

STOP YOUR 6.0L FROM FAILING

NEW POWER STROKE FIXES—FOR TRUCKS AND VANS



Bullet Proof Diesel's Jacob Lopez walked us through the install of BPD's EGR and engine oil cooler systems on this '05 E-350 with 133,000 miles. It turns out the 6.0L van is slightly different than the pickup version. The vans use a smaller radiator and intercooler and they were built in Ohio—instead of Kentucky where the Super Dutys go together.

The '03 to '07 6.0L Power Stroke engines (which were also used in E-Series vans until '09) have terrible reputations for reliability and repair costs among diesel enthusiasts. You've no doubt heard the horror stories about blown 6.0L head gaskets, fuel system problems, and turbo failures.

THEY'RE NOT JUNK

While the 6.0L isn't a perfect engine, what your Cummins and Duramax buddies won't admit to is these engines are far from junk. The 6.0L (based on International's VT365 engine) was a technological marvel when it debuted in 2003, and it was the first engine American pickup buyers could get with digitally controlled injection, exhaust gas recirculation (EGR), and a variable-geometry turbo.

The 6.0L's complexity even exceeded that of the original '01 to '03 LB7 Duramax. Readers should also know the 6.0L was designed to



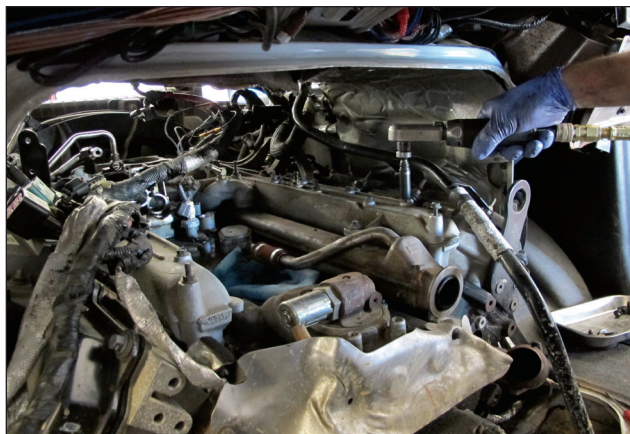
Lopez spent most of his time working with one hand on a flashlight, and the other reaching into the engine to disconnect stuff. The turbo was removed through the van's doghouse, then the oil filter hard lines, turbo pedestal, and the hose to the EGR cooler were loosened.

be produced in greater volumes than any other diesel made since WWII. When you mix Ferrari-like intricacy with millions of parts going together on two different assembly lines (in two different states!)—there are bound to be growing pains.

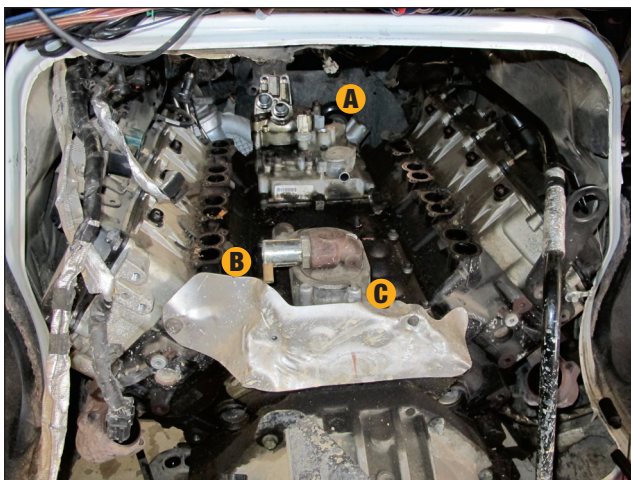
STICK WITH THE EXPERTS

When selecting a shop to work on your truck, find a place where the technicians drive 6.0Ls. As complex as these engines are, it's critical the mechanics know (and care about) what they're doing. The right shop will have at least one Super Duty with the cab off the frame when you stop by to get an estimate.

