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MARCH/APRIL 2014 M A G A Z I N E

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SIX-LITER REVIVAL

BULLETPROOF DIESEL BRINGS NEW LIFE TO THE PROBLEM-RIDDLED 6.0-LITER POWERSTROKE

BY ADAM BLATTENBERG

PHOTOGRAPHY: ADAM BLATTENBERG AND
COURTESY OF BULLETPROOF DIESEL

IN MID-2003, FORD RELEASED A NEW DIESEL ENGINE THAT WAS REVOLUTIONARY FOR ITS TIME. PAIRED WITH A NEW FIVE-SPEED TRANSMISSION THE 6.0-LITER POWERSTROKE (ALSO KNOWN AS THE VT365 BY NAVISTAR INTERNATIONAL, THE ENGINE'S MANUFACTURER) CAME WITH A NEVER-SEEN-BEFORE (IN A PRODUCTION LIGHT-DUTY PICKUP) VARIABLE GEOMETRY TURBO (VGT), PLUS NEW QUIETER INJECTORS, 325 HORSEPOWER, AND 570 POUND-FEET OF TORQUE. THE TRUCK DID THIS ALL WHILE MEETING THE NEW EPA SMOG REQUIREMENTS, WHICH HAD JUST PUT PAST DIESEL MOTORS OUT OF PRO-

DUCTION. UNFORTUNATELY, THIS NEW POWER PLANT CAME WITH A MYRIAD OF PROBLEMS. AMONG OTHER PROBLEMS THE INJECTORS FAIL, COMPUTERS FAIL, HEAD GASKETS FAIL, WATER PUMPS FAIL, THE OIL COOLER FAILS, AND THE EGR COOLER PLUGS UP EXTREMELY EASILY. THE VEINS ON THE VGT TURBO ARE VERY SUSCEPTIBLE TO HEAVY COKING, CAUSING STICTION PROBLEMS.

But once all these problems are taken care of, the 6.0-liter Powerstroke really is an excellent, powerful, and reliable motor. Brothers Gene and Ken Neal from Bulletproof Diesel in Mesa, Arizona, have dedicated their professional lives to fixing the Powerstroke's shortcomings. After spending a week at Bulletproof Diesel with the Neal Brothers, we've come to a conclusion: No one knows the 6.0-liter Powerstroke better than they do. **RV**



1 Accessing the motor for a repair like this one requires removing the cab. It's really not as bad as it looks, and only takes a couple hours to complete.

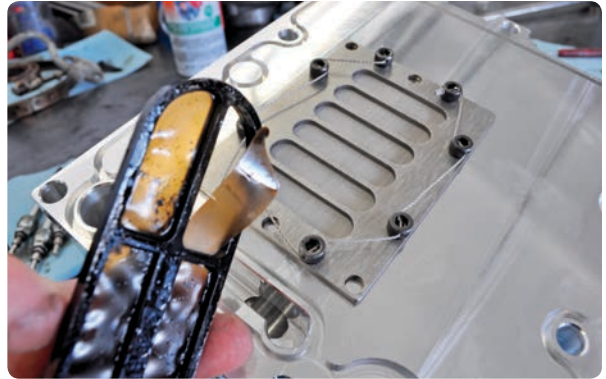


2 With the cab off, Bulletproof Diesel's Del Wamsley removed the turbo, intake manifold, EGR cooler, wiring, and more to gain access to the valley.



3 This manifold houses the factory oil cooler, a few sensors, and the factory oil filter. The black tube is what the factory drop-in filter surrounds and attaches to. Atop the tube is a bypass valve that is famous for breaking. When it does, oil completely bypasses the filter and sends contaminants straight to the high-pressure oil pump

(HPOP) and injectors. This is the last you'll see of this manifold. It will soon be replaced by a new Bulletproof Diesel part.



4 This screen is located below the oil cooler. It is there to stop contaminants from entering the injection system, potentially causing a no-start condition. They fail all the time like this one has. Bulletproof's new manifold uses a much more robust screen, which you can see in the background.



5 The factory oil cooler is a stacked plate heat-exchanger design. Coolant and oil flow through separate passageways stacked on top of each other. The problems with it are multifaceted. First, the coolant in this high-compression motor, like most, has contaminants from multiple sources, ranging from supplemental coolant additives and gasket material to leftover sand from the casting process. These contaminants clog up the passageways in the cooler and reduce its efficiency, thus creating hot, less-dense oil for everything down the line to use for lubrication. The turbo, injectors, and HPOP (high-pressure oil pump) all take a beating due to this, and failure eventually follows.



