FORD'S POWER STROKE

Some Basic Maintenance Will Reduce Costly Repairs

Neglecting routine maintenance on a gas burner may result in poor performance, loss of fuel economy and high emission output. Let the same service go on a turbo-charged diesel engine and you are in store for some expensive repairs, maybe even a turbocharger or engine replacement. While most shops leave the routine maintenance request up to the vehicle owner, a little awareness from you could save the customer some big bucks in needless repairs and save face for the shop, too.

A major mistake that results in unnecessary repairs is the misinterpretation of exactly what constitutes a general service or severe service vehicle and the proper maintenance schedule. Unknowingly, many vehicles fit the severe service category, but are treated otherwise. And the turbo-charged diesel is unforgiving when neglected.

Listed are some examples of severe service conditions:

1) Vehicles being driven continuously in excess of normal highway speeds.
2) Short trip driven vehicles.
3) Vehicles being driven commercially such as a taxi, police car, rural mail carrier, delivery service, etc.
4) Extended driving in extreme ambient temperatures (exceeding 90° F).
5) Prolonged idling or stop and go traffic conditions.
6) Off-road vehicles or vehicles being operated in dusty or sandy environments, such as a construction use vehicle.
7) Vehicles being used for tow trucks, towing trailers, or carrying heavy loads.
8) Short trip driven vehicles in extreme cold conditions (below 32° F) or vehicles driven five miles or less.

THE LUNGS OF THE POWER STROKE

The lungs of the Power Stroke Diesel would be the turbocharger. The turbo unit utilizes high velocity exhaust gases to drive a turbine wheel, which turns a compressor wheel, both fixed to a common shaft. The turbine shaft assembly can achieve speeds up to 130,000 rpms. Air for the unit is drawn into the compressor housing from the air cleaner. The air is compressed and routed to the combustion chambers, resulting in increased engine power, improved economy and better engine performance, especially at high altitudes.

A main engine oil gallery feeds oil into the turbocharger for lubrication and cooling purposes. This oil supply arrangement eliminates the necessity of an external lubrication system, which would require a supply source and additional plumbing. The turbocharger has proven itself to be a reliable component, provided it receives adequate lubrication, which reduces friction and helps cool the system from the intense hot exhaust gases. Most turbo failures that we have examined involved air cleaner or filter related problems. Most of these could have been prevented with proper system maintenance.

Systems Air Flow: One of the first checks when diagnosing a lack of power complaint would include the fresh air into the engine. Check for an air filter restriction, or an obstruction in the air plenum upstream of the turbo. It is amazing how many performance problems can be corrected due to something as simple as replacing the air filter. And if the customer drives the vehicle at highway speeds with a filter restriction, a new turbo may be in order. With a filter restriction, the turbo may suck the filter media right out of the air filter. When the media hits the fins on the compressor wheel spinning at 130,000 rpms, the fins bend and often break. The result is a destroyed turbo and sometimes engine failure due to the metal fins being expelled into the combustion chambers. The engine does not digest the metal parts very well.

Ford refers to the filter obstruction as dusting. It is becoming a common failure, especially for those vehicles that are used at construction sites. The filters used in those applications fit a severe duty category and should be replaced every 3,000 miles. *Repeating … every 3,000 miles a new filter should be installed.* Sometimes the filters become so restricted that they are pulled from their housing. When this occurs the unfiltered air is drawn into the engine, resulting in major engine wear, and it can occur quickly. The abrasive particles function just like a sandblaster. Check the integrity of the air intake plumbing. Debris or even a large bug hitting the compressor wheel spinning at 130,000 rpms can be disastrous. It can bend or destroy the fins, affecting the balance of the turbine shaft.

FUEL RESERVOIR ASSEMBLY

The fuel reservoir contains a pressure regulator, fuel filter, heating element and fuel/water separator with a water-in-fuel indicator. Let's consider how the components function as an assembly.

Fuel Pump: Depending on the year model, the system will be fitted with a two-stage mechanical fuel pump or a high-pressure electrical pump. Fuel is supplied to the fuel reservoir at pressures ranging from 30-80 psi. A fuel pressure regulator is mounted on the fuel filter reservoir and maintains fuel pressure in the cylinder head fuel galleries at approximately 50 psi.

Fuel Filter: The fuel filter is a replaceable element design that requires a replacement interval of 30,000 miles for regular service or 15,000 miles for severe service.

