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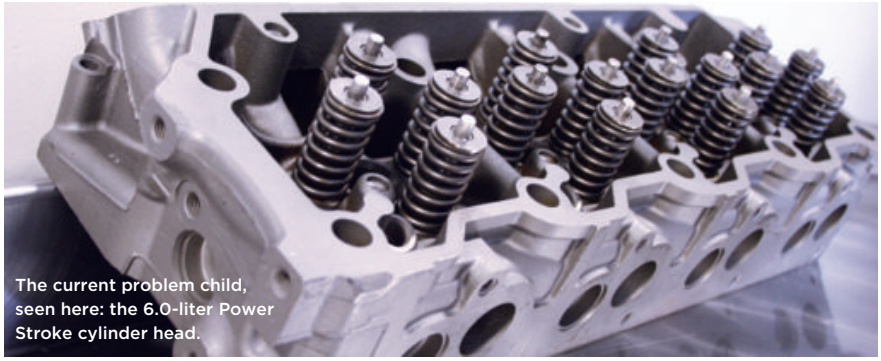
BY AARON GOLD ▼ PHOTOGRAPHY BY AARON GOLD AND COURTESY OF BULLET PROOF DIESEL

SAY NO TO CRACKS

An Innovative Fix For A Cracked 6.0 Cylinder Head



The current problem child, seen here: the 6.0-liter Power Stroke cylinder head.

Cost Comparison:
Ford's fix-
New head: Approximately $1,500
Labor: $4,000 and up
Bullet Proof Diesel's fix-
Seal head cracks: $1,000-$2,000 total, labor and all

There are few experiences in life more unpleasant than opening up one's cooling system and finding something other than coolant. If you have diesel fuel in the coolant of your 6.0-liter Ford Power Stroke, there's a very good chance you've stumbled upon one of the engine's weak points: a crack in the cylinder head between the injector bore and the coolant passage. Ford's recommended repair? Replace the head.

Bullet Proof Diesel of Mesa, Arizona, is in the business of solving problems with the 6.0, and they've come up with an innovative solution that involves sealing the crack rather than replacing the head. The benefits are obvious. A new head costs around $1,500 and the labor for replacing it—which includes removing the entire cab and front clip—can run north of $4,000. And a new head won't necessarily head off the problem. According to Bullet Proof, the cracks don't seem to correspond to any particular mileage or usage pattern, so a new head may be just as prone to cracking as those already installed on the truck.

Bullet Proof's repair does not require removal of the head, and retail cost for the repair is in the neighborhood of $1,000 to $2,000. At that rate, an owner can have four cylinders repaired on four separate occasions and still save money. (Not that this is likely to happen, though Bullet Proof has found trucks with cracks at multiple injector bores.)

Bullet Proof designed their repair kit to use basic hand tools, so if you like to swing your own wrenches and can handle fairly in-depth repairs—say, removing and replacing the fuel injectors, which you will need to do for this repair—you can test for and seal these cracks yourself. The

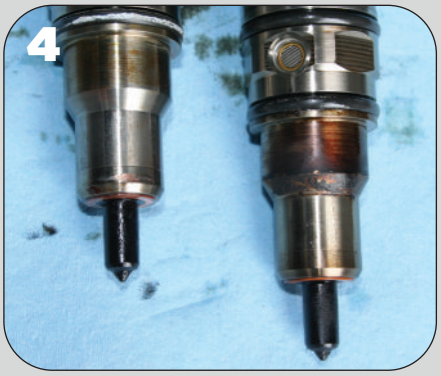
Cracked Cup?

Mechanics who are familiar with the 7.3-liter Power Stroke engine often diagnose fuel in the coolant as a cracked injector cup (the metal insert between the injector and the head). While cracked injector cups are a problem on the 7.3, Bullet Proof has yet to find a 6.0 with a cracked cup. The cracks occur in the head, at or above the top of the cup.

