

FUEL PUMPS

Operation, Diagnosis, & Repair

By: William C. "Bill" Anderson, P.E.

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Billions of mechanical fuel pumps were installed in the decades between when cars stopped using gravity fuel delivery to the engine and the advent of electrically-powered fuel pumps. These simple devices perform reliably, but they can and do wear out. However, wear of the pump components is not the only problem that can prevent the pump from doing its job.

How Fuel Pumps Work

Figure 1

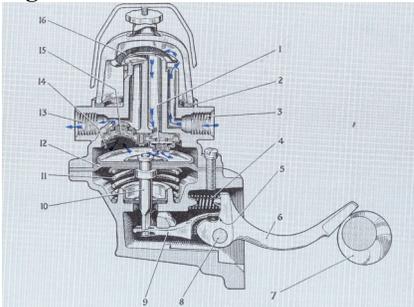


Figure 1 – Basic fuel pump components. 1) inlet valve, 2) bowl cover joint, 3) fuel inlet, 4) operating arm return spring, 5) abutment on operating arm, 6) rocker arm, 7) eccentric on camshaft, 8) pivot, 9) connecting link, 10) pull rod, 11) diaphragm return spring, 12) diaphragm, 13) fuel outlet, 14) pump chamber, 15) outlet valve, 16) fuel screen.

Figure 1 shows a cross section of a basic fuel pump. Although there are many variations, all are basically the same. An eccentric (7), typically mounted on the camshaft causes the pump arm (6) to move up and down. Sometimes, this arm does not directly ride on the eccentric, but is accentuated by a push rod driven by the eccentric. This arm is connected

by a pull rod (10) to a diaphragm (12). When the diaphragm is pulled down, it creates suction on the fuel inlet (3) line (much like sucking on a straw) through a valve (1) in the pump. When the arm completes its down stroke, a spring (11) operating on the diaphragm forces the fuel through the outlet valve (15) and on its way to the carburetor. If the fuel system is full of fuel and there is no continuing demand, the pump arm and diaphragm spring continue their cyclic motion due to the eccentric on the camshaft, but the diaphragm and flow control valves do not operate – no fuel moves through the pump.

Another type of fuel pump, referred to as a combination pump, is shown in **Figure 2**. The top half of this pump produces vacuum augmenting the engine vacuum to provide a steady supply to power vacuum-operated windshield wipers under varying engine conditions. The lower half functions the same as the basic pump shown in Figure 1.

Figure 2

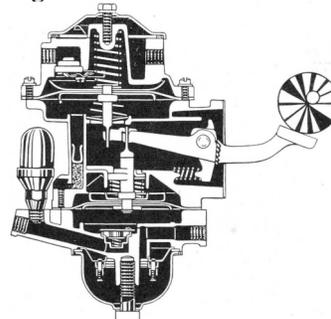


Figure 2 – Cross section of combination pump. Fuel pump section on the bottom, vacuum unit at the top.

Potential Problems

Fuel pump performance can be easily tested with a fuel pressure gauge. The pressure produced should generally be between 4 and 5 psi at the carburetor (1/2 psi more if measured at the pump); check the car's shop manual for the specific correct pressure. The other parameter to be measured is volume pumped. This test can be accomplished by disconnecting the fuel line at the carburetor and allow the pump to discharge to a measuring container while the engine runs (the fuel in the carburetor float bowl will enable the engine to run for a brief period). Collect a measured quantity and record the time period of collection. Convert the observed values to gallons per minute – typically, fuel pumps will produce $\frac{3}{4}$ to 1 pint in 60 seconds ($\frac{3}{8}$ to $\frac{1}{2}$ pint in 30 seconds, etc.). Again, check the car's manual for the specified quantity to be pumped.

If the desired pump performance is not obtained. The faulty performance may not be attributable to the pump's main components – worn flow control valves, diaphragm, and/or operating linkage. Other conditions which limit pump performance are:

- Vacuum leaks on the suction side of the pump. If all connections between the tank and the pump are not tight, the pump will suck air in addition to fuel. Also, a leak can exist at the joint between the fuel bowl and pump base or in the flexible fuel line connecting the fuel line to the pump. Because fuel does not leak from these connections, such leaks are often hard to identify.

- If the screen in the gas tank or the screen in the pump is plugged or partially plugged with fine sediment, the pump cannot perform as intended.
- Fuel lines, on both sides of the pump, can be blocked with dirt, badly dented, or kinked at bends, all of which limit the flow of fuel.

The previously described problems can be isolated with careful analysis and easily repaired where necessary. If the fuel pump is at fault, rebuilding is a simple task for one who doesn't mind a little work. Kits consisting of all the necessary parts – flow control valves, rocker arm link, rocker arm pin, spring and diaphragm, and gaskets are readily available. These kits usually include detailed, easy-to-follow instructions. Alternatively, rebuilt fuel pumps can be readily obtained from regular or specialty parts supply companies.

Fuel Pump Rebuilding Tips

For those intending to rebuild their own pumps, the following tips are offered:

- Mark the housings before disassembly so that they can be reassembled in their correct position.
- Do not mix up the flow control valves – there is an inlet and outlet valve. If working on combination pumps, be sure to correctly install these valves not forgetting to include their gaskets.
- When reassembling the pump, make sure that the diaphragm(s) are correctly positioned. This is most easily accomplished by

- positioning the operating arm to relieve the spring pressure on the diaphragm(s) before tightening the screws holding it in place.
- When reinstalling the pump, make sure the pump arm is properly engaged on the camshaft eccentric.
 - Loosely install the pump to the engine and then connect the inlet and outlet piping. Being able to move the pump slightly simplifies connecting the pipes and helps avoid cross-threading these fittings. Once the piping is connected, then the pump can be firmly tightened to the engine and the piping connections secured.

Finally, whether rebuilding a pump or acquiring a rebuilt unit, make sure that the rubber diaphragm which comes in contact with the fuel is of the latest type

of rubber that is resistant to attack from methanol-laced gasoline now commonly used.

Summary

A fuel pump which is not delivering the proper amount of fuel will limit performance and result in a lean fuel mixture. This will cause the engine to run hotter than normal and, as consequence, lead to burned valves. If the pump is delivering too much fuel, both performance and fuel mileage will be compromised. Fortunately, fuel pump problems are easily fixed.