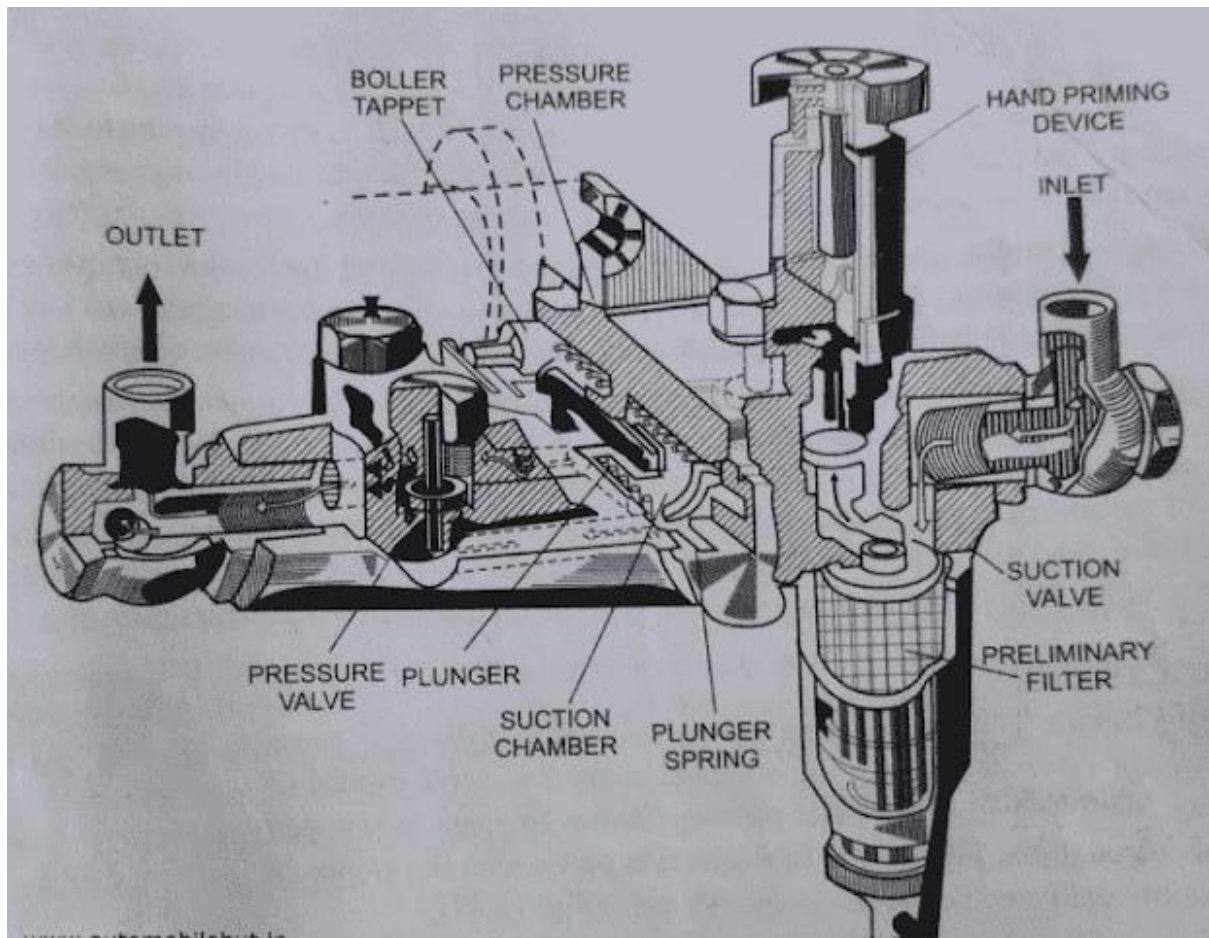
It involves the flow of fuel from fuel tank to fuel nozzles for injecting the desired quantity of fuel with required pressure in the combustion chamber. Fuel travels fuel pipes from fuel tank to fuel feed pump through primary filter under gravity and then with the help of fuel injection pump, it further reaches to injecting nozzles with pressure through high pressure pipes

- **Fuel feed pump**

The fuel comes from the fuel tank to the fuel feed pump which makes it to reach fuel injection pump after traveling through primary and secondary fuel filters. Sometimes this feed pump is also known as transfer pump or lift pump

Fuel feed pumps operate on the principle of positive displacement, which means that they deliver a consistent amount of fuel to the engine regardless of the engine's demand. This is essential to ensure that the engine always receives the correct amount of fuel to run efficiently and avoid damage. Fuel Feed Pumps are also designed to maintain a specific fuel pressure, which is necessary to achieve the optimal fuel-air mixture for combustion.

