SURGING AND STALLING

Hidden Filters Can Promote Power Loss, Surging and Stalling

Driveability technicians love the challenge of that impossible-to-diagnose performance problem. While the result of their efforts can be rewarding, it can also be a very frustrating experience and damaging to one's ego. Imagine investing many hours of diagnostic time searching for an electrical or a sensor related problem and then later determining the condition was due to a problem with a hidden component, or possibly the installation of a new defective part. In this article we will address performance problems with two different vehicles and fuel systems that resulted from an obstruction in some small hidden fuel filters.

The challenge occurs when the engine runs perfectly and then develops a surge and stall condition, restarts, and runs perfectly again. The symptoms often start out as an intermittent problem and progressively get worse. Until the technician can experience the symptoms and have sufficient down time for testing, a lot of trial and error is about all that can be done. And during this process, many parts can get replaced.

TAKE A METHODICAL APPROACH

Regardless of whether you are the first or third person to diagnose the vehicle, approach the challenge as if you were the first to raise the hood. While it is good to know as much as you can about the symptoms and what has previously been done, make no assumptions. After all, someone could have installed a new defective part. If you are fortunate enough to encounter the symptoms, you are a step ahead in the diagnostics. Too often the symptoms temporarily disappear and we are left with a vehicle that performs well. It is difficult for the technician to diagnose a condition that is not present, and especially irritating to the vehicle owner who may be contemplating buying a time-share in a tow truck.

SURGING & STALLING FORD TRUCK

The frustrating condition with the 1987 F150 equipped with dual fuel tanks had progressed from an intermittent stalling condition to the point that the engine would idle, but surge and stall when the RPMs were increased. Numerous components had been installed, including an ignition module, pick-up coil, ignition coil, MAP Sensor, fuel filter, one new in-tank fuel pump, fuel pump relay and a new ECA.

When stalled, the engine would not immediately restart and a spark tester revealed plenty of spark at the plugs. The next step was to attach a fuel pressure gauge to the fuel rail for a systems pressure test. With the gauge attached, and after numerous starting attempts, the engine responded. The fuel pressure gauge reflected 50 PSI and the engine ran perfectly, at least for a few minutes. While performing a snap throttle and then steadily increasing the RPMs, the fuel pressure gauge reflected a steady drop in fuel pressure, resulting in an eventual surge and stall condition. Just prior to the stall, the fuel return line was restricted to eliminate a potential problem with the fuel pressure regulator, to no avail. The cause of the stall condition had definitely been identified as a fuel pressure/volume condition. Cycling the ignition switch from the off/on position would activate the fuel pumps for a two second interval and the fuel pressure would recover, allowing the engine to start. Considering that one new in-tank fuel pump and a new fuel filter had been installed, the high-pressure pump was replaced. Unfortunately, that

did not correct the fuel pressure/volume problem. A second new in-tank fuel pump was installed and the same pressure loss condition prevailed.

THE PROCESS OF ELIMINATION

While the fuel pressure/volume problem had been accurately diagnosed, some premature decisions had been made and some expensive parts had been thrown at the symptoms. The fuel pumps were not losing power and there was plenty of fuel in the tank. The mysterious problem was resolved by taking a methodical approach and separating and testing the individual components that make up the fuel system.

The high-pressure pump was disconnected from the fuel tank selector valve and a fuel hose was attached to the inlet side of the pump and routed to an auxiliary fuel reservoir. The selector valve is the black canister mounted on the frame rail, fitted with six fuel line connector ports. The fuel return line from the fuel rail was routed to the same auxiliary reservoir. With the in-tank pumps disabled, the engine was started and it ran perfectly. It would respond to throttle increases and the fuel pressure was constant at 50 PSI. When the high-pressure pump was reattached to the selector valve, the stalling condition reoccurred.

The problem was definitely between the selector valve and the in-tank pumps. Removing the fuel lines coming from the in-tank pumps to the selector valve, and energizing the pumps with the fuel lines routed to a catch container, revealed a good steady flow of fuel. Dropping the selector valve and removing its bottom cap revealed an almost totally restricted fuel filter. The hidden selector valve filter was restricting fuel flow, thus starving the high-pressure pump for fuel, resulting in a cavitation. A new fuel filter (Mighty/Motorcraft FG855) re-established the fuel volume and the pressure stabilized at 50 PSI.

From the early eighties to the mid nineties, Ford vehicles equipped with dual fuel tanks are fitted with fuel tank selector valves. The valve is basically a storage canister, which supplies fuel to the high-pressure pump and returns fuel to the fuel tanks. One side of the valve has four connector ports. Each fuel tank has its own connector port for fuel to the selector valve and each tank has its own return line from the valve. The opposite side of the selector valve has two connector ports—one to the high-pressure pump and a return line from the fuel rail.