Beveled Gasket: The filter reservoir lid is fitted with a beveled gasket. Make certain the mating surfaces are clean and free of contaminates. Prior to installing, coat the gasket with diesel fuel. When the gasket is positioned on the filter reservoir, the bevel cut should be pointed upward. Install the filter slowly, allowing sufficient time for the filter to absorb the fuel. Tighten the lid until it makes contact with the reservoir.

Fuel/Water Separator: The reservoir functions as a water separator and should be drained every 5,000 miles or whenever the Water-In-Fuel indicator light is illuminated. The Water-In-Fuel indicator is illuminated when approximately one quart of water has accumulated.

Reservoir: Surprisingly, due to lack of system maintenance the fuel/water separator reservoir has become a replacement item. Some of the reservoirs carry a price tag in the $300 range, and you would be surprised how many have to be replaced. In Power Stroke country, it's a regular stock item for the Ford dealers. The life of the reservoir depends on regular system maintenance. The water and contaminates promote corrosion and deterioration of the casting. Eventually, this results in external fuel leakage and can result in fuel system contamination due to the contaminates getting past the fuel filter. We have seen numerous castings that have splits or cracks in the housings. This condition occurs when water accumulates in the reservoir and freezes. A manual drain valve is fitted to the reservoir, making the draining of the system as simple as moving a lever to the drain position and catching the water in a container.

Heating Element: The system incorporates a fuel heater in the bottom of the reservoir. The element is active when the switch is in the start and run position. Obviously, it has a life expectancy, as the elements do burn out. Many of the heaters require replacement due to the electrical connector that fits through the filter reservoir deteriorating and shorting out. Further, the deterioration of the connector promotes fuel leakage. Systems that are not drained of the accumulated water often experience a premature heater failure due to the corrosive elements attacking the heater.

ENGINE LUBRICATION AND FILTRATION

With the Power Stroke, make certain the oil and filter are changed at the proper intervals. For severe service applications the manufacturer recommends that the service be performed at 3,000-mile intervals. What if I told you to check the engine oil level for a no injector pulse symptom? If that sounds strange, read on for an explanation of the importance of good and clean engine lubricant flow.

HIGH AND LOW OIL PRESSURE SYSTEMS

The engine is fitted with two oil pumps, a high and low-pressure system. The low-pressure pump provides engine lubrication for the bearings and internal engine parts. The high-pressure pump provides increased hydraulic pressure required for the hydraulically actuated fuel injectors.

Oil is drawn from the oil pan by a low-pressure oil pump. In addition to providing lubrication for the internal engine components, a supply of oil is fed into an oil reservoir, which provides oil for the high-pressure pump mounted on top of the engine. The high-pressure pump provides oil under pressure ranging from 600–3000 psi to oil rails positioned in the cylinder heads. From there the oil is fed into the fuel injectors, which actuates the injectors.

INJECTOR OPERATION

A fuel injector is comprised of the following components: fuel inlet port, check ball, nozzle tip, check valve, plunger, amplifier piston, oil inlet port, poppet valve, solenoid and armature.

The fuel injection system is an electrical/hydraulic actuated system. When the Powertrain Control Module and the Injector Driver Module electrically energize a fuel injector, a poppet valve in the injector is opened by an electronic solenoid mounted on top of each injector. The high oil pressure, from the high-pressure pump, flowing into the injector acts on an amplifier piston forcing the piston plunger downward. When the plunger moves downward, the increased fuel pressure closes the fuel inlet check ball. The increasing fuel pressure overcomes spring pressure and opens the nozzle check valve. Fuel is then injected into the combustion chamber through spray orifices in the injector nozzle tip at pressures reaching 18,000 psi. When the injector is de-energized, the high oil pressure on the top of the amplifier piston is vented by the poppet valve through the top of the fuel injector, returning the oil back to the oil pan.

Obviously, maintaining a proper lubrication schedule and filter change is imperative in keeping the lubricant and filtration system free of contaminants, which may impede proper injector operation.

Caution: The Injector Driver Module supplies 115 DC volts to the fuel injectors. Piercing the insulation on the injector wiring harness may be more excitement than you bargained for.

Neglecting the service schedule on the turbo diesels is an invitation to disaster. A little preventative maintenance can save the customer a lot of money in needless repairs.

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