The fuel feed pump is constructed as a single-acting Fuel Feed Pump or double-acting Fuel Feed Pump and is usually provided with a hand-priming device and preliminary filter. Both diagrams are shown below.



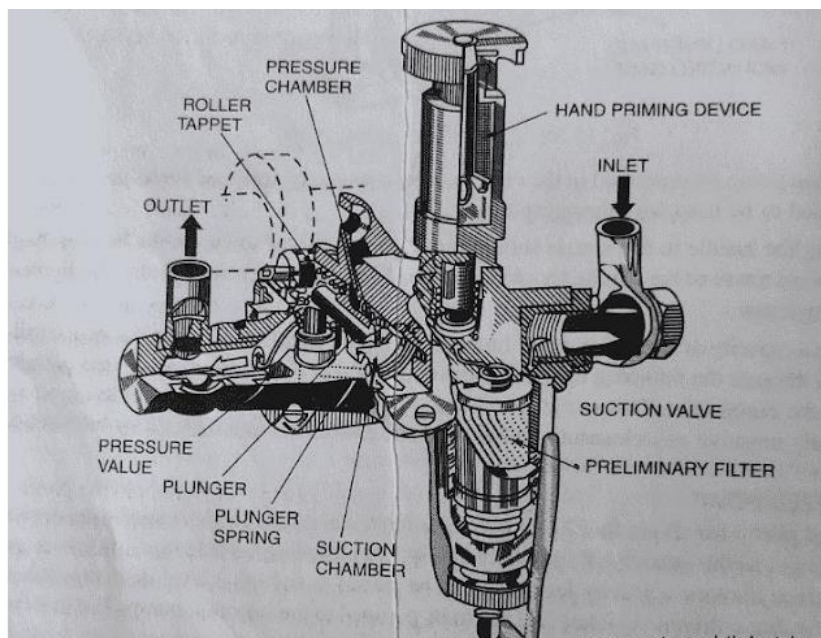
The revolving cam or eccentric presses the plunger of the **Fuel Feed Pump** downwards by means of the roller tappet and pressure spindle. A portion of the fuel present in the suction chamber equal to the swept volume or quantity of fuel delivered per stroke (or air for lack of fuel) is delivered through the pressure chamber and the plunger spring is compressed in an intermediate stroke. Toward the end of this stroke, the spring-loaded pressure valve closes again.

The pressure spindle, roller tappet, and plunger are only in slight contact with one another. As soon as the cam has passed its maximum stroke, the plunger, pressure spindle, and roller tappet accordingly move upward due to the pressure exerted by the plunger spring. A portion (quantity delivered per stroke) of the fuel pressure in the pressure chamber is thereby delivered to the injection pump (delivery stroke) through the filter. Fuel is, however, also suctioned simultaneously from the fuel tank to the suction chamber through the preliminary filter and the suction valve.

During the delivery stroke (spring actuated), all the fuel swept out by the plunger in the pressure chamber is fed to the injection pump. The volume of this, however, is slightly less than that swept out by the plunger in the suction chamber. The volume swept out in the pressure chamber is the volume swept out in the suction chamber less the volume of the spindle reaching into the pressure chamber. Therefore, during the intermediate stroke, a quantity of fuel corresponding to the volume of the spindle is fed to the injection pump.

Where the pressure in the feed pipe exceeds a specified value, the plunger spring lifts the plunger only a part of the stroke. The fuel quantity delivered per stroke is thus correspondingly smaller. Hence, the higher the pressure in the feed pipe, the smaller the quantity delivered. The **Fuel Feed Pump** is made elastic. If the overflow valve is clogged, pressure in the feed pipe would quickly rise to such an extent that the feed pump would stop functioning. The pipe is thus safe against excessive pressure. Fuel leaking along the pressure spindle is returned to the suction chamber through the leakage channel.