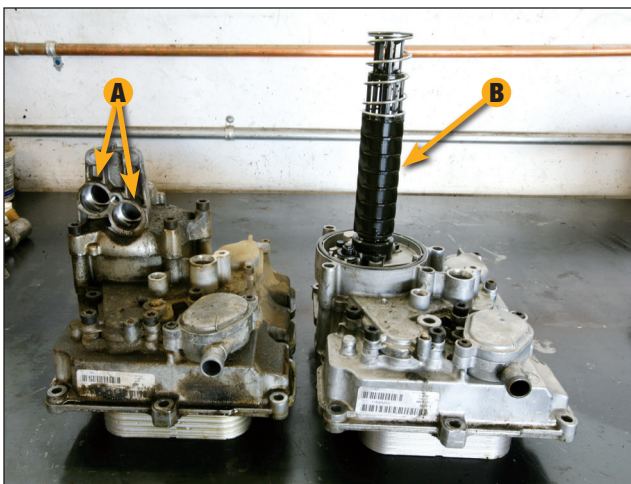
One of the most experienced 6.0L shops in the country is Bullet Proof Diesel (BPD) in Mesa, Arizona. Started by Gene and Ken Neal, BPD began as a full-service auto and diesel repair business, yet it's come to specialize in Power Stroke trucks due to the brothers' personal quest to find a permanent fix for failed 6.0L EGR coolers. Bullet Proof Diesel's lifetime-warranty, TIG-welded EGR coolers



The intake manifold bolts and studs were then removed. Lopez took special care to mark which fasteners the engine's wiring loom clipped to. This way, he could return them all to the proper location.



With the intake out of the way, Lopez vacuumed the lifter valley to remove debris. With the engine's wiring tucked off to the driver side and the top of the engine clean, Lopez removed the factory oil cooler (A) as well as the injection control pressure (IPR) valve (B), and the high-pressure oil pump cover (C).



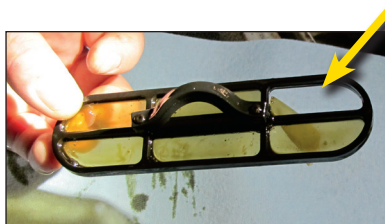
The van uses a slightly different oil cooler (left) than the pickup truck version (right). The biggest difference is the van version sends oil via these two ports (A) to a remote-mounted oil filter on the side of the engine. The truck oil cooler uses a cartridge filter that slides over this plastic inlet tube (B). Note: The oil filter housing has been removed from the truck oil cooler in this photo.

have put an end to EGR cooler failures once and for all. But the Neal brothers didn't stop there.

AIR-TO-OIL COOLER KIT

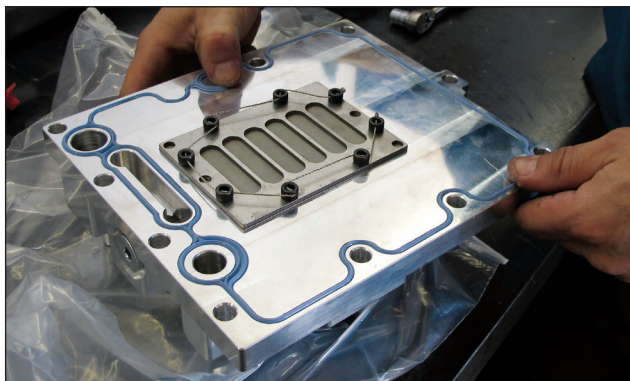
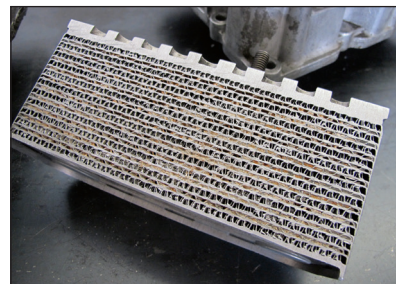
Like most diesel engines, the Ford 6.0L uses an oil-to-engine-coolant heat exchanger to cool the engine's oil. Using coolant is a very efficient way to remove heat from the oil. However, the oil in a 6.0L Power Stroke is the hardest working oil in diesel. It not only lubricates the engine and cools the pistons, it's also used as a hydraulic fluid to drive the high-pressure fuel injection system. While most diesel oil gets exposed to no more than 60 psi of pressure, the oil in a 6.0L gets routinely punished by pressures of more than 3,000 psi. That pressure makes a ton of heat!