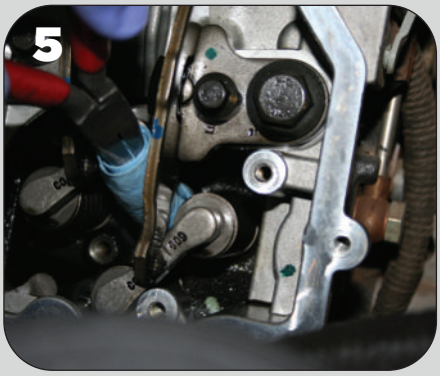
The complete kit includes the repair tool, testing stoppers, grease gun pressure gauge, and four pipettes of sealant, all packaged in a durable Pelican case.

Repair starts by draining the radiator and removing the block plugs to drain coolant from the engine. The cooling system must be completely drained. Next, remove all eight fuel injectors following the procedure in the Ford service manual.

This photo shows where the damage occurs. Fuel enters from the fuel rail (the circular opening at the left), and the crack is on the right, above the injector cup. Mechanics familiar with the 7.3 may misdiagnose the problem as a broken injector cup. On the 6.0 engines, the cracks occur in the head, above the cup



If the crack has extended below the lower injector O-ring, the injectors themselves may give some clue as to the location of the leak. The injector on the left has a small rust stain near the tip, which indicates contact with coolant pooled in the bore. The residue on the injector at right is from coolant-contaminated fuel, and may indicate a leak upstream (i.e., a lower cylinder number). Clean injectors do not indicate lack of a leak; you still need to pressure-test.

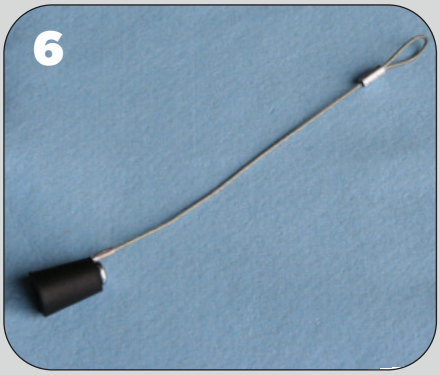


Clean the cylinder heads using a dry shop towel. Vertical marks (perpendicular to the bore) on the exhaust manifold side of the bore are indicators of a crack; machining marks for the bores run parallel to the plane of the cylinder head.

complete testing and repair kit, which includes most of the equipment needed to test the engine and repair up to four cracks, sells for $645.95. Additional sealant sells for $24.95 per pack of four.

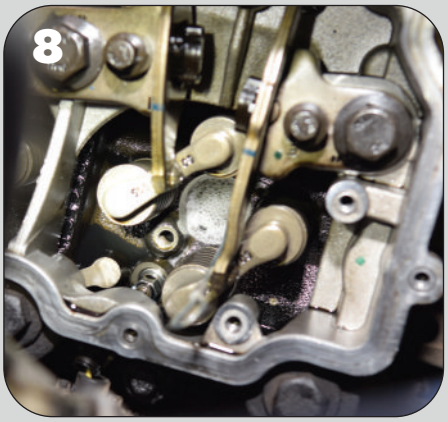
In addition to the kit, you'll need a cooling system pressure tester (Bullet Proof sells them for $49.95) and a grease gun. For disposables, you'll need WD-40, trans prep grease, a tube of grease for the grease gun, brake cleaner, and paper shop towels. Bullet Proof Diesel recommends replacing several rubber parts (including cooling and fuel system O-rings), which may be damaged by diesel fuel; a list is included in the instructions.

"The first step is to verify that you indeed have diesel fuel in your coolant."



Testing is performed on one cylinder at a time. Cracks may exist in more than one cylinder, so be sure to test all eight. Install the four rubber stoppers, which are included with the kit, into the injector bores on one side of the engine. Reinstall all parts removed to drain the coolant (block plugs, petcocks, etc.) so that the cooling system can be pressurized.

Using a coolant system pressure tester, pressurize the cooling system to 20 psi.