6 This is the HPOP or high-pressure oil pump. The motor's HEUI (hydraulically actuated electronically controlled unit injection) injectors use oil pressurized by this pump to inject fuel into the cylinders. Good, clean, and cool oil is extremely important to this power plant due to this HEUI system. Bulletproof removes and inspects the HPOP, if no problems are found, they replace all seals and reinstall it.



7 The valve seats in the heads tend to crack. So Del removed the heads and sent them out to be checked for straightness and to have the seats swapped out for hardened ones. Del then began to clean every nook and cranny of the disassembled engine until it was surgically clean.



8 Here Del installs the new Bulletproof Diesel Transfer Block. The transfer block diverts engine oil down a hydraulic line to a new air-to-oil cooler and through a traditional spin-on filter, eliminating the problematic factory filter and cooler.



9 Ready for the rebuilt heads.

10 Head gasket failure is yet another common 6.0-liter Powerstroke problem. The fix is had with a new pair of gaskets and a set of ARP head studs.



11 The final torque of the studs, done with ARP's Ultra-Torque on the threads, should be 210 ft.-lbs. Factory head bolts take a much less 85 ft.-lbs. of torque (plus another three-quarter turn of the wrench).



12 These injectors were in good shape, new gaskets and seals were installed, and they were re-installed in the heads.

13 Here's the biggest problem the 6.0 has—the EGR cooler.





14 The EGR cooler uses coolant running through a set of passageways to cool the exhaust before reintroducing it into the engine. This process of recirculating exhaust air into the intake helps reduce tailpipe emissions. The factory EGR fails in two different ways and both generally stem from a failed oil cooler. The flow of coolant goes through the oil cooler, then directly to the EGR cooler. A clogged oil cooler means less and hotter coolant going to the EGR cooler, making it much less efficient. Generally, the EGR cooler will clog with soot or crack at the coolant passage, leaking coolant into the intake that could eventually lead to catastrophic engine failure.

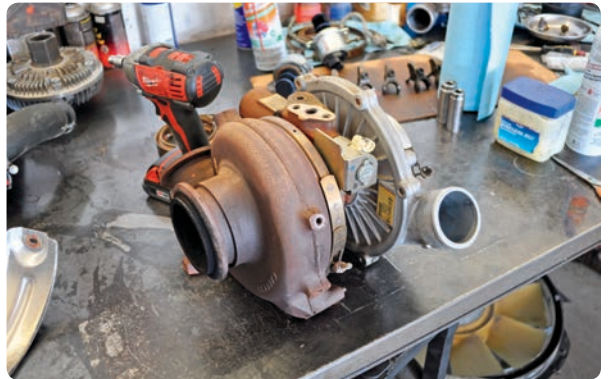


15 Here the new reworked Bulletproof EGR cooler, it's a much stronger unit consisting of six stainless steel tubes that allow less restriction in the exhaust and better coolant flow. The end result is cooler exhaust temperatures, better performance, less soot build up, and better emissions.



16 New EGR cooler and factory intake being installed.

17 A common concern for any 6.0-liter owner is the EGR valve. They clog with soot constantly and need to be cleaned regularly. With the new Bulletproof Diesel EGR Cooler, carbon build up on this valve will be much less severe.



18 Next problem area: the variable geometry turbo (VGT).



19 This VGT turbo uses a series of vanes to change the velocity at which the incoming exhaust air hits the exhaust turbine/wheel. To keep it simple, the end result is a turbo with almost zero spool up time that can give the engine a healthy and correct amount boost at any rpm. The problem occurs when the vanes become clogged with soot and freeze up.



20 This pin/lever controls the direction of the turbo's vanes.

Tech & How-To

21 Bulletproof media blasts the exhaust side of the turbo clean and adds a Ford part designed to prolong the interval between cleanings.

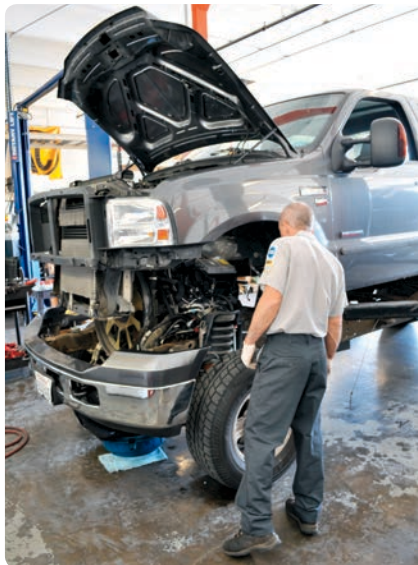


24 Before the cab settles completely onto the frame, Del installed the new oil filter assembly behind the left front bumper.

