2009 Alliant Power "Drive In" Technician Award winning paper:

"Ford 6.0L E-Series" by Robert W. Garrison

This paper concerns a 2005 Econoline 350 cutaway van that was brought to Midwest Fuel Injection's shop in the fall of last year. The customer had been traveling down the road when his truck started to lose power, and eventually stalled. He initially had the van towed to the local ford dealer, who informed it would be at least a week before they would be able to work on his vehicle. The Ford dealer informed him that our shop was capable of repairing his unit. The customer contacted us and asked if we would be able to help him as he needed the van on the road as quickly as possible. We agreed to help him and proceeded to the Ford dealer to make an initial assessment of the problem.

Upon arrival at the dealer, contact was made with the service manager to insure he was ok with turning the repair over to another shop. He was more than happy to give this job away and relinquished the keys to our facility. A quick visual inspection showed the fluid levels were all at proper levels and the batteries were low from long cranking without restarting. We jumped the vehicle and charged the batteries. A koeo and memory scan showed P2290 codes for low high pressure oil pressures. Options were discussed with the owner and the vehicle was towed to Midwest Fuel Injections Peru shop.

The vehicle was started by fully charging the batteries so proper diagnosis could be completed. A rescan for trouble codes was completed but no codes were present due to the batteries being fully discharged upon arrival at the facility. The scan tool was set to data display to monitor injection control pressure and injection pressure regulator duty cycles. Battery voltage and both fuel injection control module synch and synch signals were also monitored. The battery voltage was at 11.5 volts while cranking and both synch signals stated yes, confirming cam and crankshaft sensors were functioning properly. However the ipr duty cycle was at 85% and icp pressure was showing 350 psi. The engine requires at least 500 psi to start so further diagnosis was indicated.

Ford has issued a technical service bulletin with this problem detailed the tsb number is 08-18-06. The diagnosis was started, and the initial test showed low oil pressure and high ipr duty cycle thus indicating an air pressure test of the high pressure oil system was necessary. The turbocharger was removed from the engine after removing exhaust turbine up pipes and the turbo discharge pipe was relocated. Intercooler piping was removed from under the hood of the van along with the inlet air piping to the turbo. Finally the turbo had to be lifted off the pedestal to allow the drain tube to be removed. This allowed enough clearance for the turbo to be carefully removed from the rear of the engine compartment. The turbo pedestal was removed for access to the top of the high pressure oil pump.

The brass test port plug was removed from the top of the high pressure pump and a hose was installed so shop air pressure could be applied to the port. The ipr solenoid was disconnected from the engine harness and 12 volts dc was applied to actuate the solenoid . Shop air pressure was applied and no major air leaks were noted after allowing time for the oil to be blown out of any pipes that may have been leaking. Voltage was then removed from the solenoid and the ipr valve was removed from the

vehicle and inspected. The screen at the end of the solenoid was sucked into the solenoid. Previous experience has shown this is usually caused by low high pressure oil pump output along with high ipr duty cycles. The Sheppard style pump of this type has had reliability issues at high duty cycle times for long periods of time. The high pressure oil pump cover was removed and the pump inspected. A second sir pressure test showed leakage at the rear seal of the high pressure pump. The pump was replaced, along with a new ipr solenoid, anf the trouble prone snap to connect fitting (STC) was replace with the upgraded parts referred to in the tsb, this being the 9B246 fitting kit. The high pressure pump was installed along with the cover and a new ipr solenoid. A plug was installed in place of the turbo oil feed pipe, so the engine could be started without the turbo being reinstalled. After a short period of cranking the engine roared to life. The engine data was monitored and the oil temp was allowed to increase to 160F. The engine was idling smoothly and ipr duty cycle was showing 25% a near normal value for this engine, readings of 22-24% are normal at full operating temperature.

The engine was shut off and a restart was attempted about ten minutes later. The van would not restart. As it was the end of the workday the shop was closed for the night, work would resume the next morning.

The next morning after cycling the glow plugs the engine roared to life. Time was allowed for the oil to warm and upon shutoff the engine would not restart. They valve covers were removed, and each bank high pressure oil rail was blocked in an attempt to locate the leak. When the standpipe to the passenger head was blocked, the engine would start. The new style wavy oil rail was removed from the van and inspected. No apparent problems were noted. Since this oil rail is common to both heads, there is a block off plug installed to block oil from exiting the unused port. This plug was removed and a small split was found on the bottom seal ring. This was the leak that prevented the hot start and may have contributed to the pump failure. The plug from the opposite rail was removed and inspected. The seal ring was undamaged on that side, since one seal was bad all both seals on the plugs were replaced. The plugs were reinstalled and tightened to specs.

The stand pipes and check valves were replaced with new parts and the valve covers were reinstalled. The van was restarted and allowed to warm up to operating temperature. Repeated restarts were successfully completed. The turbocharger and all related items were reinstalled. An oil change was then performed, and the van was reflashed with the latest program for improved cold starts. The van was taken on a long test drive, as the customer was returning to the interstate to continue his trip. Upon return to the shop codes were checked and no active or memory codes were retrieved. The customer was notified his van was ready, picked up his van after paying the bill, and continued on his trip.

The problem that has been noted on this 6.0L engine is it has many failure modes. Proper testing is key to accurate repairs, and sufficient lengths of after repair test drives are necessary. A cold start the next morning is also a good idea as check engine lights have come on the next day, even though test drives were successful the previous day.