Dealing with the heat is the job of the factory stacked-plate oil cooler mounted in the lifter valley of the engine. In an ingenious attempt to

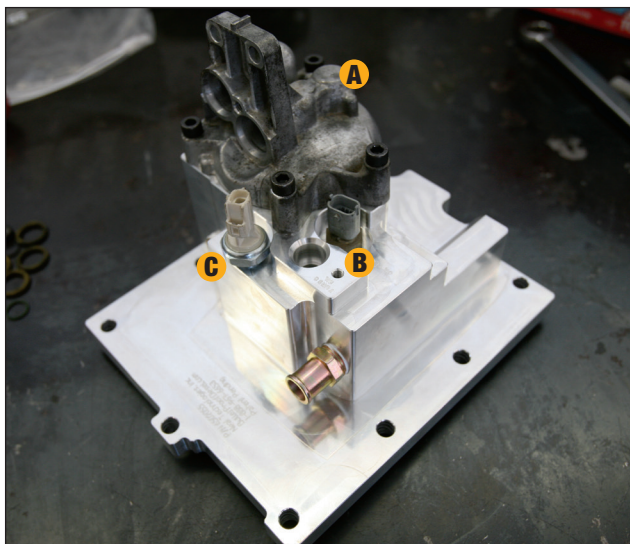


Beneath all 6.0L oil coolers is this screen that's fitted into the block to prevent contamination in the oil from being sucked into the injection system's high-pressure oil pump. As you can see, one of the screen's plastic panels had already failed (arrow).

Bullet Proof Diesel told us the problems with the factory 6.0L oil cooler are caused by contamination invading these coolant passages in the oil-to-coolant heat exchanger, which radically reduces heat transfer. You'll note in this photo that every other row in the heat exchanger core appears to be plugged up with contamination. You can tell if your oil cooler is failing by using a scan tool to compare the engine's oil and coolant temperatures. The two numbers should be within 15 degrees of each other when driving down the road.



Bullet Proof Diesel's machined-aluminum oil cooler module replaces the original cast-aluminum piece. This new cooler not only bolts in just like the factory part (it uses the OE gasket), but it also replaces the failure-prone plastic screen with a stainless steel filter that's bolted and safety-wired to the bottom of the unit.



Lopez transferred over the van's oil inlet-outlet casting (A), as well as the factory oil temperature sensor (B), and oil pressure sensor (C) to the BPD oil cooler.

eliminate oil leaks, International designed the 6.0L's oil system with no external lines or fittings. This is great for leaks but makes it hard to rid the oil of heat. Add to that the fact that these coolers tend to plug up with contamination, and your 6.0L's oil system can reach meltdown temperatures.

Bullet Proof Diesel now offers a solution for that problem as well. The BPD air-to-oil cooler kit has been installed on our company's 6.0L F-250 for years now, but when BPD adapted its kit for use on 6.0L vans, we headed over to Mesa to find out more.



The BPD oil cooler module was then bolted into place using the factory hardware.



With the oil cooler problems solved, it was time to move on to fixing the EGR system. The first thing we should point out is that the EGR system leads a very tough life, because it's constantly being bombarded with hot, sooty exhaust. The more black smoke your diesel blows, the harder it is on the EGR system. The turbo inlet on this engine was actually quite clean for a 150,000-mile 6.0L, but it does give you an idea of what the EGR system has to deal with. When an EGR cooler fails, it typically leaks coolant into the exhaust flow. Lopez looked into the turbo to make sure the vanes weren't clogged with scaly, gooey carbon buildup.