Not all selector valves contain the mentioned fuel filter, but the valves may still contribute to pressure and volume related problems, due to internal valve contamination.

Many of the selector valves on vehicles built after 1987 have the words “Do Not Open” on the bottom of the valve. These valves are not supposed to have filters, but some do. Some were installed by the vehicle manufacturer and some were probably installed during a fuel system diagnosis or service. If you remove the cover for an inspection, you will have to purchase the filter just to get a new O-ring for the cap, as it is impossible to reuse the old one without leakage. With or without the internal filter, the selector valves are susceptible to restrictions that can result in pressure/volume related performance problems. Therefore, it should be a part of your fuel system evaluation. Isolating a problem component through the process of elimination beats throwing a lot of expensive parts at the problem.

WHEN THE POWER STROKE IS DOWN ON POWER

The Power Stroke equipped Ford truck had developed a loss of power. The normal system checks had been exhausted, in addition to a complete filter evaluation. Later it will be illustrated how one small, but very important filter can be missed in the inspection, leading to a power loss condition.

On these applications special attention must be given to the fresh air inlet, as they have a history of breathing related problems. Excessive air filter contamination can result in total turbo or engine destruction. The filter air boxes have been a problem, due to cracks and distortion. Further, the turbo can suck a restricted air filter right out of the air box and expel it through the turbocharger and engine,

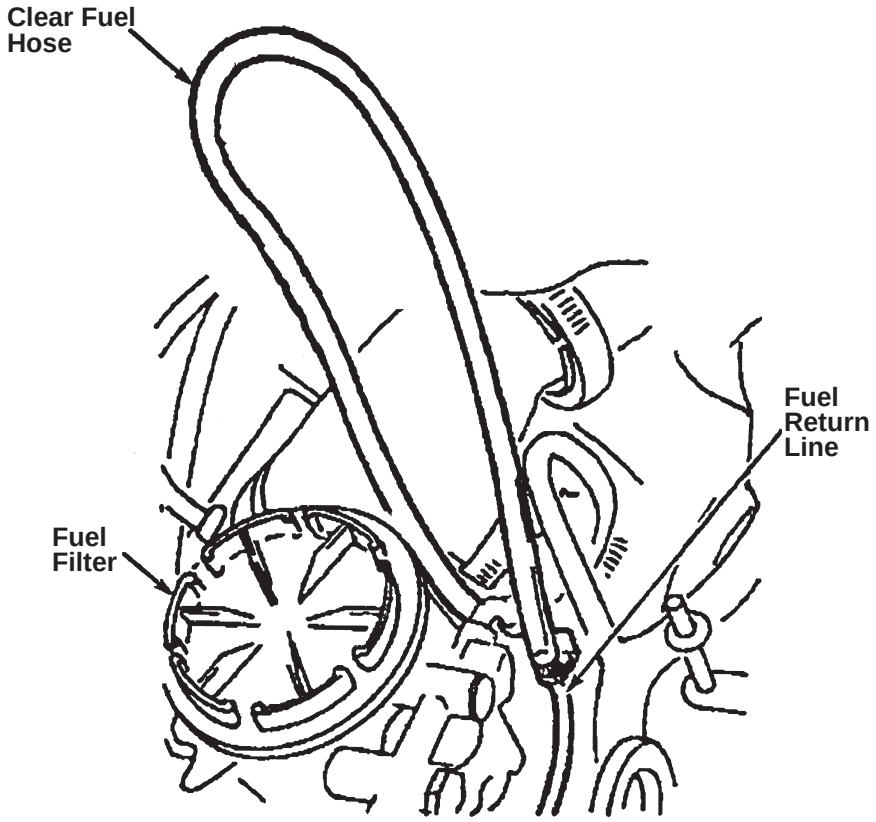
wasting some very expensive parts. The air must be properly filtered and the engine must breathe freely.

FUEL SYSTEM INSPECTION

When a fuel system related problem is suspected, the first check is the quality of the fuel itself. A fuel sample should be taken from the fuel filter reservoir and examined for the presence of water or any other contaminants. Excessive water or contamination may require the removal of the fuel tank and a thorough flushing of the entire fuel system. The presence of oil in the fuel system is an indication of leaking injector O-rings, which may require further repairs. The Power Stroke's fuel injection system is an electrical/hydraulic actuated system. Maintaining the proper oil level and filter change is imperative for injector operation. Improper viscosity oil, or fuel-diluted oil, can affect the operation of the fuel injectors.