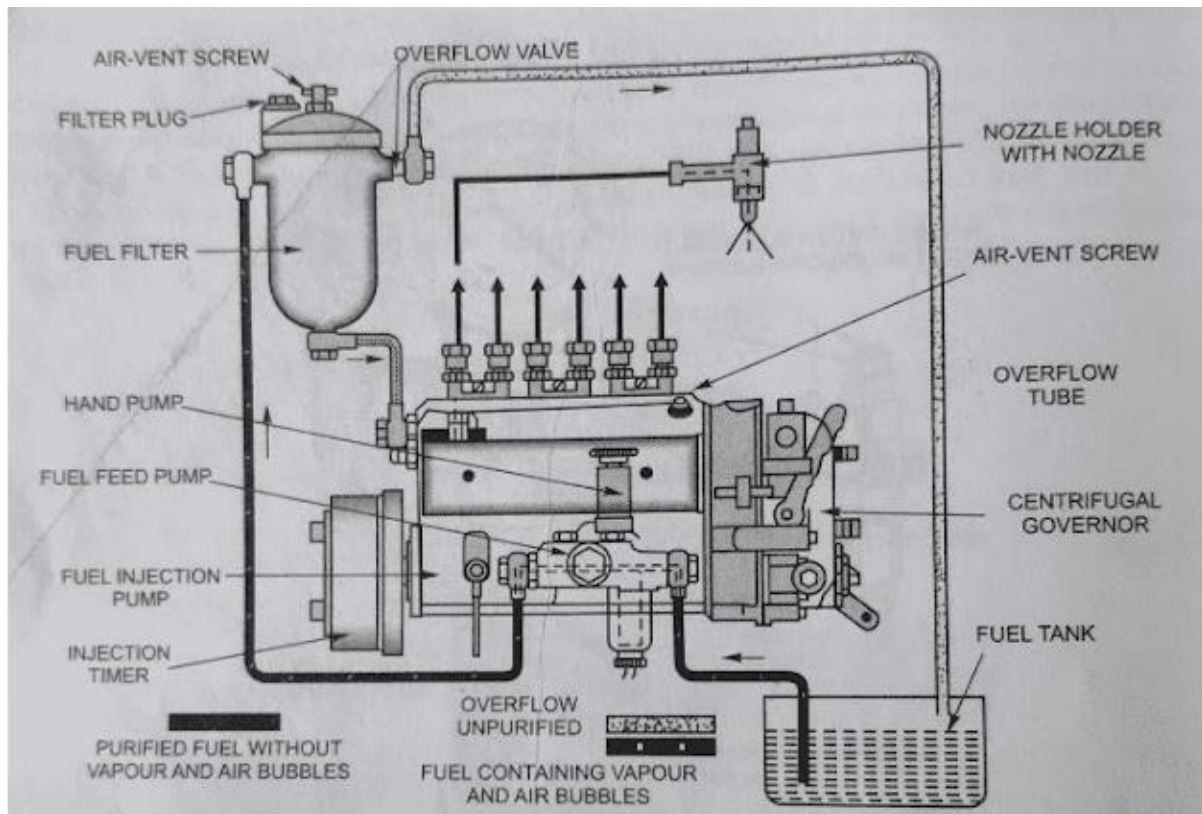
Double-acting Fuel Feed Pump-



The revolving cam or eccentric process the plunger of the feed pump downwards by means of the roller tappet and pressure spindle. This uses a suction valve and a pressure valve to open, and the plunger spring is tensioned. Both suctioning and feeding thus take place simultaneously.

Once the cam or eccentric has passed its maximum stroke, the plunger rises due to the action of its spring, and the fuel is sucked and fed to the injection pump through the other two valves, thus both suctioning and feeding again occur simultaneously. This is a double-acting fuel feed pump delivering fuel twice with every revolution with its camshaft. As the plunger, roller tappet, and pressure spindle are again only in slight contact with one another, feeding is likewise elastic. The fuel quantity delivered can not approach zero as with a single-acting pump. Because of this, an overflow valve is necessary for the pressure tube or the fuel filter.

Fuel Feed Pump Diagram-



Fuel has to be fed to the diesel engines of the vehicles under the pressure of about 1 atm(gauge) as the quantity of fuel delivered would otherwise be inadequate. Only in stationary engines and some tractors, a gravity feed tank can be placed at so high a level as to provide sufficient pressure. Hence in diesel-driven vehicles, fuel has to pump to the injection pump. The fuel feed pump has been designed to meet this demand