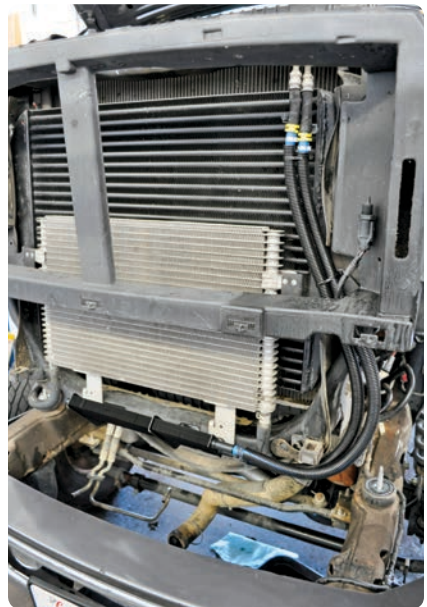


22 Home stretch. Once the turbo is cleaned and reinstalled, all the sensors are plugged back in, the exhaust gets bolted up, and it's almost ready to replace the cab on the chassis.

23 A final check as the cab is lowered into place.



25 The factory power-steering cooler must be moved on this 2006 Superduty to allow room for the new oil cooler. It's a quick job as earlier Superdutys had their power-steering cooler mounted low, so the bolt holes are already there.



26 The new air-to-oil cooler mounts to the AC condenser with supplied bracket and hardware. Heavy-duty hydraulic lines connect the manifold in the engine's valley to the filter and new cooler. This air-to-oil cooler will keep the engine oil much cooler than the factory one. This means less deposit build up and better lubrication for the entire engine.



27 Another common failure is the Powerstroke's water pump. The factory pump has a plastic impeller that commonly cracks around the hub. The new Bulletproof pump uses a much stronger billet aluminum impeller, which helps prevent failures that could lead to overheating problems.



28 The Ford's radiator fan uses an electrically controlled clutch. The wires to this clutch always seem to get caught by the fan, and obviously, get ripped apart.

Further proving their vast knowledge of the 6.0-liter Powerstroke, Bulletproof has two fixes for this. First, seen here is a protective sheath for the wires. The second fix is an adaptor they've made that will allow a mechanical clutch from an earlier Powerstroke to be installed in the electric one's place, eliminating the wires altogether.



29 Last big problem: The fuel injection control module (FICM). It's the brain of the engine and lives its life in a very harsh environment. Mounted to the driver's side, valve cover vibration and high heat levels beat up on the FICM. A failed FICM will cause slow starts, poor cool-weather performance, poor performance, poor fuel economy and possibly a no-start situation.

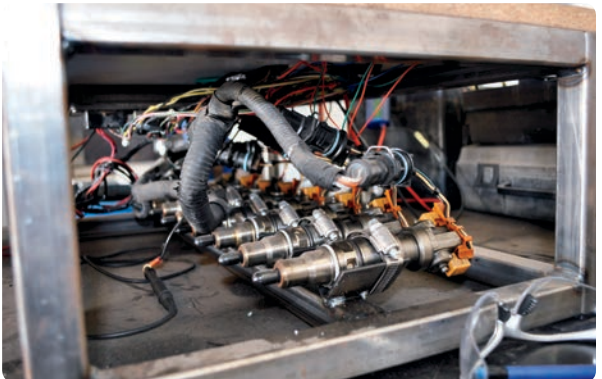


30 When FICMs fail, it's rarely the brain, but usually its power supply (on the right of the photo). Testing the FICM is easy. Simply measure the voltage output at the top pin (here it would be the bottom pin as the FICM is upside down in this photo). Anything less than 48 volts means the power supply has failed.

bottom pin as the FICM is upside down in this photo). Anything less than 48 volts means the power supply has failed.



31 Bulletproof's new unit uses a much thicker, vibration-resistant circuit board, military-grade electrical components, and a full billet aluminum case with built in heat-sinks for optimal heat dissipation. An optional six-phase unit is available that features two extra redundant power circuits ready to take over in the rare event of a failure.



32 Ken Neal built this test bench where each FICM is plugged in to ensure there are zero problems before it goes out to the final user. The tester has all eight injectors set up to fool the FICM into thinking it's plugged into a running 6.0 liter.



33 All said and done, the rebuild took five long days to complete. Once finished, Bulletproof drives each vehicle a minimum of 500 miles before handing it back to the owner to make sure all the bugs have been worked out. Problems are rare, but they want any potential issues to happen to them, not the owner. With all the Bulletproof Diesel parts installed and common problems fixed, the owner should be confident their new Bulletproof 6.0-liter Powerstroke will give them years of problem-free service.

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