This particular van's EGR system seemed to be in good overall shape. It had very little soot buildup on the EGR valve. The truck clearly had its head gaskets replaced, and it seems like the EGR valve and EGR cooler had already been replaced at least once. Lopez cleaned the EGR valve with a wire brush and replaced the seals.

STOCK EGR COOLER



The EGR cooler takes hot exhaust gas from the exhaust manifolds and cools it before the EGR valve allows it to flow into the engine. It does this by circulating engine coolant around a radiator-like core inside the EGR cooler. The problem with the factory EGR cooler is that the small passages can plug up with soot. The worst-case scenario is when the core inside the EGR cooler cracks and begins to leak coolant into the EGR system.

BPD EGR COOLER



The Bullet Proof Diesel EGR cooler eliminates these problems by using a much stronger core made from TIG-welded stainless steel tubes. These six tubes are not only less restrictive than the stock EGR core—they're also designed to outlast the rest of the engine.



The intake manifold was steam cleaned and thoroughly dried before the BPD EGR cooler was bolted on just like a stock unit. In fact, because the BPD unit uses an OE EGR cooler housing, the BPD EGR cooler looks factory.



Lopez bolted the intake onto the engine with a new set of gaskets. You'll also notice that he removed the high-pressure oil pump cover (arrow), inspected the pump and pressure line, and resealed the cover to the engine.



The factory remote-mount oil filter lines were then connected to the BPD oil cooler module using the factory hardware and new O-ring seals.



The factory wiring harness was then reconnected, and the Garrett VGT turbo was hoisted into place. It was at this point Lopez noticed the transmission dipstick tube was cracked, so he installed a replacement unit before bolting the exhaust manifold up-pipes and downpipe in place.



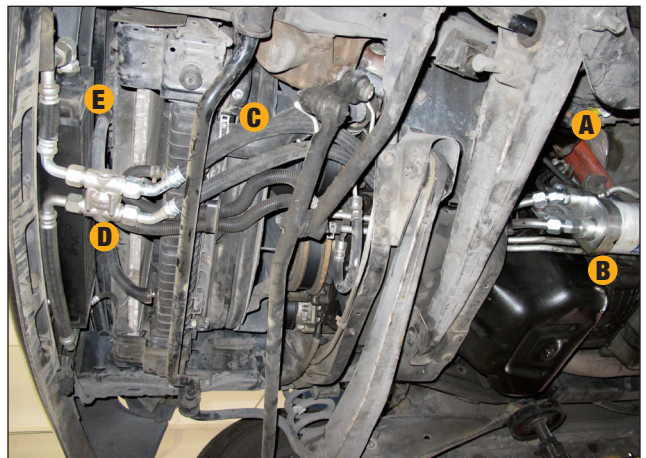
Lopez then moved to the workbench where he assembled the new BPD oil-to-air oil cooler. Now, instead of using engine coolant to remove heat, the engine's oil will be routed through this massive heat exchanger that mounts behind the van's front bumper. The oil-to-air cooler was attached to this laser-cut steel bracket that was sandwiched between the framersails and the factory front bumper (below). A sheet of expanded metal mesh was added over the oil cooler to protect it from dirt and rocks when the van goes off-road.



The factory remote-mount oil filter lines route the engine's oil down to the driver's side of the engine.



But instead of connecting to the factory oil filter, the oil lines were bolted to this slick BPD machined-aluminum oil filter housing. A massive 32-micron filter screws on to one side of the BPD filter housing, while the other side routes the engine oil forward to the oil cooler mounted behind the bumper.



The completed BPD oil cooler system works by routing hot engine oil out through the BPD oil cooler module on top of the engine, through the factory oil filter hard lines (A), to the BPD oil filter housing (B), and then forward through a braided AN line (C). If the oil is less than 180 degrees, a BPD thermostatically controlled bypass (D) sends the oil back to the engine. When the engine is up to operating temperature, the oil flows forward to the oil-to-air oil cooler (E) where the heat is dissipated into the airstream, and the cooled oil then returns through the lines back to the top of the engine. **MP**

Source

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