Technical Article:

“6.0L Power Stroke diagnostics”

We always try to do as MUCH troubleshooting & vehicle diagnostics prior to recommending that customers (or one of our dealers) invest in any repair components for a vehicle that may or may not have more severe, underlying engine issues.

This article is applicable to 2003-2007 6.0L Power Stroke vehicles, the VT365 International engine, offered in IH/Navistar chassis’… also this engine was used in some later Ford E-series vans.

Over nearly ten years of troubleshooting, rebuilding engine & injection system components, and successfully diagnosing & repairing thousands of customer concerns, we want to provide some testing & troubleshooting information that may benefit you in the future.

99% of 6.0L no start conditions are going to be related to either the FICM (fuel injector control module), or a lack of ICP (injection control pressure) in the injection system.

To check FICM voltage, follow this link:


If the vehicle starts cold, but will not restart ‘hot’ (operating temperature), this is a classic sign of an internal oil leak in the vehicles high pressure oil system, though severe HPOil system leaks may prevent the engine to start hot or cold…. Any ‘leak’ in the system will allow hot/thin oil to leak faster than the HPOP(high pressure oil pump) can displace; not allowing the HPOil system to produce the minimum (oil) pressure required to mechanically fire the fuel injectors. With cold/thick oil…while the leak is still likely to be present…the HPOPump can overcome this, and the minimum oil pressure can be reached, which allows the fuel injectors to inject fuel into the cylinders.
To check your vehicle's ICP pressure, you can either use a (professional) diagnostic scan tool (not just a simple code reader) to monitor ICP_actual while cranking the vehicle.

BEWARE that most scan tools will show ICP actual as well as ICP desired pressure for the HPOil system. ICP actual is the ACTUAL pressure being reported from the ICP sensor back to the vehicle ECM. ICP desired, however, is merely the DESIRED pressure from the ECM. If ICP actual does not exceed (approx.) 450-500psi, then there is almost zero chance of the engine starting.

If you have a late 2004 engine, you can also check the ICP actual with a handheld voltmeter, by measuring the voltage at the ICP sensor (sticks up through the passenger side valve cover, just rearward of the GPCM (glow plug control module). Early 6.0L engines have this sensor located underneath the turbocharger, which make checking the voltage very difficult, if not impossible.

The ICP sensor, pictured here

will have a 3 wire harness that plugs into it. To check the voltage (ICP “pressure”), you will need to leave the harness plugged INTO the sensor, and probe the appropriate wire with your voltmeter lead (other lead to a ground point on engine, or neg. battery terminal).

Of the 3 wires, one wire is going to have a constant ~ 4-5.0vdc reading (with the key on, engine off), one wire will be ‘ground’ (check continuity to other grounds)...and the last wire (the one you want to check) will have a variable voltage which varies linearly with pressure.

1 volt is approximately equal to 750psi...so WHILE CRANKING the engine...if the voltage at that wire is not exceeding 0.6volts (+/- couple of tenths)...then the HPOil system is not producing enough pressure to mechanically fire the fuel injectors.

If the voltage is > 0.6v while cranking, then skip to page 4.

All this has determined is that the REASON for the no start...is RELATED to the HPOil system...however it has not been determined as to which component(s) have failed, creating the ‘leak’.

Possible sources of a HPOil leak are:

IPR (injection pressure regulator)
HPOP (the pump itself)
STC fitting (snap-to-connect) at the pump outlet
Branch tubes (carry the oil from the pump to either cylinder head oil rail)
Stand pipes (a component of the HPOil rail)
Dummy plugs (a component of the HPOil rail)
Any number of fittings or o-rings ON or between the pump and oil rail(s)
Fuel injector inlet o-ring
Fuel injector spool valve
Fuel injector body
Diagnosing (& repairing) these components at the HPOil system can be tedious & time consuming…and may include turbocharger removal, valve cover removal, oil rail, injector, and even transmission and rear engine cover removal(in the case of branch tubes)…

Some methods we have successfully used in determining WHICH component has failed is by pressurizing the system with compressed air…however, it is normal to hear air escaping on a non-energized IPR as well as the injector spool valves without special equipment to move the components to a ‘closed’ position.

It should be mentioned that a bad ICP sensor cannot prevent the engine from starting.

It is possible that the lack of ICP actual pressure could be related to a lack of LOW pressure oil in the engine. Check to see if the factory (dashboard) low pressure oil gauge moves off its’ pin while cranking…if so… then the engine has plenty of LPOil..if not…you may be diagnosing a LPOil AND a possible HPOil issue…as we have seen severe HPOil ‘leaks’ actually prevent the engine from producing sufficient LPOil pressure…

Diagnosing the vehicles LPOil system may be best left to a professional shop, or someone with a high level of experience diagnosing & repairing the 6.0L engine.

Components to check would include engine oil level (LOL)... the low pressure oil pump (behind crankshaft dampener), engine front cover (cracks or scoring marks), the LPOil system pressure regulator, and even possible internal engine components, bearing clearances, etc.
No start, but have good FICM voltage & sufficient ICP actual pressure.

Once it is determined that the engine has enough (oil) pressure & voltage to fire the injectors…the no start condition could be related to a lack of fuel pressure, poor fuel quality (gas, water, etc.), or a number of electrical issues…which could be as simple as a bad cam &/or crank position sensor, a bad ECM, or as complex as a damaged wire on the vehicle. Check all engine fuse & relays, and replace any that are bad or questionable.

This article is written as information which should be useful to 6.0L owners; however we cannot offer phone diagnostic support, which are not related to our products.

If you would like to schedule in shop diagnostics & repair service at our facility, please contact us.