One by one, fill the plugged injector bores with WD-40 and allow it to settle. Now comes the part that requires patience. Look for bubbles coming from the exhaust manifold side of the bore. An inspection mirror will be helpful for the rear cylinders. Cracks are most commonly found in cylinder number five (second from the rear on the passenger's side), but Bullet Proof has found cracks in all eight cylinders. Once the cracks have been found, sponge out the WD-40, again using dry shop towels. You are now ready to begin the repair!

This specially designed tool is used to deliver sealant to the cylinder head cracks.

Install the provided O-ring into the tool and lubricate it with transmission assembly lube or grease. Lubricate the entire bottom part of the tool as well as the slide sections between the moving parts of the tool. Without proper lubrication, the tool may bind when you try to remove it.

Place a wad of paper towel into the injector bore to prevent sealant from seeping into the cylinder. The repair tool is installed using the factory injector hold-down bolt. Hand-torque the tool to 24 ft.-lb., working slowly and gently to ensure the tool remains centered and does not bind.

The sealant is packaged in a sealed plastic pipette. Four are provided with the kit, and additional sealant can be ordered from Bullet Proof Diesel.

Minimum Required Supplies:

- Bullet Proof repair kit
- Cooling system pressure tester
- Grease gun
- Tube of grease
- Brake cleaner
- WD-40
- Shop towels
- Assorted hand tools
- Miscellaneous gaskets and O-rings (list included with kit)

Fill the tool with the sealant. Each pipette contains enough sealant for one cylinder.

"Vertical marks (perpendicular to the bore) on the exhaust manifold side of the bore are indicators of a crack."

The first step is to verify that you indeed have diesel fuel in your coolant. Start with the degas (coolant reservoir) bottle. You should be able to see or smell the fuel; fuel-contaminated coolant will smell a bit like varnish. The degas bottle and its cap may swell, making removal difficult, and the coolant hoses may feel spongy. If the residue in the coolant is black or brown, it may be engine oil, which would denote a different problem.

We visited Bullet Proof Diesel to see how the repair is done, and we were impressed by how straightforward it is. Time and patience are the key elements to this repair; be sure you have plenty of both, and remember to follow Bullet Proof's instructions carefully. **UDBG**

A grease gun is used to pressurize the sealant. Prime the pressure gauge and hose (included with the kit) until grease runs out of the end; air in the hose will give a false pressure reading. Attach the hose to the repair tool and pump the gun until the pressure stabilizes at 500 psi. Do not pump more than necessary, otherwise you may force grease into the crack, which will require re-doing the repair.

Watch the gauge for 10 to 15 minutes. The pressure should drop slowly. No pressure drop indicates that either there's no crack at that cylinder or the tool is improperly installed.

After 15 minutes or when pressure drops to near zero, carefully loosen the injector hold-down bolt to remove the repair tool. Verify that there's no grease in the O-ring, which would indicate that the sealant has been pumped too far into the crack. (If this happens, you'll need to clean the crack and repeat the repair; call Bullet Proof Diesel for guidance.) Clean the tool promptly by flooding it with brake parts cleaner. Don't dawdle; if the sealant dries, it will render the repair tool useless.

The sealant must cure for 24 hours (longer in cold temperatures). Do not turn the key to the "on" position as this could pressurize the fuel system. After the sealant has cured, re-test the repaired cylinders using the rubber stoppers, WD-40, and coolant pressure tester. If any of the cylinders show signs of leaks, repeat the repair procedure.

Before refilling the cooling system, Bullet Proof Diesel recommends changing all of the cooling system O-rings and hoses, which may have been contaminated by diesel fuel. (A list of recommended replacement parts is provided with the instructions.) If the degas bottle cap binds when you screw it on, the bottle or the cap may be swollen and will need to be replaced. Flush and refill the cooling system, reinstall the injectors, and the repair is finished!

Remove the towel from the injector bore. Clean the bore using a dry shop towel, lube the O-ring and tool, and repeat the repair procedure for other cylinders with cracks.

In Closing.

If diesel fuel appears in the coolant further down the road, the repaired cylinders are probably not to blame; your engine may have developed cracks at other cylinders. Remove the injectors, drain the coolant, and re-test all eight cylinders.