RESTRICTION IN FUEL SYSTEM RETURN

Complaints of poor performance or lack of power may be the result of poor fuel return to the fuel tank. The fuel return problem may be due to *a restriction in a small filter or strainer* located in the pressure regulator. To determine if the system has a restriction, perform an "air in the fuel system test." To perform the test, disconnect the fuel return hose fitting located at the fuel filter/water separator housing. Attach a clear plastic fuel line between the return line and the fitting on the filter housing (see Illustration 1). With the clear plastic line



Courtesy of Ford Motor Co.

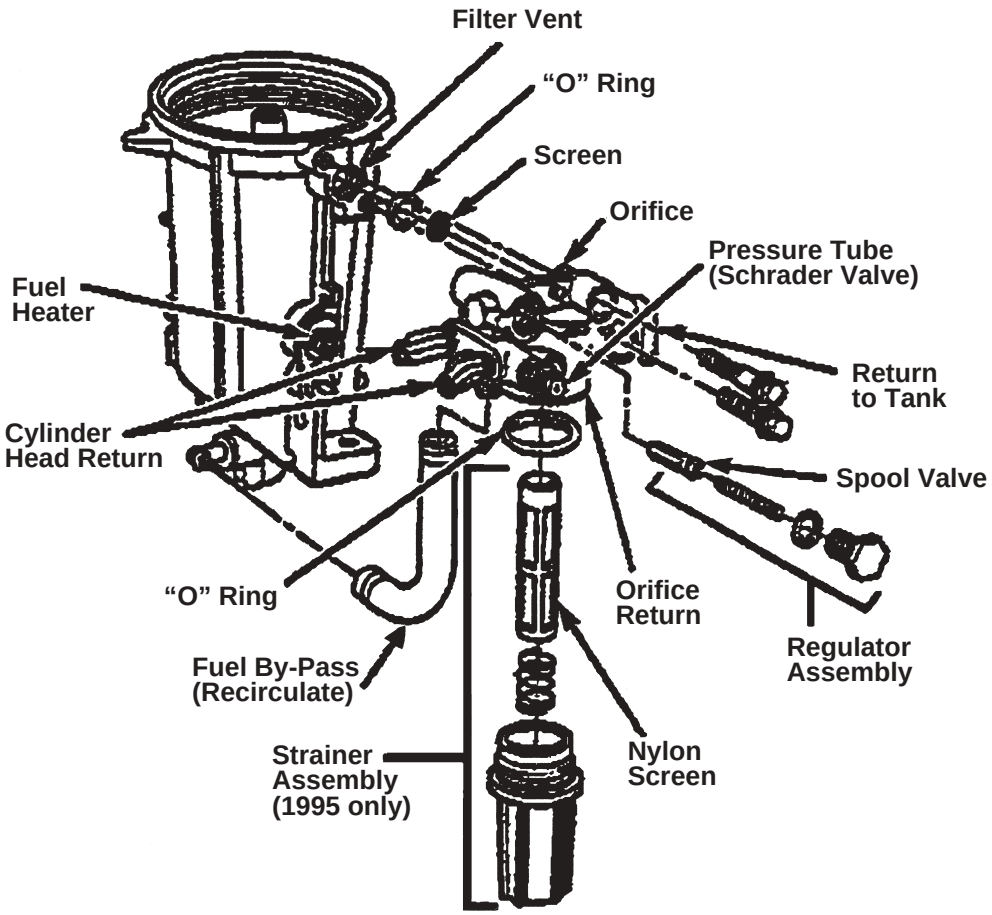
Illustration 1

looped higher than the top of the filter housing, start and run the engine for approximately five minutes. Observe the clear fuel line for any evidence of aerated fuel. It should be free of bubbles and foam. The presence of a foamy fuel is an indication of an air leak. Check the fuel lines for loose fittings or damage.

If no fuel flow exists in the clear fuel line, a restriction in the pressure regulator's fuel filter/strainer is suspect. Ford has acknowledged this condition affecting diesel applications including 1994-97 F Super Duty, F250, F350 and the 1995-97 E250, E350 vans. Later models can be affected the same. Instead of a filter strainer, some of those systems are fitted with an orifice screen that is susceptible to the same restrictions.

Checking the filter/strainer requires removal of the pressure regulator, which is mounted on the fuel filter/water separator housing. With the regulator removed, unscrew the strainer assembly from the regulator (see Illustration 2). Inspect the filter or screen for contamination and clean as necessary. **Caution:** The orifice screen may remain in the filter housing where the regulator was removed. Check this screen, orifice, and check ball for debris.

LARRY HAMMER
TECHNICAL SERVICES



Courtesy of Ford Motor Co.

Illustration 2